						BOHING NO.		B-1	
						SHEET	2	OF	2
PROJECT	T 8	BAY PARK S	TP - PERIMET	TER FLOOD PF	ROTECTION	FILE NO.		12047	
OCATIO	N		BAY PARK,	NEW YORK		SURFACE E	LEV.		3.2
BORING L	OCATION	ı s		OCATION PLA	N	DATUM		NAVD 8	8
ORING E YPE OF B RUCK KID ARGE OTHER	EQUIPMEN BORING RIC VACUL D SIZE OF R	NT AND METH TYPE O DURING JM MECHA HYDRA OTHER	F FEED G CORING NICAL ULIC	DIAMETE	*	YE DEPTH, FT. FF DEPTH, FT. FF DEPTH, FT. FF	ROM ROM ROM	X NO T	0
SAMPLE				= 5.		-			
ORE BAR	_			AUGER (	ISED	X YE	S	NO	
ORE BIT					ID DIAMETER, IN.	_ X IL		HAND AUG	FR
RILL ROD	08			111 6 70	ID DIAMETER, IN.	:		TIMID AGG	
MILL NOD				CASING	HAMMER, LBS.	Δ\/	ERAGE	FALL, IN.	
					R HAMMER, LBS.			FALL, IN.	
				SAMIFEE	n HAWWEN, LDS.	^	LINAGE		
VATERI	EVEL OBS	SERVATIONS	IN BOREHOLE						
MILITE	LVLLODO	DEPTH OF							10-00-0
DATE	TIME	HOLE	CASING	WATER		CONDITIONS	OF OBS	ERVATION	
		1			NO I	WATER LEVEL			DF.
					1				
<u>IEZOME</u>	TER INST.	ALLED	YES	x no sk	ETCH SHOWN C	ON			
TANDPIPI	E:	TYPE		ID, IN.	LFN	GTH, FT.		TOP ELEV.	
ITAKE EL		TYPE		OD, IN.		GTH, FT.		TIP ELEV.	
ILTER:		MATERIAL		OD, IN.		3TH, FT.		BOT. ELEV.	
									-
AY QUAI	NTITIES								
	RY SAMPLI	BORING	LIN. FT.		NO. OF 3" SHEL	BY TUBE SAME	PLES		
		AMPLE BORING	LIN. FT.		NO. OF 3" UNDI				
	LING IN RO		LIN. FT.		OTHER: HAND				4
OTTE DITTE	LING IN M				STILL TAND	.ouli			
ORING C	CONTRAC	TOR			WARREN GEO	BGE INC			
RILLER	JOHNIAU		ILBERT CANEL	0	HELPERS	nac, no.			
		G				MOVED TO BO	ABING	R-12A	
EMARKS		ED			BACKFILLED &				07.12
	T ENGINE			ATRICK DONALI		DA			07-13
Delivery of the control of the contr				J. MOSS	_ TYPING CHEC	N	CHERYL J. MOSS		
ARCE Form BS	CE Form BS-1						BOR	ING NO.	B-12

# MUESER RUTLEDGE CONSULTING ENGINEERS BORING LOG

PROJECT: LOCATION:

