REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
747.0	1.0	S -1	1-2-1 (3) 73%			0.0-1.5 ft Silty sand, (sm), 60% sand, fine; 40% fines, low plasticity, low toughness; maximum grain size = 1 inches, moderate yellowish brown (10YR 5/4), moist, very loose, trace gravel	sm	
746.0	2.0	S -2	5-8-15 (23) 87%			1.5-3.0 ft Silty sand, (sm), 60% sand, fine to medium; 30% fines, low plasticity, low toughness; 10% gravel, fine, angular, flat, soft hardness; maximum grain size = 0.2 inches, grayish orange (10YR 7/4) and dark gray (N3), moist, medium dense, intermixed pieces of shale.	sm	
745.0	3.0	S -3	15-16-22 (38) 100%			3.0-4.5 ft Silty sand, (sm), 60% sand, fine; 30% fines, low plasticity, low toughness; 10% gravel, fine, angular, flat, soft hardness; maximum grain size = 0.1 inches, moderate brown (5YR 4/4), moist, dense, intermixed pieces of shale, easily broken.	sm	
744.0	4.0							
743.0	5.0	S -4	10-8-10 (18) 100%			4.5-7.5 ft SILTY, CLAYEY GRAVEL WITH SAND, (GC-GM), 49.35% gravel, fine to medium, subrounded to subangular, soft hardness; 34.69% sand, fine to medium; 15.96% fines, low plasticity, medium toughness; maximum grain size = 1.0 inches, light brown (5YR 5/6) to grayish orange (10YR 7/4), moist, medium dense	GC-GM	
742.0	6.0							
741.0	7.0	S -5	11-10-8 (18) 100%					
740.0	8.0	S -6	7-9-10 (19) 100%			7.5-9.0 ft Grayish yellow (5Y 8/4) and dark gray (N3), dry, medium dense, moderately to intensely weathered shale, solid pieces, soft to medium hardness.		
739.0	9.0							
738.0	10.0	ST-1	100%			9.0-10.0 ft Silty sand with gravel, (sm), 60% sand, fine; 20% gravel, fine to medium, subangular, medium hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.2 inches, dark yellowish orange (10YR 6/6), moist	sm	9.0-10.0 ft., ST-1, down pressure of 750 psi
737.0	11.0	S -7	11-21-26 (47) 93%			10.0-11.5 ft Silty sand, (sm), 60% sand, fine; 30% fines, medium plasticity, low toughness; 10% gravel, fine to medium, subangular, medium hardness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4), moist, dense, pieces of moderately weathered shale, iron oxide staining.	sm	
736.0	12.0	S -8	6-6-8 (14) 87%			11.5-13.0 ft Silty sand with gravel, (sm), 50% sand, fine to medium; 30% gravel, fine to medium, subangular, medium hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.25 inches, grayish orange (10YR 7/4) and light greenish gray (5GY 8/1), moist, medium dense, pieces of moderately to intensely weathered shale.	sm	
735.0	13.0							
734.0	14.0	S -9	5-12-15 (27) 93%			13.0-14.5 ft Silty sand, (sm), 60% sand, fine to medium; 30% fines, medium plasticity, low toughness; 10% gravel, fine to medium, subangular, medium hardness; maximum grain size = 0.3 inches, dark yellowish orange (10YR 6/6) and yellowish gray (5Y 7/2), moist, medium dense, small, fissle pieces of moderately to intensely weathered shale dark gray (N3) and yellowish gray (5Y 7/2).	sm	
733.0	15.0	S -10	10-14-16 (30) 87%				sm	
732.0	16.0							
731.0	17.0	S -11	7-16-17 (33) 97%			14.5-16.0 ft Silty sand with gravel, (sm), 40% sand, fine; 40% fines, low plasticity, no dry strength, low toughness; 20% gravel, fine, subrounded; maximum grain size = 0.3 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), moist, medium dense, more small pieces of moderately to intensely weathered shale, some dark gray (N3), iron oxide staining.	sm	Decomposed shale starting at approximately 16.0 ft.
730.0	18.0	S -12	14-34-50/5 100%			16.0-17.0 ft Silty sand, (sm), grayish orange (10YR 7/4) and very light gray (N8), dry, dense	sm	
729.0	19.0	S -13	50/5			17.0-18.9 ft Silty sand, (sm), yellowish gray (5Y 7/2) and grayish orange (10YR 7/4), dry, very dense	sm	
728.0		R-1	100%	FD7		18.9-19.0 ft Interval not sampled		

DATE STARTED: 4/12/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

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COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
727.0	20.0					19.0-19.42 ft Silty sand, (sm), yellowish gray (5Y 7/2) and dark gray (N3), dry, very loose		
	21.0					19.42-29.5 ft SHALE, moderately hard, very intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
726.0	22.0	R-1	90% (0%)					
725.0	23.0							
724.0	24.0							
723.0	25.0			FD7				
722.0	26.0							
721.0	27.0	R-2	100% (8%)					
720.0	28.0					27.8-29.5 ft Joint, R.D. = 90°, 70°; filling: clay; surface: rough, undulating; iron oxidation on fracture faces. Fracture set #F-1.		
719.0	29.0							
718.0	30.0					29.5-34.5 ft SHALE, moderately hard, fresh, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining, intensely weathered section from 29.8 to 31.3 ft., yellowish gray (5Y 7/2).		
717.0	31.0							
716.0	32.0	R-3	88% (26%)	FD7		31.3-33.4 ft Joint, R.D. = 0°, closely spaced; filling: slightly weathered; surface: slightly rough, planar, slightly weathered. Fracture set #F-2.		
715.0	33.0							
714.0	34.0							
713.0	35.0					34.5-39.5 ft SHALE, interbedded, moderately hard, fresh, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		
712.0	36.0					34.5-38.7 ft Joint, R.D. = 50°, 75°, closely spaced; filling: slightly weathered; surface: moderately rough, slightly weathered. Fracture set #F-3.		SC-1 35.4-36.2 at 15:32 on 4/12/10.
711.0	37.0	R-4	100% (46%)	FD5				
710.0	38.0							
709.0	39.0							
708.0		R-5		FD5		39.5-40.1 ft Joint, R.D. = 0 to 20°; surface: slightly rough. Fracture set #F-4.		

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COORDINATES

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GROUND SURFACE ELEVATION: 747.68 ft

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707.0	41.0					39.5-64.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining 40.1-40.8 ft Joint, R.D. = 75°; filling: slightly weathered; surface: slightly rough, slightly weathered; iron oxide on fracture surfaces. Fracture set #F-5.		
706.0	42.0	R-5	100% (44%)	FD5		40.8-41 ft Joint, R.D. = 0° to 20°; Fracture set #F-6. 41.6-41.8 ft Joint, R.D. = 60°; Fracture set #F-7. 41.9-44.2 ft Joint, R.D. = 10°; Fracture set #F-8.		
705.0	43.0							
704.0	44.0							
703.0	45.0							
702.0	46.0					45.2-46.5 ft Joint, R.D. = 45° to 90°; filling: slightly weathered; surface: moderately rough, undulating, slightly weathered; fracture begins at 45°, progesses to 90° and retuns to 45°, iron oxide staining on fracture surfaces. Fracture set #F-9.		
701.0	47.0	R-6	100% (53%)	FD3				
700.0	48.0					47.5-49.5 ft Joint, R.D. = 30°, closely spaced; surface: smooth, planar. Fracture set #F-10.		
699.0	49.0							
698.0	50.0					49.6-49.8 ft Joint, R.D. = 65°; surface: moderately rough, planar. Fracture set #F-11.		
697.0	51.0					50.4-50.5 ft Joint, R.D. = 25°; surface: rough. Fracture set #F-12.		
696.0	52.0	R-7	100% (34%)	FD6		51.7-52.2 ft Joint, R.D. = 70°; surface: moderately rough, undulating. Fracture set #F-13.		
695.0	53.0					52.3-52.7 ft R.D. = 20°; surface: smooth, planar. Fracture set #F-14. 52.9-53.1 ft R.D. = 60°; surface: moderately rough, undulating. Fracture set #F-15.		
694.0	54.0					53.6-53.7 ft Joint, R.D. = 0°; surface: rough. Fracture set #F-16. 53.8-54.2 ft Joint, R.D. = 75°; filling: moderately healed. Fracture set #F-17.		
693.0	55.0					54.5-54.9 ft Joint, R.D. = 100°; surface: slightly rough, undulating. Fracture set #F-18.		
692.0	56.0					54.9-59 ft Joint, R.D. = 0° to 40°, closely spaced; surface: slightly rough, planar. Fracture set #F-19.		
691.0	57.0	R-8	100% (46%)	FD7				
690.0	58.0							
689.0	59.0							
688.0		R-9		FD6		59.5-64.5 ft Joint, R.D. = 0° to 20°, closely spaced; surface: slightly rough.		

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COORDINATES

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						Fracture set #F-20.		
687.0	61.0							
686.0	62.0	R-9	100% (44%)	FD6		39.5-64.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining 60.4-63.6 ft Joint, R.D. = 50°-55°, widely spaced; filling: totally healed.		
685.0	63.0							
684.0	64.0							SC-2 63.85-64.5 ft. at 10:24 on 4/13/10.
683.0	65.0					64.5-69.5 ft SHALE, moderately hard, fresh to moderately weathered, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, becomes moderately weathered from 65.9 ft., shale beginning to weather into clay yellowish gray (5Y 7/2) but still intact, all broken/fractured surfaces with iron oxide staining.		
682.0	66.0							
681.0	67.0	R-10	100% (22%)	FD8		64.5-69.5 ft Joint, R.D. = 0° to 20°, closely spaced; filling: slightly weathered; surface: slightly rough, planar, slightly weathered. Fracture set #F-21.		
680.0	68.0							
679.0	69.0							
678.0	70.0					69.5-74.5 ft SHALE, moderately hard, moderately weathered, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, moderately to intensely weathered, shale beginning to weather into clay, yellowish gray (5Y 7/2), breaking apart in places, becomes intensely weathered at 72.7 ft., quartz filled fracture 72.7-74.5 ft.		
677.0	71.0							
676.0	72.0	R-11	100% (0%)	FD8		72.7-76.1 ft Joint, R.D. = 70°, closely spaced, moderately open; filling: moderately healed, thin quartz, moderately weathered; surface: rough, moderately weathered. Fracture set #F-22.		
675.0	73.0							
674.0	74.0							
673.0	75.0					74.5-79.0 ft SHALE, interbedded, moderately hard, moderately weathered, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, moderately to intensely weathered, shale beginning to weather into yellowish gray (5Y 7/2) clay, quartz filled fracture 75.2-76.1 ft., shale becomes fresh to slightly weathered from 76.1 - 79.0 ft.		
672.0	76.0							
671.0	77.0	R-12	100% (24%)	FD6		76.1-79 ft Joint, R.D. = 20° to 45°, closely spaced, slightly open; iron oxide staining on fracture surfaces. Fracture set #F-23.		
670.0	78.0							
669.0	79.0							
668.0		R-13	100% (24%)	FD6		79.0-84.5 ft SHALE, moderately hard, fresh, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining		

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667.0	81.0					79.1-80.15 ft Joint, R.D. = 10°; surface: slightly rough, planar. Fracture set #F-25.		
666.0	82.0	R-13	100% (24%)	FD6		79.6-80.1 ft Joint, R.D. = 60°; surface: moderately rough, undulating. Fracture set #F-24.		
665.0	83.0					79.0-84.5 ft SHALE, moderately hard, fresh, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining		
664.0	84.0					80.3-81.7 ft Joint, R.D. = 70°; filling: slightly weathered; surface: moderately rough, planar, slightly weathered. Fracture set #F-26.		
663.0	85.0					82.9-83.2 ft Joint, R.D. = 0°; Fracture set #F-27.		
662.0	86.0					83.2-84.3 ft Joint, R.D. = 85°; filling: moderately healed, very thin calcite, slightly weathered; surface: slightly weathered. Fracture set #F-28.		
661.0	87.0	R-14	100% (0%)	FD7		84.5-89.5 ft SHALE, moderately hard, fresh, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, moderately weathered from 86.8-87.85 ft., shale beginning to weather into yellowish gray (5Y 7/2) clay, breaking apart in places, quartz filled fracture 85.7-86.5 ft., 75°.		
660.0	88.0					84.5-85.6 ft R.D. = 10° to 20°; surface: slightly rough, planar. Fracture set #F-29.		
659.0	89.0					85.7-86.5 ft Joint, R.D. = 70°, slightly open; filling: partly healed, very thin quartz, slightly weathered, moderately hard; surface: rough, slightly weathered; fracture healed 85.7-86.0 ft., broken open/unhealed 86.0-86.6 ft., iron oxide staining. Fracture set #F-30.		
658.0	90.0					87.85-88.3 ft Joint, R.D. = 70°; filling: moderately healed, very thin; iron staining within fracture. Fracture set #F-31.		
657.0	91.0					88.5-88.8 ft Joint, R.D. = 10°; surface: smooth, planar. Fracture set #F-32.		
656.0	92.0	R-15	100% (92%)	FD3		88.9-89.4 ft Joint, R.D. = 65°; surface: slightly rough, planar. Fracture set #F-33.		
655.0	93.0					89.5-94.5 ft SHALE, moderately hard, fresh, dark gray (N3), widely fractured, no reaction to HCl, iron oxide staining, moderately weathered shale 89.5-89.7 ft., calcite healed fracture 93.8-94.1 ft., trace pyrite on healed fracture.		SC-3 90.8 - 92.10 at 11:20 on 4/14/10.
654.0	94.0					89.5-90.8 ft Joint, R.D. = 10°; surface: smooth, planar. Fracture set #F-34.		
653.0	95.0					93.8-94.1 ft Joint, R.D. = 60°, moderately open; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-35.		
652.0	96.0					94.5-99.5 ft SHALE, moderately hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace fossils and pyrite throughout sample.		
651.0	97.0	R-16	100% (100%)	FD1		95.3-95.4 ft Joint, R.D. = 0°; surface: smooth. Fracture set #F-36.		
650.0	98.0							
649.0	99.0							
648.0		R-17		FD1				99.5 ft., Sample

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NOTES:

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DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

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647.0	101.0					99.5-241.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite throughout sample.		mechanically broken while being removed from core catcher.
646.0	102.0	R-17	100% (100%)	FD1		101.3-101.6 ft Joint, R.D. = 55°; surface: slightly rough, planar. Fracture set #F-37.		
645.0	103.0							
644.0	104.0							
643.0	105.0							
642.0	106.0							
641.0	107.0	R-18	100% (100%)	FD0		107.5-108.4 ft Joint, R.D. = 80°; filling: totally healed, moderately thin calcite, fresh, soft; surface: fresh; u-shaped fracture. Fracture set #F-38.		
640.0	108.0							
639.0	109.0							
638.0	110.0							
637.0	111.0							
636.0	112.0	R-19	100% (100%)	FD0				
635.0	113.0							
634.0	114.0							
633.0	115.0							
632.0	116.0							
631.0	117.0	R-20	100% (100%)	FD0				
630.0	118.0							
629.0	119.0							
628.0		R-21		FD0		119-120 ft Joint, R.D. = 75°, closely spaced, slightly open; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh; two		

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627.0	121.0					relatively parallel, u-shaped vertically, totally healed with calcite fractures. Fracture set #F-39.		
						99.5-241.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite throughout sample.		
626.0	122.0	R-21	100% (100%)	FD0				
625.0	123.0							
624.0	124.0							
623.0	125.0					124.25-124.3 ft Joint, R.D. = 5°; filling: totally healed, very thin calcite, moderately soft. Fracture set #F-40.		
622.0	126.0					125.8-126.55 ft Joint, R.D. = 70°; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh; u-shaped vertical fracture, discontinuous in places. Fracture set #F-41.		
621.0	127.0	R-22	96% (96%)	FD0				
620.0	128.0							
619.0	129.0							
618.0	130.0							129.5ft, Drillers having difficult time retrieving core collector, fractures in sample probably mechanical.
617.0	131.0					130.9-131.4 ft Joint, R.D. = 45°; surface: slightly rough, planar. Fracture set #F-42.		
616.0	132.0	R-23	100% (87%)	FD2		131.6-133.1 ft Joint, R.D. = 70°; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh; fracture/healing distorted, not continuous/interrupted, u-shaped vertical. Fracture set #F-43.		
615.0	133.0							
614.0	134.0							
613.0	135.0					135.3-135.4 ft Joint, R.D. = 10°, very closely spaced; surface: slightly rough, planar. Fracture set #F-44.		
612.0	136.0							
611.0	137.0	R-24	100% (100%)	FD1				
610.0	138.0							
609.0	139.0							
608.0		R-25		FD1				

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607.0	141.0					99.5-241.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite throughout sample.		SC-4 140.9 - 141.9 ft at 11:00 on 4/20/10.
606.0	142.0	R-25	100% (86%)	FD1				
605.0	143.0							
604.0	144.0							
603.0	145.0							
602.0	146.0							
601.0	147.0	R-26	96% (96%)	FD0				
600.0	148.0							
599.0	149.0							
598.0	150.0							
597.0	151.0							
596.0	152.0	R-27	100% (100%)	FD0				
595.0	153.0							
594.0	154.0							
593.0	155.0							
592.0	156.0							
591.0	157.0	R-28	100% (100%)	FD0				
590.0	158.0							
589.0	159.0							
588.0		R-29		FD0				

DATE STARTED: 4/12/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
587.0	161.0					99.5-241.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite throughout sample.		
586.0	162.0	R-29	98% (96%)	FD0		162-162.1 ft Joint, R.D. = 20°; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-46.		
585.0	163.0							
584.0	164.0							
583.0	165.0							
582.0	166.0							
581.0	167.0	R-30	100% (100%)	FD0				
580.0	168.0							
579.0	169.0							
578.0	170.0							
577.0	171.0							
576.0	172.0	R-31	100% (100%)	FD0				
575.0	173.0							
574.0	174.0							
573.0	175.0							
572.0	176.0							
571.0	177.0	R-32	100% (100%)	FD0				
570.0	178.0							
569.0	179.0							
568.0		R-33		FD0				

DATE STARTED: 4/12/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
567.0	181.0					99.5-241.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite throughout sample.		
566.0	182.0	R-33	100% (100%)	FD0				
565.0	183.0							
564.0	184.0							
563.0	185.0							
562.0	186.0							
561.0	187.0	R-34	100% (100%)	FD0				
560.0	188.0							
559.0	189.0							
558.0	190.0							Short, 2.0 ft run, due to drillers removing casing advancer
557.0	191.0	R-35	75% (75%)	FD0				
556.0	192.0							
555.0	193.0					192.7-193.2 ft Joint, R.D. = 75°, very closely spaced; surface: slightly rough, planar. Fracture set #F-47.		
554.0	194.0	R-36	100% (83%)	FD1				
553.0	195.0							SC-5 195.0- 196.5 ft at 10:30 on 4/21/10.
552.0	196.0							
551.0	197.0							
550.0	198.0	R-37	100% (94%)	FD1				
549.0	199.0							
548.0								

DATE STARTED: 4/12/10
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FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
547.0	201.0	R-37	100% (94%)	FD1		99.5-241.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite throughout sample. 200.6-200.9 ft Joint, R.D. = 60°; surface: slightly rough, planar. Fracture set #F-48.		
546.0	202.0							
545.0	203.0							
544.0	204.0	R-38	100% (100%)	FD0				
543.0	205.0							
542.0	206.0							
541.0	207.0							
540.0	208.0							
539.0	209.0	R-39	100% (98%)	FD0				
538.0	210.0							
537.0	211.0							
536.0	212.0							
535.0	213.0							
534.0	214.0	R-40	100% (100%)	FD0				
533.0	215.0							
532.0	216.0							
531.0	217.0							
530.0	218.0	R-41	98% (98%)	FD1		217.3-218 ft Joint, R.D. = 80°, tight; surface: slightly rough, planar. Fracture set #F-49.		
529.0	219.0							
528.0								

DATE STARTED: 4/12/10
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FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
527.0	221.0	R-41	98% (98%)	FD1		99.5-241.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite throughout sample.		
526.0	222.0							
525.0	223.0							
524.0	224.0	R-42	100% (100%)	FD0				
523.0	225.0							
522.0	226.0							
521.0	227.0							
520.0	228.0							
519.0	229.0	R-43	98% (98%)	FD0				
518.0	230.0							
517.0	231.0							
516.0	232.0							
515.0	233.0							
514.0	234.0	R-44	100% (100%)	FD0				
513.0	235.0							
512.0	236.0							
511.0	237.0							
510.0	238.0	R-45	100% (100%)	FD0				
509.0	239.0							
508.0								

DATE STARTED: 4/12/10
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FIELD GEOLOGIST: Jesse Merkel
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DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
507.0	241.0	R-45	100% (100%)	FD0		99.5-241.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite throughout sample.		
506.0	242.0					241.5-246.5 ft SHALE, interbedded, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite, slightly more fossils than above concentrated into several layers (242.5-242.7 ft., 244.0 ft., 245.1-245.2 ft., 246.2 ft.).		
505.0	243.0							
504.0	244.0	R-46	100% (100%)	FD0				
503.0	245.0							
502.0	246.0							
501.0	247.0					246.5-251.5 ft SHALE, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, distinct fossil bands at 246.9-247.7 ft. and 249.8-250.2 ft., trace fossils and pyrite throughout sample.		SC-6 247.35 - 248.9 ft. at 08:15 on 4/22/10.
500.0	248.0							
499.0	249.0	R-47	100% (100%)	FD0				
498.0	250.0							
497.0	251.0							
496.0	252.0					251.5-266.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, fossil layers and trace pyrite throughout sample.		
495.0	253.0							
494.0	254.0	R-48	100% (100%)	FD0				
493.0	255.0							
492.0	256.0							
491.0	257.0							
490.0	258.0	R-49	100% (100%)	FD0				
489.0	259.0							
488.0								

DATE STARTED: 4/12/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Jesse Merkel
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DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
487.0	261.0	R-49	100% (100%)	FD0		251.5-266.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, fossil layers and trace pyrite throughout sample.		
486.0	262.0							
485.0	263.0							
484.0	264.0	R-50	100% (100%)	FD0				
483.0	265.0							
482.0	266.0							
481.0	267.0					266.5-271.5 ft SHALE, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, fossil lenses, increasing toward bottom of sample, trace pyrite.		
480.0	268.0							
479.0	269.0	R-51	98% (98%)	FD0				
478.0	270.0							
477.0	271.0							
476.0	272.0					271.5-276.5 ft SHALE, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite, non-linear, wavy, calcite healed fractures at 272.2 and 272.75 ft. 272.2-272.75 ft Joint, R.D. = 15°, closely spaced; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh; fracture non-linear, wavy. Fracture set #F-50.		
475.0	273.0							
474.0	274.0	R-52	100% (100%)	FD0				
473.0	275.0							
472.0	276.0							
471.0	277.0					276.5-281.5 ft SHALE, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite, 0.05 ft. thick totally healed with calcite fracture at 277.3 ft. 277.25-277.3 ft Joint, R.D. = 20°; filling: totally healed, moderately thick calcite, fresh, moderately soft; surface: fresh. Fracture set #F-51.		
470.0	278.0	R-53	100% (100%)	FD0				
469.0	279.0							
468.0								

DATE STARTED: 4/12/10
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DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
467.0	281.0	R-53	100% (100%)	FD0		276.5-281.5 ft SHALE, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils and pyrite, 0.05 ft. thick totally healed with calcite fracture at 277.3 ft.		
466.0	282.0					281.5-286.5 ft SHALE, moderately hard, fresh, dark gray (N3), widely to very widely fractured, no reaction to HCl, trace fossils and pyrite, fractures totally healed with calcite 282.2 ft., 283.5 ft., 285.8-286.5 ft.		
465.0	283.0					282.2-283.6 ft Joint, R.D. = 15°, widely spaced; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: planar, fresh. Fracture set #F-52.		
464.0	284.0	R-54	100% (100%)	FD0				
463.0	285.0							
462.0	286.0					285.8-286.5 ft Joint, R.D. = 60°; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-53.		
461.0	287.0					286.5-291.5 ft SHALE, moderately hard, fresh, dark gray (N3), widely to very widely fractured, no reaction to HCl, trace pyrite, wavy calcite-healed fracture, very thin, at 288.55 ft.		
460.0	288.0							
459.0	289.0	R-55	92% (92%)	FD0		288.55-288.6 ft Joint, R.D. = 25°; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh; wavy. Fracture set #F-54.		
458.0	290.0							
457.0	291.0					291-291.1 ft Joint, R.D. = 25°; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-55.		
456.0	292.0					291.5-296.5 ft SHALE, moderately hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl, totally healed with calcite fracture-zone, several irregular pieces of shale within healing, 294.3-296.5 ft.		SC-7 293.2-294.3 ft. at 15:00 on 4/22/10.
455.0	293.0							
454.0	294.0	R-56	100% (100%)	FD0		294.3-296.5 ft Joint, R.D. = 10°, 55°, moderately spaced; filling: totally healed, moderately thick calcite, fresh, moderately soft; surface: fresh. Fracture set #F-56.		
453.0	295.0							
452.0	296.0							
451.0	297.0					296.5-301.5 ft SHALE, moderately hard, fresh, dark gray (N3), moderately to very widely fractured, no reaction to HCl, trace fossils and pyrite, totally healed with calcite set of fractures 297.0-298.7 ft., at 75°.		
450.0	298.0	R-57	100% (100%)	FD0		297-298.7 ft Joint, R.D. = 75°; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-57.		
449.0	299.0							
448.0								

DATE STARTED: 4/12/10
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FIELD GEOLOGIST: Jesse Merkel
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DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
447.0	301.0	R-57	100% (100%)	FD0		296.5-301.5 ft SHALE, moderately hard, fresh, dark gray (N3), moderately to very widely fractured, no reaction to HCl, trace fossils and pyrite, totally healed with calcite set of fractures 297.0-298.7 ft., at 75°.		
446.0	302.0					301.5-306.5 ft SHALE, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace pyrite throughout sample. 301.93-301.95 ft Joint, R.D. = 0°; filling: totally healed, very thin calcite, fresh, moderately soft; surface: planar, fresh. Fracture set #F-58.		
445.0	303.0							
444.0	304.0	R-58	96% (96%)	FD0				
443.0	305.0							
442.0	306.0							
441.0	307.0					306.5-356.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), closely to extremely widely fractured, no reaction to HCl, trace pyrite.		
440.0	308.0							
439.0	309.0	R-59	100% (100%)	FD0				
438.0	310.0					309.55-309.6 ft Joint, R.D. = 10°; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-59.		
437.0	311.0							
436.0	312.0							
435.0	313.0							
434.0	314.0	R-60	100% (100%)	FD0				
433.0	315.0							
432.0	316.0							
431.0	317.0							
430.0	318.0	R-61	94% (94%)	FD0				
429.0	319.0							
428.0								

DATE STARTED: 4/12/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, HQ
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NOTES:

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HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
427.0	321.0	R-61	94% (94%)	FD0		306.5-356.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), closely to extremely widely fractured, no reaction to HCl, trace pyrite.		
426.0	322.0					321.5-324 ft R.D. = 70°-80°, closely spaced; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh; healed fractures discontinuous in places. Fracture set #F-60.		
425.0	323.0							
424.0	324.0	R-62	100% (100%)	FD0		324-324.1 ft Joint, R.D. = 15°; filling: totally healed, moderately thick calcite, fresh, moderately soft; surface: planar, fresh. Fracture set #F-61.		
423.0	325.0							
422.0	326.0							
421.0	327.0							
420.0	328.0							
419.0	329.0	R-63	100% (100%)	FD0		329.35-329.85 ft Joint, R.D. = 0°, closely spaced; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-62. 329.85-330.3 ft Joint, R.D. = 70°; filling: totally healed, very thin calcite and pyrite, fresh, moderately soft; surface: fresh. Fracture set #F-63.		
418.0	330.0							
417.0	331.0							
416.0	332.0					331.9-334.2 ft Joint, R.D. = 56°; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh; discontinuous. Fracture set #F-64.		
415.0	333.0					332.9-335.7 ft Joint, R.D. = 10°, widely spaced; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-65.		
414.0	334.0	R-64	100% (100%)	FD0				
413.0	335.0							
412.0	336.0							
411.0	337.0					336.5-337.2 ft Joint, R.D. = 85°; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-66. 337.2-337.33 ft Joint, R.D. = 15°, very closely spaced; filling: totally healed, moderately thick calcite, fresh, moderately soft; surface: fresh; multiple tightly packed bands. Fracture set #F-67.		
410.0	338.0	R-65	98% (90%)	FD2		337.33-338.2 ft Joint, R.D. = 70°, very closely spaced; filling: totally healed, thin calcite, fresh, moderately soft; surface: fresh; zone of many healed fractures, generally dipping 70 °, with irregular broken pieces of shale within calcite healing.. Fracture set #F-68. 338.2-338.25 ft Joint, R.D. = 15°, very closely spaced; filling: totally healed,		
409.0	339.0							
408.0								

DATE STARTED: 4/12/10
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DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES
N. 340123.51 ft E. 2405131.34 ft
GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						thin calcite. Fracture set #F-69.		
407.0	341.0	R-65	98% (90%)	FD2				
406.0	342.0					338.3-338.7 ft Joint, R.D. = 75°, tight; surface: slightly rough, planar; probably mechanically broken during retrieval. Fracture set #F-70. 339.2-340.8 ft Joint, R.D. = 25°, moderately spaced; filling: totally healed, very thin calcite, fresh, moderately soft; surface: smooth, planar, fresh. Fracture set #F-71.		SC-8 342.8-344.0 ft. at 14:20 4/23/10.
405.0	343.0							
404.0	344.0	R-66	100% (100%)	FD0		306.5-356.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), closely to extremely widely fractured, no reaction to HCl, trace pyrite. 341.5-342.2 ft Joint, R.D. = 75°; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-72. 342.2-342.25 ft Joint, R.D. = 15°; filling: totally healed, thin calcite, fresh, moderately soft; surface: smooth, planar, fresh. Fracture set #F-73. 343.3-346.5 ft Joint, R.D. = 20°, closely spaced; filling: totally healed, very thin calcite, fresh, moderately soft; surface: smooth, planar, fresh; very thin to clean, totally healed/calcite fractures dipping geneally at 70° within this zone. Fracture set #F-74. 346.5-346.65 ft Joint, R.D. = 90°, very closely spaced; filling: totally healed, moderately thick calcite, fresh, moderately soft; surface: smooth, planar, fresh; three vertical bands with broken, irregular, shale fragments within healing. Fracture set #F-75.		
403.0	345.0							
402.0	346.0							
401.0	347.0							
400.0	348.0							
399.0	349.0	R-67	98% (90%)	FD0		349.65-350.9 ft Joint, R.D. = 0°, moderately spaced; filling: totally healed, very thin calcite, fresh, moderately soft; surface: planar, fresh; very thin to clean, calcite-healed fractures, starting below 350.9 ft., a nearly clean, calcite-healed fracture dipping at 65°, fades out at 351.1 ft.. Fracture set #F-76.		
398.0	350.0							
397.0	351.0							
396.0	352.0							
395.0	353.0							
394.0	354.0	R-68	100% (100%)	FD0				
393.0	355.0							
392.0	356.0							
						---		Snapped wireline pulling R-69
								Changed drilling rig to CME-550 (Buggy), description continues on next page

DATE STARTED: 4/12/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, HQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
407.0	341.0							This description is for the continuation of B-401 core sample collection with CME-550 (Buggy)
406.0	342.0							
405.0	343.0							
404.0	344.0							
403.0	345.0							
402.0	346.0							
401.0	347.0							
400.0	348.0							
399.0	349.0							
398.0	350.0							
397.0	351.0							
396.0	352.0							
395.0	353.0							
394.0	354.0							
393.0	355.0							
392.0	356.0							
391.0	357.0	R -69	98% (98%)	FD0		356.5-361.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite and calcite, in some areas calcite showing secondary replacement by pyrite		CME 550 (Buggy) rig starts drilling at 356.5 ft on 4/28/10, switch from HQ wireline to NQ wireline at 361.5 ft.
390.0	358.0							
389.0	359.0							
388.0								

DATE STARTED: 4/28/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
387.0	361.0	R -69	98% (98%)	FD0		356.5-361.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite and calcite, in some areas calcite showing secondary replacement by pyrite		
386.0	362.0					361.5-381.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace pyrite to zones with trace to moderate amounts of pyrite (366.9-367.8 ft.), trace calcite showing secondary replacement by pyrite, oily sheen on surface		
385.0	363.0							
384.0	364.0	R -70	100% (94%)			363.6-363.61 ft Bedding plane separation, R.D. = 10°; filling: totally healed, very thin calcite, fresh; surface: fresh.		
383.0	365.0							
382.0	366.0			FD1				
381.0	367.0							
380.0	368.0							
379.0	369.0	R -71	99% (99%)					
378.0	370.0							
377.0	371.0							
376.0	372.0							
375.0	373.0							
374.0	374.0	R -72	100% (100%)					
373.0	375.0							
372.0	376.0			FD0				
371.0	377.0							
370.0	378.0	R -73	100% (100%)					
369.0	379.0							
368.0								

DATE STARTED: 4/28/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES

N. 340123.51 ft E. 2405131.34 ft

GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
367.0	381.0	R -73	100% (100%)	FD0		381.0-396.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely to widely fractured, no reaction to HCl, trace pyrite, oily sheen on rock surface, trace calcite replaced shells		
366.0	382.0							
365.0	383.0							
364.0	384.0	R -74	100% (100%)	FD1		384.6-384.65 ft Bedding plane separation, R.D. = 10°; filling: not healed; surface: smooth, planar; slickensides on bedding plane surface.		
363.0	385.0							
362.0	386.0							
361.0	387.0							
360.0	388.0							
359.0	389.0	R -75	100% (100%)					
358.0	390.0							
357.0	391.0							
356.0	392.0							
355.0	393.0			FD0				
354.0	394.0	R -76	100% (100%)					
353.0	395.0							
352.0	396.0							
351.0	397.0					396.0-411.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite and calcite		
350.0	398.0	R -77	100% (100%)					
349.0	399.0							
348.0								

DATE STARTED: 4/28/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-401

PROJECT NO. 10-4310

COORDINATES
N. 340123.51 ft E. 2405131.34 ft
GROUND SURFACE ELEVATION: 747.68 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
347.0	401.0	R -77	100% (100%)	FD0		396.0-411.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite and calcite		SC-9, 399.9-401.0 ft, 4/28/10, 1450
346.0	402.0							
345.0	403.0							
344.0	404.0	R -78	100% (100%)					
343.0	405.0							
342.0	406.0			FD0				
341.0	407.0							
340.0	408.0							
339.0	409.0	R -79	100% (100%)					
338.0	410.0							
337.0	411.0							
336.0	412.0					411.0-420.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely fractured, no reaction to HCl, trace calcite 411.3-411.4 ft R.D. = 36°; filling: not healed; surface: smooth, planar.		
335.0	413.0							
334.0	414.0	R -80	100% (94%)	FD1				
333.0	415.0							
332.0	416.0							
331.0	417.0							
330.0	418.0	R -81	100% (100%)	FD0				
329.0	419.0							
328.0						419.6-419.61 ft Bedding plane separation, R.D. = 10°; filling: totally healed,		

DATE STARTED: 4/28/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-401

PROJECT NO. 10-4310

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	COORDINATES / DESCRIPTION	USCS SYMBOL	REMARKS
						N. 340123.51 ft E. 2405131.34 ft **GROUND SURFACE ELEVATION: 747.68 ft** **DESCRIPTION**		
						calcite, fresh; surface: fresh.		
						---- Bottom of Boring at 420.00 ft.----		

DATE STARTED: 4/28/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
761.0	1.0	S-1	2-3-5 (8) 40%			0.0-1.5 ft Organic soil, (ol/oh), 95% fines, no dry strength; 5% gravel; maximum grain size = 0.1 inches, dark yellowish brown (10YR 4/2), organic odor, moist, no HCl reaction, spongy, with roots, little shale fragments	ol/oh	
760.0	2.0	S-2	9-11-15 (26) 27%			1.5-15.0 ft SHALE, soft, decomposed to very intensely weathered, medium light gray (N6) and medium dark gray (N4), no reaction to HCl, iron oxide staining, changes to dusky yellow (5Y 6/4) at 7.9 to 8.8 ft		
759.0	3.0							
758.0	4.0	S-3	9-12-14 (26) 100%					
757.0	5.0	S-4	8-12-12 (24) 100%					
756.0	6.0							
755.0	7.0	S-5	7-8-9 (17) 100%					
754.0	8.0	S-6	9-9-11 (20) 100%					
753.0	9.0							
752.0	10.0	S-7	11-12-16 (28) 100%					
751.0	11.0	S-8	18-19-22 (41) 100%					
750.0	12.0							
749.0	13.0	S-9	22-23-27 (50) 100%					
748.0	14.0	S-10	22-27-32 (59) 93%					
747.0	15.0					15.0-27.7 ft SHALE, soft, decomposed to very intensely weathered, medium light gray (N6) and medium dark gray (N4), very closely to closely fractured, no reaction to HCl, iron oxide staining, dusky yellow (5Y 6/4)		
746.0	16.0							
745.0	17.0							
744.0	18.0	R-1	68% (0%)	FD9				
743.0	19.0							
742.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
741.0	21.0					15.0-27.7 ft SHALE, soft, decomposed to very intensely weathered, medium light gray (N6) and medium dark gray (N4), very closely to closely fractured, no reaction to HCl, iron oxide staining, dusky yellow (5Y 6/4)		
740.0	22.0	R-2	58% (0%)	FD9				
739.0	23.0							
738.0	24.0							
737.0	25.0							
736.0	26.0							
735.0	27.0			FD8				SC-1, 26.65-27.5ft., 13:00, 5/5/10
734.0	28.0	R-3	100% (17%)			27.7-28.0 ft Sandy lean clay, (cl), 100% fines; light olive gray (5Y 6/1), no HCl reaction	cl	
733.0	29.0					28.0-28.4 ft SHALE, soft, intensely weathered, dark gray (N3) with grayish orange (10YR 7/4), very closely to closely fractured, no reaction to HCl, iron oxide staining	ol/oh	
732.0	30.0					28.4-28.7 ft Organic soil, (ol/oh), 95% fines, no dry strength; 5% gravel; dark yellowish brown (10YR 4/2), organic odor, moist, no HCl reaction, spongy, with roots, little rock fragments		
731.0	31.0					28.7-34.6 ft SHALE, soft, intensely to very intensely weathered, dark gray (N3) with moderate yellow (5Y 7/6), very closely fractured, no reaction to HCl, iron oxide staining		31.0 ft., Complete loss of circulation.
730.0	32.0					28.7-45 ft R.D. = 0°-78°, very closely to moderately spaced; filling: not healed to partly healed, thin clay, iron oxide staining; surface: rough to slightly rough; moderately to intensely weathered.		
729.0	33.0	R-4	90% (25%)					
728.0	34.0							
727.0	35.0			FD7		34.6-47.5 ft SHALE, moderately soft to moderately hard, moderately to very intensely weathered, medium dark gray (N4) with pale yellowish orange (10YR 8/6), thinly to thickly bedded, very closely to moderately fractured, no reaction to HCl, iron oxide staining		
726.0	36.0							
725.0	37.0							
724.0	38.0	R-5	99% (12%)					
723.0	39.0							
722.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
721.0	41.0			FD7		34.6-47.5 ft SHALE, moderately soft to moderately hard, moderately to very intensely weathered, medium dark gray (N4) with pale yellowish orange (10YR 8/6), thinly to thickly bedded, very closely to moderately fractured, no reaction to HCl, iron oxide staining		
720.0	42.0							
719.0	43.0	R-6	96% (30%)					
718.0	44.0							
717.0	45.0							
716.0	46.0			FD5		45-80 ft Fracture, R.D. = 0°-71°, very closely to moderately spaced; filling: not healed to totally healed, very intensely to slightly weathered; surface: rough to smooth, very intensely to slightly weathered.		
715.0	47.0							
714.0	48.0	R-7	100% (35%)			47.5-49.3 ft SHALE, clayey, soft, very intensely weathered, grayish orange (10YR 7/4), very closely to closely fractured, no reaction to HCl		
713.0	49.0							
712.0	50.0					49.3-50.8 ft SHALE, moderately soft, moderately weathered, dark gray (N3), very closely to closely fractured, no reaction to HCl		
711.0	51.0					50.8-60.2 ft SHALE, clayey, very soft to moderately soft, intensely weathered to decomposed, grayish orange (10YR 7/4) to dark greenish gray (5G 4/1), very closely to closely fractured, no reaction to HCl, iron oxide staining		
710.0	52.0							
709.0	53.0	R-8	84% (22%)					
708.0	54.0							
707.0	55.0			FD7				
706.0	56.0							
705.0	57.0							
704.0	58.0	R-9	82% (24%)					
703.0	59.0							
702.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
701.0	61.0					60.2-60.45 ft Sandy lean clay, (cl), medium bluish gray (5B 5/1), no HCl reaction	cl	
700.0	62.0					60.45-74.3 ft SHALE, moderately soft, moderately weathered to fresh, clay sized particles, dark gray (N3), thinly bedded, no odor, closely to moderately fractured, no reaction to HCl		
699.0	63.0	R-10	99% (60%)					
698.0	64.0							
697.0	65.0			FD5				
696.0	66.0							
695.0	67.0							
694.0	68.0	R-11	96% (53%)					
693.0	69.0							SC-2, 69.1-70.0 ft., 08:07, 5/6/10.
692.0	70.0							
691.0	71.0							
690.0	72.0							
689.0	73.0	R-12	93% (35%)					
688.0	74.0			FD6				
687.0	75.0					74.3-87.8 ft SHALE, soft to moderately hard, moderately to intensely weathered, medium gray (N5) with moderate greenish yellow (10Y 7/4), thinly to moderately, no odor, very closely to moderately fractured, no reaction to HCl, iron oxide staining		
686.0	76.0							
685.0	77.0							
684.0	78.0	R-13	90% (35%)					
683.0	79.0			FD5				
682.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
681.0	81.0					74.3-87.8 ft SHALE, soft to moderately hard, moderately to intensely weathered, medium gray (N5) with moderate greenish yellow (10Y 7/4), thinly to moderately, no odor, very closely to moderately fractured, no reaction to HCl, iron oxide staining		
680.0	82.0	R-14	98% (30%)			80-98.8 ft R.D. = 0°-68°, closely to widely spaced; filling: not healed to moderately healed, clean, very thin pyrite, very thin clay, thin to moderately thin quartz, fresh to intensely weathered; surface: smooth to rough, fresh to intensely weathered.		
679.0	83.0							
678.0	84.0							
677.0	85.0							
676.0	86.0							
675.0	87.0							
674.0	88.0	R-15	98% (32%)					
673.0	89.0					87.8-113.05 ft SHALE, moderately soft to moderately hard, slightly weathered to fresh, dark gray (N3), thinly to moderately bedded, no odor, closely to widely fractured, no reaction to HCl, iron oxide staining, with fossiliferous zones, 112.6 ft strong reaction to HCl on only on calcite laminae		
672.0	90.0			FD5				
671.0	91.0							
670.0	92.0							
669.0	93.0	R-16	98% (58%)					
668.0	94.0							
667.0	95.0							
666.0	96.0							
665.0	97.0							
664.0	98.0	R-17	100% (70%)					
663.0	99.0							
662.0				FD4				

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
661.0	101.0					87.8-113.05 ft SHALE, moderately soft to moderately hard, slightly weathered to fresh, dark gray (N3), thinly to moderately bedded, no odor, closely to widely fractured, no reaction to HCl, iron oxide staining, with fossiliferous zones, 112.6 ft strong reaction to HCl on only on calcite laminae		
660.0	102.0					100.7-141 ft R.D. = 0°-72°, very closely to widely spaced; filling: not healed to moderately healed, clean, very thin clay, thin calcite, very thin pyrite, fresh to slightly weathered; surface: smooth to rough, fresh to slightly weathered.		
659.0	103.0	R-18	100% (80%)					
658.0	104.0			FD4				
657.0	105.0							
656.0	106.0							
655.0	107.0							
654.0	108.0	R-19	100% (88%)					
653.0	109.0							
652.0	110.0							
651.0	111.0							
650.0	112.0							
649.0	113.0	R-20	100% (88%)			113.05-113.35 ft Fat clay, (ch), 100% fines; dark gray (N3), no HCl reaction 113.05-113.35 ft No reaction to HCl	ch	
648.0	114.0			FD3		113.35-115.0 ft SHALE, moderately hard, slightly weathered to fresh, dark gray (N3) to grayish black (N2), widely fractured, no reaction to HCl		
647.0	115.0					115.0-115.2 ft Lean clay, (cl), 100% fines; dark gray (N3), no HCl reaction 115.0-115.2 ft No reaction to HCl	cl	
646.0	116.0					115.2-140.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), widely fractured, no reaction to HCl, with fossiliferous zones		
645.0	117.0							
644.0	118.0	R-21	100% (93%)					
643.0	119.0							
642.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
641.0	121.0					115.2-140.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), widely fractured, no reaction to HCl, with fossiliferous zones		
640.0	122.0							
639.0	123.0	R-22	98% (79%)					
638.0	124.0							
637.0	125.0							
636.0	126.0							
635.0	127.0							
634.0	128.0	R-23	100% (78%)					
633.0	129.0							
632.0	130.0			FD3				
631.0	131.0							
630.0	132.0							
629.0	133.0	R-24	100% (100%)					SC-3, 132.25-133.15 ft.,11:59, 5/6/10.
628.0	134.0							
627.0	135.0							
626.0	136.0							
625.0	137.0							
624.0	138.0	R-25	100% (70%)					
623.0	139.0							
622.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
621.0	141.0					140.0-165.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), widely fractured, weak reaction to HCl, trace fossils reaplaced with calcite, trace pyrite, approximately 140.0-145.0 ft., weak reaction to HCl		
620.0	142.0							
		R-26	100% (85%)					
619.0	143.0							
618.0	144.0							
617.0	145.0							
616.0	146.0							
615.0	147.0							
		R-27	100% (95%)					
614.0	148.0							
613.0	149.0							
612.0	150.0			FD3				
611.0	151.0							
610.0	152.0							
		R-28	100% (97%)					
609.0	153.0							
608.0	154.0							
607.0	155.0					155.2-195.33 ft R.D. = 10°-58°, very closely to very widely spaced; filling: not healed to moderately healed, clean, vey thin and moderately thick clay, very thin calcite, fresh to slightly weathered, moderately soft to moderately hard; surface: smooth to stepped, fresh to slightly weathered.		
606.0	156.0							
605.0	157.0							
		R-29	95% (91%)					
604.0	158.0							
603.0	159.0							
602.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
601.0	161.0					140.0-165.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), widely fractured, weak reaction to HCl, trace fossils reaplaced with calcite, trace pyrite, approximately 140.0-145.0 ft., weak reaction to HCl		
600.0	162.0							
		R-30	100% (92%)					
599.0	163.0							
598.0	164.0							
597.0	165.0							
						165.0-190.15 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), moderately to widely fractured, no reaction to HCl, trace fossils reaplaced with calcite, trace pyrite		
596.0	166.0							
595.0	167.0							
		R-31	100% (97%)					
594.0	168.0							
593.0	169.0							
592.0	170.0			FD3				
591.0	171.0							
590.0	172.0							
		R-32	100% (96%)					
589.0	173.0							
588.0	174.0							
587.0	175.0							
586.0	176.0							
585.0	177.0							
		R-33	97% (94%)					
584.0	178.0							
583.0	179.0							
582.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
581.0	181.0					165.0-190.15 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), moderately to widely fractured, no reaction to HCl, trace fossils reaplaced with calcite, trace pyrite		
580.0	182.0							
579.0	183.0	R-34	100% (86%)					
578.0	184.0							
577.0	185.0							
576.0	186.0							
575.0	187.0							
574.0	188.0	R-35	99% (96%)					
573.0	189.0							
572.0	190.0			FD3				
						190.15-190.4 ft Fat clay, (ch), 100% fines; dark gray (N3)	ch	
571.0	191.0					190.4-225.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), thickly to massive bedded, moderately to very widely fractured, no reaction to HCl, no staining, trace calcite and pyrite replaced fossils		
570.0	192.0							
569.0	193.0	R-36	99% (91%)					
568.0	194.0							
567.0	195.0							
566.0	196.0							
565.0	197.0							
564.0	198.0	R-37	100% (94%)					
563.0	199.0							
562.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
561.0	201.0					190.4-225.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), thickly to massive bedded, moderately to very widely fractured, no reaction to HCl, no staining, trace calcite and pyrite replaced fossils		
560.0	202.0	R-38	97% (91%)			200.1-237.3 ft R.D. = 29°-56°, closely to extremely widely spaced; filling: not healed, clean, moderately thin clay, very soft; surface: rough to moderately rough, fresh to slightly weathered.		
559.0	203.0							
558.0	204.0							
557.0	205.0							
556.0	206.0							
555.0	207.0	R-39	100% (93%)					
554.0	208.0							
553.0	209.0							
552.0	210.0			FD3				
551.0	211.0							
550.0	212.0							
549.0	213.0	R-40	100% (88%)					
548.0	214.0							
547.0	215.0							
546.0	216.0							
545.0	217.0							
544.0	218.0	R-41	99% (88%)					
543.0	219.0							
542.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
541.0	221.0					190.4-225.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), thickly to massive bedded, moderately to very widely fractured, no reaction to HCl, no staining, trace calcite and pyrite replaced fossils		
540.0	222.0							
		R-42	97% (92%)					
539.0	223.0							
538.0	224.0							
537.0	225.0							
						225.0-260.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), thickly to massive bedded, widely to extremely widely fractured, no reaction to HCl, no staining, trace calcite replaced shells, trace pyrite		
536.0	226.0							
535.0	227.0							
		R-43	100% (100%)					
534.0	228.0							
533.0	229.0			FD3				
532.0	230.0							
531.0	231.0							
530.0	232.0							
		R-44	100% (95%)					
529.0	233.0							
528.0	234.0							
527.0	235.0							
526.0	236.0							
525.0	237.0							
		R-45	100% (100%)					
524.0	238.0							
523.0	239.0			FD1				
522.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
521.0	241.0					225.0-260.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), thickly to massive bedded, widely to extremely widely fractured, no reaction to HCl, no staining, trace calcite replaced shells, trace pyrite		
520.0	242.0	R-46	97% (97%)					
519.0	243.0							
518.0	244.0							
517.0	245.0							
516.0	246.0							
515.0	247.0	R-47	100% (100%)					
514.0	248.0							
513.0	249.0							
512.0	250.0			FD1				
511.0	251.0							
510.0	252.0	R-48	100% (100%)					
509.0	253.0							
508.0	254.0							
507.0	255.0							
506.0	256.0							
505.0	257.0	R-49	100% (100%)					
504.0	258.0							
503.0	259.0							
502.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
501.0	261.0					260.0-280.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), thickly to massive bedded, widely to extremely widely fractured, weak reaction to HCl, no staining, with fossiliferous layers, fossils replaced with calcite and pyrite, trace pyrite		
500.0	262.0	R-50	100% (96%)			261.1- ft Bedding plane separation, R.D. = 10°; filling: totally healed, moderately thin calcite, fresh, moderately hard; surface: moderately rough, fresh; moderately thin pyrite, fossiliferous laminae.		
499.0	263.0							
498.0	264.0							
497.0	265.0							
496.0	266.0							
495.0	267.0	R-51	100% (100%)					
494.0	268.0							
493.0	269.0							
492.0	270.0			FD1				
491.0	271.0							
490.0	272.0							
489.0	273.0	R-52	100% (82%)			272.1-272.35 ft Joint, R.D. = 54°; filling: not healed, clean; surface: slightly rough.		
488.0	274.0					272.75- ft Random fracture, R.D. = 37°; filling: totally healed, pyrite, fresh; surface: slightly rough, fresh.		
487.0	275.0					274.15-274.9 ft Fracture zone, R.D. = 36°; filling: not healed, clean, fresh; surface: moderately rough, fresh; along cleavage planes.		
486.0	276.0							
485.0	277.0							
484.0	278.0	R-53	100% (100%)					
483.0	279.0							
482.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
481.0	281.0					280.0-295.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), thickly to massive bedded, widely to extremely widely fractured, weak reaction to HCl, no staining, with fossiliferous layers, fossils replaced with calcite and pyrite		
480.0	282.0							
		R-54	100% (100%)					
479.0	283.0							
478.0	284.0							
477.0	285.0							
476.0	286.0							
475.0	287.0							
		R-55	100% (100%)					
474.0	288.0							
473.0	289.0							
472.0	290.0			FD1				
471.0	291.0							
470.0	292.0							
		R-56	100% (100%)					
469.0	293.0							
468.0	294.0							
467.0	295.0					295.0-310.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), thickly to massive bedded, widely to extremely widely fractured, strong reaction to HCl, with a few sporadic zones with a weak reaction to HCl, with fossiliferous layers, trace pyrite 295.3- ft Joint, R.D. = 33°; filling: clean; surface: smooth. 296.65-297.05 ft Joint, R.D. = 24°-28°, moderately spaced; filling: clean; surface: rough.		
466.0	296.0							
465.0	297.0							
		R-57	100% (94%)					
464.0	298.0							
463.0	299.0							
462.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
461.0	301.0					295.0-310.0 ft SHALE, moderately hard, fresh, dark gray (N3) to grayish black (N2), thickly to massive bedded, widely to extremely widely fractured, strong reaction to HCl, with a few sporadic zones with a weak reaction to HCl, with fossiliferous layers, trace pyrite		
460.0	302.0	R-58	100% (100%)					
459.0	303.0					303.6-303.8 ft Joint, R.D. = 58°; filling: not healed, very thin calcite, fresh; surface: moderately rough, fresh.		
458.0	304.0					304.05-304.55 ft Joint, R.D. = 74°, moderately spaced; filling: partly healed, very thin calcite, fresh; surface: moderately rough, fresh.		
457.0	305.0					304.45 ft Very closely spaced fossiliferous laminae, at approximately 33°		
456.0	306.0					306- ft Random fracture, R.D. = 41°.		
455.0	307.0					307- ft Random fracture, R.D. = 25°.		
454.0	308.0	R-59	98% (98%)	FD1				
453.0	309.0							
452.0	310.0					310.0-335.0 ft SHALE, dark gray (N3) to grayish black (N2), thickly to massive bedded, closely to widely fractured, strong reaction to HCl, with zones with weak reaction to HCl, trace pyrite within fossiliferous layers		
451.0	311.0							
450.0	312.0							
449.0	313.0	R-60	100% (84%)					
448.0	314.0							
447.0	315.0					315- ft Random fracture; filling: not healed, thin clay; surface: rough.		
446.0	316.0							
445.0	317.0					316.9- ft Joint, R.D. = 60°; filling: not healed, clean; surface: moderately rough.		
444.0	318.0	R-61	100% (87%)			317.1- ft Joint, R.D. = 48°, one end visible; filling: partly healed, very thin, fresh; surface: slightly rough, fresh.		
443.0	319.0			FD5		317.55- ft Joint, R.D. = 78°; filling: partly healed, trace pyrite, slightly weathered to fresh; surface: moderately rough, slightly weathered.		
442.0						317.9- ft Joint, R.D. = 36°; filling: not healed, very thin clay; surface: moderately rough.		
						318.3- ft R.D. = 22°; filling: not healed, moderately thin clay; surface: slightly		

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						rough.		
441.0	321.0					319.77-328.3 ft R.D. = 73°-77°, very closely to very widely spaced; filling: not healed to moderately healed, very thin to moderately thin calcite, very thin calcite and pyrite, fresh to slightly weathered, moderately soft; surface: rough to slightly rough, fresh to slightly weathered.		
440.0	322.0					310.0-335.0 ft SHALE, dark gray (N3) to grayish black (N2), thickly to massive bedded, closely to widely fractured, strong reaction to HCl, with zones with weak reaction to HCl, trace pyrite within fossiliferous layers		
		R-62	75% (38%)	FD5				
439.0	323.0							
438.0	324.0							
437.0	325.0							
436.0	326.0							
435.0	327.0							
		R-63	94% (44%)	FD6				
434.0	328.0							
433.0	329.0							
432.0	330.0							
						330-331.45 ft Fracture zone, closely spaced; filling: not healed, clean, fresh to slightly weathered; surface: moderately rough, fresh; fractures include 36° and 56° with bedding at 10°.		
431.0	331.0							
430.0	332.0							
		R-64	96% (71%)	FD1		331.95- ft Joint, R.D. = 24°, neither ends visible; filling: partly healed, thin calcite, fresh to slightly weathered; surface: polished, fresh; slickensides present; kink banding with normal displacement (61°) with 1.5 mm displacement.		
429.0	333.0							
428.0	334.0							
427.0	335.0							
				FD5		335.0-335.5 ft SHALE, dark gray (N3), no reaction to HCl, Clay, Dark gray (N3), no reaction to HCl		
426.0	336.0					335.5-350.0 ft SHALE, moderately hard, fresh, dark gray (N3), massive to very thickly bedded, moderately to very widely fractured, no reaction to HCl		
425.0	337.0							
		R-65	98% (86%)					
424.0	338.0			FD1		337.75- ft Bedding plane separation, R.D. = 11°; filling: moderately healed, moderately thin calcite, fresh, moderately soft; surface: moderately rough, fresh; banding shows 1.0 - 1.25 mm displacement at 63°.		
423.0	339.0							
422.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-402

PROJECT NO. 10-4310

COORDINATES

N. 340214.84 ft E. 2405121.84 ft

GROUND SURFACE ELEVATION: 761.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
421.0	341.0					335.5-350.0 ft SHALE, moderately hard, fresh, dark gray (N3), massive to very thickly bedded, moderately to very widely fractured, no reaction to HCl		
420.0	342.0							
		R-66	100% (100%)					
419.0	343.0							
418.0	344.0							
417.0	345.0			FD0				
416.0	346.0							
415.0	347.0							
		R-67	89% (86%)					
414.0	348.0							
413.0	349.0							
412.0	350.0					---- Bottom of Boring at 350.00 ft.----		

DATE STARTED: 5/5/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
737.0	1.0	S-1	1-2-2 (4) 40%			0.0-1.5 ft Silt, (ml), 100% fines, non plastic, no dry strength, no dilatancy, no toughness; 0% gravel; 0% sand; dark yellowish brown (10YR 4/2), organic odor, moist, no HCl reaction, soft, with organics, with rock fragments	ml	
736.0	2.0	S-2	3-4-4 (8) 93%			1.5-3.0 ft Gravelly silt/gravelly elastic silt, (ml/mh), 70% fines, low plasticity, no dry strength, no dilatancy, low toughness; 20% gravel, fine to coarse, subangular, hard hardness; 10% sand, fine; maximum grain size = 1.0 inches, dark yellowish orange (10YR 6/6) to moderate yellowish brown (10YR 5/4), no odor, moist, no HCl reaction, medium stiff	ml/mh	
735.0	3.0						ml/mh	
734.0	4.0	S-3	12-15-16 (31) 100%			3.0-3.4 ft Silt with sand/elastic silt with sand, (ml/mh), 80% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 10% gravel, fine to coarse; 10% sand, fine; maximum grain size = 2.0 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, hard, trace roots	ml/mh	
733.0	5.0	S-4	9-9-7 (16) 100%			3.4-4.5 ft Gravelly silt/gravelly elastic silt, (ml/mh), 70% fines, high plasticity, no dry strength, no dilatancy, low toughness; 20% gravel, fine to coarse, subangular; 10% sand, fine; maximum grain size = 0.5 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, hard		
732.0	6.0						GC	
731.0	7.0	S-5	5-11-12 (23) 100%			4.5-7.5 ft CLAYEY GRAVEL WITH SAND, (GC), 41% gravel, medium to coarse, subangular, hard hardness; 31% sand, fine to medium; 28% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very stiff		
730.0	8.0	S-6	5-8-8 (16) 90%			7.5-9.0 ft SHALE, moderately soft, decomposed, dark yellowish orange (10YR 6/6), no reaction to HCl, iron oxide staining, boulder		
729.0	9.0					9.0-9.9 ft SHALE, moderately hard to hard, fresh, medium light gray (N6), no reaction to HCl, boulder		
728.0	10.0	S-7	18-13-11 (24) 60%			9.9-12.0 ft Gravelly silt/gravelly elastic silt, (ml/mh), 70% fines, high plasticity, no dry strength, no dilatancy, low toughness; 30% gravel, fine to coarse, subangular; 0% sand; maximum grain size = 1.0 inches, dark yellowish orange (10YR 6/6) with medium gray (N5), moist, no HCl reaction, very stiff to hard		
727.0	11.0	S-8	6-18-16 (34) 93%				ml/mh	
726.0	12.0							
725.0	13.0	S-9	11-12-8 (20) 93%			12.0-13.5 ft Silty sand with gravel, (sm), 60% sand, fine to medium; 20% gravel, fine to coarse, subangular, hard hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, dark yellowish orange (10YR 6/6) with medium gray (N5), moist, weak HCl reaction, medium dense	sm	
724.0	14.0	S-10	9-17-31 (48) 100%			13.5-19.9 ft SHALE, soft to moderately hard, decomposed, yellowish gray (5Y 7/2) with dark yellowish orange (10YR 6/6), no reaction to HCl, iron oxide staining		
723.0	15.0							
722.0	16.0	S-11	21-31-38 (69) 100%					
721.0	17.0	S-12	40-30-30 (60) 100%					
720.0	18.0							
719.0	19.0	S-13	16-32-50/5 86%					
718.0		S-14	50/5					

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
717.0	21.0	R -1	100% 47% (0%)	FD8		19.9-22.6 ft SHALE, moderately soft to moderately hard, intensely weathered, dark yellowish orange (10YR 6/6) with medium gray (N5), very closely to closely fractured, no reaction to HCl, iron oxide staining		
716.0	22.0					21.8-26 ft Bedding plane separation, R.D. = 10°, very closely to closely spaced; surface: smooth, planar; iron oxide staining.		
715.0	23.0					22.6-26.5 ft SHALE, moderately soft to moderately hard, moderately weathered, dark gray (N3) and dark yellowish orange (10YR 6/6), closely to very closely fractured, no reaction to HCl, iron oxide staining		
714.0	24.0	R -2	80% (9%)			22.8-24.5 ft R.D. = 56°, moderately spaced; surface: rough, planar; iron oxide staining.		
713.0	25.0							
712.0	26.0							
711.0	27.0					26.5-31.8 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), moderately to very closely fractured, no reaction to HCl, zones of slightly to moderately weathered along bedding and fractures		SC-1, 26.0-26.45 ft, 1525, 5/7/10
710.0	28.0					26.8-40.6 ft R.D. = 56°, closely to widely spaced; surface: rough, planar; Few are fresh in zone others are all weathered with iron oxide staining.		
709.0	29.0	R -3	100% (8%)			27.2-41.4 ft Bedding plane separation, R.D. = 10°, very closely to widely spaced; surface: smooth, planar; iron oxide staining.		
708.0	30.0					28.3-40.3 ft R.D. = 31°-36°, moderately to very closely spaced; surface: rough, planar; iron oxide staining.		
707.0	31.0			FD6		30.7-38.1 ft Random fracture, R.D. = 65°, very widely spaced; surface: rough, planar, slightly weathered; iron oxide staining.		
706.0	32.0					31.8-36.8 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl		
705.0	33.0							
704.0	34.0	R -4	100% (22%)					
703.0	35.0							
702.0	36.0							
701.0	37.0					36.8-41.8 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to very closely fractured, no reaction to HCl		
700.0	38.0							
699.0	39.0	R -5	100% (0%)					
698.0								

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
697.0	41.0	R -5	100% (0%)	FD6		36.8-41.8 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to very closely fractured, no reaction to HCl		
696.0	42.0					41.8-51.8 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to very closely fractured, no reaction to HCl		
695.0	43.0					41.8-50.6 ft R.D. = 90°, very widely spaced; surface: rough, planar, slightly weathered; iron oxide staining.		
694.0	44.0	R -6	100% (0%)			42.1-51.8 ft Bedding plane separation, R.D. = 10°, moderately to closely spaced; surface: smooth, planar; iron oxide staining.		
693.0	45.0					42.8-50.2 ft R.D. = 36°, moderately to widely spaced; surface: rough, planar; iron oxide staining.		
692.0	46.0					43.3-51.6 ft R.D. = 56°, moderately to widely spaced; surface: rough, undulating; iron oxide staining.		
691.0	47.0			FD6		45.7-46.8 ft R.D. = 85°, moderately spaced; surface: rough, planar; iron oxide staining.		
690.0	48.0							
689.0	49.0	R -7	90% (0%)					
688.0	50.0							
687.0	51.0							
686.0	52.0					51.8-65.6 ft SHALE, moderately hard, fresh, dark gray (N3), closely to very closely fractured, no reaction to HCl		51.8-70.6 ft., poor recovery, drilling water is slightly brown, no recovery of clay in the core barrel, small rock fragments are coming up in drilling mud
685.0	53.0					51.8-70.6 ft Fractures (56° and 70°) and bedding (10°) appear in rock, difficult to determine fracture location due to poor recovery, fractures and bedding show fresh to slightly weathered with little to no iron oxide staining.		
684.0	54.0	R -8	28% (0%)					
683.0	55.0							
682.0	56.0			FD6				
681.0	57.0							
680.0	58.0							
679.0	59.0	R -9	2% (0%)					
678.0								

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
677.0	61.0	R -9	2% (0%)	FD6		51.8-65.6 ft SHALE, moderately hard, fresh, dark gray (N3), closely to very closely fractured, no reaction to HCl		
676.0	62.0							
675.0	63.0							
674.0	64.0	R -10	14% (0%)					
673.0	65.0							
672.0	66.0					65.6-70.6 ft SHALE, very soft to hard, moderately to intensely weathered, dark gray (N3) with dark yellowish orange (10YR 6/6), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
671.0	67.0							
670.0	68.0	R -11	29% (0%)	FD7				
669.0	69.0							
668.0	70.0							
667.0	71.0					70.6-75.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very closely to widely fractured, no reaction to HCl, trace pyrite, calcite healed fractures 70.8-74.8 ft R.D. = 36°, very closely to widely spaced; surface: rough, planar; fractures at top of zone are fresh to slightly weathered with trace iron oxide staining. 71.1-73.4 ft R.D. = 56°, moderately to widely spaced; filling: moderately healed, very thin calcite, fresh to slightly weathered; surface: rough, planar, fresh; 71.1-71.2, no filling, fresh. 72.8-73.1 ft R.D. = 75°; filling: totally healed, very thin calcite, fresh; surface: fresh.		
666.0	72.0							
665.0	73.0	R -12	100% (49%)	FD6				
664.0	74.0							
663.0	75.0							
662.0	76.0					75.6-80.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl		SC-2, 75.6-76.2 ft., 5/8/10, 1504
661.0	77.0					76.65-79.4 ft R.D. = 56°, moderately spaced; filling: totally healed, moderately thin calcite, fresh; surface: fresh.		
660.0	78.0	R -13	100% (100%)	FD0		77-78.4 ft R.D. = 36°, widely spaced; filling: totally healed, moderately thin calcite, fresh; surface: fresh. 77.05-77.4 ft R.D. = 60°; filling: moderately healed, moderately thin calcite, fresh; surface: fresh. 77.7-79.7 ft Bedding plane separation, R.D. = 10°; filling: moderately healed, moderately thin calcite, fresh; surface: fresh.		
659.0	79.0							
658.0								

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
657.0	81.0	R -13		FD0		80.6-91.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to very widely fractured, no reaction to HCl, trace pyrite and calcite replaced shell casts 80.75-82.45 ft Bedding plane separation, R.D. = 10°, very closely to widely spaced; surface: smooth, planar; iron oxide staining on bedding surface.		
656.0	82.0							
655.0				FD5				
654.0	83.0	R-14	96% (74%)			83.3-84.3 ft R.D. = 36°; surface: rough, planar, slightly weathered; trace iron oxide staining.		
653.0	84.0							
652.0	85.0							
651.0	86.0							
650.0	87.0							
649.0	88.0	R-15	98% (92%)	FD3		87.9-91.4 ft Bedding plane separation, R.D. = 10°; surface: smooth, planar.		
648.0	89.0							
647.0	90.0							
646.0	91.0					91.4-105.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite and calcite replaced shell casts		
645.0	92.0							
644.0	93.0	R-16	100% (100%)					
643.0	94.0							
642.0	95.0							
641.0	96.0			FD0				
640.0	97.0							
639.0	98.0	R-17	100% (100%)					
638.0	99.0							

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
637.0	101.0	R-17				91.4-105.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite and calcite replaced shell casts		
636.0	102.0							
635.0	103.0	R-18	96% (96%)	FD0				
634.0	104.0							
633.0	105.0							
632.0	106.0					105.6-125.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to extremely widely fractured, no reaction to HCl, trace calcite replaced shell casts and pyrite		
631.0	107.0							
630.0	108.0	R -19	100% (100%)	FD0				
629.0	109.0							
628.0	110.0							
627.0	111.0					110.8-112.3 ft R.D. = 75°; filling: not healed, very thin calcite, fresh; surface: rough, planar, fresh.		
626.0	112.0					111.7-114.95 ft R.D. = 56°, very widely spaced; filling: not healed, very thin calcite, fresh; surface: rough, planar, fresh.		
625.0	113.0	R -20	100% (95%)	FD3				
624.0	114.0							
623.0	115.0							
622.0	116.0							
621.0	117.0							
620.0	118.0	R -21	100% (100%)	FD0				
619.0	119.0							
618.0								

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
617.0	120.6	R -21				105.6-125.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to extremely widely fractured, no reaction to HCl, trace calcite replaced shell casts and pyrite		
616.0	121.0							
615.0	122.0							
614.0	123.0	R -22	100% (100%)					
613.0	124.0							
612.0	125.0							
611.0	126.0			FD0		125.6-145.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace pyrite		
610.0	127.0							
609.0	128.0	R -23	98% (98%)					
608.0	129.0							
607.0	130.0					130.15-130.16 ft Bedding plane separation, R.D. = 10°; filling: moderately healed, very thin calcite, fresh; surface: fresh.		
606.0	131.0							
605.0	132.0					132.3-132.5 ft R.D. = 10°, very closely spaced; filling: moderately healed, very thin calcite and pyrite, fresh; surface: polished, planar, fresh; slickensides on surface.		
604.0	133.0	R -24	100% (100%)					
603.0	134.0			FD1				
602.0	135.0							
601.0	136.0							
600.0	137.0	R -25	100% (100%)	FD0				
599.0	138.0							
598.0	139.0							

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
597.0	141.0	R -25				125.6-145.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace pyrite		
596.0	142.0							
595.0	143.0	R -26	100% (100%)	FD0				
594.0	144.0							
593.0	145.0							
592.0	146.0					145.6-165.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace pyrite and calcite shell casts		
591.0	147.0					146.7-146.75 ft R.D. = 36°; filling: clean; surface: smooth, planar; possible slickensides on surface.		
590.0	148.0	R -27	100% (100%)	FD1				
589.0	149.0							
588.0	150.0							
587.0	151.0							
586.0	152.0							
585.0	153.0	R -28	100% (100%)	FD1		153-153.01 ft R.D. = 10°; filling: clean; surface: smooth, planar.		SC-3, 153.0-154.1 ft., 5/9/10, 1024
584.0	154.0							
583.0	155.0							
582.0	156.0							
581.0	157.0							
580.0	158.0	R -29	100% (100%)	FD0				
579.0	159.0							
578.0						159.03-159.05 ft R.D. = 10°, very closely spaced; filling: totally healed, moderately thin calcite, fresh; surface: fresh; multiple bedding showing		

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R -29				displacement within the zone.		
577.0	160.0					145.6-165.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace pyrite and calcite shell casts		
576.0	161.0							
575.0	162.0							
	163.0	R -30	100% (100%)	FD0				
574.0	164.0							
573.0	165.0							
572.0	166.0					165.6-185.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace pyrite and calcite shell casts		
571.0	167.0			FD0				
570.0	168.0	R -31	100% (100%)					
569.0	169.0					168.5-168.65 ft R.D. = 52°; filling: clean; surface: smooth, planar.		
568.0	170.0							
567.0	171.0							
566.0	172.0							
565.0	173.0	R -32	100% (100%)					
564.0	174.0					173.45-173.65 ft R.D. = 56°; filling: clean; surface: rough, planar.		
563.0	175.0			FD1				
562.0	176.0					175.6-176 ft R.D. = 65°; filling: clean; surface: rough, planar.		
561.0	177.0							
560.0	178.0	R -33	100% (100%)					
559.0	179.0							
558.0								

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
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REV 1 Final Boring B-403

PROJECT NO. 10-4310

COORDINATES

N. 340114.59 ft E. 2405041.43 ft

GROUND SURFACE ELEVATION: 737.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
557.0	180.6	R -33		FD1		165.6-185.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace pyrite and calcite shell casts		
556.0	181.0							
555.0	182.0							
554.0	183.0	R -34	100% (100%)	FD1		183.05-183.15 ft R.D. = 56°; filling: clean; surface: rough, planar.		
553.0	184.0							
552.0	185.0							
551.0	186.0			FD0		185.6-200.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace pyrite		
550.0	187.0							
549.0	188.0	R -35	100% (100%)					
548.0	189.0							
547.0	190.0							
546.0	191.0							
545.0	192.0							
544.0	193.0	R -36	100% (100%)					
543.0	194.0							
542.0	195.0							
541.0	196.0							
540.0	197.0							
539.0	198.0	R -37	100% (100%)					
538.0	199.0							SC-4, 199.0-200.0 ft., 5/9/10, 1230

---- Bottom of Boring at 200.00 ft.----

DATE STARTED: 5/7/10
DATE FINISHED: 5/9/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
744.0	1.0	S -1	2-2-2 (4) 87%		0.0-1.5 ft Clayey sand, (sc), 80% sand; 20% fines, low plasticity, low toughness; 0% gravel; dark yellowish orange (10YR 6/6), moist, no HCl reaction, very loose	sc	
743.0	2.0	S -2	3-21-22 (43) 47%		1.5-3.0 ft Silty sand, (sm), 70% sand, fine to medium; 30% fines, medium plasticity, low toughness; 0% gravel; maximum grain size = 0.5 inches, dark yellowish orange (10YR 6/6) and dark gray (N3), moist, no HCl reaction, dense, single piece of gravel	sm	
742.0	3.0						
741.0	4.0	S -3	12-33-39 (72) 93%		3.0-4.5 ft Well graded sand with silt and gravel, (sw-sm), 60% sand, fine to medium; 30% gravel, fine to medium, subangular, medium hardness; 10% fines, low plasticity, low toughness; maximum grain size = 1 inches, dark yellowish orange (10YR 6/6) and very pale orange (10YR 8/2), moist, no HCl reaction, very dense	sw-sm	
740.0	5.0	ST-1	100%		4.5-4.9 ft Silty sand with gravel, (sm), 60% sand, fine to medium; 20% gravel, fine, subangular, medium hardness; 20% fines, low plasticity, low toughness; maximum grain size = .25 inches, dark yellowish orange (10YR 6/6) and very pale orange (10YR 8/2), dry, no HCl reaction	sm	4.5-4.9 ft, ST-1, down pressure of 1000 psi
739.0	6.0				4.9-6.0 ft Interval not sampled		
738.0	7.0	S -4	9-16-11 (27) 93%		6.0-9.0 ft SILTY, CLAYEY SAND WITH GRAVEL, (SC-SM), 42.62% sand, fine to medium; 33.85% gravel, fine to medium, subrounded to subangular, medium hardness; 23.53% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, dark yellowish orange (10YR 6/6) and dark gray (N3), dry, no HCl reaction, medium dense, gravel is weathered shale	SC-SM	
737.0	8.0	S -5	9-13-12 (25) 93%				
736.0	9.0						
735.0	10.0	S -6	12-22-23 (45) 33%		9.0-10.5 ft Silty sand, (sm), 70% sand, fine to medium; 20% fines, medium plasticity, low toughness; 10% gravel, fine; maximum grain size = 1 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, dense, one 1 inch piece of gravel stuck in shoe	sm	
734.0	11.0	S -7	7-8-9 (17) 87%		10.5-12.0 ft Clayey sand, (sc), 60% sand, fine to medium; 30% fines, medium plasticity, low toughness; 10% gravel, fine; maximum grain size = .75 inches, dark yellowish orange (10YR 6/6) and grayish orange (10YR 7/4), moist, no HCl reaction, medium dense, weathered shale fragments	sc	
733.0	12.0						
732.0	13.0	S -8	10-16-16 (32) 80%		12.0-13.5 ft Poorly graded sand with silt and gravel, (sp-sm), 50% sand, fine to medium; 40% gravel, fine to medium; 10% fines, high plasticity, low toughness; maximum grain size = 0.5 inches, dark yellowish orange (10YR 6/6) and grayish orange (10YR 7/4), dry, no HCl reaction, dense, increasingly weathered shale dark gray (N3)	sp-sm	Decomposed shale starting at approximately 12 ft
731.0	14.0	S -9	7-11-14 (25) 73%		13.5-15.0 ft Poorly graded gravel with silt and sand, (gp-gm), 50% gravel, fine to medium; 40% sand, fine to medium; 10% fines, medium plasticity, low toughness; maximum grain size = 0.7 inches, dark yellowish orange (10YR 6/6) and dark gray (N3), moist, no HCl reaction, medium dense, mainly weathered shale	gp-gm	
730.0	15.0	S -10	17-34-50/5 93%		15.0-16.42 ft Silty sand with gravel, (sm), 50% sand, fine to medium; 30% gravel, fine; 20% fines, medium plasticity, low toughness; maximum grain size = 0.05 inches, very pale orange (10YR 8/2) and dark gray (N3), dry, no HCl reaction, very dense, refusal, weathered shale	sm	
729.0	16.0				16.42-16.5 ft Interval not sampled.		
728.0	17.0	S -11	26-50/5 89%		16.5-17.42 ft Poorly graded gravel with silt and sand, (gp-gm), 60% gravel, fine to medium, subangular, medium hardness; 30% sand, fine to medium; 10% fines, low plasticity, low toughness; maximum grain size = 0.05 inches, very pale orange (10YR 8/2) and dark gray (N3), dry, no HCl reaction, very dense	gp-gm	
727.0	18.0				17.42-17.75 ft Interval not sampled.		
726.0	19.0	R-1	42% (0%)	FD7			
725.0							

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES: Drilling with 6 1/4 inch hollow stem auger

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
724.0	21.0					17.75-20.15 ft SHALE, soft to moderately hard, intensely weathered, grayish orange (10YR 7/4) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining, intensely broken, most of sample washed out during drilling.		
723.0	22.0					20.15-25.15 ft SHALE, soft to moderately hard, intensely weathered, dark yellowish orange (10YR 6/6) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining, shale weathering into clay.		
722.0	23.0	R-2	36% (0%)	FD7				
721.0	24.0							
720.0	25.0							
719.0	26.0					25.15-30.15 ft SHALE, interbedded, soft to moderately hard, intensely weathered, yellowish gray (5Y 7/2) and dark yellowish orange (10YR 6/6), closely fractured, no reaction to HCl, iron oxide staining, with zones of intensely weathered shale into dark gray (N3) clay.		
718.0	27.0							
717.0	28.0	R-3	64% (0%)	FD7				
716.0	29.0							
715.0	30.0							
714.0	31.0					30.15-35.15 ft SHALE, interbedded, soft to moderately hard, intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely fractured, no reaction to HCl, iron oxide staining, shale weathering to clay		
713.0	32.0							
712.0	33.0	R-4	80% (0%)	FD7				
711.0	34.0							
710.0	35.0							
709.0	36.0					35.15-40.15 ft Sample washed out, zero recovery.		
708.0	37.0							
707.0	38.0	R-5	0% (0%)					
706.0	39.0							
705.0								

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES: Drilling with 6 1/4 inch hollow stem auger

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
704.0	41.0	R-6	86% (12%)	FD7		40.15-45.15 ft SHALE, interbedded, moderately hard, moderately to intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), very closely to closely fractured, no reaction to HCl, iron oxide staining		SC-1 40.3-41.0 ft., 1130, 4/26/10.
703.0	42.0							
702.0	43.0							
701.0	44.0							
700.0	45.0							
699.0	46.0	R-7	96% (32%)	FD6		45.15-50.15 ft SHALE, interbedded, moderately hard, fresh to slightly weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining, iron oxide staining on all fracture faces. 45.15-50.15 ft Joint, R.D. = 10°, very closely spaced; surface: smooth, planar. Fracture set #F-1.		
698.0	47.0							
697.0	48.0							
696.0	49.0							
695.0	50.0							
694.0	51.0	R-8	88% (0%)	FD6		50.15-55.15 ft SHALE, interbedded, soft to moderately hard, moderately to intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, shale weathering to clay, iron oxide staining on fracture faces, 70° fractures with quartz infilling at 51.7-52.0 and 53.3-53.7 ft. 51.7-54.7 ft Joint, R.D. = 70°, moderately spaced; filling: not healed, thin quartz, moderately weathered; surface: moderately rough, moderately weathered. Fracture set #F-2.		
693.0	52.0							
692.0	53.0							
691.0	54.0							
690.0	55.0							
689.0	56.0	R-9	56% (0%)	FD7		55.15-60.15 ft SHALE, interbedded, soft to moderately hard, intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, moderately weathered quartz infilling near middle of sample, shale weathering to clay, broken into pieces.		
688.0	57.0							
687.0	58.0							
686.0	59.0							
685.0								

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES: Drilling with 6 1/4 inch hollow stem auger

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
684.0	61.0					60.15-65.15 ft SHALE, soft to moderately hard, slightly to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, weathered quartz infilled fracture 61.5-62.2 ft.		
683.0	62.0			FD7		60.5-61 ft Joint, R.D. = 60°, closely spaced, slightly open; filling: slightly weathered; surface: slightly rough, undulating, slightly weathered; iron oxide staining on fracture faces. Fracture set #F-3.		
682.0	63.0	R-10	92% (9%)			61.2-64.4 ft Joint, R.D. = 10°, closely spaced, slightly open; surface: slightly rough, undulating; weathered quartz infilling near bottom. Fracture set #F-4.		
681.0	64.0							
680.0	65.0							
679.0	66.0					65.15-70.15 ft SHALE, soft to moderately hard, fresh to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), moderately fractured, no reaction to HCl, iron oxide staining, weathered quartz filled fractures 67.4-68.6 ft.		
678.0	67.0			FD5		65.15-65.9 ft Joint, R.D. = 25°-70°, closely spaced; filling: partly healed, very thin quartz, slightly weathered, moderately hard; surface: moderately rough, slightly weathered. Fracture set #F-5.		
677.0	68.0	R-11	84% (8%)			66.1-68.9 ft R.D. = 70°, closely spaced; filling: partly healed, quartz, slightly to moderately weathered, moderately soft; surface: moderately rough, slightly weathered; intensely weathered at 67.8-68.3 ft.. Fracture set #F-6.		
676.0	69.0							
675.0	70.0							
674.0	71.0					70.15-75.15 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, quartz filled fractures throughout		
673.0	72.0					70.15-75.15 ft Joint, R.D. = 70°, closely spaced, slightly open; filling: partly healed, moderately thin quartz, slightly weathered, moderately soft; surface: moderately rough, slightly weathered. Fracture set #F-7.		
672.0	73.0	R-12	100% (20%)	FD5				
671.0	74.0							
670.0	75.0							
669.0	76.0					75.15-80.15 ft SHALE, moderately hard, fresh, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining, quartz filled fracture at 77.6-77.7		
668.0	77.0					75.15-80.15 ft R.D. = 70°, closely spaced, slightly open; surface: slightly rough, planar; set of quartz healed, very thin, 70 ° fractures at 77.7-78.3 ft., quartz filled fracture at 77.6-77.7 ft. Fracture set #F-8.		
667.0	78.0	R-13	100% (24%)	FD5				
666.0	79.0							
665.0								

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES: Drilling with 6 1/4 inch hollow stem auger

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
664.0	81.0	R-14	100% (14%)	FD5		80.15-85.15 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining 80.15-85.15 ft Joint, R.D. = 60°-70°, closely spaced, slightly open; filling: moderately healed, moderately thin quartz, fresh to moderately weathered, moderately soft; surface: slightly rough, planar, fresh; thin to moderately thick quartz healed fractures throughout, 84.9-85.15 ft. quartz crystals (2-3 mm diameter), fracture gouge moderately weathered. Fracture set #F-9.		
663.0	82.0							
662.0	83.0							
661.0	84.0							
660.0	85.0							
659.0	86.0	R-15	98% (32%)	FD5		85.15-90.15 ft SHALE, soft to moderately hard, fresh to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, shale weathering into clay, several totally to partially quartz-healed fractures. 85.15-90.15 ft Joint, R.D. = 15°-25°, closely spaced, slightly open; filling: moderately healed, moderately thin quartz, fresh to moderately weathered, moderately soft to moderately hard; surface: slightly rough, planar, fresh. Fracture set #F-10.		
658.0	87.0							
657.0	88.0							
656.0	89.0							
655.0	90.0							
654.0	91.0	R-16	78% (25%)	FD5		90.15-95.15 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3) with yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, thin, moderately healed with slightly weathered quartz fracture at 92.0-92.4 ft. 90.9-93.9 ft Joint, R.D. = 25°, closely spaced; surface: slightly rough, planar; iron oxide staining on fracture faces, thin, moderately healed with slightly weathered quartz fracture dipping 70° at 92.2-92.6 ft.. Fracture set #F-11.		SC-2 90.3-90.9 ft., 0840, 4/27/10.
653.0	92.0							
652.0	93.0							
651.0	94.0							
650.0	95.0							
649.0	96.0	R-17	92% (92%)	FD0		95.15-200.15 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite 97.1-99.2 ft Joint, R.D. = 30°, moderately spaced; filling: totally healed, moderately thin calcite, fresh, moderately hard; surface: smooth, planar, fresh. Fracture set #F-12.		SC-3 98.1-99.0 ft., 0910 4/27/10.
648.0	97.0							
647.0	98.0							
646.0	99.0							
645.0								

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES: Drilling with 6 1/4 inch hollow stem auger

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
644.0	101.0					95.15-200.15 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
643.0	102.0							
642.0	103.0	R-18	100% (100%)	FD0				
641.0	104.0							
640.0	105.0							
639.0	106.0							
638.0	107.0							
637.0	108.0	R-19	100% (100%)	FD0				
636.0	109.0							
635.0	110.0							
634.0	111.0							
633.0	112.0							
632.0	113.0	R-20	100% (100%)	FD0		113.3-113.35 ft Joint, R.D. = 10°, very closely spaced; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh; discontinuous. Fracture set #F-13. 113.6-114.1 ft Joint, R.D. = 60°, closely spaced; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-14.		
631.0	114.0							
630.0	115.0							
629.0	116.0					115.85-117.1 ft Joint, R.D. = 66°; filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-15.		
628.0	117.0							
627.0	118.0	R-21	100% (100%)	FD0				
626.0	119.0							
625.0								

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES: Drilling with 6 1/4 inch hollow stem auger

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
624.0	120.0					95.15-200.15 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
623.0	121.0							
622.0	122.0	R-22	97% (97%)	FD0				
621.0	123.0					123.4-123.45 ft Joint, R.D. = 10°, very closely spaced; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: slightly rough, undulating, fresh; broken apart during retrieval. Fracture set #F-16.		
620.0	124.0							
619.0	125.0							
618.0	126.0							
617.0	127.0	R-23	100% (100%)	FD0				
616.0	128.0					128.85-128.9 ft Joint, R.D. = 10°, very closely spaced; filling: totally healed, very thin calcite, fresh, moderately soft; surface: smooth, planar, fresh; mechanically broken. Fracture set #F-17.		
615.0	129.0							
614.0	130.0							
613.0	131.0							
612.0	132.0	R-24	100% (100%)	FD1				
611.0	133.0							
610.0	134.0					134.1-134.12 ft Joint, R.D. = 10°, very widely spaced, slightly open; surface: slightly rough, planar. Fracture set #F-18.		
609.0	135.0							
608.0	136.0							
607.0	137.0	R-25	98% (98%)	FD0				
606.0	138.0							
605.0	139.0							

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES: Drilling with 6 1/4 inch hollow stem auger

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
604.0	141.0					95.15-200.15 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
603.0	142.0							
602.0	143.0	R-26	100% (100%)	FD0				
601.0	144.0							
600.0	145.0							
599.0	146.0							
598.0	147.0							SC-4 146.4-147.3 ft., 1310 4/27/10.
597.0	148.0	R-27	96% (96%)	FD0				
596.0	149.0							
595.0	150.0							
594.0	151.0							
593.0	152.0							
592.0	153.0	R-28	98% (98%)	FD0				
591.0	154.0							
590.0	155.0							
589.0	156.0							
588.0	157.0							
587.0	158.0	R-29	100% (100%)	FD0				
586.0	159.0							
585.0						159.05-159.1 ft Joint, R.D. = 5°, very closely spaced; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: slightly rough,		

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES: Drilling with 6 1/4 inch hollow stem auger

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						undulating, fresh; broken open during retrieval. Fracture set #F-19. 95.15-200.15 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
584.0	161.0							
583.0	162.0							
582.0	163.0	R-30	94% (94%)	FD0				
581.0	164.0							
580.0	165.0							
579.0	166.0							
578.0	167.0							
577.0	168.0	R-31	94% (94%)	FD0				
576.0	169.0							
575.0	170.0							
574.0	171.0							
573.0	172.0							
572.0	173.0	R-32	100% (100%)	FD0				
571.0	174.0							
570.0	175.0							
569.0	176.0							
568.0	177.0							
567.0	178.0	R-33	100% (100%)	FD0				
566.0	179.0							
565.0								

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

APPROVED BY: Rolando Benitez

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

NOTES: Drilling with 6 1/4 inch hollow stem auger

DRILL RIG: CME-55 (Truck)

HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
564.0	180.0					95.15-200.15 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
	181.0							
563.0								
	182.0							
562.0		R-34	100% (100%)	FD0				
	183.0							
561.0								
	184.0							
560.0								
	185.0							
559.0								
	186.0							
558.0								
	187.0							
557.0		R-35	96% (96%)	FD0				
	188.0							
556.0								
	189.0							
555.0								
	190.0							
554.0								
	191.0							
553.0								
	192.0							
552.0		R-36	96% (96%)	FD0				SC-5 192.6-193.6 ft., 1525 4/27/10.
	193.0							
551.0								
	194.0							
550.0								
	195.0							
549.0								
	196.0							
548.0								
	197.0							
547.0		R-37	100% (100%)	FD0				
	198.0							
546.0								
	199.0							
545.0								

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

APPROVED BY: Rolando Benitez

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

NOTES: Drilling with 6 1/4 inch hollow stem auger

DRILL RIG: CME-55 (Truck)

HAMMER ID: 955

REV 1 Final Boring B-404

PROJECT NO. 10-4310

COORDINATES

N. 340031.69 ft E. 2405136.97 ft

GROUND SURFACE ELEVATION: 744.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
544.0						---- Bottom of Boring at 200.15 ft.----		

DATE STARTED: 4/24/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES: Drilling with 6 1/4 inch hollow stem auger

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
757.0	1.0	S-1	3-2-5 (7) 13%		0.0-1.5 ft Well graded gravel, (gw), 95% gravel, medium, medium hardness; 5% fines, low plasticity, low toughness; maximum grain size = 0.1 inches, pinkish gray (5YR 8/1), dry, no HCl reaction, dense, homogeneous	gw	
756.0	2.0	S-2	8-16-16 (32) 93%		1.5-3.0 ft Well graded gravel, (gw), 95% gravel, medium, medium hardness; 5% fines, medium plasticity, low toughness; maximum grain size = 0.1 inches, pinkish gray (5YR 8/1), dry, no HCl reaction, dense, homogeneous	gw	
755.0	3.0						
754.0	4.0	S-.3	25-15-25 (40) 87%		3.0-4.5 ft Poorly graded gravel, (gp), 90% gravel, medium to coarse, medium hardness; 5% sand; 5% fines, medium plasticity, low toughness; maximum grain size = 0.1 inches, light olive gray (5Y 5/2), dry, no HCl reaction, dense, homogeneous	gp	
753.0	5.0				4.5-5.0 ft Interval not sampled.		4.5 ft., attempted to push Shelby tube, no recovery of sample; down pressure 4000 psi
752.0	6.0	S-4	12-9-8 (17) 100%		5.0-6.5 ft Clayey sand, (sc), 70% sand, medium, subangular, soft hardness; 25% fines, medium plasticity, low toughness; 5% gravel, medium, subangular, elongated, medium hardness; maximum grain size = 0.05 inches, very pale orange (10YR 8/2) and light brown (5YR 6/4), moist, no HCl reaction, medium dense, homogeneous	sc	
751.0	7.0	S-5	7-7-7 (14) 93%		6.5-9.5 ft Well graded gravel, (gw), 84% gravel, medium to coarse, subangular, flat and elongated, medium hardness; 14% sand, fine to coarse; maximum grain size = 1.5 inches, pale yellowish brown (10YR 6/2) and moderate yellowish brown (10YR 5/4), moist, no HCl reaction, loose, trace fines	GW	
750.0	8.0						
749.0	9.0	S-6	6-9-11 (20) 80%				
748.0	10.0	S-7	13-18-21 (39) 100%		9.5-11.0 ft Poorly graded sand with gravel, (sp), medium plasticity, low toughness; 50% gravel, medium, subangular, flat and elongated, medium hardness; 50% sand, fine to medium, subrounded, soft hardness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4) and pale yellowish brown (10YR 6/2), moist, no HCl reaction, loose, homogeneous	sp	
747.0	11.0				11.0-14.0 ft SHALE, horizontal, soft to moderately hard, very intensely weathered, dark yellowish orange (10YR 6/6) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		SC-1, 12.5-12.85 ft., 13:00, 4/26/10.
746.0	12.0	R-1	100% (0%)				
745.0	13.0						
744.0	14.0				14.0-19.0 ft SHALE, horizontal, soft to moderately hard, very intensely weathered, dark yellowish orange (10YR 6/6) and dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
743.0	15.0						
742.0	16.0	R-2	100% (54%)	FD7	15.7-19 ft Joint, R.D. = 53°, closely spaced; filling: not healed, moderately thin, very intensely weathered, soft; surface: slightly rough, very intensely weathered. Fracture set #F-1.		
741.0	17.0						
740.0	18.0						
739.0	19.0						
738.0		R-3	96% (34%)		19-24 ft Joint, R.D. = 60°, closely spaced; filling: not healed, very thin clay, slightly weathered, soft; surface: slightly rough, slightly weathered; iron		

