



SHEET 3 OF 3

BECHTEL NO.: 25352			MACTEC NO.: 6468-07-1777			COUNTY: Victoria, TX			GEOLOGIST: S. Woodham				
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS									GROUND WATER (ft)				
BORING NO.: B-3288			DRILL METHOD: Mud Rotary			SAMPLE METHODS: SPT			0 HR. ND				
GROUND SURFACE ELEV.: 80.2 ft (NAVD88)			NORTHING: 13,413,286			US ft (NAD83)			EASTING: 2,601,039 US ft (NAD83)				
24 HR. ND													
TOTAL DEPTH: 151.0 ft			DRILL MACHINE: CME 550 X			DRILLER: R. Landeros (MACTEC ATL)			HAMMER (ID): 140 lb. Auto (MEC 22)				
DATE STARTED: 3/7/09			COMPLETED: 3/8/09			CASING DEPTH: N/A			BITS USED: 2 15/16" Roller Cone Bit				
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100			
-32.0					Continued from previous page								
-39.6	119.8	9	12	11						SS-25			115.0
-49.3	129.5	5	8	12						SS-26		129.5 ft: strong HCl reaction, calcium carbonate nodules not observed	
-59.3	139.5	16	28	33						SS-27		POORLY GRADED SAND (SP), very pale brown (10YR 7/4), very dense, wet, fine to medium grained, trace fines, strong HCl reaction	135.0
-69.3	149.5	5	9	18						SS-28		SANDY FAT CLAY (CH), light gray (2.5Y 7/2), very stiff, moist, some fine grained sand, no HCl reaction on clay, few calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules	145.0
												Boring Terminated at Elevation -70.8 ft	151.0

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 10/20/09

GEOTECHNICAL BORING LOG

Prepared By WBD Date 8-10-09

Checked By KAW Date 8-10-09

SHEET 1 OF 3

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: R. Clark										
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)									
BORING NO.: B-3289		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT			0 HR. ND									
GROUND SURFACE ELEV.: 80.4 ft (NAVD88)		NORTHING: 13,413,160		US ft (NAD83)		EASTING: 2,600,933 US ft (NAD83)		24 HR. ND								
TOTAL DEPTH: 150.0 ft		DRILL MACHINE: CME 45 C Track		DRILLER: D. Rhodes (MACTEC RAL)			HAMMER (ID): 140 lb. Auto (MEC 12)									
DATE STARTED: 3/6/09		COMPLETED: 3/7/09		CASING DEPTH: 10.0 ft			BITS USED: 2 7/8" Drag Bit									
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION				
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100			
80.4					Ground Surface							80.4	0.0			
80.4	0.0	4	5	4						SS-1		80.4		FAT CLAY with sand (CH), dark grayish brown (10YR 4/2), stiff, dry, few fine grained sand, no HCl reaction, few organics		
76.7	3.7	2	3	2						SS-2		76.7	3.7	FAT CLAY (CH), light gray (2.5Y 7/2), firm, moist, few fine grained sand, weak HCl reaction, trace organics		
74.8	5.6	3	4	7						SS-3				5.6 ft: stiff, trace calcium carbonate nodules		
72.0	8.4	3	6	9						SS-4				8.4 ft: brownish yellow (10YR 6/6) mottled light gray (2.5Y 7/2)		
69.4	11.0	4	6	10						SS-5				11.0 ft: very stiff		
66.9	13.5	5	8	11						SS-6						
61.9	18.5	4	5	7						SS-7				18.5 ft: stiff, no calcium carbonate nodules observed		
56.9	23.5	3	4	5						SS-8				23.5 ft: trace calcium carbonate nodules		
51.9	28.5	4	7	11						SS-9				51.9	28.5	SANDY FAT CLAY (CH), pale yellow (2.5Y 7/3), very stiff, moist, some fine grained sand, weak HCl reaction, trace calcium carbonate nodules, trace ferrous staining
46.9	33.5	11	15	18						SS-10				33.5 ft: hard, no HCl reaction, no calcium carbonate nodules observed		
41.9	38.5	5	7	12						SS-11				41.9	38.5	FAT CLAY with sand (CH), pale yellow (2.5Y 7/3) mottled brownish yellow (10YR 6/6), very stiff, moist, little fine grained sand, weak HCl reaction, trace calcium carbonate nodules, trace organics, ferrous staining
36.9	43.5	7	11	11						SS-12				43.5 ft: no calcium carbonate nodules observed		
31.9	48.5	8	10	14						SS-13				31.9	48.5	SANDY FAT CLAY (CH), pale yellow (2.5Y 7/3), very stiff, moist, some fine grained sand, weak HCl reaction, trace calcium carbonate nodules
26.9	53.5	9	18	27						SS-14				30.4	50.0	CLAYEY SAND (SC), pale yellow (2.5Y 7/3), dense, moist, fine grained, some fines, weak HCl reaction