**BAY PARK STP - PERIMETER FLOOD PROTECTION** 

BAY PARK, NEW YORK

BORING NO. B-12A

SHEET 1 OF 2

FILE NO. 12047

SURFACE ELEV. 8.1

**RES. ENGR. PATRICK DONALDSON** 

						HES	. ENGR.	PATRICK DONALDSON
DAILY		SAME	PLE				CASING	
PROGRESS	NO.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH		REMARKS
11:30				For descriptions from 0' to 4', see boring			DRILLED	Offset from Boring
10-07-13				B-12.			AHEAD	B-12.
Monday							4"	
Partly Cloudy								
70°F	1HA	4.0	HAND	Brown fine to medium sand, some silt, trace		5	+	
11:40		6.0	AUGER	gravel, organic silty clay pockets (SM)	F			
10:30	2D	6.0	3-3	Light brown fine to medium sand, trace silt,	_ F			
10-17-13		8.0	4-4	coarse sand, gravel (SP)				
Thursday	3D	8.0	6-6	Light brown fine to medium sand, trace gravel,				
Sunny		10.0	7-8	silt, coarse sand (SP)		10		
70°F	4D	10.0	8-13	Do 3D (SP-SM)				
		12.0	20-18			12		
	5D	12.0	5-6	Gray fine to coarse sand, some clay, gravel				
		14.0	5-8	(SC)				
	6D	14.0	5-5	Gray & brown fine to medium sand, trace clay,		15		
l		16.0	5-8	gravel, coarse sand (SP-SC)				
	7D	16.0	5-6	Gray brown fine to medium sand, trace gravel,				
		18.0	9-11	silt, coarse sand (SP)				
A A	8D	18.0	12-12	Gray brown fine to medium sand, trace gravel,				
		20.0	11-10	silt, coarse sand (SP)		20		
	9D	20.0	5-8	Tan & brown fine to medium sand, trace silt				
		22.0	10-17	(SP)				
	10D	22.0	16-19	Do 9D (SP-SM)	1			
		24.0	16-18	Joos (c. c)				
	11D	24.0	8-10	Gray fine to medium sand, trace silt, gravel		25		
	110	26.0	13-19	(SP-SM)				
	12D	26.0	11-11	Gray fine to medium sand, trace silt (SP-SM)				
	120	28.0	15-14	Gray line to mediam sand, trace sit (or own)				
	13D	28.0	10-12	Tan fine to medium sand, trace silt, coarse				
	100	30.0	16-17	sand, gravel (SP)		30		
	14D	30.0	12-17	Tan fine to medium sand, trace gravel, silt		30		
	טדו	32.0	19-26	(SP-SM)	S			
	15D	32.0	4-7	Tan fine to medium sand, trace silt (SP-SM)				
	130	34.0	8-15	Tair line to medium sand, trace sit (or -own)				
	16D	34.0	11-13	Tan fine to medium sand, trace gravel, silt		35		
	100	36.0	13-18	(SP-SM)		33		
	17D	36.0	7-7	Tan fine to coarse sand, trace gravel, silt				
	170	38.0	8-10	(SP)	i i			
	18D	38.0	9-17	Tan & light brown fine to medium sand, trace				
	100	40.0	17-20	gravel, silt, gray silty clay seams (SP-SM)	1	40		
	19D	40.0	9-12	Tan fine to medium sand, trace gravel, silt		70		
1	190	42.0	14-22	(SP-SM)				
-	20D	42.0	18-24	Tan fine to medium sand, some gravel, trace				
	200	44.0	36-45	silt (SP-SM)				
	210					45		
	21D	44.0	21-32	Tan fine to medium sand, trace gravel, silt		40		
	220	45.9	53-50/5"	(SP-SM)				
-	22D	46.0	47-50/4"	Light brown fine to medium sand, trace silt				
-	00D	46.8	24.00	(SP-SM)				
13:30	23D	48.0	34-66	Light brown fine to medium sand, some gravel,		40.2		End of Boring at 40 0
		49.3	50/4"	trace silt (SP-SM)		49.3		End of Boring at 49.3'.

						BORING I	NO.	B-12	2 <b>A</b>
						SHEET	2	OF	2
PROJECT		BAY PARK STI			OTECTION	FILE NO.		12047	
LOCATIO			BAY PARK, NI			SURFACE	E ELEV.		8.1
BORING	LOCATION	N SE	BORING LO	CATION PLA	V	DATUM		NAVD 8	8
BORING I	EQUIPMEN	NT AND METHO		ZING BOREHO	<u>DLE</u>				
		TYPE OF I					1		
	BORING RIC			CASING		Lancard Control	YES	NO	
TRUCK	MOBILE			DIA., IN.	4	_DEPTH, FT			O 5
SKID		HYDRAUL	ic	DIA., IN.		DEPTH, FT			о
BARGE		OTHER		DIA., IN.		DEPTH, FT	. FROM		О
OTHER									
						-	1		
	D SIZE OF				MUD USED		YES	NO	
D-SAMPLE		D. SPLIT SPOON			R OF ROTARY BI	T, IN.		3-7/8	
U-SAMPLE				TYPE OF	DRILLING MUD			EZ-MUD	
S-SAMPLE							1		
CORE BAF				AUGER U		X	YES	NO	
CORE BIT			7.00	TYPE AN	D DIAMETER, IN.			HAND AUG	ER
DRILL RO	os wwj								
					HAMMER, LBS.	-		FALL, IN.	
					R HAMMER, LBS.		AVEHAGE	FALL, IN.	30
WATERL	בעבו ספס	SERVATIONS IN	DODELIOLE	-03ED 8/	AFETY SAMPLER	MAMMEH.			
WAICHL	EVELOBS	DEPTH OF		DEDTUTO					
DATE	TIME	HOLE	DEPTH OF CASING	DEPTH TO WATER		CONDITIO	NS OF OR	SERVATION	
	1		57.51.13	777.7.2.1	NO I			RVATIONS MA	DF.
-								-	
	1			l.	V 1.5000				
PIEZOME	TER INST	ALLED	YES X	NO SKE	ETCH SHOWN C	N			
				,					
STANDPIP	E:	TYPE		ID, IN.	LENG	GTH, FT.		TOP ELEV.	
INTAKE EL	EMENT:	TYPE		OD, IN.	LENG	GTH, FT.		TIP ELEV.	
FILTER:		MATERIAL		OD, IN.	LENG	GTH, FT.		BOT. ELEV.	
								_	
PAY QUA	<u>NTITIES</u>								
3.5" DIA. D	RY SAMPLE	E BORING	LIN. FT.	2	NO. OF 3" SHEL	BY TUBE SA	AMPLES		
3.5" DIA. COI	NTINUOUS S	AMPLE BORING	LIN. FT.	39.3	NO. OF 3" UNDIS	STURBED S	AMPLES		
CORE DRII	LLING IN RO	OCK	LIN. FT.		OTHER: HAND A	NUGER			2
BORING (	CONTRAC	TOR			WARREN GEO	RGE, INC.			
DRILLER		LC	UIS RAMOS		HELPERS		BENAC	EO ALBANE	Z
REMARKS	S		BORE	OLE TREMIE	GROUTED UPO	N COMPLE	TION.		
RESIDEN	T ENGINE	ER	PAT	RICK DONALD	SON		DATE	10-	17-13
CLASSIFI	CATION C	HECK:	CHERYL J.	MOSS	TYPING CHEC	K:	СН	ERYL J. MOS	SS
MRCE Form BS	S-1	Access Access				· · · · · · · · · · · · · · · · · · ·	BOF	RING NO.	B-12A