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						oxidation in the fractures.. Fracture set #F-2.		SC-2, 12.0-12.9 ft., 13:30, 4/26/10.
737.0	21.0					19.0-24.0 ft SHALE, horizontal, soft to moderately hard, very intensely weathered, pale yellowish orange (10YR 8/6) and dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
736.0	22.0	R-3	96% (34%)					
735.0	23.0			FD7				
734.0	24.0					24.0-29.0 ft SHALE, horizontal, soft to moderately hard, very intensely weathered, pale yellowish orange (10YR 8/6) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
733.0	25.0							
732.0	26.0					24-29 ft Joint, R.D. = 23°, closely spaced; filling: not healed, moderately weathered; surface: slightly rough, moderately weathered. Fracture set #F-3.		
731.0	27.0	R-4	80% (12%)					
730.0	28.0							
729.0	29.0					29.0-34.0 ft SHALE, horizontal, soft to moderately hard, very intensely weathered, pale yellowish orange (10YR 8/6) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
728.0	30.0							
727.0	31.0					29-31 ft Joint, R.D. = 42°, moderately spaced; filling: intensely weathered; surface: slightly rough, intensely weathered; iron oxidation staining in the fractures.. Fracture set #F-4.		
726.0	32.0	R-5	88% (0%)					
725.0	33.0			FD6				
724.0	34.0					34.0-39.0 ft SHALE, horizontal, soft to moderately hard, very intensely weathered, pale yellowish orange (10YR 8/6) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
723.0	35.0							
722.0	36.0					34-39 ft Joint, R.D. = 35°, closely spaced; filling: not healed, moderately thin clay, moderately weathered, soft; surface: slightly rough, moderately weathered. Fracture set #F-5.		
721.0	37.0	R-6	100% (12%)					
720.0	38.0							
719.0	39.0							
718.0		R-7	100% (44%)			39-44 ft Joint, R.D. = 10°-50°, closely spaced; dry but shows evidence of flow, filling: not healed, moderately weathered; surface: slightly rough,		

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						moderately weathered; iron oxidation staining in the fractures.. Fracture set #F-6.		
717.0	41.0			FD6		39.0-44.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
716.0	42.0	R-7	100% (44%)					
715.0	43.0							
714.0	44.0					44.0-49.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
713.0	45.0					44-61.7 ft Joint, R.D. = 68°, closely spaced; filling: not healed; surface: slightly rough; iron oxidation in the fractures, bedding plane fractures at 10°. Fracture set #F-7.		
712.0	46.0							
711.0	47.0	R-8	100% (10%)					
710.0	48.0							
709.0	49.0					49.0-54.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
708.0	50.0			FD6				
707.0	51.0							SC-3, 50.1-50.7 ft., 08:45, 4/27/10.
706.0	52.0	R-9	100% (10%)					
705.0	53.0							
704.0	54.0					54.0-59.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
703.0	55.0							
702.0	56.0							
701.0	57.0	R-10	100% (32%)					
700.0	58.0							
699.0	59.0			FD5				
698.0		R-11	100% (54%)					

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
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DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES
N. 340131.91 ft E. 2405221.36 ft
GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
697.0	61.0					59.0-64.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
696.0	62.0	R-11	100% (54%)			61.8-61.81 ft Joint, R.D. = 11°; filling: totally healed. Fracture set #F-8. 61.85-72.6 ft Joint, R.D. = 89°, very closely spaced; filling: not healed; surface: slightly rough. Fracture set #F-9.		
695.0	63.0							
694.0	64.0							
693.0	65.0			FD5		64.0-69.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
692.0	66.0							
691.0	67.0	R-12	100% (36%)					
690.0	68.0							
689.0	69.0							
688.0	70.0					69.0-74.0 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and dark yellowish orange (10YR 6/6), closely to moderately fractured, no reaction to HCl, dry, iron oxide staining, 10° bedding angle.		
687.0	71.0					70.5-84 ft Joint, R.D. = 90°-80°, closely spaced; filling: moderately healed, quartz, moderately weathered; surface: moderately weathered. Fracture set #F-10.		
686.0	72.0	R-13	100% (60%)					
685.0	73.0							
684.0	74.0							
683.0	75.0			FD6		74.0-79.0 ft SHALE, horizontal, moderately hard, moderately to intensely weathered, dark gray (N3) and dark yellowish orange (10YR 6/6), closely to widely fractured, no reaction to HCl, dry, iron oxide staining, 10° bedding angle, fracture zones filled with weathered shale and quartz crystals.		
682.0	76.0							
681.0	77.0	R-14	100% (0%)					
680.0	78.0							
679.0	79.0							
678.0		R-15	100% (0%)					

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DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
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DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

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DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
677.0	81.0					79.0-84.0 ft SHALE, horizontal, moderately hard, intensely weathered, pitted, typical diameter: 0.1 in. max size: 0.4 in., dark gray (N3) and dark yellowish orange (10YR 6/6), closely to widely fractured, no reaction to HCl, 10° bedding, fractures are filled with quartz crystals and weathered shale; the quartz crystals are stained		
676.0	82.0	R-15	100% (0%)	FD6				
675.0	83.0							
674.0	84.0					84.0-89.0 ft SHALE, horizontal, moderately hard, moderately to intensely weathered, dark gray (N3) and dark yellowish orange (10YR 6/6), closely to widely fractured, no reaction to HCl, dry, iron oxide staining, 10° bedding angle, fracture zones filled with weathered shale and quartz crystals.		
673.0	85.0					84-88.4 ft Joint, R.D. = 60°-90°, widely spaced; filling: moderately healed, moderately thin quartz crystals, moderately weathered, moderately hard; surface: slightly rough, moderately weathered. Fracture set #F-11.		
672.0	86.0							
671.0	87.0	R-16	100% (50%)					
670.0	88.0							
669.0	89.0					88.3-88.31 ft Joint, R.D. = 11°; surface: smooth; iron oxidation in the fracture. Fracture set #F-12.		
668.0	90.0					89.0-94.0 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and dark yellowish orange (10YR 6/6), very closely to moderately fractured, no reaction to HCl, dry, iron oxide staining, 10° bedding angle		
667.0	91.0					89-94 ft Joint, R.D. = 88°, very closely to moderately spaced; filling: partly healed, quartz crystals; surface: slightly rough. Fracture set #F-17.		
666.0	92.0	R-17	96% (22%)	FD6				
665.0	93.0							
664.0	94.0					94.0-99.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, 10° bedding angle		
663.0	95.0					94.1-94.3 ft Joint, R.D. = 6°; filling: not healed; surface: slightly rough; iron oxidation staining in the fracture. Fracture set #F-18.		
662.0	96.0					94.6-99 ft Joint, R.D. = 86°, very closely to moderately spaced; filling: moderately healed, moderately thin quartz and galena, slightly weathered, moderately soft; surface: slightly rough, slightly weathered. Fracture set #F-19.		
661.0	97.0	R-18	100% (0%)					
660.0	98.0							
659.0	99.0							
658.0		R-19	100% (100%)	FD4				

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
657.0	101.0					99.9-101.75 ft Joint, R.D. = 45°&90°, closely spaced; filling: totally healed, clean quartz, slightly weathered, moderately soft; surface: slightly weathered. Fracture set #F-20. 99.0-104.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to very widely fractured, no reaction to HCl, 10° bedding angle		
656.0	102.0	R-19	100% (100%)					
655.0	103.0							
654.0	104.0					104.0-109.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, 10 ° bedding angle, quartz clast at 105.3-105.7 ft.		
653.0	105.0							
652.0	106.0					106-107.5 ft Joint, R.D. = 45°, very closely spaced; filling: totally healed, clean quartz, slightly weathered, moderately soft; surface: slightly weathered. Fracture set #F-21.		
651.0	107.0	R-20	100% (100%)	FD4		107.5-114 ft Joint, R.D. = 89°, very closely spaced; filling: totally healed, clean quartz, slightly weathered, moderately soft; surface: slightly weathered. Fracture set #F-22.		
650.0	108.0							
649.0	109.0					109.0-204.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to extremely widely fractured, no reaction to HCl 109.1- ft Joint, R.D. = 10°, very closely spaced; filling: totally healed, quartz, slightly weathered, moderately soft; surface: slightly weathered. Fracture set #F-23.		
648.0	110.0							
647.0	111.0							
646.0	112.0	R-21	100% (100%)					
645.0	113.0							
644.0	114.0					113.7- ft Joint, R.D. = 11°; filling: totally healed, quartz, slightly weathered, moderately soft; surface: slightly weathered. Fracture set #F-24.		
643.0	115.0							
642.0	116.0							
641.0	117.0	R-22	100% (100%)	FD1				
640.0	118.0							
639.0	119.0							
638.0		R-23	100% (100%)					

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
637.0	121.0					109.0-204.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to extremely widely fractured, no reaction to HCl		
636.0	122.0	R-23	100% (100%)			120.3-122.7 ft Joint, R.D. = 70°, very closely spaced; filling: totally healed, clean quartz, slightly weathered, moderately soft; surface: slightly weathered. Fracture set #F-25.		
635.0	123.0							
634.0	124.0			FD1		123.9-124.5 ft Joint, R.D. = 77°, closely spaced; filling: moderately healed, very thin quartz, slightly weathered, moderately soft; surface: slightly rough, slightly weathered. Fracture set #F-27.		
633.0	125.0							
632.0	126.0							
631.0	127.0	R-24	100% (100%)					
630.0	128.0							
629.0	129.0							SC-4, 129.0-129.6 ft., 12:09, 4/27/10.
628.0	130.0							
627.0	131.0							
626.0	132.0	R-25	100% (100%)					
625.0	133.0							
624.0	134.0			FD0				
623.0	135.0							
622.0	136.0							
621.0	137.0	R-26	100% (100%)					
620.0	138.0							
619.0	139.0							
618.0		R-27	100% (100%)					

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
617.0	141.0			FD0		109.0-204.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to extremely widely fractured, no reaction to HCl		
616.0	142.0	R-27	100% (100%)					
615.0	143.0							
614.0	144.0							
613.0	145.0							
612.0	146.0							
611.0	147.0	R-28	100% (100%)					
610.0	148.0							
609.0	149.0							
608.0	150.0			FD0				
607.0	151.0							
606.0	152.0	R-29	100% (100%)					
605.0	153.0							
604.0	154.0							
603.0	155.0							
602.0	156.0							
601.0	157.0	R-30	100% (100%)			156.7-156.71 ft Joint, R.D. = 16°; filling: totally healed, calcite, slightly weathered, very soft; surface: slightly weathered; calcite measured 0.1 ft. Fracture set #F-28.		
600.0	158.0							
599.0	159.0			FD0				
598.0		R-31	100% (100%)					

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
597.0	161.0					109.0-204.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to extremely widely fractured, no reaction to HCl		
596.0	162.0	R-31	100% (100%)					
595.0	163.0							
594.0	164.0							
593.0	165.0							
592.0	166.0			FD0				
591.0		R-32	100% (100%)					
	167.0							
590.0	168.0							
589.0	169.0							
588.0	170.0							
587.0	171.0							
586.0		R-33	98% (98%)					
	172.0							
585.0	173.0							
584.0	174.0							
583.0	175.0							
582.0	176.0			FD0				
581.0		R-34	100% (100%)					
	177.0							
580.0	178.0							
579.0	179.0							
578.0		R-35	100% (100%)					

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
577.0	181.0					109.0-204.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to extremely widely fractured, no reaction to HCl		
576.0	182.0	R-35	100% (100%)					
575.0	183.0			FD0				
574.0	184.0							
573.0	185.0							
572.0	186.0							
571.0	187.0	R-36	100% (100%)					
570.0	188.0							
569.0	189.0							
568.0	190.0							
567.0	191.0							
566.0	192.0	R-37	100% (100%)					
565.0	193.0			FD0				
564.0	194.0							
563.0	195.0							
562.0	196.0							
561.0	197.0	R-38	100% (100%)					
560.0	198.0							
559.0	199.0							
558.0		R-39	100% (100%)					

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-405

PROJECT NO. 10-4310

COORDINATES

N. 340131.91 ft E. 2405221.36 ft

GROUND SURFACE ELEVATION: 757.56 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
557.0	201.0			FD0		109.0-204.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to extremely widely fractured, no reaction to HCl		
556.0	202.0	R-39	100% (100%)					
555.0	203.0			FD0				
554.0	204.0					---- Bottom of Boring at 204.00 ft.----		

DATE STARTED: 4/26/10
DATE FINISHED: 4/27/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
771.0	1.0	S-1	1-2-2 (4) 60%		0.0-1.5 ft Clayey sand, (sc), 75% sand, fine to medium, rounded, very soft hardness; 25% fines, medium plasticity, low toughness; moderate brown (5YR 3/4), moist, no HCl reaction, loose, homogeneous, weak cementation	sc	
770.0	2.0	S-2	5-6-8 (14) 93%		1.5-3.0 ft Clayey sand with gravel, (sc), 56% sand, fine to medium, subrounded, very soft hardness; 25% gravel, fine to medium, subangular, flat and elongated, medium hardness; 19% fines, medium plasticity, low toughness; maximum grain size = 0.05 inches, light brown (5YR 5/6) and light olive gray (5Y 5/2), no HCl reaction, medium dense, homogeneous	sc	
769.0	3.0	S-3	13-20-25 (45) 93%		3.0-6.0 ft Well graded gravel with clay and sand, (gw-gc), 69% gravel, fine to medium, subrounded to subangular, very soft hardness; 25% sand, fine to coarse; maximum grain size = 0.5 inches, light brown (5YR 5/6) and light gray (N7), moist, no HCl reaction, dense, trace fines	GW-GC	Decomposed shale starting at 3.0 ft.
768.0	4.0						
767.0	5.0	S-4	11-16-22 (38) 73%				
766.0	6.0						
765.0	7.0	S-5	7-8-7 (15) 73%		6.0-7.5 ft Poorly graded sand with clay and gravel, (sp-sc), 55% sand, fine to medium, subangular, soft hardness; 35% gravel, medium to coarse, subangular, elongated, medium hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 0.1 inches, light gray (N7), dry, no HCl reaction, loose, homogeneous	sp-sc	
764.0	8.0	S-6	9-10-11 (21) 73%		7.5-9.0 ft Poorly graded gravel with silt and sand, (gp-gm), 55% gravel, medium, subrounded, very soft hardness; 35% sand, fine to medium, subangular, flat and elongated, medium hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.05 inches, light olive gray (5Y 5/2) and light brown (5YR 6/4), dry, no HCl reaction, loose, weak cementation	gp-gm	
763.0	9.0	ST-1			9.4-9.5 ft Interval not sampled		9.0 ft, ST-1 at 9.0-9.4 ft on 4/21/10
762.0	10.0	S-7	21-28-28 (56) 73%		9.5-11.0 ft Well graded gravel with sand, (gw), 75% gravel, medium to coarse, subangular, flat and elongated, medium hardness; 25% sand, medium, subangular, elongated, soft hardness; maximum grain size = 0.1 inches, medium gray (N5), dry, no HCl reaction, medium dense, blocky, weak cementation, weathering occuring on the gravel sample.	gw	SC-1 at 11.3 - 12.2 ft. at 13:00, 4/21/10
761.0	11.0						
760.0	12.0				11.0-16.0 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3), moderately fractured, no reaction to HCl, dry, bedding is at a 10° angle		
759.0	13.0	R-1	96% (18%)		12.2-16 ft Joint, R.D. = 40-76°, moderately spaced; filling: not healed, clay; surface: slightly rough. Fracture set #F-1.		
758.0	14.0						
757.0	15.0			FD8			
756.0	16.0				16.0-21.0 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3), closely fractured, no reaction to HCl, moist, iron oxide staining, bedding is at a 10 ° angle		
755.0	17.0				16-21 ft Joint, R.D. = 58°, closely spaced; filling: not healed, clay, fresh; surface: slightly rough, fresh. Fracture set #F-2.		
754.0	18.0	R-2	94% (27%)				
753.0	19.0						
752.0							

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
751.0	21.0	R-2	94% (27%)	FD8		21.0-25.0 ft SHALE, horizontal, moderately hard, intensely weathered, dark gray (N3), no reaction to HCl, iron oxide staining, 10 ° angle on the bedding 21-25 ft Joint, R.D. = 0-60°, very closely to moderately spaced; filling: not healed, very thin clay, fresh, very soft; surface: moderately rough, undulating, fresh. Fracture set #F-3.		
750.0	22.0							
749.0	23.0	R-3	98% (0%)					
748.0	24.0							
747.0	25.0					25.0-30.0 ft SHALE, horizontal, moderately hard, intensely weathered, dark gray (N3), closely to widely fractured, no reaction to HCl, iron oxide staining, 10 ° angle bedding plane, fractures filled with clay with a color of moderate orange pink (5YR 8/4), no HCl reaction 25-34 ft Joint, R.D. = 30-70°, very closely to widely spaced; filling: partly healed, very thin clay, fresh, very soft; surface: slightly rough, fresh. Fracture set #F-4.		
746.0	26.0							
745.0	27.0	R-4	100% (34%)					
744.0	28.0							
743.0	29.0							
742.0	30.0					30.0-35.0 ft SHALE, horizontal, moderately hard, intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely fractured, no reaction to HCl, iron oxide staining, bedding at a 10 ° angle, clay fracture filling is 5YR 8/4 (moderate orange pink) 30-40 ft Joint, R.D. = 50°, closely spaced, slightly open; filling: not healed, very thin clay, fresh, very soft; surface: slightly rough, fresh. Fracture set #F-5.		30.0 - 35.0 ft. 100% water recovery
741.0	31.0							
740.0	32.0			FD6				
739.0	33.0	R-5	96% (66%)					
738.0	34.0							
737.0	35.0					35.0-40.0 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), very closely to moderately fractured, no reaction to HCl, iron oxide staining, 10 ° bedding angle, clay infilling is moderate orange pink (5YR 8/4)		
736.0	36.0							
735.0	37.0							
734.0	38.0	R-6	98% (60%)					
733.0	39.0							
732.0				FD6				

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
731.0	41.0					40.0-45.0 ft SHALE, horizontal, moderately hard, intensely weathered, dark gray (N3) and medium light gray (N6), closely fractured, no reaction to HCl, iron oxide staining, 10 ° bedding angle, clay infilling is moderate orange pink (5YR 8/4)		
730.0	42.0	R-7	88% (22%)			40-45 ft Joint, R.D. = 66°, very closely to moderately spaced; filling: moderately healed, very thin clay, fresh, very soft; surface: slightly rough, fresh. Fracture set #F-6.		
729.0	43.0							
728.0	44.0							SC-2 at 43.9-44.5 ft at 09:30 on 4/22/10
727.0	45.0							
726.0	46.0					45.0-50.0 ft SHALE, horizontal, moderately hard, very intensely weathered, dark gray (N3) and very pale orange (10YR 8/2), closely fractured, no reaction to HCl, iron oxide staining, less than a 10 ° angle on the bedding		Lost water circulation at 45.0-50.0 ft.
725.0	47.0			FD6		45-50 ft Joint, R.D. = 52°, closely spaced; filling: not healed, very thin clay, fresh, very soft; surface: slightly rough, fresh; iron oxide on some of the joint fractures. Fracture set #F-7.		
724.0	48.0	R-8	88% (34%)					
723.0	49.0							
722.0	50.0					50.0-55.0 ft SHALE, horizontal, moderately hard, very intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to widely fractured, no reaction to HCl, iron oxide staining, fracture infilled with clay, some have iron oxidation on the fracture		
721.0	51.0					50-55 ft Joint, R.D. = 46°, very closely to very widely spaced; filling: not healed, very thin clay, fresh to slightly weathered, very soft; surface: smooth, fresh; some fractures have clay filling, and others have been oxidized. Fracture set #F-8.		
720.0	52.0	R-9	100% (20%)					
719.0	53.0							
718.0	54.0							
717.0	55.0					55.0-60.0 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, 10 ° bedding, fractures are filled with clay and quartz		
716.0	56.0					55-58.5 ft Joint, R.D. = 43°, closely spaced; filling: not healed, very thin quartz and clay, slightly weathered, very soft to moderately hard; surface: slightly rough, slightly weathered. Fracture set #F-9.		
715.0	57.0			FD6				
714.0	58.0	R-10	80% (50%)					
713.0	59.0							
712.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
711.0	61.0					60.0-65.0 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely fractured, no reaction to HCl, iron oxide staining, 10 ° angle of bedding, fracture at 63.8 ft. is filled with quartz, other fractures have clay filling, 60.2-60.45 ft. clay seam, light olive brown (5Y 5/6)		
710.0	62.0	R-11	86% (40%)			60-65 ft Joint, R.D. = 35°, very closely to moderately spaced; filling: not healed, moderately thin quartz and clay, fresh to moderately weathered, very soft to moderately hard; surface: slightly rough, fresh. Fracture set #F-10.		
709.0	63.0							
708.0	64.0							
707.0	65.0			FD6		65.0-70.0 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10 ° angle of the bedding, clay infilling has a light olive brown (5Y 5/6)		
706.0	66.0							
705.0	67.0					65-69.2 ft Joint, R.D. = 18°, closely spaced; filling: moderately thin clay, fresh, very soft; surface: slightly rough, fresh. Fracture set #F-11.		
704.0	68.0	R-12	100% (30%)					
703.0	69.0					69.1-69.2 ft Joint, R.D. = 30°, closely spaced; filling: moderately weathered; surface: stepped, moderately weathered. Fracture set #F-12.		
702.0	70.0					70.0-75.0 ft SHALE, horizontal, moderately hard, moderately to slightly weathered, yellowish gray (5Y 7/2) and dark gray (N3), closely fractured, no reaction to HCl, dry, iron oxide staining, 10 ° on the bedding, fossilized shells, strong reaction to HCl from 73.5-75.0ft.		SC-3 at 70.3-71.05 ft, 13:15, 4/22/10
701.0	71.0							
700.0	72.0					70-73.5 ft Joint, R.D. = 12°, closely spaced; filling: not healed, moderately thin clay, fresh to slightly weathered, very soft; surface: slightly rough, fresh. Fracture set #F-12.		
699.0	73.0	R-13	100% (60%)					
698.0	74.0							
697.0	75.0			FD3		75.0-80.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, fossilized shells throughout		
696.0	76.0							
695.0	77.0							
694.0	78.0	R-14	100% (100%)					
693.0	79.0							
692.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
691.0	81.0					80.0-95.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), widely to very widely fractured, no reaction to HCl, fossilized shells throughout		
690.0	82.0			FD3				
		R-15	100% (100%)					
689.0	83.0							
688.0	84.0							
687.0	85.0							
686.0	86.0							
685.0	87.0							
		R-16	100% (100%)					
684.0	88.0							
683.0	89.0							
682.0	90.0							
681.0	91.0			FD1		90.7-91.2 ft Joint, R.D. = 70°, very closely spaced; filling: slightly weathered; surface: smooth, slightly weathered; iron oxide staining in the fracture. Fracture set #F-13.		
680.0	92.0							
		R-17	100% (92%)					
679.0	93.0							
678.0	94.0							
677.0	95.0					95.0-100.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), widely fractured, no reaction to HCl, fossilized shells throughout, few calcite laminae		
676.0	96.0					95.5-95.8 ft Joint, R.D. = 63°; filling: slightly weathered; surface: slightly rough, slightly weathered; iron oxide in the fracture. Fracture set #F-14.		
675.0	97.0							
		R-18	100% (94%)					
674.0	98.0							
673.0	99.0			FD1				
672.0						99.5-99.6 ft R.D. = 14°; surface: slightly rough; iron oxide in fracture. Fracture		

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						set #F-15.		
671.0	101.0					100.0-115.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), closely to very widely fractured, no reaction to HCl, few calcite laminae		
670.0	102.0							
		R-19	100% (96%)			102.6-102.95 ft Joint, R.D. = 70°, very closely spaced; filling: not healed, very thin calcite, fresh, soft; surface: slightly rough, fresh; calcite lamina. Fracture set #F-16.		
669.0	103.0							
668.0	104.0							
667.0	105.0							
666.0	106.0			FD1				
665.0	107.0							
		R-20	100% (100%)					
664.0	108.0							
663.0	109.0							
662.0	110.0							
661.0	111.0							
660.0	112.0							
		R-21	100% (74%)			112.8-114.6 ft Joint, R.D. = 10°, closely spaced; surface: slightly rough; iron oxide staining in the fracture joints. Fracture set #F-17.		
659.0	113.0							
658.0	114.0							
657.0	115.0					115.0-120.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, fossilized shells throughout, few calcite laminae		
656.0	116.0			FD0				
655.0	117.0							
		R-22	100% (100%)					
654.0	118.0							
653.0	119.0							
652.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
651.0	121.0					120.0-135.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, 10 ° bedding		
650.0	122.0							
		R-23	100% (100%)	FD0				
649.0	123.0							
648.0	124.0							
647.0	125.0							
646.0	126.0							
645.0	127.0							
		R-24	100% (100%)					
644.0	128.0							
643.0	129.0							
642.0	130.0							
641.0	131.0							
640.0	132.0			FD0				
		R-25	100% (100%)					
639.0	133.0							
638.0	134.0							
637.0	135.0					135.0-175.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, fossilized shells throughout		
636.0	136.0							
635.0	137.0							
		R-26	100% (100%)					
634.0	138.0							
633.0	139.0							
632.0				FD0				

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
631.0	141.0					135.0-175.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, fossilized shells throughout		
630.0	142.0	R-27	100% (100%)					
629.0	143.0							
628.0	144.0							
627.0	145.0							
626.0	146.0							
625.0	147.0			FD0				
		R-28	100% (100%)					
624.0	148.0							
623.0	149.0							
622.0	150.0							
621.0	151.0							
620.0	152.0							
		R-29	100% (100%)					
619.0	153.0							
618.0	154.0							
617.0	155.0							
616.0	156.0							
615.0	157.0			FD0				
		R-30	100% (100%)					
614.0	158.0							
613.0	159.0							
612.0								

DATE STARTED: 4/21/10
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FIELD GEOLOGIST: Jason Lucey
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DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
611.0	161.0					135.0-175.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, fossilized shells throughout		
610.0	162.0	R-31	100% (100%)			161.6-162.4 ft Joint, R.D. = 58°, very closely spaced; dry, tight or filled, no flow, filling: totally healed, clean calcite, fresh, soft; surface: fresh; calcite is 0.6 inches thick. Fracture set #F-18.		
609.0	163.0							
608.0	164.0							
607.0	165.0							
606.0	166.0			FD0				
605.0	167.0	R-32	98% (98%)					
604.0	168.0							
603.0	169.0					169.2-169.7 ft Joint, R.D. = 70°, very closely spaced; filling: totally healed, calcite, fresh, soft; surface: fresh. Fracture set #F-19.		
602.0	170.0							
601.0	171.0							
600.0	172.0	R-33	100% (100%)					
599.0	173.0							
598.0	174.0							
597.0	175.0					175.0-180.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl		
596.0	176.0			FD0				
595.0	177.0	R-34	100% (100%)					
594.0	178.0							
593.0	179.0							
592.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
591.0	181.0					180.0-185.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10 ° bedding angle, fossilized shells throughout		
590.0	182.0							
		R-35	100% (100%)					
589.0	183.0							
588.0	184.0			FD0				
587.0	185.0					185.0-195.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10 ° bedding angle		
586.0	186.0							
585.0	187.0							
		R-36	100% (100%)					
584.0	188.0							
583.0	189.0							
582.0	190.0							
581.0	191.0							
580.0	192.0							
		R-37	100% (100%)					
579.0	193.0							
578.0	194.0			FD0				
577.0	195.0					195.0-200.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), widely to very widely fractured, no reaction to HCl, 197.6 ft. pyrite clast, 10 ° bedding angle		
576.0	196.0							
575.0	197.0					196.65-196.66 ft Joint, R.D. = 15°; filling: totally healed, calcite, fresh; surface: fresh. Fracture set #F-20.		
		R-38	100% (100%)					
574.0	198.0							
573.0	199.0							
572.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-406

PROJECT NO. 10-4310

COORDINATES

N. 340286.99 ft E. 2405115.50 ft

GROUND SURFACE ELEVATION: 771.88 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
571.0	201.0			FD0		200.0-220.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl		
570.0	202.0							
		R-39	100% (100%)					
569.0	203.0					203.35-204 ft Joint, R.D. = 14°, very closely spaced; filling: moderately healed, thin calcite, fresh, soft; surface: smooth, fresh. Fracture set #F-21.		
568.0	204.0							
567.0	205.0							
566.0	206.0							
565.0	207.0							
		R-40	100% (100%)					
564.0	208.0							
563.0	209.0							
562.0	210.0							
561.0	211.0			FD0				
560.0	212.0							
		R-41	100% (100%)					
559.0	213.0							
558.0	214.0							
557.0	215.0							
556.0	216.0							
555.0	217.0							
		R-42	100% (100%)					
554.0	218.0							
553.0	219.0							
552.0								

---- Bottom of Boring at 220.00 ft.----

DATE STARTED: 4/21/10
DATE FINISHED: 4/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-407

PROJECT NO. 10-4310

COORDINATES

N. 340169.21 ft E. 2404971.67 ft

GROUND SURFACE ELEVATION: 734.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
734.0						0.0-1.5 ft Well graded sand with clay, (sw-sc), 90% sand, fine to medium, subrounded, soft hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; light brown (5YR 5/6), moist, no HCl reaction, medium dense, medium plasticity	sw-sc	
733.0	1.0	S-1	3-3-3 (6) 100%					
732.0	2.0	S-2	5-31-16 (47) 90%			1.5-3.0 ft Well graded sand with gravel, (sw), 70% sand, fine to medium, subrounded, soft hardness; 25% gravel, medium, subangular, medium hardness; 5% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.1 inches, light brown (5YR 5/6) and pale brown (5YR 5/2), moist, no HCl reaction, medium dense to dense, medium plasticity	sw	
731.0	3.0	S-3	10-13-13 (26) 100%			3.0-4.5 ft Poorly graded gravel with sand, (gp), 75% gravel, medium, subangular, medium hardness; 20% sand, fine to medium, subrounded, soft hardness; 5% fines, medium plasticity, no dry strength, no dilatancy, medium toughness; maximum grain size = 0.1 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, dense, homogeneous	gp	
730.0	4.0							
729.0	5.0	S-4	11-9-6 (15) 100%			4.5-6.0 ft Poorly graded sand with clay and gravel, (sp-sc), 50% sand, fine to medium, subrounded, soft hardness; 40% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, low plasticity, no dry strength, no dilatancy, no toughness; maximum grain size = 0.06 inches, very pale orange (10YR 8/2), dry, no HCl reaction, medium dense	sp-sc	
728.0	6.0	S-5	4-5-6 (11) 93%			6.0-7.5 ft Clayey sand, (sc), 65% sand, fine to medium, subrounded, soft hardness; 25% fines, low plasticity, no dry strength, no dilatancy, no toughness; 10% gravel, medium to coarse, subangular, flat, medium hardness; maximum grain size = 0.03 inches, light brown (5YR 5/6), dry, no HCl reaction, medium dense	sc	
727.0	7.0							
726.0	8.0	S-6	6-6-6 (12) 100%			7.5-9.0 ft Well graded sand with clay and gravel, (sw-sc), 60% sand, fine to medium, subrounded, soft hardness; 30% gravel, medium, subangular, flat, medium hardness; 10% fines, low plasticity, no dry strength, no dilatancy, no toughness; maximum grain size = 0.01 inches, light brown (5YR 5/6) and light brown (5YR 6/4), dry, no HCl reaction, medium dense	sw-sc	
725.0	9.0	S-7	7-7-7 (14) 100%			9.0-10.5 ft Well graded sand with clay and gravel, (sw-sc), 60% sand, fine to medium, subrounded, soft hardness; 30% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.05 inches, light brown (5YR 5/6) and light brown (5YR 6/4), dry, no HCl reaction, medium dense	sw-sc	
724.0	10.0					10.5-11.5 ft No recovery		
723.0	11.0	S-8	12-50 0%			11.5-12.0 ft Interval not sampled		
722.0	12.0	S-9	30-19-16 (35) 40%			12.0-13.5 ft Well graded sand with clay and gravel, (sw-sc), 70% sand, fine to medium, subrounded, soft hardness; 20% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.04 inches, light brown (5YR 5/6) and light brown (5YR 6/4), dry, no HCl reaction, medium dense	gw	
721.0	13.0							
720.0	14.0	S-10	13-24-20 (44) 73%			13.5-15.0 ft Well graded gravel with sand, (gw), 65% gravel, medium, subangular, flat and elongated, medium hardness; 35% sand, fine to medium, subrounded, soft hardness; 0% fines; maximum grain size = 0.1 inches, pale yellowish brown (10YR 6/2), dry, no HCl reaction, medium dense, homogeneous	gw	
719.0	15.0	S-11	15-22-45 (67) 100%					
718.0	16.0							
717.0	17.0	S-12	30-32-40 (72) 73%			15.0-16.5 ft Well graded gravel with sand, (gw), 65% gravel, medium, subangular, flat and elongated, medium hardness; 35% sand, fine to medium, subrounded, soft hardness; 0% fines; maximum grain size = 0.1 inches, pale yellowish brown (10YR 6/2), dry, no HCl reaction, medium dense, homogeneous	sw	
716.0	18.0	S-13	26-50 100%					
715.0	19.0	S-14						

DATE STARTED: 5/24/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-407

PROJECT NO. 10-4310

COORDINATES

N. 340169.21 ft E. 2404971.67 ft

GROUND SURFACE ELEVATION: 734.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
714.0						16.5-18.0 ft SHALE, intensely weathered, very pale orange (10YR 8/2) and light brown (5YR 6/4), no reaction to HCl, dry, moderately soft		
	21.0	S-14	29-21-16 (37) 100%			18.0-19.0 ft SHALE, intensely weathered, very pale orange (10YR 8/2) and light brown (5YR 6/4), no reaction to HCl, dry, moderately soft	sw	
713.0						19.0-21.0 ft Well graded sand with gravel, (sw), 70% sand, fine to medium, subangular, soft hardness; 30% gravel, medium, subangular, flat and elongated, medium hardness; maximum grain size = 0.05 inches, light brown (5YR 6/4) and dark gray (N3), moist, no HCl reaction, medium dense, medium plasticity, low toughness on silty clay trace		
	22.0	S-15	16-22-41 (63) 100%				sw	
712.0						21.0-22.5 ft Well graded sand with gravel, (sw), 70% sand, fine to medium, subangular, soft hardness; 20% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines; maximum grain size = 0.05 inches, light brown (5YR 6/4) and dark gray (N3), moist, no HCl reaction, medium dense, medium plasticity, 10% silty clay, medium plasticity, low toughness		
	23.0	S-16	21-28-22 (50) 100%				sw	
711.0								
	24.0	S-17	20-50 100%				sw-sc	
710.0						22.5-24.0 ft Well graded sand with gravel, (sw), 70% sand, fine to medium, subangular, soft hardness; 20% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines; maximum grain size = 0.05 inches, light brown (5YR 6/4) and dark gray (N3), moist, no HCl reaction, medium dense, medium plasticity, 10% silty clay, medium plasticity, low toughness		
	25.0							
709.0						24.0-25.0 ft Well graded sand with clay and gravel, (sw-sc), 70% sand, fine to medium, subangular, soft hardness; 20% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, no dry strength, no dilatancy, no toughness; maximum grain size = 0.01 inches, light brown (5YR 6/4) and light brown (5YR 5/6), moist, no HCl reaction, medium dense, medium plasticity		
	26.0							
708.0						25.0-25.5 ft Interval not sampled		
	27.0							
707.0						25.5-30.5 ft SHALE, moderately soft to moderately hard, very intensely weathered, pale yellowish brown (10YR 6/2) and dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, mechanically broken		
	28.0	R-1	70% (0%)					
706.0						25.5-50.5 ft Joint, R.D. = 21°, closely spaced; filling: not healed, moderately thin clay, intensely weathered, very soft; surface: slightly rough, planar, intensely weathered; iron oxide staining in the fracture face with clay fill. Fracture set #F-1.		
	29.0							
705.0						30.5-35.5 ft SHALE, moderately soft to moderately hard, very intensely weathered, pale yellowish brown (10YR 6/2) and dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, mechanically broken		
	30.0							
704.0								
	31.0							
703.0								
	32.0							
702.0				FD7				
	33.0	R-2	88% (12%)					
701.0								
	34.0							
700.0								SC-1 at 34.4 - 35.0 ft., 14:20, 5/24/10
	35.0							
699.0						35.5-40.5 ft SHALE, moderately hard, very intensely weathered, pale yellowish brown (10YR 6/2) and dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, mechanically broken		
	36.0							
698.0								
	37.0							
697.0								
	38.0	R-3	100% (28%)					
696.0								
	39.0							
695.0								

DATE STARTED: 5/24/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-407

PROJECT NO. 10-4310

COORDINATES

N. 340169.21 ft E. 2404971.67 ft

GROUND SURFACE ELEVATION: 734.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
694.0		R-3						
	41.0			FD7		40.5-45.5 ft SHALE, moderately hard, very intensely weathered, pale yellowish brown (10YR 6/2) and dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, mechanically broken		
693.0								
	42.0							
692.0								
	43.0	R-4	60% (0%)					
691.0								
	44.0							
690.0								
	45.0							
689.0						45.5-50.5 ft SHALE, moderately hard, very intensely weathered, pale yellowish brown (10YR 6/2) and dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, mechanically broken		
	46.0							
688.0								
	47.0							
687.0								
	48.0	R-5	100% (34%)					
686.0								
	49.0							
685.0								
	50.0			FD5				
684.0								
	51.0					50.5-55.5 ft SHALE, moderately hard, very intensely weathered, pale yellowish brown (10YR 6/2) and dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, mechanically broken		
683.0						50.5-55.5 ft Joint, R.D. = 78-85°, closely to moderately spaced; filling: not healed; surface: slightly rough; fracture face has iron oxide staining. Fracture set #F-2.		
	52.0							
682.0								
	53.0	R-6	100% (28%)					
681.0								
	54.0							
680.0								
	55.0							
679.0								
	56.0					55.5-60.5 ft SHALE, moderately hard, very intensely weathered, pale yellowish brown (10YR 6/2) and dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, mechanically broken		
678.0						55.5-60.5 ft Joint, R.D. = 25°, closely spaced; filling: not healed; surface: slightly rough, planar; iron oxide on the fracture faces. Fracture set #F-3.		
	57.0							
677.0								
	58.0	R-7	100% (54%)					
676.0								
	59.0							
675.0				FD4				

DATE STARTED: 5/24/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-407

PROJECT NO. 10-4310

COORDINATES

N. 340169.21 ft E. 2404971.67 ft

GROUND SURFACE ELEVATION: 734.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
674.0		R-7						
	61.0					60.5-65.5 ft SHALE, moderately hard, very intensely weathered, pale yellowish brown (10YR 6/2) and dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, mechanically broken		
673.0						60.5-65.5 ft Joint, R.D. = 50°, very closely to closely spaced; filling: not healed, intensely weathered; surface: slightly rough, planar, intensely weathered; bedding plane fractures, iron oxidation staining on the fracture faces. Fracture set #F-4.		
	62.0							
672.0								
	63.0	R-8	100% (60%)					
671.0								
	64.0							
670.0								
	65.0							
669.0								
	66.0					65.5-70.5 ft SHALE, horizontal, moderately hard, slightly to moderately weathered, medium dark gray (N4), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding plane		
668.0								
	67.0			FD4		65.5-70.5 ft Joint, R.D. = 20-30°, closely spaced; surface: slightly rough, planar; iron oxide staining on the fracture face. Fracture set #F-5.		
667.0								
	68.0	R-9	100% (48%)					
666.0								
	69.0							
665.0								
	70.0							
664.0								
	71.0					70.5-75.5 ft SHALE, horizontal, moderately hard, moderately to slightly weathered, dark gray (N3), very closely to widely fractured, no reaction to HCl, 10° bedding plane, fossilized shell casts		
663.0								
	72.0							
662.0								
	73.0	R-10	100% (76%)					
661.0								
	74.0							
660.0				FD0		74.3-75.5 ft Joint, R.D. = 87°, very closely spaced; filling: not healed; surface: slightly rough, planar; iron oxide staining on the fracture face. Fracture set #F-6.		
	75.0							
659.0						---- Bottom of Boring at 75.50 ft.----		

DATE STARTED: 5/24/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
728.0	1.0	S -1	1-2-2 (4) 53%			0.0-1.5 ft Silty sand, (sm), 65% sand, fine; 35% fines, non plastic, no toughness; 0% gravel; dark yellowish brown (10YR 4/2), moist, no HCl reaction, very loose	sm	
727.0	2.0	S -2	2-4-5 (9) 87%			1.5-3.0 ft Silty sand, (sm), 80% sand, fine; 15% fines, non plastic; 5% gravel, fine, subangular; maximum grain size = .15 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, loose	sm	
726.0	3.0							
725.0	4.0	S -3	2-10-15 (25) 93%			3.0-4.5 ft Silty sand, (sm), 75% sand, fine; 20% fines, non plastic, no toughness; 5% gravel, fine, subangular, medium hardness; maximum grain size = 0.1 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, medium dense, small shale dark gray (N3) fragments, LL = 25%, PL = 17%, PI = 8%, SG = 2.6	sm (CL)	
724.0	5.0	S -4	37-30-31 (61) 47%			4.5-6.0 ft Silty sand, (sm), 80% sand, fine; 15% fines, non plastic, no toughness; 5% gravel, fine, subangular, medium hardness; maximum grain size = 1.0 inches, moderate yellowish brown (10YR 5/4) with dark yellowish orange (10YR 6/6), moist, no HCl reaction, very dense, sampling through boulder medium light gray (N6), coarse sand to fine gravel sized pieces broken during sampling, single 1.0 inch piece in driving shoe, LL = 25%, PL = 17%, PI = 8%, SG = 2.6	sm (CL)	
723.0	6.0	S -5	15-50/2 100%				sw-sm	
722.0	7.0					6.0-6.65 ft Well graded sand with silt, (sw-sm), 80% sand, fine to medium; 10% gravel, fine, subangular, medium hardness; 10% fines, non plastic, no toughness; maximum grain size = 0.1 inches, moderate yellowish brown (10YR 5/4) with dark gray (N3), moist, no HCl reaction, very dense	sm	
721.0	8.0	S -6	9-19-20 (39) 100%			6.65-7.5 ft Interval not sampled		
720.0	9.0	S -7	9-14-30 (44) 100%			7.5-9.0 ft Silty sand, (sm), 80% sand, fine to coarse; 20% fines, non plastic, no toughness; maximum grain size = 0.1 inches, moderate yellowish brown (10YR 5/4) and yellowish gray (5Y 7/2), moist, no HCl reaction, dense, coarse sand sized fragments of shale, dark gray (N3)	sm	
719.0	10.0	S -8	6-11-14 (25) 100%			9.0-10.5 ft Silty sand, (sm), 75% sand, fine to coarse; 20% fines, low plasticity, low dry strength; 5% gravel, fine; maximum grain size = 0.1 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), dry, no HCl reaction, dense, some weathered shale fragments	sm	
718.0	11.0	S -9	7-8-12 (20) 87%			10.5-12.0 ft Silty sand, (sm), 80% sand, fine to coarse; 15% fines, non plastic, low dry strength; 5% gravel, fine, subangular; maximum grain size = 0.1 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), dry, no HCl reaction, medium dense	sm	
717.0	12.0	S -10	4-4-5 (9) 100%			12.0-13.5 ft Silty sand, (sm), 80% sand, fine to coarse; 20% fines, non plastic, low dry strength; 0% gravel; light brown (5YR 5/6) and yellowish gray (5Y 7/2), dry, no HCl reaction, medium dense	sm	
716.0	13.0	S -11	4-6-6 (12) 100%			13.5-15.0 ft Silty sand, (sm), 80% sand, fine to coarse; 20% fines, non plastic, low toughness; 0% gravel; light brown (5YR 5/6) and moderate orange pink (10R 7/4), dry, no HCl reaction, loose, some weathered shale fragments, dark gray (N3)	sm	
715.0	14.0	S -12	6-9-9 (18) 100%			15.0-16.5 ft Silty sand, (sm), 75% sand, fine to coarse; 20% fines, non plastic, low toughness; 5% gravel, fine, subangular, medium hardness; maximum grain size = 0.25 inches, light brown (5YR 5/6) with moderate orange pink (10R 7/4), dry, no HCl reaction, medium dense	sm	
714.0	15.0	S -13	4-10-13 (23) 100%			16.5-18.0 ft Silty sand, (sm), 80% sand, fine to coarse; 20% fines, non plastic, no toughness; 0% gravel; pale yellowish orange (10YR 8/6) with moderate reddish brown (10R 4/6), dry, no HCl reaction, medium dense, moderate reddish brown (10 R 4/6) weathered shale pieces	sm	
713.0	16.0							
712.0	17.0							
711.0	18.0							
710.0	19.0							
709.0		S -14				18.0-19.5 ft Silty sand, (sm), 75% sand, fine to coarse; 20% fines, non	sm	

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
708.0		S -14	9-15-16 (31) 100%		plastic, no toughness; 5% gravel, fine, subangular, medium hardness; maximum grain size = 0.25 inches, light brown (5YR 5/6) and pale yellowish orange (10YR 8/6), dry, no HCl reaction, medium dense, some weathered shale fragments, moderate yellowish brown (10R 4/6)	sm	
	21.0						
707.0		S -15	6-14-31 (45) 100%			sm	
	22.0						
706.0			23-50/5				Switching to casing advancer with tri-cone
	23.0	S -16	100%			gm	
705.0							
	24.0	S -17	50/5			gm	
704.0			71%				Refusal at 24.42 ft., drilling to 25.0 ft. and begins coring
	25.0						
703.0							
	26.0						
702.0							
	27.0	R-1	100% (0%)	FD7			
701.0							
	28.0						
700.0							
	29.0						
699.0							
	30.0						
698.0							
	31.0						
697.0							
	32.0	R-2	100% (0%)	FD7			SC-1 32.3-32.6 ft., 15:20 on 5/9/10
696.0							
	33.0						
695.0							
	34.0				19.5-21.0 ft Silty sand, (sm), 75% sand, fine to coarse; 20% fines, non plastic, no toughness; 5% gravel, fine, angular, medium hardness; maximum grain size = 0.1 inches, light brown (5YR 5/6) and pale yellowish orange (10YR 8/6), moist, dense, coarse sand to fine gravel size weathered shale fragments dark gray (N3) and moderate reddish brown (10R 4/6)		
694.0							
	35.0						
693.0					21.0-22.5 ft Silty sand, (sm), 70% sand, fine to coarse; 20% fines, non plastic, no toughness; 10% gravel, fine, subangular, flat and elongated, medium hardness; maximum grain size = 0.5 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), dry, dense, sample transitions into larger, drier, less/slightly weathered shale, dark gray (N3) fragments		
	36.0						
692.0							
	37.0	R-3	100% (0%)	FD7			
691.0							
	38.0				22.5-23.42 ft Silty gravel with sand, (gm), 60% gravel, fine to medium, angular, flat and elongated, medium hardness; 20% sand, fine; 20% fines, non plastic, no toughness; maximum grain size = 0.5 inches, dark yellowish orange (10YR 6/6) and yellowish gray (5Y 7/2), moist, very dense, moderately to intensely weathered shale, some dark gray (N3) pieces.		
690.0							
	39.0						
689.0					23.42-24.0 ft Interval not sampled		
		R-4		FD5			

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
688.0	40.0					24.0-24.42 ft Silty gravel with sand, (gm), 60% gravel, fine to medium, angular, flat and elongated, medium hardness; 20% sand, fine; 20% fines, non plastic, no toughness; maximum grain size = 0.5 inches, dark yellowish orange (10YR 6/6) and yellowish gray (5Y 7/2), moist, very dense, moderately to intensely weathered shale, some dark gray (N3) pieces.		
687.0	41.0					24.42-25.0 ft Interval not sampled		
686.0	42.0	R-4	100% (63%)	FD5		25.0-29.5 ft SHALE, interbedded, soft to moderately hard, moderately to intensely weathered, dark gray (N3) and pale yellowish orange (10YR 8/6), very closely to closely fractured, no reaction to HCl, iron oxide staining		
685.0	43.0					29.5-34.5 ft SHALE, soft to moderately hard, slightly to intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), very closely to closely fractured, no reaction to HCl, iron oxide staining		
684.0	44.0					34.5-39.5 ft SHALE, soft to moderately hard, slightly to intensely weathered, dark gray (N3) with pale yellowish orange (10YR 8/6), very closely to closely fractured, no reaction to HCl, iron oxide staining		
683.0	45.0					39.5-44.5 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining, intensely weathered at 42.2-42.4 ft.,trace fossils and pyrite throughout sample		
682.0	46.0							
681.0	47.0	R-5	100% (38%)	FD6		44.5-49.5 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
680.0	48.0					45.1-46.3 ft Joint, R.D. = 85-90°, slightly open; surface: slightly rough, planar. Fracture set #F-1.		
679.0	49.0					46.5-48.15 ft Joint, R.D. = 40°, moderately spaced, slightly open; surface: slightly rough, planar. Fracture set #F-2.		
678.0	50.0					49.2-50.15 ft Joint, R.D. = 40°, closely spaced, slightly open; surface: slightly rough, planar; 70° fracture at 49.2-49.5 ft., slightly open, slightly rough/planar, iron oxide staining on surfaces. Fracture set #F-3.		
677.0	51.0					49.5-54.5 ft SHALE, moderately soft to moderately hard, fresh to moderately weathered, dark gray (N3) and dark yellowish orange (10YR 6/6), closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
676.0	52.0	R-6	100% (34%)	FD7		50.4-50.8 ft Joint, R.D. = 10°, closely spaced, moderately open; surface: slightly rough, planar. Fracture set #F-4.		
675.0	53.0					51.25-52.3 ft Joint, R.D. = 70-85°, closely spaced, slightly open; surface: slightly rough, undulating. Fracture set #F-5.		
674.0	54.0					52.3-56.1 ft Joint, R.D. = 25-40°, moderately spaced, slightly open; surface: slightly rough, planar, slightly weathered, moderately hard. Fracture set #F-6.		
673.0	55.0					54.5-59.5 ft SHALE, moderately soft to moderately hard, fresh to intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, moderately to intensely weathered 56.0-58.4 ft., trace fossils and pyrite throughout		
672.0	56.0							
671.0	57.0	R-7	100% (17%)	FD7		56.4-60.3 ft Joint, R.D. = 70-80°, closely spaced, slightly open; surface: slightly rough, planar, moderately weathered, moderately hard; greater weathering 56.2-58.2 ft. Fracture set #F-7.		
670.0	58.0							
669.0	59.0							
		R-8		FD8				

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
668.0	61.0					59.5-64.5 ft SHALE, soft to moderately hard, slightly to intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), very closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
667.0	62.0	R-8	100% (20%)	FD8		60.4-63.1 ft Joint, R.D. = 40°, closely spaced, slightly open; surface: slightly rough, undulating, moderately weathered. Fracture set #F-8.		
666.0	63.0					63.1-66.4 ft Joint, R.D. = 70-85°, closely spaced; filling: partly healed, moderately thin, moderately to intensely weathered, soft; surface: slightly rough, planar, moderately to moderately weathered. Fracture set #F-9.		SC-2 63.5-64.5 ft., 09:00 on 5/10/10
665.0	64.0							
664.0	65.0					64.5-69.5 ft SHALE, soft to moderately hard, slightly to intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely fractured, no reaction to HCl, iron oxide staining, intensely weathered 67.3-69.2 ft.		
663.0	66.0							
662.0	67.0	R-9	100% (22%)	FD7		66.5-74.5 ft R.D. = 40°, closely spaced, slightly open; surface: slightly rough, undulating, intensely weathered, soft to moderately hard. Fracture set #F-10.		
661.0	68.0							
660.0	69.0							
659.0	70.0					69.5-74.5 ft SHALE, soft to moderately hard, slightly to intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
658.0	71.0							
657.0	72.0	R-10	100% (9%)	FD7				
656.0	73.0							
655.0	74.0							
654.0	75.0					74.5-79.5 ft SHALE, moderately hard, fresh to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to widely fractured, no reaction to HCl, iron oxide staining, moderately weathered quartz healed fracture 74.5-76.3 ft., trace fossils and pyrite throughout		
653.0	76.0					74.5-76.3 ft R.D. = 70°, closely spaced, slightly open; filling: moderately healed, moderately thick quartz, slightly to moderately weathered, moderately hard to moderately hard; surface: slightly rough, planar, slightly to moderately weathered, moderately hard. Fracture set #F-11.		
652.0	77.0	R-11	100% (58%)	FD4		76.7-84.7 ft Joint, R.D. = 70°, moderately spaced; filling: totally healed, moderately thin calcite, fresh, moderately hard; surface: smooth, planar, fresh. Fracture set #F-12.		
651.0	78.0							
650.0	79.0							
649.0		R-12		FD1				

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
648.0	81.0					79.5-84.5 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), very widely to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
647.0	82.0	R-12	100% (89%)	FD1				
646.0	83.0							SC-3 83.2-84.15 ft., 10:10 on 5/10/10
645.0	84.0							
644.0	85.0					84.5-204.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
643.0	86.0							
642.0	87.0	R-13	100% (90%)	FD2				
641.0	88.0							
640.0	89.0							
639.0	90.0							
638.0	91.0							
637.0	92.0	R-14	100% (95%)	FD2				
636.0	93.0							
635.0	94.0							
634.0	95.0							
633.0	96.0							
632.0	97.0	R-15	98% (98%)	FD1		96.95-98 ft R.D. = 40°, moderately spaced; filling: not healed, clean calcite, moderately hard; surface: slightly rough, undulating, moderately hard. Fracture set #F-13.		
631.0	98.0							
630.0	99.0							
629.0		R-16		FD0				

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
628.0	101.0					84.5-204.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
627.0	102.0	R-16	100% (100%)	FD0				
626.0	103.0							
625.0	104.0							
624.0	105.0							
623.0	106.0							
622.0	107.0	R-17	98% (98%)	FD0				
621.0	108.0							
620.0	109.0							
619.0	110.0							
618.0	111.0							
617.0	112.0	R-18	100% (100%)	FD0				
616.0	113.0							
615.0	114.0							
614.0	115.0							
613.0	116.0							
612.0	117.0	R-19	98% (98%)	FD0				
611.0	118.0							
610.0	119.0							
609.0		R-20		FD1				

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
608.0	120.0					84.5-204.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
607.0	121.0							
606.0	122.0	R-20	100% (100%)	FD1				
605.0	123.0					123.51-129.1 ft Joint, R.D. = 0°, slightly open; filling: not healed, moderately thin calcite, fresh, moderately hard; surface: slightly rough, undulating, fresh, moderately hard. Fracture set #F-14.		
604.0	124.0							
603.0	125.0							
602.0	126.0							
601.0	127.0	R-21	100% (100%)	FD1				
600.0	128.0							
599.0	129.0							
598.0	130.0							
597.0	131.0							
596.0	132.0	R-22	100% (100%)	FD0				
595.0	133.0							
594.0	134.0							
593.0	135.0							
592.0	136.0							
591.0	137.0	R-23	100% (100%)	FD0				
590.0	138.0							
589.0	139.0							
		R-24		FD0				

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
588.0	140.0					84.5-204.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
	141.0							
587.0								
	142.0	R-24	100% (100%)	FD0				
586.0								
	143.0							
585.0								
	144.0							
584.0								
	145.0							
583.0								
	146.0							
582.0								
	147.0	R-25	100% (100%)	FD0				
581.0								
	148.0							
580.0								
	149.0							
579.0								
	150.0							
578.0								
	151.0							
577.0								
	152.0	R-26	100% (100%)	FD0				
576.0								
	153.0							
575.0						153.14-153.17 ft Joint, R.D. = 0-10°; filling: totally healed, thin calcite, fresh, moderately hard; surface: fresh, moderately hard; 5 mm displacement across calcite healed fracture. Fracture set #F-15.		
	154.0							
574.0								
	155.0							
573.0								
	156.0							
572.0								
	157.0	R-27	100% (100%)	FD0				
571.0								
	158.0							
570.0								
	159.0							
569.0		R-28		FD0				

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
568.0	160.0					84.5-204.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
	161.0							
567.0								
	162.0	R-28	100% (100%)	FD0				
566.0								
	163.0							
565.0								
	164.0							
564.0								
	165.0							
563.0								
	166.0							
562.0								
	167.0	R-29	100% (100%)	FD0				
561.0								
	168.0							
560.0								
	169.0							
559.0								
	170.0							
558.0								
	171.0							
557.0								
	172.0	R-30	100% (100%)	FD0				
556.0								
	173.0							
555.0								
	174.0							
554.0								
	175.0							
553.0								
	176.0							
552.0								
	177.0	R-31	100% (100%)	FD0				
551.0								
	178.0							
550.0								
	179.0							
549.0								
		R-32		FD0				

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
548.0	180.0					84.5-204.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
	181.0							
547.0								
	182.0	R-32	100% (100%)	FD0				
546.0								
	183.0							
545.0								
	184.0							
544.0								
	185.0							
543.0								
	186.0							
542.0								
	187.0	R-33	100% (100%)	FD0				
541.0								
	188.0							
540.0								
	189.0							
539.0								
	190.0							
538.0								
	191.0							
537.0								
	192.0	R-34	100% (100%)	FD0				
536.0								
	193.0							
535.0								
	194.0							
534.0								
	195.0							
533.0								
	196.0							
532.0								
	197.0	R-35	100% (100%)	FD0				
531.0								
	198.0							
530.0								
	199.0							
529.0								
		R-36		FD0				

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-408

PROJECT NO. 10-4310

COORDINATES

N. 340045.08 ft E. 2404983.01 ft

GROUND SURFACE ELEVATION: 728.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
528.0						84.5-204.5 ft SHALE, massive, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
	201.0							
527.0								
	202.0	R-36	100% (100%)	FD0				
526.0								
	203.0							
525.0								
	204.0							
524.0						---- Bottom of Boring at 204.50 ft.----		

DATE STARTED: 5/9/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-409

PROJECT NO. 10-4310

COORDINATES

N. 339978.74 ft E. 2405035.71 ft

GROUND SURFACE ELEVATION: 735.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
735.0						0.0-0.5 ft Organic soil with sand, (ol/oh), 80% fines, non plastic, low dry strength, no dilatancy, no toughness; 10% gravel, fine to medium; 10% sand, fine; maximum grain size = 0.5 in inches, dark yellowish brown (10YR 4/2), organic odor, moist, no HCl reaction, with roots, some rock fragments	ol/oh	
734.0	1.0	S-1	7-10-7 (17) 93%				gp	
733.0	2.0	S-2	7-17-24 (41) 100%			0.5-1.5 ft Poorly graded gravel, (gp), 100% gravel, coarse, hard hardness; 0% fines; maximum grain size = 1.0 in inches, pale reddish brown (10R 5/4) to blackish red (5R 2/2), no HCl reaction		
732.0	3.0	S-3	24-16-12 (28) 93%			1.5-3.0 ft SANDSTONE, hard, slightly weathered, boulder sized particles, medium gray (N5), thinly bedded, no odor, no reaction to HCl, no staining, sandstone boulder, max grain size 2.0 inches		
731.0	4.0							
730.0	5.0	S-4	6-7-8 (15) 100%			3.0-6.0 ft Silt with sand, (ml), 75% fines, low plasticity, low dry strength, slow dilatancy, low toughness; 25% sand, fine to coarse, subrounded, elongated, hard hardness; dark yellowish orange (10YR 6/6) to moderate brown (5YR 3/4), moist, no HCl reaction	ml	
729.0	6.0	S-5	9-9-12 (21) 0%			6.0-7.5 ft Interval not sampled		
728.0	7.0							
727.0	8.0	S-6	7-12-16 (28) 33%			7.5-9.0 ft Silt with sand, (ml), 75% fines, low plasticity, low dry strength, slow dilatancy, low toughness; 25% sand, fine to coarse, subrounded, elongated, hard hardness; dark yellowish orange (10YR 6/6) to moderate brown (5YR 3/4), moist, no HCl reaction	ml	
726.0	9.0	S-7	10-11-11 (22) 100%			9.0-12.0 ft SHALE, soft, decomposed, pale yellowish brown (10YR 6/2) with light brown (5YR 5/6), no reaction to HCl, iron oxide staining		
725.0	10.0							
724.0	11.0	S-8	16-25-35 (60) 100%					
723.0	12.0	S-9	20-32-28 (60) 100%			12.0-14.75 ft SHALE, moderately soft, decomposed to intensely weathered, grayish orange (10YR 7/4) and light olive gray (5Y 5/2), no reaction to HCl, iron oxide staining		
722.0	13.0							
721.0	14.0	S-10	15-37-50/3 96%					
720.0	15.0					14.75-17.5 ft Interval not sampled		
719.0	16.0							
718.0	17.0							
717.0	18.0	R-1	87% (0%)	FD9		17.5-39.0 ft SHALE, moderately to very intensely weathered, dark gray (N3) with light olive gray (5Y 6/1), thinly to moderately bedded, very closely to closely fractured, no reaction to HCl		
716.0	19.0			FD7		17.5-28.05 ft Fracture, R.D. = 10 - 90°, closely to widely spaced; filling: not healed, very thin clay, slightly to intensely weathered, soft to hard; surface: smooth, slightly weathered; iron oxide staining.		

DATE STARTED: 5/10/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 925

REV 1 Final Boring B-409

PROJECT NO. 10-4310

COORDINATES

N. 339978.74 ft E. 2405035.71 ft

GROUND SURFACE ELEVATION: 735.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
715.0		R-1				17.5-39.0 ft SHALE, moderately to very intensely weathered, dark gray (N3) with light olive gray (5Y 6/1), thinly to moderately bedded, very closely to closely fractured, no reaction to HCl		
714.0	21.0							
713.0	22.0							
712.0	23.0	R-2	78% (0%)					
711.0	24.0							
710.0	25.0							
709.0	26.0							
708.0	27.0							
707.0	28.0	R-3	93% (0%)			28.05-39.2 ft Fracture zone, R.D. = 8 - 34°, closely to moderately spaced, neither ends visible; filling: not healed, very thin clay, moderately weathered; surface: rough, moderately weathered. Fracture set #3.		
706.0	29.0			FD7				
705.0	30.0							
704.0	31.0							
703.0	32.0							
702.0	33.0	R-4	100% (7%)					SC-1, 33.3 - 33.65 ft., 09:00, 5/11/10
701.0	34.0							
700.0	35.0							
699.0	36.0							
698.0	37.0							
697.0	38.0	R-5	98% (8%)					
696.0	39.0			FD5		39.2-54.2 ft Fracture zone, R.D. = 0 - 50°, very closely to moderately spaced; filling: not healed, slightly weathered; surface: moderately rough, slightly		

DATE STARTED: 5/10/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 925

REV 1 Final Boring B-409

PROJECT NO. 10-4310

COORDINATES

N. 339978.74 ft E. 2405035.71 ft

GROUND SURFACE ELEVATION: 735.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
695.0		R-5		FD5		weathered; surface has iron oxide staining. Fracture set #4.		
694.0	41.0					39.0-70.8 ft SHALE, clayey, moderately hard, slightly to moderately weathered, clay sized particles, dark gray (N3) to grayish black (N2), moderately bedded, R.D. = 15°, very closely to widely fractured		
693.0	42.0							
692.0	43.0	R-6	100% (0%)	FD7				
691.0	44.0							
690.0	45.0							
689.0	46.0							
688.0	47.0							
687.0	48.0	R-7	99% (17%)	FD6				
686.0	49.0							
685.0	50.0							
684.0	51.0							
683.0	52.0			FD4				
682.0	53.0	R-8	98% (42%)					
681.0	54.0					54.2-60.05 ft Fracture zone, R.D. = 72 - 84°, very closely spaced, slightly open; filling: not healed, very thin clay, slightly weathered; surface: moderately rough, slightly weathered; iron oxide staining. Fracture set #5.		
680.0	55.0							
679.0	56.0			FD6				
678.0	57.0							
677.0	58.0	R-9	100% (7%)					
676.0	59.0							

DATE STARTED: 5/10/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 925

REV 1 Final Boring B-409

PROJECT NO. 10-4310

COORDINATES

N. 339978.74 ft E. 2405035.71 ft

GROUND SURFACE ELEVATION: 735.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
675.0		R-9				39.0-70.8 ft SHALE, clayey, moderately hard, slightly to moderately weathered, clay sized particles, dark gray (N3) to grayish black (N2), moderately bedded, R.D. = 15°, very closely to widely fractured 60.05-71.5 ft Fracture zone, R.D. = 13 -35°, very closely to moderately spaced, slightly open; filling: not healed, slightly to moderately weathered; surface: slightly rough, slightly weathered; iron oxide staining. Fracture set #6.		SC-2, 60.8 - 61.17 ft., 10:20, 5/11/10
674.0	61.0							
673.0	62.0							
672.0	63.0	R-10	93% (8%)					
671.0	64.0							
670.0	65.0			FD6				
669.0	66.0							
668.0	67.0							
667.0	68.0	R-11	94% (13%)					
666.0	69.0							
665.0	70.0							
664.0	71.0					70.8-100.5 ft SHALE, moderately hard, slightly weathered to fresh, dark gray (N3), thinly to moderately bedded, closely to widely fractured, no staining, highly pitted 80.05-80.5 ft, pitting at 91.9-92.15 ft		
663.0	72.0							
662.0	73.0	R-12	97% (82%)			73.05-74 ft Joint, R.D. = 81°, neither ends visible, slightly open; filling: not healed, very thin iron oxide, slightly weathered; surface: slightly rough, slightly weathered.		
661.0	74.0							
660.0	75.0			FD3		74.95-75.2 ft Joint, R.D. = 42°, neither ends visible, tight; filling: not healed, clean, slightly weathered to fresh; surface: moderately rough, slightly weathered.		
659.0	76.0					75.2-82 ft Fracture zone, R.D. = 0 - 54°, closely spaced, slightly open; filling: not healed, very thin calcite, fresh, moderately soft; surface: rough, fresh. Fracture set #8.		
658.0	77.0							
657.0	78.0	R-13	90% (64%)					
656.0	79.0							

DATE STARTED: 5/10/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 925

REV 1 Final Boring B-409

PROJECT NO. 10-4310

COORDINATES

N. 339978.74 ft E. 2405035.71 ft

GROUND SURFACE ELEVATION: 735.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
655.0		R-13		FD7 FD7		70.8-100.5 ft SHALE, moderately hard, slightly weathered to fresh, dark gray (N3), thinly to moderately bedded, closely to widely fractured, no staining, highly pitted 80.05-80.5 ft, pitting at 91.9-92.15 ft		
654.0	81.0							
653.0	82.0					82-82.15 ft Joint, R.D. = 68°, one end visible; filling: moderately healed, very thin calcite, slightly weathered to fresh; surface: slightly rough, slightly weathered.		
652.0	83.0	R-14	68% (54%)	FD5		82.3-82.45 ft Joint, R.D. = 70°, one end visible; filling: moderately healed, very thin calcite, fresh, moderately hard; surface: slightly rough, fresh.		
651.0	84.0					82.87-83.3 ft Joint, R.D. = 88°, one end visible; filling: partly healed, very thin iron oxide, slightly weathered; surface: slightly rough, slightly weathered.		
650.0	85.0					83.3-100.5 ft Fracture zone, R.D. = 10 - 56°, very closely to closely spaced; filling: not healed, very thin iron oxide staining, slightly to moderately weathered; surface: moderately rough, slightly to moderately weathered. Fracture set #9.		
649.0	86.0							
648.0	87.0			FD3				
647.0	88.0	R-15	100% (51%)					
646.0	89.0							
645.0	90.0							
644.0	91.0							
643.0	92.0			FD7				
642.0	93.0	R-16	90% (26%)					
641.0	94.0							
640.0	95.0							
639.0	96.0							SC-3, 95.5 - 96.5 ft., 13:05, 5/11/10
638.0	97.0			FD2				
637.0	98.0	R-17	100% (100%)					
636.0	99.0							

DATE STARTED: 5/10/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 925

REV 1 Final Boring B-409

PROJECT NO. 10-4310

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	COORDINATES / DESCRIPTION	USCS SYMBOL	REMARKS
635.0		R-17		FD2		**COORDINATES** **N. 339978.74 ft E. 2405035.71 ft** **GROUND SURFACE ELEVATION: 735.15 ft** **DESCRIPTION** ---- Bottom of Boring at 100.50 ft.----		

DATE STARTED: 5/10/10
DATE FINISHED: 5/11/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 925

REV 1 Final Boring B-410

PROJECT NO. 10-4310

COORDINATES

N. 339957.85 ft E. 2405145.85 ft

GROUND SURFACE ELEVATION: 744.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
744.0	1.0	S -1	3-2-2 (4) 93%		0.0-1.5 ft Silty sand, (sm), 65% sand, fine; 30% fines, medium plasticity, low toughness; 5% gravel, fine, subrounded, medium hardness; maximum grain size = 0.25 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very loose	sm	
743.0	2.0	S -2	1-3-5 (8) 100%		1.5-3.0 ft Silty sand, (sm), 65% sand, fine to medium; 30% fines, medium plasticity, low toughness; 5% gravel, fine, subangular, medium hardness; maximum grain size = 1.25 inches, dark yellowish orange (10YR 6/6), moist, no HCl reaction, loose	sm	
742.0	3.0						
741.0	4.0	S -3	3-7-24 (31) 87%		3.0-4.5 ft Silty sand, (sm), 70% sand, fine to medium; 20% fines, medium plasticity, low toughness; 10% gravel, fine to medium, subangular, medium hardness; maximum grain size = 0.5 inches, moderate brown (5YR 4/4), dry, no HCl reaction, dense, sampling trough boulder, pieces med - coars gravel, (10R 8/2)	sm	
740.0	5.0	S -4	20-30-20 (50) 67%		4.5-6.0 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 20% gravel, fine to medium, medium hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, light brown (5YR 5/6) with pale yellowish orange (10YR 8/6), dry, no HCl reaction, dense, sampling through boulder/cobble (10R 8/2).	sm	
739.0	6.0						
738.0	7.0	S -5	10-12-50/3 100%		6.0-7.25 ft Silty sand, (sm), 70% sand, fine to medium; 20% fines, medium plasticity, low toughness; 10% gravel, fine, subangular, medium hardness; maximum grain size = 1.0 inches, light brown (5YR 5/6), dry, no HCl reaction, very dense	sm	
737.0	8.0	S -6	10-10-10 (20) 100%		7.25-7.5 ft Interval not sampled	sp-sm	
736.0	9.0				7.5-9.0 ft Poorly graded sand with silt and gravel, (sp-sm), 70% sand, fine to coarse; 20% gravel, fine, subangular, medium hardness; 10% fines, medium plasticity, medium toughness; maximum grain size = 0.25 inches, dark yellowish orange (10YR 6/6) and pale yellowish orange (10YR 8/6), dry, no HCl reaction, medium dense		ST-1 9.0-11.0 ft, 500 psi down pressure
735.0	10.0	ST-1	65%		9.0-11.0 ft Shelby Tube sample		
734.0	11.0				11.0-11.5 ft Interval not sampled		
733.0	12.0	S -7	6-6-14 (20) 93%		11.5-13.0 ft Poorly graded sand with silt, (sp-sm), 80% sand; 10% gravel, fine, subangular, medium hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 0.75 inches, moderate reddish brown (10R 4/6) and very pale orange (10YR 8/2), dry, no HCl reaction, medium dense, weathered shale	sp-sm	
732.0	13.0						
731.0	14.0	S -8	11-15-24 (39) 93%		13.0-14.5 ft Silty gravel with sand, (gm), 50% gravel, fine, angular, flat and elongated, medium hardness; 30% sand, fine to medium; 20% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, medium gray (N5) and very pale orange (10YR 8/2), dry, no HCl reaction, dense, weathered shale	gm	
730.0	15.0	S -9	16-28-30 (58) 100%		14.5-16.0 ft Silty sand with gravel, (sm), 50% sand, fine to coarse; 30% fines, medium plasticity, low toughness; 20% gravel, fine, subangular, flat and elongated, medium hardness; maximum grain size = 0.5 inches, yellowish gray (5Y 8/1) and very pale orange (10YR 8/2), dry, no HCl reaction, very dense, weathered shale	sm	
729.0	16.0	S -10	34-50/5 100%			sm	
728.0	17.0				16.0-16.9 ft Silty sand with gravel, (sm), 40% sand, fine to coarse; 30% gravel, fine to medium, subangular, flat and elongated, medium hardness; 30% fines, medium plasticity, low toughness; maximum grain size = 0.25 inches, yellowish gray (5Y 7/2) and medium gray (N5), dry, no HCl reaction, very dense, weathered shale		Water recirculation is minimal
727.0	18.0						
726.0	19.0	R-1	57% (0%)	FD7	16.9-17.5 ft Interval not sampled		
725.0		R-2			17.5-19.8 ft SHALE, interbedded, soft to moderately hard, moderately to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very		

DATE STARTED: 4/29/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-410

PROJECT NO. 10-4310

COORDINATES

N. 339957.85 ft E. 2405145.85 ft

GROUND SURFACE ELEVATION: 744.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
				FD6		closely fractured, no reaction to HCl, iron oxide staining		
724.0	21.0					19.8-24.8 ft SHALE, soft to moderately hard, moderately to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
723.0	22.0	R-2	100% (0%)	FD6				
722.0	23.0							
721.0	24.0							
720.0	25.0					24.8-29.8 ft SHALE, soft to moderately hard, slightly to intensely weathered, dark gray (N3) with yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, shale weathering to clay (10YR 6/6) in spots		
719.0	26.0							
718.0	27.0	R-3	100% (8%)	FD5				
717.0	28.0							
716.0	29.0							SC-1 28.9-29.35 ft, 09:35, 5/4/10
715.0	30.0					29.8-34.8 ft SHALE, soft to moderately hard, slightly to moderately weathered, dark gray (N3) with grayish orange (10YR 7/4), closely fractured, no reaction to HCl, iron oxide staining, shale weathering to clay		
714.0	31.0							
713.0	32.0	R-4	98% (13%)	FD6				
712.0	33.0							
711.0	34.0							
710.0	35.0					34.8-39.8 ft SHALE, soft to moderately hard, slightly to intensely weathered, dark gray (N3) with, closely fractured, no reaction to HCl, iron oxide staining		
709.0	36.0							
708.0	37.0	R-5	94% (7%)	FD6				
707.0	38.0							
706.0	39.0							
705.0		R-6						

DATE STARTED: 4/29/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-410

PROJECT NO. 10-4310

COORDINATES

N. 339957.85 ft E. 2405145.85 ft

GROUND SURFACE ELEVATION: 744.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
704.0	41.0			FD6		39.8-44.8 ft Joint, R.D. = 10,50,70°, closely spaced, slightly open; surface: slightly rough, planar; iron oxide staining on fracture surfaces, vertical fracture 41.4-41.8 ft.. Fracture set #F-1. 39.8-44.8 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining		
703.0	42.0	R-6	100% (7%)	FD6				
702.0	43.0							
701.0	44.0							
700.0	45.0					44.8-49.8 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining 45.4-46.3 ft Joint, R.D. = 85°, slightly open; surface: moderately rough, undulating, moderately soft; iron oxide staining. Fracture set #F-2.		SC-2 44.45-44.8 ft, 10:25, 5/4/10
699.0	46.0							
698.0	47.0	R-7	100% (26%)	FD6		47.3-49.8 ft Joint, R.D. = 70°, closely spaced, slightly open; surface: slightly rough, undulating, moderately hard. Fracture set #F-3.		
697.0	48.0							
696.0	49.0							
695.0	50.0					49.8-54.8 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3) and yellowish gray (5Y 7/2), very closely to closely fractured, no reaction to HCl, iron oxide staining, quartz-filled fracture 52.2-52.4 and 53.2-54.8, last portion mechanically broken		
694.0	51.0							
693.0	52.0	R-8	88% (0%)	FD6		52.2-52.4 ft Joint, R.D. = 70°, slightly open; filling: partly healed, moderately thin quartz, slightly to moderately weathered, moderately soft to moderately hard; surface: slightly rough, planar, slightly weathered. Fracture set #F-4. 52.4-53.4 ft Joint, R.D. = 15°, very closely spaced, slightly open; surface: slightly rough, planar, moderately hard; iron oxide staining. Fracture set #F-5.		
692.0	53.0							
691.0	54.0							
690.0	55.0					54.8-59.8 ft SHALE, soft to moderately hard, slightly to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to very closely fractured, iron oxide staining, moderately to intensely weathered quartz on fracture faces 54.8-55.4 ft. 54.8-57 ft Joint, R.D. = 50-70°, closely spaced, slightly open; filling: partly healed, very thin quartz, slightly to intensely weathered; surface: slightly rough, planar, slightly weathered. Fracture set #F-6.		
689.0	56.0							
688.0	57.0	R-9	68% (0%)	FD7				
687.0	58.0							
686.0	59.0							
685.0		R-10						

DATE STARTED: 4/29/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-410

PROJECT NO. 10-4310

COORDINATES

N. 339957.85 ft E. 2405145.85 ft

GROUND SURFACE ELEVATION: 744.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
684.0	61.0			FD5		59.8-64.8 ft SHALE, soft to moderately hard, fresh to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, sample becomes fresh at 61.1 ft. calcite infilling over quartz healed fractures throughout, calcite content increases with depth, trace fossils		
683.0	62.0	R-10	96% (52%)	FD5		60.7-64.8 ft Joint, R.D. = 70-80°, closely spaced; filling: moderately healed, moderately thin calcite infilling over, fresh to moderately weathered, moderately soft to moderately hard; surface: slightly rough, planar, fresh; jumbled, totally-healed section, with fragments of shale, 62.5-63.4 ft.. Fracture set #F-7.		
682.0	63.0							
681.0	64.0							
680.0	65.0					64.8-69.8 ft SHALE, moderately hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, iron oxide staining, trace fossils		
679.0	66.0					65.6-68.3 ft R.D. = 55-70°, closely spaced, slightly open; filling: moderately healed, thin quartz and calcite, fresh to moderately weathered, moderately soft to moderately hard; surface: moderately rough, planar, fresh. Fracture set #F-8.		
678.0	67.0	R-11	100% (54%)	FD4				
677.0	68.0					68.3-68.9 ft Joint, R.D. = 10°, closely spaced, slightly open; filling: not healed, very thin quartz, intensely weathered; surface: moderately rough, planar, intensely weathered; iron oxide staining on surfaces. Fracture set #F-9.		
676.0	69.0							
675.0	70.0					69.8-74.8 ft SHALE, moderately hard, fresh, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
674.0	71.0					70.3-71 ft Joint, R.D. = 70°, closely spaced, slightly open; surface: moderately rough, undulating, moderately hard. Fracture set #F-10.		
673.0	72.0					71.15-72.15 ft Joint, R.D. = 10°, closely spaced, slightly open; surface: smooth, planar, moderately hard. Fracture set #F-11.		
672.0	73.0	R-12	90% (52%)	FD5		72.5-73 ft Joint, R.D. = 40°, closely spaced, slightly open; surface: slightly rough, planar. Fracture set #F-12.		
671.0	74.0							
670.0	75.0					74-79.8 ft R.D. = 50-70°, closely spaced, slightly open; surface: slightly rough, planar, moderately hard; mechanically broken 75.9-76.4 ft. Fracture set #F-13.		
669.0	76.0					74.8-79.8 ft SHALE, moderately hard, fresh, dark gray (N3), moderately to widely fractured, iron oxide staining, trace fossils and pyrite		
668.0	77.0							
667.0	78.0	R-13	100% (60%)	FD4				
666.0	79.0							
665.0		R-14						

DATE STARTED: 4/29/10
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DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-410

PROJECT NO. 10-4310

COORDINATES

N. 339957.85 ft E. 2405145.85 ft

GROUND SURFACE ELEVATION: 744.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
664.0	81.0			FD3		79.8-84.8 ft Joint, R.D. = 10°, moderately spaced; surface: slightly rough, planar. Fracture set #F-14. 79.8-84.8 ft SHALE, very soft to moderately hard, fresh to intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to widely fractured, no reaction to HCl, iron oxide staining, shale intensely weathered into clay 79.8-80.4 ft., fresh to slightly weathered after, moderately weathered at 83.9-84.1 ft., trace fossils and pyrite		
663.0	82.0	R-14	100% (72%)	FD3				
662.0	83.0							
661.0	84.0							SC-3 84.1-84.8 ft, 12:50, 5/4/10
660.0	85.0					84.8-89.8 ft SHALE, moderately hard, fresh, dark gray (N3), widely fractured, no reaction to HCl, iron oxide staining, increased fossils, concentrated into bands at 86.0-86.7, 87.8-88.1, 89.0-89.3 ft., trace pyrite 84.8-86 ft Joint, R.D. = 70°, slightly open; surface: slightly rough, planar; thick calcite healng top 0.3 ft., iron oxide staining on fracture surfaces. Fracture set #F-15.		
659.0	86.0							
658.0	87.0	R-15	100% (92%)	FD2				
657.0	88.0							
656.0	89.0							
655.0	90.0					89.8-94.8 ft SHALE, moderately hard, fresh, dark gray (N3), widely fractured, no reaction to HCl, iron oxide staining, clay seam (N5) 94.6-94.8 ft., trace fossils and pyrite 89.9-90.3 ft Joint, R.D. = 10°, closely spaced, slightly open; surface: smooth, planar, moderately soft; iron oxide staining. Fracture set #F-16.		
654.0	91.0							
653.0	92.0	R-16	100% (86%)	FD2		92.2-92.9 ft Joint, R.D. = 70°, tight; filling: totally healed, thin calcite, fresh, moderately hard; surface: fresh. Fracture set #F-17.		
652.0	93.0							
651.0	94.0							
650.0	95.0					94.6-94.8 ft Joint, R.D. = 10°; filling: moderately thick clay, intensely weathered, very soft; surface: slightly rough, planar, intensely weathered; clay seam (N5). discontinuity # F-18.		
649.0	96.0					94.8-99.8 ft SHALE, moderately hard, fresh to moderately weathered, cavities, typical diameter: 0.1 in. max size: 0.5 in., dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, moderately weathered 96.0-96.55 and 98.3-99.8 ft., fissile shale, iron oxide staining, trace fossils and pyrite throughout sample, thin layer of pitted shale at 95.4-95.5 ft.		
648.0	97.0	R-17	90% (58%)	FD6				
647.0	98.0					95.5-96 ft Joint, R.D. = 90°, slightly open; filling: moderately healed, very thin, moderately weathered; surface: slightly rough, planar, moderately weathered. Fracture set #F-19.		
646.0	99.0					96-99.8 ft Joint, R.D. = 70°, closely spaced, slightly open; surface: slightly rough, planar, moderately weathered, moderately hard; fissile and iron oxide stained faces at 96.0-96.55 and 98.3-99.8 ft. Fracture set #F-20.		
645.0								

DATE STARTED: 4/29/10
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NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-410

PROJECT NO. 10-4310

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	COORDINATES N. 339957.85 ft E. 2405145.85 ft GROUND SURFACE ELEVATION: 744.85 ft DESCRIPTION	USCS SYMBOL	REMARKS
						---- Bottom of Boring at 100.00 ft.----		

DATE STARTED: 4/29/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-411

PROJECT NO. 10-4310

COORDINATES

N. 339979.47 ft E. 2405273.90 ft

GROUND SURFACE ELEVATION: 758.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
758.0								
	1.0	S -1	3-5-10 (15) 100%			0.0-1.5 ft Silty sand, (sm), 75% sand, fine to medium; 20% fines, low plasticity, low toughness; 5% gravel, fine, subangular, flat and elongated, medium hardness; maximum grain size = 0.3 inches, moderate yellowish brown (10YR 5/4), dry, medium dense	sm	
757.0								
	2.0	S -2	11-11-13 (24) 100%			1.5-3.0 ft Silty sand, (sm), 70% sand, fine to coarse; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; 10% gravel, fine, rounded, medium hardness; maximum grain size = 0.25 inches, moderate yellowish brown (10YR 5/4) and dark yellowish orange (10YR 6/6), dry, medium dense	sm	
756.0								
	3.0							
755.0		S -3	8-12-14 (26) 100%			3.0-4.5 ft Poorly graded sand with silt and gravel, (sp-sm), 55% sand, fine to coarse; 35% gravel, fine to medium, subangular, medium hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4) and light olive gray (5Y 6/1), dry, medium dense, some shale (N3) fragments coarse sand to fine gravel in size.	sp-sm	
754.0	4.0							
	5.0	S -4	9-16-27 (43) 100%			4.5-6.0 ft Poorly graded sand with silt and gravel, (sp-sm), 45% gravel, fine to coarse, subangular, medium hardness; 45% sand, fine to coarse; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, dark yellowish orange (10YR 6/6) and very light gray (N8), dry, dense, sampling through boulder	sp-sm	
753.0								
	6.0	S -5	8-21-29 (50) 93%			6.0-7.5 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 25% gravel, fine to medium, subangular, medium hardness; 15% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4) and light gray (N7), dry, dense, sampling through boulder	sm	
752.0								
	7.0							
751.0		S -6	17-24-12 (36) 100%			7.5-9.0 ft Poorly graded sand with silt and gravel, (sp-sm), 75% sand, fine to coarse; 15% gravel, fine to medium, subangular, medium hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4) and very light gray (N8), dry, dense	sp-sm	
750.0	8.0							
	9.0	S -7	11-14-50/3 92%			9.0-10.25 ft Silty sand, (sm), 70% sand, fine to medium; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; 10% gravel, fine to medium, subangular, medium hardness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4) and grayish pink (5R 8/2), dry, very dense, sampling through boulder	sm	
749.0								
	10.0					10.25-14.65 ft Interval not sampled (boulder)		SPT sampling stopped at 10.25 ft. due to boulder. Did not sample 10.5-14.65 ft. due to boulder; drillers used a roller bit and casing advancer to drill through.
748.0								
	11.0							
747.0								
	12.0							
746.0								
	13.0							
745.0								
	14.0							
744.0								
	15.0	S -8	9-9-7 (16) 73%			14.65-16.15 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 20% gravel, fine to medium; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, dark yellowish orange (10YR 6/6) with dark gray (N3), moist, medium dense	sm	
743.0								
	16.0							
742.0						16.15-17.65 ft Weathered shale, 90% fines, medium plasticity, medium dry strength, slow dilatancy, low toughness; 10% gravel, fine to medium, subangular, flat and elongated, medium hardness; 0% sand; maximum grain size = 0.2 inches, moderate brown (5YR 4/4), moist, stiff, laminated, trace sand		16.15 ft. Decomposed Shale
	17.0	S -9	4-4-5 (9) 87%					
741.0								
	18.0	S -10	7-9-13 (22) 87%			17.65-19.15 ft Weathered shale, 65% gravel, fine to medium, subangular, elongated, medium hardness; 30% fines, medium plasticity, medium dry strength, slow dilatancy, low toughness; 5% sand, fine to medium, subangular, flat and elongated, medium hardness; maximum grain size = 0.3 inches, moderate brown (5YR 4/4) with very pale orange (10YR 8/2),		
740.0								
	19.0	S -11	11-18-20 (38) 100%					
739.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/6/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-411

PROJECT NO. 10-4310

COORDINATES

N. 339979.47 ft E. 2405273.90 ft

GROUND SURFACE ELEVATION: 758.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
738.0		S -11				moist, medium dense, homogeneous		
737.0	21.0	S -12	14-29-26 (55) 93%			19.15-20.65 ft Weathered shale, 80% fines, medium plasticity, medium dry strength, slow dilatancy, low toughness; 15% gravel, fine, subangular, elongated, medium hardness; 5% sand, fine to medium, subangular, elongated, medium hardness; maximum grain size = 0.3 inches, pale yellowish brown (10YR 6/2) with moderate yellowish brown (10YR 5/4), moist, hard, All sand and gravel are derived from the shale		
736.0	22.0	S -13	19-40-50/3 100%			20.65-22.15 ft Weathered shale, 85% fines, medium plasticity, medium dry strength, slow dilatancy, low toughness; 10% sand, fine to medium, subangular, flat and elongated, medium hardness; 5% gravel, fine to medium, subangular, flat and elongated, medium hardness; maximum grain size = 0.2 inches, pale yellowish brown (10YR 6/2) with moderate yellowish brown (10YR 5/4), dry, no HCl reaction, hard		
735.0	23.0							
734.0	24.0	R-1	83% (0%)			22.15-23.45 ft Weathered shale, 80% fines, medium plasticity, medium dry strength, slow dilatancy, low toughness; 10% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 10% sand, fine to medium, subangular, flat and elongated, medium hardness; maximum grain size = 0.2 inches, moderate yellowish brown (10YR 5/4) to medium dark gray (N4), dry, hard		
733.0	25.0							
732.0	26.0					23.45-34.4 ft SHALE, silty, interbedded, moderately soft to moderately hard, intensely to moderately weathered, clay sized particles, moderate yellowish brown (10YR 5/4) with medium dark gray (N4), moderately bedded, R.D. = 0° to 45°, lower contact is conformable and jointed-contact not welded, closely to very closely fractured, no reaction to HCl, iron oxide staining, alternating weathered and slightly weathered shale		
731.0	27.0	R-2	70% (0%)					
730.0	28.0							
729.0	29.0			FD8		23.45-35.3 ft Bedding plane separation, R.D. = 10°, closely to very closely spaced, slightly open; dry but shows evidence of flow, filling: not healed, very thin, intensely to moderately weathered, moderately hard to soft; surface: slightly rough, planar, intensely weathered, moderately hard; bedding planes.		
728.0	30.0							
727.0	31.0							
726.0	32.0	R-3	58% (0%)					
725.0	33.0							
724.0	34.0							
723.0	35.0					34.4-39.9 ft SHALE, inclined, horizontal, moderately hard, moderately to slightly weathered, clay sized particles, medium dark gray (N4) with moderate yellowish brown (10YR 5/4), moderately bedded, R.D. = 15° to 75°, lower contact is conformable and jointed-contact not welded to healed (by secondary process), closely fractured, no reaction to HCl, moist, iron oxide staining, presence of vertical to subvertical open fracture, not healed		
722.0	36.0					35.3-69.9 ft Joint, R.D. = 35-60°, widely to moderately spaced, tight; filling: partly healed, clean, slightly weathered, moderately hard; surface: slightly rough, planar, slightly weathered, moderately hard; cleavage.		
721.0	37.0	R-4	100% (0%)	FD6		36-39.9 ft Joint, R.D. = 90°, widely spaced, both ends visible, tight; dry but shows evidence of flow, filling: not healed, very thin, moderately weathered, moderately hard; surface: rough, undulating, moderately weathered, moderately hard.		
720.0	38.0							
719.0	39.0							

DATE STARTED: 5/5/10
DATE FINISHED: 5/6/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-411

PROJECT NO. 10-4310

COORDINATES

N. 339979.47 ft E. 2405273.90 ft

GROUND SURFACE ELEVATION: 758.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
718.0		R-5				39.9-64.9 ft SHALE, inclined, horizontal, moderately hard, moderately to slightly weathered, clay sized particles, medium dark gray (N4), moderately bedded, R.D. = 15° to 75°, lower contact is conformable and jointed-contact not welded to healed (by secondary process), closely to moderately fractured, no reaction to HCl, moist, iron oxide staining, presence of subvertical open fractures, not healed, iron stained very thin coating in fractures.		
717.0	41.0							
716.0	42.0	R-5	100% (0%)					
715.0	43.0							
714.0	44.0							
713.0	45.0							
712.0	46.0							
711.0	47.0	R-6	100% (46%)					SC-1, 47.30 - 47.70 ft,, 12:00, 5/6/10
710.0	48.0							
709.0	49.0							
708.0	50.0			FD6				
707.0	51.0							
706.0	52.0	R-7	100% (14%)					
705.0	53.0							
704.0	54.0							
703.0	55.0							
702.0	56.0							
701.0	57.0	R-8	100% (24%)					
700.0	58.0							
699.0	59.0							

DATE STARTED: 5/5/10
DATE FINISHED: 5/6/10
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NOTES:

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REV 1 Final Boring B-411

PROJECT NO. 10-4310

COORDINATES

N. 339979.47 ft E. 2405273.90 ft

GROUND SURFACE ELEVATION: 758.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
698.0		R-9				39.9-64.9 ft SHALE, inclined, horizontal, moderately hard, moderately to slightly weathered, clay sized particles, medium dark gray (N4), moderately bedded, R.D. = 15° to 75°, lower contact is conformable and jointed-contact not welded to healed (by secondary process), closely to moderately fractured, no reaction to HCl, moist, iron oxide staining, presence of subvertical open fractures, not healed, iron stained very thin coating in fractures.		
697.0	61.0							
696.0	62.0	R-9	100% (36%)					
695.0	63.0							
694.0	64.0							
693.0	65.0			FD6		64.9-69.9 ft SHALE, inclined, horizontal, moderately hard, moderately to intensely weathered, clay sized particles, medium dark gray (N4), moderately bedded, R.D. = 15° to 75°, lower contact is conformable and jointed-contact not welded to healed (by secondary process), closely fractured, no reaction to HCl, moist, iron oxide staining, presence of vertical to subvertical open fractures		
692.0	66.0							
691.0	67.0	R-10	100% (26%)					
690.0	68.0							
689.0	69.0							
688.0	70.0					69.9-77.7 ft SHALE, inclined, horizontal, moderately hard, intensely to moderately weathered, clay sized particles, medium dark gray (N4), moderately bedded, R.D. = 15° to 60°, lower contact is jointed-contact not welded to healed (by secondary process), very closely fractured, no reaction to HCl, moist, iron oxide staining, presence of iron oxide stain and quartz filled thin to very thin healed open fractures		
687.0	71.0							
686.0	72.0	R-11	50% (0%)			69.9-75.5 ft Joint, R.D. = 10-60°, very closely spaced, very continuous, tight; dry but shows evidence of flow, filling: moderately healed, very thin quartz but only in one, moderately weathered, moderately hard to moderately soft; surface: slightly rough, planar, moderately weathered, moderately hard.		
685.0	73.0							
684.0	74.0			FD9				
683.0	75.0					75.5-100.9 ft Joint, R.D. = 30-60°, widely to moderately spaced, very continuous, tight; filling: not healed, clean, slightly weathered; surface: moderately rough, planar, slightly weathered, moderately hard.		
682.0	76.0							
681.0	77.0	R-12	100% (40%)					
680.0	78.0					77.7-100.9 ft SHALE, inclined, horizontal, hard, moderately to slightly weathered, clay sized particles, medium dark gray (N4), thickly bedded, R.D. = 15° to 60°, lower contact is conformable and intact to jointed-contact not welded, widely to moderately fractured, no reaction to HCl, moist, iron oxide staining, presence of subvertical open fractures, not healed. iron stained very thin coating in fractures.		
679.0	79.0			FD5				

DATE STARTED: 5/5/10
DATE FINISHED: 5/6/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-411

PROJECT NO. 10-4310

COORDINATES

N. 339979.47 ft E. 2405273.90 ft

GROUND SURFACE ELEVATION: 758.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
678.0		R-13		FD5		77.7-100.9 ft SHALE, inclined, horizontal, hard, moderately to slightly weathered, clay sized particles, medium dark gray (N4), thickly bedded, R.D. = 15° to 60°, lower contact is conformable and intact to jointed-contact not welded, widely to moderately fractured, no reaction to HCl, moist, iron oxide staining, presence of subvertical open fractures, not healed. iron stained very thin coating in fractures.		
677.0	81.0							SC-2, 81.5 - 82.4 ft., 14:20, 5/6/10
676.0	82.0	R-13	100% (100%)					
675.0	83.0							
674.0	84.0							
673.0	85.0							
672.0	86.0							
671.0	87.0	R-14	94% (76%)					
670.0	88.0							88.0 ft. Lost water circulation
669.0	89.0							
668.0	90.0			FD3				
667.0	91.0							
666.0	92.0	R-15	100% (88%)					
665.0	93.0							
664.0	94.0							
663.0	95.0							
662.0	96.0							
661.0	97.0	R-16	100% (97%)					
660.0	98.0							
659.0	99.0							

DATE STARTED: 5/5/10
DATE FINISHED: 5/6/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-411

PROJECT NO. 10-4310

COORDINATES

N. 339979.47 ft E. 2405273.90 ft

GROUND SURFACE ELEVATION: 758.15 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
658.0		R-16	100% (97%)	FD3		---- Bottom of Boring at 100.90 ft.----		

DATE STARTED: 5/5/10
DATE FINISHED: 5/6/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-412

PROJECT NO. 10-4310

COORDINATES

N. 340068.40 ft E. 2405294.49 ft

GROUND SURFACE ELEVATION: 763.35 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
763.0						0.0-0.4 ft Organic soil, (ol/oh), 100% fines; 85% sand, fine to medium, subrounded, very soft hardness; dusky yellowish brown (10YR 2/2) and dark yellowish brown (10YR 4/2), dry, no HCl reaction, medium dense to spongy, homogeneous, composed of roots and leaves	ol/oh	
	1.0	S-1	1-3-1 (4) 47%				sc	
762.0						0.4-1.5 ft Clayey sand, (sc), 60% sand, fine; 40% fines, low plasticity, low toughness; dark yellowish brown (10YR 4/2) and dark yellowish orange (10YR 6/6), moist, no HCl reaction, soft		
	2.0	S-2	2-7-8 (15) 87%					
761.0						1.5-4.5 ft SILTY SAND WITH GRAVEL, (SM), 47% sand, fine to coarse; 33% fines, low plasticity, low toughness; 20% gravel, fine to coarse, subangular, flat and elongated, hard hardness; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2) and moderate yellowish brown (10YR 5/4), moist, no HCl reaction, stiff, trace roots	SM	
	3.0							
760.0		S-3	4-8-7 (15) 93%					
	4.0							
759.0								
	5.0	S-4	6-26-33 (59) 100%			4.5-6.0 ft Gravelly lean clay/gravelly silt, (cl-ml), 70% fines, low plasticity, low toughness; 25% gravel, medium to coarse; 5% sand, fine; dark yellowish brown (10YR 4/2) and light brown (5YR 5/6), moist, no HCl reaction, hard	cl-ml	
758.0								
	6.0							
757.0		S-5	20-30-25 (55) 100%			6.0-7.5 ft Gravelly lean clay/gravelly silt, (cl-ml), 60% fines; 30% gravel, medium to coarse, subangular, hard hardness; 10% sand, fine; grayish brown (5YR 3/2) with moderate yellowish brown (10YR 5/4), moist, no HCl reaction, hard	cl-ml	
	7.0							
756.0								
	8.0	S-6	41-35-31 (66) 67%			7.5-8.0 ft Lean clay/silt, (cl-ml), 100% fines, low plasticity, low toughness; moderate yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/2), moist, no HCl reaction, hard, trace roots	cl-ml	
755.0						8.0-9.0 ft Silty gravel, (gm), 85% gravel; 15% fines; grayish orange (10YR 7/4), dry, no HCl reaction, hard	gm	
	9.0							
754.0		S-7	24-28-32 (60) 93%			9.0-9.65 ft Lean clay with gravel/silt with gravel, (cl-ml), 85% fines, low plasticity, low toughness; 15% gravel, fine to medium, subangular; dusky yellowish brown (10YR 2/2) and dark yellowish brown (10YR 4/2), moist, no HCl reaction, hard	cl-ml	
	10.0							
753.0						9.65-10.2 ft 100% gravel, medium to coarse; dark yellowish orange (10YR 6/6), dry, no HCl reaction, very dense, sandstone rock fragment	cl-ml	
	11.0	S-8	25-16-14 (30) 100%					
752.0						10.2-10.6 ft Sandy lean clay with gravel/sandy silt with gravel, (cl-ml), 50% fines, low plasticity, low toughness; 30% sand, fine; 20% gravel, fine to medium, subangular, medium hardness; very dark red (5R 2/6) with grayish orange (10YR 7/4), moist, no HCl reaction, hard	cl-ml	12.0 ft Decomposed shale
	12.0							
751.0		S-9	7-9-8 (17) 100%			10.6-10.75 ft 100% gravel, medium to coarse; dark yellowish orange (10YR 6/6), dry, no HCl reaction, medium dense, sandstone rock fragment	GC-GM	
	13.0							
750.0						10.75-12.0 ft Sandy lean clay with gravel/sandy silt with gravel, (cl-ml), 50% fines, low plasticity, low toughness; 40% gravel, fine to medium, subangular, medium hardness; 10% sand, medium; very dark red (5R 2/6) with dark yellowish brown (10YR 4/2), moist, no HCl reaction, very stiff		
	14.0	S-10	7-7-11 (18) 100%					
749.0						12.0-15.0 ft SILTY, CLAYEY GRAVEL WITH SAND, (GC-GM), 53% gravel, fine to coarse, angular to subangular, medium hard hardness; 29% sand, fine to coarse; 18% fines, low plasticity, low toughness; maximum grain size = 1.5 inches, moderate brown (5YR 4/4) with grayish black (N2), moist, no HCl reaction, decomposed shale	gc	
	15.0							
748.0		S-11	12-12-15 (27) 100%					
	16.0							
747.0						15.0-16.5 ft Clayey gravel, (gc), 60% gravel, medium to coarse, medium hardness; 40% fines, low plasticity, low toughness; moderate brown (5YR 4/4) with grayish black (N2), dry, no HCl reaction, decomposed shale		
	17.0	S-12	19-29-39 (68) 100%					
746.0						16.5-18.0 ft 100% gravel, medium hardness; very pale orange (10YR 8/2) with grayish black (N2), dry, no HCl reaction, decomposed shale		
	18.0							
745.0		S-13	25-43-50/5 100%					
	19.0							
744.0						18.0-19.4 ft 100% gravel; dry, no HCl reaction, decomposed shale		
		S-14	50 100%					

DATE STARTED: 4/21/10

DATE FINISHED: 4/22/10

FIELD GEOLOGIST: Adrianna Semione

CHECKED BY: Jennifer Ostrowsky

APPROVED BY: Rolando Benitez

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ

DRILLING CO. Terracon

DRILLER: J. Williams

HELPER(S): R. Hinkle

NOTES:

DRILL RIG: Diedrich D-120 (ATV)

HAMMER ID: 931

REV 1 Final Boring B-412

PROJECT NO. 10-4310

COORDINATES
N. 340068.40 ft E. 2405294.49 ft
GROUND SURFACE ELEVATION: 763.35 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
743.0			(82%)			19.4-19.5 ft Interval not sampled		Casing set at 22.0 ft
						19.5-20.0 ft 100% gravel; dry, no HCl reaction, decomposed shale		
742.0	21.0					20.0-22.0 ft Interval not sampled (SHALE)		
	22.0					22.0-34.4 ft SHALE, moderately soft to moderately hard, intensely to moderately weathered, grayish orange (10YR 7/4) and dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, mottling with various shades between the colors previously mentioned (22.0-29.4ft)		
741.0								
	23.0	R -1	100% (21%)					SC-1, 23.5-24.0 ft., 12:10, 4/21/10
740.0						22-29.4 ft R.D. = 54-56°, closely spaced; surface: rough, planar.		
	24.0					22.1-40.8 ft Bedding plane separation, R.D. = 10°, closely to widely spaced; surface: rough, planar.		
739.0								
	25.0							
738.0								
	26.0							
737.0						26.4-26.9 ft Fracture, R.D. = 76°; surface: rough, planar.		
	27.0	R -2	92% (23%)					
736.0								
	28.0			FD6				
735.0								
	29.0							
734.0						29.4-40.8 ft R.D. = 55-56°, closely to very closely spaced; filling: very thin clay; surface: rough, planar; some contain no clay filling.		
	30.0							
733.0								
	31.0							
732.0								
	32.0	R -3	98% (0%)					
731.0								
	33.0							
730.0								
	34.0							
729.0						34.4-40.8 ft SHALE, moderately soft to moderately hard, moderately weathered, dark gray (N3) and moderate greenish yellow (10Y 7/4), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
	35.0							
728.0								
	36.0							
727.0								
	37.0	R -4	66% (0%)	FD9				
726.0								
	38.0							
725.0								
	39.0							
724.0		R -5						

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-412

PROJECT NO. 10-4310

COORDINATES

N. 340068.40 ft E. 2405294.49 ft

GROUND SURFACE ELEVATION: 763.35 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
723.0				FD9				
	41.0					40.7-54.4 ft Bedding plane separation, R.D. = 10°, moderately to closely spaced; filling: not healed; surface: smooth, planar; moderate to trace iron oxide staining on face.		
722.0								
	42.0	R -5	100% (8%)			40.8-54.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl, oily sheen on rock (40.8-~44.9 ft.)		
721.0								
	43.0					41.5-49.4 ft R.D. = 36°; filling: not healed; surface: rough, planar; trace to moderate iron oxide stainig.		
720.0								
	44.0					41.6-49.4 ft R.D. = 54-56°, moderately spaced; filling: not healed; surface: rough, planar; moderate to trace iron oxide staining and maganesium oxide.		
719.0								
	45.0							
718.0								
	46.0							
717.0								
	47.0	R -6	100% (15%)	FD6				
716.0								
	48.0					47.5-49.4 ft R.D. = 76°, moderately spaced; filling: not healed; surface: rough, undulating; moderate iron oxide staining.		
715.0								
	49.0							
714.0						49.4-54.4 ft R.D. = 56°, moderately spaced; filling: not healed; surface: rough, undulating; moderate iron oxide staining, trace galena.		
	50.0							
713.0								
	51.0							
712.0								
	52.0	R -7	100% (42%)					
711.0								
	53.0							
710.0								
	54.0							
709.0				FD2		54.4-69.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl, trace pyrite		
	55.0							
708.0						54.4-64.4 ft R.D. = 10°, widely to closely spaced; surface: rough, planar, slightly weathered; half show trace iron oxide the other half are clean.		
	56.0							
707.0								
	57.0	R -8	100% (34%)					
706.0								
	58.0			FD6				
705.0								
	59.0							
704.0		R -9						

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-412

PROJECT NO. 10-4310

COORDINATES

N. 340068.40 ft E. 2405294.49 ft

GROUND SURFACE ELEVATION: 763.35 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
703.0						54.4-69.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl, trace pyrite		
702.0	61.0							
	62.0	R -9	100% (0%)	FD6				
701.0								
700.0	63.0							
	64.0							
699.0						64.4-74.4 ft R.D. = 56°; filling: not healed; surface: rough, planar, slightly weathered; trace iron oxide staining.		
698.0	65.0							
	66.0							
697.0		R -10	100% (32%)					
696.0	67.0							
	68.0							
695.0								
	69.0							
694.0				FD5		69.4-74.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl		
693.0	70.0							
	71.0							
692.0								
	72.0	R -11	100% (62%)					
691.0								
	73.0							
690.0								
	74.0							
689.0						74.4-89.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl 74.85- ft Bedding plane separation, R.D. = 10°, moderately to very closely spaced; filling: not healed; surface: smooth, planar, slightly weathered; trace iron oxide staining on face. 75.5-76.4 ft R.D. = 36°, widely spaced; filling: not healed; surface: rough, planar; trace to moderate iron oxide staining on bedding surface. 76.4-81.9 ft R.D. = 55-56°, widely to closely spaced; filling: not healed; surface: rough, planar; moderate to heavy iron oxide staining on fracture faces.		
688.0	75.0							
	76.0							
687.0								
	77.0	R -12	100% (27%)	FD6				
686.0								
	78.0							
685.0								
	79.0							
684.0								
		R -13						

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-412

PROJECT NO. 10-4310

COORDINATES

N. 340068.40 ft E. 2405294.49 ft

GROUND SURFACE ELEVATION: 763.35 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
683.0						74.4-89.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl		
	81.0							
682.0								
	82.0	R -13	100% (16%)			81.9-83 ft R.D. = 56°, closely spaced; filling: partly healed, very thin quartz, fresh; surface: fresh.		
681.0								
	83.0			FD6				
680.0								
	84.0							
679.0						84.4-86 ft R.D. = 56°, moderately to very closely spaced; filling: partly healed, moderately thin quartz, fresh; surface: fresh; few mechanically open.		
	85.0							
678.0								
	86.0					86-89.4 ft R.D. = 36°, moderately to closely spaced; filling: partly healed, moderately thin quartz.		
677.0								
	87.0	R -14	100% (67%)					
676.0								
	88.0							
675.0								
	89.0							
674.0						89.4-99.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately fractured, no reaction to HCl, trace pyrite		
	90.0					89.7- ft R.D. = 90°, moderately spaced; filling: totally healed, moderately thin quartz, fresh to slightly weathered, very hard; surface: fresh; few spots within the quartz show iron oxide staining.		
673.0						89.8-92.35 ft R.D. = 10°, moderately to closely spaced; filling: totally healed, thin quartz, fresh to slightly weathered, very hard; surface: fresh to slightly weathered; few open from drilling, zone contains fresh healed planes while others are fresh to slightly weathered quatrz filling, 92.4 ft. no quartz only moderate iron oxide staining.		
	91.0							
672.0								
	92.0	R -15	100% (77%)					
671.0								
	93.0			FD5				
670.0								
	94.0					93.45-93.9 ft R.D. = 55°, very closely spaced; filling: totally healed, thin quartz, fresh to slightly weathered, very hard; surface: rough, planar, fresh; 93.65 ft. fracture quatrz filling shows iron oxide staining to crystals while fracture at 93.45 ft. shows fresh quartz crystals.		
669.0						94.8-95.6 ft R.D. = 55-56°, closely to very closely spaced; filling: totally healed, moderately thick quartz, fresh, very hard; surface: rough, planar, fresh; fracture at 94.8 ft., no quartz healing.		
	95.0					95.8-99.4 ft R.D. = 71-75°, closely to very closely spaced; filling: totally healed, moderately thick quartz, fresh to slightly weathered, very hard; surface: rough, planar, fresh; fully formed crystals, clear, yellow, orange and dusky red (5R 3/4), some with thin filling.		
668.0								
	96.0							
667.0								
	97.0	R -16	100% (68%)					
666.0								
	98.0							
665.0								
	99.0							
664.0		R -17				99.5- ft Bedding plane, R.D. = 10°, widely to closely spaced; filling: not		

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-412

PROJECT NO. 10-4310

COORDINATES

N. 340068.40 ft E. 2405294.49 ft

GROUND SURFACE ELEVATION: 763.35 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
663.0	101.0			FD5		healed; surface: smooth, planar.		
662.0	102.0	R -17	100% (86%)	FD4		99.6-100.6 ft R.D. = 90°, closely spaced; filling: totally healed, thin quartz, fresh, very hard; surface: fresh. 99.4-114.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately fractured, no reaction to HCl 101.5-121.2 ft Bedding plane separation, R.D. = 10°, very closely to moderately spaced; filling: totally healed, very thin calcite, fresh, hard; surface: smooth, planar, fresh; 90% of bedding healed, 10% not healed, mechanically open. 103.45-103.8 ft R.D. = 53°; filling: totally healed, very thin quartz, fresh; surface: fresh. 105-109 ft R.D. = 80-90°; filling: totally healed, thick quartz, very hard; surface: rough, planar; fracture from 105.0 -106.0 ft of visible fracture face show slickensides, fully formed crystals (clear with sporadic zones of dark yellow orange (10YR 6/6).		
661.0	103.0							
660.0	104.0							
659.0	105.0			FD5				
658.0	106.0							
657.0	107.0	R -18	100% (70%)					SC-2, 107.15-108.35 ft., 10:25, 4/22/10
656.0	108.0			FD4				
655.0	109.0							
654.0	110.0					109.4-110.2 ft R.D. = 56°, very closely spaced; filling: totally healed, moderately thin quartz, fresh to slightly weathered, very hard; surface: rough, planar, fresh.		
653.0	111.0							
652.0	112.0	R -19	100% (54%)	FD6		111-121.2 ft R.D. = 31-36°, widely to closely spaced; filling: totally healed, calcite, fresh; surface: rough, planar, fresh; mostly all healed with a few fresh non-healed fractures.		
651.0	113.0							
650.0	114.0							
649.0	115.0					114.4-121.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately fractured, no reaction to HCl, Trace pyrite		
648.0	116.0					115.25-120.6 ft R.D. = 56°, widely to moderately spaced; filling: totally healed, very thin calcite, fresh, hard; surface: smooth, planar, fresh; of set only one of the fractures is not healed with calcite, face of fracture fresh.		
647.0	117.0	R -20	97% (84%)	FD5				
646.0	118.0							
645.0	119.0							
644.0		R -21						

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-412

PROJECT NO. 10-4310

COORDINATES

N. 340068.40 ft E. 2405294.49 ft

GROUND SURFACE ELEVATION: 763.35 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
643.0	121.0	R -21	100% (92%)	FD5		114.4-121.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately fractured, no reaction to HCl, Trace pyrite ---- Bottom of Boring at 121.20 ft.----		Water depth after drilling at 57.5 ft. 4/22/10

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-413

PROJECT NO. 10-4310

COORDINATES

N. 340208.12 ft E. 2405283.00 ft

GROUND SURFACE ELEVATION: 772.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
772.0								
	1.0	S-1	2-2-3 (5) 67%			0.0-1.5 ft Clayey sand, (sc), 85% sand, fine to medium, subrounded, very soft hardness; 15% fines, low plasticity, no toughness; moderate brown (5YR 4/4), moist, no HCl reaction, medium dense, homogeneous	sc	
771.0								
	2.0	S-2	4-7-10 (17) 100%			1.5-3.0 ft Clayey sand, (sc), 70% sand, fine to medium, subrounded, very soft hardness; 20% fines, low plasticity, low toughness; 10% gravel, fine to medium, subangular, flat and elongated, soft hardness; maximum grain size = 0.01 inches, moderate brown (5YR 4/4) and pale yellowish brown (10YR 6/2), moist, no HCl reaction, loose, homogeneous	sc	
770.0								
	3.0	S-3	5-50/4 0%			3.0-3.83 ft No sample recovered		
769.0						3.83-4.5 ft Interval not sampled		
	4.0							
768.0								
	5.0	S-4	32-41-50 (91) 73%			4.5-6.0 ft Poorly graded gravel with silt, (gp-gm), 80% gravel, fine to medium, subrounded, soft hardness; 10% sand, fine to coarse; 10% fines, low plasticity, low toughness; maximum grain size = 0.1 inches, light gray (N7), dry, no HCl reaction, medium dense, homogeneous, all derived from shale	gp-gm	Decomposed shale starting at 4.5 ft.
767.0								
	6.0	S-5	50-50 100%			6.0-7.0 ft Poorly graded gravel with silt, (gp-gm), 80% gravel, fine to medium, subrounded, soft hardness; 10% sand, fine to coarse; 10% fines, low plasticity, low toughness; maximum grain size = 0.1 inches, light gray (N7), dry, no HCl reaction, medium dense, homogeneous, all derived from shale	gp-gm	
766.0								
	7.0					7.0-7.5 ft Interval not sampled		
765.0								
	8.0	S-6	23-42-50 (92) 67%			7.5-9.0 ft Poorly graded gravel with silt, (gp-gm), 80% gravel, fine to medium, subrounded, soft hardness; 10% sand, fine to coarse; 10% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, light gray (N7), dry, no HCl reaction, medium dense, homogeneous, all derived from shale	gp-gm	
764.0								
	9.0							
763.0						9.0-11.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), moderately fractured, iron oxide staining, 10° bedding plane.		
	10.0	R-1	95% (0%)			9-12.3 ft Joint, R.D. = 88°, moderately spaced; filling: not healed, intensely weathered; surface: slightly rough, intensely weathered; iron oxide staining in the fractures. Fracture set #F-1.		
762.0								
	11.0					11.0-14.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), moderately fractured, iron oxide staining, 10° bedding plane.		
761.0								
	12.0	R-2	100% (0%)			12.3-14 ft Bedding plane separation, R.D. = 14°, closely spaced; filling: not healed; surface: slightly rough, planar; iron oxide staining in the fractures. Fracture set #F-2.		12.3 - 12.7 ft., SC-1, 13:20, 5/18/10
760.0								
	13.0							
759.0								
	14.0			FD6		14.0-19.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, iron oxide staining, 10° bedding plane.		
758.0								
	15.0					14-24 ft Joint, R.D. = 13-88°, closely to moderately spaced; filling: not healed, moderately thin clay, moderately weathered, very soft; surface: slightly rough, moderately weathered; iron oxide staining in the fractures as well as clay. Fracture set #F-3.		
757.0								
	16.0	R-3	96% (8%)					
756.0								
	17.0							
755.0								
	18.0							
754.0								
	19.0							
753.0		R-4	100% (36%)					

DATE STARTED: 4/28/10
DATE FINISHED: 5/19/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-413

PROJECT NO. 10-4310

COORDINATES

N. 340208.12 ft E. 2405283.00 ft

GROUND SURFACE ELEVATION: 772.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
752.0						19.0-24.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining in the fractures.		
751.0	21.0							
750.0	22.0	R-4	100% (36%)					
749.0	23.0							
748.0	24.0			FD6		24.0-29.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining in the fractures.		
747.0	25.0					24-29 ft Joint, R.D. = 19°, moderately spaced; filling: not healed, intensely weathered; surface: slightly rough, intensely weathered; iron oxide staining in the fractures. Fracture set #F-4.		
746.0	26.0	R-5	100% (60%)					
745.0	27.0							
744.0	28.0							
743.0	29.0					29.0-34.0 ft SHALE, horizontal, moderately soft, slightly weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining in the fractures.		
742.0	30.0					29-34 ft Joint, R.D. = 20°, very closely to moderately spaced; filling: not healed, very thin clay, moderately weathered, very soft; surface: slightly rough, planar, moderately weathered; iron oxidation staining in the fractures as well as clay. Fracture set #F-5.		
741.0	31.0	R-6	100% (0%)					
740.0	32.0							
739.0	33.0			FD5				
738.0	34.0					34.0-39.0 ft SHALE, horizontal, moderately soft, slightly weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining in the fractures.		
737.0	35.0					34-39 ft Joint, R.D. = 87°, closely to moderately spaced; filling: not healed, intensely weathered; surface: slightly rough, undulating, intensely weathered; iron oxidation staining in the feactures. Fracture set #F-6.		
736.0	36.0	R-7	100% (12%)					
735.0	37.0							
734.0	38.0							
733.0	39.0	R-8	100% (60%)			39.0-44.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely fractured, no reaction to HCl, 10° bedding plane.		

DATE STARTED: 4/28/10
DATE FINISHED: 5/19/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-413

PROJECT NO. 10-4310

COORDINATES

N. 340208.12 ft E. 2405283.00 ft

GROUND SURFACE ELEVATION: 772.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
732.0						39.9-44 ft Joint, R.D. = 11-45°, closely spaced; filling: not healed; surface: slightly rough, planar; iron oxidation in the fractures. Fracture set #F-7.		
731.0	41.0					39.0-44.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely fractured, no reaction to HCl, 10° bedding plane.		
730.0	42.0	R-8	100% (60%)					
729.0	43.0			FD5				
728.0	44.0					44.0-49.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely fractured, no reaction to HCl, 10° bedding plane.		
727.0	45.0					44-49 ft Joint, R.D. = 10-25°, closely spaced; filling: not healed; surface: slightly rough, planar; iron oxidation staining in the fractures. Fracture set #F-8.		
726.0	46.0	R-9	100% (38%)					
725.0	47.0							
724.0	48.0							
723.0	49.0					49.0-54.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), no odor, closely fractured, no reaction to HCl, 10° bedding plane.		
722.0	50.0					49-54 ft Joint, R.D. = 10-30°, closely spaced; filling: not healed, very thin clay, moderately weathered, very soft; surface: slightly rough, moderately weathered; iron oxidation staining in the fractures with the clay. Fracture set #F-9.		
721.0	51.0	R-10	100% (56%)					
720.0	52.0							
719.0	53.0			FD5				
718.0	54.0					54.0-59.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), no odor, closely to moderately fractured, no reaction to HCl, 10° bedding plane.		
717.0	55.0							
716.0	56.0	R-11	94% (70%)					
715.0	57.0							
714.0	58.0							
713.0	59.0	R-12	90% (34%)			59.0-64.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), no odor, closely fractured, no reaction to HCl, 10° bedding plane.		

DATE STARTED: 4/28/10
DATE FINISHED: 5/19/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-413

PROJECT NO. 10-4310

COORDINATES

N. 340208.12 ft E. 2405283.00 ft

GROUND SURFACE ELEVATION: 772.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
712.0						59-64 ft Joint, R.D. = 15°, closely spaced; filling: not healed; surface: slightly rough; iron oxidation staining in the fractures. Fracture set #F-10.		
711.0	61.0					59.0-64.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), no odor, closely fractured, no reaction to HCl, 10° bedding plane.		
710.0	62.0	R-12	90% (34%)	FD5		60-64 ft Joint, R.D. = 12°, closely to widely spaced; filling: not healed, moderately thin clay, slightly weathered, very soft; surface: slightly rough, planar, slightly weathered. Fracture set #F-12.		
709.0	63.0					61.4-62.7 ft Joint, R.D. = 35°, closely to moderately spaced; filling: not healed, very thin quartz, moderately weathered, moderately soft; surface: slightly rough, planar, moderately weathered. Fracture set #F-11.		
708.0	64.0					64.0-69.0 ft SHALE, horizontal, moderately hard to moderately soft, slightly to intensely weathered, dark gray (N3) and pale yellowish brown (10YR 6/2), no odor, closely fractured, no reaction to HCl, iron oxide staining, 10° bedding plane.		
707.0	65.0							
706.0	66.0	R-13	98% (32%)			64-69 ft Joint, R.D. = 10-45°, closely spaced; filling: not healed, clay, fresh, very soft; surface: slightly rough, planar, fresh; iron oxidation staining in the fracture. Fracture set #F-13.		
705.0	67.0							
704.0	68.0							
703.0	69.0					69.0-74.0 ft SHALE, horizontal, moderately soft to moderately hard, slightly to intensely weathered, dark gray (N3) and pale yellowish brown (10YR 6/2), closely to moderately fractured, no reaction to HCl, 10° bedding plane, quartz crystals present in the fractures at the begining of the run		
702.0	70.0							
701.0	71.0	R-14	92% (44%)	FD5		69-74 ft Joint, R.D. = 11-25°, closely spaced; filling: not healed, moderately thin quartz crysrals, slightly weathered, moderately hard; surface: slightly rough, planar, slightly weathered. Fracture set #F-14.		
700.0	72.0							
699.0	73.0							
698.0	74.0					74.0-79.0 ft SHALE, horizontal, moderately hard, slightly to moderately weathered, dark gray (N3) and pale yellowish brown (10YR 6/2), closely to widely fractured, no reaction to HCl, 10° bedding plane.		
697.0	75.0							
696.0	76.0	R-15	100% (80%)			74-79 ft Joint, R.D. = 88°, closely to widely spaced; filling: not healed, thin quartz, moderately weathered, moderately hard; surface: slightly rough, moderately weathered. Fracture set #F-15.		
695.0	77.0							
694.0	78.0							
693.0	79.0	R-16	44% (0%)					

DATE STARTED: 4/28/10
DATE FINISHED: 5/19/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-413

PROJECT NO. 10-4310

COORDINATES

N. 340208.12 ft E. 2405283.00 ft

GROUND SURFACE ELEVATION: 772.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
692.0						79.0-84.0 ft SHALE, horizontal, soft to moderately hard, intensely weathered, pale yellowish brown (10YR 6/2) and dark gray (N3), no reaction to HCl, iron oxide staining, mechanically broken.		
691.0	81.0							
690.0	82.0	R-16	44% (0%)					
689.0	83.0			FD5				
688.0	84.0					84.0-89.0 ft SHALE, horizontal, moderately hard to moderately soft, slightly to intensely weathered, dark gray (N3) and pale yellowish brown (10YR 6/2), closely to widely fractured, no reaction to HCl, iron oxide staining, 10° bedding pane, quartz crystals fill the fractures.		
687.0	85.0					84-104 ft Joint, R.D. = 45-89°, closely to widely spaced; filling: not healed, thin quartz, intensely weathered, moderately hard; surface: moderately rough, intensely weathered. Fracture set #F-16.		
686.0	86.0	R-17	100% (68%)					
685.0	87.0							
684.0	88.0							
683.0	89.0					89.0-94.0 ft SHALE, horizontal, moderately hard to moderately soft, slightly to intensely weathered, dark gray (N3) and pale yellowish brown (10YR 6/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding plane, quartz crystals fill the fractured zones.		
682.0	90.0							
681.0	91.0	R-18	100% (50%)					
680.0	92.0							
679.0	93.0			FD6				
678.0	94.0					94.0-99.0 ft SHALE, horizontal, moderately hard to moderately soft, slightly to intensely weathered, dark gray (N3) and pale yellowish brown (10YR 6/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding plane, quartz crystals fill the fractured zones.		
677.0	95.0							
676.0	96.0	R-19	56% (14%)					
675.0	97.0							
674.0	98.0							
673.0	99.0	R-20	100% (0%)					

DATE STARTED: 4/28/10
DATE FINISHED: 5/19/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-413

PROJECT NO. 10-4310

COORDINATES

N. 340208.12 ft E. 2405283.00 ft

GROUND SURFACE ELEVATION: 772.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
672.0						99.0-104.0 ft SHALE, horizontal, moderately hard, intensely weathered, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, 10° bedding plane.		
671.0	101.0							
670.0	102.0	R-20	100% (0%)					
669.0	103.0							
668.0	104.0			FD6		104.0-109.0 ft SHALE, horizontal, moderately hard, slightly to moderately weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding plane		
667.0	105.0					104-109 ft R.D. = 19°, closely to moderately spaced; filling: not healed, intensely weathered; surface: slightly rough, planar, intensely weathered; iron oxidarion staining in the fractures. Fracture set #F-17.		
666.0	106.0	R-21	88% (48%)			105.9-109.3 ft Joint, R.D. = 87°, moderately spaced; filling: not healed, moderately thin quartz, moderately weathered, moderately hard; surface: slightly rough, moderately weathered. Fracture set #F-18.		
665.0	107.0							
664.0	108.0							
663.0	109.0					109.0-114.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding plane.		
662.0	110.0					109.3-112 ft Joint, R.D. = 20°, closely spaced; filling: not healed; surface: slightly rough, planar; iron oxidation staining in the fractures, 110.2-111.0 ft. quartz veins in the run. Fracture set #F-19.		
661.0	111.0	R-22	100% (76%)					
660.0	112.0							
659.0	113.0					112.8-113.5 ft Joint, R.D. = 35°; filling: totally healed, quartz, fresh, moderately hard; surface: fresh; thickness varies from thin to moderately thick. Fracture set #F-20.		
658.0	114.0			FD2		114.0-119.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), no reaction to HCl, 10° bedding plane.		
657.0	115.0							
656.0	116.0	R-23	100% (100%)					
655.0	117.0							
654.0	118.0							
	119.0					---- Bottom of Boring at 119.00 ft.----		

DATE STARTED: 4/28/10
DATE FINISHED: 5/19/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-414

PROJECT NO. 10-4310

COORDINATES

N. 339887.65 ft E. 2404983.51 ft

GROUND SURFACE ELEVATION: 730.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
730.0	1.0	S-1	2-6-8 (14) 87%		0.0-1.5 ft Poorly graded sand with silt, (sp-sm), 85% sand, fine to coarse; 10% fines, medium plasticity, low toughness; 5% gravel, fine, subrounded, hard hardness; maximum grain size = 0.25 inches, grayish orange (10YR 7/4) and dark yellowish orange (10YR 6/6), dry, no HCl reaction, medium dense	sp-sm	
729.0	2.0				1.5-2.5 ft Interval not sampled		
728.0	3.0	S-2	50 100%		2.5-3.0 ft Poorly graded sand with silt, (sp-sm), 80% sand, fine to coarse; 10% gravel, fine to medium; 10% fines, medium plasticity, low toughness; maximum grain size = 0.2 inches, dark yellowish orange (10YR 6/6) and grayish pink (5R 8/2), dry, no HCl reaction, very loose, sampling through boulder	sp-sm	
727.0	4.0				3.0-5.0 ft Interval not sampled		
726.0	5.0						
725.0	6.0	S-3	14-12-10 (22) 100%		5.0-6.5 ft Clayey sand, (sc), 70% sand, fine to medium; 25% fines, high plasticity, medium toughness; 5% gravel, fine, subangular; maximum grain size = 0.1 inches, light brown (5YR 5/6) and pale yellowish orange (10YR 8/6), moist, no HCl reaction, medium dense, trace pieces of shale (N3)	sc	
724.0	7.0				6.5-7.5 ft Interval not sampled		
723.0	8.0	S-4	7-9-7 (16) 100%		7.5-9.0 ft Clayey sand, (sc), 50% sand, fine to medium; 40% fines, high plasticity, medium toughness; 10% gravel, fine, subangular, medium hardness; maximum grain size = 0.2 inches, light brown (5YR 5/6) and grayish yellow (5Y 8/4), moist, no HCl reaction, medium dense	sc	
722.0	9.0				9.0-10.0 ft Interval not sampled		
721.0	10.0						
720.0	11.0	S-5	2-7-10 (17) 100%		10.0-11.5 ft Clayey sand with gravel, (sc), 50% sand, fine to medium; 30% gravel, fine to medium, subangular, medium hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.25 inches, yellowish gray (5Y 7/2) with dark gray (N3), dry, no HCl reaction, medium dense	sc	Decomposed shale starting at 10.7 ft.
719.0	12.0				11.5-12.5 ft Interval not sampled		Switch to casing advancer
718.0	13.0	S-6	12-14-14 (28) 97%		12.5-14.0 ft Clayey sand with gravel, (sc), 50% sand, fine to coarse; 30% gravel, fine to medium, subangular, medium hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, yellowish gray (5Y 7/2) and light brown (5YR 5/6), moist, no HCl reaction, medium dense, few fragments of weathered shale (N3)	sc	
717.0	14.0				14.0-15.0 ft Interval not sampled		
716.0	15.0						
715.0	16.0	S-7	19-32-50 (82) 100%		15.0-16.5 ft Poorly graded sand with clay and gravel, (sp-sc), 50% sand, fine to coarse; 40% gravel, fine to medium, subangular, flat, medium hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 0.1 inches, yellowish gray (5Y 7/2) and dark gray (N3), dry, no HCl reaction, very dense	sp-sc	
714.0	17.0				16.5-19.25 ft SHALE, moderately soft to moderately hard, moderately to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
713.0	18.0	R-1	100% (0%)	FD8			SC-1 18.3-18.65 ft. at 09:30, 5/22/10
712.0	19.0						
711.0		R-2	100%	FD8			

DATE STARTED: 5/21/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-414

PROJECT NO. 10-4310

COORDINATES

N. 339887.65 ft E. 2404983.51 ft

GROUND SURFACE ELEVATION: 730.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
710.0			(0%)			19.25-24.25 ft SHALE, moderately soft to moderately hard, moderately to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
	21.0							
709.0								
	22.0	R-2	100% (0%)	FD8				
708.0								
	23.0							
707.0								
	24.0							
706.0						24.25-29.25 ft SHALE, moderately soft to moderately hard, slightly to intensely weathered, dark gray (N3) with yellowish gray (5Y 7/2), very closely to closely fractured, no reaction to HCl, iron oxide staining		
	25.0							
705.0								
	26.0							
704.0								
	27.0	R-3	100% (0%)	FD7				
703.0								
	28.0							
702.0								
	29.0							
701.0						29.25-34.25 ft SHALE, moderately soft to moderately hard, slightly to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
	30.0							
700.0								
	31.0							
699.0								
	32.0	R-4	100% (0%)	FD7				
698.0								
	33.0							
697.0								
	34.0							
696.0						34.25-39.25 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, closely to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite 34.25-35.4 ft R.D. = 80-90°, slightly open; surface: slightly rough, undulating, moderately hard. Fracture set #F-1. 35.45-35.46 ft Joint, R.D. = 10°, slightly open; surface: slightly rough, planar, moderately hard. Fracture set #F-2. 35.75-39.25 ft Joint, R.D. = 40°, closely spaced, moderately open; surface: moderately rough, undulating, moderately hard. Fracture set #F-3.		
	35.0							
695.0								
	36.0							
694.0								
	37.0	R-5	100% (57%)	FD6				
693.0								
	38.0							
692.0								
	39.0							
691.0		R-6	100%	FD5				

DATE STARTED: 5/21/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-414

PROJECT NO. 10-4310

COORDINATES

N. 339887.65 ft E. 2404983.51 ft

GROUND SURFACE ELEVATION: 730.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
690.0			(82%)			39.9-39.91 ft Joint, R.D. = 10°, slightly open; surface: smooth, planar, moderately hard. Fracture set #F-4.		
	41.0					39.25-44.25 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
689.0								
	42.0	R-6	100% (82%)	FD5				
688.0						42.6-45 ft Joint, R.D. = 45°, closely spaced, slightly open; surface: slightly rough, undulating, moderately hard; fracture goes to 80-90 ° 44.65-44.95 ft., and then back to 45 °. Fracture set #F-5.		
	43.0							
687.0								
	44.0							
686.0						44.25-49.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, trace fossils and pyrite		
	45.0							
685.0								
	46.0							
684.0								
	47.0	R-7	100% (94%)	FD4				
683.0								
	48.0							
682.0								
	49.0					48.65-68.2 ft R.D. = 0, 45°, moderately to widely spaced, slightly open; surface: slightly rough, undulating, moderately hard. Fracture set #F-6.		
681.0						49.25-54.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, widely to very widely fractured, no reaction to HCl, trace fossils and pyrite		
	50.0							
680.0								
	51.0							
679.0								
	52.0	R-8	100% (95%)	FD3				
678.0								
	53.0							
677.0								
	54.0							
676.0						54.25-59.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
	55.0							
675.0								
	56.0							
674.0								
	57.0	R-9	100% (94%)	FD3				
673.0								
	58.0							
672.0								
	59.0							
671.0		R-10	100%	FD0		59.25-64.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		

DATE STARTED: 5/21/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-414

PROJECT NO. 10-4310

COORDINATES

N. 339887.65 ft E. 2404983.51 ft

GROUND SURFACE ELEVATION: 730.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
670.0	60.0		(100%)			59.25-64.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
669.0	61.0							
668.0	62.0	R-10	100% (100%)	FD0				
667.0	63.0							
666.0	64.0					64.25-69.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, fossil bands 66.0-67.4 ft., trace fossils and pyrite throughout		
665.0	65.0							
664.0	66.0							
663.0	67.0	R-11	100% (95%)	FD1				
662.0	68.0							
661.0	69.0					69.25-74.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, fossil bands 69.6-70.1, 71.15-71.35, 72.3-72.6 ft., trace fossils and pyrite throughout sample.		
660.0	70.0					70.6-75.65 ft Joint, R.D. = 10°, very widely spaced, open; surface: smooth, undulating, moderately hard. Fracture set #F-7.		
659.0	71.0							
658.0	72.0	R-12	100% (98%)	FD1				
657.0	73.0							
656.0	74.0					74.25-79.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
655.0	75.0							
654.0	76.0							
653.0	77.0	R-13	100% (99%)	FD1				
652.0	78.0							
651.0	79.0							
		R-14	98%	FD1				

DATE STARTED: 5/21/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-414

PROJECT NO. 10-4310

COORDINATES

N. 339887.65 ft E. 2404983.51 ft

GROUND SURFACE ELEVATION: 730.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
650.0			(97%)			79.25-84.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, fossil bands at 80.3-80.75, 81.5-81.75, 83.4-83.5 ft., trace fossils and pyrite throughout		
649.0	81.0					81.1-81.15 ft R.D. = 20°, moderately open; surface: slightly rough, undulating, moderately hard. Fracture set #F-8.		
648.0	82.0	R-14	98% (97%)	FD1				
647.0	83.0							
646.0	84.0					84.25-89.25 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely to widely fractured, no reaction to HCl, iron oxide staining, increased fossils and pyrite 84.7-86.2 ft., intensely fractured 87.75-89.25 ft.		
645.0	85.0							
644.0	86.0							
643.0	87.0	R-15	100% (78%)	FD3				
642.0	88.0					87.75-96.25 ft Joint, R.D. = 10-45°, closely spaced, slightly open; surface: smooth, planar, moderately weathered, moderately soft to moderately hard. Fracture set #F-9.		
641.0	89.0					89.25-94.25 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, closely to moderately fractured, no reaction to HCl, iron oxide staining, fewer trace fossils and pyrite		
640.0	90.0							
639.0	91.0							
638.0	92.0	R-16	100% (36%)	FD6				
637.0	93.0							
636.0	94.0					94.25-99.25 ft SHALE, moderately soft to moderately hard, fresh to intensely weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining, intensely weathered from 98.25 ft., weathered shale (5Y 7/2)		
635.0	95.0							
634.0	96.0							
633.0	97.0	R-17	100% (57%)	FD7				
632.0	98.0							
631.0	99.0							
		R-18	100%	FD7		99.25-102.05 ft Joint, R.D. = 45°, closely spaced, moderately open; filling: not healed, moderately thin calcite, moderately to intensely weathered; surface:		

DATE STARTED: 5/21/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-414

PROJECT NO. 10-4310

COORDINATES

N. 339887.65 ft E. 2404983.51 ft

GROUND SURFACE ELEVATION: 730.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
630.0			(20%)			slightly rough, planar, moderately to moderately weathered. Fracture set #F-10.		
	101.0					99.25-104.25 ft SHALE, moderately soft to moderately hard, slightly to intensely weathered, dark gray (N3) with yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
629.0								
	102.0	R-18	100% (20%)	FD7		102.1-105.2 ft Joint, R.D. = 80°, closely spaced, slightly open; filling: partly healed, calcite, slightly to moderately weathered, moderately hard; surface: slightly rough, undulating, slightly to slightly weathered, moderately hard. Fracture set #F-11.		
628.0								
	103.0							
627.0								
	104.0							
626.0						104.25-109.25 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, widely fractured, no reaction to HCl, trace fossils an pyrite		
	105.0							
625.0								
	106.0							
624.0								
	107.0	R-19	96% (93%)	FD1				
623.0								
	108.0							
622.0								
	109.0					---- Bottom of Boring at 109.25 ft.----		

DATE STARTED: 5/21/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
739.0	1.0	S-1	4-5-5 (10) 40%		0.0-1.5 ft Organic soil, (ol/oh), 95% fines, low plasticity, no dilatancy, no toughness; 5% sand, fine; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2), organic odor, moist, no HCl reaction, very soft, with roots, rock fragments, (Residual)	ol/oh	
738.0	2.0	S-2	3-23-24 (47) 93%		1.5-2.0 ft Poorly graded sand with silt, (sp-sm), 90% sand, fine; 10% fines, low plasticity, no dilatancy, no toughness; pale brown (5YR 5/2), no odor, moist, no HCl reaction, homogeneous, trace roots, (Alluvial)	sp-sm	
737.0	3.0				2.0-3.0 ft Moderately soft, very intensely weathered, boulder sized particles		
736.0	4.0	S-3	7-16-17 (33) 100%		3.0-4.5 ft SHALE, clayey, very soft to moderately hard, decomposed, clay to silt sized particles, dark yellowish orange (10YR 6/6) and dusky yellowish brown (10YR 2/2), thinly bedded, no odor, no reaction to HCl, moist, iron oxide staining		
735.0	5.0				4.5-5.0 ft Interval not sampled		
734.0	6.0	S-4	11-15-15 (30) 87%		5.0-9.5 ft SHALE, clayey, very soft to moderately hard, decomposed, clay to silt sized particles, dark yellowish orange (10YR 6/6) and dusky yellowish brown (10YR 2/2), thinly bedded, no odor, no reaction to HCl, moist, iron oxide staining, turns dusky yellow (5Y 6/4) at 11.0 ft		
733.0	7.0	S-5	5-11-11 (22) 87%				
732.0	8.0						
731.0	9.0	S-6	5-6-8 (14) 100%				
730.0	10.0	S-7	6-11-18 (29) 93%		9.5-12.0 ft POORLY GRADED GRAVEL WITH SILTY CLAY AND SAND, (GP-GC), 59% gravel, fine to coarse; 33% sand, fine to coarse; 8% fines, low plasticity; maximum grain size = 1.5 inches, dark yellowish orange (10YR 6/6) and dusky yellowish brown (10YR 2/2), moist, no HCl reaction, dense	GP-GC	
729.0	11.0						
728.0	12.0	S-8	9-11-26 (37) 87%		12.0-15.5 ft SHALE, fissile, soft to moderately hard, intensely weathered to decomposed, clay to silt sized particles, yellowish gray (5Y 7/2) to light olive gray (5Y 5/2), thinly bedded, moderate odor, no reaction to HCl, moist, iron oxide staining		
727.0	13.0	S-9	8-15-30 (45) 80%				
726.0	14.0						
725.0	15.0	S-10	20-30-38 (68) 100%				
724.0	16.0				15.5-34.8 ft SHALE, clayey, soft to very soft, moderately to very intensely weathered, clay sized particles, medium dark gray (N4) to dark gray (N3), no odor, very closely to moderately fractured, no reaction to HCl, iron oxide staining		
723.0	17.0						
722.0	18.0	R-1	77% (6%)	FD7	15.5-30.5 ft Fracture zone, very closely to closely spaced, neither ends visible, slightly open; filling is damp but no free water present, filling: partly healed, very thin clay, very soft; surface: rough.		
721.0	19.0						
720.0							

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
719.0	21.0	R-1		FD7		15.5-34.8 ft SHALE, clayey, soft to very soft, moderately to very intensely weathered, clay sized particles, medium dark gray (N4) to dark gray (N3), no odor, very closely to moderately fractured, no reaction to HCl, iron oxide staining		
718.0	22.0							
717.0	23.0	R-2	96% (8%)					
716.0	24.0							
715.0	25.0							
714.0	26.0			FD6				
713.0	27.0							26.95 - 27.5 ft. SC-1, 13:10, 4/23/10
712.0	28.0	R-3	90% (14%)					
711.0	29.0							
710.0	30.0							
709.0	31.0							
708.0	32.0			FD5				
707.0	33.0	R-4	92% (24%)					
706.0	34.0							
705.0	35.0					34.8-40.5 ft SHALE, clayey, soft to moderately hard, slightly to moderately weathered, clay sized particles, dark gray (N3), no odor, moderately to widely fractured, no reaction to HCl, iron oxide staining		
704.0	36.0					34.85-35.4 ft Bedding plane, R.D. = 5-8°, moderately spaced, neither ends visible, slightly open; dry, shows evidence of flow, filling: partly healed, very thin, slightly to moderately weathered; surface: slightly rough, planar, slightly weathered.		
703.0	37.0					35.1- ft Random fracture, R.D. = 70°, widely spaced, neither ends visible, slightly open; filling: not healed, very thin, slightly weathered; surface: moderately rough, planar, slightly weathered.		
702.0	38.0	R-5	95% (67%)			37.2-38.3 ft Fracture zone, R.D. = 0-11°, closely to widely spaced; filling: moderately healed, very thin, slightly to moderately weathered; surface: slightly rough, planar, slightly to moderately weathered.		
701.0	39.0					38.4- ft Joint, R.D. = 56°, neither ends visible, slightly open; filling: not healed, very thin, slightly weathered; surface: slightly rough, planar, slightly		
700.0								

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-5				weathered. Fracture set #1, discontinuity # 2. 38.9- ft Joint; filling: not healed. Fracture set #2, discontinuity # 4. 39.1-41.25 ft R.D. = 60-69°, closely to widely spaced, neither ends visible, slightly open; filling: moderately healed, very thin, slightly weathered; surface: moderately rough, planar, slightly weathered.		
699.0	41.0							
698.0	42.0					40.5-79.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3), moderately bedded, no odor, moderately fractured, weak reaction to HCl		
697.0	43.0	R-6	100% (31%)			41.3-44 ft Fracture zone, R.D. = 0-11°, closely to widely spaced; filling: moderately healed, very thin, slightly to moderately weathered; surface: slightly rough, planar, slightly to moderately weathered.		
696.0	44.0							43.8 - 44.7 ft. SC-2, 13:50, 4/23/10
695.0	45.0							
694.0	46.0							
693.0	47.0							
692.0	48.0	R-7	100% (74%)					
691.0	49.0					48.25-51.2 ft Random fracture, moderately spaced, neither ends visible, slightly open; filling: not healed, very thin, slightly to moderately weathered; surface: slightly rough, slightly to moderately weathered; iron oxide staining.		
690.0	50.0			FD5				
689.0	51.0							
688.0	52.0							
687.0	53.0	R-8	96% (46%)					
686.0	54.0							
685.0	55.0					54.8-56.2 ft R.D. = 37-39°, closely to widely spaced; filling: not healed, clean; surface: slightly rough.		
684.0	56.0							
683.0	57.0							
682.0	58.0	R-9	100% (66%)					
681.0	59.0							
680.0						59.4-59.5 ft R.D. = 19-22°, closely spaced, neither ends visible, slightly open;		

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-9				filling: not healed, very thin iron oxide staining; surface: slightly rough.		
679.0	61.0					40.5-79.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3), moderately bedded, no odor, moderately fractured, weak reaction to HCl		
678.0	62.0					60-62 ft Fracture zone, R.D. = 45°, moderately to widely spaced; filling: not healed, very thin minor iron staining; surface: slightly rough.		
677.0	63.0	R-10	100% (70%)					
676.0	64.0					63.5-64.6 ft Random fracture, R.D. = 80°; filling: not healed, staining; surface: moderately rough.		
675.0	65.0			FD5				
674.0	66.0					65.5-66.9 ft Joint, R.D. = 15°; filling: not healed, very thin iron oxide staining; surface: slightly rough.		
673.0	67.0					66.2-66.4 ft Joint, R.D. = 45°, closely spaced; filling: not healed, very thin slight iron stain; surface: moderately rough.		
672.0	68.0	R-11	100% (32%)					
671.0	69.0					68.2-69.3 ft Fracture zone, R.D. = 30-40°, closely to moderately spaced; filling: iron oxide staining; surface: slightly rough.		
670.0	70.0					69.3- ft Joint, R.D. = 40°.		
669.0	71.0					70- ft Joint, R.D. = 56°, neither ends visible; filling: not healed, very thin iron oxide staining; surface: moderately rough.		
668.0	72.0							
667.0	73.0	R-12	100% (66%)					
666.0	74.0							
665.0	75.0			FD4		74.8-76.7 ft Random fracture, R.D. = 85°, closely spaced, neither ends visible; filling: not healed, very thin iron oxide staining; surface: rough, moderately weathered.		
664.0	76.0							
663.0	77.0							
662.0	78.0	R-13	100% (55%)			77.75-78.3 ft R.D. = 32-34°, closely to moderately spaced; filling: not healed, very thin iron oxide staining, slightly to moderately weathered; surface: moderately rough, slightly weathered.		
661.0	79.0							
660.0								

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
659.0	81.0	R-13		FD4		79.0-90.5 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3), thickly to moderately bedded, widely fractured, no reaction to HCl, with fossiliferous layers		
658.0	82.0							
657.0	83.0	R-14	100% (100%)					
656.0	84.0							
655.0	85.0							
654.0	86.0							
653.0	87.0							
652.0	88.0	R-15	82% (28%)			87.4-89.25 ft Fracture zone, R.D. = 40°, closely to very closely spaced, neither ends visible; filling: not healed, very thin iron oxide staining; surface: slightly rough.		
651.0	89.0							
650.0	90.0							
649.0	91.0					90.5-90.8 ft Clayey sand, (sc), 60% sand, fine to medium, flat, medium hardness; 40% fines, medium plasticity; dark gray (N3), no odor, moist, no HCl reaction	sc	
648.0	92.0					90.8-175.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3) to grayish black (N2), moderately to thinly bedded, no odor, very closely to very widely fractured, no reaction to HCl		
647.0	93.0	R-16	82% (8%)			91.2-94.6 ft Fracture zone, very closely to closely spaced, neither ends visible; filling: not healed, very thin iron oxide staining; surface: slightly rough; 93.7 to 94.6 ft. fractures are at 42 °.		
646.0	94.0			FD7				
645.0	95.0							
644.0	96.0							
643.0	97.0					96.2-97.3 ft R.D. = 73-74°, closely to moderately spaced; filling: not healed, very thin iron oxide staining; surface: moderately rough, moderately weathered.		
642.0	98.0	R-17	100% (37%)			97.3-101.5 ft R.D. = 28-32°, closely to moderately spaced; filling: not healed, very thin iron oxide staining, fresh to moderately weathered; surface: moderately rough, fresh to moderately weathered.		
641.0	99.0					97.6- ft Bedding plane separation, R.D. = 30°; surface: slightly rough.		
640.0								

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
639.0	101.0	R-17				90.8-175.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3) to grayish black (N2), moderately to thinly bedded, no odor, very closely to very widely fractured, no reaction to HCl		
638.0	102.0			FD7		101.6-101.9 ft Joint, R.D. = 56°; filling: not healed, thin iron oxide staining; surface: slightly rough.		
637.0	103.0	R-18	96% (55%)					
636.0	104.0					103.7-105.05 ft Fracture zone, very closely spaced, neither ends visible, slightly open; filling: partly healed, very thin iron oxide staining; surface: moderately rough, slightly weathered.		
635.0	105.0			FD5				
634.0	106.0							
633.0	107.0					106.8-114.1 ft R.D. = 0°, neither ends visible, slightly open; filling: not healed, very thin iron oxide staining; surface: rough, slightly weathered; very thin to moderately thin calcite.		
632.0	108.0	R-19	100% (41%)	FD9		107-107.65 ft Fracture zone, very closely spaced, neither ends visible, slightly open; filling: partly healed, very thin, slightly weathered; surface: rough, slightly weathered.		
631.0	109.0							
630.0	110.0					109.85-114.6 ft R.D. = 30-34°, closely to very widely spaced, neither ends visible, slightly open; filling: not healed, very thin calcite, fresh to slightly weathered; surface: moderately rough, fresh to slightly weathered.		
629.0	111.0					109.9-113.6 ft R.D. = 84-88°, widely spaced, both ends visible; filling: partly healed, very thin iron oxide; surface: moderately rough, slightly weathered; very thin calcite.		
628.0	112.0			FD5		110.9-111 ft Random fracture, R.D. = 55°, one end visible; filling: partly healed, thin quartz filling, moderately weathered, hard; surface: moderately rough, moderately weathered.		
627.0	113.0	R-20	100% (52%)					
626.0	114.0					113.3-114.7 ft R.D. = 45-46°, moderately to widely spaced; filling: moderately healed, moderately thin calcite, fresh to slightly weathered; surface: moderately rough, fresh to slightly weathered.		
625.0	115.0					113.6-120.6 ft R.D. = 22-23°, very widely spaced, neither ends visible, slightly open; filling: moderately healed, thin calcite, slightly weathered; surface: moderately rough, slightly weathered.		
624.0	116.0					114.55-114.7 ft Joint, R.D. = 60°, one end visible; filling: very thin iron oxide; surface: slightly rough.		
623.0	117.0					114.8-116.85 ft R.D. = 72-76°, moderately spaced; filling: very thin iron oxide staining; surface: rough; 114.8-115.05 ft. very thin calcite.		
622.0	118.0	R-21	100% (83%)			115.05-115.15 ft Fracture zone; filling: not healed, very thin feo stain, moderately weathered; surface: moderately weathered.		
621.0	119.0			FD3				
620.0								

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
619.0	121.0	R-21		FD3		90.8-175.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3) to grayish black (N2), moderately to thinly bedded, no odor, very closely to very widely fractured, no reaction to HCl		
618.0	122.0							
617.0	123.0	R-22	100% (100%)			123.3- ft Bedding plane separation, R.D. = 06°, neither ends visible; filling: partly healed, moderately thin calcite, fresh; surface: rough, fresh.		
616.0	124.0							
615.0	125.0							
614.0	126.0							
613.0	127.0							
612.0	128.0	R-23	100% (100%)					
611.0	129.0							
610.0	130.0			FD1				
609.0	131.0							
608.0	132.0							
607.0	133.0	R-24	100% (78%)					
606.0	134.0							
605.0	135.0							
604.0	136.0							
603.0	137.0							
602.0	138.0	R-25	96% (92%)					
601.0	139.0							
600.0								

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
599.0	141.0	R-25				90.8-175.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3) to grayish black (N2), moderately to thinly bedded, no odor, very closely to very widely fractured, no reaction to HCl 140.35-140.6 ft Random fracture; filling: moderately thick clay.		
598.0	142.0							
597.0	143.0	R-26	98% (98%)					
596.0	144.0							
595.0	145.0							
594.0	146.0					145.5- ft Random fracture; filling: thin clay.		
593.0	147.0							147.0 ft. Driller reports complete loss of circulation
592.0	148.0	R-27	100% (97%)					
591.0	149.0							
590.0	150.0			FD1				
589.0	151.0							
588.0	152.0							
587.0	153.0	R-28	96% (96%)					
586.0	154.0							
585.0	155.0							
584.0	156.0							
583.0	157.0							
582.0	158.0	R-29	100% (98%)					
581.0	159.0							
580.0								

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
579.0	161.0	R-29				90.8-175.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3) to grayish black (N2), moderately to thinly bedded, no odor, very closely to very widely fractured, no reaction to HCl		
578.0	162.0							
577.0	163.0	R-30	100% (96%)					
576.0	164.0							
575.0	165.0							
574.0	166.0							
573.0	167.0							
572.0	168.0	R-31	100% (100%)	FD1				
571.0	169.0							
570.0	170.0							
569.0	171.0							
568.0	172.0							
567.0	173.0	R-32	99% (96%)					
566.0	174.0							
565.0	175.0					175.0-200.5 ft SHALE, moderately hard, fresh, dark gray (N3) and grayish black (N2), widely to extremely widely fractured, no reaction to HCl		175.0 ft. Driller reports a net loss of water of approx. 30% during entire hole
564.0	176.0							
563.0	177.0							
562.0	178.0	R-33	98% (94%)	FD1				
561.0	179.0							
560.0								

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
559.0	181.0	R-33				175.0-200.5 ft SHALE, moderately hard, fresh, dark gray (N3) and grayish black (N2), widely to extremely widely fractured, no reaction to HCl		
558.0	182.0							
557.0				FD1				
	183.0	R-34	98% (92%)					
556.0	184.0							
555.0	185.0							
554.0	186.0					185.55- ft Bedding plane separation; filling: not healed, moderately thin clay, fresh; surface: moderately rough, fresh; Driller reports clay in run; clay traces found at 185.55 ft.		
553.0	187.0							
552.0	188.0	R-35	99% (72%)	FD4				
551.0	189.0							
550.0	190.0							
549.0	191.0							
548.0	192.0							
547.0	193.0	R-36	100% (80%)					
546.0	194.0							
545.0	195.0							
544.0	196.0			FD2				
543.0	197.0							
542.0	198.0	R-37	100% (98%)					
541.0	199.0							
540.0								

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-415

PROJECT NO. 10-4310

COORDINATES

N. 339896.90 ft E. 2405085.97 ft

GROUND SURFACE ELEVATION: 739.64 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
539.0		R-37		FD2		---- Bottom of Boring at 200.50 ft.----		

DATE STARTED: 4/23/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-416

PROJECT NO. 10-4310

COORDINATES

N. 339788.65 ft E. 2404992.39 ft

GROUND SURFACE ELEVATION: 728.86 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
728.0	1.0	S -1	1-4-6 (10) 63%			0.0-1.5 ft Silty sand, (sm), 70% sand, fine to coarse; 20% fines, low plasticity, low toughness; 10% gravel, fine, subangular, medium hardness; maximum grain size = 0.25 inches, moderate olive brown (5Y 4/4), moist, no HCl reaction, loose	sm	
727.0	2.0					1.5-2.5 ft Interval not sampled		
726.0	3.0	S -2	23-50/2 119%			2.5-3.17 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 20% gravel, fine to medium, subangular, medium hardness; 20% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, moderate brown (5YR 4/4) and yellowish gray (5Y 8/1), dry, no HCl reaction, very dense, sampling through cobble/boulder	sm	
725.0	4.0					3.17-5.0 ft Interval not sampled		
724.0	5.0	S -3	24-40-46 (86) 93%			5.0-6.5 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 20% gravel, fine to medium, subangular, medium hardness; 20% fines, low plasticity, low toughness; maximum grain size = 0.25 inches, moderate brown (5YR 4/4), dry, no HCl reaction, very dense, sampling through cobble/boulder (5Y 8/1) near bottom of run	sm	
723.0	6.0							
722.0	7.0					6.5-7.5 ft Interval not sampled		
721.0	8.0	S -4	50 100%			7.5-8.0 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 20% gravel, fine to medium, subangular; 20% fines, low plasticity, low toughness; maximum grain size = 0.33 inches, moderate brown (5YR 4/4) and pale brown (5YR 5/2), dry, no HCl reaction, very loose	sm	
720.0	9.0					8.0-10.0 ft Interval not sampled		
719.0	10.0	S -5	20-20-23 (43) 80%			10.0-11.5 ft Well graded gravel with sand, (gw), 50% sand, fine to medium; 40% gravel, fine to coarse, medium hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 1.0 inches, moderate brown (5YR 4/4) and grayish orange pink (10R 8/2), moist, no HCl reaction, dense, sampling trough cobble/boulder grayish red (10R 4/2) and grayish orange pink (10R 8/2), some shale dark gray (N3) fragments in sample	gw	
718.0	11.0							
717.0	12.0					11.5-12.5 ft Interval not sampled		
716.0	13.0	S -6	8-9-10 (19) 87%			12.5-14.0 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 20% gravel, fine to medium, medium hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.25 inches, moderate brown (5YR 4/4) and dark gray (N3), wet, no HCl reaction, medium dense, few shale (N3) fragments	sm	Drillers switch to casing advancer.
715.0	14.0					14.0-15.0 ft Interval not sampled		
714.0	15.0	S -7	4-5-9 (14) 87%			15.0-16.5 ft Clayey sand, (sc), 70% sand, medium to coarse; 20% fines, medium plasticity, low toughness; 10% gravel, fine, subangular; maximum grain size = 0.1 inches, light brown (5YR 5/6) and pale yellowish orange (10YR 8/6), moist, no HCl reaction, medium dense, weathered shale	sc	
713.0	16.0							
712.0	17.0					16.5-17.5 ft Interval not sampled		
711.0	18.0	S -8	8-8-10 (18) 87%			17.5-19.0 ft Clayey sand, (sc), 70% sand, fine to coarse; 20% fines, medium plasticity, low toughness; 10% gravel, fine to medium; maximum grain size = 1.0 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), moist, no HCl reaction, medium dense	sc	
710.0	19.0					19.0-20.0 ft Interval not sampled		
709.0								

DATE STARTED: 5/12/10
DATE FINISHED: 5/18/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-416

PROJECT NO. 10-4310

COORDINATES

N. 339788.65 ft E. 2404992.39 ft

GROUND SURFACE ELEVATION: 728.86 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
708.0	21.0	S -9	9-12-17 (29) 100%		20.0-21.5 ft Clayey sand, (sc), 70% sand, fine to coarse; 20% fines, medium plasticity, low toughness; 10% gravel, fine; maximum grain size = 0.1 inches, light brown (5YR 5/6) with yellowish gray (5Y 7/2), moist, no HCl reaction, medium dense	sc	
707.0	22.0				21.5-22.5 ft Interval not sampled		
706.0	23.0	S -10	23-50/5 98%		22.5-23.4 ft Clayey gravel, (gc), 70% gravel, fine to medium; 20% fines, low plasticity, low toughness; 10% sand, fine to medium; maximum grain size = 0.5 inches, yellowish gray (5Y 7/2) and dark gray (N3), moist, no HCl reaction, very dense, moderately to intensely weathered shale	gc	
705.0	24.0				23.4-25.0 ft Interval not sampled		
704.0	25.0				25.0-30.0 ft SHALE, soft to moderately hard, moderately to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining, shale weathering to clay (5YR 5/6)		
703.0	26.0						
702.0	27.0	R-1	96% (0%)	FD7			
701.0	28.0						
700.0	29.0						
699.0	30.0				30.0-35.0 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
698.0	31.0				30-34 ft Joint, R.D. = 10°, closely spaced, slightly open; surface: slightly rough, planar, moderately hard. Fracture set #F-1.		
697.0	32.0	R-2	100% (67%)	FD6			SC-1 31.6-32.4 ft., at 11:00 on 5/18/10
696.0	33.0						
695.0	34.0						
694.0	35.0				34.8-43.6 ft Joint, R.D. = 80°, moderately spaced, moderately open; surface: slightly rough, planar, moderately hard. Fracture set #F-2.		
693.0	36.0				35.0-40.0 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), moderately to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
692.0	37.0						
691.0	38.0	R-3	100% (46%)	FD5			
690.0	39.0						
689.0							

DATE STARTED: 5/12/10
DATE FINISHED: 5/18/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-416

PROJECT NO. 10-4310

COORDINATES

N. 339788.65 ft E. 2404992.39 ft

GROUND SURFACE ELEVATION: 728.86 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
688.0	41.0					40.0-45.0 ft SHALE, moderately hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
687.0	42.0	R-4	100% (54%)	FD5				
686.0	43.0							
685.0	44.0					43.8-45 ft Joint, R.D. = 45°, closely spaced, slightly open; surface: slightly rough, planar, moderately hard. Fracture set #F-3.		
684.0	45.0					45.0-50.0 ft SHALE, moderately hard, fresh, dark gray (N3), widely fractured, no reaction to HCl, trace fossils and pyrite		
683.0	46.0							
682.0	47.0	R-5	100% (100%)	FD3				
681.0	48.0					48.4-49.5 ft Joint, R.D. = 40°, moderately spaced, slightly open; surface: slightly rough, planar, moderately hard. Fracture set #F-4.		
680.0	49.0							
679.0	50.0					50.0-55.0 ft SHALE, interbedded, moderately hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
678.0	51.0					50.5-50.75 ft R.D. = 60°, slightly open; filling: not healed, clay, intensely weathered, very soft; surface: slightly rough, undulating, intensely weathered; iron oxide staining on fracture face with small amount of clay (5YR 5/6). Fracture set #F-5.		
677.0	52.0	R-6	100% (84%)	FD5		52.65-54.9 ft Joint, R.D. = 30°, closely spaced, slightly open; surface: slightly rough, undulating, moderately hard. Fracture set #F-6.		
676.0	53.0							
675.0	54.0							
674.0	55.0					55.0-60.0 ft SHALE, moderately hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, trace fossils and pyrite		
673.0	56.0							
672.0	57.0					56.85-58.75 ft Joint, R.D. = 65°, moderately spaced, slightly open; surface: slightly rough, undulating, moderately hard. Fracture set #F-7.		
671.0	58.0	R-7	100% (94%)	FD4				
670.0	59.0							
669.0								

DATE STARTED: 5/12/10
DATE FINISHED: 5/18/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-416

PROJECT NO. 10-4310

COORDINATES

N. 339788.65 ft E. 2404992.39 ft

GROUND SURFACE ELEVATION: 728.86 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
668.0	61.0					60.0-65.0 ft SHALE, moderately hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite, moderately weathered 10° fracture at 63.3 ft., iron oxide staining on fracture faces, moderately open		
667.0	62.0							
666.0	63.0	R-8	100% (100%)	FD3				
665.0	64.0					63.3-63.33 ft Joint, R.D. = 10°, moderately open; surface: slightly rough, planar, moderately hard; heavy iron oxide staining. Fracture set #F-8.		
664.0	65.0					64.3-66.95 ft Joint, R.D. = 45°, widely spaced, slightly open; surface: slightly rough, planar. Fracture set #F-9.		
663.0	66.0					65.0-70.0 ft SHALE, moderately hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl, trace fossils and pyrite		
662.0	67.0							
661.0	68.0	R-9	100% (94%)	FD4		68-78.15 ft Joint, R.D. = 10-20°, closely to widely spaced, slightly open; surface: slightly rough, undulating, moderately hard. Fracture set #F-10.		
660.0	69.0							
659.0	70.0					70.0-75.0 ft SHALE, moderately hard, fresh, dark gray (N3), widely fractured, no reaction to HCl, increased fossil content, trace to few, trace pyrite		
658.0	71.0							
657.0	72.0							
656.0	73.0	R-10	100% (100%)	FD2				
655.0	74.0							
654.0	75.0					75.0-80.0 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), widely fractured, no reaction to HCl, iron oxide staining, slightly weathered fracture 78.2-80.0 ft., trace fossils and pyrite throughout		
653.0	76.0							
652.0	77.0							
651.0	78.0	R-11	100% (76%)	FD3				
650.0	79.0					78.9-80.6 ft R.D. = 80°, moderately open; surface: slightly rough, undulating, moderately weathered, moderately hard; iron oxide staining on fracture face, small (5mm) pits. Fracture set #F-11.		
649.0								

DATE STARTED: 5/12/10
DATE FINISHED: 5/18/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-416

PROJECT NO. 10-4310

COORDINATES

N. 339788.65 ft E. 2404992.39 ft

GROUND SURFACE ELEVATION: 728.86 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
648.0	81.0					80.0-85.0 ft SHALE, moderately hard, fresh, dark gray (N3), widely fractured, no reaction to HCl, few fossils and pyrite		
647.0	82.0							
646.0	83.0	R-12	100% (84%)	FD1				
645.0	84.0							
644.0	85.0							
643.0	86.0					85.0-90.0 ft SHALE, moderately hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl, trace fossils and pyrite 85.9-88.85 ft Joint, R.D. = 10°, closely spaced, slightly open; surface: slightly rough, planar, moderately hard. Fracture set #F-12.		
642.0	87.0							
641.0	88.0	R-13	100% (58%)	FD6				
640.0	89.0					88.5-90 ft Joint, R.D. = 85°, slightly open; surface: slightly rough, planar. Fracture set #F-13.		
639.0	90.0							
638.0	91.0					90.0-95.0 ft SHALE, moderately hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite 91.2-94.3 ft Joint, R.D. = 10°, moderately spaced, slightly open; surface: smooth, planar. Fracture set #F-14.		
637.0	92.0							
636.0	93.0	R-14	94% (80%)	FD5				
635.0	94.0							
634.0	95.0					94.3-95 ft Joint, R.D. = 10°, slightly open; filling: not healed, very thin quartz, moderately weathered, moderately hard; surface: slightly rough, planar, moderately weathered. Fracture set #F-15.		
633.0	96.0					95.0-100.0 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
632.0	97.0					95.3-95.9 ft Joint, R.D. = 80°, moderately open; filling: moderately healed, thin quartz, slightly to moderately weathered, moderately hard; surface: slightly weathered. Fracture set #F-16.		
631.0	98.0	R-15	94% (60%)	FD6		96.7-100 ft Joint, R.D. = 10-40°, closely spaced, slightly open; surface: slightly rough, planar, moderately hard. Fracture set #F-17.		
630.0	99.0							
629.0								

DATE STARTED: 5/12/10
DATE FINISHED: 5/18/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-416

PROJECT NO. 10-4310

COORDINATES

N. 339788.65 ft E. 2404992.39 ft

GROUND SURFACE ELEVATION: 728.86 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
628.0	101.0					100.0-105.0 ft SHALE, moderately hard, fresh, dark gray (N3), closely to moderately fractured, no reaction to HCl, transition from quartz-healed fractures to calcite-healed at 101.3 ft., trace fossils and pyrite throughout		
627.0	102.0	R-16	100% (90%)	FD2		100.1-101.2 ft Joint, R.D. = 25°, closely spaced; filling: moderately healed, moderately thick quartz, fresh to slightly weathered, moderately soft to moderately hard; surface: fresh. Fracture set #F-18.		
626.0	103.0					101.3-105 ft Joint, R.D. = 70°, closely to moderately spaced; filling: totally healed, thin calcite, fresh, moderately hard; surface: slightly rough, planar, fresh; some jagged shale fragments within calcite fill at 101.75-102.25 ft. Fracture set #F-19.		
625.0	104.0							
624.0	105.0					---- Bottom of Boring at 105.00 ft.----		

DATE STARTED: 5/12/10
DATE FINISHED: 5/18/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-417

PROJECT NO. 10-4310

COORDINATES

N. 339799.26 ft E. 2405095.47 ft

GROUND SURFACE ELEVATION: 734.74 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
734.0	1.0	S -1	2-3-5 (8) 80%			0.0-1.5 ft Silty sand, (sm), 80% sand, fine to medium; 15% fines, low plasticity, low toughness; 5% gravel, fine to medium, subangular, medium hardness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, loose	sm	
733.0	2.0	S -2	11-21-21 (42) 93%			1.5-3.0 ft Silty sand, (sm), 70% sand, fine to coarse; 20% fines, low plasticity, low toughness; 10% gravel, fine, subangular, medium hardness; maximum grain size = 0.5 inches, moderate brown (5YR 4/4) and pale reddish brown (10R 5/4), moist, no HCl reaction, dense, trace fine gravel sized shale fragments (N3)	sm	
732.0	3.0							
731.0	4.0	S -3	8-21-30 (51) 93%			3.0-4.5 ft Silty sand, (sm), 70% sand, fine to coarse; 20% fines, medium plasticity, low toughness; 10% gravel, fine to medium, subangular, medium hardness; maximum grain size = 0.5 inches, moderate brown (5YR 4/4) and pale reddish brown (10R 5/4), dry, no HCl reaction, very dense, medium piece of gravel (10YR 8/2). 0.5 in.	sm	
730.0	5.0	S -4	18-31-31 (62) 100%			4.5-6.0 ft Silty sand, (sm), 70% sand, fine to coarse; 20% fines, medium plasticity, low toughness; 10% gravel, fine to medium; maximum grain size = 0.5 inches, moderate brown (5YR 4/4) with light brown (5YR 5/6), moist, no HCl reaction, very dense	sm	
729.0	6.0							
728.0	7.0	S -5	32-29-27 (56) 90%			6.0-7.5 ft Silty sand with gravel, (sm), 50% sand, fine to coarse; 30% gravel, fine to medium, subangular, hard hardness; 20% fines, low plasticity, low toughness; maximum grain size = 0.34 inches, moderate brown (5YR 4/4) with light olive gray (5Y 6/1), dry, no HCl reaction, very dense	sm	
727.0	8.0	S -6	27-50/4 100%				sm	
726.0	9.0					7.5-8.33 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 20% gravel, fine to medium, subangular, medium hardness; 20% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, moderate brown (5YR 4/4) and grayish red (10R 4/2), moist, no HCl reaction, very dense		Drillers switch to casing advancer
725.0	10.0	S -7	15-19-16 (35) 100%			8.33-9.0 ft Interval not sampled	sp-sm	
724.0	11.0					9.0-10.5 ft Poorly graded sand with silt and gravel, (sp-sm), 70% sand, fine to coarse; 20% gravel, fine to medium, subangular, medium hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, pale reddish brown (10R 5/4) and moderate brown (5YR 4/4), dry, no HCl reaction, dense, medium gravel sized broken pieces of a boulder (5R 6/2) and (5Y 5/2) in sample		10.5-12.0 ft., interval not sampled, recovered minimal mud/slush in sampler
723.0	12.0					10.5-12.0 ft Interval not sampled		
722.0	13.0	S -8	8-10-9 (19) 93%			12.0-13.5 ft Poorly graded sand with silt and gravel, (sp-sm), 65% sand, fine to coarse; 25% gravel, fine to medium, subangular, medium hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), moist, no HCl reaction, medium dense, Fine to medium gravel sized fragments of shale (N3).	sp-sm	
721.0	14.0	S -9	8-7-11 (18) 87%			13.5-15.0 ft Clayey sand, (sc), 70% sand, fine to medium; 20% fines, low plasticity, low toughness; 10% gravel, fine to medium, subangular, medium hardness; maximum grain size = 0.25 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), moist, no HCl reaction, medium dense, few fine to medium gravel sized shale (N3) fragments	sc	
720.0	15.0							Decomposed shale starts at 15.05 ft.
719.0	16.0	S -10	15-20-20 (40) 100%			15.0-16.5 ft Clayey gravel with sand, (gc), 50% gravel, fine to medium, subangular, flat and elongated, medium hardness; 30% sand, fine to medium; 20% fines, low plasticity, low toughness; maximum grain size = 1.0 inches, yellowish gray (5Y 7/2) and dark gray (N3), no HCl reaction, dense, moderately to intensely weathered shale, trace amounts of (5YR 5/6) clay.	gc	
718.0	17.0	S -11	19-25-30 (55) 100%				gp-gm	
717.0	18.0	S -12	36-50/4 100%				gp-gc	
716.0	19.0					16.5-18.0 ft Poorly graded gravel with silt and sand, (gp-gm), 50% gravel, fine to medium, angular, flat, medium hardness; 40% sand, fine to coarse; 10% fines, low plasticity, low toughness; maximum grain size = 0.1 inches, yellowish gray (5Y 7/2) and pale greenish yellow (10Y 8/2), dry, no HCl		Refusal at 18.85 ft., advancing to 20.0 ft., begin coring.
715.0								

DATE STARTED: 5/19/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-417

PROJECT NO. 10-4310

COORDINATES

N. 339799.26 ft E. 2405095.47 ft

GROUND SURFACE ELEVATION: 734.74 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						reaction, very dense, some moderately weathered shale (N3).		
714.0	21.0					18.0-18.83 ft Poorly graded gravel with clay and sand, (gp-gc), 50% gravel, fine to medium, medium hardness; 40% sand, fine and coarse; 10% fines, low plasticity, low toughness; maximum grain size = 0.25 inches, yellowish gray (5Y 7/2) with dark gray (N3), moist, no HCl reaction, very dense, moderately to intensely weathered shale		
713.0	22.0	R-1	100% (0%)	FD7		18.83-20.0 ft Interval not sampled		
712.0	23.0					20.0-24.2 ft SHALE, interbedded, soft to moderately soft, moderately to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
711.0	24.0							
710.0	25.0					24.2-29.2 ft SHALE, interbedded, soft to moderately soft, moderately to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
709.0	26.0							
708.0	27.0	R-2	35% (0%)	FD8				
707.0	28.0							
706.0	29.0							
705.0	30.0					29.2-34.2 ft SHALE, moderately soft to moderately hard, moderately to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
704.0	31.0							SC-1 30.4-30.7 ft., at 11:30 on 5/20/10
703.0	32.0	R-3	62% (0%)					
702.0	33.0			FD7				
701.0	34.0							
700.0	35.0					34.2-39.2 ft SHALE, moderately soft to moderately hard, fresh to intensely weathered, yellowish gray (5Y 7/2) to dark gray (N3), thickly to very thickly bedded, very closely to very widely fractured, no reaction to HCl, iron oxide staining, transition from moderately-intensely weathered shale to fresh at 35.6 ft., trace fossils and pyrite below transition		
699.0	36.0							
698.0	37.0	R-4	94% (66%)	FD3				
697.0	38.0							
696.0	39.0							
695.0		R-5	100% (100%)	FD0		39.2-44.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		

DATE STARTED: 5/19/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-417

PROJECT NO. 10-4310

COORDINATES

N. 339799.26 ft E. 2405095.47 ft

GROUND SURFACE ELEVATION: 734.74 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
694.0	41.0					39.2-44.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
693.0	42.0	R-5	100% (100%)	FD0				
692.0	43.0							
691.0	44.0							
690.0	45.0					44.2-49.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
689.0	46.0							
688.0	47.0	R-6	100% (100%)	FD0				
687.0	48.0							
686.0	49.0							
685.0	50.0					49.2-54.2 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, widely to very widely fractured, no reaction to HCl, iron oxide staining, near vertical fracture 52.7-54.2 ft., iron oxide staining on fracture surfaces, trace fossils and pyrite		
684.0	51.0							
683.0	52.0	R-7	100% (70%)	FD1				
682.0	53.0					52.7-54.4 ft Joint, R.D. = 60-80°, slightly open; surface: slightly rough, undulating, moderately hard; iron oxide staining. Fracture set #F-1.		
681.0	54.0							
680.0	55.0					54.2-59.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
679.0	56.0							
678.0	57.0	R-8	100% (100%)	FD0				
677.0	58.0							
676.0	59.0							
675.0		R-9	100% (100%)	FD0		59.2-64.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		

DATE STARTED: 5/19/10
DATE FINISHED: 5/20/10
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
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NOTES:

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PROJECT NO. 10-4310

COORDINATES

N. 339799.26 ft E. 2405095.47 ft

GROUND SURFACE ELEVATION: 734.74 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
674.0	61.0					59.2-64.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
673.0	62.0	R-9	100% (100%)	FD0				
672.0	63.0							
671.0	64.0							
670.0	65.0					64.2-69.2 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, iron oxide staining, nea vertical fracture 67.0-69.2 ft., trace fossils and pyrite throughout sample		
669.0	66.0							
668.0	67.0	R-10	100% (56%)	FD3		67-69.7 ft Joint, R.D. = 80°, slightly open; surface: slightly rough, undulating, moderately hard; iron oxide staining on fracture faces. Fracture set #F-2.		
667.0	68.0							
666.0	69.0							
665.0	70.0					69.2-74.2 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite, fossil bands 70.0-70.8 ft., pitted at 62.7-62.9 ft.		
664.0	71.0							
663.0	72.0	R-11	100% (54%)	FD4		71.9-72.65 ft Joint, R.D. = 70°, slightly open; surface: slightly rough, planar. Fracture set #F-3.		
662.0	73.0							
661.0	74.0							
660.0	75.0					74.2-79.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, iron oxide staining, slightly weathered at 77.4-77.6 ft, trace fossils and pyrite throughout		
659.0	76.0							
658.0	77.0	R-12	100% (70%)	FD5		76.5-78.2 ft Joint, R.D. = 80°, slightly open; surface: slightly rough, planar; iron oxide staining. Fracture set #F-4.		
657.0	78.0							
656.0	79.0							
655.0		R-13	100% (100%)	FD0				

DATE STARTED: 5/19/10
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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PROJECT NO. 10-4310

COORDINATES

N. 339799.26 ft E. 2405095.47 ft

GROUND SURFACE ELEVATION: 734.74 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
654.0	81.0					79.2-84.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite, fossil bands at 81.6-82.45, 83.55-83.95 ft.		
653.0	82.0	R-13	100% (100%)	FD0				
652.0	83.0							
651.0	84.0							
650.0	85.0					84.2-89.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
649.0	86.0							
648.0	87.0	R-14	100% (100%)	FD0				
647.0	88.0							
646.0	89.0							
645.0	90.0					89.2-94.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, closely to widely fractured, no reaction to HCl, trace fossils and pyrite 89.47-89.61 ft R.D. = 10°, closely spaced; filling: totally healed, moderately thin calcite, fresh, moderately hard; surface: slightly rough, undulating, fresh. Fracture set #F-5.		
644.0	91.0							
643.0	92.0	R-15	100% (100%)	FD1		91.6-98.4 ft Joint, R.D. = 10°, very widely spaced, slightly open; surface: smooth, planar, moderately hard; iron oxide staining. Fracture set #F-6.		
642.0	93.0							
641.0	94.0							
640.0	95.0					94.2-99.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, trace fossils and pyrite, thin, totally calcite healed, 10° fracture at 96.3 ft.		
639.0	96.0							
638.0	97.0	R-16	100% (94%)	FD1				
637.0	98.0							
636.0	99.0							
635.0		R-17	99% (91%)	FD1				

DATE STARTED: 5/19/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-417

PROJECT NO. 10-4310

COORDINATES

N. 339799.26 ft E. 2405095.47 ft

GROUND SURFACE ELEVATION: 734.74 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
634.0	101.0					99.2-104.2 ft SHALE, moderately hard, fresh, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, trace fossils and pyrite, totally calcite healed fractures with angular shale fragments included 101.8-104.2 ft.		
633.0	102.0	R-17	99% (91%)	FD1				
632.0	103.0					103.3-104.1 ft Joint, R.D. = 25°, closely spaced; surface: smooth, planar, moderately hard. Fracture set #F-7.		
631.0	104.0					---- Bottom of Boring at 104.20 ft.----		

DATE STARTED: 5/19/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
743.0	1.0	S-1	2-4-4 (8) 53%			0.0-1.5 ft Silty sand, (sm), 80% sand, fine to coarse; 15% fines, non plastic, no toughness; 5% gravel, fine, subangular, hard hardness; maximum grain size = 0.1 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, loose	sm	
742.0	2.0					1.5-2.5 ft Interval not sampled		
741.0	3.0	S-2	4-12-20 (32) 93%			2.5-4.0 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 20% gravel, fine to medium, subangular, medium hardness; 20% fines, non plastic, no toughness; maximum grain size = 0.5 inches, moderate brown (5YR 4/4) and grayish orange pink (5YR 7/2), dry, no HCl reaction, dense	sm	
740.0	4.0					4.0-5.0 ft Interval not sampled		
739.0	5.0	S-3	50/3 100%			5.0-5.25 ft Silty sand with gravel, (sm), 70% sand, fine to coarse; 15% gravel, fine, subangular, medium hardness; 15% fines, non plastic, no toughness; maximum grain size = 0.1 inches, moderate yellowish brown (10YR 5/4) and light gray (N7), dry, no HCl reaction, very dense	sm	
738.0	6.0					5.25-7.5 ft Interval not sampled		
736.0	8.0	S-4	13-31-14 (45) 100%			7.5-9.0 ft Silty sand, (sm), 70% sand, fine to coarse; 20% fines, non plastic, no toughness; 10% gravel, fine to medium, subangular, medium hardness; maximum grain size = 0.25 inches, moderate brown (5YR 4/4) and moderate orange pink (10R 7/4), moist, no HCl reaction, dense	sm	
735.0	9.0					9.0-10.0 ft Interval not sampled		
734.0	10.0	S-5	13-12-16 (28) 100%			10.0-11.5 ft Silty sand, (sm), 60% sand, fine to medium; 30% fines, non plastic, no toughness; 10% gravel, fine to medium, subangular, medium hardness; maximum grain size = 0.5 inches, moderate brown (5YR 3/4) with light brown (5YR 5/6), moist, no HCl reaction, medium dense	sm	
733.0	11.0					11.5-12.5 ft Interval not sampled		11.5 ft. Switch to casing advancer
732.0	12.0					12.5-14.0 ft Clayey sand, (sc), 70% sand; 20% fines, low plasticity, low toughness; 10% gravel, fine, subangular, medium hardness; maximum grain size = 0.1 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), moist, no HCl reaction, dense, few fine gravl size shale (N3) fragments	sc	
731.0	13.0	S-6	10-14-19 (33) 100%			14.0-15.0 ft Interval not sampled		
730.0	14.0					15.0-16.5 ft Poorly graded sand with clay and gravel, (sp-sc), 50% sand, fine to coarse; 40% gravel, fine to medium, subangular, medium hardness; 10% fines, low plasticity, low toughness; maximum grain size = 1.0 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), dry, no HCl reaction, dense, few medium size gravel shale (N3) fragments	sp-sc	
729.0	15.0	S-7	13-16-20 (36) 100%			16.5-17.5 ft Interval not sampled		
728.0	16.0					17.5-19.0 ft Clayey sand with gravel, (sc), 40% gravel, fine to medium, medium hardness; 40% sand, fine to coarse; 20% fines, medium plasticity, low toughness; maximum grain size = 1.0 inches, dark gray (N3) with yellowish gray (5Y 7/2), moist, very dense	sc	
727.0	17.0					19.0-20.0 ft Interval not sampled		
726.0	18.0	S-8	35-42-50 (92) 100%					
725.0	19.0							