SHEET 2 OF 3

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: R. Clark							
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)						
BORING NO.: B-3289		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT		0 HR. ND							
GROUND SURFACE ELEV.: 80.4 ft (NAVD88)		NORTHING: 13,413,160		US ft (NAD83)		EASTING: 2,600,933 US ft (NAD83)							
TOTAL DEPTH: 150.0 ft		DRILL MACHINE: CME 45 C Track		DRILLER: D. Rhodes (MACTEC RAL)		HAMMER (ID): 140 lb. Auto (MEC 12)							
DATE STARTED: 3/6/09		COMPLETED: 3/7/09		CASING DEPTH: 10.0 ft		BITS USED: 2 7/8" Drag Bit							
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100	MOI		
24.3					Continued from previous page								
21.9	58.5												CLAYEY SAND (SC), pale yellow (2.5Y 7/3), dense, moist, fine grained, some fines, weak HCl reaction (continued)
		27	31	42									21.9
													58.5
16.9	63.5												SILTY SAND (SM), pale yellow (2.5Y 7/3), very dense, wet, fine grained, little fines, weak HCl reaction
		5	7	11									18.4
													62.0
11.9	68.5												FAT CLAY with sand (CH), pale yellow (2.5Y 7/3), very stiff, moist, little fine grained sand, weak HCl reaction, trace calcium carbonate nodules
		4	6	8									11.9
													68.5
6.9	73.5												FAT CLAY (CH), pale brown (10YR 6/3), stiff, moist, few fine grained sand, weak HCl reaction, trace calcium carbonate nodules
		7	7	11									73.5 ft: light brownish gray (10YR 6/2) mottled brownish yellow (10YR 6/6), very stiff
1.9	78.5												1.9
		6	8	12									78.5
													FAT CLAY with sand (CH), pale yellow (2.5Y 7/3), very stiff, moist, little fine grained sand, weak HCl reaction
-3.1	83.5												-3.1
		8	9	13									83.5
													SILTY SAND (SM), light gray (10YR 7/2), very firm, wet, fine grained, little fines, no to weak HCl reaction
-8.1	88.5												85.0 ft: bit chatter
		10	16	23									-8.1
													88.5
-13.1	93.5												SANDY FAT CLAY (CH), pale yellow (2.5Y 7/3), hard, moist, some fine grained sand, weak HCl reaction, trace calcium carbonate nodules
		17	46	50/0.2									-11.6
													92.0 ft: bit chatter
-18.1	98.5												SILTY SAND (SM), pale brown (2.5Y 7/3), very dense, wet, fine grained, little fines, weak to strong HCl reaction, few calcium carbonate nodules and caliche
		38	33	49									94.8 - 95.5 ft: bit chatter
-28.1	108.5												98.5 ft: light yellowish brown (2.5Y 6/3), weak HCl reaction, calcium carbonate nodules and caliche not observed
		30	46	48									
													108.5 ft: pale yellow (2.5Y 7/3), fine to coarse grained, subangular

EXELON COL BORE VICTORIA PHASE IILGJ EXELON COL.GDT 8/10/09



SHEET 3 OF 3

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: R. Clark							
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)						
BORING NO.: B-3289		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT		0 HR. ND							
GROUND SURFACE ELEV.: 80.4 ft (NAVD88)		NORTHING: 13,413,160		US ft (NAD83)		EASTING: 2,600,933 US ft (NAD83)							
TOTAL DEPTH: 150.0 ft		DRILL MACHINE: CME 45 C Track		DRILLER: D. Rhodes (MACTEC RAL)		HAMMER (ID): 140 lb. Auto (MEC 12)							
DATE STARTED: 3/6/09		COMPLETED: 3/7/09		CASING DEPTH: 10.0 ft		BITS USED: 2 7/8" Drag Bit							
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				
-31.8					Continued from previous page								
-38.1	118.5	5	5	10	15					SS-25			112.0 ft: bit chatter SILTY SAND (SM), pale brown (2.5Y 7/3), very dense, wet, fine grained, little fines, weak to strong HCl reaction, few calcium carbonate nodules and caliche (continued)
-48.1	128.5	7	9	11	20					SS-26			128.5 ft: pale yellow (2.5Y 7/3) mottled brownish yellow (10YR 6/6), very stiff, weak HCl reaction
-58.1	138.5	6	21	30	51					SS-27			135.0 ft: bit chatter SILTY SAND (SM), pale yellow (2.5Y 7/3), very dense, wet, fine to coarse grained, little fines, weak HCl reaction
-68.1	148.5	5	7	8	15					SS-28			141.0 ft: FAT CLAY (CH), pale yellow (2.5Y 7/3), stiff, moist, few fine grained sand, weak HCl reaction, trace calcium carbonate nodules
													Boring Terminated at Elevation -69.6 ft