# MUESER RUTLEDGE CONSULTING ENGINEERS BORING LOG

PROJECT: LOCATION:

BAY PARK STP - PERIMETER FLOOD PROTECTION

BAY PARK, NEW YORK

BORING NO. B-13P

SHEET 1 OF 4

FILE NO. 12047

SURFACE ELEV. 8.8

**RES. ENGR. PATRICK DONALDSON** 

DAILV		SAM			CASINO			THE TOTAL BOTH LEBOON
PROGRESS	NO.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	BLOWS	REMARKS
12:45	1HA	0.0	HAND	Brown fine to medium sand, some silt, trace	JIIIAIA	DCI III	DRILLED	
10-07-13	-111/5	2.0	AUGER	gravel, trace coarse sand, vegetation (SM)		-	AHEAD	
Monday	2HA	2.0	HAND	Brown fine to medium sand, some gravel, trace			4"	
Partly Cloudy		4.0	AUGER	silt, coarse sand (SP-SM)			<u> </u>	
70°F	ЗНА	4.0	HAND	Brown fine to medium sand, some gravel, silt		5		
13:00	SIIA	6.0	AUGER	(SM)		3		
	4D	6.0	13-13	Brown fine to coarse sand, some gravel, trace	_			Filter fabric found in
13:00 10-17-13	40	8.0	14-13	silt (SP-SM)	F	-		Sample 4D.
	ED			Black & brown fine to medium sand, some				Sample 4D.
Thursday	5D	8.0	13-14			40		
Sunny	25	10.0	17-18	gravel, trace silt (SP-SM)		10		
70°F	6D	10.0	14-13	Brown fine to medium sand, trace gravel, silt,			*	
		12.0	12-10	coarse sand (SP-SM)				
						13.5		
						15		
	7D	15.0	8-11	Gray fine to medium sand, trace gravel, silt				
		17.0	12-14	coarse sand (SP)				
						20		
i	8D	20.0	14-20	Do 7D (SP-SM)				
		22.0	21-24					
1								
						25		
l i	9D	25.0	16-18	Tan & light brown fine sand, trace silt, medium				
1		27.0	19-21	sand (SP-SM)				
1								
						30		
1	10D	30.0	28-41	Do 9D (SP-SM)		30		
44.45	100	31.8	59-50/4"	DO 9D (SF -SIM)				
14:45		31.0	39-30/4		S			
07:45					-			
10-18-13						25		
Friday	445		40.00			35		
Sunny	11D	35.0	13-28	Tan fine to medium sand, some gravel, trace				
70°F		37.0	33-26	silt, silty clay seams (SP-SM)				
-								
						40	4	
	12D	40.0	26-33	Light brown medium to fine sand, trace coarse				
		41.8	44-50/4"	sand, silt, gravel (SP)				
						45		
	13D	45.0	18-30	Light brown fine to medium sand, trace silt,				
		47.0	50-49	gravel (SP-SM)				
a second						50		
10:00	14D	50.0	38-100/6"	Do 13D (SP-SM)		51		End of Boring at 51'.
		51.0		, ,				•
				I and the second				