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
723.0	21.0					20.0-24.5 ft SHALE, moderately soft to moderately hard, slightly to moderately weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
722.0	22.0	R-1	94% (0%)	FD7				
721.0	23.0							
720.0	24.0							
719.0	25.0					24.5-29.5 ft SHALE, moderately soft to moderately hard, slightly to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
718.0	26.0							SC-1 25.8-26.2 ft., at 10:30, 5/24/10
717.0	27.0	R-2	84% (0%)	FD8				
716.0	28.0							
715.0	29.0							
714.0	30.0					29.5-34.5 ft SHALE, moderately soft to moderately hard, slightly to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), very closely to closely fractured, no reaction to HCl, iron oxide staining		
713.0	31.0							
712.0	32.0	R-3	100% (0%)	FD7				SC-2 32.1-32.4 ft., at 10:50, 5/24/10
711.0	33.0							
710.0	34.0							
709.0	35.0					34.5-39.5 ft SHALE, moderately soft to moderately hard, slightly to intensely weathered, yellowish gray (5Y 7/2) and dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		
708.0	36.0							
707.0	37.0	R-4	100% (7%)	FD7				
706.0	38.0							
705.0	39.0							
		R-5		FD6				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
703.0	41.0					39.5-44.5 ft SHALE, moderately soft to moderately hard, fresh to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), thinly, closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
702.0	42.0	R-5	94% (67%)	FD6		40.9-43 ft Joint, R.D. = 45°, moderately spaced, slightly open; surface: smooth, planar, moderately hard. Fracture set #F-1.		
701.0	43.0							
700.0	44.0							
699.0	45.0					44.5-49.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
698.0	46.0							
697.0	47.0	R-6	100% (100%)	FD0				
696.0	48.0							
695.0	49.0							SC-3 49.0-49.5 ft., at 13:50, 5/24/10
694.0	50.0					49.5-54.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
693.0	51.0							
692.0	52.0	R-7	100% (100%)	FD0				
691.0	53.0							
690.0	54.0							
689.0	55.0					54.5-59.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		54.5 ft. Reduced water circulation
688.0	56.0					54.5-56.7 ft Joint, R.D. = 70-90°, slightly open; surface: moderately rough, planar, moderately hard; long, linear, near vertical fracture, curves around sample at top. Fracture set #F-2.		
687.0	57.0	R-8	100% (100%)	FD0				
686.0	58.0							
685.0	59.0							
		R-9		FD5				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
683.0	61.0					59.5-64.5 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
682.0	62.0	R-9	100% (49%)	FD5				
681.0	63.0							
680.0	64.0							
679.0	65.0					64.5-69.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
678.0	66.0							
677.0	67.0	R-10	100% (100%)	FD0				
676.0	68.0							
675.0	69.0							
674.0	70.0					69.5-74.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite 69.75-85.5 ft Joint, R.D. = 0-10°, very widely spaced, moderately open; filling: totally healed, very thin calcite, fresh to slightly weathered, moderately hard; surface: smooth, planar, fresh, moderately hard. Fracture set #F-3.		
673.0	71.0							
672.0	72.0	R-11	100% (95%)	FD1				
671.0	73.0							
670.0	74.0							
669.0	75.0					74.5-79.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, fossil bands 74.6-74.6, 77.0-77.4 ft., tace sossils and pyrite throughout sample, very thin, totally calcite healed fracture, horizontal, at 77.6 ft.		
668.0	76.0							
667.0	77.0	R-12	100% (100%)	FD0				
666.0	78.0							
665.0	79.0							
		R-13		FD1				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
663.0	81.0					79.5-84.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, fossil band 84.5-85.0 ft., trace fossils and pyrite throuhout sample		
662.0	82.0	R-13	100% (99%)	FD1				
661.0	83.0							
660.0	84.0							
659.0	85.0					84.5-89.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
658.0	86.0							
657.0	87.0	R-14	100% (100%)	FD0				
656.0	88.0							
655.0	89.0							
654.0	90.0					89.5-94.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, widely to moderately fractured, no reaction to HCl, trace fossils and pyrite, mechanically broken in parts		
653.0	91.0							
652.0	92.0	R-15	100% (96%)	FD1		92.2-95.3 ft Joint, R.D. = 70°, moderately spaced, moderately open; surface: slightly rough, planar, moderately hard. Fracture set #F-4.		
651.0	93.0							
650.0	94.0							
649.0	95.0					94.5-99.5 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite, moderately weathered 98.2-98.6 ft.		
648.0	96.0					95.5-96.5 ft Joint, R.D. = 80-96°, slightly open; surface: stepped, planar, moderately hard. Fracture set #F-5.		
647.0	97.0	R-16	100% (45%)	FD6		96.7-99.5 ft R.D. = 40°, closely spaced, moderately open; surface: stepped, planar, moderately weathered, moderately hard; moderately weathered at 98.2-98.6 ft. Fracture set #F-7.		
646.0	98.0							
645.0	99.0							
		R-17		FD6				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
643.0	101.0					99.5-104.5 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, closely to moderately fractured, no reaction to HCl, iron oxide staining, thick fossil band 102.3-103.3 ft., trace fossils and pyrite throughout sample		
642.0	102.0	R-17	100% (44%)	FD6		100.5-101.7 ft Joint, R.D. = 10°, moderately spaced, slightly open; surface: smooth, planar, moderately hard. Fracture set #F-7.		
641.0	103.0							
640.0	104.0							
639.0	105.0					104.2-104.3 ft Joint, R.D. = 20°; filling: totally healed, moderately thin calcite, fresh, moderately hard; surface: smooth, planar, fresh. Fracture set #F-8.		
638.0	106.0					104.5-109.5 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), massive, closely to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
637.0	107.0	R-18	100% (80%)	FD6		105.1-109.5 ft R.D. = 0-10°, closely to moderately spaced, slightly open; surface: smooth, planar, moderately hard. Fracture set #F-9.		
636.0	108.0							
635.0	109.0							
634.0	110.0					109.5-114.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, iron oxide staining, few fossils, trace pyrite		
633.0	111.0							
632.0	112.0	R-19	100% (86%)	FD5		111.6-125.1 ft Joint, R.D. = 45°, closely to widely spaced, moderately open; surface: stepped, planar, moderately hard. Fracture set #F-10.		
631.0	113.0							
630.0	114.0							
629.0	115.0					114.5-119.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, iron oxide staining, abundant fossils at 114.5-116.5, 118.5-119.5 ft, trace fossils and pyrite		
628.0	116.0							
627.0	117.0	R-20	100% (95%)	FD2				
626.0	118.0							
625.0	119.0							
		R-21		FD3				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
623.0	121.0					119.5-124.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, moderately to widely fractured, no reaction to HCl, iron oxide staining, abundant fossils 119.5-122.0 ft., trace fossils and pyrite throughout sample		
622.0	122.0	R-21	100% (85%)	FD3				
621.0	123.0							
620.0	124.0							
619.0	125.0					124.5-129.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
618.0	126.0					126-134.5 ft Joint, R.D. = 45°, moderately spaced; filling: totally healed, moderately thin calcite, fresh, moderately hard; surface: slightly rough, planar, fresh; vertical, thin, totally healed with calcite fracture bisects this fracture set, vertical fracture is stepped in appearance 127.4-128.2 ft. Fracture set #F-11.		
617.0	127.0	R-22	100% (99%)	FD1				
616.0	128.0							
615.0	129.0							
614.0	130.0					129.5-134.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very closely to widely fractured, no reaction to HCl, trace fossils and pyrite		
613.0	131.0							
612.0	132.0	R-23	100% (100%)	FD0				
611.0	133.0							
610.0	134.0							
609.0	135.0					134.5-139.5 ft SHALE, moderately hard, fresh, dark gray (N3), very closely to moderately fractured, no reaction to HCl, trace fossils and pyrite, randomly oriented totally calcite healed fracture zone with angular shale inclusions		
608.0	136.0					134.5-140.5 ft Fracture zone, R.D. = 20-70°, closely to moderately spaced; filling: totally healed, moderately thin calcite, fresh, moderately hard; surface: slightly rough, planar, fresh; fracture zone of multiple dip orientations and ranging in thicknes from discontinuous/clean to moderately thin healed fractures, abundant angular shale fragments within gouge. Fracture set #F-12.		
607.0	137.0	R-24	100% (92%)	FD1				
606.0	138.0							
605.0	139.0							
		R-25		FD0				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
603.0	141.0					139.5-144.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very closely to widely fractured, no reaction to HCl, trace fossils and pyrite		
602.0	142.0	R-25	100% (100%)	FD0				
601.0	143.0							
600.0	144.0							
599.0	145.0					144.5-149.5 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely fractured, no reaction to HCl, trace fossils and pyrite		
598.0	146.0							
597.0	147.0	R-26	100% (100%)	FD0				
596.0	148.0							
595.0	149.0							
594.0	150.0					149.2-153.85 ft Joint, R.D. = 20°, very widely spaced; filling: totally healed, moderately thin calcite, fresh, moderately hard; surface: smooth, undulating, fresh; two 40 degree fractures, very closely spaced, clean to very thin, totally calcite healed at 153.3-153.75 ft.. Fracture set #F-13.		
593.0	151.0					149.5-220.6 ft SHALE, moderately hard, fresh, dark gray (N3), massive, extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
592.0	152.0	R-27	100% (100%)	FD0				
591.0	153.0							
590.0	154.0							
589.0	155.0							
588.0	156.0							
587.0	157.0	R-28	100% (100%)	FD0		157.15-158 ft Joint, R.D. = 40°, very closely spaced; filling: totally healed, clean calcite, fresh, moderately hard; surface: smooth, planar, fresh; 10 degree,clean to thin, totally calcite healed fracture at 157.95-158.0. Fracture set #F-14.		
586.0	158.0							
585.0	159.0							
		R-29		FD0				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
583.0	161.0					149.5-220.6 ft SHALE, moderately hard, fresh, dark gray (N3), massive, extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
582.0	162.0	R-29	100% (100%)	FD0				
581.0	163.0							
580.0	164.0							
579.0	165.0					164.6-164.65 ft Joint, R.D. = 15°; filling: totally healed, very thin calcite, fresh, moderately hard; surface: slightly rough, undulating, fresh. Fracture set #F-15.		
578.0	166.0							
577.0	167.0	R-30	100% (100%)	FD0				
576.0	168.0							
575.0	169.0							
574.0	170.0							
573.0	171.0							
572.0	172.0	R-31	100% (100%)	FD0				
571.0	173.0							
570.0	174.0							
569.0	175.0							
568.0	176.0							
567.0	177.0	R-32	100% (100%)	FD0				
566.0	178.0							
565.0	179.0							
		R-33		FD0				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						149.5-220.6 ft SHALE, moderately hard, fresh, dark gray (N3), massive, extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
563.0	181.0							
562.0	182.0	R-33	100% (100%)	FD0				
561.0	183.0							
560.0	184.0							
559.0	185.0							
558.0	186.0							
557.0	187.0	R-34	100% (100%)	FD0				
556.0	188.0							
555.0	189.0							
554.0	190.0							
553.0	191.0							
552.0	192.0	R-35	100% (100%)	FD0				
551.0	193.0							
550.0	194.0							
549.0	195.0							
548.0	196.0							
547.0	197.0	R-36	100% (100%)	FD0				
546.0	198.0							
545.0	199.0							
		R-37		FD0				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						149.5-220.6 ft SHALE, moderately hard, fresh, dark gray (N3), massive, extremely widely fractured, no reaction to HCl, trace fossils and pyrite		
543.0	201.0							
542.0	202.0	R-37	100% (100%)	FD0				
541.0	203.0							
540.0	204.0							
539.0	205.0							
538.0	206.0							
537.0	207.0	R-38	100% (100%)	FD0				
536.0	208.0							
535.0	209.0							
534.0	210.0							
533.0	211.0							
532.0	212.0	R-39	100% (100%)	FD0				
531.0	213.0							
530.0	214.0							
529.0	215.0							
528.0	216.0							
527.0	217.0	R-40	100% (100%)	FD0				
526.0	218.0							
525.0	219.0							
		R-41		FD0				

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-418

PROJECT NO. 10-4310

COORDINATES

N. 339853.39 ft E. 2405203.43 ft

GROUND SURFACE ELEVATION: 744.02 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-41	100% (100%)	FD0		---- Bottom of Boring at 220.60 ft.----		

DATE STARTED: 5/23/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-419

PROJECT NO. 10-4310

COORDINATES

N. 339860.44 ft E. 2405278.15 ft

GROUND SURFACE ELEVATION: 748.14 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
748.0						0.0-0.25 ft Silt with gravel, (ml), 95% fines, non plastic, low dry strength, no dilatancy, no toughness; 5% gravel, fine to medium, subrounded, hard hardness; maximum grain size = 0.5 inches, dusky yellowish brown (10YR 2/2), organic odor, moist, no HCl reaction, with roots	ml	
747.0	1.0	S-1	2-2-5 (7) 80%			0.25-5.1 ft Silt with gravel, (ml), 75% fines, non plastic, medium dry strength, no dilatancy, no toughness; 15% gravel; 10% sand, fine, subangular; maximum grain size = 1.5 inches, moderate brown (5YR 4/4), no odor, moist, no HCl reaction, some roots, with rock fragments, dense to very dense	ml	
746.0	2.0	S-2	8-10-12 (22) 83%					
745.0	3.0	S-3	25-35-27 (62) 80%					
744.0	4.0							
743.0	5.0	S-4	5-22-24 (46) 90%			5.1-6.9 ft Poorly graded sand with gravel, (sp), 80% sand, fine to medium, subrounded, hard hardness; 15% gravel, medium, subangular, flat and elongated, hard hardness; 5% fines, non plastic, no dry strength, no dilatancy, no toughness; maximum grain size = 1.0 inches, moderate brown (5YR 4/4) to moderate brown (5YR 3/4), no odor, moist, no HCl reaction, low plasticity, some rock fragments, little roots	sp	
742.0	6.0	S-5	9-50/5 78%					
741.0	7.0					6.9-7.5 ft Interval not sampled		
740.0	8.0	S-6	16-23-25 (48) 100%			7.5-9.5 ft Silty gravel with sand, (gm), 40% gravel, fine to coarse, angular, elongated, hard hardness; 40% fines, non plastic, no dry strength, no dilatancy, no toughness; 20% sand, fine to medium, subangular; moderate brown (5YR 4/4) to moderate brown (5YR 3/4), no odor, moist, no HCl reaction, with rock fragments, some coal	gm	
739.0	9.0	S-7	13-9-20 (29) 100%			9.5-12.0 ft Sandy silt with gravel, (ml), 60% fines, non plastic, medium dry strength, no dilatancy, low toughness; 25% sand, fine, subangular, hard hardness; 15% gravel, fine to medium, angular, hard hardness; maximum grain size = 1.0 inches, moderate brown (5YR 4/4), no odor, moist, no HCl reaction, some rock fragments, some coal	ml	
738.0	10.0							
737.0	11.0	S-8	11-13-13 (26) 80%					
736.0	12.0	S-9	11-12-50/5 68%			12.0-13.4 ft Clayey sand with gravel, (sc), about 5% cobbles, subangular; 50% sand, fine to coarse, subangular; 30% gravel, fine to coarse, subangular, very hard hardness; 20% fines, high plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches	sc	
735.0	13.0					13.4-13.5 ft Interval not sampled		
734.0	14.0	S-10	21-20-16 (36) 83%			13.5-14.3 ft Well graded sand, (sw), 85% sand, fine to medium, subangular, hard hardness; 10% gravel, medium, angular, flat, hard hardness; 5% fines, non plastic, no dry strength, no dilatancy; maximum grain size = 0.5 inches, dark yellowish brown (10YR 4/2), no odor, wet, no HCl reaction, lensed, some rock fragments	sw	
733.0	15.0	S-11	19-24-34 (58) 40%			14.3-16.5 ft Sandy silt with gravel, (ml), 50% fines, low plasticity, medium dry strength, no dilatancy, low toughness; 30% sand, fine to medium, angular, hard hardness; 20% gravel, fine, angular, hard hardness; moderate brown (5YR 4/4), no odor, moist, no HCl reaction	ml	
732.0	16.0							
731.0	17.0	S-12	5-10-23 (33) 70%			16.5-18.0 ft Silty sand with gravel, (sm), 60% sand; 20% gravel; 20% fines; maximum grain size = 1.5 inches, dusky yellowish brown (10YR 2/2), sandstone boulders	sm	
730.0	18.0	S-13	9-20-33 (53) 67%			18.0-19.8 ft Silty sand with gravel, (sm), 50% sand, fine to coarse, subangular, medium hard hardness; 30% fines, low plasticity, high dry strength, no dilatancy, low toughness; 20% gravel, fine to coarse, angular, elongated, hard hardness; maximum grain size = 1.5 inches, dark yellowish	sm	
729.0	19.0	S-14						

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): B. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-419

PROJECT NO. 10-4310

COORDINATES

N. 339860.44 ft E. 2405278.15 ft

GROUND SURFACE ELEVATION: 748.14 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
728.0						orange (10YR 6/6), no odor, moist, no HCl reaction, with rock fragments		
		S-14	20-23-35 (58) 93%			19.8-23.25 ft SHALE, clayey, soft to very soft, very intensely weathered to decomposed, clay sized particles, dusky yellow (5Y 6/4) with light olive gray (5Y 5/2), no odor, no reaction to HCl, iron oxide staining		
727.0	21.0							
		S-15	10-20-23 (43) 67%					
726.0	22.0							
		S-16	6-45-50/3 72%					
725.0	23.0							
						23.25-23.75 ft Interval not sampled		
724.0	24.0					23.75-28.2 ft SHALE, clayey, moderately soft, very intensely weathered, light olive gray (5Y 5/2) and grayish olive green (5GY 3/2), moderately to thinly bedded, no odor, very closely to closely fractured, no reaction to HCl, no staining		
				FD7				
723.0	25.0	R-1	82% (0%)			23.75-34.25 ft R.D. = 5- -85°, very closely to moderately spaced, neither ends visible, moderately open; filling: not healed, clean iron oxide staining, moderately to very intensely weathered; surface: moderately rough, moderately weathered; very thin to moderately thin clay, very soft.		
722.0	26.0			FD6				
721.0	27.0							
720.0	28.0					28.2-33.2 ft SHALE, clayey, moderately soft to soft, moderately to intensely weathered, light olive (10Y 5/4) and dark gray (N3), thinly to moderately bedded, no odor, closely to moderately fractured, no reaction to HCl, no staining		
		R-2	95% (13%)	FD5				
719.0	29.0							
718.0	30.0							
717.0	31.0							
716.0	32.0							
715.0	33.0					33.2-39.4 ft SHALE, clayey, soft to moderately soft, intensely to very intensely weathered, dusky yellow (5Y 6/4) with dark gray (N3), moderately bedded, no odor, closely fractured, no reaction to HCl, no staining		
		R-3	95% (0%)					
714.0	34.0					34.4-43.75 ft R.D. = 6-81°, very closely to moderately spaced, neither ends visible, moderately open; filling: not healed, clean iron oxide staining, moderately to intensely weathered; surface: rough, moderately weathered; very thin clay, very soft.		
713.0	35.0							
				FD6				
712.0	36.0							
711.0	37.0							
710.0	38.0	R-4	93% (14%)					
709.0	39.0							

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): B. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-419

PROJECT NO. 10-4310

COORDINATES

N. 339860.44 ft E. 2405278.15 ft

GROUND SURFACE ELEVATION: 748.14 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
708.0						39.4-48.25 ft SHALE, clayey, soft to moderately hard, moderately to very intensely weathered, dusky yellow (5Y 6/4) and dark gray (N3), thinly bedded, no odor, closely fractured, no reaction to HCl, no staining		
707.0	41.0	R-4	93% (14%)					
706.0	42.0							
705.0	43.0							
704.0	44.0	R-5	84% (22%)	FD6				
703.0	45.0							
702.0	46.0					45.4-74.4 ft R.D. = 5-88°, very closely to widely spaced, slightly open; filling: not healed, clean iron oxide, fresh to moderately weathered; surface: rough, fresh; very thin clay.		
701.0	47.0							
700.0	48.0							
699.0	49.0	R-6	70% (7%)			48.25-53.4 ft SHALE, moderately hard, slightly weathered, medium dark gray (N4) to dark gray (N3), thinly to moderately bedded, no odor, closely fractured, no staining, with fossiliferous layers		
698.0	50.0							
697.0	51.0			FD5				
696.0	52.0							
695.0	53.0							
694.0	54.0	R-7	98% (78%)			53.4-105.25 ft SHALE, moderately hard, fresh, dark gray (N3), thickly to massive bedded, no odor, widely fractured, no reaction to HCl, no staining, with fossiliferous zones		
693.0	55.0							
692.0	56.0							
691.0	57.0			FD3				
690.0	58.0	R-8	96% (94%)					
689.0	59.0							

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): B. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-419

PROJECT NO. 10-4310

COORDINATES

N. 339860.44 ft E. 2405278.15 ft

GROUND SURFACE ELEVATION: 748.14 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
688.0						53.4-105.25 ft SHALE, moderately hard, fresh, dark gray (N3), thickly to massive bedded, no odor, widely fractured, no reaction to HCl, no staining, with fossiliferous zones		
	61.0	R-8	96% (94%)					
687.0								
	62.0							
686.0								
	63.0							
685.0								
	64.0	R-9	100% (90%)					
684.0								
	65.0							
683.0								
	66.0							
682.0								
	67.0							
681.0								
	68.0							
680.0								
	69.0	R-10	98% (64%)					
679.0								
	70.0			FD3				
678.0								
	71.0							
677.0								
	72.0							
676.0								
	73.0							
675.0								
	74.0	R-11	100% (100%)					
674.0								
	75.0							
673.0								
	76.0					75.5-96.35 ft R.D. = 12-58°, very closely to widely spaced, neither ends visible, moderately open; filling: not healed, clean iron oxide staining, fresh to slightly weathered; surface: smooth, fresh; very thin calcite, fresh, moderately hard.		
672.0								
	77.0							
671.0								
	78.0	R-12	95% (91%)					
670.0								
	79.0							
669.0								

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): B. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-419

PROJECT NO. 10-4310

COORDINATES

N. 339860.44 ft E. 2405278.15 ft

GROUND SURFACE ELEVATION: 748.14 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
668.0						53.4-105.25 ft SHALE, moderately hard, fresh, dark gray (N3), thickly to massive bedded, no odor, widely fractured, no reaction to HCl, no staining, with fossiliferous zones		
	81.0	R-12	95% (91%)					
667.0								
	82.0							
666.0								
	83.0			FD3				
665.0								
	84.0	R-13	98% (94%)					
664.0								
	85.0							
663.0								
	86.0							
662.0								
	87.0							
661.0								
	88.0							
660.0								
	89.0	R-14	47% (33%)					
659.0								
	90.0							
658.0								
	91.0			FD5				
657.0								
	92.0							
656.0								
	93.0							
655.0								
	94.0	R-15	93% (40%)					
654.0								
	95.0							
653.0								
	96.0							
652.0				FD7				
	97.0							
651.0								
	98.0	R-16	89% (48%)					
650.0								
	99.0			FD4				
649.0						99.4-100.2 ft Joint, R.D. = 42-44°, very closely spaced, neither ends visible,		

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): B. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-419

PROJECT NO. 10-4310

COORDINATES

N. 339860.44 ft E. 2405278.15 ft

GROUND SURFACE ELEVATION: 748.14 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
648.0						tight; dry and tight or filled, water flow not possible, filling: totally healed, clean, slightly weathered; surface: slightly rough, slightly weathered. Fracture set #3.		
	101.0	R-16	89% (48%)			53.4-105.25 ft SHALE, moderately hard, fresh, dark gray (N3), thickly to massive bedded, no odor, widely fractured, no reaction to HCl, no staining, with fossiliferous zones		
647.0								
	102.0			FD4		100.3-106.24 ft R.D. = 14-59°, very closely to widely spaced, neither ends visible; filling: not healed, iron oxide staining, slightly to moderately weathered; surface: rough, slightly weathered.		
646.0								
	103.0							
645.0								
	104.0	R-17	76% (39%)					
644.0								
	105.0			FD6				
643.0						105.25-106.2 ft SHALE, moderately hard to moderately soft, moderately weathered, pitted, medium dark gray (N4) and dark greenish gray (5GY 4/1), massive bedded, no odor, closely fractured, weak reaction to HCl, iron oxide staining		
	106.0							
642.0								
	107.0	R-18	100% (91%)	FD4		106.2-108.6 ft SHALE, moderately hard, fresh, dark gray (N3), massive bedded, no odor, moderately fractured, weak reaction to HCl, no staining, with fossiliferous zones		
641.0								
	108.0							
640.0						---- Bottom of Boring at 108.60 ft.----		

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): B. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-420

PROJECT NO. 10-4310

COORDINATES

N. 340403.18 ft E. 2405150.67 ft

GROUND SURFACE ELEVATION: 778.81 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
778.0	1.0	S-1	1-3-4 (7) 60%			0.0-1.5 ft Clayey sand, (sc), 80% sand, fine to medium, subrounded, soft hardness; 15% fines, low plasticity, low toughness; 5% gravel, medium, subangular, elongated, medium hardness; maximum grain size = 0.3 inches, moderate brown (5YR 4/4), moist, medium dense	sc	
777.0	2.0					1.5-2.5 ft Interval not sampled		
776.0	3.0	S-2	6-10-10 (20) 67%			2.5-4.0 ft Poorly graded sand with clay and gravel, (sp-sc), 50% sand, fine to medium, subrounded, soft hardness; 40% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, moderate brown (5YR 4/4), moist, medium dense	sp-sc	
775.0	4.0					4.0-5.0 ft Interval not sampled		
774.0	5.0	S-3	4-4-5 (9) 93%			5.0-6.5 ft Poorly graded sand with clay and gravel, (sp-sc), 50% sand, fine to medium, subrounded, soft hardness; 40% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, moderate brown (5YR 4/4), moist, medium dense	sp-sc	
773.0	6.0							
772.0	7.0					6.5-7.5 ft Interval not sampled		
771.0	8.0	S-4	3-5-10 (15) 67%			7.5-9.0 ft Silty gravel with sand, (gm), 50% gravel, fine to medium, subangular, soft hardness; 30% sand, fine, subangular, soft hardness; 20% fines, low plasticity, low toughness; maximum grain size = 1.0 inches, dusky brown (5YR 2/2), dry, medium dense	gm	
770.0	9.0					9.0-10.0 ft Interval not sampled		
769.0	10.0	S-5	16-31-31 (62) 87%			10.0-11.5 ft Silty gravel with sand, (gm), 55% gravel, fine, subrounded, very soft hardness; 25% sand, fine to medium, very soft hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, pale yellowish brown (10YR 6/2), dry, loose	gm	All particles derived from intensely weathered shale
768.0	11.0							
767.0	12.0					11.5-12.5 ft Interval not sampled		
766.0	13.0	S-6	14-18-50/4 100%			12.5-13.83 ft Silty gravel with sand, (gm), 55% gravel, fine, subrounded, very soft hardness; 25% sand, fine to medium, very soft hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, pale yellowish brown (10YR 6/2), dry, loose	gm	
765.0	14.0					13.83-15.0 ft Interval not sampled		
764.0	15.0	S-7	50 100%			15.0-15.5 ft Silty gravel with sand, (gm), 55% gravel, fine, subrounded, very soft hardness; 25% sand, fine to medium, very soft hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, pale yellowish brown (10YR 6/2), dry, loose	gm	
763.0	16.0					15.5-15.6 ft Interval not sampled		
762.0	17.0	R-1	100% (15%)	FD6		15.6-19.6 ft SHALE, inclined, moderately soft, moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl 15.6-19.6 ft Joint, R.D. = 30°, very closely to moderately spaced; filling: not healed, intensely weathered; surface: slightly rough, intensely weathered; iron oxide staining in the fractures. Fracture set #F-1.		
761.0	18.0							
760.0	19.0							
759.0		R-2				19.6-29.6 ft Joint, R.D. = 38°, closely to moderately spaced; filling: not		

DATE STARTED: 5/5/10
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FIELD GEOLOGIST: Jason Lucey
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DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-420

PROJECT NO. 10-4310

COORDINATES

N. 340403.18 ft E. 2405150.67 ft

GROUND SURFACE ELEVATION: 778.81 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						healed, intensely weathered; surface: slightly rough, intensely weathered; iron oxide staining in the fracture. Fracture set #F-2.		
758.0	21.0							
757.0	22.0	R-2	84% (0%)					
756.0	23.0							
755.0	24.0							
754.0	25.0							
753.0	26.0			FD6		19.6-24.6 ft SHALE, inclined, moderately soft, moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl		
752.0	27.0	R-3	88% (24%)			24.6-29.6 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
751.0	28.0							
750.0	29.0							
749.0	30.0					29.6-34.6 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), very closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
748.0	31.0					29.6-34.6 ft Joint, R.D. = 29°, moderately spaced; filling: not healed, moderately thin clay, intensely weathered, very soft; surface: slightly rough, intensely weathered. Fracture set #F-3.		
747.0	32.0	R-4	86% (0%)					
746.0	33.0							
745.0	34.0							
744.0	35.0					34.6-39.6 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), very closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding angle, quartz crystals in clay filled fracture at 35.5 ft		
743.0	36.0			FD6		34.6-39.6 ft Joint, R.D. = 40°, closely to widely spaced; filling: not healed, moderately thin clay, intensely weathered, very soft; surface: slightly rough, intensely weathered; fractures also contains quartz crystals. Fracture set #F-4.		
742.0	37.0	R-5	92% (0%)			35.8-38.6 ft Joint, R.D. = 88°, very closely to closely spaced; filling: not healed, moderately thin clay, moderately weathered, very soft; surface: slightly rough, moderately weathered; quartz crystals in clay filled the fractures. Fracture set #F-5.		
741.0	38.0							
740.0	39.0							
739.0		R-6				39.6-44.6 ft Joint, R.D. = 88°, very widely spaced; filling: very intensely		

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DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-420

PROJECT NO. 10-4310

COORDINATES

N. 340403.18 ft E. 2405150.67 ft

GROUND SURFACE ELEVATION: 778.81 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
738.0	41.0					weathered; surface: moderately rough, very intensely weathered; very intensely fractured and broken, iron oxide staining throughout. Fracture set #F-6.		
737.0	42.0	R-6	64% (0%)					
736.0	43.0							
735.0	44.0							
734.0	45.0			FD6				
733.0	46.0							
732.0	47.0	R-7	92% (24%)			39.6-44.6 ft SHALE, horizontal, moderately hard, intensely weathered, dark gray (N3) and yellowish gray (5Y 7/2), very closely to closely fractured, no reaction to HCl, iron oxide staining, 10° bedding angle		
731.0	48.0					44.6-49.6 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding plane		
730.0	49.0					44.6-59.6 ft Joint, R.D. = 7°, very closely to moderately spaced; filling: not healed, very thin clay, intensely weathered, very soft; surface: slightly rough, intensely weathered; fracture filling has bedded quartz crystals. Fracture set #F-7.		
729.0	50.0					45.9-48.9 ft Joint, R.D. = 50°, closely spaced; filling: not healed, very thin clay, intensely weathered, very soft; surface: slightly rough, intensely weathered; quartz crystals inbedded in the filling. Fracture set #F-8.		
728.0	51.0							
727.0	52.0	R-8	100% (24%)			49.6-54.6 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and pale yellowish brown (10YR 6/2), moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding plane		
726.0	53.0					49.6-54.6 ft Joint, R.D. = 7°, closely to moderately spaced; filling: not healed, very thin gypsum, slightly weathered, very soft; surface: slightly rough, slightly weathered. Fracture set #F-9.		
725.0	54.0					50.1-54.5 ft Joint, R.D. = 88°, closely to moderately spaced; filling: not healed, very thin clay, slightly weathered, very soft; surface: slightly rough, slightly weathered. Fracture set #F-9.		
724.0	55.0			FD5		54.6-64.6 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and pale yellowish brown (10YR 6/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding plane		
723.0	56.0							
722.0	57.0	R-9	100% (23%)					
721.0	58.0							
720.0	59.0							
719.0								

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DRILLING CO. Terracon

NOTES:

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DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-420

PROJECT NO. 10-4310

COORDINATES

N. 340403.18 ft E. 2405150.67 ft

GROUND SURFACE ELEVATION: 778.81 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
718.0	61.0					54.6-64.6 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3) and pale yellowish brown (10YR 6/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, 10° bedding plane		
717.0	62.0	R-9	100% (23%)	FD5				
716.0	63.0							SC-1, 63.2-64.05 ft., 08:30, 05/07/10
715.0	64.0							
714.0	65.0					64.6-74.6 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to widely fractured, no reaction to HCl, iron oxide staining		
713.0	66.0							
712.0	67.0							
711.0	68.0							
710.0	69.0					68.8-70.1 ft Joint, R.D. = 7°; filling: totally healed, calcite, slightly weathered, moderately soft; surface: slightly weathered. Fracture set #F-11.		
709.0	70.0	R-10	100% (77%)					
708.0	71.0							
707.0	72.0			FD3				
706.0	73.0							
705.0	74.0							
704.0	75.0					74.6-84.6 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), widely to extremely widely fractured, no reaction to HCl, fossillized shell fragments throughout, 10° bedding plane		
703.0	76.0							75.6-84.6 ft. Rock becomes freshly weathered
702.0	77.0	R-11	100% (100%)			76.8-76.9 ft Joint, R.D. = 22°, moderately spaced; filling: not healed, intensely weathered; surface: smooth, planar, intensely weathered; fracture is intensely weathered with iron oxide staining. Fracture set #F-10.		
701.0	78.0							
700.0	79.0							
699.0				FD0				

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698.0	81.0					74.6-84.6 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), widely to extremely widely fractured, no reaction to HCl, fossillized shell fragments throughout, 10° bedding plane		
697.0	82.0	R-11	100% (100%)					
696.0	83.0							
695.0	84.0							
694.0	85.0					84.6-94.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, fossillized shell fragments,10° bedding plane		
693.0	86.0							
692.0	87.0			FD0				
691.0	88.0							
690.0	89.0							
689.0	90.0	R-12	100% (100%)					
688.0	91.0							
687.0	92.0							
686.0	93.0							
685.0	94.0							
684.0	95.0					94.6-104.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, fossillized shell fragments throughout,10° bedding plane		
683.0	96.0							
682.0	97.0			FD0				
681.0	98.0	R-13	100% (100%)					
680.0	99.0							
679.0								

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COORDINATES

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GROUND SURFACE ELEVATION: 778.81 ft

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678.0	101.0					94.6-104.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, fossillized shell fragments throughout,10° bedding plane		
677.0	102.0	R-13	100% (100%)					
676.0	103.0							
675.0	104.0			FD0				
674.0	105.0					104.6-114.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, horizontal calcite laminae throughout, 10° bedding plane		
673.0	106.0							
672.0	107.0							
671.0	108.0							
670.0	109.0							
669.0	110.0	R-14	100% (100%)					
668.0	111.0							
667.0	112.0							
666.0	113.0							
665.0	114.0			FD0				
664.0	115.0					114.6-124.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, fossillized shell fragments throughout, pyrite at 116.5ft., 10° bedding plane		
663.0	116.0							
662.0	117.0	R-15	100% (100%)					
661.0	118.0							
660.0	119.0							
659.0								

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REV 1 Final Boring B-420

PROJECT NO. 10-4310

COORDINATES

N. 340403.18 ft E. 2405150.67 ft

GROUND SURFACE ELEVATION: 778.81 ft

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658.0	121.0					114.6-124.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, fossillized shell fragments throughout, pyrite at 116.5ft., 10° bedding plane		
657.0	122.0	R-15	100% (100%)	FD0				
656.0	123.0							
655.0	124.0							
654.0	125.0					124.6-134.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, fossillized shell fragments throughout,10 ° bedding plane		
653.0	126.0							
652.0	127.0							
651.0	128.0							
650.0	129.0							
649.0	130.0	R-16	100% (100%)	FD0				
648.0	131.0							
647.0	132.0							
646.0	133.0							
645.0	134.0							
644.0	135.0					134.6-144.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10 ° bedding plane		
643.0	136.0							
642.0	137.0	R-17	100% (100%)					
641.0	138.0			FD0				
640.0	139.0							
639.0								

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638.0	141.0					134.6-144.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10 ° bedding plane		
637.0	142.0	R-17	100% (100%)					
636.0	143.0							
635.0	144.0							
634.0	145.0			FD0		144.6-154.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane, few fossilized shells at 145.1 ft		
633.0	146.0							
632.0	147.0							
631.0	148.0							
630.0	149.0							
629.0	150.0	R-18	100% (100%)					
628.0	151.0							
627.0	152.0							
626.0	153.0							
625.0	154.0							
624.0	155.0			FD0		154.6-164.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane, fossiled shells throughout		
623.0	156.0							
622.0	157.0	R-19	100% (100%)					
621.0	158.0							
620.0	159.0							
619.0								

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618.0	161.0					154.6-164.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane, fossiled shells throughout		
617.0	162.0	R-19	100% (100%)	FD0				
616.0	163.0							
615.0	164.0							
614.0	165.0					164.6-174.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane, trace pyrite at 165.1 ft, and a nodule (0.5 inches) of calcite at 165.41 ft		
613.0	166.0							
612.0	167.0							
611.0	168.0							
610.0	169.0							
609.0	170.0	R-20	100% (100%)					
608.0	171.0							
607.0	172.0			FD0				
606.0	173.0							
605.0	174.0							
604.0	175.0					174.6-184.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
603.0	176.0							
602.0	177.0	R-21	100% (100%)					
601.0	178.0							
600.0	179.0							
599.0				FD0				

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COORDINATES

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GROUND SURFACE ELEVATION: 778.81 ft

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598.0	181.0					174.6-184.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
597.0	182.0	R-21	100% (100%)					
596.0	183.0							
595.0	184.0							
594.0	185.0					184.6-194.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
593.0	186.0							SC-2. 186.1-186.85 ft.,13:50, 05/07/10
592.0	187.0			FD0				
591.0	188.0							
590.0	189.0							
589.0	190.0	R-22	100% (100%)					
588.0	191.0							
587.0	192.0							
586.0	193.0							
585.0	194.0							
584.0	195.0					194.6-204.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
583.0	196.0							
582.0	197.0			FD0		196.43-196.47 ft Joint, R.D. = 13°; filling: totally healed, moderately thick calcite, fresh, moderately soft; surface: fresh. Fracture set #F-12.		
581.0	198.0	R-23	100% (100%)					
580.0	199.0							
579.0								

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578.0	201.0					194.6-204.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
577.0	202.0	R-23	100% (100%)					
576.0	203.0					202.99-203 ft Joint, R.D. = 13°; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-13.		
575.0	204.0			FD0				
574.0	205.0					204.6-214.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
573.0	206.0							
572.0	207.0							
571.0	208.0							
570.0	209.0							
569.0	210.0	R-24	100% (100%)					
568.0	211.0							
567.0	212.0							
566.0	213.0							
565.0	214.0			FD0				
564.0	215.0					214.6-224.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
563.0	216.0							
562.0	217.0							
561.0	218.0	R-25	100% (100%)					
560.0	219.0							
559.0								

DATE STARTED: 5/5/10
DATE FINISHED: 5/7/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-420

PROJECT NO. 10-4310

COORDINATES

N. 340403.18 ft E. 2405150.67 ft

GROUND SURFACE ELEVATION: 778.81 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
558.0	221.0					214.6-224.6 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
557.0	222.0	R-25	100% (100%)	FD0				
556.0	223.0							
555.0	224.0					---- Bottom of Boring at 224.60 ft.----		

DATE STARTED: 5/5/10
DATE FINISHED: 5/7/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-421

PROJECT NO. 10-4310

COORDINATES

N. 340410.50 ft E. 2405228.92 ft

GROUND SURFACE ELEVATION: 783.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
783.0	1.0	S-1	1-4-6 (10) 93%		0.0-0.35 ft Well graded sand with clay, (sw-sc), 90% sand, fine to coarse, subangular, hard hardness; 10% fines, non plastic, no dry strength, no dilatancy, no toughness; 0% gravel; dark yellowish orange (10YR 6/6) and dark gray (N3), dry, no HCl reaction, medium stiff	sw-sc cl-ml	
782.0	2.0	S-2	6-11-17 (28) 73%		0.35-0.5 ft Lean clay with sand/silt with sand, (cl-ml), 80% fines, low plasticity, no dry strength, no dilatancy, low toughness; 10% gravel, fine to medium, subangular; 10% sand, fine; dark yellowish brown (10YR 4/2), dry, no HCl reaction, medium stiff, with organics	gm	
781.0	3.0						
780.0	4.0	S-3	4-8-12 (20) 93%		0.5-1.5 ft Silty gravel, (gm), 50% gravel, fine to coarse, subangular, hard hardness; 40% fines, low plasticity, no dry strength, no dilatancy, low toughness; 10% sand, fine to coarse, subangular, hard hardness; moderate yellowish brown (10YR 5/4), moist, no HCl reaction, loose	gm	
779.0	5.0	S-4	11-13-10 (23) 7%		1.5-3.0 ft Silty gravel, (gm), 50% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 40% gravel, fine to coarse, subangular, hard hardness; 10% sand, fine to coarse, subangular, hard hardness; moderate yellowish brown (10YR 5/4), moist, no HCl reaction, medium dense	ml/mh	
778.0	6.0						
777.0	7.0	S-5	6-6-5 (11) 47%		3.0-4.5 ft Silty gravel, (gm), 50% fines, high plasticity, low toughness; 40% gravel, fine to coarse, subangular, hard hardness; 10% sand, fine to coarse, subangular, hard hardness; moderate yellowish brown (10YR 5/4), moist, no HCl reaction, medium dense, trace roots		
776.0	8.0	S-6	3-3-4 (7) 100%		4.5-6.0 ft Silt with sand/elastic silt with sand, (ml/mh), 80% fines, high plasticity, low toughness; 10% gravel, fine, subangular, hard hardness; 10% sand, fine, subangular, hard hardness; moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very stiff		
775.0	9.0						
774.0	10.0	S-7	5-9-11 (20) 80%		6.0-14.3 ft SHALE, very soft to hard, decomposed, moderate yellowish brown (10YR 5/4) with medium dark gray (N4), no reaction to HCl, dry to moist, iron oxide staining, thin layers of clay/silt with low toughness and low plasticity		
773.0	11.0	S-8	7-8-17 (25) 67%				
772.0	12.0						
771.0	13.0	S-9	8-18-45 (63) 93%				
770.0	14.0	S-10	40-50/4 38%				
769.0	15.0	S-11	50/5		14.3-15.0 ft Interval not sampled		
768.0	16.0				15.0-15.4 ft SHALE, very soft to hard, decomposed, moderate yellowish brown (10YR 5/4) with medium dark gray (N4), no reaction to HCl, dry to moist, iron oxide staining, thin layers of clay/silt with low toughness and low plasticity		
767.0	17.0	R -1	100% (25%)	FD6	15.4-23.2 ft SHALE, soft to moderately hard, intensely weathered, dark yellowish brown (10YR 4/2) with medium dark gray (N4), very closely to moderately fractured, no reaction to HCl, iron oxide staining 15.6-23.7 ft R.D. = 31-36°, very closely to moderately spaced; surface: rough, planar, intensely weathered; iron oxide staining. 16.6-23 ft R.D. = 52-56°, very closely to moderately spaced; surface: rough, planar, intensely weathered; iron oxide staining.		
766.0	18.0						
765.0	19.0						
764.0		R -2			19.1-19.6 ft R.D. = 62°, closely spaced; surface: rough, planar; iron oxide staining.		

DATE STARTED: 5/4/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-421

PROJECT NO. 10-4310

COORDINATES

N. 340410.50 ft E. 2405228.92 ft

GROUND SURFACE ELEVATION: 783.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
763.0	21.0					15.4-23.2 ft SHALE, soft to moderately hard, intensely weathered, dark yellowish brown (10YR 4/2) with medium dark gray (N4), very closely to moderately fractured, no reaction to HCl, iron oxide staining		SC-1, 19.8-20.35ft, 5/4/10 1300
762.0	22.0	R -2	100% (30%)			22.1-22.75 ft R.D. = 10°, moderately spaced; surface: rough, planar, intensely weathered; iron oxide staining.		
761.0	23.0					23.2-31.6 ft SHALE, soft to moderately hard, moderately weathered, medium dark gray (N4) with dark yellowish brown (10YR 4/2), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
760.0	24.0					23.8-31.7 ft R.D. = 52-56°, very closely to moderately spaced; surface: rough, planar; iron oxide staining.		
759.0	25.0			FD6				
758.0	26.0							
757.0	27.0	R -3	92% (10%)					
756.0	28.0							
755.0	29.0							
754.0	30.0					30.3-30.4 ft R.D. = 32°; surface: rough, planar.		
753.0	31.0							
752.0	32.0	R -4	83% (29%)			31.6-33.1 ft SHALE, soft to moderately hard, intensely weathered, dark yellowish brown (10YR 4/2) with medium dark gray (N4), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
751.0	33.0					31.9-36.1 ft R.D. = 10°, moderately to widely spaced; surface: smooth, planar.		
750.0	34.0					33.1-43.7 ft SHALE, very soft to moderately hard, intensely to very intensely weathered, moderate brown (5YR 4/4) with medium gray (N5), very closely to closely fractured, no reaction to HCl, iron oxide staining		
749.0	35.0			FD6		34.4-34.8 ft R.D. = 75°; filling: very thin clay; surface: smooth, planar.		
748.0	36.0					34.8-44.4 ft R.D. = 52-56°, very closely to widely spaced; surface: rough, planar.		
747.0	37.0	R -5	88% (42%)			36.5-37.5 ft R.D. = 32-36°; surface: rough, planar; iron oxide staining.		
746.0	38.0					37.85-38.25 ft R.D. = 70°; filling: moderately thin clay, slightly weathered; surface: slightly weathered; moderately thin quartz crystals.		
745.0	39.0							
744.0		R -6		FD8		39.4-44.4 ft Bedding plane separation, R.D. = 10°, very closely to closely		

DATE STARTED: 5/4/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-421

PROJECT NO. 10-4310

COORDINATES

N. 340410.50 ft E. 2405228.92 ft

GROUND SURFACE ELEVATION: 783.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						spaced; surface: rough, planar; iron oxide staining.		
743.0	41.0							
742.0	42.0	R -6	96% (0%)	FD8				
741.0	43.0					33.1-43.7 ft SHALE, very soft to moderately hard, intensely to very intensely weathered, moderate brown (5YR 4/4) with medium gray (N5), very closely to closely fractured, no reaction to HCl, iron oxide staining		
740.0	44.0					43.7-49.2 ft SHALE, moderately hard, moderately to slightly weathered, medium dark gray (N4) with dark yellowish brown (10YR 4/2), very closely to moderately fractured, no reaction to HCl, iron oxide staining 44.7-47.8 ft Bedding plane separation, R.D. = 10°, very closely to moderately spaced; surface: smooth, planar; trace clay along few beddding planes. 45.2-46.1 ft R.D. = 36°, moderately spaced; filling: partly healed, moderately thin quartz, slightly weathered; surface: rough, planar, slightly weathered; only one of fractures in the interval contains quartz crystals.		
739.0	45.0							
738.0	46.0							
737.0	47.0	R -7	100% (18%)					
736.0	48.0					47.8-49.2 ft R.D. = 82°, closely spaced; surface: rough, planar, slightly weathered.		
735.0	49.0							
734.0	50.0					49.2-59.4 ft SHALE, moderately hard to hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining 49.2-59.1 ft Bedding plane separation, R.D. = 10°; surface: smooth, planar, slightly weathered; iron oxide staining. 50.2-57.4 ft R.D. = 36°; surface: rough, planar, slightly weathered.		
733.0	51.0							
732.0	52.0	R -8	100% (44%)	FD6				
731.0	53.0							
730.0	54.0							
729.0	55.0							
728.0	56.0					55.4-58.4 ft R.D. = 56°, moderately to widely spaced; surface: rough, planar, slightly weathered; iron oxide staining.		
727.0	57.0	R -9	100% (60%)					
726.0	58.0							
725.0	59.0							
724.0		R -10		FD5		59.5-70 ft Bedding plane separation, R.D. = 10°, very closely to widely		

DATE STARTED: 5/4/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-421

PROJECT NO. 10-4310

COORDINATES

N. 340410.50 ft E. 2405228.92 ft

GROUND SURFACE ELEVATION: 783.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						spaced; filling: totally healed, calcite, slightly weathered; surface: smooth, planar, slightly to slightly weathered; most are defined by calcite laminae, few show no calcite with iron oxide staining.		
723.0	61.0							
722.0	62.0	R -10	100% (54%)					
721.0	63.0							
720.0	64.0			FD5				
719.0	65.0							
718.0	66.0							
717.0	67.0	R -11	100% (62%)					
716.0	68.0							
715.0	69.0			FD6				
714.0	70.0					59.6-60.1 ft R.D. = 36°, moderately spaced; surface: rough, planar, slightly weathered; iron oxide staining.		
713.0	71.0					59.4-70.0 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, zone from 68.1-70.0 ft. shows moderately to slightly weathered zones, presents quartz crystals		
712.0	72.0	R -12	100% (74%)	FD4		62.3-65.8 ft R.D. = 85°, widely spaced; surface: rough, planar, slightly weathered; iron oxide staining.		
711.0	73.0					63.2-63.8 ft R.D. = 75°; surface: rough, planar, slightly weathered; iron oxide staining.		
710.0	74.0					65.2-74 ft R.D. = 56°, widely to very widely spaced; surface: rough, planar.		
709.0	75.0					70.0-74.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to very widely fractured, no reaction to HCl, trace calcite and pyrite replaced shells		
708.0	76.0					72.9-72.91 ft Bedding plane separation, R.D. = 10°; surface: smooth, planar.		
707.0	77.0	R -13	100% (100%)	FD1		74.4-89.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely to very widely fractured, weak reaction to HCl, increase in HCl reaction with depth, calcite replaced shell casts, pyrite replacing calcite (secondary)		SC-2, 74.95-75.6ft, 5/5/10 1415
706.0	78.0					77.9-78.6 ft R.D. = 56°; surface: rough, planar.		
705.0	79.0							
704.0		R -14		FD0				

DATE STARTED: 5/4/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-421

PROJECT NO. 10-4310

COORDINATES

N. 340410.50 ft E. 2405228.92 ft

GROUND SURFACE ELEVATION: 783.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
703.0	81.0					74.4-89.4 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely to very widely fractured, weak reaction to HCl, increase in HCl reaction with depth, calcite replaced shell casts, pyrite replacing calcite (secondary)		
702.0	82.0	R -14	100% (100%)					
701.0	83.0							
700.0	84.0							
699.0	85.0			FD0				
698.0	86.0							
697.0	87.0	R -15	100% (100%)					
696.0	88.0					87.3-90.9 ft Bedding plane separation, R.D. = 10°, closely spaced; filling: totally healed, moderately thin calcite and pyrite, fresh; surface: fresh.		
695.0	89.0							
694.0	90.0					89.4-95.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely to very widely fractured, weak reaction to HCl, increase in HCl reaction with depth, calcite replaced shell casts, pyrite replacing calcite (secondary)		
693.0	91.0							
692.0	92.0	R -16	100% (100%)	FD1				
691.0	93.0					92.2-92.4 ft R.D. = 56°; filling: partly healed, very thin calcite, fresh; surface: rough, planar, fresh.		
690.0	94.0							
689.0	95.0							
688.0	96.0					95.5-100.7 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, weak reaction to HCl, trace calcite replaced shell casts and pyrite replacing calcite (secondary)		
687.0	97.0	R -17	100% (100%)	FD0				
686.0	98.0							
685.0	99.0							
684.0		R -18		FD1				

DATE STARTED: 5/4/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-421

PROJECT NO. 10-4310

COORDINATES

N. 340410.50 ft E. 2405228.92 ft

GROUND SURFACE ELEVATION: 783.85 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
683.0		R -18	100% (100%)	FD1		99.85-101.15 ft R.D. = 56°; surface: rough, planar. ---- Bottom of Boring at 100.70 ft.----		

DATE STARTED: 5/4/10
DATE FINISHED: 5/5/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-422

PROJECT NO. 10-4310

COORDINATES

N. 339721.35 ft E. 2405472.52 ft

GROUND SURFACE ELEVATION: 724.95 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
724.0	1.0	S-1	2-4-4 (8) 60%		0.0-1.5 ft Silty sand, (sm), 60% sand, fine; 30% fines, medium plasticity, low toughness; 10% gravel, fine to medium, subangular, elongated, hard hardness; maximum grain size = 0.005 inches, moderate brown (5YR 4/4), dry, loose, homogeneous, fines are silty clay	sm	
723.0	2.0				1.5-2.5 ft Interval not sampled		
722.0	3.0	S-2	14-18-24 (42) 100%		2.5-4.0 ft Silty sand, (sm), 60% sand, fine to medium; 30% fines, medium plasticity, low toughness; 10% gravel, fine to coarse, subangular, flat and elongated, hard hardness; maximum grain size = 0.08 inches, pale brown (5YR 5/2), moist, dense, homogeneous, fines are silty clay, moderate brown (5 YR 4/4)	sm	
721.0	4.0				4.0-5.0 ft Interval not sampled		
720.0	5.0	S-3	17-26-21 (47) 87%		5.0-6.5 ft Poorly graded sand with silt and gravel, (sp-sm), 50% sand, fine to coarse; 40% gravel, fine to medium, subangular, flat and elongated, hard hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, moderate brown (5YR 4/4) and pale red (10R 6/2), dry, dense	sp-sm	
719.0	6.0						
718.0	7.0				6.5-7.5 ft Interval not sampled		
717.0	8.0	S-4	11-17-25 (42) 100%		7.5-9.0 ft SILTY, CLAYEY GRAVEL WITH SAND, (GC-GM), 49% gravel, fine to coarse, subangular, flat and elongated, hard hardness; 33% sand, fine to coarse; 18% fines, low plasticity, low toughness; maximum grain size = 1.0 inches, light brown (5YR 5/6) and yellowish gray (5Y 7/2), dry, dense	GC-GM	
716.0	9.0				9.0-10.0 ft Interval not sampled		
715.0	10.0	ST-1	93%		10.0-11.5 ft ST-1		10.0-11.5 ft. ST-1, 5000 psi, sample too far down in sampler to describe
714.0	11.0						
713.0	12.0	S-5	10-10-13 (23) 87%		11.5-13.0 ft SILTY, CLAYEY GRAVEL WITH SAND, (GC-GM), 49% gravel, fine to coarse, subangular, flat and elongated, hard hardness; 33% sand, fine to coarse; 18% fines, low plasticity, low toughness; maximum grain size = 1.0 inches, medium gray (N5), dry, dense	GC-GM	
712.0	13.0				13.0-15.0 ft Interval not sampled		Decomposed shale starts at 12.9 ft.
711.0	14.0						
710.0	15.0	S-6	50/5 100%		15.0-15.4 ft Well graded sand, (sw), 70% sand, fine to medium; 20% fines, medium plasticity, low toughness; 10% gravel, fine to medium, subangular, flat and elongated, hard hardness; maximum grain size = 0.08 inches, medium gray (N5) and light brown (5YR 5/6), dry, strong HCl reaction, fines are silty clay, moderate brown (5YR 4/4) and medium brown (5YR 5/6)	sw	
709.0	16.0				15.4-16.0 ft Interval not sampled		
708.0	17.0						
707.0	18.0	R-1	100% (90%)	FD3	16.0-20.5 ft SHALE, moderately hard, intensely weathered, grayish blue (5PB 5/2), moderately fractured, no reaction to HCl, dry, shell fossil at 18.5 ft 16.4-20.5 ft Fracture zone, R.D. = 70°, closely to moderately spaced, both ends visible, slightly open; dry, tight or filled, no flow, filling: not healed, very thin calcite, slightly weathered, moderately hard; surface: rough, slightly weathered. Fracture set #F-1.		
706.0	19.0						

DATE STARTED: 4/8/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-422

PROJECT NO. 10-4310

COORDINATES

N. 339721.35 ft E. 2405472.52 ft

GROUND SURFACE ELEVATION: 724.95 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-1						
704.0	21.0					20.5-30.5 ft SHALE, moderately hard, fresh, grayish blue (5PB 5/2), closely to moderately fractured, no reaction to HCl, iron oxide staining		
						20.5-20.7 ft Joint, R.D. = 70°, closely to moderately spaced, one end visible, slightly open; dry, filling: very thin, slightly weathered, moderately hard; surface: slightly rough, slightly weathered. Fracture set #F-2.		
703.0	22.0							
702.0	23.0	R-2	100% (88%)					
701.0	24.0							
700.0	25.0			FD3				
699.0	26.0					26-29.35 ft Joint, R.D. = 70°, closely to moderately spaced, both ends visible, slightly open; dry, filling: moderately thin, slightly weathered, moderately hard; surface: slightly rough, undulating, slightly weathered. Fracture set #F-3.		
698.0	27.0							
697.0	28.0	R-3	95% (87%)					
696.0	29.0							
695.0	30.0							
694.0	31.0					30.5-35.5 ft SHALE, moderately hard, fresh, grayish black (N2), closely to widely fractured, no reaction to HCl, iron oxide staining		
693.0	32.0			FD3				
692.0	33.0	R-4	100% (86%)					
691.0	34.0							
690.0	35.0					34.8-35.2 ft Joint, R.D. = 37°, closely to moderately spaced, both ends visible, slightly open; dry but shows evidence of flow, filling: not healed, moderately thin clay, slightly weathered, soft; surface: slightly rough, undulating, slightly weathered. Fracture set #F-4.		
689.0	36.0							SC-1, 35.5-37.0 ft, 15:45, 4/8/10
688.0	37.0					35.5-40.5 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl		
687.0	38.0	R-5	99% (99%)	FD1				
686.0	39.0							

DATE STARTED: 4/8/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-422

PROJECT NO. 10-4310

COORDINATES
N. 339721.35 ft E. 2405472.52 ft
GROUND SURFACE ELEVATION: 724.95 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-5						
684.0	41.0			FD1		40.5-50.5 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, iron oxide staining, trace fossils		
683.0	42.0							
682.0	43.0	R-6	96% (96%)					
681.0	44.0							
680.0	45.0							
679.0	46.0							
678.0	47.0							
677.0	48.0	R-7	100% (95%)					
676.0	49.0							
675.0	50.0							
674.0	51.0			FD0		50.5-55.5 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl		
673.0	52.0							
672.0	53.0	R-8	100% (100%)					
671.0	54.0							
670.0	55.0							
669.0	56.0					55.5-65.5 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, trace fossils		
668.0	57.0							
667.0	58.0	R-9	100% (100%)					
666.0	59.0							

DATE STARTED: 4/8/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-422

PROJECT NO. 10-4310

COORDINATES

N. 339721.35 ft E. 2405472.52 ft

GROUND SURFACE ELEVATION: 724.95 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-9				55.5-65.5 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, trace fossils		
664.0	61.0							
663.0	62.0							
662.0	63.0	R-10	100% (100%)	FD0				
661.0	64.0							
660.0	65.0							
659.0	66.0					65.5-70.5 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, trace fossils, iron oxide in the fracture		
658.0	67.0					66.25-66.26 ft Joint, R.D. = 5°, moderately spaced, one end visible, moderately open; dry, filling: not healed, moderately thin, moderately weathered, moderately hard; surface: slightly rough, undulating, moderately weathered; iron oxide staining in fracture, pitted. Fracture set #F-5.		
657.0	68.0	R-11	98% (97%)	FD1				
656.0	69.0							
655.0	70.0							
654.0	71.0					70.5-75.5 ft SHALE, moderately hard, fresh, pitted, typical diameter: 0.01 in. max size: 0.02 in., grayish black (N2), very widely fractured, no reaction to HCl		
653.0	72.0							
652.0	73.0	R-12	100% (100%)					
651.0	74.0							
650.0	75.0			FD0				
649.0	76.0					75.5-90.5 ft SHALE, moderately hard, fresh, grayish black (N2), extremely widely fractured, no reaction to HCl		
648.0	77.0							
647.0	78.0	R-13	100% (100%)					
646.0	79.0							

DATE STARTED: 4/8/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-422

PROJECT NO. 10-4310

COORDINATES

N. 339721.35 ft E. 2405472.52 ft

GROUND SURFACE ELEVATION: 724.95 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-13				75.5-90.5 ft SHALE, moderately hard, fresh, grayish black (N2), extremely widely fractured, no reaction to HCl		
644.0	81.0							
643.0	82.0							
642.0	83.0	R-14	100% (100%)					
641.0	84.0							
640.0	85.0			FD0				
639.0	86.0							
638.0	87.0							
637.0	88.0	R-15	100% (100%)					
636.0	89.0							
635.0	90.0							
634.0	91.0					90.5-95.5 ft SHALE, moderately hard, fresh, grayish black (N2), widely to moderately fractured, no reaction to HCl		
633.0	92.0							
632.0	93.0	R-16	98% (88%)	FD5		92.4-92.75 ft Joint, R.D. = 74°, widely spaced, slightly open; dry, filling: very thin, moderately weathered, moderately hard; surface: stepped, undulating, moderately weathered; iron oxide in fracture. Fracture set #F-6. 92.9-93 ft Joint, R.D. = 60°, tight; dry, filling: totally healed, clean calcite, fresh, moderately soft; surface: fresh. Fracture set #F-7.		
631.0	94.0					94.2-94.85 ft Joint, R.D. = 60.0°, very closely spaced, tight; dry, filling: totally healed, clean, fresh, moderately soft; surface: fresh. Fracture set #F-8.		
630.0	95.0							
629.0	96.0					95.5-100.5 ft SHALE, moderately hard, fresh, medium light gray (N6) and grayish black (N2), very closely to widely fractured, no reaction to HCl 95.5- ft Fracture, R.D. = 75°, closely spaced; dry, filling: totally healed, calcite.		
628.0	97.0							
627.0	98.0	R-17	100% (100%)	FD0		97.6-100.5 ft Joint, R.D. = 70°, very closely spaced, tight; dry, filling: totally healed, very thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-9.		
626.0	99.0							

DATE STARTED: 4/8/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-422

PROJECT NO. 10-4310

COORDINATES

N. 339721.35 ft E. 2405472.52 ft

GROUND SURFACE ELEVATION: 724.95 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-17		FD0		100.5-105.5 ft SHALE, moderately hard, fresh, grayish black (N2), very closely to widely fractured, iron oxide staining, mechanically broken calcite filled healed fracture at 102.3 ft.		
624.0	101.0							
623.0	102.0							
622.0	103.0	R-18	94% (94%)			103.24-104.64 ft Joint, R.D. = 53°, widely spaced, slightly open; filling: clean, moderately weathered, moderately hard; surface: smooth, planar, moderately weathered; iron oxide staining. Fracture set #F-10.		
621.0	104.0							
620.0	105.0							
				FD3		105.5-110.5 ft SHALE, moderately hard, fresh, grayish black (N2), closely to widely fractured, no reaction to HCl, iron oxide staining		
619.0	106.0					105.9-106 ft Joint, R.D. = 30°, widely spaced, tight; filling: very thin, moderately weathered, moderately hard; surface: smooth, planar, moderately weathered. Fracture set #F-11.		
618.0	107.0					106.95-107.2 ft Joint, R.D. = 60°, closely spaced; filling: totally healed, moderately thin calcite, fresh; surface: smooth, planar, fresh. Fracture set #F-12.		
617.0	108.0	R-19	100% (100%)			107.4-109.8 ft Joint, R.D. = 0°, widely spaced; filling: moderately healed, moderately thin calcite, fresh, moderately soft; surface: slightly rough, undulating, fresh; healed fractures mechanically broken apart. Fracture set #F-13.		
616.0	109.0							
615.0	110.0							
614.0	111.0					110.5-115.5 ft SHALE, moderately hard, fresh, grayish black (N2), widely to extremely widely fractured, no reaction to HCl		
613.0	112.0							
612.0	113.0	R-20	100% (100%)					
611.0	114.0							
610.0	115.0			FD0				
609.0	116.0					115.5-120.2 ft SHALE, moderately hard, fresh, grayish black (N2), closely to moderately fractured, no reaction to HCl, calcite infilling from 119.6 to 119.8 ft.		
608.0	117.0							
607.0	118.0	R-21	100% (100%)			117.3-117.57 ft Joint, R.D. = 65°, closely spaced, slightly open; filling: moderately weathered; surface: smooth, planar, moderately weathered; iron oxide staining. Fracture set #F-14.		
606.0	119.0					118.07-118.29 ft Joint, R.D. = 7°, closely spaced; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-15.		

DATE STARTED: 4/8/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-422

PROJECT NO. 10-4310

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	COORDINATES N. 339721.35 ft E. 2405472.52 ft GROUND SURFACE ELEVATION: 724.95 ft DESCRIPTION	USCS SYMBOL	REMARKS
604.9						---- Bottom of Boring at 120.20 ft.----		

DATE STARTED: 4/8/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
723.0	1.0	S-1	2-3-4 (7) 53%		0.0-0.1 ft Organic soil, (ol/oh), 95% fines, non plastic, no dry strength, no dilatancy, no toughness; 5% sand, fine; dusky yellowish brown (10YR 2/2), organic odor, moist, no HCl reaction, medium stiff, with roots, with organics	ol/oh	
					0.1-1.5 ft Silt, (ml), 95% fines, non plastic, no toughness; 5% sand, fine; dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2), moist, no HCl reaction, medium stiff, trace roots, trace clay	ml	
722.0	2.0	S-2	16-30-32 (62) 100%		1.5-3.0 ft Silty gravel, (gm), 50% gravel, coarse, subangular, hard hardness; 50% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, dusky yellowish brown (10YR 2/2) and, moist, no HCl reaction, very dense	gm	
721.0	3.0	S-3	2-6-24 (30) 27%		3.0-4.5 ft Gravelly silt, (ml), 70% fines, low plasticity, no dry strength, no dilatancy, low toughness; 30% gravel, fine to coarse, subangular, medium hardness; maximum grain size = 1.0 inches, blackish red (5R 2/2) and moderate brown (5YR 4/4), dry, weak HCl reaction, medium dense, trace clay, mottled with pinkish gray (5YR 8/2) and grayish black (N2), saprolite fragments of glacial derived cobbles	ml	After S-2, switch to casing advancer
720.0	4.0	S-4	17-31-30 (61) 67%		4.5-6.0 ft Silty gravel, (gm), 70% gravel, medium to coarse, subangular, hard hardness; 30% fines, high plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, grayish red (10R 4/2), moist, no HCl reaction, trace clay, mottled with grayish black (N2)	gm	
719.0	5.0	S-5	30-50/2 31%		6.0-6.65 ft Well graded gravel, (gw), 98% gravel, fine to coarse; 2% fines, non plastic, no dry strength, no dilatancy, no toughness; maximum grain size = 1.0 inches, medium dark gray (N4), dry, very dense	gw	
718.0	6.0				6.65-7.0 ft Interval not sampled		
717.0	7.0	S-6	15-16-19 (35) 80%		7.0-8.5 ft CLAYEY SAND WITH GRAVEL, (SC), 44% sand, fine to coarse; 35% gravel, fine to coarse, subangular, hard hardness; 21% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, moderate brown (5YR 3/4), moist, no HCl reaction, hard	SC	
716.0	8.0	S-7	13-15-13 (28) 73%		8.5-10.0 ft CLAYEY SAND WITH GRAVEL, (SC), 44% sand, fine to coarse; 35% gravel, fine to coarse, subangular, hard hardness; 21% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2) with pale brown (5YR 5/2), moist, no HCl reaction, very stiff	SC	
715.0	9.0	S-8	5-10-39 (49) 87%		10.0-11.5 ft CLAYEY SAND WITH GRAVEL, (SC), 44% sand, fine to coarse; 35% gravel, fine to coarse, subangular, hard hardness; 21% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2) and pale brown (5YR 5/2), organic odor, moist, no HCl reaction, hard, trace fine sand pockets	SC	
714.0	10.0	S-9	50/3 100%		11.5-11.75 ft SHALE, moderately hard, medium dark gray (N4), no reaction to HCl, moist, weathered bedrock with pockets of silt from above		
713.0	11.0				11.75-13.2 ft Interval not sampled		
712.0	12.0						
711.0	13.0						Casing set at 13.2 ft.
710.0	14.0						
709.0	15.0						
708.0	16.0	R -1	75% (27%)	FD5	13.2-18.7 ft SHALE, moderately hard to hard, fresh to slightly weathered, medium dark gray (N4), moderately to closely fractured, weak reaction to HCl, iron oxide staining, fractures have iron oxide staining		
707.0	17.0				13.2-29 ft R.D. = 31-36°; filling: iron oxide staining, slightly weathered; surface: rough, planar, slightly weathered. Fracture set #1.		
706.0	18.0				15.3-33 ft R.D. = 61-65°; filling: fresh to slightly weathered; surface: rough, planar, fresh. Fracture set #2.		
705.0	19.0				18.7-19.6 ft Interval not sampled		
		R -2					

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
703.0	21.0			FD5		19.7-24.0 ft SHALE, moderately hard to hard, fresh to slightly weathered, medium dark gray (N4) to dark gray (N3), closely to moderately fractured, weak reaction to HCl, iron oxide staining, fractures have iron oxide staining with trace material of from above, few show trace calcite filling on fracture face		
702.0	22.0	R -2	97% (37%)					
701.0	23.0			FD5				
700.0	24.0					24.0-29.0 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), very closely to moderately fractured, weak reaction to HCl, iron oxide staining, fractures have iron oxide staining with trace material from above, trace pyrite, trace calcite replaced shell casts		
699.0	25.0							
698.0	26.0			FD7				
697.0	27.0	R -3	96% (21%)					
696.0	28.0			FD5				
695.0	29.0					29.0-34.0 ft SHALE, moderately hard to hard, fresh to slightly weathered, medium dark gray (N4), moderately to widely fractured, weak reaction to HCl, iron oxide staining, fractures have iron oxide staining with others showing calcite lining, trace pyrite, trace calcite replaced shell casts, HCl reaction very weak		Top of competent rock at 29.0 ft
694.0	30.0							
693.0	31.0	R -4	100% (84%)					
692.0	32.0			FD3				
691.0	33.0							
690.0	34.0	R -5	100% (0%)			34.0-34.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very closely fractured, weak reaction to HCl, no staining, HCl reaction very weak compared to rock at start of coring, trace shell casts		
689.0	35.0	R -6	67% (0%)			34.5-35.2 ft No sample recovered		34.5-35.2 ft. no recovery due to issues with coring bit-inner barrel coupling
688.0	36.0					35.2-35.8 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very closely fractured, no reaction to HCl, no staining		35.8 ft. no water circulation
687.0	37.0	R -7	84% (78%)	FD3		35.2- ft R.D. = 61°, open; filling: fresh; surface: rough, planar, fresh. Fracture set #1.		
686.0	38.0					35.8-39.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely fractured, no reaction to HCl, no staining, weak reaction to HCl from 36.7 to 39.0 ft., trace pyrite, calcite replaced shell casts, some calcite shells show replacement by pyrite, crinoid stem pieces		
685.0	39.0	R -8	100% (96%)			35.8- ft R.D. = 56°, open; filling: fresh; surface: rough, undulating, fresh. Fracture set #2.		

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
683.0	41.0					39.0-44.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely fractured, weak reaction to HCl, iron oxide staining, trace pyrite increasing in percentage, calcite replaced shell casts, some calcite shells show secondary replacement by pyrite, 39.5-40.5 ft. crinoid stem pieces and fossil hash		
682.0	42.0	R -8	100% (96%)	FD3		40.5- ft R.D. = 37°; filling: iron oxide staining, slightly weathered; surface: rough, planar, slightly weathered. Fracture set #3.		
681.0	43.0							
680.0	44.0					44.0-48.8 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to closely fractured, weak reaction to HCl, iron oxide staining, trace oily sheen on rock surface,trace pyrite, calcite replaced shell casts, some calcite shells show secondary replacement by pyrite, crinoid stems, Turritela sp. casts, becomes slightly weathered at 47.2 ft		
679.0	45.0			FD1				
678.0	46.0	R -9	96% (69%)					
677.0	47.0			FD6		47.2- ft R.D. = 36°, very closely spaced, open; filling is damp but no free water present, filling: very thin iron oxide staining, slightly weathered; surface: rough, planar, slightly weathered.		47.0 ft. no water ciculation
676.0	48.0					47.3- ft R.D. = 56°, very closely spaced; filling: very thin iron oxide staining, slightly weathered; surface: rough, planar, slightly weathered.		
675.0	49.0					48.8-53.8 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to widely fractured, weak reaction to HCl, no staining, trace oily sheen on rock surface, calcite replaced shell cast, crinoid stems, Turritela sp. casts, calcite along bedding at 10°		
674.0	50.0							
673.0	51.0	R -10	97% (88%)	FD2				
672.0	52.0							
671.0	53.0							
670.0	54.0					53.8-59.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, weak reaction to HCl, no staining, calcite replaced shell cast, crinoid stems and other fossil shell hash		
669.0	55.0							
668.0	56.0	R -11	100% (92%)	FD0				
667.0	57.0							
666.0	58.0							
665.0	59.0							
		R -12	94% (84%)	FD4		59-64.5 ft R.D. = 56-58°, closely to moderately spaced, open; filling: fresh; surface: rough, planar, fresh.		

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
663.0	61.0					59.0-69.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to very widely fractured, weak reaction to HCl, no staining, calcite replaced shell cast, crinoid stems, Turritela sp. and other shell hash, no reaction to HCl starting at 65.8 ft, trace pyrite starting at approximately 66 ft		
662.0	62.0	R -12	94% (84%)					
661.0	63.0							
660.0	64.0							
659.0	65.0							64.55-65.8 ft. SC-1, 16:20, 4/10/10
658.0	66.0	R -13	99% (90%)	FD4				
657.0	67.0							
656.0	68.0							
655.0	69.0					69.0-74.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3) and medium dark gray (N4), moderately to widely fractured, no reaction to HCl, no staining, trace calcite replaced shell cast, brachiopod shells show secondary recrystilization by pyrite, trace pyrite, sporadic zones show oily sheen when wet		
654.0	70.0							
653.0	71.0	R -14	100% (89%)			69-79 ft R.D. = 54-56°, widely to very closely spaced, moderately open; filling is damp but no free water present, filling: very thin clay; surface: rough, planar.		
652.0	72.0							
651.0	73.0							
650.0	74.0					74.0-89.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to closely fractured, no reaction to HCl, no staining, 74.0-84.0 ft. oily sheen present when wet		
649.0	75.0							
648.0	76.0	R -15	100% (82%)	FD4				
647.0	77.0							
646.0	78.0							
645.0	79.0							
		R -16	100% (100%)	FD0				

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
643.0	81.0					74.0-89.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to closely fractured, no reaction to HCl, no staining, 74.0-84.0 ft. oily sheen present when wet		
642.0	82.0	R -16	100% (100%)					
641.0	83.0							
640.0	84.0			FD0				
639.0	85.0							
638.0	86.0	R -17	98% (94%)					
637.0	87.0							
636.0	88.0							
635.0	89.0					89.0-99.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to moderately fractured, no reaction to HCl, no staining, 92.3 ft. trace fossils replaced by calcite with secondary replacement by pyrite		
634.0	90.0							
633.0	91.0	R -18	100% (93%)					
632.0	92.0							
631.0	93.0							
630.0	94.0			FD1		94.1-94.4 ft R.D. = 56°; surface: rough, planar; trace to moderate amounts of iron oxide staining.		
629.0	95.0							
628.0	96.0	R -19	100% (98%)					
627.0	97.0							
626.0	98.0							
625.0	99.0							
		R -20	100% (84%)	FD4				

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
623.0	101.0					99.0-104.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, no staining, 99.35-94.0 ft., calcite laminae of 10° shows offset of less than 1/2 inch, calcite crystals present		
622.0	102.0	R -20	100% (84%)			100-104 ft R.D. = 56-58°, moderately spaced; surface: rough, planar; trace iron oxide staining on fracture face. 101.8-102.3 ft R.D. = 64°, tight; filling: totally healed, very thin calcite, moderately hard.		
621.0	103.0							
620.0	104.0			FD4		104.0-109.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl, iron oxide staining, trace fossil hash replaced with calcite		104.7 ft. iron oxide staining along bedding at ten °
619.0	105.0					104-109 ft R.D. = 54-56°, very closely to widely spaced; surface: rough, planar; moderate to heavy iron oxide staining.		
618.0	106.0	R -21	99% (78%)					
617.0	107.0							
616.0	108.0							
615.0	109.0					109.0-114.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl		
614.0	110.0							
613.0	111.0	R -22	100% (100%)					
612.0	112.0							
611.0	113.0							
610.0	114.0			FD1		114.0-124.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3) and medium dark gray (N4), very widely to closely fractured, no reaction to HCl, trace sporadic calcite replaced fossil hash, trace pyrite, 123.7 ft bedding at 10° shows moderate iron oxide staining		
609.0	115.0							
608.0	116.0	R -23	100% (100%)					
607.0	117.0							117.45-118.0 ft., SC-2, 11:50, 4/11/10
606.0	118.0							
605.0	119.0	R -24	96% (82%)					

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
603.0	121.0			FD1		114.0-124.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3) and medium dark gray (N4), very widely to closely fractured, no reaction to HCl, trace sporadic calcite replaced fossil hash, trace pyrite, 123.7 ft bedding at 10° shows moderate iron oxide staining		
602.0	122.0	R -24	96% (82%)					
601.0	123.0					122.5- ft R.D. = 56°; filling: not healed, clean, fresh; surface: rough, planar, fresh.		
600.0	124.0			FD5		124.0-129.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining, moderate amounts of pyrite on fracture faces and throughout, quartz filled fracture with pyrite, 125.45 ft bedding at 10° shows moderate iron oxide staining		
599.0	125.0					124.6-124.9 ft R.D. = 55-56°, very closely spaced, slightly open; surface: rough, planar; trace pyrite.		
598.0	126.0	R -25	100% (18%)			125.45-128.2 ft R.D. = 60-64°, moderately wide; filling: totally healed, moderately thick quartz, fresh, hard; surface: rough, planar, fresh; well formed quartz cystal, thickness ranges from lamination up to 0.5 in, pyrite cubes.		
597.0	127.0			FD7				
596.0	128.0							
595.0	129.0					129.0-134.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to moderately fractured, no reaction to HCl, pyrite on fracture faces and trace throughout, 129.9 ft bedding at 10 degrees shows iron oxide staining		
594.0	130.0					129-136 ft R.D. = 36°, very closely to widely spaced, slightly open; filling: moderately healed, thin calcite, fresh; surface: moderately rough, undulating, fresh; zone contains healed and non healed fractures.		
593.0	131.0	R -26	98% (50%)					
592.0	132.0					132-132.3 ft R.D. = 56°, very closely spaced, slightly open; filling: moderately healed, calcite; surface: rough, planar; fracture pair cut across bedding, pyrite and calcopyrite.		
591.0	133.0							
590.0	134.0			FD4		134.0-139.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to moderately fractured, no reaction to HCl		
589.0	135.0					134.4-134.95 ft R.D. = 56°, open; filling: partly healed, thin calcite, fresh; surface: rough, planar, fresh; fracture goes from being open to healed with calcite approximately 5 mm thick.		
588.0	136.0	R -27	100% (80%)					
587.0	137.0							
586.0	138.0							
585.0	139.0							
		R -28	100% (95%)					

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
583.0	141.0					139.0-144.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to moderately fractured, no reaction to HCl, trace pyrite replaced shell hash, calcite along bedding, also appears to run 36-90 degrees within the calcite zone which contains angular pieces of shale (breccia) (1-5mm), secondary replacement by pyrite		
582.0	142.0	R -28	100% (95%)					
581.0	143.0					142.5-159 ft R.D. = 31-36°, closely to widely spaced; filling: moderately healed, very thin calcite; surface: rough, planar; trace pyrite, healed and unhealed fractures all fresh.		
580.0	144.0			FD4		144.0-149.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to moderately fractured, no reaction to HCl, trace pyrite, calcite along bedding, also runs a variety of other directions due to crystal growth, pits throughout with calcite crystals		
579.0	145.0							
578.0	146.0	R -29	100% (91%)					
577.0	147.0							
576.0	148.0							
575.0	149.0					149.0-158.1 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl, trace pyrite in fractures, calcite healed fractures, vertical and 31° fractures filled with quartz (fresh, white (N9)) brecciated rock in fractures		
574.0	150.0					149.4-150.1 ft R.D. = 90°; surface: rough, planar; trace pyrite.		
573.0	151.0			FD6				
572.0	152.0	R -30	100% (55%)					
571.0	153.0							
570.0	154.0							
569.0	155.0			FD4				
568.0	156.0							
567.0	157.0	R -31	100% (86%)					
566.0	158.0			FD5		158.1-158.3 ft Decomposed shale seam containing clay, dark gray(N3), moist, soft		
565.0	159.0					158.3-169.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, calcite healed fractures, calcite along cleavage plane, brecciated zone from calcite crystal growth		
		R -32	100% (94%)	FD4				

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
563.0	161.0					159-189 ft R.D. = 56-58°, moderately to widely spaced, tight; filling: totally healed, moderately thin calcite, fresh; surface: rough, planar, fresh; some of fractures not healed with calcite, trace pyrite.		
562.0	162.0	R -32	100% (94%)			158.3-169.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, calcite healed fractures, calcite along cleavage plane, brecciated zone from calcite crystal growth		
561.0	163.0							
560.0	164.0			FD4				
559.0	165.0							
558.0	166.0	R -33	100% (96%)					
557.0	167.0							
556.0	168.0							
555.0	169.0					169.0-174.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, calcite healed fractures, calcite along cleavage plane, brecciated zone from calcite crystal growth along bedding and vertically		
554.0	170.0					169-189 ft R.D. = 36°, closely to moderately spaced; filling: moderately healed, very thin calcite, fresh; surface: fresh; trace pyrite, some fresh not healed fractures.		
553.0	171.0	R -34	95% (92%)	FD1				
552.0	172.0							
551.0	173.0							
550.0	174.0					174.0-189.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to closely fractured, no reaction to HCl, calcite healed fractures, calcite along cleavage and bedding , calcite healed brecciated area from calcite crystal growth, fully formed crystals		
549.0	175.0					174-184 ft R.D. = 90°, closely to widely spaced; filling: totally healed, very thin, fresh; surface: fresh; trace pyrite.		
548.0	176.0	R -35	100% (92%)	FD4				
547.0	177.0							
546.0	178.0							SC-3, 178.1-179.0 ft., 08:45, 4/12/10
545.0	179.0	R -36	95% (52%)	FD6				

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
543.0	181.0					174.0-189.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to closely fractured, no reaction to HCl, calcite healed fractures, calcite along cleavage and bedding , calcite healed brecciated area from calcite crystal growth, fully formed crystals		
542.0	182.0	R -36	95% (52%)					
541.0	183.0			FD6				
540.0	184.0							
539.0	185.0							
538.0	186.0	R -37	100% (84%)					
537.0	187.0			FD0				
536.0	188.0			FD7				
535.0	189.0					189.0-199.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to closely fractured, no reaction to HCl, calcite and trace pyrite along bedding (10 degrees), trace pyrite,199.0ft calcite and trace pyrite along bedding shows displacement less than 1/8 in		
534.0	190.0							
533.0	191.0	R-38	99% (98%)					
532.0	192.0			FD1				
531.0	193.0							
530.0	194.0							
529.0	195.0							
528.0	196.0			FD6		195.6-197 ft R.D. = 56°, closely spaced; filling: very thin pyrite; surface: rough, planar.		
527.0	197.0	R -39	100% (73%)					
526.0	198.0			FD2				
525.0	199.0							
		R -40	84% (81%)					

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
523.0	201.0					199.0-214.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to very closely fractured, no reaction to HCl, trace to moderate pyrite localized to fractures at 56 degrees		
522.0	202.0	R -40	84% (81%)	FD2		200.2-214 ft R.D. = 56°, very closely to closely spaced; filling: partly healed, very thin pyrite; surface: rough, planar; some contain pyrite while others not healed but tight.		
521.0	203.0							
520.0	204.0							
519.0	205.0							
518.0	206.0	R -41	60% (11%)					
517.0	207.0			FD6				
516.0	208.0							
515.0	209.0							
514.0	210.0							
513.0	211.0	R -42	100% (60%)			211.4-212.3 ft R.D. = 75°, both ends visible; filling: totally healed, very thin calcite, fresh; surface: fresh.		
512.0	212.0			FD4				
511.0	213.0							
510.0	214.0					214.0-223.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to closely fractured, no reaction to HCl, trace pyrite		
509.0	215.0					214-223 ft R.D. = 56°, very closely to widely spaced, slightly open; filling: partly healed, very thin calcite and pyrite, fresh; surface: rough, planar, fresh; some fractures open due to drilling methods, fracture faces contain pyrite (fresh) others show a combination of calcite or pyrite.		
508.0	216.0	R -43	100% (40%)					
507.0	217.0			FD6				
506.0	218.0							
505.0	219.0	R -44	100% (84%)					SC-4, 219.0-219.7 ft., 13:20, 4/12/10
				FD3				

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-423

PROJECT NO. 10-4310

COORDINATES

N. 339727.11 ft E. 2405533.75 ft

GROUND SURFACE ELEVATION: 724.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
503.0	221.0	R -44	100% (84%)	FD3		214.0-223.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to closely fractured, no reaction to HCl, trace pyrite		
502.0	222.0							
	223.0					---- Bottom of Boring at 223.00 ft.----		

DATE STARTED: 4/8/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 3-7/8" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES: 4-1.4" I.D. Hollow Stem Auger used from 0.0-3.0 ft.