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 8/10/09



GEOTECHNICAL BORING LOG

Prepared By PAI Date 8/10/09Checked By KAW Date 8-10-09

SHEET 1 OF 6

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: B. Mabie									
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)								
BORING NO.: B-3290		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT			0 HR.	ND							
GROUND SURFACE ELEV.: 80.5 ft (NAVD88)		NORTHING: 13,413,567		US ft (NAD83)	EASTING: 2,601,256 US ft (NAD83)		24 HR.	ND							
TOTAL DEPTH: 300.0 ft		DRILL MACHINE: CME 550		DRILLER: L. Carter (MACTEC ATL)		HAMMER (ID): 140 lb. Auto (CME-08)									
DATE STARTED: 2/21/09		COMPLETED: 2/24/09		CASING DEPTH: 5.0 ft			BITS USED: 4" Drag Bit								
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION			
		0.5ft	0.5ft	0.5ft	0	20	40	60	80				100		
80.5					Ground Surface							80.5	0.0		
80.5	0.0	2	3	3						SS-1		80.5	CLAYEY SAND (SC), black (10YR 2/1), loose, moist, fine grained, little fines, no HCl reaction, organics, roots and grass	0.0	
77.0	3.5	8	11	14						SS-2		77.0	FAT CLAY with sand (CH), grayish brown (10YR 5/2), very stiff, moist, little fine grained sand, strong HCl reaction, calcium carbonate nodules, black staining	3.5	
74.5	6.0	8	10	10						SS-3		74.5	FAT CLAY (CH), grayish brown (10YR 5/2), very stiff, moist, few fine grained sand, strong HCl reaction, calcium carbonate nodules, black and orange staining	6.0	
72.0	8.5	12	15	15						SS-4		72.0	FAT CLAY (CH), grayish brown (10YR 5/2), very stiff, moist, few fine grained sand, strong HCl reaction, calcium carbonate nodules, black and orange staining	8.5	
69.5	11.0	8	10	11						SS-5		69.5	CLAYEY SAND (SC), light yellowish brown (10YR 6/4), very firm, moist, fine grained, little fines, strong HCl reaction, calcium carbonate nodules, black and orange staining	11.0	
67.0	13.5	5	6	8						SS-6					
62.0	18.5	7	9	12						SS-7			18.5 ft: very stiff, few fine grained sand, caliche not observed		
57.0	23.5	4	6	7						SS-8			23.5 ft: stiff, weak HCl reaction		
52.0	28.5	5	6	10						SS-9			28.5 ft: very stiff, trace calcium carbonate nodules		
47.0	33.5	8	7	10						SS-10					
42.0	38.5	5	6	13						SS-11			38.5 ft: no calcium carbonate nodules observed		
37.0	43.5	10	14	13						SS-12			37.0	POORLY GRADED SAND with clay (SP-SC), light gray (10YR 7/2), reddish yellow (7.5YR 6/6), very firm, moist, fine to medium grained, few fines, weak HCl reaction, orange staining	43.5
32.0	48.5	10	16	16						SS-13			48.5 ft: very pale brown (10YR 7/3), dense, wet, fine grained, no HCl reaction		
27.0	53.5	13	16	22						SS-14			27.0	SILTY SAND (SM), yellow (10YR 7/6), dense, wet, fine grained, little fines, weak HCl reaction, orange staining	53.5

EXELON COL BORE VICTORIA PHASE III GP1 EXELON COL.GDT 8/10/09



BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: B. Mable					
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS						GROUND WATER (ft)					
BORING NO.: B-3290		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT		0 HR. ND					
GROUND SURFACE ELEV.: 80.5 ft (NAVD88)		NORTHING: 13,413,567		US ft (NAD83)		EASTING: 2,601,256 US ft (NAD83)					
TOTAL DEPTH: 300.0 ft		DRILL MACHINE: CME 550		DRILLER: L. Carter (MACTEC ATL)		HAMMER (ID): 140 lb. Auto (CME-08)					
DATE STARTED: 2/21/09		COMPLETED: 2/24/09		CASING DEPTH: 5.0 ft		BITS USED: 4" Drag Bit					
ELEV. (ft)	DEPTH (ft)	BLOW COUNT 0.5ft 0.5ft 0.5ft			BLOWS PER FOOT 0 20 40 60 80 100			SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	
24.4		Continued from previous page									
22.0	58.5	21	27	41				SS-15		SILTY SAND (SM), yellow (10YR 7/6), dense, wet, fine grained, little fines, weak HCl reaction, orange staining (continued) 58.5	
17.0	63.5	7	10	10				SS-16		CLAYEY SAND (SC), very pale brown (10YR 7/3), very dense, wet, fine grained, little fines, weak HCl reaction, orange staining 17.0	
12.0	68.5	6	8	11				SS-17		FAT CLAY (CH), light gray (10YR 7/2), very stiff, moist, few fine grained sand, weak HCl reaction, trace calcium carbonate nodules, black and orange staining 68.5 ft: gray (10YR 5/1), strong HCl reaction 63.5	
7.0	73.5	7	11	14				SS-18		73.5 ft: light gray (10YR 7/2), some calcium carbonate nodules 7.0	
2.0	78.5	7	7	10				SS-19		78.5 ft: very pale brown (10YR 7/3) 2.0	
-3.0	83.5	16	22	25				SS-20		POORLY GRADED SAND (SP), very pale brown (10YR 7/3), dense, wet, fine to medium grained, no HCl reaction -3.0	
-8.0	88.5	7	10	12				SS-21		FAT CLAY (CH), light gray (10YR 7/2) and reddish yellow (7.5Y 6/6), very stiff, moist, strong HCl reaction, carbonate nodules, trace black staining -8.0	
-13.0	93.5	15	20	25				SS-22		POORLY GRADED SAND (SP), very pale brown (10YR 7/3), dense, wet, fine to medium grained, no HCl reaction -13.0	
-18.0	98.5	18	34	36				SS-23		CLAYEY SAND (SC), light gray (10YR 7/2), very dense, moist, fine grained, some fines, strong HCl reaction, calcium carbonate nodules, black and orange staining -18.0	
-28.0	108.5	48	50/0.4					SS-24		POORLY GRADED SAND (SP), very pale brown (10YR 7/3), very dense, wet, fine to coarse grained, weak HCl reaction, calcium carbonate nodules -28.0	

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 8/10/09



SHEET 3 OF 6

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: B. Mable							
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)						
BORING NO.: B-3290		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT			0 HR.	ND					
GROUND SURFACE ELEV.: 80.5 ft (NAVD88)		NORTHING: 13,413,567		US ft (NAD83)		EASTING: 2,601,256	24 HR.	ND					
TOTAL DEPTH: 300.0 ft		DRILL MACHINE: CME 550		DRILLER: L. Carter (MACTEC ATL)			HAMMER (ID): 140 lb. Auto (CME-08)						
DATE STARTED: 2/21/09		COMPLETED: 2/24/09		CASING DEPTH: 5.0 ft			BITS USED: 4" Drag Bit						
ELEV.	DEPTH	BLOW COUNT			BLOWS PER FOOT					SAMP.	LOG	SOIL AND ROCK DESCRIPTION	
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	20	40	60	80	100			NO.
-31.7					Continued from previous page								
													POORLY GRADED SAND (SP), very pale brown (10YR 7/3), very dense, wet, fine to coarse grained, weak HCl reaction, calcium carbonate nodules (continued)
-38.0	118.5	7	9	16						SS-25			FAT CLAY (CH), light gray (10YR 7/2), very stiff, moist, weak HCl reaction, calcium carbonate nodules, caliche, black and orange staining
-48.0	128.5	7	11	16						SS-26			128.5 ft: caliche not observed
-58.0	138.5	8	46	43						SS-27A/B			SANDY FAT CLAY (CH), light gray (10YR 7/2), hard, moist, some fine grained sand, strong HCl reaction, calcium carbonate nodules, orange and black staining
													POORLY GRADED SAND (SP), very dense, moist, fine to medium grained, no HCl reaction, trace orange staining
-68.0	148.5	8	10	13						SS-28			FAT CLAY (CH), light gray (10YR 7/2) mottled reddish yellow (7.5YR 6/6), very stiff, moist, weak HCl reaction, trace calcium carbonate fragments, black staining
-78.0	158.5	6	6	12						SS-29			CLAYEY SAND (SC), very pale brown (10YR 7/3), firm, wet, fine grained, little fines, weak HCl reaction, trace calcium carbonate nodules, trace orange staining

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 8/10/09



SHEET 4 OF 6

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: B. Mable						
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)					
BORING NO.: B-3290		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT		0 HR. ND						
GROUND SURFACE ELEV.: 80.5 ft (NAVD88)		NORTHING: 13,413,567		US ft (NAD83)		EASTING: 2,601,256 US ft (NAD83)						
TOTAL DEPTH: 300.0 ft		DRILL MACHINE: CME 550		DRILLER: L. Carter (MACTEC ATL)		HAMMER (ID): 140 lb. Auto (CME-08)						
DATE STARTED: 2/21/09		COMPLETED: 2/24/09		CASING DEPTH: 5.0 ft		BITS USED: 4" Drag Bit						
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80			
-87.8	168.5	23	33	58	Continued from previous page							
-98.0	178.5	25	36	36						SS-30		POORLY GRADED SAND (SP), very pale brown (10YR 7/3), very dense, wet, fine to coarse grained, few gravel, weak HCl reaction, calcium carbonate nodules, orange staining
-108.0	188.5	37	52	54/0.5						SS-31		
-118.0	198.5	70/0.1								SS-32		SILTY SAND (SM), very pale brown (10YR 7/3), very dense, wet, fine grained, little fines, strong HCl reaction, trace orange staining
-128.0	208.5	19	21	35						SS-33		POORLY GRADED SAND (SP), white (10YR 8/1), very dense, moist, fine to medium grained, few cemented zones, strong HCl reaction
-138.0	218.5	31	34	52						SS-34		208.5 ft: yellow (10YR 7/8), wet, weak HCl reaction, calcium carbonate nodules
										SS-35		218.5 ft: light gray (10YR 7/1), no HCl reaction, no calcium carbonate nodules observed

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 8/10/09

ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT	SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft				
-143.9								Continued from previous page
-148.0	228.5	8	12	50/0.4	62/0.4	SS-36		POORLY GRADED SAND (SP), white (10YR 8/1), very dense, moist, fine to medium grained, few cemented zones, strong HCl reaction (continued)
-158.0	238.5	28		50/0.3	78/0.3	SS-37		FAT CLAY (CH), light gray (10YR 7/2), hard, moist, strong HCl reaction, little calcium carbonate nodules, orange and black staining
-168.0	248.5	20	41	47	98	SS-38		232.0 to 234.0 ft: hard drilling, bit chatter POORLY GRADED SAND (SP), very pale brown (10YR 7/3), very dense, wet, fine grained, strong HCl reaction, trace calcium carbonate nodules
-178.0	258.5	10	12	19	31	SS-39		248.5 ft: fine to coarse grained, calcium carbonate nodules CLAYEY SAND (SC), very pale brown (10YR 7/3), very dense, wet, fine grained, some fines, strong HCl reaction, calcium carbonate nodules, orange staining
-188.0	268.5	14	23	30	53	SS-40		FAT CLAY with sand (CH), light gray (10YR 7/2), hard, moist, little fine grained sand, strong HCl reaction, calcium carbonate nodules, orange staining
-198.0	278.5	34	48	56/0.5	104/1.0	SS-41		POORLY GRADED SAND (SP), very pale brown (10YR 7/3), very dense, wet, fine to medium grained, no HCl reaction, trace orange staining