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)

HAMMER ID: 931

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
745.0	0.0	S-1	3-5-2 (7) 77%			0.0-0.45 ft Organic soil, (ol/oh), 90% fines, non plastic, low dry strength, no dilatancy; 5% gravel, fine, subangular, flat, medium hardness; 5% sand, fine, subrounded; grayish brown (5YR 3/2), organic odor, moist, no HCl reaction, with roots, some rock fragments	ol/oh	
744.0	1.0					1.5-2.5 ft Interval not sampled		
743.0	2.0	S-2	3-4-16 (20) 73%			2.5-4.0 ft Sandy silt, (ml), 80% fines, low plasticity, high dry strength, no dilatancy, low toughness; 15% sand, fine, subrounded, hard hardness; 5% gravel, fine to medium, rounded, elongated, hard hardness; maximum grain size = 1.0 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, some roots, some rock fragments	ml	
742.0	3.0					4.0-5.0 ft Interval not sampled		
741.0	4.0	S-3	7-8-15 (23) 100%			5.0-6.5 ft Sandy silt, (ml), 80% fines, low plasticity, high dry strength, no dilatancy, low toughness; 15% sand, fine, subrounded, hard hardness; 5% gravel, fine to medium, rounded, elongated, hard hardness; maximum grain size = 1.0 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, some roots, some rock fragments	ml	
740.0	5.0					6.5-7.5 ft Interval not sampled		
739.0	6.0	S-4	11-44-33 (77) 87%			7.5-9.0 ft Sandy silt, (ml), 80% fines, low plasticity, high dry strength, no dilatancy, low toughness; 15% sand, fine, subrounded, hard hardness; 5% gravel, fine to medium, rounded, elongated, hard hardness; maximum grain size = 1.0 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, some roots, some rock fragments	ml	
738.0	7.0					9.0-10.0 ft Interval not sampled		
737.0	8.0	S-5	10-15-13 (28) 83%			10.0-11.5 ft Sandy silt with gravel, (ml), 50% fines, low plasticity, low dry strength, no dilatancy, low toughness; 35% sand, fine to medium, subrounded, elongated, hard hardness; 15% gravel, fine to coarse, subrounded, flat, hard hardness; maximum grain size = 0.5 inches, moderate brown (5YR 3/4), moist, no HCl reaction, strong cementation, some coal, some rock fragments, 10.0 -10.15 ft. contains fragments of a cross-bedded sandstone boulder	ml	
736.0	9.0					11.5-12.5 ft Interval not sampled		
735.0	10.0	S-6	7-20-10 (30) 67%			12.5-14.0 ft Silty sand with gravel, (sm), 70% sand, fine, subrounded, hard hardness; 15% gravel, fine to coarse, subangular, flat, medium hardness; 15% fines, low plasticity, low dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, grayish orange pink (5YR 7/2), moist, no HCl reaction, trace coal, some rock fragments	sm	
734.0	11.0					14.0-15.0 ft Interval not sampled		
733.0	12.0							
732.0	13.0							
731.0	14.0							

DATE STARTED: 5/21/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
730.0	16.0	S-7	2-8-10 (18) 47%		15.0-16.5 ft Silty sand with gravel, (sm), 70% sand, fine, subrounded, hard hardness; 15% gravel, fine to coarse, subangular, flat, medium hardness; 15% fines, medium plasticity, low dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, grayish orange pink (5YR 7/2), moist, no HCl reaction, trace coal, some rock fragments	sm	
729.0	17.0				16.5-17.5 ft Interval not sampled		
728.0	18.0	S-8	6-8-7 (15) 80%		17.5-18.0 ft Silty sand with gravel, (sm), 70% sand, fine, subrounded, hard hardness; 15% gravel, fine to coarse, subangular, flat, medium hardness; 15% fines, medium plasticity, low dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, grayish orange pink (5YR 7/2), moist, no HCl reaction, trace coal, some rock fragments	sm	
727.0	19.0				18.0-19.0 ft SHALE, clayey, very soft to moderately soft, decomposed, clay sized particles, dark yellowish orange (10YR 6/6) and greenish black (5G 2/1), no reaction to HCl, iron oxide staining		
726.0	20.0				19.0-20.0 ft Interval not sampled		
725.0	21.0	S-9	8-9-8 (17) 90%		20.0-21.5 ft SHALE, clayey, very soft to moderately soft, decomposed, clay sized particles, dark yellowish orange (10YR 6/6) and greenish black (5G 2/1), no reaction to HCl, iron oxide staining		
724.0	22.0				21.5-22.5 ft Interval not sampled		
723.0	23.0	S-10	27-50/5 100%		22.5-23.4 ft SHALE, clayey, very soft to moderately soft, decomposed, clay sized particles, dark yellowish orange (10YR 6/6) and greenish black (5G 2/1), no reaction to HCl, iron oxide staining		
722.0	24.0				23.4-30.9 ft SHALE, clayey, moderately soft to soft, very intensely weathered to decomposed, dark yellowish orange (10YR 6/6) and medium dark gray (N4), thinly to moderately bedded, R.D. = 15°, closely to very closely fractured, no reaction to HCl, iron oxide staining		
721.0	25.0				23.4-44.7 ft R.D. = 9°-30°, very closely to moderately spaced; filling: not healed, very thin clay to iron oxidation staining; surface, slightly rough to rough, slightly to very intensely weathered. Fracture set #1.		
720.0	26.0						
719.0	27.0	R-1	70% (26%)	FD8			
718.0	28.0						
717.0	29.0				28.15-30.5 ft Joint, R.D. = 61°, very closely spaced, neither ends visible, tight; filling: not healed, very thin iron oxide; surface: rough.		
716.0		R-2					

DATE STARTED: 5/21/10
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FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
715.0				FD8				
	31.0					30.9-44.7 ft SHALE, clayey, moderately soft to moderately hard, slightly to moderately weathered, clay sized particles, medium dark gray (N4), moderately bedded, closely to moderately fractured, no reaction to HCl, iron oxide staining		
714.0						31.2- ft Joint, R.D. = 75°, moderately spaced, neither ends visible, moderately open; filling: not healed, very thin clay; surface: rough.		
	32.0	R-2	95% (26%)					
713.0				FD6		32.55- ft Joint, R.D. = 86°, moderately spaced, both ends visible, slightly open; filling: not healed, very thin iron oxide; surface: slightly rough.		
	33.0							
712.0						33.7-34.5 ft Joint, R.D. = 84°, moderately spaced, neither ends visible, slightly open; filling: not healed, clean; surface: moderately rough.		
	34.0							
711.0								
	35.0							
710.0								
	36.0							
709.0								
	37.0	R-3	100% (57%)					
708.0				FD5				
	38.0							
707.0								
	39.0							
706.0								
	40.0							
705.0								
	41.0							
704.0				FD6				
	42.0	R-4	98% (45%)					
703.0								
	43.0							
702.0				FD5				
	44.0							
701.0		R-5						

DATE STARTED: 5/21/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
700.0	46.0					44.7-84.7 ft SHALE, clayey, moderately soft to soft, slightly to intensely weathered, medium dark gray (N4) and dark greenish gray (5G 4/1), moderately to thickly bedded, very closely to moderately fractured, iron oxide staining 45-72.4 ft R.D. = 13°-89°, closely to moderately spaced; slightly to moderately open; filling: not healed, very thin iron oxidation staining, very thin clay, slightly weathered; surface: slightly to moderately rough, fresh to moderately weathered. Fracture set #2.		
699.0	47.0							
698.0	48.0							
697.0	49.0							
696.0	50.0	R-5	28% (11%)	FD6				
695.0	51.0							
694.0	52.0							
693.0	53.0							
692.0	54.0							
691.0	55.0							
690.0	56.0							
689.0	57.0	R-6	84% (35%)	FD5				
688.0	58.0							
687.0	59.0							
686.0		R-7						

DATE STARTED: 5/21/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
685.0						44.7-84.7 ft SHALE, clayey, moderately soft to soft, slightly to intensely weathered, medium dark gray (N4) and dark greenish gray (5G 4/1), moderately to thickly bedded, very closely to moderately fractured, iron oxide staining		
	61.0							
684.0								
	62.0							
683.0		R-7	100% (42%)	FD5				
	63.0							
682.0								
	64.0							
681.0								
	65.0							
680.0								
	66.0							
679.0								
	67.0	R-8	97% (15%)					
678.0								
	68.0							
677.0				FD7				
	69.0							
676.0								
	70.0							
675.0								
	71.0							
674.0								
	72.0	R-9	98% (24%)					
673.0								
	73.0			FD5		72.95-90.7 ft R.D. = 13°-65°, very closely to moderately spaced, slightly open; filling: not healed to partly healed, clean, very thin iron oxide staining, very thin clay; surface: smooth to moderately rough, slightly weathered to moderately weathered. Fracture set #3.		
672.0								
	74.0			FD7				
671.0		R-10						

DATE STARTED: 5/21/10
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CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
670.0	76.0					44.7-84.7 ft SHALE, clayey, moderately soft to soft, slightly to intensely weathered, medium dark gray (N4) and dark greenish gray (5G 4/1), moderately to thickly bedded, very closely to moderately fractured, iron oxide staining		
669.0	77.0							
668.0		R-10	85% (0%)					
667.0	78.0							
666.0	79.0							
665.0	80.0			FD7				
664.0	81.0							
663.0	82.0	R-11	80% (7%)					
662.0	83.0							
661.0	84.0							
660.0	85.0					84.7-104.7 ft SHALE, moderately hard to moderately soft, slightly weathered to fresh, medium dark gray (N4) and dark gray (N3), moderately to very thickly bedded, moderately to widely fractured, weak reaction to HCl, no staining		
659.0	86.0							
658.0	87.0	R-12	99% (27%)					
657.0	88.0			FD5				
656.0	89.0							
		R-13						

DATE STARTED: 5/21/10
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
655.0	90.0					84.7-104.7 ft SHALE, moderately hard to moderately soft, slightly weathered to fresh, medium dark gray (N4) and dark gray (N3), moderately to very thickly bedded, moderately to widely fractured, weak reaction to HCl, no staining		
654.0	91.0			FD5				
	92.0	R-13	100% (71%)			91.7-108.4 ft R.D. = 45°-64°, moderately to widely spaced; slightly open; filling: not healed to partly healed, clean, very thin iron oxidation, very thin calcite, fresh to slightly weathered; surface: slightly rough to moderately rough, fresh to slightly weathered. Fracture set #4.		
653.0	93.0							
652.0	94.0							
651.0	95.0							
650.0	96.0							
649.0	97.0	R-14	97% (75%)					
648.0	98.0							
647.0	99.0			FD4				
646.0	100.0							
645.0	101.0							
644.0	102.0	R-15	100% (84%)					
643.0	103.0							
642.0	104.0							
641.0		R-16						

DATE STARTED: 5/21/10
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FIELD GEOLOGIST: Adam Meyer
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
640.0				FD4		104.7-110.55 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), thickly to massive bedded, moderately to widely fractured, no reaction to HCl, no staining, with fossiliferous intervals and a closely spaced zone		
	106.0							
639.0								
	107.0							
638.0		R-16	95% (50%)	FD7				
	108.0							
637.0								
	109.0							
636.0								
	110.0					109.7-123.4 ft R.D. = 12°-58°, closely to moderately spaced, neither ends visible; tight to slightly open; filling: not healed to moderately healed, clean, very thin to thin calcite, very thin and moderately thin clay, very thin iron oxide staining, fresh to slightly weathered; surface: rough to slightly rough, fresh to slightly weathered. Fracture set #5.		
635.0						110.55-110.75 ft Fat clay, (ch), 100% fines, medium plasticity, slow dilatancy; medium light gray (N6)	ch	
	111.0					110.75-119.7 ft SHALE, moderately hard to moderately soft, fresh, dark gray (N3), very thickly to massive bedded, moderately fractured, no staining		
634.0								
	112.0							
633.0		R-17	98% (77%)					
	113.0							
632.0				FD5				
	114.0							
631.0								
	115.0							
630.0								
	116.0							
629.0								
	117.0							
628.0		R-18	90% (46%)					
	118.0							
627.0								
	119.0							
626.0				FD4				
		R-19						

DATE STARTED: 5/21/10
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
625.0	120.0					119.7-202.8 ft SHALE, moderately hard to moderately soft, fresh to slightly weathered, dark gray (N3) and medium dark gray (N4), thickly to massive bedded, moderately to widely fractured, no staining, with fossiliferous intervals		
624.0	121.0							
623.0	122.0	R-19	100% (73%)	FD4				
622.0	123.0							
621.0	124.0			FD7		124.2-139.4 ft R.D. = 20°-67°, very closely to widely spaced, neither ends visible; tight to open; filling: not healed to moderately healed, very thin to moderately thin clay, clean, very thin to moderately thin calcite, very thin iron oxide staining, fresh to slightly weathered; moderately to slightly rough, fresh to slightly weathered. Fracture set #6.		
620.0	125.0							
619.0	126.0							
618.0	127.0	R-20	99% (97%)					
617.0	128.0							
616.0	129.0							
615.0	130.0			FD3				
614.0	131.0							
613.0	132.0	R-21	100% (93%)					
612.0	133.0							
611.0	134.0							
		R-22						

DATE STARTED: 5/21/10
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FIELD GEOLOGIST: Adam Meyer
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
610.0	136.0					119.7-202.8 ft SHALE, moderately hard to moderately soft, fresh to slightly weathered, dark gray (N3) and medium dark gray (N4), thickly to massive bedded, moderately to widely fractured, no staining, with fossiliferous intervals		
609.0	137.0							
608.0		R-22	100% (60%)					
607.0	138.0							
606.0	139.0							
605.0	140.0							
604.0	141.0							
603.0	142.0	R-23	92% (89%)	FD3		141.4-154.9 ft R.D. = 10°-54°, very closely to widely spaced, neither ends visible; tight to slightly open; filling: not healed to moderately healed, clean, thin to moderately thin calcite, thin clay, fresh, moderately hard; surface: smooth to moderately rough, fresh. Fracture set #7.		
602.0	143.0							
601.0	144.0							
600.0	145.0							
599.0	146.0							
598.0	147.0	R-24	98% (97%)					
597.0	148.0							
596.0	149.0							
		R-25						

DATE STARTED: 5/21/10
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FIELD GEOLOGIST: Adam Meyer
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
595.0	150.0					119.7-202.8 ft SHALE, moderately hard to moderately soft, fresh to slightly weathered, dark gray (N3) and medium dark gray (N4), thickly to massive bedded, moderately to widely fractured, no staining, with fossiliferous intervals		
594.0	151.0							
	152.0							
593.0		R-25	100% (94%)	FD3				
592.0	153.0							
	154.0							
591.0								
	155.0							
590.0				FD6		155.25-156.1 ft Joint, R.D. = 66°, neither ends visible, slightly open; filling: partly healed, thin calcite, fresh, moderately hard; surface: moderately rough, fresh.		
	156.0					156.1-170.1 ft R.D. = 11°-48°, very closely to widely spaced, neither ends visible; tight to slightly open; filling: not healed to moderately healed, clean, thin clay, moderately thin calcite, fresh, very soft to moderately hard; surface: smooth to rough, fresh. Fracture set #8.		
589.0								
	157.0							
588.0		R-26	68% (40%)					
	158.0							
587.0								
	159.0							
586.0								
	160.0							
585.0				FD3				
	161.0							
584.0								
	162.0							
583.0		R-27	100% (98%)					
	163.0							
582.0								
	164.0							
581.0								
		R-28						

DATE STARTED: 5/21/10
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
580.0	166.0					119.7-202.8 ft SHALE, moderately hard to moderately soft, fresh to slightly weathered, dark gray (N3) and medium dark gray (N4), thickly to massive bedded, moderately to widely fractured, no staining, with fossiliferous intervals		
579.0	167.0							
578.0		R-28	100% (98%)					
	168.0					168.4-168.7 ft Joint, R.D. = 63°, neither ends visible, tight; filling: moderately healed, very thin calcite, fresh, moderately hard; surface: slightly rough, fresh.		
577.0	169.0							
576.0	170.0							
575.0	171.0							
574.0				FD3				
	172.0	R-29	91% (49%)					
573.0	173.0							
572.0	174.0							
571.0	175.0							
570.0	176.0							
569.0	177.0					176.5-195.5 ft R.D. = 32°-66°, very closely to widely spaced, neither ends visible; tight to moderately open; filling: not healed to moderately healed, very thin iron oxide staining and clay, very thin pyrite, fresh; surface: smooth to moderately rough, fresh. Fracture set #9.		
568.0		R-30	47% (9%)					
	178.0							
567.0				FD6				
566.0	179.0	R-31						

DATE STARTED: 5/21/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adam Meyer
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
565.0	180.4					119.7-202.8 ft SHALE, moderately hard to moderately soft, fresh to slightly weathered, dark gray (N3) and medium dark gray (N4), thickly to massive bedded, moderately to widely fractured, no staining, with fossiliferous intervals		
564.0	181.0			FD6				
	182.0							
563.0		R-31	90% (70%)					
	183.0							
562.0								
	184.0							
561.0								
	185.0							
560.0								
	186.0							
559.0				FD3				
	187.0							
558.0		R-32	100% (85%)					
	188.0							
557.0								
	189.0							
556.0								
	190.0							
555.0								
	191.0							
554.0								
	192.0							
553.0		R-33	100% (87%)					
	193.0			FD5				
552.0								
	194.0							
551.0								
		R-34						

DATE STARTED: 5/21/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-424

PROJECT NO. 10-4310

COORDINATES

N. 339868.96 ft E. 2405458.50 ft

GROUND SURFACE ELEVATION: 745.40 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
550.0						119.7-202.8 ft SHALE, moderately hard to moderately soft, fresh to slightly weathered, dark gray (N3) and medium dark gray (N4), thickly to massive bedded, moderately to widely fractured, no staining, with fossiliferous intervals		
	196.0			FD5		196.1-199.55 ft R.D. = 42°-66°, closely to moderately spaced, neither ends visible; tight to moderately open; filling: not healed to moderately healed, clean, very thin calcite, fresh, moderately hard; surface: moderately rough to rough, fresh. Fracture set #10.		
549.0								
	197.0							
548.0		R-34	90% (81%)					
	198.0							
547.0								
	199.0							
546.0								
	200.0			FD3				
545.0								
	201.0							
544.0		R-35	81% (81%)					
	202.0							
543.0						---- Bottom of Boring at 202.80 ft.----		

DATE STARTED: 5/21/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-425

PROJECT NO. 10-4310

COORDINATES

N. 339874.33 ft E. 2405519.37 ft

GROUND SURFACE ELEVATION: 744.91 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
744.0	1.0	S-1	2-1-2 (3) 53%			0.0-1.5 ft Organic soil, (ol/oh), 90% fines, low plasticity, no dry strength, no dilatancy, low toughness; 10% gravel, medium, angular, flat, medium hardness; dark yellowish brown (10YR 4/2), organic odor, moist, no HCl reaction, with roots, some rock fragments	ol/oh	
743.0	2.0	S-2	2-7-18 (25) 100%			1.5-3.0 ft Silt with gravel, (ml), 85% fines, low plasticity, no dilatancy, low toughness; 10% gravel, fine to medium, angular, elongated, medium hardness; 5% sand, fine, subangular; maximum grain size = 1 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, little roots, with rock fragments	ml	
742.0	3.0	S-3	13-19-21 (40) 100%			3.0-7.5 ft Sandy silt with gravel, (ml), 55% fines, medium plasticity, no dilatancy, low toughness; 30% sand, fine, subrounded; 15% gravel, fine to coarse, subangular, medium hardness; maximum grain size = 1/2 inches, moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6), moist, no HCl reaction, with rock fragments	ml	
741.0	4.0							
740.0	5.0	S-4	10-19-20 (39) 93%					
739.0	6.0							
738.0	7.0	S-5	6-15-15 (30) 97%					
737.0	8.0	S-6	10-12-13 (25) 100%			7.5-10.5 ft Poorly graded sand with gravel, (sp), 80% sand, fine to medium, subangular; 15% gravel, fine to medium, angular, elongated; 5% fines, low plasticity, no dilatancy, low toughness; maximum grain size = 0.05 inches, moderate brown (5YR 4/4), moist, no HCl reaction, with rock fragments	sp	
736.0	9.0							
735.0	10.0	S-7	13-16-16 (32) 27%					
734.0	11.0	S-8	7-7-14 (21) 47%			10.5-21.75 ft Silt with gravel, (ml), 75% fines, low plasticity, medium dry strength, no dilatancy, medium toughness; 25% gravel, fine to medium, angular, elongated, hard hardness; maximum grain size = 1 inches, moderate yellowish brown (10YR 5/4) to light brown (5YR 5/6), moist, no HCl reaction, with rock fragments	ml	
733.0	12.0							
732.0	13.0	S-9	9-10-10 (20) 87%					
731.0	14.0	S-10	5-6-7 (13) 90%					
730.0	15.0							
729.0	16.0	S-11	5-5-6 (11) 83%					
728.0	17.0	S-12	6-8-10 (18) 73%					
727.0	18.0							
726.0	19.0	S-13	13-10-19 (29) 93%					
		S-14						

DATE STARTED: 5/18/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-425

PROJECT NO. 10-4310

COORDINATES

N. 339874.33 ft E. 2405519.37 ft

GROUND SURFACE ELEVATION: 744.91 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
724.0	21.0	S-14	11-13-18 (31) 100%				ml	
723.0	22.0	S-15	10-27-36 (63) 100%			21.75-23.9 ft SHALE, clayey, moderately soft, decomposed, medium dark gray (N4) and light brown (5YR 5/6), no reaction to HCl, iron oxide staining		
722.0	23.0	S-16	20-27-50/5 100%					
721.0	24.0					23.9-37.4 ft SHALE, clayey, moderately soft to soft, very intensely weathered, clay sized particles, pale yellowish brown (10YR 6/2) and dark yellowish orange (10YR 6/6), moderately to thinly bedded, closely fractured, no reaction to HCl		SC-1, 23.9-24.4 ft, 5/18/10, 1445
720.0	25.0	R-1	100% (19%)			24.15-44.9 ft R.D. = 5°-75°, very closely to moderately spaced, neither ends visible; tight to moderately open; filling: not healed, intensely to slightly weathered, very thin to moderately thin clay, iron oxide staining; surface: moderately rough to smooth, very intensely to slightly weathered. Fracture set #1.		
719.0	26.0							
718.0	27.0							
717.0	28.0							
716.0	29.0	R-2	68% (0%)					
715.0	30.0							
714.0	31.0			FD6				
713.0	32.0							
712.0	33.0							
711.0	34.0	R-3	60% (0%)					
710.0	35.0							
709.0	36.0							
708.0	37.0							
707.0	38.0	R-4	92% (24%)			37.4-52.8 ft SHALE, clayey, moderately hard, slightly weathered, medium dark gray (N4), moderately to thinly bedded, moderately fractured, no reaction to HCl, iron oxide staining		
706.0	39.0			FD5				SC-2, 38.7-39.3 ft, 5/19/10, 0827

DATE STARTED: 5/18/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-425

PROJECT NO. 10-4310

COORDINATES

N. 339874.33 ft E. 2405519.37 ft

GROUND SURFACE ELEVATION: 744.91 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-5				37.4-52.8 ft SHALE, clayey, moderately hard, slightly weathered, medium dark gray (N4), moderately to thinly bedded, moderately fractured, no reaction to HCl, iron oxide staining		
704.0	41.0							
703.0	42.0	R-5	98% (63%)					
702.0	43.0							
701.0	44.0			FD5				
700.0	45.0							
699.0	46.0							
698.0	47.0	R-6	94% (54%)			46.5-64.9 ft R.D. = 16°-73°, very closely to widely spaced; tight to moderately open; filling: not healed, clean, iron oxide staining, very thin and moderately thin quartz, very thin clay, slightly weathered; surface: smooth to rough, fresh to intensely weathered. Fracture set #2.		
697.0	48.0							
696.0	49.0			FD6				
695.0	50.0							
694.0	51.0			FD5				
693.0	52.0	R-7	87% (38%)					
692.0	53.0			FD7		52.8-54.3 ft SHALE, clayey, soft, intensely weathered to decomposed, medium dark gray (N4) and greenish gray (5GY 6/1), very closely fractured, no reaction to HCl, iron oxide staining		
691.0	54.0					54.3-100.3 ft SHALE, moderately hard to moderately soft, slightly weathered to fresh, medium dark gray (N4), thinly to moderately bedded, closely to moderately fractured, no reaction to HCl		
690.0	55.0							
689.0	56.0							
688.0	57.0	R-8	100% (63%)	FD5				
687.0	58.0							
686.0	59.0							

DATE STARTED: 5/18/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-425

PROJECT NO. 10-4310

COORDINATES

N. 339874.33 ft E. 2405519.37 ft

GROUND SURFACE ELEVATION: 744.91 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
684.0	61.0	R-9		FD8		54.3-100.3 ft SHALE, moderately hard to moderately soft, slightly weathered to fresh, medium dark gray (N4), thinly to moderately bedded, closely to moderately fractured, no reaction to HCl		
683.0	62.0							
682.0	63.0	R-9	100% (37%)					
681.0	64.0							
680.0	65.0					64.9-86.75 ft R.D. = 10°-63°, closely to widely spaced, neither ends visible; filling: not healed; moderately to slightly open; filling: clean, iron oxide staining, very thin clay; surface: slightly to moderately rough, slightly to moderately weathered. Fracture set #3.		
679.0	66.0			FD5				
678.0	67.0							
677.0	68.0	R-10	70% (43%)					
676.0	69.0							68.4-68.9 ft, Driller reports clay at bottom of the run.
675.0	70.0			FD6				
674.0	71.0							
673.0	72.0			FD5				
672.0	73.0	R-11	98% (30%)					
671.0	74.0							
670.0	75.0							
669.0	76.0							
668.0	77.0			FD8				
667.0	78.0	R-12	74% (0%)					
666.0	79.0							

DATE STARTED: 5/18/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-425

PROJECT NO. 10-4310

COORDINATES

N. 339874.33 ft E. 2405519.37 ft

GROUND SURFACE ELEVATION: 744.91 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-13				54.3-100.3 ft SHALE, moderately hard to moderately soft, slightly weathered to fresh, medium dark gray (N4), thinly to moderately bedded, closely to moderately fractured, no reaction to HCl		
664.0	81.0							
663.0	82.0	R-13	90% (7%)	FD6				
662.0	83.0							
661.0	84.0							
660.0	85.0					85.0-100.3 ft Weak reaction to HCl		
659.0	86.0							
658.0	87.0	R-14	95% (53%)					
657.0	88.0					88.1-97.5 ft R.D. = 46°-58°, closely to widely spaced, neither ends visible; tight to slightly open; filling: not healed, clean, iron oxide staining; surface: stepped to slightly rough, fresh to moderately weathered. Fracture set #4.		
656.0	89.0							
655.0	90.0							
654.0	91.0							
653.0	92.0	R-15	100% (72%)	FD5				
652.0	93.0							
651.0	94.0							
650.0	95.0							
649.0	96.0							
648.0	97.0							
		R-16	100% (78%)					
647.0	98.0							
646.0	99.0							SC-3, 98.55-99.45 ft, 5/20/10, 1036

DATE STARTED: 5/18/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-425

PROJECT NO. 10-4310

COORDINATES

N. 339874.33 ft E. 2405519.37 ft

GROUND SURFACE ELEVATION: 744.91 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-16						
644.0						---- Bottom of Boring at 100.30 ft.----		

DATE STARTED: 5/18/10
DATE FINISHED: 5/20/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
745.0						0.0-1.5 ft Organic soil, (ol/oh), 100% fines; dusky yellowish brown (10YR 2/2), organic odor, dry, no HCl reaction, medium stiff, with organics, contained large gravel of sandstone, fifty percent of leaves and roots, fifty percent silt	ol/oh	
744.0	1.0	S-1	2-3-4 (7) 47%					
	2.0	S-2	2-3-10 (13) 87%			1.5-3.0 ft Sandy lean clay/sandy silt, (cl-ml), 70% fines, low plasticity, low toughness; 30% sand, fine to medium, subangular; maximum grain size = 1 inches, moderate yellowish brown (10YR 5/4), dry, stiff, trace large to medium subangular gravel	cl-ml	
743.0	3.0							
742.0		S-3	4-10-10 (20) 87%			3.0-4.5 ft Sandy lean clay/sandy silt, (cl-ml), 75% fines, low plasticity, low toughness; 25% sand, medium, subangular; moderate yellowish brown (10YR 5/4), dry, very stiff	cl-ml	
741.0	4.0							
740.0	5.0	S-4	4-9-8 (17) 100%			4.5-6.0 ft Sandy silt with gravel, (ml), 50% fines, low plasticity, low toughness; 30% gravel, fine to coarse, subangular, medium hardness; 20% sand, fine; maximum grain size = 1 inches, moderate yellowish brown (10YR 5/4), dry, very stiff	ml	
739.0	6.0	S-5	8-12-22 (34) 87%			6.0-7.5 ft Silt with gravel, (ml), 50% fines, high plasticity, low toughness; 40% gravel, fine to coarse, subangular, medium hardness; 10% sand, fine to medium; maximum grain size = 1.5 inches, moderate yellowish brown (10YR 5/4) and dark yellowish orange (10YR 6/6), moist, hard	ml	
738.0	7.0							
737.0	8.0	S-6	18-21-16 (37) 100%			7.5-12.0 ft WELL GRADED SAND WITH CLAY AND GRAVEL, (SW-SC), 50% sand, fine to coarse; 41% gravel, fine to coarse, subangular, soft hardness; 9% fines, low plasticity; maximum grain size = 1.25 inches, moderate orange pink (5YR 8/4) and dark yellowish orange (10YR 6/6) from 7.9-9.0 ft, light brown (5YR 5/6) and dusky yellow (5Y 6/4) from 9.0-10.5 ft, and grayish yellow (15Y 8/4) from 10.5-12.0 ft, moist, dense to very dense, weathered shale	SW-SC	7.5 ft, Decomposed shale
736.0	9.0	S-7	5-15-18 (33)					
735.0	10.0							
734.0	11.0	S-8	12-17-39 (56) 93%					
733.0	12.0	S-9	17-13-14 (27) 100%			12.0-13.5 ft Silty gravel, (gm), 50% gravel, fine to coarse, subangular, soft hardness; 50% fines, low plasticity, high toughness; maximum grain size = 1 inches, light olive brown (5Y 5/6), dry, medium dense, weathered shale	gm	
732.0	13.0							
731.0	14.0	S-10	45-45-30 (75) 100%			13.5-15.0 ft Well graded gravel with silt, (gw-gm), 90% gravel, fine to coarse, medium hardness; 10% fines, low plasticity, low toughness; maximum grain size = 1/2 inches, yellowish gray (5Y 7/2), dry, very dense, weathered shale	gw-gm	
730.0	15.0	S-11	20-50 100%			15.0-16.0 ft Clayey gravel, (gc), 70% gravel, fine to coarse, soft hardness; 30% fines, low plasticity, low toughness; maximum grain size = 1.5 inches, yellowish gray (5Y 7/2) and dark yellowish orange (10YR 6/6), dry, very dense, weathered shale	gc	
729.0	16.0					16.0-16.5 ft Interval not sampled		
728.0	17.0	S-12	32-32-16 (48) 87%			16.5-18.0 ft Well graded gravel with silt, (gw-gm), 90% gravel, fine to coarse, medium hardness; 10% fines, low plasticity, low toughness; maximum grain size = 1.5 inches, yellowish gray (5Y 7/2) with dark yellowish orange (10YR 6/6), dry, dense, weathered shale	gw-gm	
727.0	18.0	S-13	21-25-47 (72) 93%			18.0-19.5 ft Well graded gravel with silt, (gw-gm), 90% gravel, fine to coarse, medium hardness; 10% fines, low plasticity, low toughness; maximum grain size = 1 inches, yellowish gray (5Y 7/2) with dusky yellowish brown (10YR 2/2), dry, very dense, weathered shale	gw-gm	
726.0	19.0	S-14	50/4					

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
725.0			100%			19.5-19.83 ft SHALE, decomposed, dark gray (N3), no reaction to HCl		Casing set at 20.0 ft; Lose water circulation coring run one, pumping approximately 15 galllons per minute
						19.83-20.0 ft Interval not sampled due to casing installation		
724.0	21.0					20.0-25.0 ft SHALE, moderately hard to moderately soft, moderately to very intensely weathered, medium dark gray (N4) and yellowish gray (5Y 7/2), no reaction to HCl, iron oxide staining, weathering increases with depth from 20.0 to 25.0		
723.0	22.0	R -1	70% (26%)	FD6		20-25 ft R.D. = 70-75°; surface: rough, planar, very intensely weathered; as depth increases from 20-25 ft. fracture surface weathering increases.		
722.0	23.0							
721.0	24.0							
720.0	25.0					25.0-39.9 ft SHALE, moderately soft to very soft, intensely weathered to decomposed, yellowish gray (5Y 7/2), very closely to closely fractured, no reaction to HCl, iron oxide staining, weathering increases with depth, possible fracture show moderate to heavy iron oxide staining, clay thin layers starting at apprximately at 33.0 ft		
719.0	26.0							
718.0	27.0	R -2	89% (0%)					
717.0	28.0							
716.0	29.0							
715.0	30.0							
714.0	31.0							
713.0	32.0	R -3	81% (0%)	FD8				
712.0	33.0							
711.0	34.0							
710.0	35.0							
709.0	36.0							
708.0	37.0	R -4	42% (0%)					
707.0	38.0							
706.0	39.0							

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
705.0		R -5				39.9-54.9 ft Bedding plane separation, R.D. = 10°, very closely to closely spaced; surface: rough, planar; moderate amounts of iron oxide staining.		Casing depth lowered to 39.9 ft due to weathered bedrock
704.0	41.0					39.9-49.9 ft SHALE, moderately soft to soft, moderately to intensely weathered, yellowish gray (5Y 7/2) and yellowish gray (5Y 7/2), very closely fractured, no reaction to HCl, iron oxide staining, quartz crystal growth along weathered fracture faces		
703.0	42.0	R -5	100% (0%)	FD8		40.1-49.9 ft Fracture zone, R.D. = 56°, moderately spaced; filling: not healed, quartz, slightly weathered; surface: rough, planar, slightly weathered.		
702.0	43.0							
701.0	44.0							
700.0	45.0							
699.0	46.0							
698.0	47.0	R -6	100% (8%)					
697.0	48.0							
696.0	49.0							
695.0	50.0					49.9-56.9 ft SHALE, moderately hard, moderately to intensely weathered, yellowish gray (5Y 7/2) and medium dark gray (N4), closely fractured, no reaction to HCl, iron oxide staining, weathering is contained to fracture zones, becomes less weathered as depth increases		
694.0	51.0					49.9-57.5 ft R.D. = 10°, moderately to closely spaced; surface: smooth, planar; moderate to heavy iron oxide staining.		
693.0	52.0	R -7	100% (9%)	FD5		50.7- ft R.D. = 56°, moderately spaced; surface: rough, planar; moderate to heavy iron oxide staining.		SC-2, 52.0-52.65 ft., 4/14/10
692.0	53.0							
691.0	54.0					53.5-54.5 ft R.D. = 90°; filling is damp but no free water present, filling: not healed, very thin quartz, fresh; surface: rough, planar, fresh; heavy iron oxide staining on fracture surface prior to quartz crystal formation.		
690.0	55.0							
689.0	56.0							
688.0	57.0	R -8	100% (44%)			56.35-57.85 ft Random fracture, R.D. = 71°; surface: rough, planar; moderate to heavy iron oxide staining on fracture, weathering increases close to fracture.		
687.0	58.0					56.9-64.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very thickly to laminated, very widely fractured, no reaction to HCl, calcite replaced shell casts, trace pyrite, pyrite replacing calcite shell casts at approximately 62.8 ft., bedding visible by 10° calcite laminae, weak reaction to HCl approximately 59.0 ft		
686.0	59.0							SC-1, 58.8-59.9 ft., 09:00, 4/14/10

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
685.0		R -9		FD5		56.9-64.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very thickly to laminated, very widely fractured, no reaction to HCl, calcite replaced shell casts, trace pyrite, pyrite replacing calcite shell casts at approximately 62.8 ft., bedding visible by 10° calcite laminae, weak reaction to HCl approximately 59.0 ft		
684.0	61.0							
683.0	62.0	R -9	98% (96%)					
682.0	63.0							
681.0	64.0							
680.0	65.0			FD1		64.8-70 ft R.D. = 56°, very widely spaced; surface: rough, planar.		
679.0	66.0					64.9-74.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to laminated, very widely to widely fractured, no reaction to HCl, calcite replaced shell casts, trace pyrite, pyrite replaceing calcite shell casts (secondary), bedding visible by 10° calcite laminae		
678.0	67.0	R -10	100% (98%)					
677.0	68.0							
676.0	69.0							
675.0	70.0			FD4				
674.0	71.0							
673.0	72.0	R -11	100% (98%)					
672.0	73.0					72.5-73.2 ft Bedding plane separation, R.D. = 10°; surface: rough, planar; trace pyrite.		
671.0	74.0							
670.0	75.0					74.9-84.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately, extremely widely fractured, weak reaction to HCl, trace calcite replaced shell casts, trace pyrite replacing calcite (secondary), bedding visible by 10° calcite laminae		
669.0	76.0							
668.0	77.0	R -12	100% (100%)	FD0				
667.0	78.0							
666.0	79.0							

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
665.0		R -13				74.9-84.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately, extremely widely fractured, weak reaction to HCl, trace calcite replaced shell casts, trace pyrite replacing calcite (secondary), bedding visible by 10° calcite laminae		
664.0	81.0							
663.0	82.0	R -13	99% (99%)					
662.0	83.0			FD0				
661.0	84.0							
660.0	85.0					84.9-99.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately, widely to very closely fractured, weak reaction to HCl, calcite replaced shell casts, pyrite replacing calcite (secondary), bedding visible by 10° calcite laminae		
659.0	86.0							
658.0	87.0	R -14	96% (86%)	FD8				
657.0	88.0					87.7-88.4 ft Bedding plane separation, R.D. = 10°, very closely to closely spaced; surface: smooth, planar; trace to moderate iron oxide staining.		
656.0	89.0							
655.0	90.0			FD4		90.1-92.9 ft R.D. = 56°, widely spaced; filling: not healed, very thin trace calcite & pyrite; surface: rough, planar.		
654.0	91.0							
653.0	92.0	R -15	100% (82%)					
652.0	93.0			FD5				
651.0	94.0					94-94.6 ft R.D. = 90°, moderately spaced; filling: very thin trace calcite & pyrite; surface: rough, planar.		
650.0	95.0							
649.0	96.0							
648.0	97.0	R -16	100% (100%)	FD1				
647.0	98.0					97.9- ft Bedding plane separation, R.D. = 10°; surface: moderately rough, planar.		
646.0	99.0							

DATE STARTED: 4/13/10
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FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
645.0		R -17				99.9-109.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to very widely fractured, no reaction to HCl, trace pyrite and calcite		
644.0	101.0							
643.0	102.0	R -17	100% (100%)	FD1				
642.0	103.0							
641.0	104.0							
640.0	105.0							
639.0	106.0							
638.0	107.0	R -18	100% (92%)			107.2-107.3 ft R.D. = 36°; surface: moderately rough, planar.		
637.0	108.0							
636.0	109.0							
635.0	110.0			FD1		109.9-129.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to extremely widely fractured, no reaction to HCl, trace pyrite, hard calcareous circular nodule at 117.35 ft. (0.35ft.) and 116.7 ft (0.15ft)(strong reaction to HCl)		
634.0	111.0					111-111.6 ft R.D. = 56°, moderately spaced; surface: rough, planar.		
633.0	112.0	R -19	100% (98%)					
632.0	113.0							SC-3, 113.3-114.65 ft, 12:55, 4/14/10
631.0	114.0							
630.0	115.0							
629.0	116.0							
628.0	117.0	R -20	100% (98%)	FD0				
627.0	118.0							
626.0	119.0							

DATE STARTED: 4/13/10
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FIELD GEOLOGIST: Adrianna Semione
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
625.0	120.0	R -21				109.9-129.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to extremely widely fractured, no reaction to HCl, trace pyrite, hard calcareous circular nodule at 117.35 ft. (0.35ft.) and 116.7 ft (0.15ft)(strong reaction to HCl)		
624.0	121.0							
623.0	122.0	R -21	100% (100%)					
622.0	123.0							
621.0	124.0							
620.0	125.0							
619.0	126.0							
618.0	127.0	R -22	100% (100%)					
617.0	128.0							
616.0	129.0			FD0				
615.0	130.0					129.9-134.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, weak reaction to HCl, trace pyrite		
614.0	131.0							
613.0	132.0	R -23	100% (100%)					
612.0	133.0							
611.0	134.0							
610.0	135.0					134.9-149.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, trace pyrite (134.9-144.9 ft.), trace calcite replaced shells		
609.0	136.0							
608.0	137.0	R -24	100% (90%)			137.4-137.9 ft R.D. = 56°; surface: rough, planar.		
607.0	138.0			FD4				
606.0	139.0					138.8-139.3 ft R.D. = 71°; surface: rough, planar.		

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Adrianna Semione
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
605.0						134.9-149.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, trace pyrite (134.9-144.9 ft.), trace calcite replaced shells		
604.0	141.0							
603.0	142.0			FD3				
602.0	143.0							
601.0	144.0							
600.0	145.0							
599.0	146.0							
598.0	147.0	R -25	90% (90%)					
597.0	148.0							
596.0	149.0							
595.0	150.0					149.6- ft Bedding plane separation, R.D. = 10°; filling: totally healed, very thin calcite, fresh; surface: rough, planar, fresh; calcite replaced shell casts along bedding plane filled with calcite.		
594.0	151.0					149.9-159.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite starting at 154.9 ft.		
593.0	152.0	R -26	100% (100%)	FD0				SC-4, 152.25-153.5 ft., 16:05, 4/14/10
592.0	153.0							
591.0	154.0							
590.0	155.0							
589.0	156.0					155.7- ft Bedding plane separation, R.D. = 10°; filling: totally healed, thin calcite, fresh; surface: fresh; bedding planes within the thin layer with calcite show displacement of less than 10 mm.		
588.0	157.0	R -27	100% (100%)					
587.0	158.0							
586.0	159.0							

DATE STARTED: 4/13/10
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
585.0		R -28				159.9-174.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite replacing calcite in trace shell casts		
584.0	161.0							
583.0	162.0	R -28	98% (94%)					
582.0	163.0							
581.0	164.0							
580.0	165.0							
579.0	166.0							
578.0	167.0	R -29	100% (100%)					
577.0	168.0							
576.0	169.0							
575.0	170.0			FD0				
574.0	171.0							
573.0	172.0	R -30	100% (100%)					
572.0	173.0							
571.0	174.0							
570.0	175.0					174.9-184.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely to very widely fractured, no reaction to HCl		
569.0	176.0							
568.0	177.0	R -31	90% (90%)			176.6-176.7 ft Bedding plane separation, R.D. = 10°, very closely spaced; filling: totally healed, moderately thick calcite, fresh; surface: smooth, planar, fresh; pyrite with in bedding, show displacement with in zone of 10 mm or less.		
567.0	178.0							
566.0	179.0					179.5-179.52 ft Bedding plane separation, R.D. = 10°, very closely spaced;		

DATE STARTED: 4/13/10
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
565.0		R -32				filling: totally healed, moderately thin calcite, fresh; surface: rough, planar, fresh; shows displacement of 10-20 mm.		
564.0	181.0							
563.0	182.0	R -32	90% (90%)					
562.0	183.0							
561.0	184.0			FD0				
560.0	185.0					174.9-184.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely to very widely fractured, no reaction to HCl		
559.0	186.0					183.6-183.85 ft R.D. = 10°, very closely to closely spaced; filling: totally healed, very thin calcite and pyrite, fresh; surface: rough, planar, fresh; displacement ranges from 0-10 mm.		
558.0	187.0	R -33	100% (95%)			184.9-199.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to extremely widely fractured, no reaction to HCl, very trace pyrite and calcite replaced shell casts, increase in pyrite and calcite shell casts starting at 194.9ft		
557.0	188.0					185.7-185.72 ft Bedding plane separation, R.D. = 10°, very closely spaced; filling: totally healed, moderately thin calcite and pyrite, fresh; surface: rough, planar, fresh; shows displacement of less than 5 mm, galena.		
556.0	189.0			FD1		187.7-187.75 ft Bedding plane separation, R.D. = 10°, very closely spaced; filling: totally healed, moderately thick calcite and pyrite, fresh; surface: rough, planar, fresh; bedding shows displacement of less than 10 mm.		
555.0	190.0					188-188.7 ft Random fracture, R.D. = 75°; filling is damp but no free water present, filling: not healed, very thin calcite, fresh; surface: rough, planar, fresh.		
554.0	191.0							
553.0	192.0	R -34	100% (100%)					
552.0	193.0							
551.0	194.0							
550.0	195.0			FD0				
549.0	196.0							
548.0	197.0	R -35	100% (100%)					
547.0	198.0							
546.0	199.0							

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Adrianna Semione
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
545.0	200.0	R -36				199.9-214.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite and calcite starting at 209.9 ft.		
544.0	201.0							
543.0	202.0	R -36	100% (100%)					
542.0	203.0							
541.0	204.0							
540.0	205.0							
539.0	206.0							SC-5, 206.35-207.8 ft., 11:15, 4/15/10
538.0	207.0	R -37	100% (100%)					
537.0	208.0							
536.0	209.0							
535.0	210.0			FD0				
534.0	211.0							
533.0	212.0	R -38	90% (90%)					
532.0	213.0							
531.0	214.0							
530.0	215.0					214.9-223.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite and calcite, bedding visible between 216.75-217.1 ft. of very closely to closely spaced marked by laminae of calcite		
529.0	216.0							
528.0	217.0	R -39	100% (100%)					
527.0	218.0							
526.0	219.0							

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-426

PROJECT NO. 10-4310

COORDINATES

N. 340296.20 ft E. 2404892.65 ft

GROUND SURFACE ELEVATION: 745.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
525.0		R -40				214.9-223.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace pyrite and calcite, bedding visible between 216.75-217.1 ft. of very closely to closely spaced marked by laminae of calcite		
524.0	221.0	R -40	100% (100%)	FD0				
523.0	222.0							
	223.0					---- Bottom of Boring at 223.00 ft.----		

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-427

PROJECT NO. 10-4310

COORDINATES

N. 340301.39 ft E. 2404954.97 ft

GROUND SURFACE ELEVATION: 753.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
753.0	1.0	S-1	2-7-7 (14) 60%			0.0-0.15 ft Sandy organic soil, (ol/oh), 68% fines, low plasticity, no dry strength, no dilatancy, low toughness; 30% sand, fine to coarse, subangular; 2% gravel, fine to coarse, subangular; maximum grain size = 0.5 inches, dark yellowish brown (10YR 4/2), dry, no HCl reaction, Spongy	ol/oh sm	
752.0	2.0					0.15-0.75 ft Silty sand, (sm), about 5% cobbles; 50% sand, fine to coarse, subangular; 45% fines, low plasticity, no dry strength, no dilatancy, low toughness; 5% gravel, coarse, subangular, hard hardness; maximum grain size = 1.0 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, medium dense, some roots, trace rock fragments	sm	
751.0	3.0	S-2	9-11-8 (19) 77%			0.75-1.5 ft Silty sand, (sm), 55% sand, fine to coarse, subangular; 45% fines, low plasticity, no dry strength, no dilatancy, low toughness; 0% gravel; maximum grain size = 1.0 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, medium dense, some roots		
750.0	4.0					1.5-2.5 ft Interval not sampled		
749.0	5.0	S-3	5-7-7 (14) 100%			2.5-2.65 ft Silty sand with gravel, (sm), about 5% cobbles, subangular; 40% sand, fine to coarse, subangular; 30% gravel, fine to coarse, subangular, medium hardness; 30% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4) and yellowish gray (5Y 7/2), moist, no HCl reaction, medium dense, trace roots		
748.0	6.0					2.65-4.0 ft SHALE, moderately hard to moderately soft, decomposed, yellowish gray (5Y 7/2) and grayish orange (10YR 7/4), no reaction to HCl, dry, iron oxide staining, fissile		
747.0	7.0	S-4	4-10-11 (21) 100%			4.0-5.0 ft Interval not sampled		
746.0	8.0					5.0-5.9 ft SHALE, moderately hard to moderately soft, decomposed, yellowish gray (5Y 7/2) and grayish orange (10YR 7/4), no reaction to HCl, dry, iron oxide staining, fissile		
745.0	9.0	S-5	38-24-19 (43) 80%			5.9-6.5 ft SHALE, moderately hard to moderately soft, decomposed, yellowish gray (5Y 7/2) and medium gray (N5), no reaction to HCl, dry to moist, iron oxide staining, pockets of silty sand; moderate yellowish brown (10YR 5/4), low toughness, low plasticity, no dry strength, no dilantancy. fissile		
744.0	10.0					6.5-7.5 ft Interval not sampled		
743.0	11.0	S-6	50/2			7.5-7.9 ft SHALE, moderately hard to moderately soft, decomposed, medium gray (N5) and yellowish gray (5Y 7/2), no reaction to HCl, dry to moist, iron oxide staining, pockets of silty sand; moderate yellowish brown (10YR 5/4), fissile		Casing advancer set at 12.7 ft.
742.0	12.0	R -1	100%			7.9-9.0 ft SHALE, moderately hard to moderately soft, decomposed, yellowish gray (5Y 7/2) and medium gray (N5), no reaction to HCl, dry, iron oxide staining, fissile		
741.0	13.0		75% (0%)			9.0-10.0 ft Interval not sampled		
740.0	14.0					10.0-11.0 ft SHALE, moderately hard to moderately soft, decomposed, medium gray (N5) and yellowish gray (5Y 7/2), no reaction to HCl, wet, iron oxide staining, fissile		
739.0	15.0	R -2	100% (74%)	FD6		11.0-11.5 ft SHALE, moderately hard to moderately soft, decomposed, yellowish gray (5Y 7/2) and grayish orange (10YR 7/4), no reaction to HCl, wet, iron oxide staining, fissile		
738.0	16.0					11.5-12.5 ft Interval not sampled		
737.0	17.0					12.5-12.65 ft SHALE, moderately hard to moderately soft, decomposed, medium dark gray (N4) and yellowish gray (5Y 7/2), no reaction to HCl, wet, iron oxide staining, fissile		
736.0	18.0					12.65-12.7 ft Sample lost with casing advancer set		
735.0	19.0	R -3	72% (36%)			12.7-28.7 ft R.D. = 80-90°, very closely to moderately spaced; surface: rough,		

DATE STARTED: 6/7/10
DATE FINISHED: 6/7/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-427

PROJECT NO. 10-4310

COORDINATES

N. 340301.39 ft E. 2404954.97 ft

GROUND SURFACE ELEVATION: 753.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
						planar; heavy iron oxide staining, clay laminae on few.		
733.0	21.0					13.7-28.1 ft Bedding plane separation, R.D. = 10°, widely to very closely spaced; surface: smooth, planar; few contain clay laminae, heavy iron oxide staining.		
732.0	22.0	R -3	72% (36%)	FD6		12.7-23.7 ft SHALE, moderately hard to hard, moderately weathered, medium dark gray (N4) with grayish orange (10YR 7/4), closely to moderately fractured, no reaction to HCl, iron oxide staining		
731.0	23.0							
730.0	24.0					23.7-33.7 ft SHALE, moderately hard to hard, moderately weathered, medium dark gray (N4) with grayish orange (10YR 7/4), closely to moderately fractured, no reaction to HCl, iron oxide staining, core becomes very intensely weathered to decomposed, see notes for 32.7-33.7 ft		
729.0	25.0							
728.0	26.0	R -4	100% (38%)					
727.0	27.0							
726.0	28.0							
725.0	29.0			FD6		28.5-38.7 ft R.D. = 56°, widely to moderately spaced; surface: rough, planar; iron oxide staining.		
724.0	30.0					29.2-38.7 ft R.D. = 36°, very closely to moderately spaced; surface: rough, planar, slightly weathered; iron oxide staining.		
723.0	31.0	R -5	84% (47%)			29.3-43.7 ft R.D. = 80-90°, moderately to widely spaced; surface: rough, undulating, slightly weathered; iron oxide staining, clay laminae on some fractures.		
722.0	32.0							
721.0	33.0					32.7-33.7 ft Possible void, clay zone, or decomposed, very fast drilling.		
720.0	34.0					33.7-38.7 ft SHALE, moderately hard to hard, intensely to moderately weathered, medium dark gray (N4) with grayish orange (10YR 7/4), very closely to moderately fractured, no reaction to HCl, iron oxide staining, decomposed intervals		
719.0	35.0							
718.0	36.0	R -6	60% (28%)	FD8				
717.0	37.0							
716.0	38.0							
715.0	39.0	R -7	70% (0%)	FD7		38.7-43.7 ft SHALE, soft to moderately hard, intensely weathered, grayish orange (10YR 7/4) with yellowish gray (5Y 7/2), very closely to closely fractured, no reaction to HCl, iron oxide staining, decomposed zones		

DATE STARTED: 6/7/10
DATE FINISHED: 6/7/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-427

PROJECT NO. 10-4310

COORDINATES

N. 340301.39 ft E. 2404954.97 ft

GROUND SURFACE ELEVATION: 753.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
713.0	41.0					38.7- ft Highly fractured zone, difficult to determine dip direction. 38.7-43.7 ft SHALE, soft to moderately hard, intensely weathered, grayish orange (10YR 7/4) with yellowish gray (5Y 7/2), very closely to closely fractured, no reaction to HCl, iron oxide staining, decomposed zones		
712.0	42.0	R -7	70% (0%)					
711.0	43.0							
710.0	44.0					43.7-54.2 ft SHALE, moderately soft to moderately hard, intensely to moderately weathered, grayish orange (10YR 7/4) with medium gray (N5), very closely to moderately fractured, no reaction to HCl, iron oxide staining, decomposed zones		
709.0	45.0					43.7-48.7 ft Fracture zone, very closely to closely spaced; surface: rough, planar, intensely weathered; fractures include 36, 56, 10° bedding planes, all have heavy iron oxide staining. few contain very thin quartz crystals filling.		
708.0	46.0	R -8	82% (8%)					
707.0	47.0							
706.0	48.0			FD7				
705.0	49.0					48.7-53.7 ft Fracture zone, very closely to closely spaced; surface: rough, planar; fractures include 36, 56, and 90°, bedding at 10°, all contain iron oxide staining with quarttz crystals in some (predominately at 90°).		
704.0	50.0							
703.0	51.0	R -9	76% (8%)					
702.0	52.0							
701.0	53.0							
700.0	54.0					54.2-60.8 ft SHALE, moderately hard to hard, fresh to slightly weathered, medium gray (N5), very closely to widely fractured, no reaction to HCl, trace iron oxide staining, very weak reaction in sporadic thin layers and laminae in core, 58.7 ft trace molds of shells with and without calcite fill		
699.0	55.0							
698.0	56.0	R -10	96% (60%)			54.2-55.4 ft Bedding plane separation, R.D. = 10°, very closely to closely spaced; surface: smooth, planar; iron oxide staining, some bedding planes are fresh. 55-59.3 ft R.D. = 80-90°; surface: rough, undulating; iron oxide staining and copper color on fracture face. 55.9-56.1 ft R.D. = 56°, very closely spaced; surface: rough, planar; iron oxide staining.		
697.0	57.0							
696.0	58.0			FD5				
695.0	59.0							
		R -11	100% (96%)					

DATE STARTED: 6/7/10
DATE FINISHED: 6/7/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-427

PROJECT NO. 10-4310

COORDINATES

N. 340301.39 ft E. 2404954.97 ft

GROUND SURFACE ELEVATION: 753.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
693.0	61.0			FD5		59.9-60.85 ft Bedding plane separation, R.D. = 10°, moderately spaced; surface: moderately rough, planar, moderately weathered; moderately rough due to shell casts at bedding plane, moderate iron oxide staining.		
692.0	62.0	R -11	100% (96%)			60.8-68.7 ft SHALE, moderately hard to hard, fresh, dark gray (N3) with medium dark gray (N4), laminated to thickly, very widely fractured, strong reaction to HCl, calcite and pyrite replaced shell casts, calcite replaced shells layers and calcite laminae along 10° bedding		
691.0	63.0							
690.0	64.0							
689.0	65.0			FD1				
688.0	66.0	R -12	100% (99%)					
687.0	67.0							
686.0	68.0							
685.0	69.0			FD4		68.7-74.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), laminated to thickly, moderately fractured, strong reaction to HCl, zones of weak and no below 71.0 to 74.2 ft, few zones showing fresh to slightly weathered, calcite and pyrite replaced shell casts, calcite and fossiliferous intervals show bedding		
684.0	70.0					69.2-73.7 ft Bedding plane separation, R.D. = 10°, moderately to widely spaced; surface: slightly rough, planar, slightly weathered; iron oxide staining, moderately rough due to shell casts along bedding.		
683.0	71.0	R -13	99% (74%)			71-74.2 ft R.D. = 70-72°, closely to widely spaced; surface: rough, planar, slightly weathered; iron oxide staining.		
682.0	72.0							
681.0	73.0			FD5		72.4-73.4 ft R.D. = 80°; surface: rough, planar, slightly weathered; iron oxide staining.		
680.0	74.0							
679.0	75.0					74.2-78.7 ft SHALE, moderately hard to hard, fresh, dark gray (N3), laminated to thickly, widely fractured, strong reaction to HCl, calcite and pyrite replaced shell casts, calcite and fossiliferous intervals show bedding		
678.0	76.0	R -14	100% (96%)	FD0				
677.0	77.0							
676.0	78.0							
675.0	79.0	R -15	98% (98%)	FD1		78.7-93.7 ft SHALE, moderately hard to hard, fresh, dark gray (N3), laminated to thickly, widely to very widely fractured, strong reaction to HCl, calcite and pyrite replaced shell casts, calcite shows bedding		

DATE STARTED: 6/7/10
DATE FINISHED: 6/7/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-427

PROJECT NO. 10-4310

COORDINATES

N. 340301.39 ft E. 2404954.97 ft

GROUND SURFACE ELEVATION: 753.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
673.0	81.0					78.7-93.7 ft SHALE, moderately hard to hard, fresh, dark gray (N3), laminated to thickly, widely to very widely fractured, strong reaction to HCl, calcite and pyrite replaced shell casts, calcite shows bedding		
672.0	82.0	R -15	98% (98%)					
671.0	83.0							
670.0	84.0			FD1		84.45-84.75 ft R.D. = 56°; surface: rough, planar.		
669.0	85.0							
668.0	86.0	R -16	94% (83%)					
667.0	87.0							
666.0	88.0							
665.0	89.0							
664.0	90.0							
663.0	91.0	R -17	100% (100%)					
662.0	92.0			FD0				
661.0	93.0							
660.0	94.0					93.7-98.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), laminated to moderately, widely to closely fractured, strong reaction to HCl, calcite and pyrite replaced shell casts, calcite shows bedding, HCl reaction weakens with depth		
659.0	95.0			FD7		95.1-95.15 ft R.D. = 36°; surface: rough, planar.		
658.0	96.0	R -18	100% (86%)			95.35-95.85 ft Bedding plane separation, R.D. = 10°, closely to moderately spaced; surface: smooth, planar.		
657.0	97.0							
656.0	98.0			FD0				
655.0	99.0	R -19	100% (100%)			98.5-101.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), laminated to moderately, widely fractured, no reaction to HCl, calcite and pyrite replaced shell casts, calcite shows bedding		

DATE STARTED: 6/7/10
DATE FINISHED: 6/7/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-427

PROJECT NO. 10-4310

COORDINATES

N. 340301.39 ft E. 2404954.97 ft

GROUND SURFACE ELEVATION: 753.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
653.0	101.0	R -19	100% (100%)	FD0		---- Bottom of Boring at 101.00 ft.----		

DATE STARTED: 6/7/10
DATE FINISHED: 6/7/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-428

PROJECT NO. 10-4310

COORDINATES

N. 340444.20 ft E. 2404878.07 ft

GROUND SURFACE ELEVATION: 750.57 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
750.0	1.0	S-1	0-1-1 (2) 67%		0.0-1.5 ft Silty sand, (sm), 80% sand, fine to medium; 15% fines, low plasticity, low toughness; 5% gravel, fine; maximum grain size = 0.01 inches, moderate brown (5YR 4/4), moist, no HCl reaction, very loose	sm	
749.0	2.0	S-2	2-2-3 (5) 93%		1.5-4.5 ft CLAYEY SAND WITH GRAVEL, (SC), 52% sand, fine to coarse; 25% fines, low plasticity, low toughness; 23% gravel, fine to coarse, subrounded to subangular, flat and elongated, hard hardness; maximum grain size = 1.0 inches, moderate yellowish brown (10YR 5/4) and dark yellowish orange (10YR 6/6), moist, no HCl reaction, loose, coarse sand layer from 3.8-4.0 ft	SC	
748.0	3.0						
747.0	4.0	S-3	4-4-6 (10) 80%				
746.0	5.0	S-4	4-7-9 (16) 87%		4.5-6.0 ft Well graded sand with silt, (sw-sm), 80% sand, fine to medium; 10% gravel, fine to medium, subrounded, hard hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 0.03 inches, grayish orange (10YR 7/4) and dark yellowish orange (10YR 6/6), dry, no HCl reaction, medium dense, coarse sand from 5.4 to 5.6 ft.	sw-sm	
745.0	6.0						
744.0	7.0	S-5	3-4-6 (10) 100%		6.0-9.0 ft CLAYEY SAND WITH GRAVEL, (SC), 48% sand, fine to coarse; 29% fines, medium plasticity, low toughness; 23% gravel, fine to medium, subrounded to subangular, hard hardness; maximum grain size = 0.9 inches, grayish orange (10YR 7/4) and dark yellowish orange (10YR 6/6), moist, no HCl reaction, loose to medium dense	SC	
743.0	8.0	S-6	4-9-7 (16) 100%				
742.0	9.0						
741.0	10.0	ST-1	80%		9.0-11.0 ft Shelby tube to be sampled (not for laboratory testing)		
740.0	11.0						
739.0	12.0	S-7	11-13-12 (25) 93%		11.0-12.5 ft Poorly graded sand with silt and gravel, (sp-sm), 70% sand, fine to medium; 20% gravel, fine to medium, subangular, flat and elongated, hard hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.03 inches, dusky yellow (5Y 6/4) and light brown (5YR 5/6), moist, no HCl reaction, medium dense	sp-sm	
738.0	13.0	S-8	13-47-50/5 86%		12.5-13.9 ft Poorly graded sand with silt and gravel, (sp-sm), 50% sand, fine to coarse; 40% gravel, fine to medium, subangular, flat and elongated, hard hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 0.03 inches, very pale orange (10YR 8/2), moist, no HCl reaction, very dense	sp-sm	Decomposed shale starting at 12.5 ft.
737.0	14.0						
736.0	15.0	S-9	23-46-46 (92) 93%		14.0-15.5 ft Silty sand with gravel, (sm), 50% sand, fine to medium; 30% fines, medium plasticity, low toughness; 20% gravel, fine, angular, flat and elongated, soft hardness; maximum grain size = 0.01 inches, dusky yellow (5Y 6/4), moist, no HCl reaction, very dense	sm	
735.0	16.0	S-10	37-50/5 100%		15.5-16.42 ft Poorly graded gravel with silt and sand, (gp-gm), 70% gravel, fine to medium, subangular, flat and elongated, soft hardness; 20% sand, fine to medium; 10% fines, medium plasticity, low toughness; maximum grain size = 0.08 inches, light olive gray (5Y 5/2), moist, no HCl reaction, dense	gp-gm	
734.0	17.0						
733.0	18.0	S-11	16-37-50/2 100%		16.42-17.0 ft Interval not sampled	gp-gm	
732.0	19.0	R-1	72% (13%)	FD7	17.0-18.17 ft Poorly graded gravel with silt and sand, (gp-gm), 70% gravel, fine to coarse, angular, soft hardness; 20% sand, fine to medium; 10% fines, medium plasticity, low toughness; maximum grain size = 0.75 inches, medium light gray (N6) and moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very dense		
731.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. Vanvactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-428

PROJECT NO. 10-4310

COORDINATES

N. 340444.20 ft E. 2404878.07 ft

GROUND SURFACE ELEVATION: 750.57 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
730.0	21.0	R-1		FD7		18.17-20.8 ft SHALE, moderately soft to moderately hard, slightly weathered, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining		
729.0	22.0					20.8-25.8 ft SHALE, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		
728.0	23.0					21.3-21.9 ft R.D. = 80°; filling: slightly weathered; surface: slightly rough, undulating, slightly weathered. Fracture set #F-1.		
727.0	24.0	R-2	98% (12%)	FD7				
726.0	25.0							
725.0	26.0					25.8-30.8 ft SHALE, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining, intensely broken (due to a combination of weathering and fracturing)		
724.0	27.0					25.8-26.6 ft Joint, R.D. = 75°; surface: smooth, planar. Fracture set #F-2.		
723.0	28.0							
722.0	29.0	R-3	100% (8%)	FD7				
721.0	30.0							
720.0	31.0					30.8-35.8 ft SHALE, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		30.8 ft. Approximately 90% of fluid loss
719.0	32.0					30.8-35.8 ft Joint, R.D. = 85°, open; filling: totally healed, iron oxide staining; surface: slightly rough, undulating. Fracture set #F-3.		
718.0	33.0							
717.0	34.0	R-4	92% (20%)	FD7				
716.0	35.0							
715.0	36.0					35.8-37.9 ft SHALE, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		
714.0	37.0							
713.0	38.0	R-5	92% (20%)	FD7		37.7-39.1 ft R.D. = 75°; surface: smooth, planar. Fracture set #F-4.	ch	
712.0	39.0					37.9-38.0 ft Fat clay, (ch), medium gray (N5)		
711.0						38.0-40.8 ft SHALE, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. Vanvactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-428

PROJECT NO. 10-4310

COORDINATES

N. 340444.20 ft E. 2404878.07 ft

GROUND SURFACE ELEVATION: 750.57 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
710.0	41.0	R-5		FD7		40.8-45.8 ft SHALE, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining 40.8-43.25 ft Joint, R.D. = 85°; surface: slightly rough, undulating. Fracture set #F-5.		
709.0	42.0							
708.0	43.0	R-6	94% (12%)	FD7				
707.0	44.0							
706.0	45.0							
705.0	46.0					45.8-50.8 ft SHALE, moderately hard, slightly weathered, dark gray (N3), closely to widely fractured, no reaction to HCl, iron oxide staining 45.8-46.2 ft Joint, R.D. = 90°; filling: partly healed, moderately thin quartz fill, moderately weathered; surface: rough, moderately weathered. Fracture set #F-6.		47.0 ft. Top of competant rock
704.0	47.0							
703.0	48.0	R-7	98% (74%)	FD3				
702.0	49.0							
701.0	50.0							
700.0	51.0					50.8-55.8 ft SHALE, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils throughout, trace pyrite at 54.15 ft		
699.0	52.0							
698.0	53.0	R-8	98% (98%)	FD0				
697.0	54.0							
696.0	55.0							
695.0	56.0					55.8-60.8 ft SHALE, moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace fossils throughout, trace pyrite throughout		
694.0	57.0							
693.0	58.0	R-9	100% (100%)	FD0				
692.0	59.0							
691.0								

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. Vanvactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-428

PROJECT NO. 10-4310

COORDINATES

N. 340444.20 ft E. 2404878.07 ft

GROUND SURFACE ELEVATION: 750.57 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
690.0	61.0	R-9		FD0		60.8-90.8 ft SHALE, moderately hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace fossils throughout, trace pyrite throughout		
689.0	62.0							
688.0	63.0	R-10	100% (100%)	FD0				
687.0	64.0							
686.0	65.0							
685.0	66.0							
684.0	67.0							
683.0	68.0	R-11	100% (100%)	FD0				
682.0	69.0							
681.0	70.0							
680.0	71.0							
679.0	72.0							
678.0	73.0	R-12	100% (100%)	FD0				
677.0	74.0							
676.0	75.0							
675.0	76.0							
674.0	77.0							
673.0	78.0	R-13	98% (92%)	FD1		77.7-78 ft Joint, R.D. = 15°; filling: slightly weathered; surface: smooth, planar, slightly weathered. Fracture set #F-7.		
672.0	79.0							
671.0								

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. Vanvactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-428

PROJECT NO. 10-4310

COORDINATES

N. 340444.20 ft E. 2404878.07 ft

GROUND SURFACE ELEVATION: 750.57 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
670.0	81.0	R-13		FD1		60.8-90.8 ft SHALE, moderately hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace fossils throughout, trace pyrite throughout		
669.0	82.0							
668.0	83.0	R-14	100% (100%)	FD0				
667.0	84.0							
666.0	85.0							
665.0	86.0							
664.0	87.0							
663.0	88.0	R-15	92% (92%)	FD0				
662.0	89.0							
661.0	90.0							
660.0	91.0					90.8-105.8 ft SHALE, moderately hard, fresh, dark gray (N3), no reaction to HCl, less abundant fossils and pyrite throughout		
659.0	92.0							
658.0	93.0	R-16	100% (100%)	FD0				
657.0	94.0							
656.0	95.0							
655.0	96.0							
654.0	97.0							
653.0	98.0	R-17	100% (100%)	FD0				
652.0	99.0							
651.0								

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. Vanvactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-428

PROJECT NO. 10-4310

COORDINATES

N. 340444.20 ft E. 2404878.07 ft

GROUND SURFACE ELEVATION: 750.57 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
650.0	101.0	R-17		FD0		90.8-105.8 ft SHALE, moderately hard, fresh, dark gray (N3), no reaction to HCl, less abundant fossils and pyrite throughout		
649.0	102.0							
648.0	103.0							
647.0	104.0	R-18	100% (100%)	FD0				
646.0	105.0							
645.0	106.0					105.8-120.8 ft SHALE, moderately hard, fresh, dark gray (N3), extremely widely fractured, no reaction to HCl, trace fossils throughout, trace pyrite throughout		
644.0	107.0							
643.0	108.0							
642.0	109.0	R-19	100% (100%)	FD0				
641.0	110.0							
640.0	111.0							
639.0	112.0							
638.0	113.0							
637.0	114.0	R-20	100% (100%)	FD0				
636.0	115.0							
635.0	116.0							
634.0	117.0							
633.0	118.0	R-21	100% (100%)	FD0				
632.0	119.0							
631.0								

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. Vanvactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-428

PROJECT NO. 10-4310

COORDINATES

N. 340444.20 ft E. 2404878.07 ft

GROUND SURFACE ELEVATION: 750.57 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
630.0		R-21		FD0		---- Bottom of Boring at 120.80 ft.----		

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Jennifer Ostrowsky

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. Vanvactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
757.0						0.0-1.5 ft Clayey sand, (sc), 80% sand, fine, rounded, very soft hardness; 20% fines, low plasticity, no dilatancy; moderate brown (5YR 4/4), moist, loose, homogeneous, weak cementation	sc	
756.0	1.0	S-1	1-1-2 (3) 47%					
	2.0					1.5-2.5 ft Interval not sampled		
755.0								
754.0	3.0	S-2	5-5-8 (13) 67%			2.5-4.0 ft CLAYEY SAND, (SC), 58% sand, fine to coarse, subrounded to rounded; 42% fines, low plasticity, no dilatancy, no toughness; moderate brown (5YR 4/4), moist, stiff	SC	
753.0	4.0					4.0-5.0 ft Interval not sampled		
752.0	5.0	S-3	7-13-15 (28) 53%			5.0-6.5 ft CLAYEY SAND, (SC), 58% sand, fine to coarse, subrounded; 42% fines, low plasticity, no dilatancy, no toughness; moderate yellowish brown (10YR 5/4), moist, very stiff	SC	
751.0	6.0							
750.0	7.0					6.5-7.5 ft Interval not sampled		
749.0	8.0	S-4	3-5-8 (13) 100%			7.5-9.0 ft CLAYEY SAND, (SC), 58% sand, fine to coarse, subrounded; 42% fines, low plasticity; dark yellowish orange (10YR 6/6), stiff	SC	
748.0	9.0					9.0-10.0 ft Interval not sampled		
747.0	10.0	S-5	18-33-21 (54) 53%			10.0-11.5 ft Poorly graded sand with clay and gravel, (sp-sc), 60% sand, fine to medium, subrounded, soft hardness; 30% gravel, fine to medium, subangular, flat and elongated, medium hardness; 10% fines; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4), dense, homogeneous	sp-sc	
746.0	11.0							
745.0	12.0					11.5-12.5 ft Interval not sampled		
744.0	13.0	S-6	13-15-15 (30) 100%			12.5-14.0 ft SILTY GRAVEL WITH SAND, (GM), 43.02% gravel, fine to medium, subangular, flat and elongated, hard hardness; 36.68% sand, fine, subrounded, soft hardness; 20.3% fines; moderate yellowish brown (10YR 5/4), moist, medium dense, homogeneous, Iron oxidation staining	GM	
743.0	14.0					14.0-15.0 ft Interval not sampled		
742.0	15.0	S-7	19-28-39 (67) 100%			15.0-16.5 ft SILTY GRAVEL WITH SAND, (GM), 43.02% gravel, fine to medium, subangular, medium hardness; 36.68% sand, fine to medium, subrounded, soft hardness; 20.3% fines; maximum grain size = 0.7 inches, moderate yellowish brown (10YR 5/4) and light brown (5YR 5/6), very dense, homogeneous	GM	
741.0	16.0							
740.0	17.0					16.5-17.5 ft Interval not sampled		
739.0	18.0	S-8	15-19-26 (45) 100%			17.5-19.0 ft Clayey sand with gravel, (sc), 70% sand, fine to medium, subrounded, soft hardness; 15% gravel, fine to medium, subangular, flat and elongated, medium hardness; 15% fines, low plasticity; maximum grain size = 0.4 inches, pale yellowish brown (10YR 6/2) and light brown (5YR 5/6), moist, dense, homogeneous	sc	
738.0	19.0					19.0-20.0 ft Interval not sampled		

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
737.0		S-9	50 5%			20.0-20.1 ft No representative sample recovered		
						20.1-21.0 ft Interval not sampled		
736.0	21.0					21.0-25.0 ft SHALE, moderately soft, moderately weathered, pitted, dark gray (N3), closely to moderately fractured, dry, iron oxide staining, intensely weathered thin layers of iron oxide stained shale, striated clay laminae		
735.0	22.0							
734.0	23.0	R-1	100% (33%)					
733.0	24.0							
732.0	25.0					25.0-30.0 ft SHALE, moderately hard, moderately weathered, dark gray (N3), moderately to closely fractured, no reaction to HCl, dry, iron oxide staining		
731.0	26.0					25.71-26.1 ft Joint, R.D. = 29°, closely spaced; filling: not healed; surface: smooth, planar; iron oxide staining on the fracture spaces. Fracture set #F1.		
730.0	27.0	R-2	100% (44%)					
729.0	28.0			FD5		28.3-28.5 ft Joint, R.D. = 70°, closely spaced, slightly open; dry, surface: stepped, planar. Fracture set #F2.		
728.0	29.0							
727.0	30.0					30.0-35.0 ft SHALE, moderately hard, moderately weathered, dark gray (N3), moderately fractured, no reaction to HCl, dry, iron oxide staining		
726.0	31.0					30.4-30.52 ft Joint, R.D. = 22°, very closely spaced, slightly open; surface: stepped, undulating. Fracture set #F3.		
725.0	32.0	R-3	100% (68%)			30.95-31.45 ft Joint, R.D. = 75°, closely spaced; dry but shows evidence of flow, filling: not healed, intensely weathered; surface: slightly rough, intensely weathered; iron oxide on the fracture face. Fracture set #F4.		
724.0	33.0					32.3-32.55 ft Joint, R.D. = 45.°; Fracture set #F5.		
723.0	34.0					32.55-35 ft Joint, R.D. = 86°, very closely to closely spaced; dry, filling: partly healed, slightly weathered; surface: smooth, undulating, slightly weathered. Fracture set #F6.		
722.0	35.0					35.0-40.0 ft SHALE, moderately hard, slightly weathered, grayish black (N2), moderately fractured, no reaction to HCl, dry, iron oxide staining		
721.0	36.0					35-40 ft Joint, R.D. = 79°, very closely to moderately spaced, slightly open; dry, filling: not healed; surface: slightly rough; fracture angles vary from horizontal to 80 °. Fracture set #F6.		
720.0	37.0							
719.0	38.0	R-4	100% (78%)	FD5				
718.0	39.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
717.0						40.0-45.0 ft SHALE, moderately hard, slightly weathered, dark gray (N3), moderately to closely fractured, no reaction to HCl, dry, iron oxide staining		
716.0	41.0			FD5		40-41.5 ft Joint, R.D. = 80°, very closely spaced; dry, filling: partly healed, very thin; surface: slightly rough. Fracture set #F7.		
715.0	42.0	R-5	98% (60%)			41.9-45 ft Joint; surface: slightly rough; closely spaced fractures, multiple angle fractures. Fracture set #F8.		
714.0	43.0							
713.0	44.0							
712.0	45.0					45.0-50.0 ft SHALE, moderately hard, slightly weathered, dark gray (N3), moderately to closely fractured, no reaction to HCl, dry, iron oxide staining		
711.0	46.0			FD5				
710.0	47.0	R-6	94% (84%)			46.8-46.9 ft Joint, R.D. = 20°, closely spaced; dry, surface: smooth. Fracture set #F9.		
709.0	48.0							
708.0	49.0							
707.0	50.0					50.0-55.0 ft SHALE, moderately hard, slightly weathered, dark gray (N3), moderately to widely fractured, dry, iron oxide staining, fossil casts, strong reaction to HCl		
706.0	51.0							
705.0	52.0	R-7	90% (58%)					
704.0	53.0					53.1-53.4 ft Joint, R.D. = 53°; filling: not healed; surface: slightly rough. Fracture set #F10.		
703.0	54.0							
702.0	55.0			FD1		55.0-60.0 ft SHALE, moderately hard, fresh, grayish black (N2), moderately to widely fractured, no reaction to HCl, dry, strong HCl reaction on the fossils, 10° bedding		55.0 - 56.3 ft., SC-1, 08:15, 4/11/10, top of competent rock
701.0	56.0							
700.0	57.0	R-8	100% (100%)					
699.0	58.0							
698.0	59.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
697.0						60.0-70.0 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, dry, 10° bedding planes, strong HCl reaction on the fossil		
696.0	61.0							
695.0	62.0	R-9	100% (100%)	FD1				
694.0	63.0							
693.0	64.0							
692.0	65.0							
691.0	66.0							
690.0	67.0	R-10	100% (100%)					
689.0	68.0							
688.0	69.0							
687.0	70.0					70.0-75.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, dry, 10° bedding planes		
686.0	71.0							
685.0	72.0	R-11	100% (100%)	FD0				
684.0	73.0							
683.0	74.0							
682.0	75.0					75.0-80.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, dry, 10° dip angle of the bedding plane, very small fossils, strong reaction to HCl at 76.1 ft		
681.0	76.0							
680.0	77.0	R-12	100% (100%)					
679.0	78.0							
678.0	79.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
677.0						80.0-85.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), widely to closely fractured, no reaction to HCl, dry, 10° bedding planes		
676.0	81.0							
675.0	82.0	R-13	96% (94%)					
674.0	83.0							
673.0	84.0					83.5-83.6 ft Joint, R.D. = 28°, closely spaced; dry but shows evidence of flow, filling: not healed, slightly weathered; surface: stepped, slightly weathered; iron oxide staining on the fracture. Fracture set #F11.		
672.0	85.0					85.0-90.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), widely to moderately fractured, no reaction to HCl, dry, intensely mechanically broken, 10° bedding		
671.0	86.0							
670.0	87.0	R-14	100% (48%)	FD1				
669.0	88.0							
668.0	89.0							
667.0	90.0					90.0-100.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), very widely to extremely widely fractured, no reaction to HCl, dry, bedding is at a 10° angle		
666.0	91.0							
665.0	92.0	R-15	100% (100%)					
664.0	93.0							
663.0	94.0							
662.0	95.0							
661.0	96.0							
660.0	97.0	R-16	96% (90%)	FD0				
659.0	98.0							
658.0	99.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
657.0						100.0-105.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), very widely fractured, dry, 10° dip angle of the bedding plane		
656.0	101.0							
						101.2-102.2 ft Joint, R.D. = 80°, closely spaced; filling: not healed, very thin calcite, fresh, soft; surface: slightly rough, fresh. Fracture set #F12.		
655.0	102.0	R-17	100% (84%)					
654.0	103.0							103.8-105.0 ft., SC-2, 11:00, 4/11/10
653.0	104.0							
652.0	105.0			FD0		105.0-110.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), very widely fractured, dry, 10° dip angle of the bedding plane. very small fossil, strong reaction to HCl at 105.77 ft., small fleck of pyrite at 108.25 ft		
651.0	106.0							
650.0	107.0	R-18	98% (98%)					
649.0	108.0							
648.0	109.0							
647.0	110.0					110.0-115.0 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, dry, 10° bedding planes, small fossil nodules that have strong reaction to HCl		
646.0	111.0							
645.0	112.0	R-19	100% (100%)					
644.0	113.0							
643.0	114.0							
642.0	115.0			FD0		115.0-120.0 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, dry, 10° bedding plane, small fossil nodules that have strong reaction to HCl, fleck of pyrite at 119.7 ft		
641.0	116.0							
640.0	117.0	R-20	100% (100%)					
639.0	118.0							
638.0	119.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
637.0	120.0					120.0-135.0 ft SHALE, moderately hard, fresh, grayish black (N2), extremely widely fractured, no reaction to HCl, dry, 10° bedding planes, small fossil nodules that have strong reaction to HCl		
636.0	121.0							
635.0	122.0	R-21	100% (100%)					
634.0	123.0							
633.0	124.0							
632.0	125.0							
631.0	126.0							
630.0	127.0	R-22	100% (100%)	FD0				
629.0	128.0							
628.0	129.0							
627.0	130.0							
626.0	131.0							
625.0	132.0	R-23	98% (98%)					
624.0	133.0							
623.0	134.0							
622.0	135.0					135.0-140.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, dry, 10° bedding planes		
621.0	136.0							
620.0	137.0	R-24	100% (100%)	FD0				
619.0	138.0							
618.0	139.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
617.0	140.0					140.0-155.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), extremely widely fractured, no reaction to HCl, dry, 10° bedding planes		
616.0	141.0							
615.0	142.0	R-25	100% (100%)					
614.0	143.0							
613.0	144.0							
612.0	145.0							
611.0	146.0							
610.0	147.0	R-26	100% (100%)					
609.0	148.0							148.3-149.4 ft., SC-3, 14:00, 4/11/10
608.0	149.0							
607.0	150.0			FD0				
606.0	151.0							
605.0	152.0	R-27	96% (96%)					
604.0	153.0							
603.0	154.0							
602.0	155.0					155.0-160.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), extremely widely fractured, no reaction to HCl, dry, 10° bedding planes		
601.0	156.0							
600.0	157.0	R-28	100% (100%)					
599.0	158.0							
598.0	159.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
597.0	160.0					160.0-165.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, dry, 10° bedding planes		
596.0	161.0							
595.0	162.0	R-29	88% (88%)					
594.0	163.0							
593.0	164.0					163.43-164.44 ft Joint, R.D. = 2°, very closely spaced; dry, filling: totally healed, clean calcite, fresh, very soft; surface: stepped, fresh. Fracture set #F13.		
592.0	165.0			FD1		165.0-170.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, dry, 10° bedding planes, pyrite fleck at 168.41 ft		
591.0	166.0					165.11-165.13 ft Joint, R.D. = 4°; filling: totally healed, thin calcite, fresh, soft; surface: fresh; completely healed fracture. Fracture set #F13.		
590.0	167.0	R-36	98% (96%)					
589.0	168.0							
588.0	169.0							
587.0	170.0					170.0-185.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), extremely widely fractured, no reaction to HCl, dry, 10° bedding planes		
586.0	171.0							
585.0	172.0	R-31	100% (100%)					
584.0	173.0							
583.0	174.0							
582.0	175.0			FD0				
581.0	176.0							
580.0	177.0	R-32	100% (100%)					
579.0	178.0							
578.0	179.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
577.0						170.0-185.0 ft SHALE, horizontal, moderately hard, fresh, grayish black (N2), extremely widely fractured, no reaction to HCl, dry, 10° bedding planes		
576.0	181.0							
575.0	182.0	R-33	100% (100%)	FD0				
574.0	183.0							
573.0	184.0							
572.0	185.0					185.0-190.0 ft SHALE, moderately hard, fresh, grayish black (N2), very widely fractured, no reaction to HCl, dry, 10° bedding planes, fossils present		
571.0	186.0							
570.0	187.0	R-34	100% (100%)	FD1				
569.0	188.0							
568.0	189.0							
567.0	190.0					190.0-200.0 ft SHALE, moderately hard, fresh, grayish black (N2), very widely to widely fractured, no reaction to HCl, dry, 10° bedding planes, calcite bedding laminae		
566.0	191.0							
565.0	192.0	R-35	100% (100%)					
564.0	193.0							
563.0	194.0							
562.0	195.0			FD0				
561.0	196.0							
560.0	197.0	R-36	100% (100%)					
559.0	198.0							
558.0	199.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

COORDINATES

N. 340449.24 ft E. 2404939.62 ft

GROUND SURFACE ELEVATION: 757.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
557.0						200.0-220.3 ft SHALE, moderately hard, fresh, grayish black (N2), very widely to extremely widely fractured, no reaction to HCl, dry, 10° bedding planes		
556.0	201.0							200.7 - 201.7 ft., SC-4, 12:00, 4/12/10
555.0	202.0	R-37	100% (100%)					
554.0	203.0							
553.0	204.0							
552.0	205.0							
551.0	206.0							
550.0	207.0	R-38	100% (100%)					
549.0	208.0							
548.0	209.0							
547.0	210.0			FD0				
546.0	211.0							
545.0	212.0	R-39	100% (100%)					
544.0	213.0							
543.0	214.0							
542.0	215.0							
541.0	216.0							
540.0	217.0	R-40	100% (100%)					
539.0	218.0							
538.0	219.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-429

PROJECT NO. 10-4310

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	COORDINATES / DESCRIPTION	USCS SYMBOL	REMARKS
						N. 340449.24 ft E. 2404939.62 ft **GROUND SURFACE ELEVATION: 757.19 ft**		
537.0		R-40				---- Bottom of Boring at 220.30 ft.----		

DATE STARTED: 4/10/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 2-15/16" O.D. Tri-cone Roller Bit, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-430

PROJECT NO. 10-4310

COORDINATES

N. 340146.97 ft E. 2405389.90 ft

GROUND SURFACE ELEVATION: 775.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
775.0						0.0-1.5 ft Organic soil, (ol/oh), 90% fines, non plastic, no dry strength, no dilatancy, no toughness; 10% gravel, fine to coarse, subangular; dark yellowish brown (10YR 4/2), moist, no HCl reaction, with roots	ml	
774.0	1.0	S-1	4-6-12 (18) 60%			0.2-0.5 ft Silt with gravel, (ml), 80% fines, low plasticity, no dry strength, no dilatancy, low toughness; 10% gravel, fine, subangular, medium hardness; 10% sand, fine; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, very stiff	ml ol/oh	
773.0	2.0							
772.0	3.0	S-2	9-40-16 (56) 73%			0.5-1.5 ft Silt with gravel, (ml), 65% fines, low plasticity, no dry strength, no dilatancy, low toughness; 30% gravel, fine to coarse, subangular, medium hardness; 5% sand, fine; maximum grain size = 1.0 inches, light brown (5YR 5/6), moist, no HCl reaction, very stiff	ml ml	
771.0	4.0					1.5-2.5 ft Interval not sampled		
770.0	5.0	S-3	18-13-13 (26) 100%			2.5-2.8 ft Gravelly silt, (ml), 60% fines, low plasticity, no dry strength, no dilatancy, low toughness; 20% gravel, fine to coarse, subangular, medium hardness; 10% sand, fine; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, hard		Attempted Shelby Tube sample, no recovery due to presence of gravels
769.0	6.0					2.8-3.15 ft Gravelly silt, (ml), 60% fines, low plasticity, no dry strength, no dilatancy, low toughness; 30% gravel, fine to medium, subangular, medium hardness; 10% sand, fine; maximum grain size = 1.0 inches, light brown (5YR 5/6), moist, no HCl reaction, hard	SC	
768.0	7.0							
767.0	8.0	S-4	11-16-21 (37) 100%			3.15-4.0 ft 100% gravel, medium; maximum grain size = 1.0 inches, light olive gray (5Y 5/2), no HCl reaction, very dense, sandstone boulder	SC	
766.0	9.0					4.0-5.0 ft Interval not sampled		
765.0	10.0	S-5	2-10-7 (17) 100%			5.0-5.4 ft 90% gravel, medium to coarse, subangular, very hard hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, light olive gray (5Y 5/2) and light olive brown (5Y 5/6), no HCl reaction, medium dense, sandstone boulders	ml/mh	
764.0	11.0					5.4-6.5 ft CLAYEY SAND WITH GRAVEL, (SC), 54% sand, fine to coarse; 26% gravel, fine to medium, subangular, very hard hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.8 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, medium dense	gm	
763.0	12.0					6.5-7.5 ft Interval not sampled		
762.0	13.0	S-6	16-18-30 (48) 100%			7.5-9.0 ft CLAYEY SAND WITH GRAVEL, (SC), 54% sand, fine to coarse; 26% gravel, fine to medium, subangular, hard hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.8 inches, moderate brown (5YR 3/4), moist, no HCl reaction, medium dense	ml	12.5 ft. Top of decomposed shale
761.0	14.0					9.0-10.0 ft Interval not sampled	ml	
760.0	15.0	S-7	10-27-50 (77) 100%			10.0-10.4 ft Gravelly silt/gravelly elastic silt, (ml/mh), 55% fines, high plasticity, no dry strength, no dilatancy, low toughness; 40% gravel, fine to coarse, subangular, hard hardness; 5% sand, fine; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, medium dense	cl-ml	
759.0	16.0					10.4-11.5 ft Silty gravel, (gm), 70% gravel, fine to coarse, subangular, hard hardness; 30% fines, low plasticity, no dry strength, no dilatancy, low toughness; 0% sand; maximum grain size = 1.5 inches, light brown (5YR 5/6), moist, no HCl reaction, medium dense	gc	
758.0	17.0							
757.0	18.0	S-8	50/5 100%			11.5-12.5 ft Interval not sampled	gw-gc	
756.0	19.0					12.5-13.6 ft Sandy silt, (ml), 50% fines, non plastic, no dry strength, no dilatancy, no toughness; 40% sand, fine; 10% gravel, fine to coarse, subangular, hard hardness; maximum grain size = 2.0 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, hard		

DATE STARTED: 4/23/10
DATE FINISHED: 4/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-430

PROJECT NO. 10-4310

COORDINATES

N. 340146.97 ft E. 2405389.90 ft

GROUND SURFACE ELEVATION: 775.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
755.0		S-9	50/3 100%			13.6-14.0 ft Sandy silt with gravel, (ml), 50% fines, non plastic, no dry strength, no dilatancy, no toughness; 30% sand, fine; 20% gravel, fine to coarse, subangular, hard hardness; maximum grain size = 2.0 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, hard	gw	20.25 ft. Sample lost during casing installation, intensely weathered shale, casing set 21.8ft then lowered to 25.0 ft after first run
754.0	21.0					14.0-15.0 ft Interval not sampled		
753.0	22.0					15.0-15.6 ft Lean clay/silt, (cl-ml), 90% fines, high plasticity, no dry strength, no dilatancy, medium toughness; 10% gravel, fine to coarse, subangular, hard hardness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, hard		
752.0	23.0	R-1	100% (0%)			15.6-16.5 ft Clayey gravel, (gc), 80% gravel, fine to coarse, hard hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, light olive gray (5Y 5/2), no HCl reaction, very dense		
751.0	24.0					16.5-17.5 ft Interval not sampled		
750.0	25.0			FD8		17.5-17.9 ft Well graded gravel with clay, (gw-gc), 90% gravel, fine to coarse, hard hardness; 10% fines, low plasticity, low toughness; maximum grain size = 1.0 inches, light olive gray (5Y 5/2), no HCl reaction, very dense		
749.0	26.0					17.9-20.0 ft Interval not sampled		
748.0	27.0	R-2	100% (9%)			20.0-20.25 ft Well graded gravel, (gw), 95% gravel, fine to coarse, hard hardness; 5% fines, low plasticity, low toughness; maximum grain size = 1.0 inches, light olive gray (5Y 5/2), no HCl reaction		
747.0	28.0					20.25-21.8 ft Sample not recovered		
746.0	29.0					21.8-29.7 ft SHALE, soft to moderately soft, intensely to very intensely weathered, moderate yellowish brown (10YR 5/4) with medium dark gray (N4), very closely to closely fractured, no reaction to HCl, iron oxide staining		
745.0	30.0					21.8-39.3 ft Bedding plane separation, R.D. = 10°, very closely to moderately spaced; surface: smooth, planar; iron oxide staining. 22.3-36 ft R.D. = 90°, closely to moderately spaced; filling: not healed; surface: rough, planar; iron oxide staining. 22.8-39.7 ft R.D. = 56°, closely to moderately spaced; filling: not healed; surface: rough, planar; iron oxide staining.		30.6-31.2 ft., SC-1, 12:30, 4/23/10
744.0	31.0							
743.0	32.0	R-3	100% (68%)			29.7-39.7 ft SHALE, moderately soft to moderately hard, intensely to moderately weathered, moderate yellowish brown (10YR 5/4) with medium dark gray (N4), closely to moderately fractured, no reaction to HCl, iron oxide staining		
742.0	33.0							
741.0	34.0			FD5				
740.0	35.0							
739.0	36.0							
738.0	37.0	R-4	100% (40%)					
737.0	38.0							
736.0	39.0							
		R-5						

DATE STARTED: 4/23/10
DATE FINISHED: 4/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-430

PROJECT NO. 10-4310

COORDINATES

N. 340146.97 ft E. 2405389.90 ft

GROUND SURFACE ELEVATION: 775.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
735.0				FD6		39.7-54.7 ft R.D. = 56°, moderately to widely spaced; filling: not healed; surface: rough, planar; iron oxide staining.		
734.0	41.0					39.9-49.7 ft R.D. = 10°, closely to moderately spaced; filling: not healed; surface: smooth, planar, moderately weathered; iron oxide staining.		
733.0	42.0	R-5	100% (34%)			39.7-49.7 ft SHALE, moderately soft to soft, intensely to moderately weathered, moderate yellowish brown (10YR 5/4) with medium dark gray (N4), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
732.0	43.0							
731.0	44.0							
730.0	45.0			FD6				
729.0	46.0							
728.0	47.0	R-6	100% (22%)					
727.0	48.0							
726.0	49.0					49-49.5 ft R.D. = 36°, closely spaced; filling: not healed; surface: rough, undulating; iron oxide staining.		
725.0	50.0					49.7-54.7 ft SHALE, moderately hard to moderately soft, fresh to moderately weathered, dark gray (N3) with moderate yellowish brown (10YR 5/4), closely to moderately fractured, no reaction to HCl, iron oxide staining		
724.0	51.0					49.8-64.7 ft Bedding plane separation, R.D. = 10°, moderately to closely spaced; filling: not healed; surface: smooth, planar, slightly weathered; some contain iron oxide staining while others are unaltered.		
723.0	52.0	R-7	100% (0%)			52-62.1 ft R.D. = 36°, moderately to closely spaced; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		
722.0	53.0							
721.0	54.0							
720.0	55.0			FD6		54.7-64.7 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		
719.0	56.0					55.2-57.9 ft R.D. = 51-56°, very closely to widely spaced; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		
718.0	57.0	R-8	100% (33%)					
717.0	58.0							
716.0	59.0							58.5 - 59.0 ft., SC-2, 14:00, 4/23/10
		R-9				59.35-59.6 ft Random fracture, R.D. = 72°; filling: not healed; surface: rough,		

DATE STARTED: 4/23/10
DATE FINISHED: 4/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-430

PROJECT NO. 10-4310

COORDINATES

N. 340146.97 ft E. 2405389.90 ft

GROUND SURFACE ELEVATION: 775.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
715.0						planar, slightly weathered; iron oxide staining.		
	61.0					54.7-64.7 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		
714.0						60.6-63.5 ft R.D. = 36°, moderately spaced; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		
	62.0	R-9	97% (42%)	FD6		60.8-62.9 ft R.D. = 84-86°, very closely spaced; filling: totally healed, thin calcite; surface: slightly weathered; Sporadic zones where calcite contains iron oxide staining.		
713.0								
	63.0							
712.0						63.4-66 ft R.D. = 90°; filling: not healed; surface: rough, planar; iron oxide staining.		
	64.0							
711.0								
	65.0					64.7-74.7 ft SHALE, hard to soft, fresh to very intensely weathered, dark gray (N3) with moderate yellowish brown (10YR 5/4), closely to moderately fractured, no reaction to HCl, iron oxide staining, zones of intensely (66.6-66.8 ft, 68.9-69.7 ft) to very intensely (67.9-68.9 ft) weathered rock, moderately thick quartz layer at 73.15-73.45 ft		
710.0								
	66.0							
709.0								
	67.0	R-10	92% (11%)			64.7-74.7 ft Bedding plane separation, R.D. = 10°, closely to moderately spaced; filling: not healed; surface: smooth, planar, slightly weathered; some contain iron oxide staining.		
708.0						66.3-67.8 ft R.D. = 90°, closely spaced; filling: not healed, quartz, slightly to moderately weathered; surface: rough, planar, slightly to moderately weathered; iron oxide staining.		
	68.0							
707.0								
	69.0							
706.0								
	70.0					69.6-79.7 ft R.D. = 36°, closely to moderately spaced; filling: not healed; surface: rough, planar, slightly weathered; some contain iron oxide staining.		
705.0						70.4-73.5 ft R.D. = 70-76°, widely spaced; filling: totally healed, quartz, slightly weathered; surface: rough, planar, slightly weathered.		
	71.0							
704.0								
	72.0	R-11	100% (33%)	FD6				
703.0								
	73.0							
702.0								
	74.0							
701.0								
	75.0					74.7-84.7 ft SHALE, moderately soft to hard, fresh to moderately weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
700.0						75.5-82.3 ft R.D. = 36°, closely to moderately spaced; filling: totally healed, very thin; surface: rough, planar, slightly weathered; iron oxide staining on non healed surfaces.		
	76.0							
699.0								
	77.0	R-12	100% (45%)			76.9-89.3 ft R.D. = 10°, closely to widely spaced; filling: not healed, clay; surface: smooth, planar.		
698.0								
	78.0							
697.0								
	79.0							
696.0		R-13						

DATE STARTED: 4/23/10
DATE FINISHED: 4/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-430

PROJECT NO. 10-4310

COORDINATES

N. 340146.97 ft E. 2405389.90 ft

GROUND SURFACE ELEVATION: 775.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
695.0				FD6		74.7-84.7 ft SHALE, moderately soft to hard, fresh to moderately weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
694.0	81.0							
693.0	82.0	R-13	100% (38%)	FD6				
692.0	83.0							
691.0	84.0							
690.0	85.0					84.7-99.7 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl		Top of competent rock at 84.7 ft
689.0	86.0							
688.0	87.0	R-14	100% (74%)					
687.0	88.0							
686.0	89.0					89.3-90.1 ft R.D. = 72°; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		
685.0	90.0							
684.0	91.0					91.3-97.7 ft R.D. = 10°, moderately to widely spaced; surface: smooth, planar.		
683.0	92.0	R-15	100% (68%)	FD4				
682.0	93.0							
681.0	94.0					93.6-99.6 ft R.D. = 54-56°, closely to widely spaced; filling: not healed; surface: rough, planar, slightly weathered; few fractures contain iron oxide staining.		
680.0	95.0							
679.0	96.0							
678.0	97.0	R-16	100% (84%)					
677.0	98.0							
676.0	99.0							
		R-17						

DATE STARTED: 4/23/10
DATE FINISHED: 4/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-430

PROJECT NO. 10-4310

COORDINATES

N. 340146.97 ft E. 2405389.90 ft

GROUND SURFACE ELEVATION: 775.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
675.0				FD4		99.7-112.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, trace pyrite		
	101.0					100.3-112.5 ft R.D. = 36°, closely to widely spaced; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining (99.7-104.7 ft,106.3-112.5 ft), 105.8-106.0 ft fractures are totally healed with quartz, fresh, very thin, 110.4-111.7 ft totally healed with quartz, fresh-slightly weather quartz, very thin. 112.2 ft moderately thick fresh quartz.		
674.0								
	102.0	R-17	100% (86%)					
673.0								
	103.0							
672.0								
	104.0							
671.0								
	105.0					104.9-110 ft R.D. = 54-56°; filling: totally healed, thin quartz, fresh; surface: rough, planar, fresh to slightly weathered; fracture at 108.6 ft contains trace to moderate iron oxide staining.		
670.0								
	106.0			FD4		105.1-112.3 ft R.D. = 10°, very closely to very widely spaced; filling: totally healed, quartz, fresh; surface: smooth, planar, fresh to slightly weathered; fracture at end of zone contains iron oxide staining.		
669.0								
	107.0	R-18	100% (84%)			106-115.1 ft R.D. = 90°, very widely spaced; filling: moderately healed, very thin quartz, fresh; surface: planar, fresh.		
668.0						106.9-107.3 ft R.D. = 76°; filling: not healed; surface: rough, planar.		
	108.0							
667.0								
	109.0					108.6-108.7 ft R.D. = 36°; filling: not healed, fresh; surface: smooth, planar, fresh to slightly weathered; slickensides on fracture face, trace iron oxide staining.		
666.0								
	110.0							
665.0								
	111.0							
664.0								
	112.0	R-19	100% (66%)					
663.0						112.5-114.2 ft SHALE, moderately soft to moderately hard, slightly to moderately weathered, dark gray (N3) with light olive brown (5Y 5/6), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
	113.0							
662.0								
	114.0			FD6		112.5-114.2 ft R.D. = 36°, very closely to moderately spaced; filling: totally healed, thin quartz, slightly weathered; surface: rough, planar, slightly weathered; 112.5-113.65 ft, quartz filling with fresh and iron oxide staining, iron oxide staining on nonhealed fracture faces.		
661.0						113-114.1 ft Bedding plane separation, R.D. = 10°; filling: totally healed, very thin quartz, slightly weathered; surface: smooth, planar, slightly to slightly weathered; iron oxide staining.		
	115.0							
660.0								
	116.0					114.2-119.7 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl, trace pyrite		
659.0								
	117.0	R-20	100% (86%)	FD1		115.6-119.5 ft R.D. = 36°, very closely to widely spaced; filling: not healed; surface: rough, undulating, slightly weathered; 115.6 and 118.3 ft. fractures are totally healed with quartz, fresh to slightly weathered filling, other fractures contain iron oxide staining.		
658.0						115.61-119.2 ft R.D. = 56°, very closely to widely spaced; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		
	118.0							
657.0								
	119.0			FD7		116.9-119.4 ft Bedding plane separation, R.D. = 10°, moderately spaced; filling: totally healed, very thin quartz, fresh; surface: smooth, planar, fresh.		
656.0								
		R-21						

DATE STARTED: 4/23/10
DATE FINISHED: 4/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-430

PROJECT NO. 10-4310

COORDINATES

N. 340146.97 ft E. 2405389.90 ft

GROUND SURFACE ELEVATION: 775.32 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
655.0				FD4		119.7-125.85 ft R.D. = 36°, closely to very widely spaced; surface: rough, planar; fracture at 119.7 ft only totally healed fracture, fresh, very thin quartz.		
	121.0	R-21	100% (87%)			119.7-131.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, trace pyrite and calcite		
654.0						120.5-121.2 ft R.D. = 56°, closely spaced; filling: totally healed, very thin quartz, fresh; surface: fresh.		
	122.0					121.1-130.6 ft Bedding plane separation, R.D. = 10°, very widely to moderately spaced; filling: not healed; surface: smooth, planar.		
653.0						121.95-122.6 ft R.D. = 80°; filling: not healed; surface: rough, planar.		
	123.0							
652.0				FD4				
		R-22	100% (84%)					
	124.0							
651.0								
	125.0							
650.0								
	126.0							
649.0								
	127.0							
648.0								
	128.0			FD3				
647.0								
		R-23	100% (100%)					
	129.0							
646.0								
	130.0							
645.0				FD5				
	131.0					---- Bottom of Boring at 131.20 ft.----		

DATE STARTED: 4/23/10
DATE FINISHED: 4/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES

N. 340160.61 ft E. 2405519.42 ft

GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
783.0						0.0-1.5 ft SANDY LEAN CLAY, (CL), 56% fines, low plasticity, no dry strength, no dilatancy, low toughness; 38% sand, fine to coarse, subangular; 6% gravel, fine to medium, subangular; maximum grain size = 0.75 inches, moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6), moist, no HCl reaction, medium stiff, with roots	CL	
	1.0	S-1	4-3-3 (6) 100%					
782.0								
	2.0							
781.0						2.5-3.5 ft SANDY LEAN CLAY, (CL), 56% fines, low plasticity, no dry strength, no dilatancy, low toughness; 38% sand, fine to coarse, subangular; 6% gravel, fine to medium, subangular, hard hardness; maximum grain size = 0.75 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, medium stiff, with roots	CL	
	3.0	S-2	10-12-20 (32) 80%					
780.0						3.5-4.0 ft Well graded gravel, (gw), 100% gravel, fine to coarse, subangular; 0% sand; 0% fines; maximum grain size = 1.0 inches, medium gray (N5) to medium dark gray (N4), no HCl reaction, dense	gw	
	4.0					4.0-5.0 ft Interval not sampled		
779.0								
	5.0					5.0-6.1 ft Gravelly silt, (ml), 60% fines, low plasticity, medium toughness; 30% gravel, fine to coarse, subangular, very hard hardness; 10% sand, fine to coarse, subangular; moderate yellowish brown (10YR 5/4), moist, no HCl reaction	ml	5.0-6.1 ft, ST-1, 400 psi of down pressure
778.0		S T -1	100%					
	6.0					6.1-7.5 ft Interval not sampled		
777.0								
	7.0							
776.0						7.5-8.2 ft Gravelly lean clay/gravelly silt, (cl-ml), 60% fines, high plasticity, no dry strength, no dilatancy, low toughness; 30% gravel, fine to coarse, subangular, very hard hardness; 10% sand, fine to coarse, subangular; maximum grain size = 1.5 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very dense	cl-ml	
	8.0	S-3	1-21-38 (59) 87%				gw	
775.0						8.2-8.5 ft Well graded gravel, (gw), 100% gravel, fine to coarse, subangular, very hard hardness; maximum grain size = 1.5 inches, light gray (N7), no HCl reaction, very dense, granite boulder	ml/mh	
	9.0					8.5-9.0 ft Sandy silt with gravel/sandy elastic silt with gravel, (ml/mh), 65% fines, low plasticity, no dry strength, no dilatancy, low toughness; 20% sand, fine to medium, subangular; 15% gravel, fine to coarse, subangular, hard hardness; maximum grain size = 1.5 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very dense		
774.0								

DATE STARTED: 4/24/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES

N. 340160.61 ft E. 2405519.42 ft

GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
773.0						9.0-10.0 ft Interval not sampled	gw	
						10.0-10.1 ft Well graded gravel, (gw), 100% gravel, fine to coarse, subangular; maximum grain size = 0.5 inches, grayish red (5R 4/2), strong HCl reaction, dense	ml/mh	
		S-4	8-20-18 (38) 67%			10.1-10.45 ft Silt with sand/elastic silt with sand, (ml/mh), 80% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 10% gravel, fine to coarse, subangular; 10% sand, fine to medium; maximum grain size = 0.5 inches, moderate brown (5YR 3/4), moist, no HCl reaction, hard	ml/mh	
772.0	11.0					10.45-10.8 ft Gravelly silt/gravelly elastic silt, (ml/mh), 70% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 20% gravel, fine to medium, subangular; 10% sand, fine to medium; maximum grain size = 0.5 inches, moderate brown (5YR 3/4), moist, no HCl reaction, hard	ml/mh	
771.0	12.0					10.8-11.5 ft Gravelly silt/gravelly elastic silt, (ml/mh), 60% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 30% gravel, fine to medium, subangular; 10% sand, fine to coarse; maximum grain size = 0.5 inches, moderate brown (5YR 3/4), moist, no HCl reaction, hard	sm	
	13.0						gw	
770.0		S-5	10-11-13 (24) 100%			11.5-12.5 ft Interval not sampled		
						12.5-12.75 ft Silty sand with gravel, (sm), 50% sand, fine to coarse, subangular; 30% fines, low plasticity, no dry strength, no dilatancy, no toughness; 20% gravel, fine to coarse, subangular, very hard hardness; maximum grain size = 0.5 inches, moderate brown (5YR 3/4), moist, weak HCl reaction, medium dense		
769.0	14.0					12.75-12.9 ft Well graded gravel, (gw), 100% gravel, fine to coarse, subangular, hard hardness; 0% sand; 0% fines; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4), no HCl reaction		
						12.9-14.0 ft SHALE, soft, decomposed, yellowish gray (5Y 7/2), no reaction to HCl, iron oxide staining, contains pockets of silt/clay moderate brown (5YR 4/4)		
768.0	15.0					14.0-15.0 ft Interval not sampled		
		S-6	9-8-13 (21) 100%			15.0-16.5 ft SHALE, soft, decomposed, yellowish gray (5Y 7/2), no reaction to HCl, iron oxide staining, contains pockets of silt/clay moderate brown (5YR 4/4)		
767.0	16.0							
						16.5-17.5 ft Interval not sampled		
766.0	17.0							
						17.5-18.4 ft SHALE, soft, decomposed, yellowish gray (5Y 7/2), no reaction to HCl, iron oxide staining, contains pockets of silt/clay moderate brown (5YR 4/4)		
765.0	18.0	S-7	40-50/5 100%					
						18.4-20.0 ft Interval not sampled		
764.0	19.0							

DATE STARTED: 4/24/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES

N. 340160.61 ft E. 2405519.42 ft

GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
763.0		S-8	50/3 100%			20.0-20.25 ft SHALE, decomposed, yellowish gray (5Y 7/2), no reaction to HCl, iron oxide staining 20.3-30.7 ft SHALE, moderately soft, intensely to very intensely weathered, yellowish gray (5Y 7/2) with medium gray (N5), very closely to moderately fractured, no reaction to HCl, iron oxide staining 20.5-38.3 ft R.D. = 56°, closely to moderately spaced; filling: not healed; surface: rough, planar; iron oxide staining. 21-39.2 ft Bedding plane separation, R.D. = 10°, closely to widely spaced; filling: not healed; surface: smooth, planar, intensely weathered; iron oxide staining, very thin to thin clay fill. 21.6-37.8 ft R.D. = 36°, closely to moderately spaced; filling: not healed; surface: rough, planar, intensely weathered; iron oxide staining and trace clay fill.		Casing set at 24.2 for run 1, water circulation present
762.0	21.0							
761.0	22.0	R -1	100% (12%)	FD6				
760.0	23.0							
759.0	24.0							
758.0	25.0							
757.0	26.0							
756.0	27.0	R -2	100% (35%)	FD5				
755.0	28.0							
754.0	29.0							SC-1, 28.75-29.2 ft. 4/26/10, 0920
		R -3	100% (54%)			29.7-30.8 ft R.D. = 72°; filling: not healed; surface: rough, planar; iron oxide		

DATE STARTED: 4/24/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES

N. 340160.61 ft E. 2405519.42 ft

GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
753.0						staining. 20.3-30.7 ft SHALE, moderately soft, intensely to very intensely weathered, yellowish gray (5Y 7/2) with medium gray (N5), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
	31.0					30.7-36.9 ft SHALE, moderately soft to moderately hard, moderately to intensely weathered, medium dark gray (N4) with yellowish gray (5Y 7/2), moderately to closely fractured, no reaction to HCl, iron oxide staining		
752.0								
	32.0	R -3	100% (54%)	FD5				
751.0								
	33.0							
750.0								
	34.0					33.9-35.4 ft R.D. = 90°; filling: not healed; surface: rough, planar; iron oxide staining.		~34.2 ft, water return drops to approximately 50%
749.0								
	35.0							
748.0								
	36.0							
747.0				FD6				
		R -4	98% (73%)					
	37.0					36.9-39.5 ft SHALE, moderately soft to moderately hard, intensely to very intensely weathered, yellowish gray (5Y 7/2) with medium gray (N5), closely to moderately fractured, no reaction to HCl, iron oxide staining		
746.0								
	38.0							
745.0								
	39.0							
744.0				FD5				
		R -5	100% (74%)			39.6-58.9 ft R.D. = 10°, moderately spaced; filling: not healed; surface: smooth, planar, slightly weathered; iron oxide staining.		

DATE STARTED: 4/24/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES

N. 340160.61 ft E. 2405519.42 ft

GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
743.0						39.5-44.2 ft SHALE, moderately hard to moderately soft, moderately to slightly weathered, medium dark gray (N4) with yellowish gray (5Y 7/2), moderately fractured, no reaction to HCl, iron oxide staining 40-59.2 ft R.D. = 56°, very closely to widely spaced; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		
	41.0							
742.0								
	42.0	R -5	100% (74%)					
741.0								
	43.0							
740.0				FD5				
	44.0					43.8-58.5 ft R.D. = 36°; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		
739.0						44.2-49.2 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3) with yellowish gray (5Y 7/2), moderately fractured, no reaction to HCl, iron oxide staining		
	45.0							
738.0								
	46.0							
737.0								
	47.0	R -6	100% (36%)					
736.0								
	48.0							
735.0				FD6				
	49.0							
734.0						49.2-53.7 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl		
		R -7	98% (56%)					

DATE STARTED: 4/24/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES

N. 340160.61 ft E. 2405519.42 ft

GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
733.0						49.2-53.7 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl		
	51.0							
732.0								
	52.0	R -7	98% (56%)					
731.0								
	53.0							
730.0								
	54.0					53.7-56.0 ft SHALE, moderately hard to moderately soft, moderately weathered, yellowish gray (5Y 7/2) with, very closely to closely fractured, no reaction to HCl, iron oxide staining		
729.0				FD6				
	55.0							
728.0								
	56.0					56.0-59.2 ft SHALE, moderately hard to hard, moderately to slightly weathered, dark gray (N3) with yellowish gray (5Y 7/2), moderately to very closely fractured, no reaction to HCl, iron oxide staining		
727.0								
		R -8	98% (34%)					
	57.0							
726.0								
	58.0							
725.0								
	59.0							
724.0						59.2-74.2 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), moderately to closely fractured, no reaction to HCl, hydrocarbon staining, trace pyrite, oily sheen on rock surface		
		R -9	94% (56%)	FD6		59.2-73.2 ft R.D. = 36°, moderately to widely spaced; filling: not healed;		

DATE STARTED: 4/24/10
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FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES
N. 340160.61 ft E. 2405519.42 ft
GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
723.0						surface: rough, planar, slightly weathered; iron oxide staining.		
	61.0							
722.0						59.5-63.8 ft R.D. = 56°, moderately to closely spaced; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		
	62.0	R -9	94% (56%)			59.7-74.2 ft Bedding plane separation, R.D. = 10°, moderately to closely spaced; surface: smooth, planar, slightly weathered; iron oxide staining.		
721.0						59.2-74.2 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), moderately to closely fractured, no reaction to HCl, hydrocarbon staining, trace pyrite, oily sheen on rock surface		
	63.0							
720.0								
	64.0							
719.0								
	65.0			FD6				
718.0								
	66.0							
717.0								
		R -10	100% (48%)					
	67.0							
716.0								SC-2, 67.6-68.2 ft, 4/26/10, 12:10
	68.0							
715.0								
	69.0							69.0 ft, loose all water return
714.0								
		R -11	100% (56%)			69.5-77.6 ft R.D. = 72-74°, very widely spaced; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		

DATE STARTED: 4/24/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES

N. 340160.61 ft E. 2405519.42 ft

GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
713.0						59.2-74.2 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), moderately to closely fractured, no reaction to HCl, hydrocarbon staining, trace pyrite, oily sheen on rock surface		
	71.0							
712.0								
	72.0	R -11	100% (56%)	FD6				
711.0								
	73.0							
710.0								
	74.0							
709.0						74.2-79.2 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3) with yellowish gray (5Y 7/2), moderately to closely fractured, no reaction to HCl, iron oxide staining, trace pyrite 74.7-89.2 ft Bedding plane separation, R.D. = 10°, very closely to widely spaced; filling: not healed; surface: smooth, planar, slightly weathered; most are fresh with iron oxide staining on the rest. 75-87.9 ft R.D. = 56°, widely to very closely spaced; filling: not healed; surface: rough, planar, slightly weathered; iron oxide staining.		
	75.0							
708.0								
	76.0							
707.0								
		R -12	100% (54%)					
	77.0			FD6				
706.0								
	78.0							
705.0						78.2-88.6 ft R.D. = 36°, very closely to widely spaced; filling: not healed; surface: rough, planar, slightly weathered.		
	79.0							
704.0						79.2-89.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl, trace pyrite		
		R -13	98% (36%)					

DATE STARTED: 4/24/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES

N. 340160.61 ft E. 2405519.42 ft

GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
703.0						79.2-89.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl, trace pyrite		
	81.0							
702.0								
	82.0	R -13	98% (36%)					
701.0								
	83.0							
700.0								
	84.0							
699.0				FD6				
	85.0							
698.0								
	86.0							
697.0								
		R -14	100% (76%)					
	87.0							
696.0								
	88.0							
695.0								
	89.0							
694.0						89.2-96.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl, trace pyrite		
		R -15	98% (78%)	FD6		89.2-96 ft Bedding plane separation, R.D. = 10°, very closely to moderately spaced; filling: not healed; surface: smooth, planar, slightly weathered; iron		

DATE STARTED: 4/24/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES
N. 340160.61 ft E. 2405519.42 ft
GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
693.0						oxide staining. 89.2-96.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl, trace pyrite		
692.0	91.0							
691.0	92.0	R -15	98% (78%)					
690.0	93.0							
689.0	94.0							
688.0	95.0			FD6				
687.0	96.0					96.0-98.2 ft SHALE, moderately hard to moderately soft, moderately weathered, dark gray (N3) with yellowish gray (5Y 7/2), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
686.0	97.0	R -16	100% (30%)			96-98.2 ft R.D. = 10°, very closely to closely spaced; filling: not healed; surface: smooth, planar, moderately weathered; iron oxide staining. 96.6-96.8 ft R.D. = 56°; surface: rough, planar, moderately weathered; iron oxide staining.		
685.0	98.0					98.2-104.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl 98.4-103.3 ft R.D. = 10°, very closely to widely spaced; filling: not healed; surface: smooth, planar; 100.55 and 106.0 ft, moderately healed, fresh with very thin calcite.		
684.0	99.0	R -17	100% (84%)	FD4		99.2-99.7 ft R.D. = 36°; filling: not healed; surface: rough, planar.		

DATE STARTED: 4/24/10
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FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-431

PROJECT NO. 10-4310

COORDINATES

N. 340160.61 ft E. 2405519.42 ft

GROUND SURFACE ELEVATION: 783.22 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
683.0						98.2-104.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl		
	101.0							
682.0								
	102.0	R -17	100% (84%)	FD4				
681.0								
	103.0							
680.0								
	104.0					103.7-104 ft Fracture, R.D. = 56°; filling: totally healed, very thin calcite.		
						---- Bottom of Boring at 104.20 ft.----		

DATE STARTED: 4/24/10
DATE FINISHED: 4/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-432

PROJECT NO. 10-4310

COORDINATES

N. 340173.52 ft E. 2405665.64 ft

GROUND SURFACE ELEVATION: 789.49 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
789.0	1.0	S-1	2-3-14 (17) 93%			0.0-1.5 ft Organic soil with gravel, (ol/oh), 80% fines, low plasticity, no dry strength, slow dilatancy, low toughness; 15% gravel, medium, subangular, flat, hard hardness; 5% sand, fine, subangular; dark yellowish brown (10YR 4/2), organic odor, moist, with roots, some rock fragments, maximum grain size if trace of fine gravel	ol/oh	
788.0	2.0					1.5-2.5 ft Interval not sampled		
787.0	3.0	S-2	10-20-32 (52) 100%			2.5-3.0 ft Organic soil with gravel, (ol/oh), 80% fines, low plasticity, no dry strength, slow dilatancy, low toughness; 15% gravel, medium, subangular, flat, hard hardness; 5% sand, fine, subangular; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2), organic odor, moist, with roots, some rock fragments	ol/oh	
786.0	4.0	ST-1	100%			3.0-4.0 ft Silty gravel with sand, (gm), 40% gravel, fine; 30% sand, fine to coarse, angular; 30% fines, low plasticity, no dry strength, no dilatancy, low toughness; moderate brown (5YR 3/4) to moderate yellowish brown (10YR 5/4), no odor, moist, no HCl reaction, some rock fragments	gm	
785.0	5.0					4.0-4.5 ft Poorly graded sand with gravel, (sp), 70% sand, fine to coarse, subangular; 25% gravel, fine, angular, medium hardness; 5% fines, no dry strength, no dilatancy; moderate yellowish brown (10YR 5/4), no odor, dry, no HCl reaction, trace rock fragments	sp	4.0-4.5 ft, ST-1 down pressure of 500 psi
784.0	6.0	S-3	12-20-21 (41) 100%			4.5-5.0 ft Interval not sampled	sm	
783.0	7.0					5.0-6.5 ft Silty sand with gravel, (sm), 50% sand, fine to medium, subangular; 25% gravel, fine to coarse, angular, flat, medium hardness; 25% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, moderate brown (5YR 3/4), no odor, moist, no HCl reaction, some rock fragments, trace coal, fragments of sandstone boulder		
782.0	8.0	S-4	12-12-50/2 100%			6.5-7.5 ft Interval not sampled	sm	
781.0	9.0					7.5-8.65 ft Silty sand with gravel, (sm), 50% sand, fine to medium, subangular; 25% gravel, fine to coarse, angular, flat, medium hardness; 25% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, moderate brown (5YR 3/4), no odor, moist, no HCl reaction, some rock fragments, trace coal, fragments of sandstone boulder		
780.0	10.0					8.65-10.0 ft Interval not sampled	GC-GM	
779.0	11.0	S-5	35-26-30 (56) 100%			10.0-11.5 ft SILTY, CLAYEY GRAVEL WITH SAND, (GC-GM), 58% gravel, fine to coarse, angular, flat, medium hardness; 28% sand, fine to coarse, subangular; 14% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.8 inches, moderate brown (5YR 3/4), moist, no HCl reaction, fragments of sandstone boulder		
778.0	12.0					11.5-12.5 ft Interval not sampled	GC-GM	
777.0	13.0	S-6	32-30-24 (54) 67%			12.5-14.0 ft SILTY, CLAYEY GRAVEL WITH SAND, (GC-GM), 58% gravel, fine to coarse, angular, flat, medium hardness; 28% sand, fine to coarse, subangular; 14% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.8 inches, moderate brown (5YR 3/4), moist, no HCl reaction, fragments of sandstone boulder		
776.0	14.0					14.0-15.0 ft Interval not sampled	sm	
775.0	15.0	S-7	50-26-26 (52) 80%			15.0-16.5 ft Silty sand with gravel, (sm), 50% sand, fine to medium, subangular; 25% gravel, fine to coarse, angular, flat, medium hardness; 25% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, moderate brown (5YR 3/4), no odor, moist, no HCl reaction, some rock fragments, trace coal, fragments of sandstone boulder showing cross bedding 15 to 16.5 ft (alluvium)		
774.0	16.0					16.5-17.5 ft Interval not sampled	ml	
773.0	17.0							
772.0	18.0	S-8	10-25-47 (72) 93%					
771.0	19.0							
770.0								

DATE STARTED: 4/27/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-432

PROJECT NO. 10-4310

COORDINATES

N. 340173.52 ft E. 2405665.64 ft

GROUND SURFACE ELEVATION: 789.49 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
769.0	21.0	S-9	14-16-20 (36) 87%		17.5-19.0 ft Sandy silt with gravel, (ml), 60% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 25% sand, fine; 15% gravel, fine to medium, subrounded, elongated; maximum grain size = 1.0 inches, moderate brown (5YR 4/4), no odor, moist, trace coal, some rock fragments	ml	
768.0	22.0				19.0-20.0 ft Interval not sampled		
767.0	23.0	S-10	25-22-24 (46) 73%		20.0-21.5 ft Sandy silt with gravel, (ml), 60% fines, low plasticity, no dry strength, no dilatancy, low toughness; 25% sand, fine; 15% gravel, fine to medium, subrounded, elongated; maximum grain size = 1.0 inches, moderate brown (5YR 4/4), no odor, moist, trace coal, some rock fragments		
766.0	24.0				21.5-22.5 ft Interval not sampled		
765.0	25.0				22.5-24.0 ft SHALE, clayey, very soft, decomposed, clay sized particles, light olive brown (5Y 5/6) with dark yellowish orange (10YR 6/6), no odor, no reaction to HCl, moist		
764.0	26.0	S-11	19-30-50/4 100%		24.0-25.0 ft Interval not sampled		
763.0	27.0				25.0-26.35 ft SHALE, clayey, very soft, decomposed, clay sized particles, light olive brown (5Y 5/6) with dark yellowish orange (10YR 6/6), no odor, no reaction to HCl, moist		
762.0	28.0	S-12	50 100%		26.35-27.5 ft Interval not sampled		
761.0	29.0	R-1	65% (65%)	FD6	27.5-28.0 ft SHALE, clayey, very soft, decomposed, clay sized particles, light olive brown (5Y 5/6) with dark yellowish orange (10YR 6/6), no odor, no reaction to HCl, moist		
760.0	30.0				28.0-44.3 ft SHALE, moderately soft, moderately weathered, clay sized particles, dark greenish gray (5G 4/1), no odor, closely fractured, no reaction to HCl, iron oxide staining		29.25-30.0 ft, SC-1, 14:33, 4/27/10
759.0	31.0				28.75-43.5 ft R.D. = 3°-80°, very closely to moderately spaced; filling; not healed to moderately healed, iron oxide staining, very thin to moderately thin clay; surface: moderately rough to rough, planar, undulating, slightly to intensely weathered. Fracture set #1.		
758.0	32.0						
757.0	33.0	R-2	96% (41%)				
756.0	34.0						
755.0	35.0			FD5			
754.0	36.0						
753.0	37.0						
752.0	38.0	R-3	100% (56%)				
751.0	39.0						
750.0							

DATE STARTED: 4/27/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-432

PROJECT NO. 10-4310

COORDINATES

N. 340173.52 ft E. 2405665.64 ft

GROUND SURFACE ELEVATION: 789.49 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
749.0	41.0					28.0-44.3 ft SHALE, moderately soft, moderately weathered, clay sized particles, dark greenish gray (5G 4/1), no odor, closely fractured, no reaction to HCl, iron oxide staining		
748.0	42.0							
747.0	43.0	R-4	100% (53%)					
746.0	44.0							
745.0	45.0					44.3-115.55 ft SHALE, moderately soft, slightly to moderately weathered, clay sized particles, dark gray (N3), thinly bedded, no odor, closely to moderately fractured, no reaction to HCl, iron oxide staining		
744.0	46.0					44.65-52.45 ft R.D. = 0°-72°, closely to moderately spaced; filling: not healed to moderately healed, iron oxide staining, moderately thin clay, very thin clay and iron oxide staining, clean, very soft to soft; surface: smooth to rough, moderately to slightly weathered. Fracture set #2.		
743.0	47.0							
742.0	48.0	R-5	100% (78%)					
741.0	49.0							
740.0	50.0			FD5				
739.0	51.0							
738.0	52.0							
737.0	53.0	R-6	96% (26%)			52.8-59.75 ft R.D. = 17°-74°, very closely to moderately spaced; filling: not healed to moderately healed, clean, very thin to thin clay, iron oxide staining, very soft to soft; surface: smooth to rough, moderately to slightly weathered. Fracture set #3.		
736.0	54.0							
735.0	55.0							
734.0	56.0							
733.0	57.0							
732.0	58.0	R-7	88% (16%)					
731.0	59.0							
730.0								

DATE STARTED: 4/27/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adam Meyer
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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REV 1 Final Boring B-432

PROJECT NO. 10-4310

COORDINATES

N. 340173.52 ft E. 2405665.64 ft

GROUND SURFACE ELEVATION: 789.49 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
729.0	61.0					44.3-115.55 ft SHALE, moderately soft, slightly to moderately weathered, clay sized particles, dark gray (N3), thinly bedded, no odor, closely to moderately fractured, no reaction to HCl, iron oxide staining		
728.0	62.0					60-73.6 ft R.D. = 0°-77°, closely to widely spaced; filling: not healed to moderately healed, iron oxide staining, very thin to moderately thin clay, very soft; surface: smooth to rough, fresh to moderately weathered. Fracture set #4.		
727.0	63.0	R-8	98% (60%)					
726.0	64.0							
725.0	65.0							
724.0	66.0							
723.0	67.0							
722.0	68.0	R-9	100% (55%)	FD5				67.8-68.8 ft, SC-2, 08:23, 4/28/10
721.0	69.0							
720.0	70.0							
719.0	71.0							
718.0	72.0							
717.0	73.0	R-10	100% (56%)					
716.0	74.0							
715.0	75.0					74.2-87.75 ft R.D. = 5°-90°, very closely to moderately spaced; filling: not healed to moderately healed, clean, thin to moderately thin clay, iron oxide staining, very soft; surface: slightly rough to rough, fresh to slightly weathered. Fracture set #5.		
714.0	76.0							
713.0	77.0							
712.0	78.0	R-11	98% (54%)					
711.0	79.0			FD6				
710.0								

DATE STARTED: 4/27/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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HAMMER ID: 931

REV 1 Final Boring B-432

PROJECT NO. 10-4310

COORDINATES

N. 340173.52 ft E. 2405665.64 ft

GROUND SURFACE ELEVATION: 789.49 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
709.0	81.0					44.3-115.55 ft SHALE, moderately soft, slightly to moderately weathered, clay sized particles, dark gray (N3), thinly bedded, no odor, closely to moderately fractured, no reaction to HCl, iron oxide staining		
708.0	82.0			FD6				
707.0		R-12	100% (36%)					
706.0	83.0							
705.0	84.0							
704.0	85.0							
703.0	86.0							
702.0	87.0	R-13	98% (42%)			87.7-97.45 ft R.D. = 0°-76°, very closely to moderately spaced; filling: not healed to moderately healed, thin to very thin clay, iron oxide staining, very soft; surface: smooth to rough, slightly to moderately weathered. Fracture set #6.		
701.0	88.0							
700.0	89.0							
699.0	90.0			FD5				
698.0	91.0							
697.0	92.0	R-14	98% (38%)					
696.0	93.0							
695.0	94.0							
694.0	95.0							
693.0	96.0							
692.0	97.0	R-15	100% (73%)					
691.0	98.0			FD4		98.1-116.9 ft R.D. = 31°-90°, very closely to widely spaced; filling: not healed to moderately healed, iron oxide staining, very thin to moderately thin clay, very thin calcite, fresh to moderately weathered, very soft; surface: smooth to rough, fresh to moderately weathered. Fracture set #7.		
690.0	99.0							

DATE STARTED: 4/27/10
DATE FINISHED: 4/28/10
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DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

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DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-432

PROJECT NO. 10-4310

COORDINATES

N. 340173.52 ft E. 2405665.64 ft

GROUND SURFACE ELEVATION: 789.49 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
689.0	101.0					44.3-115.55 ft SHALE, moderately soft, slightly to moderately weathered, clay sized particles, dark gray (N3), thinly bedded, no odor, closely to moderately fractured, no reaction to HCl, iron oxide staining		
688.0	102.0							
687.0	103.0	R-16	96% (60%)					
686.0	104.0							
685.0	105.0							
684.0	106.0							
683.0	107.0							
682.0	108.0	R-17	100% (82%)	FD4				
681.0	109.0							
680.0	110.0							
679.0	111.0							
678.0	112.0							
677.0	113.0	R-18	100% (88%)					
676.0	114.0							
675.0	115.0							
674.0	116.0			FD6		115.55-117.3 ft SHALE, clayey, moderately soft, very intensely weathered, dusky yellow (5Y 6/4) and medium dark gray (N4), moderately bedded, no odor, closely to very closely fractured, no reaction to HCl		
673.0	117.0					117.05-129.9 ft R.D. = 9°-75°, closely to very widely spaced; filling: not healed to totally healed, iron oxide staining, very thin to thin clay, thin to moderately thin quartz, fresh to very intensely weathered, hard; surfaces: slightly rough to rough, fresh to intensely weathered. Fracture set #8.		
672.0	118.0	R-19	100% (48%)	FD5				
671.0	119.0					117.3-130.1 ft SHALE, moderately hard to hard, slightly weathered to fresh, dark gray (N3), thickly bedded, no odor, closely to widely fractured, no reaction to HCl		
670.0								

DATE STARTED: 4/27/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-432

PROJECT NO. 10-4310

COORDINATES

N. 340173.52 ft E. 2405665.64 ft

GROUND SURFACE ELEVATION: 789.49 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
669.0	121.0					117.3-130.1 ft SHALE, moderately hard to hard, slightly weathered to fresh, dark gray (N3), thickly bedded, no odor, closely to widely fractured, no reaction to HCl		
668.0	122.0							
667.0		R-20	100% (50%)					
	123.0			FD5				
666.0								
	124.0							
665.0								
	125.0							
664.0								
	126.0							
663.0								
	127.0							
662.0		R-21	100% (86%)					
	128.0			FD3				
661.0								
	129.0							
660.0								
	130.0					---- Bottom of Boring at 130.10 ft.----		

DATE STARTED: 4/27/10
DATE FINISHED: 4/28/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-433

PROJECT NO. 10-4310

COORDINATES

N. 340485.71 ft E. 2405380.47 ft

GROUND SURFACE ELEVATION: 792.77 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
792.0	1.0	S-1	3-3-4 (7) 80%			0.0-1.5 ft Sandy silt with gravel, (ml), 65% fines, low plasticity, no dilatancy, low toughness; 20% sand, fine to coarse, subangular, hard hardness; 15% gravel, medium to coarse, subangular, flat and elongated, hard hardness; maximum grain size = 1 inches, dark yellowish brown (10YR 4/2), no odor, moist, no HCl reaction, trace coal, trace roots, (Till)	ml	
791.0	2.0					1.5-5.0 ft Interval not sampled		
790.0	3.0							
789.0	4.0							
788.0	5.0							
787.0	6.0	S-2	16-29-33 (62) 93%			5.0-6.5 ft CLAYEY GRAVEL WITH SAND, (GC), 43% gravel, fine to coarse, angular, flat, medium hardness; 43% sand, fine to coarse; 14% fines, low plasticity, low toughness; maximum grain size = 0.9 inches, dark yellowish orange (10YR 6/6) to dark yellowish brown (10YR 4/2), no odor, moist, no HCl reaction, trace roots, trace coal, (till)	GC	
786.0	7.0					6.5-10.0 ft Interval not sampled		
785.0	8.0							
784.0	9.0							
783.0	10.0							
782.0	11.0	S-3	11-19-21 (40) 87%			10.0-11.5 ft CLAYEY GRAVEL WITH SAND, (GC), 43% gravel, fine to coarse, angular, flat, medium hardness; 43% sand, fine to coarse; 14% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.9 inches, dark yellowish orange (10YR 6/6) to dark yellowish brown (10YR 4/2), no odor, moist, no HCl reaction, trace roots, trace coal, (till)	GC	
781.0	12.0	ST-1	0%			11.5-12.0 ft Shelby Tube sample attempted, no sample recovered		11.5-12.0 ft, ST-1, down pressure of 500 psi, no recovery, Shelby tube bent
780.0	13.0					12.0-15.0 ft Interval not sampled		
779.0	14.0							
778.0	15.0					15.0-15.5 ft Silt with gravel, (ml), medium, subrounded, medium hard hardness; 90% fines, low plasticity, low toughness; 10% sand; maximum grain size = 1/2 inches, light brown (5YR 5/6), moist, no HCl reaction	ml	
777.0	16.0	S-4	6-8-17 (25) 100%			15.5-16.5 ft SHALE, moderately soft, decomposed, clay sized particles, yellowish gray (5Y 7/2), no reaction to HCl, moist		15.5 ft, Weathered shale
776.0	17.0					16.5-20.0 ft Interval not sampled		
775.0	18.0							
774.0	19.0							
773.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-433

PROJECT NO. 10-4310

COORDINATES

N. 340485.71 ft E. 2405380.47 ft

GROUND SURFACE ELEVATION: 792.77 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
772.0	21.0	S-5	27-15-15 (30) 33%			20.0-21.5 ft SHALE, moderately soft, very intensely weathered, clay sized particles, yellowish gray (5Y 7/2), very thinly bedded, no reaction to HCl, dry		
771.0	22.0					21.5-25.0 ft Interval not sampled		
770.0	23.0							
769.0	24.0							
768.0	25.0							
767.0	26.0	S-6	10-12-31 (43) 100%			25.0-26.5 ft SHALE, soft, decomposed, clay sized particles, grayish yellow (5Y 8/4) to dark yellowish orange (10YR 6/6), no reaction to HCl, moist, iron oxide staining		
766.0	27.0					26.5-27.0 ft SHALE, soft, decomposed, clay sized particles, grayish yellow (5Y 8/4) to dark yellowish orange (10YR 6/6), no reaction to HCl, moist, iron oxide staining		
765.0	28.0	R-1	50% (30%)			27.0-30.5 ft SANDSTONE, hard, slightly weathered, boulder sized particles, light gray (N7), no reaction to HCl, boulder		
764.0	29.0							
763.0	30.0							
762.0	31.0					30.5-50.0 ft SHALE, clayey, very soft, decomposed, clay sized particles, medium gray (N5) to moderate yellowish brown (10YR 5/4), thinly to very thinly bedded, very closely to closely fractured, no reaction to HCl, moist, iron oxide staining		
761.0	32.0					30.5-50 ft R.D. = 55°, closely spaced, both ends visible; filling is damp but no free water present, filling: not healed, moderately thin clay, very soft; surface: slightly rough, planar. Fracture set #1, discontinuity # 1.		
760.0	33.0	R-2	44% (0%)					
759.0	34.0							
758.0	35.0			FD5				
757.0	36.0							
756.0	37.0							
755.0	38.0	R-3	88% (12%)					38.1-38.7 ft, SC-1, 4/21/10, 1330
754.0	39.0							
753.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-433

PROJECT NO. 10-4310

COORDINATES

N. 340485.71 ft E. 2405380.47 ft

GROUND SURFACE ELEVATION: 792.77 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
752.0	41.0					30.5-50.0 ft SHALE, clayey, very soft, decomposed, clay sized particles, medium gray (N5) to moderate yellowish brown (10YR 5/4), thinly to very thinly bedded, very closely to closely fractured, no reaction to HCl, moist, iron oxide staining		
751.0	42.0							
750.0	43.0	R-4	86% (25%)					
749.0	44.0							
748.0	45.0			FD5				
747.0	46.0							
746.0	47.0							
745.0	48.0	R-5	84% (19%)					
744.0	49.0							
743.0	50.0					50.0-70.0 ft SHALE, moderately soft, slightly to moderately weathered, clay sized particles, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining		50.55-51.3 ft, SC-2, 4/21/10, 1450
742.0	51.0					50-70 ft R.D. = 55°, closely spaced, both ends visible; filling: not healed; surface: slightly rough, planar. Fracture set #1, discontinuity # 2.		
741.0	52.0							
740.0	53.0	R-6	98% (32%)			52.6-53.3 ft Joint, R.D. = 4°, closely spaced, both ends visible, slightly open; dry but shows evidence of flow, filling: not healed, very thin, soft; surface: slightly rough, planar.		
739.0	54.0			FD5				
738.0	55.0							
737.0	56.0							
736.0	57.0							
735.0	58.0	R-7	86% (9%)					
734.0	59.0			FD7				
733.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-433

PROJECT NO. 10-4310

COORDINATES

N. 340485.71 ft E. 2405380.47 ft

GROUND SURFACE ELEVATION: 792.77 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
732.0	61.0					50.0-70.0 ft SHALE, moderately soft, slightly to moderately weathered, clay sized particles, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining		60.0-65.0 ft, During run 8 the bit plugged up causing loss of recovery
731.0	62.0							
730.0	63.0	R-8	15% (0%)	FD7				
729.0	64.0							
728.0	65.0							
727.0	66.0							
726.0	67.0							
725.0	68.0	R-9	68% (22%)	FD8				
724.0	69.0							
723.0	70.0					70.0-120.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3), widely fractured, no reaction to HCl, no staining, with fossiliferous zones, pyrite crystals trace after 94.1 ft		
722.0	71.0					70-75.85 ft R.D. = 21°-69°, very closely to widely spaced; tight to moderately open; filling: not healed to moderately healed, moderately thin calcite, fresh to slightly weathered; surface: undulating, undualating and rough, moderately rough and planar, fresh to slightly weathered. Fracture set #2.		
721.0	72.0							
720.0	73.0	R-10	98% (65%)					
719.0	74.0							
718.0	75.0			FD4				
717.0	76.0							
716.0	77.0							
715.0	78.0	R-11	100% (92%)					
714.0	79.0							
713.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-433

PROJECT NO. 10-4310

COORDINATES

N. 340485.71 ft E. 2405380.47 ft

GROUND SURFACE ELEVATION: 792.77 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
712.0	81.0					70.0-120.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3), widely fractured, no reaction to HCl, no staining, with fossiliferous zones, pyrite crystals trace after 94.1 ft 80.1-95.5 ft R.D. = 18°-71°, closely to widely spaced; filling: not healed, very thin pyrite, fresh; surface: smooth to moderately rough, planar, fresh.		81.2-82.5 ft, SC-3, 4/22/10, 1033
711.0	82.0							
710.0	83.0	R-12	98% (92%)					
709.0	84.0							
708.0	85.0							
707.0	86.0							
706.0	87.0							
705.0	88.0	R-13	99% (90%)	FD3				
704.0	89.0							
703.0	90.0							
702.0	91.0							
701.0	92.0							
700.0	93.0	R-14	98% (93%)					
699.0	94.0							
698.0	95.0							
697.0	96.0							
696.0	97.0							
695.0	98.0	R-15	100% (92%)	FD1				
694.0	99.0							
693.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-433

PROJECT NO. 10-4310

COORDINATES

N. 340485.71 ft E. 2405380.47 ft

GROUND SURFACE ELEVATION: 792.77 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
692.0	101.0					70.0-120.0 ft SHALE, moderately hard, slightly weathered to fresh, clay sized particles, dark gray (N3), widely fractured, no reaction to HCl, no staining, with fossiliferous zones, pyrite crystals trace after 94.1 ft 96.4-120.0 ft Weak reaction to HCl 97.3-119.3 ft R.D. = 10°-62°, very closely to widely spaced, neither ends visible; filling: not healed to moderately healed, clean, very thin pyrite, very thin calcite, fresh to slightly weathered; surface: smooth to moderately rough, planar and undulating, fresh. 96.4-120.0 ft Weak reaction to HCl		
691.0	102.0							
690.0	103.0	R-16	100% (94%)					
689.0	104.0							
688.0	105.0							
687.0	106.0			FD3				
686.0	107.0							
685.0	108.0	R-17	100% (93%)					
684.0	109.0							
683.0	110.0							
682.0	111.0							
681.0	112.0							
680.0	113.0	R-18	98% (90%)	FD2				
679.0	114.0							
678.0	115.0							
677.0	116.0							
676.0	117.0			FD4				
675.0	118.0	R-19	98% (91%)					
674.0	119.0							
673.0								

---- Bottom of Boring at 120.00 ft.----

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-434

PROJECT NO. 10-4310

COORDINATES

N. 339641.97 ft E. 2404822.94 ft

GROUND SURFACE ELEVATION: 709.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
708.0	1.0	S-1	1-1-3 (4) 73%			0.0-0.35 ft Organic soil, (ol/oh), 95% fines, low plasticity, low dry strength, no dilatancy, low toughness; 5% sand, fine to medium, subangular, flat; very dusky red (10R 2/2), organic odor, moist, no HCl reaction, with roots, some rock fragments	ol/oh	
							sp	
707.0	2.0					0.35-1.5 ft Poorly graded sand, (sp), 95% sand, fine, subangular; 5% fines, low plasticity, slow dilatancy, low toughness; moderate yellowish brown (10YR 5/4), no odor, moist, no HCl reaction, some roots		
706.0	3.0					1.5-5.0 ft Interval not sampled		
705.0	4.0							
704.0	5.0	S-2	10-15-27 (42) 100%			5.0-6.5 ft Silty sand, (sm), 75% sand, fine, subangular; 15% fines, medium plasticity, no dilatancy, low toughness; 10% gravel, medium to coarse, flat, medium hardness; brownish gray (5YR 4/1), no odor, moist, no HCl reaction, some rock fragments	sm	
703.0	6.0							
702.0	7.0					6.5-10.0 ft Interval not sampled		
701.0	8.0							
700.0	9.0							
699.0	10.0	S-3	2-1-1 (2) 80%			10.0-11.5 ft Poorly graded sand, (sp), 100% sand, fine, subrounded; moderate brown (5YR 3/4) with light brown (5YR 5/6), no odor, moist, no HCl reaction, little rock fragments	sp	
698.0	11.0							
697.0	12.0					11.5-15.0 ft Interval not sampled		
696.0	13.0							
695.0	14.0							
694.0	15.0	S-4	12-50/5			15.0-15.9 ft SHALE, moderately soft, moderately weathered, greenish black (5GY 2/1), moderate odor, very closely fractured, no reaction to HCl, no staining		
693.0	16.0		100%			15.9-43.3 ft SHALE, moderately hard to moderately soft, slightly weathered to fresh, medium dark gray (N4) to dark gray (N3), moderately bedded, no odor, closely fractured, no reaction to HCl, fossiliferous zones, iron oxide staining restricted to fractures		
692.0	17.0							
691.0	18.0	R-1	79% (11%)	FD6		16.5-17.1 ft Bedding plane, R.D. = 11°-14°, moderately spaced, neither ends visible, slightly open; filling: not healed, very thin clay, iron oxide staining, very soft; surface: slightly rough, slightly weathered.		
690.0	19.0					16.55-21.6 ft R.D. = 53°-60°, closely to widely spaced, neither ends visible; filling: slightly to moderately weathered; surface: moderately rough, slightly weathered; slightly to moderately open; filling: not healed to moderately healed, iron oxide staining.		
		R-2						

DATE STARTED: 5/12/10
DATE FINISHED: 5/12/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-434

PROJECT NO. 10-4310

COORDINATES

N. 339641.97 ft E. 2404822.94 ft

GROUND SURFACE ELEVATION: 709.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
688.0	21.0			FD6		18.25-22.5 ft Bedding plane, R.D. = 8°-11°, very widely spaced, neither ends visible, moderately open; filling: not healed, very thin clay, iron oxide staining, very soft; surface: slightly rough, slightly weathered.		
687.0	22.0	R-2	96% (68%)			19.85-20.95 ft R.D. = 22°-24°, closely to moderately spaced, neither ends visible; slightly to moderately open; filling: not healed, very thin caly, very soft; surface: slightly rough, moderately weathered.		
686.0	23.0					15.9-43.3 ft SHALE, moderately hard to moderately soft, slightly weathered to fresh, medium dark gray (N4) to dark gray (N3), moderately bedded, no odor, closely fractured, no reaction to HCl, fossiliferous zones, iron oxide staining restricted to fractures		
685.0	24.0					21.85-29.8 ft R.D. = 64°-68°, moderately to widely spaced, neither ends visible, slightly open; filling: not healed, clean (21. 85 ft), very thin clay; surface: slightly rough, slightly weathered.		
684.0	25.0					22.9-33.55 ft R.D. = 52°-54°, moderately spaced, neither ends visible; tight to slightly open; filling: not healed, clean, very thin clay (23.25 ft), very soft;surface: moderately rough to rough, fresh to slightly weathered.		
683.0	26.0			FD5		24.95-25.45 ft Neither ends visible, slightly open; filling: not healed, clean; surface: slightly rough; subvertical curved fracture that ends on the same side it begins, vertical to subvertical fractures.		
682.0	27.0	R-3	94% (65%)			25.5-42.05 ft R.D. = 13°-18°, widely spaced, neither ends visible; moderately to slightly open; filling: not healed to partly healed, very thin calcite (42.05 ft), very thin to moderately thin clay, slightly weathered, very soft (clay) and moderately soft (calcite); surface: rough to slightly rough, slightly weathered.		
681.0	28.0							
680.0	29.0							
679.0	30.0							
678.0	31.0					31-39.8 ft R.D. = 70°-73°, moderately to widely spaced, neither ends visible; tight to slightly open; filling: not healed, clean; surface: moderately rough, fresh.		
677.0	32.0	R-4	100% (81%)			31.9-32.5 ft Joint, R.D. = 80°, moderately to widely spaced, neither ends visible, slightly open; filling: not healed, clean; surface: moderately rough.		
676.0	33.0							
675.0	34.0							
674.0	35.0					34.6- ft Joint, R.D. = 40°, moderately to widely spaced, neither ends visible, moderately open; filling: not healed, clean; surface: moderately rough.		
673.0	36.0							
672.0	37.0	R-5	100% (92%)	FD3				
671.0	38.0							
670.0	39.0							
		R-6						

DATE STARTED: 5/12/10
DATE FINISHED: 5/12/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-434

PROJECT NO. 10-4310

COORDINATES

N. 339641.97 ft E. 2404822.94 ft

GROUND SURFACE ELEVATION: 709.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
668.0	41.0	R-6	100% (100%)	FD3		15.9-43.3 ft SHALE, moderately hard to moderately soft, slightly weathered to fresh, medium dark gray (N4) to dark gray (N3), moderately bedded, no odor, closely fractured, no reaction to HCl, fossiliferous zones, iron oxide staining restricted to fractures		
667.0	42.0					42- ft R.D. = 4°, neither ends visible, slightly open; filling: not healed, very thin clay, very soft; surface: moderately rough.		
666.0	43.0					---- Bottom of Boring at 43.30 ft.----		

DATE STARTED: 5/12/10
DATE FINISHED: 5/12/10
FIELD GEOLOGIST: Adam Meyer
CHECKED BY: Jesse Merkel

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): E. Zetwick

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-435

PROJECT NO. 10-4310

COORDINATES

N. 339687.56 ft E. 2406056.31 ft

GROUND SURFACE ELEVATION: 687.27 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
687.0					0.0-0.5 ft Sandy silt/sandy elastic silt, (ml/mh), about 2% cobbles, subangular, hard; 50% fines, low plasticity, no dry strength, no dilatancy, low toughness; 30% sand, fine to medium, subangular; 10% gravel, fine to coarse, subangular, hard hardness; maximum grain size = 0.5 inches, dark yellowish brown (10YR 4/2), dry, no HCl reaction, very loose, with roots, with organics	ml/mh	
686.0	1.0	S-1	3-2-2 (4) 73%			sm	
685.0	2.0	S-2	3-5-5 (10) 97%		0.5-1.5 ft Silty sand, (sm), 70% sand, fine to medium, subangular; 25% fines, low plasticity, no dry strength, no dilatancy, low toughness; 5% gravel, fine to coarse, angular, hard hardness; maximum grain size = .03 inches, dark yellowish orange (10YR 6/6), moist, no HCl reaction, very loose	sm	
684.0	3.0	S-3	2-3-3 (6) 100%		1.5-3.0 ft Silty sand, (sm), 80% sand, fine to medium, subangular; 18% fines, low plasticity, no dry strength, no dilatancy, low toughness; 2% gravel, fine to coarse, subangular, hard hardness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, loose	sp-sm	
683.0	4.0					sp-sm	
682.0	5.0	S-4	2-2-1 (3) 100%		3.0-3.6 ft Poorly graded sand with silt, (sp-sm), about 5% cobbles, subangular, hard, flat and elongated; 80% sand, fine to medium, subangular; 10% gravel, fine to coarse, subangular, hard hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, loose	sw-sm	
681.0	6.0	S-5	2-1-2 (3) 100%				
680.0	7.0				3.6-4.2 ft Poorly graded sand with silt and gravel, (sp-sm), about 5% cobbles, subangular, hard; 60% sand, fine to medium; 30% gravel, fine to coarse, subangular, hard hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, loose	sw	
679.0	8.0	S-6	2-3-4 (7) 100%				
678.0	9.0	S-7	5-8-10 (18) 100%		4.2-4.5 ft Well graded sand with silt, (sw-sm), about 5% cobbles, subangular, hard; 80% sand, fine to coarse, subangular; 10% gravel, fine to coarse, subangular, hard hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very loose		
677.0	10.0					gw	
676.0	11.0	S-8	7-50/5 100%		4.5-9.8 ft Well graded sand, (sw), about 2% cobbles, subangular, hard; 95% sand, fine to coarse, subangular; 5% gravel, fine to coarse, subangular, hard hardness; 0% fines; maximum grain size = 0.01 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, very loose to medium dense		
675.0	12.0	S-9	50/2				
674.0	13.0	R -1	100% (0%)		9.8-10.5 ft Well graded gravel with sand, (gw), about 30% cobbles, subangular, hard; 70% gravel, fine to coarse, subangular, hard hardness; 30% sand, fine to coarse, subangular; 0% fines; maximum grain size = 0.5 inches, dark gray (N3) and moderate yellowish brown (10YR 5/4), moist, no HCl reaction, medium dense		
673.0	14.0				10.5-11.4 ft SHALE, soft to hard, fresh to slightly weathered, medium dark gray (N4) and dark yellowish orange (10YR 6/6), no reaction to HCl, wet, iron oxide staining, clay pockets that have low toughness and high plasticity, sand pockets, fissile shale		
672.0	15.0				11.4-12.0 ft No sample recovered		
671.0	16.0			FD8	12.0-12.17 ft SHALE, soft to hard, fresh to slightly weathered, medium dark gray (N4) with dark yellowish orange (10YR 6/6), no reaction to HCl, wet, iron oxide staining, fissile		
670.0	17.0	R -2	100% (0%)		12.17-12.2 ft Interval not sampled		
669.0	18.0				12.2-20.1 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), closely to very closely fractured, no reaction to HCl, wet, iron oxide staining		
668.0	19.0				12.2-20 ft Bedding plane separation, R.D. = 10°, very closely to closely spaced; surface: smooth, planar, slightly weathered; iron oxide staining present on some of bedding surfaces.		

DATE STARTED: 6/2/10
DATE FINISHED: 6/3/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-435

PROJECT NO. 10-4310

COORDINATES

N. 339687.56 ft E. 2406056.31 ft

GROUND SURFACE ELEVATION: 687.27 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
667.0	20.0					12.5-19.6 ft R.D. = 36°, closely to moderately spaced; surface: rough, planar, slightly weathered; few contain iron oxide staining.		
666.0	21.0					13-20.1 ft R.D. = 56°, moderately to closely spaced; surface: rough, planar, slightly weathered; few contain iron oxide staining.		
665.0	22.0	R -3	100% (8%)			20.1-30.1 ft SHALE, moderately hard to hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		
664.0	23.0					20.1-28.2 ft Bedding plane separation, R.D. = 10°, closely to moderately spaced; surface: smooth, planar, slightly weathered; iron oxide staining on bedding surface.		
663.0	24.0					20.7-28.65 ft R.D. = 56°, moderately spaced; surface: rough, planar, slightly weathered; iron oxide staining on fracture face.		
662.0	25.0			FD6		21-27.6 ft R.D. = 36°, moderately spaced; surface: rough, planar, slightly weathered; iron oxide staining on fracture face.		
661.0	26.0							
660.0	27.0	R -4	95% (17%)					27.7-28.1ft, SC-1, 6/3/10, 0903
659.0	28.0							
658.0	29.0							
657.0	30.0					30.1-45.1 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl		
656.0	31.0					30.5-41 ft R.D. = 56°, widely to very widely spaced; filling: clean; surface: rough, planar; fracture at 30.5 ft contains trace iron oxide staining and fresh to slightly weathered.		
655.0	32.0	R -5	100% (53%)			31-39.1 ft Bedding plane separation, R.D. = 10°, very closely to widely spaced; filling: clean; surface: smooth, planar; bedding at 31.0 ft shows trace iron oxide staining and fresh to slightly weathered.		
654.0	33.0					31.1-40.6 ft R.D. = 36°, moderately to closely spaced; filling: clean; surface: rough, planar; fracture at 31.1 ft contains trace iron oxide staining and fresh to slightly weathered.		
653.0	34.0							
652.0	35.0			FD5				
651.0	36.0							
650.0	37.0	R -6	100% (82%)					
649.0	38.0							
648.0	39.0					39.1-39.6 ft R.D. = 10&90°; filling: moderately healed, very thin calcite, fresh; surface: fresh; zone contains other random healed fractures due to calcite		

DATE STARTED: 6/2/10
DATE FINISHED: 6/3/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-435

PROJECT NO. 10-4310

COORDINATES

N. 339687.56 ft E. 2406056.31 ft

GROUND SURFACE ELEVATION: 687.27 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
647.0						crystal growth, also 36° angle fractures.		
	41.0					30.1-45.1 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to widely fractured, no reaction to HCl		
646.0								
	42.0			FD6		41.35-53.4 ft R.D. = 10°, moderately to very widely spaced; filling: moderately healed, moderately thin calcite, fresh; surface: smooth, planar, fresh; few bedding surfaces do not contain calcite filling.		
645.0		R -7	100% (60%)			42.2-49.5 ft R.D. = 36°, widely spaced; filling: moderately healed, moderately thin calcite, fresh; surface: rough, planar, fresh; fracture at 42.2 ft, no calcite filling, fresh.		
	43.0					42.55-51.15 ft R.D. = 56°, moderately to very widely spaced; filling: clean, fresh; surface: rough, planar, fresh; fracture at 43.15 ft contains trace pyrite.		
644.0								
	44.0							
643.0								
	45.0					45.1-54.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl		
642.0								
	46.0							
641.0								
	47.0							
640.0		R -8	100% (99%)			47.3-47.7 ft Random fracture, R.D. = 60°; filling: clean; surface: rough, planar; possible mechanical break.		
	48.0							
639.0								
	49.0			FD3				
638.0								
	50.0							
637.0						50.5-51.1 ft Random fracture, R.D. = 70°, both ends visible; filling: moderately healed, thick calcite, fresh, hard; surface: fresh.		
	51.0							
636.0								
	52.0	R -9	100% (98%)			52.35-53.4 ft Random fracture, R.D. = 75°, both ends visible; filling: moderately healed, very thin calcite, fresh; surface: fresh.		
635.0								
	53.0							
634.0								
	54.0							
633.0								
	55.0					54.5-60.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, trace pyrite and calcite replaced shell casts		
632.0						54.6-57.8 ft Bedding plane separation, R.D. = 10°, very closely to widely spaced; filling: moderately healed, moderately thick calcite, fresh; surface: fresh; bedding at 54.6 and 54.65 ft are filled with very thin filling of pyrite, totally healed, fresh.		
	56.0							
631.0								
	57.0	R -10	100% (100%)	FD0				
630.0								
	58.0							
629.0								
	59.0							
628.0		R -11						

DATE STARTED: 6/2/10
DATE FINISHED: 6/3/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-435

PROJECT NO. 10-4310

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	COORDINATES / DESCRIPTION	USCS SYMBOL	REMARKS
						COORDINATES **N. 339687.56 ft E. 2406056.31 ft** **GROUND SURFACE ELEVATION: 687.27 ft**		
627.0			100% (100%)			---- Bottom of Boring at 60.20 ft.----		

DESCRIPTION

DATE STARTED: 6/2/10
DATE FINISHED: 6/3/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: C. VanVactor
HELPER(S): R. Terral

DRILL RIG: CME-55 (Truck)
HAMMER ID: 955

REV 1 Final Boring B-436

PROJECT NO. 10-4310

COORDINATES

N. 339698.74 ft E. 2406180.69 ft

GROUND SURFACE ELEVATION: 682.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
682.0	1.0	S-1	1-2-2 (4) 87%			0.0-12.5 ft Silty sand, (sm), 70% sand, fine to medium, rounded, soft hardness; 30% fines, medium plasticity, no dry strength, no dilatancy, low toughness; moderate brown (5YR 4/4), moist, no HCl reaction, loose, homogeneous	sm	
681.0	2.0	S-2	2-3-4 (7) 93%					
680.0	3.0							
679.0	4.0	S-3	2-2-2 (4) 93%					
678.0	5.0	S-4	2-2-3 (5) 100%					
677.0	6.0							
676.0	7.0	S-5	2-2-4 (6) 100%					
675.0	8.0	S-6	4-3-6 (9) 100%					
674.0	9.0							
673.0	10.0	ST-1	100%					ST-1, 300 psi down pressure
672.0	11.0							
671.0	12.0	S-7	7-7-6 (13) 60%					
670.0	13.0	S-8	2-4-6 (10) 67%			12.5-15.5 ft Silty sand, (sm), 85% sand, fine to medium, rounded, soft hardness; 15% fines, no dry strength, no dilatancy; moderate brown (5YR 4/4) and moderate brown (5YR 3/4), moist, no HCl reaction, loose, homogeneous	sm	
669.0	14.0							
668.0	15.0	S-9	5-6-7 (13) 87%					
667.0	16.0	S-10	10-13-11 (24) 67%			15.5-17.0 ft Silty sand with gravel, (sm), 75% sand, fine to medium, subrounded, soft hardness; 15% gravel, medium to coarse, subangular, flat and elongated, medium hardness; 10% fines, no dry strength, no dilatancy; maximum grain size = 0.5 inches, moderate brown (5YR 4/4) and light brown (5YR 5/6), moist, no HCl reaction, dense	sm	
666.0	17.0							
665.0	18.0	S-11	14-13-10 (23) 67%			17.0-18.5 ft Silty sand with gravel, (sm), 50% sand, fine to medium, subangular, flat, soft hardness; 40% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 10% fines, no dry strength, no dilatancy; maximum grain size = 1 inches, dark reddish brown (10R 3/4) and moderate brown (5YR 4/4), moist, no HCl reaction, loose	sm	
664.0	19.0	S-12	8-8-12 (20) 47%				gp-gc	

DATE STARTED: 6/3/10
DATE FINISHED: 6/4/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-436

PROJECT NO. 10-4310

COORDINATES

N. 339698.74 ft E. 2406180.69 ft

GROUND SURFACE ELEVATION: 682.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
662.0	21.0	S-13	8-11-14 (25) 50%		18.5-21.5 ft Poorly graded gravel with clay and sand, (gp-gc), 60% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 30% sand, medium, subangular, soft hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1 inches, moderate reddish brown (10R 4/6) and moderate brown (5YR 4/4), moist, no HCl reaction, medium dense	gp-gc	
661.0	22.0	S-.14	16-36-32 (68) 93%		21.5-27.4 ft Poorly graded gravel with clay and sand, (gp-gc), 60% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 30% sand, fine to coarse, subangular, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.4 inches, light brown (5YR 5/6) and dark gray (N3), moist, no HCl reaction, loose to medium dense		
660.0	23.0						
659.0	24.0	S-15	16-22-50 (72) 87%				
658.0	25.0	S-16	22-30-39 (69) 100%			gp-gc	
657.0	26.0						
656.0	27.0	S-17	26-17-50/5 100%				
655.0	28.0	S-18	50 100%		27.4-27.5 ft Interval not sampled 27.7-28.0 ft SHALE, moderately soft, slightly weathered, dark gray (N3), no reaction to HCl, iron oxide staining		
654.0	29.0				28.0-29.0 ft Interval not sampled		
653.0	30.0	S-19	25-27-50 (77) 90%		29.0-30.5 ft Poorly graded gravel with clay and sand, (gp-gc), 65% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 25% sand, fine to coarse, subangular, flat and elongated, soft hardness; 10% fines, medium plasticity, no dry strength, low toughness; maximum grain size = 0.6 inches, dark gray (N3) and dark yellowish brown (10YR 4/2), moist, no HCl reaction, dense	gp-gc	
652.0	31.0				30.5-31.5 ft Interval not sampled		
651.0	32.0	S-20	24-50/4 100%		31.5-32.3 ft Poorly graded gravel with clay and sand, (gp-gc), 65% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 25% sand, fine to coarse, subangular, flat and elongated, soft hardness; 10% fines, medium plasticity, no dry strength, low toughness; maximum grain size = 0.6 inches, dark gray (N3) and dark yellowish brown (10YR 4/2), moist, no HCl reaction, dense	gp-gc	
650.0	33.0						
649.0	34.0	R-1	90% (0%)	FD7	32.3-34.0 ft Interval not sampled 34.0-35.0 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, 10° bedding plane.		
648.0	35.0				34-40 ft Joint, R.D. = 27-67°, closely spaced; filling: not healed, intensely weathered; surface: slightly rough, planar, intensely weathered; fracture face's have iron oxidation staining. Fracture set #F-1.		
647.0	36.0						
646.0	37.0	R-2	44% (20%)	FD5	35.0-40.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining, strong HCl reaction to the calcite white (N9) laminae, 10° bedding plane, trace of pyrite		
645.0	38.0						
644.0	39.0						

DATE STARTED: 6/3/10
DATE FINISHED: 6/4/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-436

PROJECT NO. 10-4310

COORDINATES

N. 339698.74 ft E. 2406180.69 ft

GROUND SURFACE ELEVATION: 682.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
642.0	41.0					40.0-45.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely fractured, no reaction to HCl, iron oxide staining, strong HCl reaction to the calcite white (N9) laminae, 10° bedding plane, trace of pyrite, closely spaced bedding planes		
641.0	42.0	R-3	78% (0%)	FD7				
640.0	43.0							
639.0	44.0							
638.0	45.0					45.0-50.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), widely fractured, no reaction to HCl, strong HCl reaction to the calcite white (N9) laminae, 10° bedding plane		
637.0	46.0							
636.0	47.0	R-4	90% (90%)					
635.0	48.0							
634.0	49.0							
633.0	50.0					50.0-55.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
632.0	51.0							
631.0	52.0	R-5	98% (98%)	FD1				
630.0	53.0							
629.0	54.0							
628.0	55.0					55.0-60.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), widely to very widely fractured, no reaction to HCl, 10° bedding plane		
627.0	56.0							
626.0	57.0							
625.0	58.0	R-6	100% (100%)					
624.0	59.0							

---- Bottom of Boring at 60.00 ft.----

DATE STARTED: 6/3/10
DATE FINISHED: 6/4/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-437

PROJECT NO. 10-4310

COORDINATES

N. 339709.67 ft E. 2406305.29 ft

GROUND SURFACE ELEVATION: 679.59 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
679.0	1.0	S-1	1-2-2 (4) 100%			0.0-12.0 ft Silty sand, (sm), 75% sand, fine to medium, subrounded, soft hardness; 25% fines, low plasticity, no dry strength, no dilatancy, low toughness; moderate brown (5YR 4/4), moist, no HCl reaction, very loose to medium dense		
678.0	2.0	S-2	2-3-3 (6) 87%					
677.0	3.0							
676.0	4.0	S-3	3-3-3 (6) 100%					
675.0	5.0	S-4	2-5-7 (12) 47%					
674.0	6.0						sm	
673.0	7.0	S-5	7-9-10 (19) 100%					
672.0	8.0	S-6	4-8-10 (18) 87%					
671.0	9.0							
670.0	10.0	S-7	8-8-11 (19) 100%					
669.0	11.0	S-8	6-10-14 (24) 100%					
668.0	12.0							
667.0	13.0	S-9	11-14-14 (28) 100%			12.0-13.5 ft Silty sand, (sm), 75% sand, fine to medium, subrounded, soft hardness; 25% fines, low plasticity, no dry strength, no dilatancy, low toughness; moderate brown (5YR 4/4), moist, no HCl reaction, medium dense, weathered shale	sm	
666.0	14.0	S-10	4-15-14 (29) 87%			13.5-15.0 ft Silty sand, (sm), 75% sand, fine to medium, subrounded, soft hardness; 25% fines, low plasticity, no dry strength, no dilatancy, low toughness; moderate brown (5YR 4/4), moist, no HCl reaction, medium dense	sm	
665.0	15.0							
664.0	16.0	S-11	13-22-27 (49) 93%			15.0-16.5 ft Poorly graded gravel with clay and sand, (gp-gc), 50% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 40% sand, fine to medium, subrounded, soft hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.07 inches, light brown (5YR 5/6), dry, no HCl reaction, dense, homogeneous	gp-gc	
663.0	17.0	S-12	16-28-19 (47) 60%			16.5-18.0 ft Poorly graded gravel with clay and sand, (gp-gc), 70% gravel, fine to coarse, subangular, hard hardness; 20% sand, fine to coarse, angular, flat and elongated, soft hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.1 inches, moderate brown (5YR 3/4) and dark gray (N3), moist, no HCl reaction, dense	gp-gc	
662.0	18.0							
661.0	19.0	S-13	9-12-12 (24) 77%				sp-sc	
660.0		S-14						

DATE STARTED: 6/6/10
DATE FINISHED: 6/7/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-437

PROJECT NO. 10-4310

COORDINATES

N. 339709.67 ft E. 2406305.29 ft

GROUND SURFACE ELEVATION: 679.59 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
659.0		S-14	14-11-14 (25) 67%		18.0-21.0 ft Poorly graded sand with clay and gravel, (sp-sc), 60% sand, fine to coarse, subangular, soft hardness; 30% gravel, fine to coarse, angular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.05 inches, moderate brown (5YR 3/4) and moderate reddish brown (10R 4/6), moist, no HCl reaction, medium dense	sp-sc	
	21.0						
658.0		S-15	34-15-15 (30) 80%			sp-sc	
	22.0				21.0-22.5 ft Poorly graded sand with clay and gravel, (sp-sc), 50% sand, fine to coarse, subangular, soft hardness; 40% gravel, medium to coarse, angular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.1 inches, dusky brown (5YR 2/2) and dusky red (5R 3/4), moist, no HCl reaction, medium dense		
657.0							
	23.0	S-16	14-12-16 (28) 67%				
656.0							
	24.0						
655.0		S-17	10-7-10 (17) 60%		22.5-27.0 ft Poorly graded gravel with clay and sand, (gp-gc), 65% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 25% sand, fine to coarse, subangular, flat and elongated, soft hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.11 inches, moderate brown (5YR 4/4), moist, no HCl reaction, medium dense, blocky	gp-gc	
	25.0						
654.0							
	26.0	S-18	8-8-10 (18) 80%				
653.0							
	27.0						
652.0		S-19	10-12-22 (34) 73%		27.0-28.3 ft Poorly graded gravel with clay and sand, (gp-gc), 65% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 25% sand, fine to coarse, subangular, flat and elongated, soft hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.11 inches, moderate brown (5YR 4/4) and dark gray (N3), moist, no HCl reaction, dense to very dense, blocky, weathered shale	gp-gc	
	28.0						
651.0		S-20	50/4 100%		28.3-30.0 ft Interval not sampled		
	29.0						
650.0							
	30.0						
649.0		S-21	4-25-18 (43) 73%		30.0-31.5 ft Poorly graded gravel with clay and sand, (gp-gc), 65% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 25% sand, fine to coarse, subangular, flat and elongated, soft hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.11 inches, moderate brown (5YR 4/4) and dark gray (N3), moist, no HCl reaction, dense to very dense, blocky, weathered shale	gp-gc	
	31.0						
648.0		S-22	50 100%		31.5-32.0 ft SHALE, moderately soft, slightly weathered, dark gray (N3), no reaction to HCl		
	32.0						
647.0							
	33.0				32.0-33.0 ft Interval not sampled		Overburden material. Mechanically broken.
646.0					33.0-36.0 ft SANDSTONE, moderately hard, fresh to slightly weathered, dark gray (N3) and white (N9), no reaction to HCl, iron oxide staining, quartz constitues a third of the sample, overburden material (boulders)		
	34.0						
645.0		R-1	60% (33%)				
	35.0						
644.0							
	36.0				36.0-40.9 ft SANDSTONE, horizontal, moderately hard, slightly to intensely weathered, dark gray (N3), no reaction to HCl, overburden material (boulder)		
643.0				FD0			
	37.0						
642.0		R-2	78% (53%)				
	38.0						
641.0							
	39.0						
640.0		R-3					

DATE STARTED: 6/6/10
DATE FINISHED: 6/7/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-437

PROJECT NO. 10-4310

COORDINATES

N. 339709.67 ft E. 2406305.29 ft

GROUND SURFACE ELEVATION: 679.59 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
639.0	41.0					40.9-44.6 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very widely fractured, no reaction to HCl, iron oxide staining		
638.0	42.0	R-3	96% (80%)					
637.0	43.0							
636.0	44.0							
635.0	45.0			FD0		44.6-60.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), extremely widely fractured, no reaction to HCl		
634.0	46.0							
633.0	47.0	R-4	100% (100%)					
632.0	48.0							
631.0	49.0							
630.0	50.0							
629.0	51.0							
628.0	52.0	R-5	100% (100%)					
627.0	53.0							
626.0	54.0							
625.0	55.0			FD0				
624.0	56.0							
623.0	57.0	R-6	94% (94%)					
622.0	58.0							
621.0	59.0							
620.0								

---- Bottom of Boring at 60.00 ft.----

DATE STARTED: 6/6/10
DATE FINISHED: 6/7/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-438

PROJECT NO. 10-4310

COORDINATES

N. 339721.41 ft E. 2406429.61 ft

GROUND SURFACE ELEVATION: 679.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
678.0	1.0	S-1	2-2-4 (6) 100%			0.0-3.0 ft Silty sand, (sm), 80% sand, fine; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; moderate brown (5YR 4/4) with pale yellowish brown (10YR 6/2), moist, no HCl reaction, stiff to medium stiff	sm	
677.0	2.0	S-2	4-5-6 (11) 100%					
676.0	3.0	S-3	7-10-12 (22) 100%			3.0-4.6 ft Silty sand, (sm), 80% sand, fine; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very stiff	sm	
675.0	4.0	S-4	7-11-12 (23) 73%			4.6-6.0 ft Well graded sand, (sw), 80% sand, fine to medium; 10% gravel, fine to medium, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, moderate brown (5YR 3/4), moist, no HCl reaction, medium dense	sw	
674.0	5.0	S-5	8-11-12 (23) 73%			6.0-7.5 ft Well graded sand, (sw), 90% sand, fine to medium; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; moderate brown (5YR 3/4), moist, no HCl reaction, medium dense	sw	
673.0	6.0	S-6	8-11-13 (24) 100%			7.5-9.0 ft Poorly graded sand with silt, (sp-sm), 90% sand, fine to medium; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; grayish brown (5YR 3/2), moist, no HCl reaction, medium dense, 8.9-8.93, black (N1) lamination of clay/silt	sp-sm	
672.0	7.0	S-7	9-10-10 (20) 100%			9.0-11.0 ft Silty sand, (sm), 70% sand, fine to medium; 30% fines, medium plasticity, no dry strength, no dilatancy, low toughness; dusky brown (5YR 2/2), wet, no HCl reaction, medium dense	sm	
671.0	8.0	S-8	7-8-8 (16) 100%			11.0-12.0 ft Silty sand, (sm), 70% sand, fine to medium; 30% fines, medium plasticity, no dry strength, no dilatancy, low toughness; dusky brown (5YR 2/2), moist, no HCl reaction, medium dense	sm	
670.0	9.0	S-9	11-15-15 (30) 100%			12.0-15.0 ft Sandy elastic silt/sandy lean clay, (mh/cl), 70% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 30% sand; moderate yellowish brown (10YR 5/4) with black (N1), moist, hard	mh/cl	
669.0	10.0	S-10	11-21-10 (31) 100%					
668.0	11.0	S-11	7-10-11 (21) 87%			15.0-21.0 ft Clayey gravel, (gc), 60% gravel, fine to coarse, subangular; 30% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 10% sand, fine to medium, subangular; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, dense	gc	
667.0	12.0	S-12	7-11-14 (25) 77%					
666.0	13.0	S-13	7-8-9 (17) 53%					
665.0	14.0	S-14						
664.0	15.0							
663.0	16.0							
662.0	17.0							
661.0	18.0							
660.0	19.0							

DATE STARTED: 5/11/10
DATE FINISHED: 5/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-438

PROJECT NO. 10-4310

COORDINATES

N. 339721.41 ft E. 2406429.61 ft

GROUND SURFACE ELEVATION: 679.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
658.0	21.0	S-14	4-7-13 (20) 73%			gc	
		ST -1	56%		21.0-21.9 ft Silty gravel, (gm), 60% gravel, fine to coarse, subangular; 30% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 10% sand, fine to medium, subangular; maximum grain size = 0.5 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction	gm	ST-1, 21.0-21.9 ft, recovered 0.5 ft, down pressure of 350 psi with max at end of 500 psi with refusal of shelby, let set 15 minutes
657.0	22.0	S-15	4-7-12 (19) 67%		21.9-24.9 ft Well graded sand with silt and gravel, (sw-sm), about 2% cobbles, subangular; 60% sand, fine to coarse, subangular; 30% gravel, fine to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, dusky brown (5YR 2/2), wet, no HCl reaction, medium dense	sw-sm	
656.0	23.0						
655.0	24.0	S-16	6-11-14 (25) 50%				
654.0	25.0	S-17	5-5-10 (15) 67%		24.9-26.4 ft Silty gravel, (gm), about 2% cobbles, subangular; 1% boulders, subangular; 70% gravel, fine to coarse, subangular; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 10% sand, fine to coarse, subangular; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense	gm	
653.0	26.0						
652.0	27.0	S-18	8-9-10 (19) 57%		26.4-27.9 ft Well graded sand with silt and gravel, (sw-sm), about 2% cobbles, subangular; 50% sand, fine to coarse, subangular; 40% gravel, fine to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense	sw-sm	
651.0	28.0	S-19	8-8-12 (20) 73%		27.9-29.4 ft Silty gravel, (gm), about 5% cobbles, subangular; 10% boulders, subangular; 70% gravel, fine to coarse, subangular; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 10% sand, fine to coarse, subangular; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense	gm	
650.0	29.0						
649.0	30.0	S-20	8-8-10 (18) 100%		29.4-32.4 ft Well graded gravel with silt and sand, (gw-gm), about 5% cobbles, subangular; 2% boulders, subangular; 70% gravel, fine to coarse, subangular; 20% sand, fine to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense	gw-gm	
648.0	31.0	S-21	4-7-19 (26) 67%				
647.0	32.0						
646.0	33.0	S-22	9-22-12 (34) 57%		32.4-35.4 ft Well graded gravel with silt and sand, (gw-gm), about 5% cobbles, subangular; 0% boulders; 70% gravel, fine to coarse, subangular; 20% sand, fine to coarse, subangular; 10% fines, non plastic, no dry strength, no dilatancy, no toughness; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, dense to medium dense	gw-gm	
645.0	34.0	S-23	3-6-8 (14) 67%				
644.0	35.0						
643.0	36.0	S-24	4-6-11 (17) 60%		35.4-35.65 ft Well graded sand with silt, (sw-sm), 90% sand, fine to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; medium dark gray (N4), medium dense	sw-sm	
						gm	
642.0	37.0	S-25	50/4 33%		35.65-36.9 ft Silty gravel with sand, (gm), about 5% cobbles, subangular; 1% boulders, subangular; 60% gravel, fine to coarse, subangular; 20% sand, fine to coarse, subangular; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense		
641.0	38.0						
		S-26	50/4		36.9-37.23 ft SHALE, moderately hard, fresh, medium dark gray (N4), weak reaction to HCl		
640.0	39.0		100%				
		R -1	46% (38%)	FD4	37.23-38.4 ft Interval not sampled		39.0-40.5 ft mechanically broken

DATE STARTED: 5/11/10
DATE FINISHED: 5/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-438

PROJECT NO. 10-4310

COORDINATES

N. 339721.41 ft E. 2406429.61 ft

GROUND SURFACE ELEVATION: 679.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
638.0	41.0	R -1	46% (38%)			38.4-38.75 ft SHALE, moderately hard, fresh, medium dark gray (N4), weak reaction to HCl 38.75-39.0 ft Interval not sampled 39.0-51.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl 40.5-41.5 ft R.D. = 90°; filling: moderately healed, moderately thin calcite, fresh; surface: fresh. 41.1-41.5 ft R.D. = 65°; filling: moderately healed, moderately thick calcite, fresh; surface: fresh. 41.5-43.8 ft R.D. = 56°, widely spaced; filling: clean; surface: rough, planar. 43.2-49.7 ft R.D. = 10°, very widely spaced; filling: clean; surface: smooth, planar.		
637.0	42.0							
636.0	43.0							
635.0	44.0	R -2	100% (98%)					
634.0	45.0							
633.0	46.0			FD4				
632.0	47.0							
631.0	48.0					47.8-51.5 ft R.D. = 36°; filling: clean; surface: rough, planar.		
630.0	49.0	R -3	100% (95%)					
629.0	50.0							
628.0	51.0							
627.0	52.0					51.5-61.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace calcite and pyrite replaced shell casts		
626.0	53.0							
625.0	54.0	R -4	100% (100%)	FD2				
624.0	55.0							
623.0	56.0							
622.0	57.0							
621.0	58.0	R -5	97% (97%)	FD0				
620.0	59.0							

DATE STARTED: 5/11/10
DATE FINISHED: 5/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-438

PROJECT NO. 10-4310

COORDINATES

N. 339721.41 ft E. 2406429.61 ft

GROUND SURFACE ELEVATION: 679.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
618.0	61.0	R -5	97% (97%)	FD0		51.5-61.5 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely to extremely widely fractured, no reaction to HCl, trace calcite and pyrite replaced shell casts		
						---- Bottom of Boring at 61.50 ft.----		

DATE STARTED: 5/11/10
DATE FINISHED: 5/12/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook
HELPER(S): J. Parlett

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-439

PROJECT NO. 10-4310

COORDINATES

N. 339757.11 ft E. 2406541.81 ft

GROUND SURFACE ELEVATION: 677.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
677.0						0.0-1.5 ft Sandy silt/sandy elastic silt, (ml/mh), 70% fines, low plasticity, no dry strength, no dilatancy, low toughness; 30% sand, fine; 0% gravel; dark yellowish brown (10YR 4/2) and moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very soft, 0.0-0.5 ft roots and organic material, color changes from dark yellowish brown (10YR 4/2) to moderate yellowish brown (10YR 5/4) at 0.6 ft	ml/mh	Auger set to 5.0 ft for temporary casing
676.0	1.0	S-1	1-1-2 (3) 100%					
						1.5-2.5 ft Interval not sampled		
675.0	2.0							
674.0	3.0	S-2	7-14-16 (30) 100%			2.5-4.0 ft Clayey sand with gravel, (sc), about 5% cobbles, subangular, hard, flat; 40% fines, low plasticity, no dry strength, no dilatancy, low toughness; 30% gravel, fine to coarse, subangular, flat, hard hardness; 30% sand, fine to coarse, subangular; maximum grain size = 2 inches, dark yellowish brown (10YR 4/2) and moderate yellowish brown (10YR 5/4), moist, no HCl reaction, medium dense	sc	
673.0	4.0					4.0-5.0 ft Interval not sampled		
672.0	5.0	S-3	5-13-22 (35) 97%			5.0-5.4 ft Sandy silt/sandy elastic silt, (ml/mh), 60% fines, low plasticity, no dry strength, no dilatancy, low toughness; 30% sand, fine to coarse, subangular; 10% gravel, fine to coarse, subangular, flat, hard hardness; maximum grain size = 0.25 inches, dark yellowish brown (10YR 4/2) and moderate yellowish brown (10YR 5/4), moist, no HCl reaction, hard, 5.35-5.4, Laminae of organic smelling material, grayish black (N2) to black (N1).	ml/mh	
						5.4-5.7 ft Well graded sand with silt, (sw-sm), 90% sand, fine to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; 0% gravel; moderate yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/2), moist, no HCl reaction, dense	sw-sm	
671.0	6.0						sc	
670.0	7.0					5.7-6.5 ft Clayey sand with gravel, (sc), about 5% cobbles, subangular, hard; 2% boulders, subangular, hard; 40% sand, fine to coarse, subangular; 30% gravel, fine to coarse, subangular, hard hardness; 25% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2 inches, dark yellowish brown (10YR 4/2), moist, no HCl reaction, dense		
669.0	8.0	S-4	12-11-11 (22) 67%			6.5-7.5 ft Interval not sampled		
						7.5-9.0 ft Clayey sand with gravel, (sc), about 5% cobbles, subangular; 2% boulders, subangular, hard; 40% sand, fine to coarse, subangular, hard hardness; 30% gravel, fine to coarse, subangular, hard hardness; 30% fines, high plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense	sc	
668.0	9.0					9.0-10.0 ft Interval not sampled		

DATE STARTED: 5/22/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-439

PROJECT NO. 10-4310

COORDINATES

N. 339757.11 ft E. 2406541.81 ft

GROUND SURFACE ELEVATION: 677.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
667.0								
	11.0	S-5	9-12-12 (24) 67%			10.0-11.5 ft Clayey sand with gravel, (sc), about 5% cobbles, subangular; 40% sand, fine to coarse, subangular, hard hardness; 30% gravel, fine to coarse, subangular, hard hardness; 30% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense	sc	
666.0								
	12.0					11.5-12.5 ft Interval not sampled		
665.0								
	13.0	S-6	14-17-23 (40) 77%			12.5-14.0 ft Clayey sand with gravel, (sc), about 5% cobbles, subangular; 1% boulders, subangular; 50% sand, fine to coarse, subangular, hard hardness; 30% gravel, fine to coarse, subangular, hard hardness; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2 inches, pale brown (5YR 5/2), wet, no HCl reaction, dense	sc	
664.0								
	14.0					14.0-15.0 ft Interval not sampled		
663.0								
	15.0	S-7	10-22-25 (47) 60%			15.0-16.5 ft Clayey sand with gravel, (sc), about 5% cobbles, subangular; 2% boulders, subangular; 50% sand, fine to coarse, subangular, hard hardness; 30% gravel, fine to coarse, subangular, hard hardness; 20% fines, high plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 3.5 inches, pale brown (5YR 5/2), wet, no HCl reaction, dense	sc	
662.0								
	16.0					16.5-17.5 ft Interval not sampled		
661.0								
	17.0	S-8	14-19-26 (45) 67%			17.5-19.0 ft Clayey sand with gravel, (sc), about 10% cobbles, subangular, very hard; 2% boulders, subangular, hard; 40% gravel, fine to coarse, subangular, hard hardness; 40% sand, fine to coarse, subangular, hard hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, dense	sc	
660.0								
	18.0							
659.0								
	19.0							
658.0								

DATE STARTED: 5/22/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-439

PROJECT NO. 10-4310

COORDINATES

N. 339757.11 ft E. 2406541.81 ft

GROUND SURFACE ELEVATION: 677.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
657.0						20.0-21.5 ft Well graded sand with clay and gravel, (sw-sc), about 10% cobbles, subangular, hard; 2% boulders, subangular, hard; 50% sand, fine to coarse, subangular, hard hardness; 40% gravel, fine to coarse, subangular, hard hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense	sw-sc	
656.0	21.0	S-9	7-9-9 (18) 67%					
						21.5-22.5 ft Interval not sampled		
655.0	22.0							
						22.5-24.0 ft Clayey sand with gravel, (sc), about 5% cobbles, subangular, hard; 5% boulders, subangular, hard; 40% sand, fine to coarse, subangular, hard hardness; 30% gravel, fine to coarse, subangular, hard hardness; 30% fines, high plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense	sc	
654.0	23.0	S-10	10-9-12 (21) 73%					
653.0	24.0					24.0-25.0 ft Interval not sampled		
652.0	25.0					25.0-26.5 ft Clayey gravel with sand, (gc), about 10% cobbles, subangular, hard; 5% boulders, subangular, hard; 50% gravel, fine to coarse, subangular, hard hardness; 30% sand, fine to coarse, subangular, hard hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, dense	gc	
651.0	26.0	S-11	10-23-23 (46) 63%					
						26.5-27.5 ft Interval not sampled		
650.0	27.0	S-12	50/1					
		S-13	100% 50/0			27.5-27.62 ft 100% boulders; 100% gravel, hard hardness; maximum grain size = 2.5 inches, medium dark gray (N4), wet, no HCl reaction, very dense, shale boulder		
649.0	28.0					27.62-27.9 ft Interval not sampled		
						27.9 ft Very dense, shale boulder 27.91-30.0 ft Interval not sampled		
648.0	29.0							

DATE STARTED: 5/22/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-439

PROJECT NO. 10-4310

COORDINATES

N. 339757.11 ft E. 2406541.81 ft

GROUND SURFACE ELEVATION: 677.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
647.0						30.0-31.5 ft Well graded sand with silt and gravel, (sw-sm), about 2% cobbles, subangular, very hard; 2% boulders, subangular, hard; 70% sand, fine to coarse, subangular, hard hardness; 20% gravel, fine to coarse, subangular, hard hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, medium dark gray (N4), wet, no HCl reaction, medium dense	sw-sm	
646.0	31.0	S-14	5-7-17 (24) 47%					
						31.5-32.5 ft Interval not sampled		
645.0	32.0							
						32.5-33.75 ft Well graded gravel, (gw), 95% boulders, subangular; 100% gravel, coarse; maximum grain size = 1.0 inches, medium dark gray (N4) with light brownish gray (5YR 6/1), wet, no HCl reaction, very dense, fissile shale boulder	gw	
644.0	33.0	S-15	25-25-50/3 80%					
						33.75-35.0 ft Interval not sampled		
643.0	34.0							
642.0	35.0					35.0-36.17 ft Well graded gravel, (gw), about 2% cobbles; 50% boulders, subangular, hard; 90% gravel, fine to coarse, subangular, very hard hardness; 5% sand, fine to coarse, subangular, very hard hardness; 5% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, medium dark gray (N4), wet, no HCl reaction, very dense, domanited by shale fragments that are fissile	gw	
		S-16	37-40-50/2 26%					
641.0	36.0					36.17-42.5 ft No sample recovered		36.17-42.5 ft. attempted to start coring due to refusal, no core recovery, switching back to SPT
640.0	37.0							
639.0	38.0							
638.0	39.0							

DATE STARTED: 5/22/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-439

PROJECT NO. 10-4310

COORDINATES
N. 339757.11 ft E. 2406541.81 ft
GROUND SURFACE ELEVATION: 677.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
637.0						36.17-42.5 ft No sample recovered		
636.0	41.0							
635.0	42.0							
		S-17	50/3 100%			42.5-42.75 ft SHALE, moderately hard to hard, fresh, medium dark gray (N4), no reaction to HCl, no staining, fissile		
634.0	43.0							
		S-18	50/1 0%			43.4-43.5 ft No recovery, SPT refusal suggest rock 43.5-44.8 ft No core recovered		
633.0	44.0							
632.0	45.0					44.8-55.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts		Casing set to 44.8 ft.
631.0	46.0							
630.0	47.0							
		R -1	100% (98%)	FD3				
629.0	48.0					48.2-54.3 ft R.D. = 10°, widely to very widely spaced; filling: clean; surface: smooth, planar.		
628.0	49.0							

DATE STARTED: 5/22/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-439

PROJECT NO. 10-4310

COORDINATES

N. 339757.11 ft E. 2406541.81 ft

GROUND SURFACE ELEVATION: 677.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
627.0						44.8-55.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts 50.05-51.25 ft R.D. = 36°, widely spaced; filling: clean; surface: rough, planar.		
626.0	51.0							
625.0	52.0	R -2	100% (98%)	FD4				
624.0	53.0							
623.0	54.0					53.75-54.4 ft R.D. = 88°; filling: moderately healed, moderately thick calcite, fresh; surface: fresh.		
622.0	55.0					55.0-60.2 ft SHALE, hard to moderately hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, no staining, trace calcite and pyrite replaced shell casts 55.35-59.45 ft Bedding plane separation, R.D. = 10°, very widely spaced; filling: clean; surface: smooth, planar.		
621.0	56.0							
620.0	57.0	R -3	100% (94%)	FD1				
619.0	58.0							
618.0	59.0							

DATE STARTED: 5/22/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-439

PROJECT NO. 10-4310

COORDINATES

N. 339757.11 ft E. 2406541.81 ft

GROUND SURFACE ELEVATION: 677.06 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
617.0		R -3		FD1		---- Bottom of Boring at 60.20 ft.----		

DATE STARTED: 5/22/10
DATE FINISHED: 5/24/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: Casing Advancer, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
675.0	1.0	S-1	1-1-3 (4) 100%			0.0-4.3 ft Silt with sand, (ml), about 2% cobbles, subangular; 65% fines, low plasticity, no dry strength, no dilatancy, low toughness; 30% sand, fine to medium; 5% gravel, medium to coarse; maximum grain size = 1 inches, dark yellowish orange (10YR 6/6) and moderate yellowish brown (10YR 5/4), moist, no HCl reaction, soft to hard	ml	Temporary casing set to 10.0 ft Casing advancer set to 34.3 ft
674.0	2.0	S-2	4-9-21 (30) 93%					
673.0	3.0	S-3	19-15-24 (39) 100%					
672.0	4.0					4.3-5.2 ft Poorly graded gravel, (gp), 100% gravel, coarse; pale brown (5YR 5/2), dry, no HCl reaction, dense, sandstone boulder	gp	
671.0	5.0	S-4	23-16-12 (28) 80%			5.2-7.5 ft Well graded gravel with silt, (gw-gm), about 2% cobbles, subangular; 2% boulders, subangular; 90% gravel, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2) and grayish red (10R 4/2), dry, no HCl reaction, very dense	gw-gm	
670.0	6.0							
669.0	7.0	S-5	30-21-16 (37) 67%					
668.0	8.0	S-6	15-15-15 (30) 93%			7.5-10.0 ft Silty gravel, (gm), about 2% cobbles, subangular; 2% boulders, subangular; 70% gravel, fine to coarse, subangular; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; 10% sand, fine to coarse, subangular; maximum grain size = 1.5 inches, moderate brown (5YR 3/4), dry, no HCl reaction, dense to very dense, 10.0 ft refusal on sandstone boulder	gm	
667.0	9.0	S-7	26-50 100%					

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
665.0	11.0	S-8	4-17-30 (47) 67%			10.0-11.5 ft Clayey sand with gravel, (sc), about 2% cobbles, subangular, hard; 1% boulders, subangular, hard; 50% sand, fine to coarse, subangular; 30% gravel, fine to coarse, subangular, hard hardness; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, dense	sc	
664.0	12.0	S-9	17-27-19 (46) 73%			11.5-11.9 ft Well graded gravel, (gw), about 3% cobbles, subangular; 100% gravel, fine to coarse, subangular, hard hardness; maximum grain size = 1.5 inches, light gray (N7) and medium gray (N5), wet, no HCl reaction, dense	gw	
						11.9-13.0 ft Clayey sand with gravel, (sc), about 2% cobbles, subangular, very hard; 50% sand, fine to coarse, subangular; 30% gravel, fine to coarse, subangular; 20% fines, low plasticity, no dry strength, rapid dilatancy, low toughness; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, dense	sc	
663.0	13.0							
662.0	14.0	S-10	15-16-19 (35) 67%			13.0-14.5 ft Silty gravel with sand, (gm), about 3% cobbles, subangular, hard; 2% boulders, subangular, hard; 40% gravel, fine to coarse, subangular, very hard hardness; 40% fines, high plasticity, no dry strength, rapid dilatancy, low toughness; 20% sand, fine to coarse, subangular; maximum grain size = 2.0 inches, dark yellowish brown (10YR 4/2) and moderate brown (5YR 3/4), wet, no HCl reaction, dense	gm	
661.0	15.0	S-11	11-11-22 (33) 67%			14.5-16.0 ft Clayey gravel with sand, (gc), about 3% cobbles, subangular, hard; 3% boulders, subangular, hard; 40% gravel, fine to coarse, subangular, very hard hardness; 40% fines, high plasticity, no dry strength, rapid dilatancy, low toughness; 20% sand, medium to coarse, subangular; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, dense, gravel, cobbles and boulders include sandstones, shale, anthracite coal	gc	
660.0	16.0	S-12	30-38-28 (66) 47%			16.0-17.5 ft Clayey gravel, (gc), about 2% cobbles, subangular, very hard; 1% boulders, subangular, very hard; 70% gravel, fine to coarse, subangular; 20% fines, high plasticity, rapid dilatancy, low toughness; 10% sand, fine to medium, subangular; maximum grain size = 1 inches, medium dark gray (N4) with moderate yellowish brown (10YR 5/4), wet, no HCl reaction, very dense, decomposed shale fragments	gc	
659.0	17.0							
658.0	18.0	S-13	12-14-14 (28) 57%			17.5-19.0 ft Well graded gravel with silt and sand, (gw-gm), about 5% cobbles, subangular, hard; 2% boulders, subangular, very hard; 60% gravel, fine to coarse, subangular; 30% sand, fine to coarse, subangular; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense	gw-gm	
657.0	19.0	S-14	16-23-25 (48) 73%			19.0-19.3 ft Well graded sand with gravel, (sw), 85% sand, fine to coarse, subangular; 15% gravel, medium to coarse, subangular, hard hardness; maximum grain size = 0.5 inches, dark gray (N3), wet, no HCl reaction, dense	sw	
							gw-gc	

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		S-14	16-23-25 (48) 73%			19.3-20.5 ft Well graded gravel with clay and sand, (gw-gc), about 5% cobbles, subangular, very hard, elongated; 60% gravel, fine to coarse, subangular, very hard hardness; 30% sand, medium to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, dark gray (N3), wet, no HCl reaction, dense	gw-gc	
655.0	21.0	S-15	22-27-40 (67) 80%			20.5-21.0 ft Well graded gravel, (gw), 100% boulders, subangular; 100% gravel, coarse, subangular, medium hardness; maximum grain size = 4 inches, dark gray (N3), wet, no HCl reaction, very dense, zone contains boulder of granite and shale, shale is fissile and fresh to slightly weathered	gw	
654.0	22.0					21.0-22.3 ft Well graded sand with clay and gravel, (sw-sc), about 5% cobbles, subangular, medium; 60% sand, fine to coarse, subangular; 30% gravel, fine to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, moderate yellowish brown (10YR 5/4), wet, no HCl reaction, very dense	sw-sc	
653.0	23.0	S-16	16-17-22 (39) 67%			22.3-23.5 ft Clayey sand with gravel, (sc), about 2% cobbles, subangular, medium; 40% gravel, fine to coarse, subangular, hard hardness; 40% sand, fine to coarse, subangular; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, dense	sc	
652.0	24.0	S-17	10-50 80%			23.5-24.5 ft Clayey gravel with sand, (gc), about 5% cobbles, subangular, very hard; 2% boulders, subangular, hard; 50% gravel, fine to coarse, subangular, very hard hardness; 30% sand, fine to coarse, subangular; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, dark gray (N3) with moderate yellowish brown (10YR 5/4), wet, no HCl reaction, very dense	gc	
651.0	25.0					24.5-26.5 ft SHALE, shale boulder, interval not sampled		Clay seams found in bedrock some contained a strong organic smell
650.0	26.0							
649.0	27.0	S-18	16-27-37 (64) 80%			26.5-28.0 ft Well graded gravel with silt and sand, (gw-gm), about 10% cobbles, subangular; 15% boulders, subangular, very hard; 70% gravel, fine to coarse, subangular, very hard hardness; 20% sand, medium to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, pale yellowish orange (10YR 8/6) and yellowish gray (5Y 7/2), wet, weak HCl reaction, very dense, HCl reaction is to sand and silt pockets not to gravels, cobbles and boulders	gw-gm	
648.0	28.0	S-19	36-26-29 (55) 60%			28.0-31.0 ft Well graded gravel with silt and sand, (gw-gm), about 5% cobbles, subangular, hard; 5% boulders, medium; 50% gravel, fine to coarse, subangular, very hard hardness; 40% sand, fine to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, medium dark gray (N4) and yellowish gray (5Y 7/2), wet, weak HCl reaction, very dense, HCl reaction to sand and silt pockets	gw-gm	
647.0	29.0	S-20	18-35-18 (53) 60%					

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
		S-20	18-35-18 (53) 60%			gw-gm	
645.0	31.0				31.0-32.5 ft SHALE, very soft to hard, fresh, medium dark gray (N4), no reaction to HCl, wet		
		S-21	12-12-8 (20) 57%				
644.0	32.0						
					32.5-34.0 ft Well graded gravel with clay and sand, (gw-gc), about 5% cobbles, subangular, hard; 10% boulders, subangular, hard; 70% gravel, fine to coarse, subangular, hard hardness; 20% sand, fine to coarse, subangular; 10% fines, high plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2 inches, medium dark gray (N4), wet, no HCl reaction, very dense, fissile shale and contains trace pieces of sandstone	gw-gc	
643.0	33.0	S-22	9-16-40 (56) 73%				
642.0	34.0	S-23	50/3 0%		34.0-34.25 ft No sample collected, spoon bouncing on top of shale bed rock		
					34.3-41.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to very closely fractured, no reaction to HCl, no staining 34.3-34.75 ft R.D. = 56°; filling: clean; surface: rough, planar.		Casing advancer set to 40.0 ft due to rock conditions, 5/20/10
641.0	35.0	R -1	100% (82%)				
640.0	36.0				36.2-50.7 ft Bedding plane separation, R.D. = 10°, very closely to widely spaced; filling: clean; surface: smooth, planar; 39.1 ft, 39.15 ft, and 41.65 ft bedding totally healed, moderately thick (39.1 ft) and very thin (39.15 ft and 41.65 ft) fresh calcite filling.		
639.0	37.0			FD5			
638.0	38.0	R -2	96% (83%)				
637.0	39.0				39-39.55 ft R.D. = 36°, moderately spaced; filling: clean; surface: rough, planar.		