SHEET 6 OF 6

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: B. Mable												
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)											
BORING NO.: B-3290		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT		0 HR. ND												
GROUND SURFACE ELEV.: 80.5 ft (NAVD88)		NORTHING: 13,413,567		US ft (NAD83)		EASTING: 2,601,256 US ft (NAD83)												
TOTAL DEPTH: 300.0 ft		DRILL MACHINE: CME 550		DRILLER: L. Carter (MACTEC ATL)		HAMMER (ID): 140 lb. Auto (CME-08)												
DATE STARTED: 2/21/09		COMPLETED: 2/24/09		CASING DEPTH: 5.0 ft		BITS USED: 4" Drag Bit												
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION					
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100								
-200.0					Continued from previous page													
-208.0	288.5	15	26	30											SS-42		POORLY GRADED SAND (SP), very pale brown (10YR 7/3), very dense, wet, fine to medium grained, no HCl reaction, trace orange staining (continued)	
-218.0	298.5	11	16	23											SS-43		288.5 ft: light gray (10YR 7/2), weak HCl reaction	
																	-218.0 -219.5 298.5 300.0	FAT CLAY (CH), light gray (10YR 7/2), hard, moist, few fine grained sand, strong HCl reaction, calcium carbonate nodules, black and orange staining Boring Terminated at Elevation -219.5 ft

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 8/10/09



GEOTECHNICAL BORING LOG

Prepared By PAW Date 8/10/09Checked By KAW Date 8-10-09

SHEET 1 OF 3

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: R. Harwell								
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)							
BORING NO.: B-3291		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT			0 HR. ND							
GROUND SURFACE ELEV.: 80.2 ft (NAVD88)		NORTHING: 13,412,951		US ft (NAD83)		EASTING: 2,600,556 US ft (NAD83)		24 HR. ND						
TOTAL DEPTH: 150.1 ft		DRILL MACHINE: CME 55 Track		DRILLER: T. Hahn (MACTEC RAL)			HAMMER (ID): 140 lb. Auto (MEC 21)							
DATE STARTED: 3/7/09		COMPLETED: 3/9/09		CASING DEPTH: 15.0 ft			BITS USED: 3" Drag Bit							
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100				
80.2					Ground Surface							80.2	0.0	
80.2	0.0	2	3	4						SS-1		80.2	LEAN CLAY (CL), black (2.5Y 2.5/1), firm, dry, few fine grained sand, weak HCl reaction on clay, trace roots	
76.6	3.6	2	8	9						SS-2		76.6	3.6	3.6 ft: grayish brown (2.5Y 5/2), very stiff, moist, few calcium carbonate nodules, strong HCl reaction
73.8	6.4	2	9	10						SS-3		73.8	6.4	FAT CLAY (CH), light yellowish brown (2.5Y 6/3), very stiff, moist, few fine grained sand, weak HCl reaction, trace calcium carbonate nodules
71.5	8.7	2	7	8						SS-4		71.5	8.7	LEAN CLAY (CL), light gray (2.5Y 7/2) mottled olive yellow (2.5Y 6/8), stiff, moist, few fine grained sand, weak HCl reaction on clay, few calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules
68.7	11.5	6	6	6						SS-5		68.7	11.5	11.5 ft: mottled brownish yellow (10YR 6/6), trace fine grained sand
66.4	13.8	3	3	5						SS-6		66.4	13.8	13.8 ft: firm, black staining, weak HCl reaction, calcium carbonate nodules not observed
61.5	18.7	2	3	4						SS-7		61.5	18.7	18.7 ft: mottled pale yellow (2.5Y 8/2)
56.5	23.7	2	4	9						SS-8		56.5	23.7	23.7 ft: stiff
51.5	28.7	10	13	18						SS-9		51.5	28.7	SILTY SAND (SM), pale yellow (2.5Y 8/2), dense, moist, fine grained, some fines, no HCl reaction
46.5	33.7	11	8	9						SS-10		46.5	33.7	SANDY FAT CLAY (CH), pale yellow (2.5Y 8/2), very stiff, moist, some fine grained sand, weak HCl reaction
41.5	38.7	6	7	10						SS-11		41.5	38.7	FAT CLAY (CH), brownish yellow (10YR 6/8) mottled pale yellow (2.5Y 8/2), very stiff, moist, trace fine grained sand, weak HCl reaction, black staining
36.5	43.7	5	5	8						SS-12		36.5	43.7	43.7 ft: stiff
31.6	48.6	4	4	7						SS-13		31.6	48.6	
26.6	53.6	3	5	9						SS-14		26.6	53.6	53.6 ft: reddish yellow (7.5YR 6/6) mottled light gray (2.5Y 7/2)