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R -2	96% (83%)	FD5		34.3-41.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to very closely fractured, no reaction to HCl, no staining		
635.0	41.0					41.0-51.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to moderately fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts		
634.0	42.0							
633.0	43.0	R -3	100% (79%)					
632.0	44.0							
631.0	45.0			FD4				
630.0	46.0					46-46.8 ft Soft zone during drilling, clay pulled from inner barrel (0.25 ft), low toughness, high plasticity, rapid dilatancy.		
629.0	47.0							
628.0	48.0	R -4	88% (82%)					
627.0	49.0							

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R -4	88% (82%)	FD4		41.0-51.0 ft SHALE, moderately hard to hard, fresh, dark gray (N3), widely to moderately fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts		
625.0	51.0							
		R -5	100% (71%)	FD6		51.0-52.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to closely fractured, no reaction to HCl, no staining, trace pyrite and calcite, clay zone from 51.85-52.05 ft, medium gray (N5)		
624.0	52.0							
						52.2-52.6 ft Sample lost due to destructive drilling used to remove pieces from destroyed bit		
623.0	53.0					52.6-61.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts		
622.0	54.0	R -6	100% (100%)					
621.0	55.0							
620.0	56.0			FD0				
619.0	57.0							
		R -7	100% (100%)					
618.0	58.0							
617.0	59.0							

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
615.0	61.0	R -7	100% (100%)	FD0		52.6-61.2 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts		60.3-60.7 ft, SC-1, 5/21/10, 11:15
614.0	62.0					61.2-61.4 ft Fat clay, (ch), 100% fines, high plasticity, medium dry strength, slow dilatancy, low toughness; 0% gravel; 0% sand; medium dark gray (N4), wet, no HCl reaction 61.2-66.4 ft Bedding plane separation, R.D. = 10°, closely to moderately spaced; filling: clean; surface: smooth, planar.	ch	
613.0	63.0	R -8	100% (93%)	FD4		61.4-70.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts, clay seam from 66.2-66.3 ft, medium dark gray (N4), low toughness, high plasticity 61.45-61.55 ft R.D. = 56°; filling: clean; surface: rough, planar.		
612.0	64.0							
611.0	65.0							
610.0	66.0					66-66.01 ft Bedding plane separation, R.D. = 10°, very closely spaced; filling: moderately healed, moderately thin calcite, fresh, hard; surface: fresh; bedding shows displacement between very closely spaced beds, approximately 1 cm.		
609.0	67.0							
608.0	68.0	R -9	99% (88%)	FD0				
607.0	69.0							

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R -9	99% (88%)	FD0		61.4-70.9 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts, clay seam from 66.2-66.3 ft, medium dark gray (N4), low toughness, high plasticity		
605.0	71.0					70.9-75.8 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts, clay seam with rock fragments from 71.35-71.6 ft and 75.3-75.4 ft, medium dark gray (N4), low toughness, high plasticity		
604.0	72.0			FD6		71.4-72.7 ft Bedding plane separation, R.D. = 10°, very closely to moderately spaced; filling: clean; surface: smooth, planar.		
603.0	73.0	R -10	100% (94%)					
602.0	74.0			FD1				
601.0	75.0							
600.0	76.0					75.8-85.3 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts		
599.0	77.0							
598.0	78.0	R -11	100% (100%)	FD0				
597.0	79.0							

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R -11		FD0		75.8-85.3 ft SHALE, moderately hard to hard, fresh, dark gray (N3), very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts		
595.0	81.0					81-81.15 ft R.D. = 36°; filling: clean; surface: rough, planar.		
594.0	82.0							
		R -12	100% (100%)					
593.0	83.0			FD1				
592.0	84.0							
591.0	85.0					85.3-90.3 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to very widely fractured, no reaction to HCl, no staining, trace pyrite and calcite replaced shell casts, clay laminae at 84.67-85.1 ft medium dark gray (N4), low toughness, high plasticity, rock fragment laminae		
590.0	86.0					85.45-85.75 ft Bedding plane separation, R.D. = 10°; surface: smooth, planar.		
589.0	87.0							
		R -13	100% (94%)					
588.0	88.0			FD0				
587.0	89.0							

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R -13		FD0		90.3-100.3 ft SHALE, moderately hard to hard, fresh, dark gray (N3), closely to very widely fractured, no reaction to HCl, no staining, trace calcite and pyrite replaced shell casts		
585.0	91.0							
						91.8-94.8 ft R.D. = 10°, widely spaced; filling: clean; surface: smooth, planar.		
584.0	92.0							
		R -14	100% (94%)	FD2				
583.0	93.0							
582.0	94.0							
						94.46-94.5 ft R.D. = 36°; filling: clean; surface: rough, planar.		
581.0	95.0							
						95.45-95.46 ft Bedding plane separation, R.D. = 10°; filling: clean; surface: smooth, planar.		
580.0	96.0							
579.0	97.0							
		R -15	96% (92%)	FD0				
578.0	98.0							
577.0	99.0							

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-440

PROJECT NO. 10-4310

COORDINATES

N. 339706.74 ft E. 2406546.24 ft

GROUND SURFACE ELEVATION: 675.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R -15		FD0				
						---- Bottom of Boring at 100.30 ft.----		
575.0								

DATE STARTED: 5/13/10
DATE FINISHED: 5/21/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: D. Westbrook/ J. Parlett
HELPER(S): J. Parlett/ E. Zetwick

DRILL RIG: CME-550 (Buggy)
HAMMER ID: 925

REV 1 Final Boring B-441

PROJECT NO. 10-4310

COORDINATES

N. 339619.81 ft E. 2407095.21 ft

GROUND SURFACE ELEVATION: 666.90 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
666.0	1.0	S -1	1-1-2 (3) 100%			0.0-1.5 ft Silty sand, (sm), 80% sand, fine; 20% fines, low plasticity, low toughness; moderate yellowish brown (10YR 5/4), moist, no HCl reaction, very loose	sm	
665.0	2.0	S -2	2-3-5 (8) 100%			1.5-3.0 ft Silty sand, (sm), 80% sand, fine; 20% fines, low plasticity, low toughness; moderate yellowish brown (10YR 5/4), moist, no HCl reaction, loose	sm	
664.0	3.0							
663.0	4.0	S -3	4-5-6 (11) 100%			3.0-4.5 ft Silty sand, (sm), 80% sand, fine to medium; 20% fines, low plasticity, low toughness; moderate yellowish brown (10YR 5/4), moist, no HCl reaction, medium dense	sm	
662.0	5.0	S -4	4-4-4 (8) 93%			4.5-6.0 ft Silty sand, (sm), 80% sand, fine to medium; 20% fines, low plasticity, low toughness; dark yellowish brown (10YR 4/2), moist, no HCl reaction, loose	sm	
661.0	6.0							
660.0	7.0	S -5	2-2-5 (7) 87%			6.0-7.5 ft Silty sand, (sm), 85% sand, fine to medium; 15% fines, low plasticity, low toughness; dark yellowish brown (10YR 4/2), moist, no HCl reaction, loose	sm	
659.0	8.0	S -6	7-32-37 (69) 100%			7.5-9.0 ft Well graded sand with silt and gravel, (sw-sm), 70% sand, medium; 20% gravel, fine to medium, subangular, flat and elongated, medium hardness; 10% fines, non plastic, no toughness; maximum grain size = 0.25 inches, dark yellowish brown (10YR 4/2) with dark gray (N3), moist, no HCl reaction, very dense, fine to medium gravel size shale fragments	sw-sm	7.5 ft Switch to casing advancer
658.0	9.0	S -7	13-50/5 92%			9.0-9.9 ft Poorly graded sand with clay and gravel, (sp-sc), 60% sand, fine to medium; 30% gravel, fine to medium, angular, flat and elongated, hard hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.25 inches, dark yellowish brown (10YR 4/2) with dark gray (N3), moist, no HCl reaction, very dense	sp-sc	
657.0	10.0							
656.0	11.0	S -8	40-50/1 86%			9.9-10.5 ft Interval not sampled	gm	
655.0	12.0	S -9	50/1 0%			10.5-11.1 ft Silty gravel with sand, (gm), 40% gravel, fine to coarse; 30% sand, fine to medium, subangular, medium hardness; 30% fines, medium plasticity, medium toughness; maximum grain size = 0.25 inches, dark yellowish brown (10YR 4/2) and dark gray (N3), moist, no HCl reaction, very dense		12.0-13.5 ft., no recovery, destroyed SPT driving shoe, destructively drilling to 13.5 ft.
654.0	13.0					11.1-12.0 ft Interval not sampled		
653.0	14.0	S -10	23-50/3 93%			12.0-12.1 ft No sample recovered	sm	
652.0	15.0	S -11	20-30-50/0 90%			13.5-14.25 ft Silty sand with gravel, (sm), 40% gravel, fine to medium, subangular, hard hardness; 40% sand, fine to coarse; 20% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, dark gray (N3) with dark yellowish brown (10YR 4/2), wet, no HCl reaction, very dense	sm	
651.0	16.0					14.25-15.0 ft Interval not sampled		
650.0	17.0	S -12	37-35-50/2 94%			15.0-16.0 ft Silty sand with gravel, (sm), 50% sand, fine to coarse; 35% gravel, fine to medium, subangular, hard hardness; 15% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, dark yellowish brown (10YR 4/2) and dark gray (N3), wet, no HCl reaction, very dense, sampling through sandstone boulder/cobbles grayish red (5R 4/2) and yellowish gray (5Y 7/2), hard, rounded, medium size gravel fragments	sp-sm	
649.0	18.0					16.0-16.5 ft Interval not sampled		
648.0	19.0	S -13	33-15-40 (55) 73%			16.5-17.65 ft Poorly graded sand with silt and gravel, (sp-sm), 50% sand, fine to coarse; 40% gravel, fine to medium, subangular, hard hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches,	sp-sm	
647.0		S -14					sp-	

DATE STARTED: 6/2/10
DATE FINISHED: 6/4/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-441

PROJECT NO. 10-4310

COORDINATES

N. 339619.81 ft E. 2407095.21 ft

GROUND SURFACE ELEVATION: 666.90 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		S -14	19-50/5 83%			dark gray (N3) with dark yellowish brown (10YR 4/2), wet, no HCl reaction, very dense	sm	
646.0	21.0					17.65-18.0 ft Interval not sampled		21.0 - 22.0 ft, on boulder, drill destructively, continue sampling at 22.0 ft
645.0	22.0					18.0-19.5 ft Poorly graded sand with silt and gravel, (sp-sm), 50% sand, fine to coarse; 40% gravel, fine to medium, subangular, hard hardness; 10% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, dark gray (N3) with grayish red (5R 4/2), wet, no HCl reaction, very dense		
644.0	23.0	S -15	13-25-23 (48) 50%			19.5-20.4 ft Poorly graded sand with silt and gravel, (sp-sm), 50% sand, fine to coarse; 40% gravel, fine to coarse, subangular, hard hardness; 10% fines, non plastic, no toughness; maximum grain size = 1.0 inches, dark gray (N3) and dusky yellow green (5GY 5/2), wet, no HCl reaction, very dense, other fragments grayish red (5R 4/2) in color, with subrounded, fine to coarse sand size quartz fragments	gp-gc	
643.0	24.0	S -16	20-13-13 (26) 73%			20.4-22.0 ft Interval not sampled	sc	
642.0	25.0					22.0-23.5 ft Poorly graded gravel with clay and sand, (gp-gc), 50% gravel, fine to coarse; 40% sand, fine to coarse, subangular, hard hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.75 inches, grayish red (5R 4/2) and greenish black (5GY 2/1), wet, no HCl reaction, dense, clay light gray (N7) present		
641.0	26.0	S -17	9-9-11 (20) 67%			23.5-25.0 ft Clayey sand with gravel, (sc), 50% sand, fine to coarse; 35% gravel, fine to medium, subangular, hard hardness; 15% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, dark gray (N3) and grayish red (5R 4/2), wet, no HCl reaction, medium dense	sc	
640.0	27.0	S -18	9-8-8 (16) 53%			25.0-26.5 ft Clayey sand with gravel, (sc), 50% sand, fine to coarse; 30% gravel, fine to medium, subangular, hard hardness; 20% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, dark gray (N3) and grayish orange (10YR 7/4), wet, no HCl reaction, medium dense	sc	
639.0	28.0					26.5-28.0 ft Clayey sand, (sc), 70% sand, fine to coarse; 20% fines, low plasticity, low toughness; 10% gravel, fine, subangular, hard hardness; maximum grain size = 0.25 inches, dark gray (N3) and pale yellowish brown (10YR 6/2), wet, no HCl reaction, medium dense		
638.0	29.0	S -19	8-8-7 (15) 53%			28.0-29.5 ft Poorly graded sand with clay and gravel, (sp-sc), 60% sand, fine to coarse; 30% gravel, fine to medium, subangular, hard hardness; 10% fines; maximum grain size = 0.5 inches, dark gray (N3) and moderate yellowish brown (10YR 5/4), wet, no HCl reaction, medium dense	sp-sc	
637.0	30.0	S -20	7-9-9 (18) 60%			29.5-31.0 ft Poorly graded sand with clay and gravel, (sp-sc), 65% sand, fine to coarse; 25% gravel, fine to medium, subangular, hard hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.3 inches, dark gray (N3) with grayish red (5R 4/2), wet, no HCl reaction, medium dense	sp-sc	
636.0	31.0					31.0-32.5 ft Clayey sand with gravel, (sc), 40% gravel, fine to medium, subangular, hard hardness; 40% sand, fine to coarse; 20% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, dark greenish gray (5GY 4/1) and moderate yellowish brown (10YR 5/4), wet, no HCl reaction, medium dense		
635.0	32.0	S -21	12-14-14 (28) 57%			32.5-34.0 ft Poorly graded gravel with clay, (gp-gc), 80% gravel, fine to coarse; 10% sand, fine to coarse, subangular, hard hardness; 10% fines, low plasticity, low toughness; maximum grain size = 1.0 inches, dark gray (N3) and moderate red (5R 4/6), wet, no HCl reaction, medium dense	sc	
634.0	33.0	S -22	10-11-13 (24) 33%			34.0-35.5 ft Clayey sand, (sc), 70% sand, fine to coarse; 20% fines, medium plasticity, low toughness; 10% gravel, fine to medium, subangular, hard hardness; maximum grain size = 0.5 inches, dark gray (N3) and pale yellowish brown (10YR 6/2), wet, no HCl reaction, medium dense	gp-gc	
633.0	34.0					35.5-37.0 ft Poorly graded sand with silt and gravel, (sp-sm), 60% sand, fine to coarse; 30% gravel, fine to coarse, subangular, hard hardness; 10%		
632.0	35.0	S -23	10-9-7 (16) 47%				sc	
631.0	36.0	S -24	11-8-9 (17) 80%				sp-sm	
630.0	37.0							
629.0	38.0	S -25	10-8-6 (14) 67%				sp-sc	
628.0	39.0	S -26	8-8-7 (15) 80%				sc	
627.0								

DATE STARTED: 6/2/10
DATE FINISHED: 6/4/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-441

PROJECT NO. 10-4310

COORDINATES

N. 339619.81 ft E. 2407095.21 ft

GROUND SURFACE ELEVATION: 666.90 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
626.0	41.0	S -27	4-15-27 (42) 100%		fines, low plasticity, low toughness; maximum grain size = 1.0 inches, dark gray (N3) and pale yellowish brown (10YR 6/2), wet, no HCl reaction, medium dense	sm	
625.0	42.0	S -28	35-32-30 (62) 87%		37.0-38.5 ft Poorly graded sand with clay and gravel, (sp-sc), 60% sand, fine to coarse; 30% gravel, fine, subangular, hard hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.1 inches, dark gray (N3) and pale yellowish brown (10YR 6/2), wet, no HCl reaction, medium dense	sc	
624.0	43.0				38.5-40.0 ft Clayey sand, (sc), 80% sand, fine to medium; 20% fines; light brown (5YR 5/6) and dusky yellowish brown (10YR 2/2), wet, no HCl reaction, medium dense		
623.0	44.0	S -29	16-30-40 (70) 80%		40.0-41.5 ft Silty sand, (sm), 70% sand, fine to coarse; 25% fines; 5% gravel, fine, subangular, hard hardness; maximum grain size = 0.1 inches, moderate brown (5YR 3/4) and grayish brown (5YR 3/2), dense	sc	
622.0	45.0	S -30	50/2 29%		41.5-43.0 ft Clayey sand with gravel, (sc), 60% sand, fine to coarse; 20% gravel, fine to medium, subangular, medium hardness; 20% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, grayish red (5R 4/2) and medium dark gray (N4), wet, no HCl reaction, very dense	gc	Attempted to core at 45.0-46.6 ft. still in soil, resume SPTs.
621.0	46.0						
620.0	47.0	S -31	36-25-27 (52) 93%		43.0-44.5 ft Clayey sand with gravel, (sc), 60% sand, fine to coarse; 20% gravel, fine to medium, subangular, hard hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.5 inches, moderate red (5R 5/4) and pale yellowish brown (10YR 6/2), moist, no HCl reaction, very dense	sc	
619.0	48.0	S -32	50/4 100%		44.5-44.65 ft Clayey gravel, (gc), 75% gravel, fine to medium, subrounded, hard hardness; 20% fines, low plasticity, low toughness; 5% sand, fine to coarse; maximum grain size = 0.5 inches, grayish red (5R 4/2) and light olive gray (5Y 6/1), moist, no HCl reaction, very dense	sm	
618.0	49.0						
617.0	50.0				44.65-46.6 ft Interval not sampled		
616.0	51.0	S -33	12-13-21 (34) 60%		46.6-48.1 ft Clayey sand with gravel, (sc), 35% gravel, fine to coarse, subrounded, hard hardness; 35% sand, fine to coarse; 30% fines, low plasticity, low toughness; maximum grain size = 1.0 inches, dark gray (N3) and light brown (5YR 5/6), moist, no HCl reaction, very dense	sm	
615.0	52.0	S -34	16-8-22 (30) 40%		48.1-48.44 ft Silty sand, (sm), 60% sand, fine to coarse; 30% fines, medium plasticity, low toughness; 10% gravel, fine to medium, subangular, hard hardness; maximum grain size = 0.5 inches, dark yellowish orange (10YR 6/6) and grayish red (5R 4/2), moist, no HCl reaction, very dense	sp-sm	
614.0	53.0				48.44-50.0 ft Interval not sampled		
613.0	54.0	S -35	13-19-50 (69) 47%		50.0-51.5 ft Silty sand, (sm), 70% sand, fine to coarse; 20% fines, medium plasticity, low toughness; 10% gravel, fine, subrounded, hard hardness; maximum grain size = 0.2 inches, light olive gray (5Y 5/2) and dark reddish brown (10R 3/4), wet, no HCl reaction, dense	sc	
612.0	55.0				51.5-53.0 ft Poorly graded sand with silt and gravel, (sp-sm), 70% sand, fine to coarse; 20% gravel, fine to medium, subrounded, hard hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.25 inches, greenish gray (5GY 6/1) and dark gray (N3), wet, no HCl reaction, medium dense		Drilled through hard material 54.5-55.0 ft., switch to core barrel to check for bedrock. Cuttings alternate in color and consistency. Competant rock/shale at 55.8 ft., begin rock coring
611.0	56.0						
610.0	57.0	R-1	100% (100%)	FD0	53.0-54.5 ft Clayey sand, (sc), 70% sand, fine to coarse; 20% fines, low plasticity, low toughness; 10% gravel, fine to medium, subangular, hard hardness; maximum grain size = 0.25 inches, greenish gray (5GY 6/1) and light olive gray (5Y 5/2), wet, no HCl reaction, very dense		
609.0	58.0				54.5-55.8 ft Interval not sampled		
608.0	59.0	R-2	100% (91%)	FD1	55.8-64.0 ft SHALE, moderately hard, fresh, dark gray (N3), massive, closely to widely fractured, no reaction to HCl, trace fossils and pyrite		SC-1 58.58-59.0 ft., 11:15, 6/4/10
607.0					56.3-59 ft R.D. = 70-90°, moderately spaced; filling: totally healed, moderately		

DATE STARTED: 6/2/10
DATE FINISHED: 6/4/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-441

PROJECT NO. 10-4310

COORDINATES

N. 339619.81 ft E. 2407095.21 ft

GROUND SURFACE ELEVATION: 666.90 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
606.0	61.0					thin calcite, fresh, moderately hard; surface: stepped, planar, fresh; closely-spaced, thin, totally-calcite healed, horizontal (0-10 °) fractures 59.7-60.2 ft. Fracture set #F-1.		
605.0	62.0	R-2	100% (91%)	FD1		55.8-64.0 ft SHALE, moderately hard, fresh, dark gray (N3), massive, closely to widely fractured, no reaction to HCl, trace fossils and pyrite		
604.0	63.0							
603.0	64.0					---- Bottom of Boring at 64.00 ft.----		

DATE STARTED: 6/2/10
DATE FINISHED: 6/4/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring B-442

PROJECT NO. 10-4310

COORDINATES

N. 339570.73 ft E. 2406579.03 ft

GROUND SURFACE ELEVATION: 673.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
673.0						0.0-0.6 ft Silty sand, (sm), 60% sand, fine to medium; 40% fines, non plastic, no dry strength, no dilatancy, no toughness; 0% gravel; dark yellowish brown (10YR 4/2), moist, weak HCl reaction, very loose, top 0.1 ft contains organic material (roots and corn stalk)	sm	
672.0	1.0	S-1	1-2-2 (4) 97%			0.6-1.5 ft Silty sand, (sm), 60% sand, fine to medium; 40% fines, low plasticity, no dry strength, no dilatancy, low toughness; 0% gravel; moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2), moist, no HCl reaction, very loose	sm	
671.0	2.0							
670.0	3.0	S-2	3-12-14 (26) 100%			1.5-2.5 ft Interval not sampled	ml	
669.0	4.0					2.5-4.0 ft Sandy silt, (ml), about 2% cobbles, subangular, hard; 55% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 40% sand, fine to medium; 5% gravel, fine to coarse, subangular, hard hardness; maximum grain size = 1.0 inches, dark yellowish orange (10YR 6/6) and moderate yellowish brown (10YR 5/4), moist, weak HCl reaction, mottled, reaction to HCl is weak		
668.0	5.0	S-3	24-30-50/4 81%				ml	
667.0	6.0					4.0-5.0 ft Interval not sampled	sw-sm	
666.0	7.0					5.0-5.2 ft Sandy silt, (ml), about 2% cobbles, subangular, hard; 55% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 40% sand, fine to medium; 5% gravel, fine to coarse, subangular, hard hardness; maximum grain size = 1.0 inches, dark yellowish orange (10YR 6/6) and moderate yellowish brown (10YR 5/4), moist, weak HCl reaction, mottled, reaction to HCl is weak	gw	
665.0	8.0	S-4	25-50 70%			5.2-5.4 ft Well graded sand with silt and gravel, (sw-sm), about 10% cobbles, subangular, hard; 50% sand, fine to coarse, subangular; 40% gravel, fine to coarse, subangular, very hard hardness; 10% fines, non plastic, no dry strength, no dilatancy, no toughness; maximum grain size = 1.0 inches, pale brown (5YR 5/2), dry, no HCl reaction, very dense	sc	
664.0	9.0							
663.0	10.0	S-5	50/5 88%			5.4-6.13 ft Well graded gravel, (gw), about 10% cobbles, subangular, hard; 20% boulders, subangular, very hard; 90% gravel, fine to coarse, subangular, hard hardness; 10% sand, medium to coarse; 0% fines; maximum grain size = 2.0 inches, pale brown (5YR 5/2) and very pale orange (10YR 8/2), dry, no HCl reaction, very dense	gw-gm	
662.0	11.0							
661.0	12.0					6.13-7.5 ft Interval not sampled		
660.0	13.0	S-6	40-50/1 83%			7.5-8.1 ft Clayey sand with gravel, (sc), about 20% cobbles, subangular, hard; 5% boulders, subangular, very hard; 50% sand, fine to coarse, subangular; 30% gravel, fine to coarse, subangular, hard hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.5 inches, moderate brown (5YR 3/4), wet, no HCl reaction, very dense		
659.0	14.0					8.1-8.5 ft SANDSTONE, no reaction to HCl, boulder		
658.0	15.0	S-7	50/4 0%			8.5-10.0 ft Interval not sampled		
657.0	16.0					10.0-10.4 ft Well graded gravel with silt and sand, (gw-gm), about 2% cobbles, subangular; 40% boulders, subangular, very hard; 50% gravel, fine to coarse, subangular, very hard hardness; 40% sand, medium to coarse, subangular, hard hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, very dense, boulder, diorite (?)		
656.0	17.0					10.4-12.5 ft Interval not sampled		
655.0	18.0	S-8	14-18-27 (45) 73%			12.5-13.1 ft SHALE, hard, fresh, medium dark gray (N4), no reaction to HCl, no staining, boulder	gc	
654.0	19.0					13.1-15.0 ft Interval not sampled		
						15.0-15.35 ft Boulder, no recovery		
						15.35-17.5 ft Interval not sampled		

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550
HAMMER ID: 925

REV 1 Final Boring B-442

PROJECT NO. 10-4310

COORDINATES

N. 339570.73 ft E. 2406579.03 ft

GROUND SURFACE ELEVATION: 673.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
653.0						17.5-19.0 ft Clayey gravel with sand, (gc), about 10% cobbles, subangular, hard; 2% boulders, subangular, hard; 50% gravel, fine to coarse, subangular, hard hardness; 30% sand, medium to coarse, subangular; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, dense		
652.0	21.0	S-9	20-11-9 (20) 67%				sw-sm	
651.0	22.0					20.0-21.5 ft Well graded sand with silt and gravel, (sw-sm), about 5% cobbles, subangular, very hard; 2% boulders, subangular, very hard; 50% sand, fine to coarse, subangular; 40% gravel, fine to coarse, subangular, hard hardness; 10% fines, non plastic, no dry strength, no dilatancy, no toughness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, medium dense		
650.0	23.0	S-10	21-30-50 (80) 57%				gw-gm	
649.0	24.0					21.5-22.5 ft Interval not sampled		
648.0	25.0	S-11	15-50/3 87%			22.5-24.0 ft Well graded gravel with silt and sand, (gw-gm), about 5% cobbles, subangular, hard; 5% boulders, subangular, very hard; 50% gravel, fine to coarse, subangular, hard hardness; 40% sand, fine to coarse, subangular; 10% fines, non plastic, no dry strength, no dilatancy, no toughness; maximum grain size = 2.0 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, very dense	gw-gm	
647.0	26.0					24.0-25.0 ft Interval not sampled		
646.0	27.0					25.0-25.4 ft Well graded gravel with silt and sand, (gw-gm), about 2% cobbles, subangular, hard; 20% boulders, subangular, hard; 70% gravel, fine to coarse, subangular, hard hardness; 20% sand, fine to coarse, subangular; 10% fines, non plastic, no dry strength, no dilatancy, no toughness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2), wet, no HCl reaction, very dense		
645.0	28.0	S-12	33-50/5 67%				gw-gm	
644.0	29.0					25.4-25.75 ft SANDSTONE, grayish red (10R 4/2), no reaction to HCl, boulder		
643.0	30.0	S-13	35-50/2 100%			25.75-27.5 ft Interval not sampled	gw-gm	
642.0	31.0					27.5-28.4 ft Well graded gravel with silt and sand, (gw-gm), about 10% cobbles, subangular, hard; 2% boulders, subangular, hard; 70% gravel, fine to coarse, subangular, hard hardness; 20% sand, fine to coarse, subangular; 10% fines, non plastic, no dry strength, no dilatancy, no toughness; maximum grain size = 1.5 inches, dark yellowish brown (10YR 4/2) and dark gray (N3), wet, no HCl reaction, very dense, refusal on shale boulder		
641.0	32.0							
640.0	33.0	S-14	24-20-40 (60) 60%			28.4-30.0 ft Interval not sampled	gw-gc	
639.0	34.0					30.0-30.65 ft Well graded gravel with silt and sand, (gw-gm), about 50% cobbles, subangular, hard; 10% boulders, subangular, hard; 70% gravel, fine to coarse, subangular, hard hardness; 20% sand, fine to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, dark gray (N3), wet, no HCl reaction, very dense, fissile shale boulders, refusal on shale boulder		
638.0	35.0	S-15	15-50/2 77%				gw-gc	
637.0	36.0					30.65-32.5 ft Interval not sampled		
636.0	37.0					32.5-34.0 ft Well graded gravel with clay and sand, (gw-gc), about 2% cobbles, subangular, hard; 30% boulders, subangular, hard; 70% gravel, fine to coarse, subangular, hard hardness; 20% sand, fine to coarse, subangular; 10% fines, high plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, medium gray (N5), wet, no HCl reaction, very dense, fissile shale boulder and anthracite boulder		
635.0	38.0	S-16	50/5 75%				gw-gc	
634.0	39.0					34.0-35.0 ft Interval not sampled		
						35.0-35.65 ft Well graded gravel with clay and sand, (gw-gc), about 5% cobbles, subangular, hard; 10% boulders, subangular, hard; 70% gravel, fine to coarse, subangular, hard hardness; 20% sand, fine to coarse,		

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550
HAMMER ID: 925

REV 1 Final Boring B-442

PROJECT NO. 10-4310

COORDINATES

N. 339570.73 ft E. 2406579.03 ft

GROUND SURFACE ELEVATION: 673.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
633.0		S-17				subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 2.0 inches, dark gray (N3) and pale red (5R 6/2), wet, no HCl reaction, very dense, shale and sandstone boulder		
		R -1	0%	FD8				
632.0	41.0		100% (0%)			35.65-37.5 ft Interval not sampled		
631.0	42.0					37.5-37.9 ft Well graded gravel with clay and sand, (gw-gc), about 5% cobbles, subangular, hard; 0% boulders; 70% gravel, fine to coarse, subangular, hard hardness; 20% sand, fine to coarse, subangular; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1.0 inches, dark gray (N3) and medium dark gray (N4), wet, no HCl reaction, very dense		
630.0	43.0	R -2	100% (94%)			37.9-40.0 ft Interval not sampled		
629.0	44.0					40.0-40.1 ft No recovery		
628.0	45.0					40.1-40.6 ft SHALE, moderately hard to hard, fresh, medium dark gray (N4), closely fractured, no reaction to HCl, no staining, oily sheen when wet		
				FD4		40.1-40.25 ft R.D. = 56°; filling: clean; surface: rough, planar.		
627.0	46.0					40.6-50.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, no staining, trace calcite and pyrite replaced shell casts, 40.6-40.65 ft small clay lamina; medium dark gray (N4), low toughness, high plasticity.		
626.0	47.0					40.9-41.5 ft R.D. = 88°; filling: moderately healed, thin calcite, fresh; surface: fresh.		
625.0	48.0	R -3	100% (100%)			41.7-42.15 ft R.D. = 36°, moderately spaced; filling: moderately healed, thick calcite, fresh, hard; surface: fresh.		
624.0	49.0					42.2-42.5 ft R.D. = 90°; filling: moderately healed, thick calcite, fresh, hard; surface: fresh.		
623.0	50.0					42.5-46.7 ft R.D. = 85-90°, closely spaced; filling: moderately healed, moderately thick calcite, fresh, hard; surface: fresh; fracture starts at 85 ° and then goes between 88-90 °, thickness ranges from very thin to thick throughout, paralell fractures.		
622.0	51.0					47.02-47.03 ft Bedding plane separation, R.D. = 10°, very closely spaced; filling: moderately healed, very thin calcite, fresh, hard; surface: fresh.		
621.0	52.0			FD5		47.15-47.9 ft R.D. = 85°; filling: moderately healed, moderately thin calcite, fresh, hard; surface: fresh.		
620.0	53.0	R -4	100% (80%)			50.05-50.6 ft R.D. = 75°, very closely spaced; filling: moderately healed, very thin calcite, fresh, hard; surface: fresh; fractures dominately have calcite infilling, very thin but can range up to thick.		
				FD6		50.6-60.6 ft SHALE, moderately hard to hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl, no staining, trace calcite and pyrite replaced shell casts		
619.0	54.0					50.6-50.72 ft R.D. = 56°; filling: moderately healed, moderately thick calcite, fresh, hard; surface: fresh.		
618.0	55.0			FD5		50.85-59.6 ft Bedding plane separation, R.D. = 10°, very closely to widely spaced; filling: moderately healed, very thin calcite, fresh, hard; surface: smooth, planar, fresh; bedding containing calcite filling are at 52.0 ft, 53.3 ft, and 59.6 ft, remaining depths contain no calcite and have fresh bedding plane.		
617.0	56.0					52.2-53.1 ft R.D. = 52°, very closely to closely spaced; filling: moderately healed, very thin calcite, fresh; surface: fresh.		
616.0	57.0					52.75-53 ft Random fracture, R.D. = 60°; filling: moderately healed, moderately thick calcite, fresh, hard; surface: fresh.		
615.0	58.0	R -5	100% (88%)	FD3		57-58.3 ft R.D. = 56°, widely spaced; filling: moderately healed, moderately thin calcite, fresh; surface: fresh.		
614.0	59.0							

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550
HAMMER ID: 925

REV 1 Final Boring B-442

PROJECT NO. 10-4310

COORDINATES

N. 339570.73 ft E. 2406579.03 ft

GROUND SURFACE ELEVATION: 673.20 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
613.0		R -5		FD3		60-60.05 ft R.D. = 36°; filling: clean; surface: rough, planar.		60.05-60.6 ft, SC-1, 0859, 5/26/10
						---- Bottom of Boring at 60.80 ft.----		

DATE STARTED: 5/24/10
DATE FINISHED: 5/26/10
FIELD GEOLOGIST: Adrianna Semione
CHECKED BY: Adrianna Semione

DRILLING METHOD: NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Parlett
HELPER(S): E. Zetwick

DRILL RIG: CME-550
HAMMER ID: 925

REV 1 Final Boring B-443

PROJECT NO. 10-4310

COORDINATES

N. 341137.47 ft E. 2405090.24 ft

GROUND SURFACE ELEVATION: 728.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
728.0								
	1.0	S-1	4-13-15 (28) 60%			0.0-1.5 ft Poorly graded gravel with clay and sand, (gp-gc), 60% gravel, fine to medium, subrounded, hard hardness; 30% sand, fine to medium, subrounded, soft hardness; 10% fines, low plasticity, no dry strength, low toughness; maximum grain size = 1 inches, moderate brown (5YR 4/4) and pale brown (5YR 5/2), moist, loose to dense, homogeneous	gp-gc	
727.0	2.0					1.5-2.5 ft Interval not sampled		
726.0	3.0	S-2	12-15-10 (25) 73%			2.5-4.0 ft Clayey sand with gravel, (sc), 65% sand, fine to medium, subrounded, very soft hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; 15% gravel, medium, subrounded, flat, medium hardness; maximum grain size = 1 inches, light brown (5YR 5/6) and moderate brown (5YR 4/4), no odor, moist, no HCl reaction, medium dense	sc	
725.0	4.0					4.0-5.0 ft Interval not sampled		
724.0	5.0	S-3	6-24-15 (39) 100%			5.0-6.5 ft Clayey sand with gravel, (sc), 60% sand, fine to medium, subrounded, soft hardness; 20% gravel, medium, subrounded, flat, medium hardness; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1 inches, dark reddish brown (10R 3/4) and light brown (5YR 5/6), moist, no HCl reaction, medium dense	sc	
723.0	6.0					6.5-7.5 ft Interval not sampled		
722.0	7.0	S-4	9-12-15 (27) 100%			7.5-9.0 ft Clayey sand, (sc), 60% sand, fine to medium, subrounded, soft hardness; 30% fines, low plasticity, no dry strength, no dilatancy, low toughness; 10% gravel, medium, subangular, flat and elongated, medium hardness; maximum grain size = 0.4 inches, light brown (5YR 5/6) and dusky brown (5YR 2/2), moist, no HCl reaction, dense	sc	
721.0	8.0					9.0-10.0 ft Interval not sampled		
720.0	9.0	S-5	12-13-15 (28) 100%			10.0-11.5 ft Clayey sand with gravel, (sc), 40% gravel, medium, subangular, medium hardness; 40% sand, fine to medium, subrounded, soft hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1 inches, dark reddish brown (10R 3/4) and light brown (5YR 5/6), moist, no HCl reaction, medium dense to loose	sc	
719.0	10.0					11.5-12.5 ft Interval not sampled		
718.0	11.0	S-6	32-50/1 100%			12.5-13.1 ft Clayey sand with gravel, (sc), 40% gravel, medium, subangular, flat and elongated, medium hardness; 40% sand, fine to medium, subrounded, soft hardness; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.6 inches, light brown (5YR 5/6) and medium light gray (N6), moist, no HCl reaction, dense	sc	
717.0	12.0					13.1-15.0 ft Interval not sampled		
716.0	13.0							
715.0	14.0							
714.0	15.0	S-7	8-10-12 (22) 67%			15.0-16.5 ft Clayey sand with gravel, (sc), 70% sand, medium, subrounded, soft hardness; 15% gravel, medium, subangular, flat and elongated, medium hardness; 15% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.1 inches, light brown (5YR 5/6), moist, no HCl reaction, medium dense	sc	
713.0	16.0					16.5-17.5 ft Interval not sampled		
712.0	17.0	S-8	10-12-15 (27) 100%			17.5-19.0 ft Well graded sand with clay and gravel, (sw-sc), 60% sand, medium, subrounded, soft hardness; 30% gravel, medium, subangular, hard hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1 inches, light brown (5YR 5/6) and medium light gray (N6), moist, no HCl reaction, dense	sw-sc	
711.0	18.0					19.0-20.0 ft Interval not sampled		
710.0	19.0							
709.0								

DATE STARTED: 5/21/10
DATE FINISHED: 5/22/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-443

PROJECT NO. 10-4310

COORDINATES

N. 341137.47 ft E. 2405090.24 ft

GROUND SURFACE ELEVATION: 728.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
708.0							
	21.0	S-9	10-11-12 (23) 47%		20.0-21.5 ft Clayey sand, (sc), 70% sand, medium, subrounded, soft hardness; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 10% gravel, medium, subangular, elongated, medium hardness; maximum grain size = 0.6 inches, light brown (5YR 5/6), moist, no HCl reaction, medium dense	sc	
707.0							
	22.0				21.5-22.5 ft Interval not sampled		
706.0							
	23.0	S-10	8-7-10 (17) 73%		22.5-24.0 ft Well graded sand with clay and gravel, (sw-sc), 60% sand, fine to medium, subrounded, soft hardness; 30% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, light brown (5YR 5/6), moist, no HCl reaction, medium dense	sw-sc	
705.0							
	24.0				24.0-25.0 ft Interval not sampled		
704.0							
	25.0	S-11	9-9-15 (24) 90%		25.0-26.5 ft Well graded sand with clay and gravel, (sw-sc), 60% sand, fine to medium, subrounded, soft hardness; 30% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, light brown (5YR 5/6), moist, no HCl reaction, medium dense	sw-sc	
703.0							
	26.0						
702.0							
	27.0				26.5-27.5 ft Interval not sampled		
701.0							
	28.0	S-12	7-10-12 (22) 53%		27.5-29.0 ft Well graded sand with clay and gravel, (sw-sc), 60% sand, fine to medium, subrounded, soft hardness; 30% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, light brown (5YR 5/6), moist, no HCl reaction, medium dense	sw-sc	
700.0							
	29.0				29.0-30.0 ft Interval not sampled		
699.0							
	30.0	S-13	17-17-17 (34) 73%		30.0-31.5 ft Poorly graded sand with clay and gravel, (sp-sc), 60% sand, medium, subrounded, soft hardness; 30% gravel, medium, subangular, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1 inches, light brown (5YR 5/6) and light gray (N7), moist, no HCl reaction, dense	sp-sc	
698.0							
	31.0						
697.0							
	32.0				31.5-32.5 ft Interval not sampled		
696.0							
	33.0	S-14	9-12-25 (37) 100%		32.5-34.0 ft Poorly graded sand with clay and gravel, (sp-sc), 45% gravel, medium, subangular, flat and elongated, medium hardness; 45% sand, medium, subrounded, soft hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.1 inches, dark gray (N3) and light brown (5YR 5/6), moist, no HCl reaction, medium dense	sp-sc	
695.0							
	34.0				34.0-35.0 ft Interval not sampled		
694.0							
	35.0				35.0-39.0 ft SHALE, horizontal, moderately soft to moderately hard, slightly weathered to decomposed, dark gray (N3), closely to moderately fractured, no reaction to HCl, 10° bedding plane, intensely mechanically broken		
693.0							
	36.0						
692.0							
	37.0	R-1	60% (38%)	FD2	36.2-36.7 ft Joint, R.D. = 30°, closely spaced; filling: not healed, very thin clay, slightly weathered, very soft; surface: slightly rough, planar, slightly weathered. Fracture set #F-1.		
691.0							
	38.0						
690.0							
	39.0						
689.0		R-2	72% (42%)				

DATE STARTED: 5/21/10
DATE FINISHED: 5/22/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-443

PROJECT NO. 10-4310

COORDINATES

N. 341137.47 ft E. 2405090.24 ft

GROUND SURFACE ELEVATION: 728.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
688.0						39.0-44.0 ft SHALE, horizontal, moderately hard to moderately soft, slightly weathered, dark gray (N3), moderately to widely fractured, no reaction to HCl, 10° bedding plane, moderately mechanically broken		
687.0	41.0							
686.0	42.0	R-2	72% (42%)					
685.0	43.0							
684.0	44.0					44.0-49.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to widely fractured, no reaction to HCl, 10° bedding plane		
683.0	45.0							
682.0	46.0	R-3	100% (86%)	FD2		45.6-46.4 ft Joint, R.D. = 22°, closely spaced; filling: not healed; surface: slightly rough, planar; iron oxide staining in the fractures. Fracture set #F-2.		
681.0	47.0							
680.0	48.0							
679.0	49.0					49.0-54.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), widely fractured, no reaction to HCl, 10° bedding plane		
678.0	50.0							
677.0	51.0	R-4	100% (100%)					
676.0	52.0							
675.0	53.0							
674.0	54.0					54.0-59.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
673.0	55.0							
672.0	56.0	R-5	100% (100%)	FD0				
671.0	57.0							
670.0	58.0							
669.0	59.0					59.0-64.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
		R-6	100% (100%)					

DATE STARTED: 5/21/10
DATE FINISHED: 5/22/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-443

PROJECT NO. 10-4310

COORDINATES

N. 341137.47 ft E. 2405090.24 ft

GROUND SURFACE ELEVATION: 728.19 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
668.0						59.0-64.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane		
667.0	61.0							
666.0	62.0	R-6	100% (100%)					
665.0	63.0							
664.0	64.0					64.0-69.0 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), no reaction to HCl, 10° bedding plane		
663.0	65.0							
662.0	66.0	R-7	100% (100%)	FD0				
661.0	67.0							
660.0	68.0							
659.0	69.0					69.0-71.5 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), no reaction to HCl, 10° bedding plane		
658.0	70.0	R-8	100% (100%)					
657.0	71.0					---- Bottom of Boring at 71.50 ft.----		

DATE STARTED: 5/21/10
DATE FINISHED: 5/22/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-444

PROJECT NO. 10-4310

COORDINATES

N. 341202.71 ft E. 2405787.65 ft

GROUND SURFACE ELEVATION: 782.61 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
782.0	1.0	S-1	2-2-3 (5) 60%			0.0-1.5 ft Clayey sand, (sc), 80% sand, fine to medium, subrounded, soft hardness; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; 0% gravel; moderate brown (5YR 4/4), moist, no HCl reaction, medium dense	sc	
781.0	2.0					1.5-2.5 ft Interval not sampled		
780.0	3.0	S-2	50/3 100%			2.5-2.75 ft Well graded sand with clay and gravel, (sw-sc), 60% sand, fine to medium, subrounded, soft hardness; 30% gravel, medium, subangular, flat, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.8 inches, moderate brown (5YR 4/4) and light gray (N7), moist, no HCl reaction, medium dense	sw-sc	
779.0	4.0					2.75-5.0 ft Interval not sampled		
778.0	5.0					4.1-5.9 ft Joint, R.D. = 19°, very closely spaced; filling: not healed, very thin clay, slightly weathered, very soft; surface: slightly rough, planar, slightly weathered. Fracture set #F-1.		
777.0	6.0	S-3	8-13-7 (20) 100%			5.0-6.5 ft Well graded sand with clay, (sw-sc), 90% sand, fine to medium, subrounded, soft hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; light brown (5YR 5/6), moist, no HCl reaction, medium dense	sw-sc	
776.0	7.0					6.5-7.5 ft Interval not sampled		
775.0	8.0	S-4	3-7-9 (16) 90%			7.5-9.0 ft Well graded sand with clay, (sw-sc), 90% sand, fine to medium, subrounded, soft hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; light brown (5YR 5/6), moist, no HCl reaction, medium dense	sw-sc	
774.0	9.0					9.0-10.0 ft Interval not sampled		
773.0	10.0	S-5	10-14-24 (38) 100%			10.0-11.5 ft Clayey sand with gravel, (sc), 60% sand, fine to medium, subrounded, soft hardness; 25% gravel, medium, subangular, flat and elongated, medium hardness; 15% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1 inches, pale brown (5YR 5/2) and moderate brown (5YR 4/4), moist, no HCl reaction, medium dense	sc	
772.0	11.0					11.5-12.5 ft Interval not sampled		
771.0	12.0	S-6	13-15-20 (35) 93%			12.5-14.0 ft Clayey sand with gravel, (sc), 70% sand, fine to medium, subrounded, soft hardness; 15% gravel, medium, subangular, medium hardness; 15% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.8 inches, light brown (5YR 5/6), moist, no HCl reaction, medium dense	sc	
770.0	13.0					14.0-15.0 ft Interval not sampled		
769.0	14.0	S-7	16-22-21 (43) 100%			15.0-16.5 ft Well graded sand with clay, (sw-sc), 80% sand, medium, subrounded, soft hardness; 10% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.5 inches, light brown (5YR 5/6) and light gray (N7), moist, no HCl reaction, dense	sw-sc	
768.0	15.0					16.5-17.5 ft Interval not sampled		
767.0	16.0	S-8	16-20-50 (70) 100%			17.5-19.0 ft Well graded sand with clay, (sw-sc), 80% sand, fine to medium, subrounded, soft hardness; 10% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.6 inches, light brown (5YR 5/6) and pale brown (5YR 5/2), moist, no HCl reaction, dense	sw-sc	
766.0	17.0							
765.0	18.0							
764.0	19.0							
763.0								

DATE STARTED: 5/23/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-444

PROJECT NO. 10-4310

COORDINATES

N. 341202.71 ft E. 2405787.65 ft

GROUND SURFACE ELEVATION: 782.61 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	DESCRIPTION	USCS SYMBOL	REMARKS
762.0	21.0	S-9	37-50 100%		19.0-20.0 ft Interval not sampled		
					20.0-21.0 ft Well graded sand with clay, (sw-sc), 80% sand, fine to medium, subrounded, soft hardness; 10% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.6 inches, light brown (5YR 5/6) and pale brown (5YR 5/2), moist, no HCl reaction, dense	sw-sc	
761.0	22.0						
760.0	23.0	S-10	32-50/4 94%		21.0-22.5 ft Interval not sampled		
					22.5-23.3 ft Poorly graded sand with clay and gravel, (sp-sc), 50% sand, medium, subangular, soft hardness; 40% gravel, medium, subangular, flat and elongated, medium hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 1 inches, medium light gray (N6) and, moist, no HCl reaction, dense	sp-sc	
759.0	24.0						
758.0	25.0				23.3-24.5 ft Interval not sampled		
757.0	26.0				24.5-29.5 ft SHALE, clayey, soft to moderately hard, very intensely weathered, light brown (5YR 5/6) and medium light gray (N6), no reaction to HCl, iron oxide staining, weathered shale into clay then back into weathered shale, fracture spacing difficult to determine due to intense weathering and condition of sample		
756.0	27.0	R-1	50% (0%)	FD6			
755.0	28.0						
754.0	29.0						
753.0	30.0				29.5-34.5 ft SHALE, horizontal, moderately hard, slightly to moderately weathered, dark gray (N3), very closely to widely fractured, no reaction to HCl, 10° bedding plane		
752.0	31.0						
751.0	32.0	R-2	100% (80%)				
750.0	33.0						
749.0	34.0						
748.0	35.0			FD1	34.5-39.5 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to widely fractured, no reaction to HCl, 10° bedding plane		
747.0	36.0						
746.0	37.0	R-3	100% (98%)				
745.0	38.0						
744.0	39.0						
743.0		R-4					

DATE STARTED: 5/23/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-444

PROJECT NO. 10-4310

COORDINATES

N. 341202.71 ft E. 2405787.65 ft

GROUND SURFACE ELEVATION: 782.61 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
742.0	41.0					39.5-44.5 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), widely to very widely fractured, no reaction to HCl, 10° bedding plane		
741.0	42.0	R-4	100% (100%)					
740.0	43.0							
739.0	44.0							
738.0	45.0			FD1		44.5-49.5 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), widely to very widely fractured, no reaction to HCl, 10° bedding plane		
737.0	46.0							
736.0	47.0	R-5	100% (100%)					
735.0	48.0							
734.0	49.0							
733.0	50.0					49.5-54.5 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), widely to very widely fractured, no reaction to HCl, 10° bedding plane, fossilized shells throughout		
732.0	51.0							
731.0	52.0	R-6	100% (100%)			52.2-52.22 ft Joint, R.D. = 60°; filling: totally healed, very thin clay, fresh, very soft; surface: slightly rough, planar, fresh. Fracture set #F-2.		
730.0	53.0							
729.0	54.0							
728.0	55.0			FD0		54.5-59.5 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), widely to very widely fractured, no reaction to HCl, 10° bedding plane, fossilized shells throughout		
727.0	56.0							
726.0	57.0	R-7	100% (100%)					
725.0	58.0							
724.0	59.0							
723.0		R-8						

DATE STARTED: 5/23/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring B-444

PROJECT NO. 10-4310

COORDINATES

N. 341202.71 ft E. 2405787.65 ft

GROUND SURFACE ELEVATION: 782.61 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
722.0	61.0					59.5-64.5 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very widely fractured, no reaction to HCl, 10° bedding plane, fossilized shells throughout		
721.0	62.0	R-8	100% (100%)	FD0				
720.0	63.0							
719.0	64.0							
718.0	65.0					64.5-69.5 ft SHALE, horizontal, moderately hard, fresh to slightly weathered, dark gray (N3), moderately to widely fractured, no reaction to HCl, 10° bedding plane, fossilized shells throughout		
717.0	66.0							
716.0	67.0	R-9	100% (100%)	FD4		66.35-66.6 ft Joint, R.D. = 52°, closely spaced; filling: partly healed, very thin clay, slightly weathered, very soft; surface: slightly rough, planar, slightly weathered; Bedding plane fracture t the same depth.. Fracture set #F-3.		
715.0	68.0					67.45-68.05 ft Joint, R.D. = 30°, closely spaced; filling: not healed, very thin clay, slightly weathered, very soft; surface: slightly rough, planar, slightly weathered. Fracture set #F-4.		
714.0	69.0							
713.0	70.0	R-10	100% (100%)	FD0		69.5-70.5 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), moderately fractured, no reaction to HCl, 10° bedding plane, fossilized shells throughout		
						---- Bottom of Boring at 70.50 ft.----		

DATE STARTED: 5/23/10
DATE FINISHED: 5/23/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: CME-55 (Track)
HAMMER ID: 340665

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
780.0	0					0.0-3.0 ft Lean clay with sand, (cl-ml), 75% fines, medium plasticity, no dilatancy, medium toughness; 20% sand, fine, subrounded; 5% gravel, medium, subangular; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4) to moderate brown (5YR 3/4), moist	cl-ml	0 - 16.0 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
779.0	1.0							
778.0	2.0							
777.0	3.0					3.0-6.0 ft Poorly graded gravel, (gp), 90% gravel, medium to coarse, subangular, soft hardness; 5% sand, fine, subrounded; 5% fines; moderate brown (5YR 4/4), dry, no HCl reaction	gp	
776.0	4.0							
775.0	5.0							
774.0	6.0					6.0-10.0 ft Poorly graded gravel with silt, (gp-gm), 85% gravel, fine to medium, subangular, medium hardness; 10% fines; 5% sand, fine, subrounded; light brown (5YR 6/4) to greenish black (5GY 2/1), dry, Gravel is black (N1)	gp-gm	
773.0	7.0							
772.0	8.0							
771.0	9.0							
770.0	10.0					10.0-11.0 ft Poorly graded sand with silt and gravel, (sp-sm), 70% sand, fine to medium, subrounded; 20% gravel, medium, subangular, soft hardness; 10% fines; pale brown (5YR 5/2) to moderate brown (5YR 3/4), dry	sp-sm	
769.0	11.0					11.0-12.0 ft Poorly graded gravel with silt and sand, (gp-gm), 60% gravel, fine, subrounded, medium hardness; 30% sand, fine, subrounded; 10% fines; olive gray (5Y 4/1) to brownish gray (5YR 4/1), dry	gp-gm	
768.0	12.0					12.0-14.0 ft Poorly graded sand with silt and gravel, (sp-sm), 60% sand, fine, subrounded; 30% gravel, fine, subrounded, soft hardness; 10% fines; medium bluish gray (5B 5/1) to medium light gray (N6), dry	sp-sm	Weathered shale from 12.0 -16.0 ft
767.0	13.0							
766.0	14.0					14.0-16.0 ft SHALE, moderately hard, dark greenish gray (5GY 4/1) to greenish black (5G 2/1), dry		
765.0	15.0							Top of bedrock at 16.0 ft
	16.0					---- Bottom of Boring at 16.00 ft.----		Changed drilling rig, description continues on following page

DATE STARTED: 4/7/10
DATE FINISHED: 4/7/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES
N. 340753.25 ft E. 2405097.68 ft
GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
780.0	1.0							Continuation of MW401 boring log, see previous page for description for 0-16.0 ft
779.0	2.0							
778.0	3.0							
777.0	4.0							
776.0	5.0							
775.0	6.0							
774.0	7.0							
773.0	8.0							
772.0	9.0							
771.0	10.0							
770.0	11.0							
769.0	12.0							
768.0	13.0							
767.0	14.0							
766.0	15.0							
765.0	16.0					16.0-17.5 ft SHALE, moderately soft, medium gray (N5), moderately fractured 16-17.5 ft Fracture zone, R.D. = 50 - 70°, closely spaced, slightly open; surface: rough, undulating. Fracture set #3, discontinuity # 1.		
764.0	17.0	R-1	100% (67%)					
763.0	18.0			FD5		17.5-22.2 ft SHALE, moderately soft, medium gray (N5), moderately fractured		
762.0	19.0	R-2	100% (47%)					
761.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
760.0						17.5-22.2 ft SHALE, moderately soft, medium gray (N5), moderately fractured		
	21.0	R-2	100% (47%)					
759.0	22.0							
758.0		R-3	100% (40%)	FD5		22.2-24.8 ft SHALE, soft to moderately soft, slightly to moderately weathered, pale yellowish brown (10YR 6/2) to dark yellowish orange (10YR 6/6), very thinly bedded, moderately fractured, no reaction to HCl, iron oxide staining		
	23.0							
757.0	24.0							
756.0						24.5-24.7 ft Joint, R.D. = 60°; filling: clay, moderately weathered, very soft; surface: rough, moderately weathered, moderately soft. Fracture set #3, discontinuity # 2.		
	25.0							
755.0	26.0					24.8-33.9 ft SHALE, moderately soft, medium gray (N5), slightly fractured		
754.0		R-4	93% (68%)			26.5-36 ft Joint, R.D. = 45°, closely spaced, moderately continuous, slightly open; surface: moderately rough, planar, moderately hard; some of the fracture surfaces react strongly to HCL. Fracture set #2, discontinuity # 3.		
753.0	27.0							
	28.0							
752.0	29.0							
751.0								
	30.0							
750.0	31.0							
749.0		R-5	100% (100%)	FD3				
	32.0							
748.0	33.0							
747.0						33.9-34.7 ft SHALE, soft to moderately soft, slightly to moderately weathered, pale yellowish brown (10YR 6/2) to dark yellowish orange (10YR 6/6), very thinly bedded, slightly fractured, no reaction to HCl, iron oxide staining		
	34.0							
746.0	35.0					34.7-57.9 ft SHALE, hard, fresh to slightly weathered, medium gray (N5), slightly fractured		
745.0	36.0							
744.0		R-6	97% (89%)					
	37.0							
743.0	38.0							
742.0	39.0							
741.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
740.0	41.0	R-7	100% (100%)	FD1		34.7-57.9 ft SHALE, hard, fresh to slightly weathered, medium gray (N5), slightly fractured		
739.0	42.0							
738.0	43.0							
737.0	44.0							
736.0	45.0							
735.0	46.0							
734.0	47.0							
733.0	48.0	R-8	98% (96%)					
732.0	49.0							
731.0	50.0							
730.0	51.0							
729.0	52.0							
728.0	53.0							
727.0	54.0							
726.0	55.0					55.2-55.3 ft Joint, R.D. = 42°, slightly open; surface: slightly rough, planar, hard. Fracture set #2, discontinuity # 4.		
725.0	56.0							
724.0	57.0	R-9	99% (97%)	FD1				
723.0	58.0					57.9-93.0 ft SHALE, calcareous, hard, fresh, medium gray (N5), strong reaction to HCl, some nodules of pyrite and traces of fossils (calcite) throughout the entire section of core		
722.0	59.0							
721.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
720.0	60.0					57.9-93.0 ft SHALE, calcareous, hard, fresh, medium gray (N5), strong reaction to HCl, some nodules of pyrite and traces of fossils (calcite) throughout the entire section of core		
719.0	61.0	R-9	99% (97%)					
718.0	62.0							
717.0	63.0							
716.0	64.0							
715.0	65.0							
714.0	66.0			FD1				
713.0	67.0	R-10	99% (95%)			67.7-68 ft Joint, R.D. = 43°, slightly open; surface: smooth, planar, hard; iron oxide staining on fracture surface. Fracture set #2, discontinuity # 5.		Iron oxide stained, slightly weathered material
712.0	68.0							
711.0	69.0							
710.0	70.0							
709.0	71.0							
708.0	72.0	R-11	87% (87%)					
707.0	73.0					73.15-73.4 ft Joint, R.D. = 60°, slightly open; surface: slightly rough, planar, hard. Fracture set #3, discontinuity # 6.		
706.0	74.0			FD2		73.9-75.25 ft Fracture zone, R.D. = 0 - 20°, closely to moderately spaced, slightly open; surface: rough, undulating, moderately hard to hard; iron oxide staining. Fracture set #1, discontinuity # 7.		
705.0	75.0							
704.0	76.0	R-12	97% (93%)					
703.0	77.0			FD0				
702.0	78.0							
701.0	79.0							

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
700.0	81.0	R-12	97% (93%)	FD0		57.9-93.0 ft SHALE, calcareous, hard, fresh, medium gray (N5), strong reaction to HCl, some nodules of pyrite and traces of fossils (calcite) throughout the entire section of core		
699.0	82.0							
698.0	83.0							
697.0	84.0							
696.0	85.0							
695.0	86.0							
694.0	87.0					86.45-87.25 ft Joint, R.D. = 70 - 90°, slightly open; surface: stepped, undulating, hard; iron oxide staining on fractured surface, two fractures spaced moderately apart. Fracture set #4, discontinuity # 8.		
693.0	88.0	R-13	99% (95%)			87.65-87.85 ft Joint, R.D. = 41°, slightly open; filling: clay; surface: stepped, planar, moderately hard to hard. Fracture set #2, discontinuity # 9.		
692.0	89.0							
691.0	90.0							
690.0	91.0							
689.0	92.0							
688.0	93.0			FD1 FD1		93.0-99.6 ft SHALE, calcareous, hard, fresh, medium gray (N5), strong reaction to HCl, no staining, traces of calcite and some pyrite throughout entire section of core		
687.0	94.0							
686.0	95.0							
685.0	96.0							
684.0	97.0	R-14	100% (95%)					
683.0	98.0							
682.0	99.0							
681.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
680.0	101.0	R-14	100% (95%)			99.6-113.0 ft SHALE, calcareous, hard, fresh, medium dark gray (N4), strong reaction to HCl, some nodules of pyrite and trace fossils (calcite) throughout the entire section of core		
679.0	102.0							
678.0	103.0							
677.0	104.0							
676.0	105.0							
675.0	106.0					105.6-105.7 ft Joint, R.D. = 39°, moderately open; surface: smooth, planar, moderately hard. Fracture set #2, discontinuity # 10.		Vugs partially filled with pyrite
674.0	107.0							
673.0	108.0	R-15	100% (100%)			107.6-107.65 ft Joint, R.D. = 10°; filling: totally healed, very thin calcite, hard. Fracture set #1, discontinuity # 11.		
672.0	109.0							
671.0	110.0							
670.0	111.0							
669.0	112.0					111.6-111.7 ft Joint, R.D. = 18°; filling: totally healed, thin calcite, hard. Fracture set #1, discontinuity # 12.		
668.0	113.0					113.0-143.0 ft SHALE, moderately hard to hard, fresh, medium dark gray (N4), no reaction to HCl, nodules of pyrite and trace fossils (calcite) from 113.0 to 114.0 ft bgs, sporadic fossils throughout remainder of core section		
667.0	114.0							
666.0	115.0							
665.0	116.0							
664.0	117.0	R-16	100% (100%)					
663.0	118.0							
662.0	119.0							
661.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
660.0	120.0					113.0-143.0 ft SHALE, moderately hard to hard, fresh, medium dark gray (N4), no reaction to HCl, nodules of pyrite and trace fossils (calcite) from 113.0 to 114.0 ft bgs, sporadic fossils throughout remainder of core section		
659.0	121.0	R-16	100% (100%)					
658.0	122.0							
657.0	123.0							
656.0	124.0							
655.0	125.0							
654.0	126.0							
653.0	127.0							
652.0	128.0	R-17	100% (100%)					
651.0	129.0							
650.0	130.0							
649.0	131.0							
648.0	132.0							
647.0	133.0					133.2-133.4 ft Joint, R.D. = 30°, moderately open; surface: slightly rough, planar; slight iron oxide staining. Fracture set #2, discontinuity # 13.		
646.0	134.0							
645.0	135.0							
644.0	136.0	R-18	95% (91%)	FD1				
643.0	137.0							
642.0	138.0							
641.0	139.0							

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
640.0	141.0	R-18	95% (91%)	FD1		113.0-143.0 ft SHALE, moderately hard to hard, fresh, medium dark gray (N4), no reaction to HCl, nodules of pyrite and trace fossils (calcite) from 113.0 to 114.0 ft bgs, sporadic fossils throughout remainder of core section		
639.0	142.0							
638.0	143.0							
637.0	144.0					143.0-151.0 ft SHALE, moderately hard to moderately soft, slightly to moderately weathered, medium dark gray (N4), fossils (calcite) sporadically throughout section of core, calcareous from 150.0 to 151.0 ft bgs 143.4-143.5 ft Joint, R.D. = 22°, moderately open; filling: moderately weathered; surface: slightly rough, planar, moderately weathered. Fracture set #2, discontinuity # 14.		
636.0	145.0							
635.0	146.0							
634.0	147.0	R-19	100% (88%)					
633.0	148.0			FD4		147.4-147.6 ft Fracture zone; weathered, iron oxide staining (fracture angles cannot be determined). discontinuity # 15. 148-148.4 ft Fracture zone; intensely weathered, iron oxide staining, clay infilling (fracture angles cannot be determined). discontinuity # 16.		
632.0	149.0							
631.0	150.0							
630.0	151.0							
629.0	152.0	R-20	100% (100%)			151.0-183.0 ft SHALE, calcareous, moderately hard, fresh, medium dark gray (N4), weak reaction to HCl, sporadic calcite and pyrite throughout section of core, numerous bands of fossiliferous (calcite) zones from 151.0 to 173.0 ft bgs		
628.0	153.0							
627.0	154.0							
626.0	155.0							
625.0	156.0							
624.0	157.0	R-21	100% (100%)	FD0				
623.0	158.0							
622.0	159.0							
621.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
620.0	161.0	R-21	100% (100%)	FD0		151.0-183.0 ft SHALE, calcareous, moderately hard, fresh, medium dark gray (N4), weak reaction to HCl, sporadic calcite and pyrite throughout section of core, numerous bands of fossiliferous (calcite) zones from 151.0 to 173.0 ft bgs		
619.0	162.0							
618.0	163.0							
617.0	164.0							
616.0	165.0							
615.0	166.0							
614.0	167.0							
613.0	168.0	R-22	100% (100%)					
612.0	169.0							
611.0	170.0							
610.0	171.0							
609.0	172.0							
608.0	173.0							
607.0	174.0							
606.0	175.0							
605.0	176.0							
604.0	177.0	R-23	100% (100%)					
603.0	178.0							
602.0	179.0							
601.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
600.0	181.0	R-23	100% (100%)	FD0		151.0-183.0 ft SHALE, calcareous, moderately hard, fresh, medium dark gray (N4), weak reaction to HCl, sporadic calcite and pyrite throughout section of core, numerous bands of fossiliferous (calcite) zones from 151.0 to 173.0 ft bgs		
599.0	182.0							
598.0	183.0					183.0-213.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, sporadic fossiliferous bands and fossils throughout core section		
597.0	184.0							
596.0	185.0							
595.0	186.0							
594.0	187.0							
593.0	188.0	R-24	100% (100%)					
592.0	189.0							
591.0	190.0							
590.0	191.0							
589.0	192.0							
588.0	193.0							
587.0	194.0							
586.0	195.0							
585.0	196.0							
584.0	197.0	R-25	100% (100%)					
583.0	198.0							
582.0	199.0							
581.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
580.0	201.0					183.0-213.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, sporadic fossiliferous bands and fossils throughout core section		
579.0		R-25	100% (100%)					
	202.0							
578.0								
	203.0							
577.0								
	204.0							
576.0								
	205.0							
575.0								
	206.0							
574.0								
	207.0							
573.0								
	208.0	R-26	100% (100%)					
572.0								
	209.0							
571.0								
	210.0			FD0				
570.0								
	211.0							
569.0								
	212.0							
568.0								
	213.0					213.0-253.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, trace calcite (fossils) and pyrite		
567.0								
	214.0							
566.0								
	215.0							
565.0								
	216.0							
564.0		R-27	100% (100%)					
	217.0							
563.0								
	218.0							
562.0								
	219.0							
561.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
560.0	221.0	R-27	100% (100%)	FD0		213.0-253.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, trace calcite (fossils) and pyrite		
559.0	222.0							
558.0	223.0							
557.0	224.0							
556.0	225.0							
555.0	226.0							
554.0	227.0							
553.0	228.0	R-28	100% (100%)					
552.0	229.0							
551.0	230.0							
550.0	231.0							
549.0	232.0							
548.0	233.0							
547.0	234.0							
546.0	235.0							
545.0	236.0							
544.0	237.0	R-29	95% (95%)					
543.0	238.0							
542.0	239.0							
541.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW401

PROJECT NO. 10-4310

COORDINATES

N. 340753.25 ft E. 2405097.68 ft

GROUND SURFACE ELEVATION: 780.44 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
540.0	241.0					213.0-253.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, trace calcite (fossils) and pyrite		
539.0		R-29	95% (95%)					
	242.0							
538.0								
	243.0							
537.0								
	244.0							
536.0								
	245.0							
535.0								
	246.0							
534.0				FD0				
	247.0							
533.0								
	248.0	R-30	100% (100%)					
532.0								
	249.0							
531.0								
	250.0							
530.0								
	251.0							
529.0								
	252.0							
528.0								
	253.0					---- Bottom of Boring at 253.00 ft.----		

DATE STARTED: 4/8/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
785.0	0.0					0.0-10.0 ft Sandy lean clay with gravel/sandy silt with gravel, (cl-ml), 55% fines, high plasticity, low toughness; 30% sand, fine to medium, subrounded; 15% gravel, fine to medium, subangular; light brown (5YR 5/6) to moderate brown (5YR 4/4), no odor, moist, no HCl reaction, trace roots	cl-ml	0 - 30.0 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
784.0	1.0							
783.0	2.0							
782.0	3.0							
781.0	4.0							
780.0	5.0							
779.0	6.0							
778.0	7.0							
777.0	8.0							
776.0	9.0							
775.0	10.0					10.0-14.0 ft Silty sand with gravel, (sm), 55% sand, fine to medium, subangular; 30% gravel, fine to medium, subangular; 15% fines; light brown (5YR 5/6) to moderate brown (5YR 4/4), no odor, moist, no HCl reaction	sm	
774.0	11.0							
773.0	12.0							
772.0	13.0							
771.0	14.0					14.0-20.0 ft Well graded sand with silt and gravel, (sw-sm), 65% sand, fine to medium, subrounded; 25% gravel, fine to medium, subangular; 10% fines; light brown (5YR 5/6) to moderate brown (5YR 3/4), no odor, moist, no HCl reaction	sw-sm	
770.0	15.0							
769.0	16.0							
768.0	17.0							
767.0	18.0							
766.0	19.0							

DATE STARTED: 4/8/10
DATE FINISHED: 4/8/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Mark Zatezalo

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
765.0	20.0					20.0-24.0 ft Well graded sand with silt and gravel, (sw-sm), 75% sand, fine to medium, subangular; 15% gravel, fine to medium, subangular; 10% fines; light brown (5YR 5/6) to moderate brown (5YR 4/4), no odor, moist, no HCl reaction		
764.0	21.0							
763.0	22.0						sw-sm	
762.0	23.0							
761.0	24.0					24.0-25.0 ft Poorly graded sand with silt and gravel, (sp-sm), 60% sand, fine, subangular; 30% gravel, fine to medium, subangular, medium hardness; 10% fines; medium light gray (N6) to moderate brown (5YR 4/4), dry, some Shale	sp-sm	
760.0	25.0					25.0-30.0 ft SHALE, moderately soft, silt sized particles, medium light gray (N6), no odor, no reaction to HCl, dry		
759.0	26.0							
758.0	27.0							
757.0	28.0							
756.0	29.0							
	30.0					---- Bottom of Boring at 30.00 ft.----		Changed drilling rig, description continues on following page

DATE STARTED: 4/8/10
DATE FINISHED: 4/8/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Mark Zatezalo

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
765.0	20.0							Continuation of MW402 boring log, see previous page for description for 0-30.0 ft
764.0	21.0							
763.0	22.0							
762.0	23.0							
761.0	24.0							
760.0	25.0							
759.0	26.0							
758.0	27.0							
757.0	28.0							
756.0	29.0							
755.0	30.0					30.0-32.0 ft SHALE, calcareous, lenticular, hard, moderately weathered, clay sized particles, dark gray (N3), thinly bedded, R.D. = 45°, moderately fractured		
754.0	31.0	R-1	100% (45%)	FD5		30-44.3 ft R.D. = 40-65°, widely spaced, moderately continuous; dry with no previous evidence, but water flow possible, filling: fresh, very hard; surface: rough, undulating, fresh, very hard; Mechanical breaks are variable in angle and spacing. Fracture set #2/3, discontinuity # 1.		
753.0	32.0							
752.0	33.0					32.0-61.5 ft SHALE, calcareous, inclined, interbedded, hard to very hard, fresh, dark gray (N3), thinly bedded, extremely widely fractured, weak reaction to HCl, pyrite nodules		
751.0	34.0	R-2	98% (90%)					
750.0	35.0							
749.0	36.0			FD1				
748.0	37.0							
747.0	38.0	R-3	100% (86%)					
746.0	39.0							

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
745.0	41.0	R-3	100% (86%)	FD1		32.0-61.5 ft SHALE, calcareous, inclined, interbedded, hard to very hard, fresh, dark gray (N3), thinly bedded, extremely widely fractured, weak reaction to HCl, pyrite nodules		
744.0	42.0							
743.0	43.0							
742.0	44.0	R-4	96% (94%)					
741.0	45.0							
740.0	46.0							
739.0	47.0							
738.0	48.0							
737.0	49.0	R-5	98% (98%)					
736.0	50.0							
735.0	51.0							
734.0	52.0			FD1				
733.0	53.0							
732.0	54.0	R-6	98% (92%)					
731.0	55.0							
730.0	56.0							
729.0	57.0							
728.0	58.0	R-7	98% (94%)					
727.0	59.0							
726.0								

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
725.0		R-7	98% (94%)			32.0-61.5 ft SHALE, calcareous, inclined, interbedded, hard to very hard, fresh, dark gray (N3), thinly bedded, extremely widely fractured, weak reaction to HCl, pyrite nodules		
724.0	61.0					60.2-60.4 ft Joint, R.D. = 30°, very widely spaced, slightly open; filling is damp but no free water present, filling: partly healed, very thin iron oxide, moderately weathered, very soft; surface: moderately rough, undulating, moderately weathered. Fracture set #2, discontinuity # 2.		
723.0	62.0							
722.0	63.0	R-8	100% (100%)			61.5-84.5 ft SHALE, calcareous, banded, very hard, fresh, clay sized particles, pyrite, medium dark gray (N4) to grayish black (N2), thinly bedded, R.D. = 30°, extremely widely fractured, iron oxide staining, two parallel fractures at 60.2 ft and 60.4 ft, oriented 30° with iron oxide staining and calcite filling		
721.0	64.0							
720.0	65.0							
719.0	66.0							
718.0	67.0	R-9	100% (100%)					
717.0	68.0							
716.0	69.0							
715.0	70.0	R-107-	100% (100%)	FD1				
714.0	71.0							Bedding evident dip 22°
713.0	72.0							
712.0	73.0	R-11	94% (88%)					
711.0	74.0							
710.0	75.0							
709.0	76.0							Weathered fracture with iron oxide staining dip 65° some pyrite noted along bedding
708.0	77.0							
707.0	78.0	R-12	100% (98%)					
706.0	79.0							

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
705.0		R-12	100% (98%)			61.5-84.5 ft SHALE, calcareous, banded, very hard, fresh, clay sized particles, pyrite, medium dark gray (N4) to grayish black (N2), thinly bedded, R.D. = 30°, extremely widely fractured, iron oxide staining, two parallel fractures at 60.2 ft and 60.4 ft, oriented 30° with iron oxide staining and calcite filling		
704.0	81.0							
703.0	82.0							
702.0	83.0	R-13	100% (90%)					
701.0	84.0							
700.0	85.0			FD1		84.5-111.5 ft SHALE, very hard, fresh, calcite inclusions, grayish black (N2) to medium dark gray (N4), very thinly bedded, R.D. = 0° to 30°, extremely widely fractured, occasional fossils with calcite, fracture zone from 106.0 ft to 107.0 ft with iron oxide staining, fractures are approximately 0.1 ft apart, pyrite inclusions		
699.0	86.0							
698.0	87.0							
697.0	88.0	R-14	98% (88%)					
696.0	89.0							
695.0	90.0					90-90.4 ft Joint, R.D. = 69-°, extremely widely spaced, slightly open; filling is damp but no free water present, filling: very thin iron oxide, slightly weathered; surface: moderately rough, undulating, slightly weathered, moderately soft. Fracture set #3, discontinuity # 3.		Fracture at 90.0 to 90.4 dipping 65°
694.0	91.0							
693.0	92.0							
692.0	93.0	R-15	100% (100%)					
691.0	94.0							
690.0	95.0			FD0				
689.0	96.0							
688.0	97.0							
687.0	98.0	R-16	100% (100%)					
686.0	99.0							

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
685.0						84.5-111.5 ft SHALE, very hard, fresh, calcite inclusions, grayish black (N2) to medium dark gray (N4), very thinly bedded, R.D. = 0° to 30°, extremely widely fractured, occasional fossils with calcite, fracture zone from 106.0 ft to 107.0 ft with iron oxide staining, fractures are approximately 0.1 ft apart, pyrite inclusions		
684.0	101.0	R-16	100% (100%)					
683.0	102.0							
682.0	103.0	R-17	100% (100%)	FD0				
681.0	104.0							
680.0	105.0							
679.0	106.0			FD7				weathered zone with iron staining along horizontal fractures and 50 degree fracture
678.0	107.0							
677.0	108.0	R-18	88% (62%)					
676.0	109.0							
675.0	110.0							
674.0	111.0					111.5-126.8 ft SHALE, very hard, fresh, clay sized particles, dark gray (N3) to grayish black (N2), thinly bedded, calcareous and fossiliferous		
673.0	112.0			FD0				
672.0	113.0	R-19	98% (94%)					
671.0	114.0							
670.0	115.0							
669.0	116.0							
668.0	117.0							
667.0	118.0	R-20	98% (92%)	FD0				
666.0	119.0							

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
665.0	120.0	R-20	98% (92%)	FD0		111.5-126.8 ft SHALE, very hard, fresh, clay sized particles, dark gray (N3) to grayish black (N2), thinly bedded, calcareous and fossiliferous		soft clay lens temporarily blocked the core barrel
664.0	121.0							
663.0	122.0							
662.0	123.0	R-21	100% (98%)					
661.0	124.0							
660.0	125.0							
659.0	126.0							
658.0	127.0					126.8-156.3 ft SHALE, wavy, very hard, fresh, clay sized particles, medium dark gray (N4) to dark gray (N3), thinly to thickly bedded, weak reaction to HCl, calcareous		
657.0	128.0	R-22	100% (98%)					
656.0	129.0							
655.0	130.0							
654.0	131.0							
653.0	132.0							
652.0	133.0	R-23	94% (90%)	FD0				
651.0	134.0							
650.0	135.0							
649.0	136.0							
648.0	137.0							
647.0	138.0	R-24	98% (94%)					
646.0	139.0							

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
645.0						126.8-156.3 ft SHALE, wavy, very hard, fresh, clay sized particles, medium dark gray (N4) to dark gray (N3), thinly to thickly bedded, weak reaction to HCl, calcareous		
	141.0	R-24	98% (94%)					
644.0								
	142.0							
643.0								
	143.0							
642.0		R-25	90% (88%)					
	144.0							
641.0								
	145.0							
640.0								
	146.0							
639.0								
	147.0							
638.0								
	148.0							
637.0		R-26	100% (98%)					
	149.0							
636.0								
	150.0			FD0				
635.0								
	151.0							
634.0								
	152.0							
633.0								
	153.0							
632.0		R-27	100% (98%)					
	154.0							
631.0								
	155.0							
630.0								
	156.0							
629.0						156.3-168.9 ft SHALE, banded, very hard, fresh, clay sized particles, dark gray (N3) to medium dark gray (N4), very thinly to moderately bedded, weak reaction to HCl, calcareous nodule at 156.4 ft, and 168.5 ft, unit is fossiliferous, calcite filled fossils, pyrite inclusions		
	157.0							
628.0								
	158.0	R-28	100% (96%)					
627.0								
	159.0							
626.0								

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
625.0		R-28	100% (96%)			156.3-168.9 ft SHALE, banded, very hard, fresh, clay sized particles, dark gray (N3) to medium dark gray (N4), very thinly to moderately bedded, weak reaction to HCl, calcareous nodule at 156.4 ft, and 168.5 ft, unit is fossiliferous, calcite filled fossils, pyrite inclusions		
624.0	161.0							
623.0	162.0							
622.0	163.0	R-29	100% (96%)					
621.0	164.0							
620.0	165.0							
619.0	166.0							
618.0	167.0							
617.0	168.0	R-30	100% (98%)					
616.0	169.0					168.9-191.0 ft SHALE, banded, very hard, fresh, clay sized particles, dark gray (N3) to grayish black (N2), very thinly to moderately bedded, no reaction to HCl		
615.0	170.0			FD0				
614.0	171.0							
613.0	172.0							
612.0	173.0	R-31	100% (100%)					
611.0	174.0							
610.0	175.0							
609.0	176.0							
608.0	177.0							
607.0	178.0	R-32	98% (98%)					
606.0	179.0							

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
605.0						168.9-191.0 ft SHALE, banded, very hard, fresh, clay sized particles, dark gray (N3) to grayish black (N2), very thinly to moderately bedded, no reaction to HCl		
	181.0	R-32	98% (98%)					
604.0								
	182.0							
603.0								
	183.0							
602.0		R-33	96% (96%)					
	184.0							
601.0								
	185.0			FD0				
600.0								
	186.0							
599.0								
	187.0							
598.0								
	188.0							
597.0		R-34	100% (100%)					
	189.0							
596.0								
	190.0							
595.0								
	191.0					191.0-196.0 ft SHALE, hard, fresh, dark gray (N3), moderately bedded, no reaction to HCl, trace fossils with partially replaced pyrite at 193.3 ft, also traces of flakes of pyrite though the entire core		
594.0								
	192.0							
593.0								
	193.0							
592.0		R-35	100% (100%)					
	194.0							
591.0								
	195.0							
590.0				FD0				
	196.0							
589.0						196.0-206.0 ft SHALE, hard, fresh, dark gray (N3), thinly to moderately bedded, no reaction to HCl, trace of fossil with partially replaced by pyrite at 204.2 ft, also some nuggets of pyrite though the entire core		
	197.0							
588.0								
	198.0	R-36	100% (100%)					
587.0								
	199.0							
586.0								

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
585.0	201.0	R-36	100% (100%)	FD0		196.0-206.0 ft SHALE, hard, fresh, dark gray (N3), thinly to moderately bedded, no reaction to HCl, trace of fossil with partially replaced by pyrite at 204.2 ft, also some nuggets of pyrite though the entire core		
584.0	202.0							
583.0	203.0							
582.0		R-37	92% (92%)					
581.0	204.0							
580.0	205.0							
579.0	206.0			FD0		206.0-224.0 ft SHALE, hard, fresh, dark gray (N3), moderately bedded, no reaction to HCl, traces of fossil (clams shapes at 206.4 ft and 207.6 ft), also traces of flakes of pyrite though the entire core		
578.0	207.0							
577.0	208.0	R-38	100% (100%)					
576.0	209.0							
575.0	210.0							
574.0	211.0							
573.0	212.0							
572.0	213.0	R-39	100% (100%)					
571.0	214.0							
570.0	215.0			FD0				
569.0	216.0							
568.0	217.0	R-40	100% (100%)					
567.0	218.0							
566.0	219.0							

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW402

PROJECT NO. 10-4310

COORDINATES

N. 340870.66 ft E. 2405855.94 ft

GROUND SURFACE ELEVATION: 785.24 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
565.0	221.0			FD0		206.0-224.0 ft SHALE, hard, fresh, dark gray (N3), moderately bedded, no reaction to HCl, traces of fossil (clams shapes at 206.4 ft and 207.6 ft), also traces of flakes of pyrite though the entire core		
564.0	222.0	R-41	100% (100%)					
563.0	223.0							
562.0	224.0					224.0-234.0 ft SHALE, banded, hard, fresh, dark gray (N3), thinly to moderately bedded, no reaction to HCl, traces of flakes of pyrite and calcite though the entire core		
561.0	225.0							
560.0	226.0							
559.0	227.0	R-42	100% (100%)					
558.0	228.0			FD0				
557.0	229.0							
556.0	230.0							
555.0	231.0							
554.0	232.0	R-43	100% (100%)					
553.0	233.0							
552.0	234.0					---- Bottom of Boring at 234.00 ft.----		

DATE STARTED: 4/9/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
801.0	1.0					0.0-2.0 ft Poorly graded sand with silt and gravel, (sp-sm), 70% sand, fine to medium, subrounded; 20% gravel, fine to medium, subangular, medium hardness; 10% fines; pale brown (5YR 5/2) to dark yellowish brown (10YR 4/2), no odor, moist, no HCl reaction, trace roots	sp-sm	0 - 60.0 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
800.0	2.0					2.0-10.0 ft Well graded sand with silt and gravel, (sw-sm), 60% sand, fine, subangular; 30% gravel, fine to medium, subrounded, hard hardness; 10% fines; maximum grain size = 1.5 inches, light brown (5YR 5/6) to dark yellowish brown (10YR 4/2), no odor, moist, no HCl reaction	sw-sm	
799.0	3.0							
798.0	4.0							
797.0	5.0							
796.0	6.0							
795.0	7.0							
794.0	8.0							
793.0	9.0							
792.0	10.0					10.0-47.5 ft Poorly graded gravel with sand, (gp), 65% gravel, fine to medium, subangular, medium hardness; 30% sand, fine, subrounded; 5% fines; maximum grain size = 2 inches, pale brown (5YR 5/2), no odor, moist, no HCl reaction	gp	
791.0	11.0							
790.0	12.0							
789.0	13.0							
788.0	14.0							
787.0	15.0							
786.0	16.0							
785.0	17.0							
784.0	18.0							
783.0	19.0							

DATE STARTED: 4/7/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
781.0	21.0					10.0-47.5 ft Poorly graded gravel with sand, (gp), 65% gravel, fine to medium, subangular, medium hardness; 30% sand, fine, subrounded; 5% fines; maximum grain size = 2 inches, pale brown (5YR 5/2), no odor, moist, no HCl reaction		
780.0	22.0							22-30 ft Increase in water content
779.0	23.0							
778.0	24.0							
777.0	25.0							Water encountered at 25ft during casing installation
776.0	26.0							
775.0	27.0							
774.0	28.0							
773.0	29.0							
772.0	30.0						gp	
771.0	31.0							
770.0	32.0							
769.0	33.0							
768.0	34.0							
767.0	35.0							
766.0	36.0							
765.0	37.0							
764.0	38.0							
763.0	39.0							

DATE STARTED: 4/7/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
761.0	41.0					10.0-47.5 ft Poorly graded gravel with sand, (gp), 65% gravel, fine to medium, subangular, medium hardness; 30% sand, fine, subrounded; 5% fines; maximum grain size = 2 inches, pale brown (5YR 5/2), no odor, moist, no HCl reaction	gp	
760.0	42.0							
759.0	43.0							
758.0	44.0							
757.0	45.0							
756.0	46.0							
755.0	47.0							
754.0	48.0					47.5-60.0 ft SHALE, moderately hard, silt sized particles, dusky yellow (5Y 6/4) to dusky yellowish brown (10YR 2/2), no odor, no reaction to HCl, dry to moist, pulverized by hammer		
753.0	49.0							
752.0	50.0							
751.0	51.0							
750.0	52.0							
749.0	53.0							
748.0	54.0							
747.0	55.0							
746.0	56.0							
745.0	57.0							Changed drilling rig, description continues on following page
744.0	58.0							
743.0	59.0							

---- Bottom of Boring at 60.00 ft.----

DATE STARTED: 4/7/10
DATE FINISHED: 4/10/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
741.0	61.0	R-1	100% (67%)	FD5		60.0-63.0 ft SHALE, moderately soft, moderately weathered, medium dark gray (N4), no reaction to HCl 61.5-61.8 ft Joint, R.D. = 85°; surface: slightly rough, planar; iron oxide staining. Fracture set #4, discontinuity # 1. 61.6-61.7 ft Joint, R.D. = 60°; surface: slightly rough, planar; three fractures at a 60° angle running off of a nearly horizontal fracture, iron oxide staining. Fracture set #3, discontinuity # 2. 61.9-62 ft Joint, R.D. = 45°; surface: moderately rough, planar; iron oxide staining. Fracture set #2, discontinuity # 3. 62.1- ft Joint, R.D. = 10°; surface: moderately rough, planar; iron oxide staining and trace clay infilling. Fracture set #1, discontinuity # 4. 62.3- ft Joint, R.D. = 10°; surface: slightly rough, planar; minor iron oxide staining. Fracture set #1, discontinuity # 5.		Continuation of MW403 boring log, see previous pages for description for 0-60.0 ft
740.0	62.0							
739.0	63.0							
738.0	64.0			FD4				
737.0	65.0							
736.0	66.0	R-2	95% (42%)			63.0-69.0 ft SHALE, moderately soft, moderately to intensely weathered, medium dark gray (N4) and pale yellowish brown (10YR 6/2), no reaction to HCl 63- ft Joint, R.D. = 10°; surface: slightly rough, planar; iron oxide staining. Fracture set #1, discontinuity # 6. 63.2- ft Joint, R.D. = 10°; surface: slightly rough, planar; iron oxide staining. Fracture set #1, discontinuity # 7. 64- ft Joint, R.D. = 10°; surface: slightly rough, planar; minor iron oxide staining. Fracture set #1, discontinuity # 8. 65.2-65.3 ft Joint, R.D. = 15°; surface: slightly rough, planar; iron oxide staining. Fracture set #1, discontinuity # 9. 66-66.5 ft Fracture zone, R.D. = 30/85°, slightly open; surface: smooth, planar; three 30° fractures with a nearly horizontal fracture running between, iron oxide staining present. Fracture set #2/4, discontinuity # 10. 66.6-69 ft Fracture zone; intensely weathered, iron oxide staining and clay infilling present. discontinuity # 11.		
735.0	67.0			FD7				
734.0	68.0							
733.0	69.0							
732.0	70.0			FD6				
731.0	71.0	R-3	93% (58%)	FD1		69.0-73.0 ft SHALE, moderately soft, moderately weathered, medium dark gray (N4), no reaction to HCl 69-70.2 ft Fracture zone, R.D. = 75-85°, slightly open; surface: slightly rough, planar; iron oxide staining present, clay infilling at 70.2 ft bgs. Fracture set #4, discontinuity # 12. 71.7- ft Joint, R.D. = 10°; filling: totally healed, moderately thin calcite. Fracture set #1, discontinuity # 13.		
730.0	72.0							
729.0	73.0							
728.0	74.0					73.0-123.0 ft SHALE, calcareous, moderately hard, fresh, medium dark gray (N4), weak reaction to HCl, fossiliferous zones scattered throughout length of core to approximately 95.0 feet bgs, trace fossils from 95.0 - 123.0 feet bgs, sporadic pyrite nodules from 85.0 - 123.0 feet bgs		
727.0	75.0							
726.0	76.0	R-4	100% (100%)	FD0				
725.0	77.0							
724.0	78.0							
723.0	79.0							

DATE STARTED: 4/11/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
721.0	81.0	R-4	100% (100%)	FD0		73.0-123.0 ft SHALE, calcareous, moderately hard, fresh, medium dark gray (N4), weak reaction to HCl, fossiliferous zones scattered throughout length of core to approximately 95.0 feet bgs, trace fossils from 95.0 - 123.0 feet bgs, sporadic pyrite nodules from 85.0 - 123.0 feet bgs		
720.0	82.0							
		R-5	83% (83%)					
719.0	83.0							
718.0	84.0							
717.0	85.0							
716.0	86.0							
715.0	87.0							
714.0	88.0	R-6	97% (97%)					
713.0	89.0							
712.0	90.0							
711.0	91.0							
710.0	92.0							
709.0	93.0							
708.0	94.0							
707.0	95.0							
706.0	96.0							
		R-7	100% (100%)					
705.0	97.0							
704.0	98.0							
703.0	99.0							

DATE STARTED: 4/11/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
701.0	101.0	R-7	100% (100%)	FD0		73.0-123.0 ft SHALE, calcareous, moderately hard, fresh, medium dark gray (N4), weak reaction to HCl, fossiliferous zones scattered throughout length of core to approximately 95.0 feet bgs, trace fossils from 95.0 - 123.0 feet bgs, sporadic pyrite nodules from 85.0 - 123.0 feet bgs		
700.0	102.0							
699.0	103.0							
698.0	104.0							
697.0	105.0							
696.0	106.0							
695.0	107.0							
694.0	108.0	R-8	100% (100%)					
693.0	109.0							
692.0	110.0							
691.0	111.0							
690.0	112.0							
689.0	113.0							
688.0	114.0							
687.0	115.0							
686.0	116.0	R-9	100% (100%)					
685.0	117.0							
684.0	118.0							
683.0	119.0							