EXELON COL BORE VICTORIA PHASE III.GP? EXELON COL.GDT 8/10/09



SHEET 2 OF 3

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: R. Harwell						
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS						GROUND WATER (ft)						
BORING NO.: B-3291		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT		0 HR. ND						
GROUND SURFACE ELEV.: 80.2 ft (NAVD88)		NORTHING: 13,412,951 US ft (NAD83)		EASTING: 2,600,556 US ft (NAD83)		24 HR. ND						
TOTAL DEPTH: 150.1 ft		DRILL MACHINE: CME 55 Track		DRILLER: T. Hahn (MACTEC RAL)		HAMMER (ID): 140 lb. Auto (MEC 21)						
DATE STARTED: 3/7/09		COMPLETED: 3/9/09		CASING DEPTH: 15.0 ft		BITS USED: 3" Drag Bit						
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100		
24.1					Continued from previous page							
21.6	58.6	3	5	9						SS-15		FAT CLAY (CH), brownish yellow (10YR 6/8) mottled pale yellow (2.5Y 8/2), very stiff, moist, trace fine grained sand, weak HCl reaction, black staining (continued) 58.6 ft: light gray (2.5Y 7/2), few fine grained sand, no HCl reaction
16.6	63.6	4	6	11						SS-16		63.6 ft: very stiff
11.6	68.6	3	4	5						SS-17		68.6 ft: light brownish gray (2.5Y 6/2), stiff, trace fine grained sand, weak HCl reaction on clay, trace calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules
6.6	73.6	3	5	8						SS-18		73.6 ft: pale yellow (2.5Y 7/3)
1.6	78.6	4	6	7						SS-19		78.6 ft: light gray (2.5Y 7/2), few fine grained sand, no HCl reaction, calcium carbonate nodules not observed, black staining
-3.4	83.6	3	4	4						SS-20		-3.4 FAT CLAY with sand (CH), light gray (5Y 7/2), firm, moist, little fine grained sand, weak HCl reaction
-8.4	88.6	4	8	8						SS-21		-8.4 FAT CLAY (CH), pale yellow (2.5Y 8/2), very stiff, moist, few fine grained sand, weak HCl reaction on clay, few calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules
-13.4	93.6	12	23	34						SS-22		-13.4 POORLY GRADED SAND (SP), pale yellow (2.5Y 8/2), very dense, wet, fine grained, trace fines, weak HCl reaction
-18.4	98.6	26	19	21						SS-23A/B		-18.6 98.6 ft: yellow (2.5Y 7/6), dense
-28.4	108.6	7	27	100/0.3						SS-24A/B		-28.4 FAT CLAY (CH), pale yellow (2.5Y 8/2) mottled brownish yellow (10YR 6/6), hard, moist, few fine grained sand, weak HCl reaction on clay, few calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules
												-29.4 SILTY SAND (SM), light gray (2.5Y 7/2), very dense, moist, fine grained, some fines, no HCl reaction
												POORLY GRADED SAND (SP), pale yellow (2.5Y 8/3), very dense, wet, fine to medium grained, weak HCl reaction

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 8/10/09



SHEET 3 OF 3

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: R. Harwell								
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)							
BORING NO.: B-3291		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT			0 HR. ND							
GROUND SURFACE ELEV.: 80.2 ft (NAVD88)		NORTHING: 13,412,951		US ft (NAD83)		EASTING: 2,600,556 US ft (NAD83)		24 HR. ND						
TOTAL DEPTH: 150.1 ft		DRILL MACHINE: CME 55 Track		DRILLER: T. Hahn (MACTEC RAL)			HAMMER (ID): 140 lb. Auto (MEC 21)							
DATE STARTED: 3/7/09		COMPLETED: 3/9/09		CASING DEPTH: 15.0 ft			BITS USED: 3" Drag Bit							
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION		
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100				
-32.0					Continued from previous page									
-38.4	118.6	8	20	14						SS-25		-38.4	118.6	POORLY GRADED SAND (SP), pale yellow (2.5Y 8/3), very dense, wet, fine to medium grained, weak HCl reaction (continued)
-48.4	128.6	6	9	13						SS-26				128.6 ft: pale yellow (2.5Y 8/2), very stiff, weak HCl reaction on clay, trace calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules
-58.4	138.6	21	23	26						SS-27		-58.4	138.6	POORLY GRADED SAND (SP), pale yellow (2.5Y 8/2), dense, wet, fine grained, weak HCl reaction
-68.4	148.6	17	15	14						SS-28		-68.4	148.6	SANDY FAT CLAY (CH), pale yellow (2.5Y 8/2), very stiff, moist, some fine to medium grained sand, weak HCl reaction
												-69.9	150.1	Boring Terminated at Elevation -69.9 ft

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 8/10/09



GEOTECHNICAL BORING LOG

Prepared By WSD Date 11-10-09Checked By DAN Date 4/10/09

SHEET 1 OF 4

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: S. Woodham										
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)									
BORING NO.: B-3292		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT			0 HR.	ND								
GROUND SURFACE ELEV.: 80.5 ft (NAVD88)		NORTHING: 13,413,352		US ft (NAD83)		EASTING: 2,601,080 US ft (NAD83)		24 HR.	ND							
TOTAL DEPTH: 174.9 ft		DRILL MACHINE: CME 550 X		DRILLER: R. Landeros (MACTEC ATL)			HAMMER (ID): 140 lb. Auto (MEC 22)									
DATE STARTED: 3/5/09		COMPLETED: 3/6/09		CASING DEPTH: 9.0 ft			BITS USED: 2 15/16" Roller Cone Bit									
ELEV.	DEPTH	BLOW COUNT			BLOWS PER FOOT					SAMP.	LOG	SOIL AND ROCK DESCRIPTION				
(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	20	40	60	80	100			NO.			
80.5					Ground Surface							80.5	0.0			
80.5	0.0	13	10	11	● 21					SS-1		FAT CLAY with sand (CH), dark gray (10YR 4/1), very stiff, dry, little fine grained sand				
78.0	2.5	5	8	8	● 16					SS-2		78.0	2.5	FAT CLAY (CH), dark gray (10YR 4/1), very stiff, moist, few fine grained sand, no HCl reaction on clay, trace calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules		
75.5	5.0	6	9	8	● 17					SS-3		75.5	5.0	FAT CLAY with sand (CH), light gray (5Y 7/1), very stiff, dry, little fine grained sand, no HCl reaction on clay, few calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules		
73.0	7.5	5	8	9	● 17					SS-4		73.0	7.5	FAT CLAY (CH), light gray (5Y 7/2), very stiff, moist, few fine grained sand, no HCl reaction on clay, few calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules		
70.5	10.0	6	8	9	● 17					SS-5				FAT CLAY (CH), light gray (5Y 7/2), very stiff, moist, few fine grained sand, no HCl reaction on clay, few calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules		
68.0	12.5	5	8	9	● 17					SS-6				10.0 ft: and brownish yellow (10YR 6/6), little calcium carbonate nodules, strong HCl reaction		
														12.5 ft: few calcium carbonate nodules, strong HCl reaction		
61.0	19.5	4	5	8	● 13					SS-7				19.5 ft: stiff		
56.0	24.5	4	6	8	● 14					SS-8				24.5 ft: trace calcium carbonate nodules, strong HCl reaction		
51.0	29.5	5	8	8	● 16					SS-9				51.0	29.5	FAT CLAY with sand (CH), light gray (5Y 7/2), very stiff, moist, little fine grained sand, no HCl reaction on clay, few calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules
46.0	34.5	7	10	14	● 24					SS-10				34.5 ft: and brownish yellow (10YR 6/6)		
41.0	39.5	5	5	9	● 14					SS-11			41.0	39.5	FAT CLAY (CH), light gray (5Y 7/2) and brownish yellow (10YR 6/6), stiff, moist, few fine grained sand, weak HCl reaction on clay, trace calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules, black staining	
36.0	44.5	3	5	7	● 12					SS-12			44.5 ft: weak HCl reaction, no calcium carbonate nodules observed			
31.0	49.5	5	6	9	● 15					SS-13			49.5 ft: no HCl reaction on clay, trace calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules			
26.0	54.5	5	7	10	● 17					SS-14			26.0	54.5		