DATE STARTED: 4/11/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
681.0	121.0	R-9	100% (100%)	FD0		73.0-123.0 ft SHALE, calcareous, moderately hard, fresh, medium dark gray (N4), weak reaction to HCl, fossiliferous zones scattered throughout length of core to approximately 95.0 feet bgs, trace fossils from 95.0 - 123.0 feet bgs, sporadic pyrite nodules from 85.0 - 123.0 feet bgs		
680.0	122.0							
679.0	123.0					123.0-173.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, fossils (calcite) sporadically throughout section of the core, trace pyrite		
678.0	124.0							
677.0	125.0							
676.0	126.0							
675.0	127.0							
674.0	128.0	R-10	100% (100%)					
673.0	129.0							
672.0	130.0							
671.0	131.0							
670.0	132.0							
669.0	133.0							
668.0	134.0							
667.0	135.0							
666.0	136.0	R-11	98% (98%)					
665.0	137.0							
664.0	138.0							
663.0	139.0							

DATE STARTED: 4/11/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
661.0	141.0	R-11	98% (98%)	FD0		123.0-173.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, fossils (calcite) sporadically throughout section of the core, trace pyrite		
660.0	142.0							
659.0	143.0							
658.0	144.0							
657.0	145.0							
656.0	146.0							
655.0	147.0							
654.0	148.0	R-12	100% (100%)					
653.0	149.0							
652.0	150.0							
651.0	151.0							
650.0	152.0							
649.0	153.0							
648.0	154.0							
647.0	155.0	R-13	100% (100%)					
646.0	156.0							
645.0	157.0							
644.0	158.0							
643.0	159.0	R-14	100% (100%)					

DATE STARTED: 4/11/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
641.0	161.0	R-14	100% (100%)	FD0		123.0-173.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, fossils (calcite) sporadically throughout section of the core, trace pyrite		
640.0	162.0							
639.0	163.0							
638.0	164.0							
637.0	165.0							
636.0	166.0							
635.0	167.0							
634.0	168.0	R-15	97% (97%)					
633.0	169.0							
632.0	170.0							
631.0	171.0							
630.0	172.0							
629.0	173.0					173.0-218.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, trace pyrite and fossils (calcite) throughout section of the core		
628.0	174.0							
627.0	175.0							
626.0	176.0							
		R-16	100% (100%)					
625.0	177.0							
624.0	178.0							
623.0	179.0							

DATE STARTED: 4/11/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
621.0	181.0	R-16	100% (100%)	FD0		173.0-218.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, trace pyrite and fossils (calcite) throughout section of the core		
620.0	182.0							
619.0	183.0							
618.0	184.0							
617.0	185.0	R-17	100% (100%)					
616.0	186.0							
615.0	187.0							
614.0	188.0							
613.0	189.0							
612.0	190.0	R-18	98% (98%)					
611.0	191.0							
610.0	192.0							
609.0	193.0							
608.0	194.0							
607.0	195.0	R-19	100% (100%)					
606.0	196.0							
605.0	197.0							
604.0	198.0							
603.0	199.0	R-20	100% (100%)					

DATE STARTED: 4/11/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW403

PROJECT NO. 10-4310

COORDINATES

N. 340579.28 ft E. 2405542.37 ft

GROUND SURFACE ELEVATION: 801.97 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
601.0	201.0					173.0-218.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, trace pyrite and fossils (calcite) throughout section of the core		
		R-20	100% (100%)					
600.0	202.0							
599.0	203.0							
598.0	204.0							
597.0	205.0							
596.0	206.0							
				FD0				
595.0	207.0							
594.0	208.0	R-21	98% (98%)					
593.0	209.0							
592.0	210.0							
591.0	211.0							
590.0	212.0							
589.0	213.0							
588.0	214.0							
587.0	215.0							
		R-22	100% (100%)	FD3				
586.0	216.0							
585.0	217.0					216.5- ft Joint, R.D. = 10°; filling: totally healed, calcite; surface: slightly rough, planar; width of joint is approximately 0.05 feet, infilling material (calcite) mixed with shale fragments. Fracture set #1, discontinuity # 14.		
584.0	218.0					216.6-218 ft Fracture zone; filling: totally healed, calcite; various fracture angles, slightly offset (approx 0.01 feet), fracture width varies from very thin to nodules. discontinuity # 15.		
						---- Bottom of Boring at 218.00 ft.----		

DATE STARTED: 4/11/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW404

PROJECT NO. 10-4310

COORDINATES

N. 340170.50 ft E. 2404985.30 ft

GROUND SURFACE ELEVATION: 735.42 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
735.0	0.0					0.0-11.0 ft Silty sand, (sm), 75% sand, fine to medium, subrounded; 15% fines; 10% gravel, fine, subangular; moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6), no odor, dry, no HCl reaction, trace organics	sm	0 - 33.5 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
734.0	1.0							
733.0	2.0							
732.0	3.0							
731.0	4.0							
730.0	5.0							
729.0	6.0							
728.0	7.0							
727.0	8.0							
726.0	9.0							
725.0	10.0							
724.0	11.0					11.0-20.0 ft Clayey sand with gravel, (sc), 40% sand, fine, subrounded; 40% fines; 20% gravel, fine to medium, subrounded; moderate yellowish brown (10YR 5/4), no odor, dry, no HCl reaction	sc	
723.0	12.0							
722.0	13.0							
721.0	14.0							
720.0	15.0							
719.0	16.0							
718.0	17.0							
717.0	18.0							
716.0	19.0							

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Mark Zatezalo

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW404

PROJECT NO. 10-4310

COORDINATES

N. 340170.50 ft E. 2404985.30 ft

GROUND SURFACE ELEVATION: 735.42 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
715.0	20.0					20.0-26.0 ft Clayey sand with gravel, (sc), 60% sand, fine to medium, subrounded; 25% gravel, fine to medium, subangular; 15% fines; light olive gray (5Y 5/2), no odor, dry, no HCl reaction	sc	
714.0	21.0							
713.0	22.0							
712.0	23.0							
711.0	24.0							
710.0	25.0							
709.0	26.0					26.0-30.0 ft Silty gravel with sand, (gm), 60% gravel, fine to medium, subangular; 20% sand, fine, subrounded; 20% fines; medium dark gray (N4), no odor, dry, no HCl reaction, rock fragments, weathered shale mixed with soil	gm	
708.0	27.0							
707.0	28.0							
706.0	29.0							
705.0	30.0					30.0-31.0 ft SHALE, soft, medium gray (N5) to light olive gray (5Y 5/2), no odor, dry, weathered		
704.0	31.0					31.0-33.5 ft SHALE, moderately soft, dark gray (N3), no odor, no reaction to HCl, dry		
703.0	32.0							
702.0	33.0					---- Bottom of Boring at 33.50 ft.----		Changed drilling rig, description continues on following page

DATE STARTED: 4/13/10
DATE FINISHED: 4/13/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Mark Zatezalo

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW404

PROJECT NO. 10-4310

COORDINATES
N. 340170.50 ft E. 2404985.30 ft
GROUND SURFACE ELEVATION: 735.42 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
715.0	20.0							Continuation of MW404 boring log, see previous page for description for 0-20.0 ft
714.0	21.0							
713.0	22.0							
712.0	23.0							
711.0	24.0							
710.0	25.0							
709.0	26.0							
708.0	27.0							
707.0	28.0							
706.0	29.0							
705.0	30.0							
704.0	31.0							
703.0	32.0							
702.0	33.0							
701.0	34.0					33.5-69.0 ft SHALE, moderately hard to moderately soft, very intensely to intensely weathered, dark gray (N3) to light olive gray (5Y 5/2), very closely fractured, iron oxide staining, quartz crystals growing in fracture, sand found in some fractures		
700.0	35.0							
699.0	36.0							
698.0	37.0	R-1	100% (9%)	FD9				
697.0	38.0							
696.0	39.0							

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: Water used as fluid during coring operations

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW404

PROJECT NO. 10-4310

COORDINATES

N. 340170.50 ft E. 2404985.30 ft

GROUND SURFACE ELEVATION: 735.42 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
695.0	41.0	R-1	100% (9%)	FD9		33.5-69.0 ft SHALE, moderately hard to moderately soft, very intensely to intensely weathered, dark gray (N3) to light olive gray (5Y 5/2), very closely fractured, iron oxide staining, quartz crystals growing in fracture, sand found in some fractures		
694.0	42.0							
693.0	43.0							
692.0	44.0							
691.0	45.0							
690.0	46.0	R-2	61% (0%)					
689.0	47.0							
688.0	48.0							
687.0	49.0							
686.0	50.0							
685.0	51.0							
684.0	52.0							
683.0	53.0							
682.0	54.0	R-3	92% (0%)					
681.0	55.0							
680.0	56.0							
679.0	57.0							
678.0	58.0	R-4	100% (20%)					
677.0	59.0							
676.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: Water used as fluid during coring operations

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW404

PROJECT NO. 10-4310

COORDINATES

N. 340170.50 ft E. 2404985.30 ft

GROUND SURFACE ELEVATION: 735.42 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
675.0	60.0	R-4	100% (20%)	FD9		33.5-69.0 ft SHALE, moderately hard to moderately soft, very intensely to intensely weathered, dark gray (N3) to light olive gray (5Y 5/2), very closely fractured, iron oxide staining, quartz crystals growing in fracture, sand found in some fractures		
674.0	61.0							
673.0	62.0							
672.0	63.0							
671.0	64.0							
670.0	65.0	R-5	88% (19%)					
669.0	66.0							
668.0	67.0							
667.0	68.0							
666.0	69.0							
665.0	70.0	R-6	80% (75%)	FD4		69.0-120.0 ft SHALE, fossiliferous, very hard, slightly weathered, clay sized particles, medium dark gray (N4) to dark gray (N3), thinly bedded, fossils are calcareous		
664.0	71.0							
663.0	72.0							
662.0	73.0							
661.0	74.0							
660.0	75.0	R-7	96% (95%)	FD0				
659.0	76.0							
658.0	77.0							
657.0	78.0							
656.0	79.0							

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: Water used as fluid during coring operations

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW404

PROJECT NO. 10-4310

COORDINATES

N. 340170.50 ft E. 2404985.30 ft

GROUND SURFACE ELEVATION: 735.42 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
655.0	81.0	R-7	96% (95%)	FD0		69.0-120.0 ft SHALE, fossiliferous, very hard, slightly weathered, clay sized particles, medium dark gray (N4) to dark gray (N3), thinly bedded, fossils are calcareous		
654.0	82.0							
653.0	83.0							
652.0	84.0							
651.0	85.0	R-8	96% (94%)	FD1				Iron oxide stained horizontal fracture
650.0	86.0							Iron oxide stained horizontal fracture
649.0	87.0							
648.0	88.0							
647.0	89.0							
646.0	90.0	R-9	95% (95%)					
645.0	91.0							
644.0	92.0							
643.0	93.0							
642.0	94.0							
641.0	95.0			FD0				
640.0	96.0	R-10						
639.0	97.0							
638.0	98.0							
637.0	99.0							
636.0								

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

APPROVED BY: Daniel Bansah

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

DRILLER: T. Growden
HELPER(S): J. Bechtel

NOTES: Water used as fluid during coring operations

DRILL RIG: Diedrich D-120 (Truck)

HAMMER ID: NA

REV 1 Final Boring MW404

PROJECT NO. 10-4310

COORDINATES

N. 340170.50 ft E. 2404985.30 ft

GROUND SURFACE ELEVATION: 735.42 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
635.0	100.0	R-10				69.0-120.0 ft SHALE, fossiliferous, very hard, slightly weathered, clay sized particles, medium dark gray (N4) to dark gray (N3), thinly bedded, fossils are calcareous		
634.0	101.0							
633.0	102.0							
632.0	103.0							
631.0	104.0							
630.0	105.0							
629.0	106.0	R-11	95% (95%)					
628.0	107.0							
627.0	108.0							
626.0	109.0							
625.0	110.0			FD0				
624.0	111.0							
623.0	112.0							
622.0	113.0							
621.0	114.0							
620.0	115.0	R-12	96% (96%)					
619.0	116.0							
618.0	117.0							
617.0	118.0							
616.0	119.0							

---- Bottom of Boring at 120.00 ft.----

DATE STARTED: 4/21/10
DATE FINISHED: 4/22/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: Water used as fluid during coring operations

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW405

PROJECT NO. 10-4310

COORDINATES

N. 339970.47 ft E. 2404646.35 ft

GROUND SURFACE ELEVATION: 693.84 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
693.0	1.0					0.0-8.0 ft Poorly graded sand with silt and gravel, (sp-sm), 65% sand, fine to medium, subrounded; 25% gravel, fine to coarse, subangular, medium hardness; 10% fines; grayish yellow (5Y 8/4) to pale brown (5YR 5/2), no odor, moist, no HCl reaction, trace roots, trace sandstone fragments	sp-sm	0 - 40.0 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
692.0	2.0							
691.0	3.0							
690.0	4.0							
689.0	5.0							
688.0	6.0							
687.0	7.0							
686.0	8.0							
685.0	9.0					8.0-10.0 ft Poorly graded gravel with silt and sand, (gp-gm), 60% gravel, fine to coarse, subangular, medium hardness; 30% sand, fine to medium, subrounded; 10% fines; moderate brown (5YR 4/4), no odor, moist, no HCl reaction	gp-gm	
684.0	10.0					10.0-18.0 ft Well graded sand with gravel, (sw), 80% sand, fine to medium, rounded; 15% gravel, fine to medium, subrounded, medium hardness; 5% fines; moderate yellowish brown (10YR 5/4), no odor, dry, no HCl reaction	sw	
683.0	11.0							
682.0	12.0							
681.0	13.0							
680.0	14.0							
679.0	15.0							
678.0	16.0							
677.0	17.0							
676.0	18.0							
675.0	19.0					18.0-28.0 ft Poorly graded gravel with silt and sand, (gp-gm), 65% gravel, fine to coarse, subrounded, medium hardness; 25% sand, fine, subrounded; 10% fines; light brown (5YR 6/4) to pale brown (5YR 5/2), no odor, dry, no HCl reaction	gp-gm	
674.0								

DATE STARTED: 4/8/10
DATE FINISHED: 4/8/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW405

PROJECT NO. 10-4310

COORDINATES

N. 339970.47 ft E. 2404646.35 ft

GROUND SURFACE ELEVATION: 693.84 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
673.0	21.0					18.0-28.0 ft Poorly graded gravel with silt and sand, (gp-gm), 65% gravel, fine to coarse, subrounded, medium hardness; 25% sand, fine, subrounded; 10% fines; light brown (5YR 6/4) to pale brown (5YR 5/2), no odor, dry, no HCl reaction	gp-gm	
672.0	22.0							
671.0	23.0							
670.0	24.0							
669.0	25.0							
668.0	26.0							
667.0	27.0							
666.0	28.0							
665.0	29.0					28.0-29.0 ft Clayey sand with gravel, (sc), 45% sand, fine to medium, subrounded; 30% fines, medium plasticity, high toughness; 25% gravel, fine, subrounded; moderate brown (5YR 3/4), no odor, moist, no HCl reaction, trace shale fragments	sc	
664.0	30.0					29.0-40.0 ft SHALE, moderately hard, silt sized particles, medium dark gray (N4) to olive black (5Y 2/1), no odor, no reaction to HCl, dry		
663.0	31.0							
662.0	32.0							
661.0	33.0							
660.0	34.0							
659.0	35.0							
658.0	36.0							
657.0	37.0							
656.0	38.0							Changed drilling rig, description continues on following page
655.0	39.0							
654.0								

---- Bottom of Boring at 40.00 ft.----

DATE STARTED: 4/8/10
DATE FINISHED: 4/8/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW405

PROJECT NO. 10-4310

COORDINATES

N. 339970.47 ft E. 2404646.35 ft

GROUND SURFACE ELEVATION: 693.84 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
653.0	41.0					40.0-47.0 ft SHALE, moderately hard, intensely to very intensely weathered, medium dark gray (N4), thinly to moderately bedded, no reaction to HCl, wet, iron oxide staining 40-47 ft Fracture zone, R.D. = 0 - 10°, moderately open; filling: very thin, moderately weathered, moderately hard; surface: rough, planar, moderately weathered, moderately hard; infilling with light brown (5YR 5/6) quartz crystals. Fracture set #1, discontinuity # 1.		Continuation of MW405 boring log, see previous pages for description for 0-40.0 ft
652.0	42.0							
651.0	43.0	R-1	69% (0%)	FD8				
650.0	44.0							
649.0	45.0							
648.0	46.0							
647.0	47.0					47.0-54.0 ft SHALE, hard, moderately to slightly weathered, pitted to vuggy, medium dark gray (N4), thinly to moderately bedded, no reaction to HCl, wet, iron oxide staining, highly weathered zone of moderate brown (5YR 3/4) to light olive gray (5Y 5/2.) clay at 50.0 - 50.2 ft. bgs 47-52.5 ft Joint, R.D. = 0 - 10°, closely spaced, slightly open; surface: slightly rough, planar, hard. Fracture set #1, discontinuity # 2.		
646.0	48.0							
645.0	49.0							
644.0	50.0	R-2	91% (14%)	FD6				
643.0	51.0							
642.0	52.0							
641.0	53.0					52.5-54 ft Joint, R.D. = 45 - 60°, very closely spaced, slightly open; surface: slightly rough, planar, hard; iron oxide staining on fractured surface. Fracture set #2/#3, discontinuity # 3.		
640.0	54.0					54.0-57.0 ft SHALE, hard, fresh, medium dark gray (N4) to dark gray (N3), moderately to thinly bedded, no reaction to HCl, calcareous (weak HCL reaction), flecks of pyrite, fossiliferous at 59.2 - 59.5 ft. bgs (shells)		
639.0	55.0					54-54.6 ft Joint, R.D. = 45 - 60°, slightly open; filling: iron; surface: slightly rough, planar, moderately hard. Fracture set #2/#3, discontinuity # 4.		
638.0	56.0	R-3	93% (73%)	FD3		55.8-56.2 ft Joint, R.D. = 0°, slightly open; surface: smooth, planar, hard; fractured surfaces exhibit iron oxide staining. Fracture set #1, discontinuity # 5.		
637.0	57.0					57.0-87.0 ft SHALE, hard to very hard, fresh, medium dark gray (N4) to dark gray (N3), moderately to thinly bedded, some fossils and pyrite nodules, calcareous (weak reaction to HCL)		
636.0	58.0							
635.0	59.0	R-4	100% (100%)	FD0				
634.0								

DATE STARTED: 4/12/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Daniel Bansah
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW405

PROJECT NO. 10-4310

COORDINATES

N. 339970.47 ft E. 2404646.35 ft

GROUND SURFACE ELEVATION: 693.84 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
633.0	61.0					57.0-87.0 ft SHALE, hard to very hard, fresh, medium dark gray (N4) to dark gray (N3), moderately to thinly bedded, some fossils and pyrite nodules, calcareous (weak reaction to HCL)		
632.0	62.0							
631.0	63.0	R-4	100% (100%)	FD0				
630.0	64.0							
629.0	65.0							
628.0	66.0							
627.0	67.0							
626.0	68.0							
625.0	69.0							
624.0	70.0							
623.0	71.0							
622.0	72.0	R-5	100% (100%)	FD0				
621.0	73.0							
620.0	74.0							
619.0	75.0							
618.0	76.0							
617.0	77.0							
616.0	78.0							
615.0	79.0	R-6	100% (100%)	FD0				
614.0								

DATE STARTED: 4/12/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Daniel Bansah
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW405

PROJECT NO. 10-4310

COORDINATES

N. 339970.47 ft E. 2404646.35 ft

GROUND SURFACE ELEVATION: 693.84 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
613.0	81.0					57.0-87.0 ft SHALE, hard to very hard, fresh, medium dark gray (N4) to dark gray (N3), moderately to thinly bedded, some fossils and pyrite nodules, calcareous (weak reaction to HCL)		
612.0	82.0							
611.0	83.0	R-6	100% (100%)	FD0				
610.0	84.0							
609.0	85.0							
608.0	86.0							
607.0	87.0					87.0-100.4 ft SHALE, hard to very hard, fresh, medium dark gray (N4) to dark gray (N3), moderately to thinly bedded, no reaction to HCl, trace pyrite and fossils		
606.0	88.0							
605.0	89.0							
604.0	90.0							
603.0	91.0							
602.0	92.0	R-7	100% (100%)	FD0				
601.0	93.0							
600.0	94.0							
599.0	95.0							
598.0	96.0							
597.0	97.0							
596.0	98.0	R-8	100% (100%)	FD0				
595.0	99.0							
594.0								

DATE STARTED: 4/12/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Daniel Bansah
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW405

PROJECT NO. 10-4310

COORDINATES

N. 339970.47 ft E. 2404646.35 ft

GROUND SURFACE ELEVATION: 693.84 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
593.0		R-8		FD0		---- Bottom of Boring at 100.40 ft.----		

DATE STARTED: 4/12/10
DATE FINISHED: 4/12/10
FIELD GEOLOGIST: Daniel Bansah
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW406

PROJECT NO. 10-4310

COORDINATES

N. 339710.35 ft E. 2404789.81 ft

GROUND SURFACE ELEVATION: 712.51 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
712.0	1.0					0.0-6.0 ft Well graded gravel with clay and sand, (gw-gc), 50% gravel, fine to medium, subangular; 40% sand, fine to medium, subrounded; 10% fines; dark reddish brown (10R 3/4) to moderate brown (5YR 4/4), no odor, wet, no HCl reaction, trace rock fragments	gw-gc	Rainfall previous day topsoil saturated. 0 - 20.0 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
711.0	2.0							
710.0	3.0							
709.0	4.0							
708.0	5.0							
707.0	6.0							
706.0	7.0					6.0-13.0 ft Poorly graded gravel with silt and sand, (gp-gm), 60% gravel, fine to coarse, subangular, medium hardness; 30% sand, fine to medium, subrounded; 10% fines; moderate brown (5YR 3/4), no odor, moist, no HCl reaction, trace sandstone fragments	gp-gm	
705.0	8.0							
704.0	9.0							
703.0	10.0							
702.0	11.0							
701.0	12.0							
700.0	13.0							
699.0	14.0					13.0-14.0 ft Poorly graded sand with gravel, (sp), 70% sand, fine to coarse, subrounded; 25% gravel, fine to medium, subrounded; 5% fines; light brown (5YR 6/4) to moderate yellowish brown (10YR 5/4), no odor, dry, no HCl reaction, rock fragments, weathered shale	sp	
698.0	15.0					14.0-20.0 ft SHALE, moderately soft, silt sized particles, brownish black (5YR 2/1) to grayish black (N2), no odor, no reaction to HCl, dry		
697.0	16.0							
696.0	17.0							Changed drilling rig, description continues on following page
695.0	18.0							
694.0	19.0							
693.0								

---- Bottom of Boring at 20.00 ft.----

DATE STARTED: 4/9/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Mark Zatezalo

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW406

PROJECT NO. 10-4310

COORDINATES

N. 339710.35 ft E. 2404789.81 ft

GROUND SURFACE ELEVATION: 712.51 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
692.0	21.0					20.0-65.5 ft SHALE, hard to very hard, moderately weathered, clay sized particles, vuggy, typical diameter: 0.5 in. medium dark gray (N4) to dark gray (N3), very widely fractured, weak reaction to HCl, iron oxide staining, iron oxide staining at 20.0, 21.3, and 24.5 ft along fractures, fossiliferous with crinoids and shells		Continuation of MW406 boring log, see previous page for description for 0-20.0 ft
691.0	22.0					20-21.2 ft R.D. = 0°, closely spaced, moderately open; dry but shows evidence of flow, filling: very thin iron oxide, slightly to intensely weathered, moderately soft; surface: slightly rough, planar, slightly weathered. Fracture set #1, discontinuity # 1.		
690.0	23.0	R-1	98% (58%)	FD5		23-27 ft Joint, R.D. = 65°; filling: iron oxide; surface: moderately rough, planar. Fracture set #3, discontinuity # 2.		
689.0	24.0							
688.0	25.0							
687.0	26.0							
686.0	27.0							
685.0	28.0							
684.0	29.0							
683.0	30.0	R-2	99% (68%)					
682.0	31.0			FD5				
681.0	32.0							
680.0	33.0							
679.0	34.0					33-34.5 ft R.D. = 69°, closely spaced; filling: very thin iron oxide, moderately hard; surface: moderately rough, planar, moderately hard. Fracture set #3, discontinuity # 3.		
678.0	35.0	R-3	89% (56%)					
677.0	36.0							Special care sample taken SC-1
676.0	37.0							
675.0	38.0	R-4	100% (58%)	FD6				
674.0	39.0							
673.0								

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW406

PROJECT NO. 10-4310

COORDINATES

N. 339710.35 ft E. 2404789.81 ft

GROUND SURFACE ELEVATION: 712.51 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
672.0	41.0					20.0-65.5 ft SHALE, hard to very hard, moderately weathered, clay sized particles, vuggy, typical diameter: 0.5 in. medium dark gray (N4) to dark gray (N3), very widely fractured, weak reaction to HCl, iron oxide staining, iron oxide staining at 20.0, 21.3, and 24.5 ft along fractures, fossiliferous with crinoids and shells		
671.0	42.0			FD7				
670.0	43.0	R-4	100% (58%)					
669.0	44.0							
668.0	45.0							
667.0	46.0							
666.0	47.0							
665.0	48.0					47.7-53.7 ft R.D. = 65°, widely to closely spaced, neither ends visible, open; dry but shows evidence of flow, filling: not healed, iron oxide; surface: moderately rough, intensely weathered, moderately soft. Fracture set #3, discontinuity # 4.		
664.0	49.0							
663.0	50.0	R-5	96% (75%)					
662.0	51.0			FD6				
661.0	52.0							
660.0	53.0							
659.0	54.0							
658.0	55.0	R-6	100% (64%)			55.1-56 ft R.D. = 90°; filling: iron oxide; surface: undulating. Fracture set #4, discontinuity # 5.		
657.0	56.0							
656.0	57.0					56.5-56.6 ft Joint, R.D. = 0°, closely spaced, neither ends visible, open; wet with seepage, filling: moderately thick iron oxide, intensely weathered, moderately soft; surface: slightly rough, undulating, intensely weathered, soft. Fracture set #1, discontinuity # 6.		
655.0	58.0	R-7I	100% (53%)					
654.0	59.0					58.4-60 ft R.D. = 90°; Fracture set #4, discontinuity # 7.		
653.0								

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW406

PROJECT NO. 10-4310

COORDINATES

N. 339710.35 ft E. 2404789.81 ft

GROUND SURFACE ELEVATION: 712.51 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
652.0	61.0					20.0-65.5 ft SHALE, hard to very hard, moderately weathered, clay sized particles, vuggy, typical diameter: 0.5 in. medium dark gray (N4) to dark gray (N3), very widely fractured, weak reaction to HCl, iron oxide staining, iron oxide staining at 20.0, 21.3, and 24.5 ft along fractures, fossiliferous with crinoids and shells		
651.0	62.0	R-7I	100% (53%)	FD6				
650.0	63.0							
649.0	64.0							
648.0	65.0	R-8	100% (65%)	FD5				
647.0	66.0					65.5-95.0 ft SHALE, very hard, slightly to intensely weathered, clay sized particles, dark gray (N3) to medium dark gray (N4), R.D. = 45° to 60°, widely fractured		Widely spaced healed fractures with calcite filling
646.0	67.0							
645.0	68.0							
644.0	69.0							
643.0	70.0							
642.0	71.0	R-9	100% (75%)					
641.0	72.0							
640.0	73.0			FD4				
639.0	74.0							
638.0	75.0							
637.0	76.0							
636.0	77.0							
635.0	78.0	R-10	100% (72%)					
634.0	79.0							
633.0								

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW406

PROJECT NO. 10-4310

COORDINATES

N. 339710.35 ft E. 2404789.81 ft

GROUND SURFACE ELEVATION: 712.51 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
632.0	81.0	R-10	100% (72%)			65.5-95.0 ft SHALE, very hard, slightly to intensely weathered, clay sized particles, dark gray (N3) to medium dark gray (N4), R.D. = 45° to 60°, widely fractured		
631.0	82.0							
630.0	83.0			FD4				
629.0	84.0	R-11	100% (96%)					
628.0	85.0							
627.0	86.0							
626.0	87.0							
625.0	88.0							
624.0	89.0							
623.0	90.0							
622.0	91.0	R-12	98% (90%)	FD2				
621.0	92.0							
620.0	93.0							
619.0	94.0							
618.0	95.0					95.0-103.0 ft SHALE, moderately weathered, clay sized particles, vuggy, typical diameter: 0.25 in. dark gray (N3) to medium dark gray (N4), R.D. = 0° to 60°, closely fractured, wet, several fractures filled with quartz as much as 0.5 inch thick, rock is broken and has thin quartz veins		
617.0	96.0							
616.0	97.0							
615.0	98.0	R-13	100% (54%)	FD6				
614.0	99.0							
613.0								

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW406

PROJECT NO. 10-4310

COORDINATES

N. 339710.35 ft E. 2404789.81 ft

GROUND SURFACE ELEVATION: 712.51 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
612.0	101.0					95.0-103.0 ft SHALE, moderately weathered, clay sized particles, vuggy, typical diameter: 0.25 in. dark gray (N3) to medium dark gray (N4), R.D. = 0° to 60°, closely fractured, wet, several fractures filled with quartz as much as 0.5 inch thick, rock is broken and has thin quartz veins		
611.0	102.0			FD6				
610.0		R-13	100% (54%)					
	103.0					103.0-125.0 ft SHALE, very hard, clay sized particles, dark gray (N3) to medium dark gray (N4), R.D. = 0°, rock is intact-to slightly broken		
609.0	104.0							
608.0	105.0							
607.0	106.0							
606.0	107.0							
605.0	108.0							
604.0	109.0							
603.0	110.0	R-14	100% (98%)					
602.0	111.0							
601.0	112.0			FD1				
600.0	113.0							
599.0	114.0							
598.0	115.0							
597.0	116.0							
596.0	117.0							
595.0		R-15	100% (98%)					
	118.0							
594.0	119.0							
593.0								

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW406

PROJECT NO. 10-4310

COORDINATES

N. 339710.35 ft E. 2404789.81 ft

GROUND SURFACE ELEVATION: 712.51 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
592.0	121.0					103.0-125.0 ft SHALE, very hard, clay sized particles, dark gray (N3) to medium dark gray (N4), R.D. = 0°, rock is intact-to slightly broken		
591.0	122.0							
590.0	123.0	R-15	100% (98%)	FD1				
589.0	124.0							
588.0	125.0					---- Bottom of Boring at 125.00 ft.----		

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW407

PROJECT NO. 10-4310

COORDINATES

N. 339784.93 ft E. 2405144.25 ft

GROUND SURFACE ELEVATION: 734.76 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
734.0	1.0					0.0-11.0 ft Well graded sand with clay and gravel, (sw-sc), 65% sand, fine to medium, subrounded; 25% gravel, fine to medium, subangular; 10% fines; moderate brown (5YR 4/4), no odor, moist, no HCl reaction	sw-sc	0 - 41.0 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
733.0	2.0							
732.0	3.0							
731.0	4.0							
730.0	5.0							
729.0	6.0							
728.0	7.0							
727.0	8.0							
726.0	9.0							
725.0	10.0							
724.0	11.0							
723.0	12.0					11.0-14.0 ft Poorly graded sand with silt and gravel, (sp-sm), 55% sand, fine to coarse, subrounded; 35% gravel, fine to coarse, subangular; 10% fines; moderate brown (5YR 3/4), no odor, moist, no HCl reaction	sp-sm	
722.0	13.0							
721.0	14.0							
720.0	15.0					14.0-15.0 ft Poorly graded gravel with clay and sand, (gp-gc), 50% gravel, fine, subrounded; 40% sand, fine to medium, subrounded; 10% fines; pale brown (5YR 5/2), no odor, moist, no HCl reaction	gp-gc	
						15.0-18.0 ft SHALE, soft, silt sized particles, dusky brown (5YR 2/2), no odor, no reaction to HCl, dry		
719.0	16.0							
718.0	17.0							
717.0	18.0					18.0-22.0 ft SHALE, dusky yellow (5Y 6/4), no odor, no reaction to HCl, dry, weathered shale		
716.0	19.0							
715.0								

DATE STARTED: 4/9/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW407

PROJECT NO. 10-4310

COORDINATES

N. 339784.93 ft E. 2405144.25 ft

GROUND SURFACE ELEVATION: 734.76 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
714.0	21.0					18.0-22.0 ft SHALE, dusky yellow (5Y 6/4), no odor, no reaction to HCl, dry, weathered shale		
713.0	22.0					22.0-37.0 ft SHALE, light olive brown (5Y 5/6) and grayish black (N2), no odor, no reaction to HCl, dry, mix of weathered and competent rock		
712.0	23.0							
711.0	24.0							
710.0	25.0							
709.0	26.0							
708.0	27.0							
707.0	28.0							
706.0	29.0							
705.0	30.0							
704.0	31.0							
703.0	32.0							
702.0	33.0							
701.0	34.0							
700.0	35.0							
699.0	36.0							
698.0	37.0							
697.0	38.0					37.0-41.0 ft SHALE, moderately soft, grayish black (N2), no odor, no reaction to HCl, dry, pulverized		
696.0	39.0							
695.0								

DATE STARTED: 4/9/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW407

PROJECT NO. 10-4310

COORDINATES

N. 339784.93 ft E. 2405144.25 ft

GROUND SURFACE ELEVATION: 734.76 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
694.0	41.0					37.0-41.0 ft SHALE, moderately soft, grayish black (N2), no odor, no reaction to HCl, dry, pulverized ---- Bottom of Boring at 41.00 ft.----		Changed drilling rig, description continues on following page

DATE STARTED: 4/9/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW407

PROJECT NO. 10-4310

COORDINATES

N. 339784.93 ft E. 2405144.25 ft

GROUND SURFACE ELEVATION: 734.76 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
694.0	41.0							Continuation of MW407 boring log, see previous pages for description for 0-41.0 ft
693.0	42.0					41.0-59.0 ft SHALE, moderately hard, fresh to slightly weathered, medium dark gray (N4), very weak HCl reaction, trace fossils		
692.0	43.0							
691.0	44.0							
690.0	45.0	R-1	94% (94%)	FD2				
689.0	46.0							
688.0	47.0					46.3-46.4 ft Joint, R.D. = 45°; surface: slightly rough, planar; iron oxide staining. Fracture set #2, discontinuity # 1.		
687.0	48.0					47.1-47.2 ft Joint, R.D. = 65°; surface: slightly rough, planar; slight iron oxide staining, fracture only extends partially through core. Fracture set #3, discontinuity # 2.		
686.0	49.0							
685.0	50.0							
684.0	51.0							
683.0	52.0							
682.0	53.0							
681.0	54.0	R-2	100% (100%)	FD1				
680.0	55.0							
679.0	56.0							
678.0	57.0							
677.0	58.0							
676.0	59.0							
675.0		R-3	100% (100%)			59.0-79.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, fossils scattered throughout length of core, trace pyrite		

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW407

PROJECT NO. 10-4310

COORDINATES

N. 339784.93 ft E. 2405144.25 ft

GROUND SURFACE ELEVATION: 734.76 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
674.0	61.0					59.0-79.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, fossils scattered throughout length of core, trace pyrite		
673.0	62.0							
672.0	63.0							
671.0	64.0					63.4-63.6 ft Joint, R.D. = 45°; surface: smooth, planar; two fractures spaced approximately 0.1 ft apart, slight iron oxide staining. Fracture set #2, discontinuity # 3.		
670.0	65.0	R-3	100% (100%)	FD1				
669.0	66.0							
668.0	67.0							
667.0	68.0							
666.0	69.0							
665.0	70.0							
664.0	71.0					71- ft Fracture zone, R.D. = 0-20°; surface: moderately rough, planar; weathered zone with slight iron oxide staining and abundant fossils in vicinity, vugs present near and within zone. Fracture set #1, discontinuity # 4.		
663.0	72.0							
662.0	73.0							
661.0	74.0	R-4	99% (99%)	FD1				
660.0	75.0							
659.0	76.0							
658.0	77.0							
657.0	78.0							
656.0	79.0							
655.0		R-5	100% (100%)	FD4				

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW407

PROJECT NO. 10-4310

COORDINATES

N. 339784.93 ft E. 2405144.25 ft

GROUND SURFACE ELEVATION: 734.76 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-6				79.0-99.0 ft SHALE, moderately hard, fresh to slightly weathered, medium dark gray (N4), no reaction to HCl, fossils and pyrite throughout length of core		
654.0	81.0							
653.0	82.0							
652.0	83.0							
651.0	84.0							
		R-6	100% (98%)					
650.0	85.0							
649.0	86.0							
648.0	87.0							
647.0	88.0					87.3- ft Joint, R.D. = 10°; surface: moderately rough, planar; weathered zone, vugs present in the vicinity of the fracture, slight iron oxide staining, large shell fossil (approx. 0.1 ft diameter), smaller fossils present. Fracture set #1, discontinuity # 5.		
646.0	89.0					87.4-87.7 ft Joint, R.D. = 70°; surface: moderately rough, planar; heavy iron oxide staining, vugs present in and around fracture. Fracture set #3, discontinuity # 6.		
645.0	90.0			FD4		88.1-88.2 ft Joint, R.D. = 45°; surface: moderately rough, planar; light iron oxide staining, vugs present in and around fracture, large and small shell fragments present. Fracture set #2, discontinuity # 7.		
644.0	91.0							
643.0	92.0							
642.0	93.0							
641.0	94.0	R-7	100% (85%)			94.2-94.4 ft Fracture zone; broken up/various fracture angles, slight iron oxide staining. discontinuity # 8.		
640.0	95.0					94.5-94.6 ft Joint, R.D. = 45°; iron oxide staining. Fracture set #2, discontinuity # 9.		
639.0	96.0							
638.0	97.0							
637.0	98.0					97.4-97.6 ft Joint, R.D. = 45°; iron oxide staining. Fracture set #2, discontinuity # 10.		
636.0	99.0					98.2-98.3 ft Joint, R.D. = 60°; moderate iron oxide staining. Fracture set #3, discontinuity # 11.		
635.0		R-8	98% (94%)	FD5		98.8-99 ft Fracture zone; various fracture angles, heavy iron oxide staining, small amount of quartz infilling. discontinuity # 12.		

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW407

PROJECT NO. 10-4310

COORDINATES

N. 339784.93 ft E. 2405144.25 ft

GROUND SURFACE ELEVATION: 734.76 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
634.0	101.0					99-107 ft Joint, R.D. = 85°; filling: partly healed, quartz; surface: rough, planar; heavy iron oxide staining, fractures vary from quartz infilling to completely healed by quartz, variable fracture width from very thin to up to 0.05 feet. Fracture set #4, discontinuity # 13.		
633.0	102.0					99.0-119.0 ft SHALE, moderately hard to hard, fresh to slightly weathered, medium dark gray (N4), no reaction to HCl, quartz healed fractures make up a significant portion of the core from 116.0 to 119.0 feet bgs, broken up rock fragments mixed with quartz from 116.0 to 119.0 ft bgs, weathered dark gray clayey zone from 116.4 to 116.6 ft bgs		
632.0	103.0					103.3- ft Joint, R.D. = 5°; surface: slightly rough, planar; iron oxide staining. Fracture set #1, discontinuity # 14.		
631.0	104.0					104- ft Joint, R.D. = 5°; surface: slightly rough, planar; iron oxide staining. Fracture set #1, discontinuity # 15.		
630.0	105.0	R-8	98% (94%)			105.4-105.6 ft Joint, R.D. = 60°; filling: partly healed, very thin quartz. Fracture set #3, discontinuity # 16.		
629.0	106.0					105.5-107.8 ft Joint; filling: partly healed, quartz; surface: rough, planar; fracture angle orientation varies between near vertical and approximately 45°, fractures vary from partially to completely healed, iron oxide staining, small amount of clay infilling. discontinuity # 17.		
628.0	107.0							
627.0	108.0							
626.0	109.0					108.6-110.6 ft Joint, R.D. = 85°; varies from tight to moderately open, visible iron oxide staining. Fracture set #4, discontinuity # 18.		
625.0	110.0			FD5		108.8- ft Joint, R.D. = 5°; surface: slightly rough, planar; iron oxide staining. Fracture set #1, discontinuity # 19.		
624.0	111.0					109.8- ft Joint, R.D. = 5°; slight iron oxide staining. Fracture set #1, discontinuity # 20.		
623.0	112.0							
622.0	113.0					112.2-112.5 ft Joint, R.D. = 70°, moderately open; Fracture set #3, discontinuity # 21.		
621.0	114.0	R-9	99% (90%)			112.4-112.5 ft Joint, R.D. = 45°; surface: slightly rough, undulating; small amount of quartz infilling. Fracture set #2, discontinuity # 22.		
620.0	115.0					112.5-112.7 ft Joint, R.D. = 60°; surface: slightly rough, undulating; small amount of quartz infilling. Fracture set #3, discontinuity # 23.		
619.0	116.0							
618.0	117.0					115.9-116 ft Joint, R.D. = 35°; surface: slightly rough, undulating. Fracture set #2, discontinuity # 24.		
617.0	118.0					116-116.2 ft Joint, R.D. = 45°; filling: totally healed, very thin quartz. Fracture set #2, discontinuity # 25.		
616.0	119.0					116.5-123.2 ft Fracture zone; filling: totally healed, quartz; heavy quartz infilling in zone, infilling thickness varies from thin to greater than 0.1 ft. discontinuity # 27.		
615.0		R-10	96% (96%)	FD1		116.8- ft Joint, R.D. = 5°; surface: slightly rough, planar; slight iron oxide staining and vugs. Fracture set #1, discontinuity # 26.		

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW407

PROJECT NO. 10-4310

COORDINATES

N. 339784.93 ft E. 2405144.25 ft

GROUND SURFACE ELEVATION: 734.76 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
614.0	121.0					119.0-129.0 ft SHALE, moderately hard to hard, fresh, medium dark gray (N4) to white (N9), no reaction to HCl, significant quartz infilling from 119.0 to 124.0 ft bgs, trace fossils throughout section		
613.0	122.0							
612.0	123.0							
611.0	124.0							
610.0	125.0	R-10	96% (96%)					
609.0	126.0					125.3-125.4 ft Joint, R.D. = 20°; filling: totally healed, moderately thin quartz. Fracture set #1, discontinuity # 28.		
608.0	127.0							
607.0	128.0					127.9-128.1 ft Joint, R.D. = 55°; surface: smooth, planar; trace quartz and pyrite infilling. Fracture set #3, discontinuity # 29.		
606.0	129.0							
605.0	130.0			FD1		129.0-139.0 ft SHALE, moderately hard, fresh, medium dark gray (N4), no reaction to HCl, trace of fossils and pyrite nodules throughout core section, large pyrite nodule (0.1 x 0.05 ft) noted at 132.3 feet bgs		
604.0	131.0							
603.0	132.0							
602.0	133.0							
601.0	134.0	R-11	92% (89%)					
600.0	135.0							
599.0	136.0					135.6-137 ft Joint, R.D. = 80°; filling: totally healed, moderately thin quartz; three parallel fractures, approximately 0.05 ft apart. Fracture set #4, discontinuity # 30.		
598.0	137.0							
597.0	138.0							
596.0	139.0					---- Bottom of Boring at 139.00 ft.----		

DATE STARTED: 4/13/10
DATE FINISHED: 4/14/10
FIELD GEOLOGIST: Dan Check
CHECKED BY: Dan Check

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Malecki
HELPER(S): F. Smith

DRILL RIG: CME-75
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
766.0	1.0					0.0-5.0 ft Clayey sand with gravel, (sc), 60% sand, fine to coarse, subrounded; 25% gravel, fine to coarse, flat; 15% fines; dark yellowish brown (10YR 4/2), dry, no HCl reaction, some rock fragments	sc	0 - 238.0 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
765.0	2.0							
764.0	3.0							
763.0	4.0							
762.0	5.0					5.0-11.0 ft Well graded sand with clay and gravel, (sw-sc), 70% sand, medium, subrounded; 20% gravel, fine to medium, subrounded, elongated; 10% fines; dark yellowish brown (10YR 4/2) to moderate brown (5YR 3/4), no odor, moist, no HCl reaction, trace organics	sw-sc	
761.0	6.0							
760.0	7.0							
759.0	8.0							
758.0	9.0							
757.0	10.0							
756.0	11.0					11.0-30.0 ft SHALE, soft, silt to fine sand sized particles, moderate yellowish brown (10YR 5/4), no odor, no reaction to HCl, dry, weathered		
755.0	12.0							
754.0	13.0							
753.0	14.0							
752.0	15.0							
751.0	16.0							
750.0	17.0							
749.0	18.0							
748.0	19.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
746.0	21.0					11.0-30.0 ft SHALE, soft, silt to fine sand sized particles, moderate yellowish brown (10YR 5/4), no odor, no reaction to HCl, dry, weathered		
745.0	22.0							
744.0	23.0							
743.0	24.0							
742.0	25.0							
741.0	26.0							
740.0	27.0							
739.0	28.0							
738.0	29.0							
737.0	30.0					30.0-44.0 ft SHALE, soft, slightly weathered, dark greenish gray (5GY 4/1), no odor, no reaction to HCl, dry		
736.0	31.0							
735.0	32.0							
734.0	33.0							
733.0	34.0							
732.0	35.0							
731.0	36.0							
730.0	37.0							
729.0	38.0							
728.0	39.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
726.0	41.0					30.0-44.0 ft SHALE, soft, slightly weathered, dark greenish gray (5GY 4/1), no odor, no reaction to HCl, dry		
725.0	42.0							
724.0	43.0							
723.0	44.0							
722.0	45.0					44.0-53.0 ft SHALE, soft, dark yellowish brown (10YR 4/2), no odor, no reaction to HCl, dry, weathered		
721.0	46.0							
720.0	47.0							
719.0	48.0							
718.0	49.0							
717.0	50.0							
716.0	51.0							
715.0	52.0							
714.0	53.0					53.0-73.0 ft SHALE, moderately soft, medium dark gray (N4), no odor, no reaction to HCl, dry		
713.0	54.0							
712.0	55.0							
711.0	56.0							
710.0	57.0							
709.0	58.0							
708.0	59.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
706.0	61.0					53.0-73.0 ft SHALE, moderately soft, medium dark gray (N4), no odor, no reaction to HCl, dry		Driller remarks that zone is fractured, no change in cuttings
705.0	62.0							
704.0	63.0							
703.0	64.0							
702.0	65.0							
701.0	66.0							
700.0	67.0							
699.0	68.0							
698.0	69.0							
697.0	70.0							
696.0	71.0							
695.0	72.0							
694.0	73.0					73.0-98.0 ft SHALE, moderately soft, medium dark gray (N4), no odor, no reaction to HCl, dry		
693.0	74.0							
692.0	75.0							
691.0	76.0							
690.0	77.0							
689.0	78.0							
688.0	79.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	COORDINATES / DESCRIPTION	USCS SYMBOL	REMARKS
						COORDINATES **N. 340342.30 ft E. 2405819.88 ft** **GROUND SURFACE ELEVATION: 767.00 ft** **DESCRIPTION**		
686.0	81.0					73.0-98.0 ft SHALE, moderately soft, medium dark gray (N4), no odor, no reaction to HCl, dry		
685.0	82.0							
684.0	83.0							
683.0	84.0							
682.0	85.0							
681.0	86.0							
680.0	87.0							
679.0	88.0							
678.0	89.0							
677.0	90.0							
676.0	91.0							
675.0	92.0							
674.0	93.0							
673.0	94.0							
672.0	95.0							
671.0	96.0							
670.0	97.0							
669.0	98.0					98.0-123.0 ft SHALE, moderately soft, medium dark gray (N4) to dark gray (N3), no odor, no reaction to HCl, dry		
668.0	99.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
666.0	101.0					98.0-123.0 ft SHALE, moderately soft, medium dark gray (N4) to dark gray (N3), no odor, no reaction to HCl, dry		
665.0	102.0							
664.0	103.0							
663.0	104.0							
662.0	105.0							
661.0	106.0							
660.0	107.0							
659.0	108.0							
658.0	109.0							
657.0	110.0							
656.0	111.0							
655.0	112.0							
654.0	113.0							
653.0	114.0							
652.0	115.0							
651.0	116.0							
650.0	117.0							
649.0	118.0							
648.0	119.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	COORDINATES / DESCRIPTION	USCS SYMBOL	REMARKS
						N. 340342.30 ft E. 2405819.88 ft **GROUND SURFACE ELEVATION: 767.00 ft**		
646.0	121.0					98.0-123.0 ft SHALE, moderately soft, medium dark gray (N4) to dark gray (N3), no odor, no reaction to HCl, dry		Small amount of water encountered, flow approximated at 1 gallon per minute
645.0	122.0							
644.0	123.0					123.0-148.0 ft SHALE, moderately soft, medium dark gray (N4) to dark gray (N3), no odor, no reaction to HCl, dry		
643.0	124.0							
642.0	125.0							
641.0	126.0							
640.0	127.0							
639.0	128.0							
638.0	129.0							
637.0	130.0							
636.0	131.0							
635.0	132.0							
634.0	133.0							
633.0	134.0							
632.0	135.0							
631.0	136.0							
630.0	137.0							
629.0	138.0							
628.0	139.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
626.0	141.0					123.0-148.0 ft SHALE, moderately soft, medium dark gray (N4) to dark gray (N3), no odor, no reaction to HCl, dry		
625.0	142.0							
624.0	143.0							
623.0	144.0							
622.0	145.0							
621.0	146.0							
620.0	147.0							
619.0	148.0					148.0-173.0 ft SHALE, moderately soft, medium dark gray (N4) to dark gray (N3), no odor, no reaction to HCl, dry		
618.0	149.0							
617.0	150.0							
616.0	151.0							
615.0	152.0							
614.0	153.0							
613.0	154.0							
612.0	155.0							
611.0	156.0							
610.0	157.0							
609.0	158.0							
608.0	159.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
606.0	161.0					148.0-173.0 ft SHALE, moderately soft, medium dark gray (N4) to dark gray (N3), no odor, no reaction to HCl, dry		
605.0	162.0							
604.0	163.0							
603.0	164.0							
602.0	165.0							
601.0	166.0							
600.0	167.0							
599.0	168.0							
598.0	169.0							
597.0	170.0							
596.0	171.0							
595.0	172.0							
594.0	173.0					173.0-198.0 ft SHALE, moderately soft, medium dark gray (N4) to dark gray (N3), no odor, no reaction to HCl, dry		
593.0	174.0							
592.0	175.0							
591.0	176.0							
590.0	177.0							
589.0	178.0							
588.0	179.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
586.0	181.0					173.0-198.0 ft SHALE, moderately soft, medium dark gray (N4) to dark gray (N3), no odor, no reaction to HCl, dry		
585.0	182.0							
584.0	183.0							
583.0	184.0							
582.0	185.0							
581.0	186.0							
580.0	187.0							
579.0	188.0							
578.0	189.0							
577.0	190.0							
576.0	191.0							
575.0	192.0							
574.0	193.0							
573.0	194.0							
572.0	195.0							
571.0	196.0							
570.0	197.0							
569.0	198.0					198.0-216.0 ft SHALE, moderately soft, dark gray (N3), no odor, no reaction to HCl, dry		
568.0	199.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
566.0	201.0					198.0-216.0 ft SHALE, moderately soft, dark gray (N3), no odor, no reaction to HCl, dry		
565.0	202.0							
564.0	203.0							
563.0	204.0							
562.0	205.0							
561.0	206.0							
560.0	207.0							
559.0	208.0							
558.0	209.0							
557.0	210.0							
556.0	211.0							
555.0	212.0							
554.0	213.0							
553.0	214.0							
552.0	215.0							
551.0	216.0					216.0-238.0 ft SHALE, moderately soft, dark gray (N3), no odor, no reaction to HCl, dry		
550.0	217.0							
549.0	218.0							
548.0	219.0							

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW408

PROJECT NO. 10-4310

COORDINATES

N. 340342.30 ft E. 2405819.88 ft

GROUND SURFACE ELEVATION: 767.00 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
546.0	221.0					216.0-238.0 ft SHALE, moderately soft, dark gray (N3), no odor, no reaction to HCl, dry		
545.0	222.0							
544.0	223.0							
543.0	224.0							
542.0	225.0							
541.0	226.0							
540.0	227.0							
539.0	228.0							
538.0	229.0							
537.0	230.0							
536.0	231.0							
535.0	232.0							
534.0	233.0							
533.0	234.0							
532.0	235.0							
531.0	236.0							
530.0	237.0							
529.0	238.0					---- Bottom of Boring at 238.00 ft.----		

DATE STARTED: 4/10/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW409

PROJECT NO. 10-4310

COORDINATES

N. 339760.65 ft E. 2405905.35 ft

GROUND SURFACE ELEVATION: 720.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
720.0	1.0					0.0-1.0 ft Topsoil		0 - 7.5 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
719.0	2.0					1.0-7.5 ft SHALE, moderately soft, dark gray (N3), no odor, weak reaction to HCl, dry, powdered cuttings had a weak reaction to 1N HCl		
718.0	3.0							
717.0	4.0							
716.0	5.0							
715.0	6.0							
714.0	7.0					---- Bottom of Boring at 7.50 ft.----		Changed drilling rig, description continues on following page

DATE STARTED: 4/9/10
DATE FINISHED: 4/9/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Mark Zatezalo

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY:

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW409

PROJECT NO. 10-4310

COORDINATES
N. 339760.65 ft E. 2405905.35 ft
GROUND SURFACE ELEVATION: 720.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
720.0	1.0							Continuation of MW407 boring log, see previous page for description for 0-7.5 ft
719.0	2.0							
718.0	3.0							
717.0	4.0							
716.0	5.0							
715.0	6.0							
714.0	7.0							
713.0	8.0	R-1	75% (0%)	FD6		7.5-32.0 ft SHALE, moderately hard to hard, very intensely weathered, medium dark gray (N4), R.D. = 0° to 65°, very closely fractured, weak reaction to HCl, dry, iron oxide staining, calcareous		
712.0	9.0							
711.0	10.0	R-2	91% (0%)					
710.0	11.0							
709.0	12.0							
708.0	13.0							
707.0	14.0	R-3	95% (0%)					
706.0	15.0							
705.0	16.0							
704.0	17.0	R-4	100% (0%)					
703.0	18.0							
702.0	19.0	R-5	100% (25%)					
701.0								

DATE STARTED: 4/14/10
DATE FINISHED: 4/21/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: water used to drill

APPROVED BY:

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW409

PROJECT NO. 10-4310

COORDINATES

N. 339760.65 ft E. 2405905.35 ft

GROUND SURFACE ELEVATION: 720.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
700.0	21.0	R-5	100% (25%)	FD6		7.5-32.0 ft SHALE, moderately hard to hard, very intensely weathered, medium dark gray (N4), R.D. = 0° to 65°, very closely fractured, weak reaction to HCl, dry, iron oxide staining, calcareous		Shale is weathered to light greenish gray to greenish gray, heavy iron oxide staining, small vugs also apparent.
699.0	22.0							
698.0	23.0							
697.0	24.0	R-6	89% (23%)					
696.0	25.0							
695.0	26.0							
		R-7	100% (0%)					
694.0	27.0							
693.0	28.0							
692.0	29.0	R-8	98% (51%)					
691.0	30.0							
690.0	31.0							
689.0	32.0			FD1		32.0-75.5 ft SHALE, calcareous, very hard, fresh to slightly weathered, clay sized particles, dark gray (N3) to medium dark gray (N4), R.D. = 0° to 75°, very widely fractured, weak reaction to HCl, fossiliferous		
688.0	33.0							
687.0	34.0	R-9	100% (98%)					
686.0	35.0							
685.0	36.0							
684.0	37.0							
683.0	38.0	R-10	100% (62%)					Multiple weathered fracture zones that are iron stained.
682.0	39.0							
681.0								

DATE STARTED: 4/14/10
DATE FINISHED: 4/21/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: water used to drill

APPROVED BY:

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW409

PROJECT NO. 10-4310

COORDINATES

N. 339760.65 ft E. 2405905.35 ft

GROUND SURFACE ELEVATION: 720.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
680.0	41.0					32.0-75.5 ft SHALE, calcareous, very hard, fresh to slightly weathered, clay sized particles, dark gray (N3) to medium dark gray (N4), R.D. = 0° to 75°, very widely fractured, weak reaction to HCl, fossiliferous		some fractures are near vertical, drilling is difficult
679.0	42.0	R-10	100% (62%)					
678.0	43.0							
677.0	44.0							
676.0	45.0							
675.0	46.0							
674.0	47.0							
673.0	48.0			FD1				
672.0	49.0	R-11	90% (67%)					
671.0	50.0							
670.0	51.0							
669.0	52.0							
668.0	53.0							
667.0	54.0	R-12	100% (91%)					
666.0	55.0							
665.0	56.0							
664.0	57.0							
663.0	58.0	R-13	99% (76%)	FD1				
662.0	59.0							
661.0								

DATE STARTED: 4/14/10
DATE FINISHED: 4/21/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: water used to drill

APPROVED BY:

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW409

PROJECT NO. 10-4310

COORDINATES

N. 339760.65 ft E. 2405905.35 ft

GROUND SURFACE ELEVATION: 720.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
660.0	61.0					32.0-75.5 ft SHALE, calcareous, very hard, fresh to slightly weathered, clay sized particles, dark gray (N3) to medium dark gray (N4), R.D. = 0° to 75°, very widely fractured, weak reaction to HCl, fossiliferous		
659.0	62.0	R-13	99% (76%)					
658.0	63.0							
657.0	64.0							
656.0	65.0	R-14	71% (67%)					
655.0	66.0							
654.0	67.0			FD1				
653.0	68.0							
652.0	69.0							
651.0	70.0							
650.0	71.0	R-..	100% (100%)					
649.0	72.0							
648.0	73.0							
647.0	74.0							
646.0	75.0							
645.0	76.0					75.5-97.0 ft SHALE, very hard, fresh to slightly weathered, clay sized particles, grayish black (N2) to dark gray (N3), iron oxide staining		
644.0	77.0			FD5				
643.0	78.0	R-16	83% (82%)					
642.0	79.0							
641.0								

DATE STARTED: 4/14/10
DATE FINISHED: 4/21/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: water used to drill

APPROVED BY:

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW409

PROJECT NO. 10-4310

COORDINATES

N. 339760.65 ft E. 2405905.35 ft

GROUND SURFACE ELEVATION: 720.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
640.0	81.0	R-16	83% (82%)	FD5		75.5-97.0 ft SHALE, very hard, fresh to slightly weathered, clay sized particles, grayish black (N2) to dark gray (N3), iron oxide staining		Vertical fracture with iron oxide staining infilling
639.0	82.0							
638.0	83.0							
637.0	84.0	R-17	98% (82%)					
636.0	85.0							
635.0	86.0							
634.0	87.0			FD1				
633.0	88.0							
632.0	89.0	R-18	98% (89%)					
631.0	90.0							
630.0	91.0							
629.0	92.0							
628.0	93.0							
627.0	94.0	R-19	100% (98%)					
626.0	95.0							
625.0	96.0							
624.0	97.0					97.0-116.0 ft SHALE, very hard to moderately hard, fresh to slightly weathered, clay sized particles, grayish black (N2) to dark gray (N3), thinly bedded, R.D. = 0° to 90°, widely to extremely widely fractured		
623.0	98.0	R-20	96% (94%)					
622.0	99.0							
621.0								

DATE STARTED: 4/14/10
DATE FINISHED: 4/21/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: water used to drill

APPROVED BY:

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW409

PROJECT NO. 10-4310

COORDINATES

N. 339760.65 ft E. 2405905.35 ft

GROUND SURFACE ELEVATION: 720.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
620.0	101.0	R-20	96% (94%)	FD1		97.0-116.0 ft SHALE, very hard to moderately hard, fresh to slightly weathered, clay sized particles, grayish black (N2) to dark gray (N3), thinly bedded, R.D. = 0° to 90°, widely to extremely widely fractured		
619.0	102.0							
618.0	103.0							
617.0	104.0	R-21	100% (100%)					
616.0	105.0							
615.0	106.0							
614.0	107.0	R-22	95% (50%)	FD5				Very broken shale with coal like lenses
613.0	108.0							
612.0	109.0							
611.0	110.0							
610.0	111.0							
609.0	112.0	R-23	99% (50%)					
608.0	113.0							
607.0	114.0							
606.0	115.0							
605.0	116.0					116.0-134.0 ft SHALE, very hard to moderately hard, fresh to slightly weathered, clay sized particles, grayish black (N2) to dark gray (N3), thinly bedded, R.D. = 0° to 90°, intact		
604.0	117.0							
603.0	118.0	R-24	100% (100%)	FD0				
602.0	119.0							
601.0								

DATE STARTED: 4/14/10
DATE FINISHED: 4/21/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: water used to drill

APPROVED BY:

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW409

PROJECT NO. 10-4310

COORDINATES

N. 339760.65 ft E. 2405905.35 ft

GROUND SURFACE ELEVATION: 720.79 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
600.0	121.0					116.0-134.0 ft SHALE, very hard to moderately hard, fresh to slightly weathered, clay sized particles, grayish black (N2) to dark gray (N3), thinly bedded, R.D. = 0° to 90°, intact		
599.0	122.0							
598.0	123.0	R-24	100% (100%)					
597.0	124.0							
596.0	125.0							
595.0	126.0							
594.0	127.0			FD0				
593.0	128.0							
592.0	129.0							
591.0	130.0	R-25	93% (93%)					
590.0	131.0							
589.0	132.0							
588.0	133.0							
587.0	134.0					---- Bottom of Boring at 134.00 ft.----		

DATE STARTED: 4/14/10
DATE FINISHED: 4/21/10
FIELD GEOLOGIST: Mark Zatezalo
CHECKED BY: Mark Zatezalo

DRILLING METHOD: NQ
DRILLING CO. Eichelbergers, Inc.

NOTES: water used to drill

APPROVED BY:

DRILLER: T. Growden
HELPER(S): J. Bechtel

DRILL RIG: Diedrich D-120 (Truck)
HAMMER ID: NA

REV 1 Final Boring MW410

PROJECT NO. 10-4310

COORDINATES

N. 339662.11 ft E. 2406412.50 ft

GROUND SURFACE ELEVATION: 679.04 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
678.0	1.0					0.0-3.0 ft Poorly graded sand with clay, (sp-sc), 80% sand, fine to coarse, rounded; 10% gravel, fine, subrounded; 10% fines; grayish brown (5YR 3/2) to dark yellowish brown (10YR 4/2), no odor, moist, no HCl reaction, trace roots	sp-sc	0 - 39.0 ft. Destructive drilling, no samples taken, descriptions based on air hammer cuttings.
677.0	2.0							
676.0	3.0					3.0-6.0 ft Sandy silt, (ml), 60% fines, medium plasticity, medium dry strength, medium toughness; 30% sand, fine to medium, subangular; 10% gravel, fine, subrounded; light brown (5YR 5/6) to moderate yellowish brown (10YR 5/4), no odor, moist, no HCl reaction	ml	
675.0	4.0							
674.0	5.0							
673.0	6.0					6.0-11.0 ft Poorly graded sand, (sp), 85% sand, fine to coarse, subrounded; 10% gravel, fine, subangular; 5% fines; moderate brown (5YR 3/4), no odor, moist, no HCl reaction	sp	
672.0	7.0							
671.0	8.0							
670.0	9.0							
669.0	10.0							
668.0	11.0					11.0-26.0 ft Silty sand with gravel, (sm), 55% sand, fine to medium, subrounded; 25% gravel, fine to coarse, subrounded, elongated; 20% fines; dark yellowish brown (10YR 4/2), no odor, wet, no HCl reaction	sm	
667.0	12.0							
666.0	13.0							
665.0	14.0							
664.0	15.0							
663.0	16.0							
662.0	17.0							
661.0	18.0							
660.0	19.0							

DATE STARTED: 4/11/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring MW410

PROJECT NO. 10-4310

COORDINATES

N. 339662.11 ft E. 2406412.50 ft

GROUND SURFACE ELEVATION: 679.04 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
658.0	21.0					11.0-26.0 ft Silty sand with gravel, (sm), 55% sand, fine to medium, subrounded; 25% gravel, fine to coarse, subrounded, elongated; 20% fines; dark yellowish brown (10YR 4/2), no odor, wet, no HCl reaction		
657.0	22.0							
656.0	23.0						sm	
655.0	24.0							
654.0	25.0							
653.0	26.0					26.0-36.0 ft Poorly graded gravel with silt and sand, (gp-gm), 60% gravel, fine to coarse, subrounded, elongated; 30% sand, fine to medium, subrounded; 10% fines; dusky yellowish brown (10YR 2/2), wet, no HCl reaction, trace Cobbles		
652.0	27.0							
651.0	28.0							
650.0	29.0							
649.0	30.0							
648.0	31.0						gp-gm	
647.0	32.0							
646.0	33.0							
645.0	34.0							
644.0	35.0							
643.0	36.0					36.0-39.0 ft SHALE, moderately soft, grayish black (N2), no odor, no reaction to HCl, moist		
642.0	37.0							
641.0	38.0							
	39.0					---- Bottom of Boring at 39.00 ft.----		

DATE STARTED: 4/11/10
DATE FINISHED: 4/11/10
FIELD GEOLOGIST: Eugene Tabacchi
CHECKED BY: Dan Check

DRILLING METHOD: Air Hammer, Destructive
DRILLING CO. Eichelbergers, Inc.

NOTES:

APPROVED BY: Daniel Bansah

DRILLER: J. Trish
HELPER(S): B. Kuntz

DRILL RIG: T4-W 1250
HAMMER ID: NA

REV 1 Final Boring PMT-401

PROJECT NO. 10-4310

COORDINATES

N. 340151.69 ft E. 2405219.62 ft

GROUND SURFACE ELEVATION: 759.09 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
758.0	1.0					0.0-17.5 ft Interval not sampled		
757.0	2.0							
756.0	3.0							
755.0	4.0							
754.0	5.0							
753.0	6.0							
752.0	7.0							
751.0	8.0							
750.0	9.0							
749.0	10.0							
748.0	11.0							
747.0	12.0							
746.0	13.0							
745.0	14.0							
744.0	15.0							
743.0	16.0							
742.0	17.0							
741.0	18.0					17.5-34.8 ft SHALE, moderately soft to moderately hard, intensely weathered, moderate yellow (5Y 7/6) and dark gray (N3), very closely to closely fractured, no reaction to HCl		
740.0	19.0	R-1	57% (0%)	FD6		17.5-44.8 ft Bedding plane separation, R.D. = 11-25°, closely to widely spaced; filling: not healed, clay, slightly weathered, very soft; surface: moderately rough, planar, slightly weathered; vertical fractures in the run as		

DATE STARTED: 6/9/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring PMT-401

PROJECT NO. 10-4310

COORDINATES

N. 340151.69 ft E. 2405219.62 ft

GROUND SURFACE ELEVATION: 759.09 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		R-1	57% (0%)			well as joint and bedding plane fractures. Fracture set #F-1. 17.5-34.8 ft SHALE, moderately soft to moderately hard, intensely weathered, moderate yellow (5Y 7/6) and dark gray (N3), very closely to closely fractured, no reaction to HCl		
738.0	21.0							
737.0	22.0							
736.0	23.0	R-2	100% (0%)					
735.0	24.0							
734.0	25.0							
733.0	26.0			FD6				
732.0	27.0	R-3	100% (0%)					
731.0	28.0							
730.0	29.0							
729.0	30.0							
728.0	31.0							
727.0	32.0	R-4	100% (12%)					
726.0	33.0							
725.0	34.0							
724.0	35.0					34.8-48.1 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl		
723.0	36.0							
722.0	37.0	R-5	100% (26%)	FD6				
721.0	38.0							
720.0	39.0							
		R-6						

DATE STARTED: 6/9/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring PMT-401

PROJECT NO. 10-4310

COORDINATES

N. 340151.69 ft E. 2405219.62 ft

GROUND SURFACE ELEVATION: 759.09 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
718.0	41.0					34.8-48.1 ft SHALE, horizontal, moderately hard, moderately weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl		
717.0	42.0	R-6	100% (40%)			42.2 ft Fresh to slightly weathered		
716.0	43.0			FD6				
715.0	44.0							
714.0	45.0					44.8-56.8 ft Bedding plane separation, R.D. = 15°, closely spaced; filling: not healed; surface: slightly rough, planar; iron oxide staining on the fracture faces, also joint fractures at a 60° angle at 54.2 ft. Fracture set #F-2.		
713.0	46.0	R-7	100% (39%)					
712.0	47.0							
711.0	48.0					48.1-51.1 ft SHALE, horizontal, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl		
710.0	49.0	R-8	100% (47%)					
709.0	50.0							
708.0	51.0					51.1-54.8 ft SHALE, horizontal, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl		
707.0	52.0	R-9	100% (24%)					
706.0	53.0			FD5				
705.0	54.0							
704.0	55.0					54.8-59.8 ft SHALE, horizontal, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		
703.0	56.0							
702.0	57.0	R-10	100% (48%)			56.8-59.8 ft Joint, R.D. = 84°, closely spaced; filling: not healed; surface: slightly rough; iron oxide staining on fracture surfaces. Fracture set #F-3.		
701.0	58.0							
700.0	59.0							
		R-11						

DATE STARTED: 6/9/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring PMT-401

PROJECT NO. 10-4310

COORDINATES

N. 340151.69 ft E. 2405219.62 ft

GROUND SURFACE ELEVATION: 759.09 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
698.0	61.0					59.8-81 ft Bedding plane separation, R.D. = 15°, closely spaced; filling: not healed; surface: slightly rough, planar; iron oxide stainung on the fracture face. Fracture set #F-4. 59.8-64.8 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl		
697.0	62.0	R-11	100% (44%)					
696.0	63.0							
695.0	64.0							
694.0	65.0			FD5		64.8-69.8 ft SHALE, horizontal, moderately hard to moderately soft, slightly to moderately weathered, dark gray (N3) and moderate brown (5YR 4/4), closely to moderately fractured, no reaction to HCl, trace quartz crystals throughout		
693.0	66.0							
692.0	67.0	R-12	90% (0%)					
691.0	68.0							
690.0	69.0							
689.0	70.0					69.8-74.8 ft SHALE, horizontal, moderately hard, slightly to moderately weathered, dark gray (N3) and moderate brown (5YR 4/4), very closely to closely fractured, no reaction to HCl		
688.0	71.0							
687.0	72.0	R-13	90% (0%)	FD7				
686.0	73.0							
685.0	74.0							
684.0	75.0					74.8-81.0 ft SHALE, horizontal, moderately hard, slightly to moderately weathered, dark gray (N3) and moderate brown (5YR 4/4), very closely to moderately fractured, no reaction to HCl		
683.0	76.0							
682.0	77.0	R-14	100% (33%)	FD5				
681.0	78.0							
680.0	79.0							
		R-15						

DATE STARTED: 6/9/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring PMT-401

PROJECT NO. 10-4310

COORDINATES

N. 340151.69 ft E. 2405219.62 ft

GROUND SURFACE ELEVATION: 759.09 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
678.0	81.0	R-15	75% (0%)	FD5		81.0-86.0 ft SHALE, moderately soft to moderately hard, moderately to intensely weathered, dark gray (N3) and moderate brown (5YR 4/4), very closely to moderately fractured, no reaction to HCl, iron oxide staining, quartz crystals filling fractures		
677.0	82.0							
676.0	83.0	R-16	90% (0%)					
675.0	84.0							
674.0	85.0							
673.0	86.0					86.0-89.8 ft SHALE, moderately soft to moderately hard, moderately to intensely weathered, dark gray (N3) and moderate brown (5YR 4/4), closely to moderately fractured, no reaction to HCl, iron oxide staining, quartz crystals filling fractures		
672.0	87.0							
671.0	88.0	R-17	92% (38%)	FD6				
670.0	89.0							
669.0	90.0					89.8-94.8 ft SHALE, moderately soft to moderately hard, moderately to intensely weathered, dark gray (N3) and moderate brown (5YR 4/4), closely to moderately fractured, no reaction to HCl, iron oxide staining, quartz crystals filling fractures		
668.0	91.0							
667.0	92.0	R-18	100% (40%)					
666.0	93.0							
665.0	94.0							
664.0	95.0					94.8-99.8 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to widely fractured, no reaction to HCl, calcite healed fractures		
663.0	96.0							
662.0	97.0	R-19	100% (100%)	FD1				
661.0	98.0							
660.0	99.0							
		R-20						

DATE STARTED: 6/9/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring PMT-401

PROJECT NO. 10-4310

COORDINATES

N. 340151.69 ft E. 2405219.62 ft

GROUND SURFACE ELEVATION: 759.09 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
658.0	101.0					99.8-104.8 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), very closely to widely fractured, no reaction to HCl, calcite healed fractures		
657.0	102.0	R-20	100% (84%)			102.2-109.8 ft Bedding plane separation, R.D. = 19°, closely spaced; filling: not healed, calcite; surface: slightly rough, planar. Fracture set #F-5.		
656.0	103.0							
655.0	104.0							
654.0	105.0			FD1		104.8-114.8 ft SHALE, horizontal, moderately hard, slightly weathered, dark gray (N3), closely to widely fractured, no reaction to HCl, calcite healed fractures		
653.0	106.0					104.8-107 ft Joint, R.D. = 61°, closely spaced; filling: totally healed, moderately thin calcite, fresh, moderately soft; surface: fresh. Fracture set #F-6.		
652.0	107.0	R-21	100% (100%)					
651.0	108.0							
650.0	109.0							
649.0	110.0							
648.0	111.0							
647.0	112.0	R-22	100% (100%)	FD0				
646.0	113.0							
645.0	114.0					---- Bottom of Boring at 114.80 ft.----		

DATE STARTED: 6/9/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Adrianna Semione

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring PMT-402

PROJECT NO. 10-4310

COORDINATES

N. 340053.75 ft E. 2405001.22 ft

GROUND SURFACE ELEVATION: 729.82 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
729.0	1.0					0.0-28.0 ft Interval not sampled		
728.0	2.0							
727.0	3.0							
726.0	4.0							
725.0	5.0							
724.0	6.0							
723.0	7.0							
722.0	8.0							
721.0	9.0							
720.0	10.0							
719.0	11.0							
718.0	12.0							
717.0	13.0							
716.0	14.0							
715.0	15.0							
714.0	16.0							
713.0	17.0							
712.0	18.0							
711.0	19.0							
710.0								

DATE STARTED: 6/10/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 340665

REV 1 Final Boring PMT-402

PROJECT NO. 10-4310

COORDINATES

N. 340053.75 ft E. 2405001.22 ft

GROUND SURFACE ELEVATION: 729.82 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
709.0	21.0					0.0-28.0 ft Interval not sampled		
708.0	22.0							
707.0	23.0							
706.0	24.0							
705.0	25.0							
704.0	26.0							
703.0	27.0							
702.0	28.0							
701.0	29.0	R-1	90% (13%)	FD6		28.0-31.0 ft SHALE, moderately hard, fresh to moderately weathered, dark gray (N3), closely to widely fractured, no reaction to HCl, iron oxide staining 28-37.5 ft Joint, R.D. = 25-50°, very closely to closely spaced, moderately open; surface: slightly rough, planar, moderately hard. Fracture set #F-1.		
700.0	30.0							
699.0	31.0					31.0-35.0 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), closely to moderately fractured, no reaction to HCl, iron oxide staining		
698.0	32.0							
697.0	33.0	R-2	98% (68%)	FD4				
696.0	34.0							
695.0	35.0					35.0-40.0 ft SHALE, moderately hard, fresh to moderately weathered, dark gray (N3) to yellowish gray (5Y 7/2), closely to widely fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
694.0	36.0							
693.0	37.0							
692.0	38.0	R-3	100% (24%)	FD7		37.5-45 ft Bedding plane separation, R.D. = 10°, very closely to closely spaced, slightly open; surface: slightly rough, planar, moderately hard; moderately spaced fractures, 70 °, slightly rough, undulating, slightly weathered walls 39.3-41.2 ft. Fracture set #F-2.		
691.0	39.0							
690.0								

DATE STARTED: 6/10/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 340665

REV 1 Final Boring PMT-402

PROJECT NO. 10-4310

COORDINATES

N. 340053.75 ft E. 2405001.22 ft

GROUND SURFACE ELEVATION: 729.82 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
689.0	41.0					40.0-45.0 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining, moderately weathered 44.3-44.5 ft., yellowish gray (5Y 7/2)		
688.0	42.0							
687.0	43.0	R-4	100% (40%)	FD6				
686.0	44.0							
685.0	45.0							
684.0	46.0					45.0-50.0 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
683.0	47.0					45-47.8 ft R.D. = 70°, moderately spaced; surface: slightly rough, undulating, moderately hard. Fracture set #F-3.		
682.0	48.0	R-5	100% (20%)	FD7		48-48.8 ft R.D. = 10°, very closely to closely spaced, slightly open; surface: slightly rough, planar, moderately hard. Fracture set #F-4.		
681.0	49.0							
680.0	50.0							
679.0	51.0	R-6	100% (40%)	FD5		50.0-51.0 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
678.0	52.0					50.3-55.8 ft Joint, R.D. = 25-70°, closely spaced, moderately open; surface: slightly rough, undulating, moderately weathered, moderately hard. Fracture set #F-5.		
677.0	53.0	R-7	100% (18%)	FD6		51.0-55.0 ft SHALE, moderately hard, fresh to slightly weathered, dark gray (N3), very closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
676.0	54.0							
675.0	55.0							
674.0	56.0					55.0-60.0 ft SHALE, moderately hard, fresh to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), very closely to moderately fractured, no reaction to HCl, iron oxide staining		
673.0	57.0					55.8-71 ft Joint, R.D. = 35°, very closely to closely spaced, slightly open; surface: slightly rough, planar, moderately weathered, moderately hard; 80° fracture, slightly to moderately weathered, slightly rough planar, moderately open, 60.1-61.0 ft and 63.1-63.8 ft. Fracture set #F-6.		
672.0	58.0	R-8	100% (20%)	FD7				
671.0	59.0							
670.0								

DATE STARTED: 6/10/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 340665

REV 1 Final Boring PMT-402

PROJECT NO. 10-4310

COORDINATES

N. 340053.75 ft E. 2405001.22 ft

GROUND SURFACE ELEVATION: 729.82 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
669.0	61.0					60.0-65.0 ft SHALE, moderately soft to moderately hard, fresh to moderately weathered, dark gray (N3) with yellowish gray (5Y 7/2), closely fractured, no reaction to HCl, iron oxide staining		
668.0	62.0							
667.0	63.0	R-9	100% (16%)	FD7				
666.0	64.0							
665.0	65.0							
664.0	66.0					65.0-70.0 ft SHALE, moderately soft to moderately hard, fresh to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely fractured, no reaction to HCl, iron oxide staining		
663.0	67.0							
662.0	68.0	R-10	100% (20%)	FD7				
661.0	69.0							
660.0	70.0							
659.0	71.0	R-11	100% (50%)	FD6		70.0-71.0 ft SHALE, moderately soft to moderately hard, fresh to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely fractured, no reaction to HCl, iron oxide staining		
658.0	72.0					71.0-75.0 ft SHALE, moderately soft to moderately hard, fresh to moderately weathered, dark gray (N3) and yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
657.0	73.0	R-12	90% (53%)	FD6		71-75 ft Joint, R.D. = 10-30°, very closely to moderately spaced, slightly open; surface: slightly rough, planar, slightly weathered, moderately hard. Fracture set #F-7.		
656.0	74.0							
655.0	75.0					75.0-80.0 ft SHALE, moderately hard, fresh to moderately weathered, dark gray (N3) with yellowish gray (5Y 7/2), closely to moderately fractured, no reaction to HCl, iron oxide staining, trace fossils and pyrite		
654.0	76.0					76-77.2 ft Joint, R.D. = 50°, moderately open; surface: smooth, planar, moderately weathered, moderately hard; quartz infilling 76.8-77.2 ft. Fracture set #F-8.		
653.0	77.0	R-13	92% (38%)	FD5		77.2-78.2 ft Bedding plane separation, R.D. = 10°, very closely spaced, slightly open; surface: smooth, planar, moderately hard. Fracture set #F-9.		
652.0	78.0							
651.0	79.0					78.4-86 ft Joint, R.D. = 10-70°, closely to moderately spaced; filling: totally healed, very thin calcite, fresh, moderately hard; surface: slightly rough, planar, fresh, moderately hard. Fracture set #F-10.		
650.0								

DATE STARTED: 6/10/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 340665

REV 1 Final Boring PMT-402

PROJECT NO. 10-4310

COORDINATES

N. 340053.75 ft E. 2405001.22 ft

GROUND SURFACE ELEVATION: 729.82 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
649.0	81.0					80.0-86.0 ft SHALE, moderately hard, fresh, dark gray (N3), very thickly to massive, closely to widely fractured, no reaction to HCl, trace fossils and pyrite		
648.0	82.0							
		R-14	98% (94%)	FD3				
647.0	83.0							
646.0	84.0							
645.0	85.0							
		R-15	75% (75%)					
644.0	86.0					---- Bottom of Boring at 86.00 ft.----		

DATE STARTED: 6/10/10
DATE FINISHED: 6/10/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: S. Silverman
HELPER(S): J. Tousley

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 340665

REV 1 Final Boring W-5

PROJECT NO. 10-4310

COORDINATES

N. 339124.92 ft E. 2404761.41 ft

GROUND SURFACE ELEVATION: 658.18 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
658.0	0.0	S-1	2-2-3 (5) 93%			0.0-1.5 ft Clayey sand, (sc), 75% sand, fine to medium, subrounded, soft hardness; 25% fines, low plasticity, no dry strength, no dilatancy, low toughness; 0% gravel; light brown (5YR 5/6) and moderate brown (5YR 4/4), moist, no HCl reaction, medium dense	sc	
657.0	1.0					1.5-5.0 ft Interval not sampled		
656.0	2.0							
655.0	3.0							
654.0	4.0							
653.0	5.0	S-2	22-13-12 (25) 87%			5.0-6.5 ft Poorly graded sand with silt and gravel, (sp-sm), 45% gravel, medium to coarse, subangular, flat and elongated, medium hardness; 45% sand, fine, subrounded, very soft hardness; 10% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.1 inches, moderate reddish brown (10R 4/6) and moderate brown (5YR 4/4), moist, no HCl reaction, dense to very loose, changes from gravel back to silty sand	sp-sm	
652.0	6.0					6.5-10.0 ft Interval not sampled		
651.0	7.0							
650.0	8.0							
649.0	9.0							
648.0	10.0	S-3	19-50/4 100%			10.0-10.83 ft Clayey sand with gravel, (sc), 60% sand, fine to medium, subrounded, soft hardness; 20% gravel, medium to coarse, subangular, flat and elongated, medium hardness; 20% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.04 inches, grayish brown (5YR 3/2), moist, no HCl reaction, medium dense	sc	
647.0	11.0					10.83-15.0 ft Interval not sampled		
646.0	12.0							
645.0	13.0							
644.0	14.0							
643.0	15.0	S-4	23-27-22 (49) 67%			15.0-16.5 ft Clayey sand with gravel, (sc), 40% gravel, medium to coarse, subangular, flat and elongated, medium hardness; 40% sand, fine to medium, subangular, soft hardness; 20% fines, low plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.1 inches, moderate brown (5YR 4/4) and dark gray (N3), moist, no HCl reaction, medium dense	sc	
642.0	16.0					16.5-20.0 ft Interval not sampled		
641.0	17.0							
640.0	18.0							
639.0	19.0							

DATE STARTED: 6/7/10
DATE FINISHED: 6/8/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring W-5

PROJECT NO. 10-4310

COORDINATES

N. 339124.92 ft E. 2404761.41 ft

GROUND SURFACE ELEVATION: 658.18 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
638.0		S-5	23-50/5 67%			20.0-20.9 ft Poorly graded gravel with silt and sand, (gp-gm), 60% gravel, fine to coarse, subangular, flat and elongated, medium hardness; 30% sand, fine to medium, subangular, soft hardness; 10% fines, medium plasticity, no dry strength, no dilatancy, low toughness; maximum grain size = 0.1 inches, moderate brown (5YR 4/4) and dark gray (N3), moist, no HCl reaction, dense	gp-gm	
637.0	21.0							
636.0	22.0	R-1	73% (0%)			21.0-24.0 ft OVERBURDEN, (boulders), horizontal, moderately hard, slightly to moderately weathered, dark gray (N3) and dusky red (5R 3/4), no reaction to HCl, iron oxide staining, mechanically broken, overburden material		
635.0	23.0							
634.0	24.0					24.0-29.0 ft OVERBURDEN, (boulders), moderately hard, slightly to moderately weathered, light gray (N7) and dusky red (5R 3/4), no reaction to HCl, iron oxide staining, overburden material, mechanically broken		
633.0	25.0							
632.0	26.0	R-2	26% (0%)					
631.0	27.0							
630.0	28.0							
629.0	29.0					29.0-34.0 ft OVERBURDEN, (boulders), moderately hard, fresh to slightly weathered, medium light gray (N6) and very light gray (N8), no reaction to HCl, iron oxide staining, quartz, and shale material, overburden material, mechanically broken		
628.0	30.0							
627.0	31.0	R-3	64% (8%)					
626.0	32.0							
625.0	33.0							
624.0	34.0					34.0-37.5 ft Interval not sampled		
623.0	35.0							
622.0	36.0							
621.0	37.0							
620.0	38.0	S-6	24-31-27 (58) 47%			37.5-39.0 ft Poorly graded gravel with clay and sand, (gp-gc), 70% gravel, medium to coarse, angular, flat and elongated, medium hardness; 20% sand, fine to coarse, subangular, flat and elongated, soft hardness; 10% fines, non plastic, no dry strength, no dilatancy, no toughness; maximum grain size = 0.1 inches, moderate brown (5YR 4/4), moist, no HCl reaction, medium dense	gp-gc	
619.0	39.0							

DATE STARTED: 6/7/10
DATE FINISHED: 6/8/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring W-5

PROJECT NO. 10-4310

COORDINATES

N. 339124.92 ft E. 2404761.41 ft

GROUND SURFACE ELEVATION: 658.18 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
618.0		S-7	50/2 100%			40.0-40.25 ft Poorly graded gravel, (gp), 100% gravel, medium to coarse, angular, flat and elongated, hard hardness; maximum grain size = 0.1 inches, medium light gray (N6) and dark reddish brown (10R 3/4), dry, no HCl reaction, dense, blocky, sandstone	gp	
617.0	41.0							
						40.25-44.3 ft Interval not sampled		
616.0	42.0							
615.0	43.0							
614.0	44.0							
613.0	45.0	R-4	88% (88%)			44.3-51.0 ft SHALE, horizontal, moderately hard, fresh, dark gray (N3), moderately to widely fractured, no reaction to HCl		
612.0	46.0							
611.0	47.0			FD5				
610.0	48.0	R-5	100% (100%)					
609.0	49.0							
608.0	50.0							
	51.0					---- Bottom of Boring at 51.00 ft.----		

DATE STARTED: 6/7/10
DATE FINISHED: 6/8/10
FIELD GEOLOGIST: Jason Lucey
CHECKED BY: Jesse Merkel

DRILLING METHOD: 6" Solid Flight Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring W-9A

PROJECT NO. 10-4310

COORDINATES

N. 339407.90 ft E. 2407287.39 ft

GROUND SURFACE ELEVATION: 670.01 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
669.0	1.0	S-1	2-2-2 (4) 100%			0.0-1.5 ft Silty sand, (sm), 80% sand, fine; 20% fines, low plasticity, low toughness; dark yellowish orange (10YR 6/6), moist, no HCl reaction, very loose	sm	
668.0	2.0					1.5-5.0 ft Interval not sampled		
667.0	3.0							
666.0	4.0							
665.0	5.0	S-2	12-14-17 (31) 67%			5.0-6.5 ft Clayey sand, (sc), 70% sand, fine to coarse; 25% fines, medium plasticity, low toughness; 5% gravel, fine, angular, hard hardness; maximum grain size = 0.25 inches, pale brown (5YR 5/2) and moderate red (5R 5/4), dry, no HCl reaction, dense	sc	Switch to casing advancer
664.0	6.0							
663.0	7.0					6.5-10.0 ft Interval not sampled		
662.0	8.0							
661.0	9.0							
660.0	10.0	S-3	24-19-26 (45) 53%			10.0-11.5 ft Poorly graded gravel with silt and sand, (gp-gm), 60% gravel, fine to medium, subangular, hard hardness; 30% sand, fine to coarse; 10% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, light olive gray (5Y 5/2) and moderate yellowish brown (10YR 5/4), wet, dense, gravel stuck in driving shoe, N value may be affected	gp-gm	
659.0	11.0							
658.0	12.0					11.5-15.0 ft Interval not sampled		
657.0	13.0							
656.0	14.0							
655.0	15.0	S-4	19-24-16 (40) 47%			15.0-16.5 ft Clayey sand with gravel, (sc), 50% sand, fine to coarse; 30% gravel, fine, subangular, hard hardness; 20% fines, low plasticity, low toughness; maximum grain size = 0.25 inches, medium dark gray (N4) and dark yellowish brown (10YR 4/2), wet, no HCl reaction, dense	sc	
654.0	16.0							
653.0	17.0					16.5-20.0 ft Interval not sampled		
652.0	18.0							
651.0	19.0							

DATE STARTED: 6/5/10
DATE FINISHED: 6/5/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring W-9A

PROJECT NO. 10-4310

COORDINATES

N. 339407.90 ft E. 2407287.39 ft

GROUND SURFACE ELEVATION: 670.01 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
649.0	21.0	S-5	15-10-11 (21) 47%			20.0-21.5 ft Clayey sand with gravel, (sc), 50% sand, fine to coarse; 30% gravel, fine, angular, flat and elongated, hard hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.25 inches, moderate brown (5YR 4/4) and dark greenish gray (5GY 4/1), wet, no HCl reaction, medium dense	sc	
648.0	22.0					21.5-25.0 ft Interval not sampled		
647.0	23.0							
646.0	24.0							
645.0	25.0	S-6	11-10-10 (20) 57%			25.0-26.5 ft Poorly graded sand with silt and gravel, (sp-sm), 50% sand, fine to coarse; 40% gravel, fine to medium, subrounded, hard hardness; 10% fines, low plasticity, low toughness; maximum grain size = 0.5 inches, moderate yellowish brown (10YR 5/4) and medium dark gray (N4), wet, no HCl reaction, medium dense	sp-sm	
644.0	26.0							
643.0	27.0					26.5-30.0 ft Interval not sampled		
642.0	28.0							
641.0	29.0							
640.0	30.0	S-7	23-17-23 (40) 33%			30.0-31.5 ft Silty sand, (sm), 75% sand, fine to coarse; 20% gravel, fine, subangular, flat and elongated, hard hardness; 5% fines, low plasticity, low toughness; maximum grain size = 0.1 inches, medium dark gray (N4) and greenish gray (5GY 6/1), wet, no HCl reaction, dense	sm	
639.0	31.0					31.5-35.0 ft Interval not sampled		
638.0	32.0							
637.0	33.0							
636.0	34.0							
635.0	35.0	S-8	22-13-17 (30) 60%			35.0-36.5 ft Silty sand with gravel, (sm), 60% sand, fine to coarse; 20% gravel, fine, flat, medium hardness; 20% fines, medium plasticity, low toughness; maximum grain size = 0.2 inches, dark gray (N3) and grayish red (5R 4/2), wet, no HCl reaction, medium dense	sm	
634.0	36.0					36.5-40.0 ft Interval not sampled		
633.0	37.0							
632.0	38.0							
631.0	39.0							

DATE STARTED: 6/5/10
DATE FINISHED: 6/5/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931

REV 1 Final Boring W-9A

PROJECT NO. 10-4310

COORDINATES

N. 339407.90 ft E. 2407287.39 ft

GROUND SURFACE ELEVATION: 670.01 ft

ELEVATION (Feet)	DEPTH (Feet)	SAMPLE OR RUN NO.	BLOW/6in & (N) OR %REC & (RQD)	FRACTURE DENSITY	PROFILE	DESCRIPTION	USCS SYMBOL	REMARKS
		S-9	50/2 100%			40.0-40.17 ft Silty sand, (sm), dark gray (N3), wet, no HCl reaction, very dense, shale	sm	
629.0	41.0					40.17-44.17 ft SHALE, moderately hard, fresh, dark gray (N3), massive, very widely to widely fractured, no reaction to HCl, trace fossils and pyrite		
628.0	42.0	R-1	100% (100%)	FD0				
627.0	43.0							
626.0	44.0					44.17-49.17 ft SHALE, moderately hard, fresh, dark gray (N3), massive, moderately to very widely fractured, no reaction to HCl, trace fossils and pyrite 44.55-46.4 ft R.D. = 60°, moderately spaced, slightly open; surface: smooth, planar, moderately hard. Fracture set #F-1.		
625.0	45.0							
624.0	46.0	R-2	100% (89%)	FD2				
623.0	47.0							
622.0	48.0							
621.0	49.0	R-3	100% (100%)	FD0		49.17-50.17 ft SHALE, moderately hard, fresh, dark gray (N3), massive, moderately fractured, no reaction to HCl, trace fossils and pyrite		
620.0	50.0					---- Bottom of Boring at 50.17 ft.----		

DATE STARTED: 6/5/10
DATE FINISHED: 6/5/10
FIELD GEOLOGIST: Jesse Merkel
CHECKED BY: Adrianna Semione

DRILLING METHOD: 4-1/4" I.D. Hollow Stem Auger, NQ
DRILLING CO. Terracon

NOTES:

APPROVED BY: Rolando Benitez

DRILLER: J. Williams
HELPER(S): R. Hinkle

DRILL RIG: Diedrich D-120 (ATV)
HAMMER ID: 931