EXELON COL BORE VICTORIA PHASE III GPJ EXELON COL GDT 10/20/09



SHEET 2 OF 4

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: S. Woodham																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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BORING NO.: B-3292		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT		0 HR. ND																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
GROUND SURFACE ELEV.: 80.5 ft (NAVD88)		NORTHING: 13,413,352		US ft (NAD83)		EASTING: 2,601,080 US ft (NAD83)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
TOTAL DEPTH: 174.9 ft		DRILL MACHINE: CME 550 X		DRILLER: R. Landeros (MACTEC ATL)		HAMMER (ID): 140 lb. Auto (MEC 22)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
DATE STARTED: 3/5/09		COMPLETED: 3/6/09		CASING DEPTH: 9.0 ft		BITS USED: 2 15/16" Roller Cone Bit																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 10/20/09



SHEET 3 OF 4

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: S. Woodham							
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)						
BORING NO.: B-3292		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT			0 HR.	ND					
GROUND SURFACE ELEV.: 80.5 ft (NAVD88)		NORTHING: 13,413,352		US ft (NAD83)		EASTING: 2,601,080 US ft (NAD83)		24 HR.	ND				
TOTAL DEPTH: 174.9 ft		DRILL MACHINE: CME 550 X		DRILLER: R. Landeros (MACTEC ATL)			HAMMER (ID): 140 lb. Auto (MEC 22)						
DATE STARTED: 3/5/09		COMPLETED: 3/6/09		CASING DEPTH: 9.0 ft			BITS USED: 2 15/16" Roller Cone Bit						
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100			
-31.7					Continued from previous page								
-39.0	119.5	8	13	13									-32.5 POORLY GRADED SAND with silt (SP-SM), yellow (10YR 7/6), very dense, wet, fine to coarse grained, few fines, strong HCl reaction, few calcium carbonate nodules (continued) FAT CLAY (CH), light gray (5Y 7/2), very stiff, moist, few fine grained sand, no HCl reaction on clay, few calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules 113.0
-49.0	129.5	6	12	14									129.5 ft: strong HCl reaction
-59.0	139.5	6	18	24									-59.0 POORLY GRADED SAND with silt (SP-SM), very pale brown (10YR 7/4), dense, wet, medium grained, few fines, strong HCl reaction 139.5
-69.0	149.5	14	13	16									149.5 ft: very firm, moist, few fine grained sand, weak HCl reaction on sand, trace calcium carbonate nodules, strong HCl reaction on calcium carbonate nodules
-79.0	159.5	23	29	29									-79.0 SILTY SAND (SM), pale yellow (2.5Y 7/4), very dense, wet, medium grained, little fines, strong HCl reaction 159.5

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 10/20/09



SHEET 4 OF 4

BECHTEL NO.: 25352		MACTEC NO.: 6468-07-1777		COUNTY: Victoria, TX		GEOLOGIST: S. Woodham								
SITE DESCRIPTION: Exelon Texas COL Project - Supplemental Investigation, Including UHS							GROUND WATER (ft)							
BORING NO.: B-3292		DRILL METHOD: Mud Rotary		SAMPLE METHODS: SPT		0 HR. ND								
GROUND SURFACE ELEV.: 80.5 ft (NAVD88)		NORTHING: 13,413,352		US ft (NAD83)		EASTING: 2,601,080 US ft (NAD83)								
TOTAL DEPTH: 174.9 ft		DRILL MACHINE: CME 550 X		DRILLER: R. Landeros (MACTEC ATL)		HAMMER (ID): 140 lb. Auto (MEC 22)								
DATE STARTED: 3/5/09		COMPLETED: 3/6/09		CASING DEPTH: 9.0 ft		BITS USED: 2 15/16" Roller Cone Bit								
ELEV. (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	20	40	60	80	100				
-87.8					Continued from previous page									
-89.0	169.5	27	49	45						SS-30			SILTY SAND (SM), pale yellow (2.5Y 7/4), very dense, wet, medium grained, little fines, strong HCl reaction (continued)	
-93.0	173.5	40	65	50/0.4						SS-31			169.5 ft: very pale brown (10YR 8/2), medium to coarse grained	
													173.5 ft: trace carbonate nodules	
													Boring Terminated at Elevation -94.4 ft	

EXELON COL BORE VICTORIA PHASE III.GPJ EXELON COL.GDT 10/20/09

Test Pit Logs

Section Not Used

SPT Energy Reports



Engineering and constructing a better tomorrow

May 4, 2009

Memorandum to File

From: Jon Honeycutt, Staff Professional JNH

Reviewed By: Steve Kiser, Principal Professional SK

Subject: **Report of SPT Energy – MACTEC CME 55LC Track
Hammer Serial No. MEC-02 Automatic Hammer
WORK INSTRUCTION No. 311 (DCN: EXE-917)**
Exelon Texas COL Project – Supplemental Investigation, Including UHS
Victoria, Texas
MACTEC Project No. 6468-07-1777

Jonathan Honeycutt, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the above referenced drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on January 24, 2009, during drilling of Boring B3204 at the referenced site. The testing was performed by Jonathan Honeycutt from approximately 12:24 PM to 4:08 PM (ET) under cloudy skies with a temperature of about 60 degrees Fahrenheit. The boring was drilled with personnel and equipment from the MACTEC Raleigh office. The drilling equipment consisted of a CME 55LC model track-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of NW-J-sized drilling rods and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the boring. The drill rig operator during sampling was Mr. David White. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. K990 and K1050) and strain gages (Serial Nos. NW#146/1 and NW#146/2). A steel drill rod, 2-feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert had a cross-sectional area of approximately 1.43 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25 inches, respectively. The recommended operation rate of the hammer is not known. Due to the closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

16 Pages Total

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Calibration Records

The calibration records for all the above are filed in DCN EXE-918.

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV

F(t) = Calculated force at time t

V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDILOT tables and are also shown graphically in the PDILOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction. This may result in more or less blows evaluated for ETR than what is shown on the boring logs.
- The average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 265 foot-pounds to 290 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 76% to 83% of the theoretical energy (350 foot-pounds) of the SPT hammer.
- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) was 281.2 foot-pounds, with an average ETR of 80.3%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN EXE-917 – 1 Page
Page 6 Record of SPT Energy Measurement – 1 Page
Pages 7 – 16 PDILOT Output – 10 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
 Exelon Texas COL Project - Supplemental Investigation, Including UHS
 Victoria, Texas
 MACTEC Project No. 6468-07-1777

Automatic Hammer Serial Number and Rig Model	Rig Owner	Rig Operator	Boring No. Tested	Date Tested	Drill Rod Size	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs) ^a	Energy Transfer Ratio (%) ^b (Average ETR)
MEC-02 (CME 55 LC Track)	MACTEC Raleigh	David White	B3204	1/24/2009	NW-J	39.1 - 40.6	6 - 8 - 10	25	285	81.4%
						44.1 - 45.6	8 - 11 - 14	34	284	81.1%
						49.1 - 50.6	7 - 11 - 13	32	290	82.9%
						54.1 - 55.6	10 - 11 - 13	34	265	75.7%
						64.1 - 65.6	7 - 9 - 10	27	284	81.1%
Average for Rig:							281.2	80.3%		

^aMeasured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy. This may result in more or less blows evaluated for ETR than what is shown on the boring logs.

EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).

^bEnergy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet).

The average EFV and ETR values may differ slightly and insignificantly from those in the PDILOT tables due to roundoff.

Prepared By: 	Date: 5/4/09	Checked By: 	Date: 5-4-09
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Work Instruction No. 311
Exelon COL Victoria Site
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1777

DCN 11/2/09

Issued To: Steve Kiser and Jonathan Honeycutt

Issued By: Daniel E. Atkinson

Rev. No. 0

Valid From: 11/12/09

Date: 11/12/09

To: 12/31/09

Task Description: Perform SPT Energy Measurements

Applicable Technical Procedures or Plans, or other reference:

1. Geotechnical Work Plan (current revision; available at Site Office), and
2. ASTM D 4633-05 (copy attached.).

Specific Instructions (note attachments where necessary): Perform energy measurements for each drill rig on site in accordance with ASTM D-4633-05. Consult with Site Manager as to schedule for performing the measurements. Hammer weights have been checked by site personnel, and records will be available on site. All rigs are using automatic hammer systems. Confirm that automatic hammer system is being operated within manufacturer's recommendations or in a typical operating fashion as observed from watching one or two SPT measurements prior to measuring energy. Check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Manager. See Site Manager for current boring logs of holes drilled and use these to plan most effective field measurement program. Submit copies of calibration records for equipment to Project Principal for review prior to beginning work on site.

Special Instructions (note attachments where necessary): Confirm with Site Manager that approval of equipment calibration records have been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, contact Site Manager or Project Principal immediately.

Report Format: Prepare standard report in accordance with ASTM D 4633 requirements.

Specific Quality Assurance Procedures Applicable: QAP 20-1; QAP 25-1; QAP for Reporting Nuclear-Related Defects, or Noncompliances, per Federal Regulation 10CFR21 and Section 306 of the Energy Reorganization Act of 1974. Current revisions apply.

Hold Points or Witness Points: None

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)

Project Manager: _____

Project Principal Engineer: _____

Date: _____

Site Manager/Coordinator: [Signature]

Date: _____

Pages: 1 plus attachment

Date: 11/2/09

Attachments: ASTM D 4633-05

DCN: EXE917