BORING NO. B-13P

# Mueser Rutledge Consulting Engineers 14 Penn Plaza - 225 West 34th Street

New York, NY 10122

T: 917 339-9300 F: 917 339-9400

www.mrce.com

PIEZOMETER RECORD

PIEZOMETER OR BORING NO. 8-13P

SHEET 2 OF 4

FILE NO. 12047

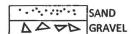
INSTALLATION DATE 10/18/13

RES ENGR. PED

PROJECT: Bay Park STP
LOCATION: East Rockaway, Ny
PIEZOMETER LOCATION:

Ш	SEE	SKET	ГСН	ON	BACK

STRATA	PIEZOMETER INSTALLATION	DEPTH (FT)		PIEZO	OMETER TYPE	Screened	PVC
GROUND SURFACE ELEV. 88	DETAILS	0.3°			depth t dep diameter, in =	, ft = NDPIPE/RISER on of rim, ft =	10.3 10 = L 0.17 = 2R
			READIN	IG TIME	DEPTH – RIM TO WATER	ELEVATION OF WATER	REMARKS
	7 /		10/18	1825	12.2'	-3.7	
n .	9.		10/21	0735	12.2'	~3.7 ~3.5	
	· ' _ ' .	10.3	10/21	0715	12.0'	-2.5	
			10/22	1435	12.2'	-2.7	
	10 1 = 10 m		10/23	6715	12.35'	-3.9	
			10/23	1240	12.2'		PEFORE FUT
-	: : =		11/9	1005	12.75'	-4.3	
			11/16	1105	14.8	-6.3 -6.8	
	$i_{i_1} = i_{i_1}$		11/22	1438 1750	15.3 15.6	-7.1	
			12/1	1035	13.0	-4.5	
			12/7	1020	15.25	-6.8	
	ے الطاب ایا	20.3					
	A 12 1 1 8						
					- 1000000		
							711111111111





GROUND SURFACE ELEV. 8.8

PIEZOMETER NO. B- 13 P



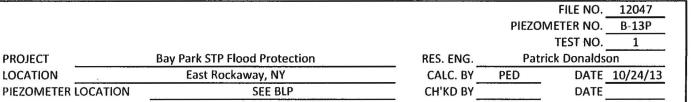
**PROJECT** 

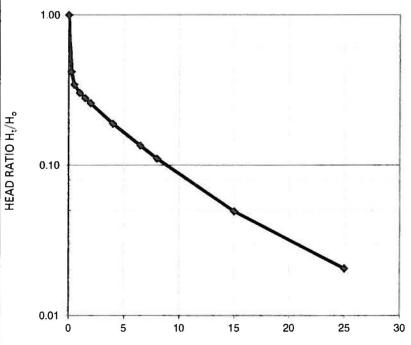
LOCATION

## **Mueser Rutledge Consulting Engineers** 14 Penn Plaza - West 34th Street New York, NY 10122

## **VARIABLE HEAD PERMEABILITY TEST**

### SHEET 3 OF 4





#### **INTAKE POINT** DEPTH TO BOTTOM, FT= 20.3 DEPTH TO TOP, FT= 10.3 LENGTH, FT= 10 DIAMETER, IN= RADIUS, FT= 0.083

STANDPIPE / RISER DIAMETER, IN= RADIUS, FT= **DEPTH TOP OF** CASING, FT= 0.3

**BOREHOLE** DEPTH OF BOREHOLE, FT= DIAMETER, IN= RADIUS, FT= 0.167

ELEPSED TIME, Δt, MIN.

Average Permeability: 7.77E-04 ft/min

3.95E-04 cm/sec

R	EADING TIM	E	TEST DEPTH	DEPTH	UNBALANCED	HEAD	PERME	ABILITY
DATE	CLOCK	Δt MIN.	RIM TO WATER ft.	RIM TO TIDE OR GWL, ft.	HEAD, H ft.	RATIO H <sub>I</sub> /H <sub>o</sub>	ft/min	cm/sec
10/23/2013	13:21		12.20	12.20	0.00		STATIC WA	TER LEVEL
	TIMER	0	0.00	12.20	12.20	1.00		William !
		0.25	7.10	12.20	5.10	0.42	4.96E-03	2.52E-03
		0.5	8.00	12.20	4.20	0.34	1.10E-03	5.61E-04
		1	8.50	12.20	3.70	0.30	3.60E-04	1.83E-04
		1.5	8.80	12.20	3.40	0.28	2.40E-04	1.22E-04
		2	9.05	12.20	3.15	0.26	2.17E-04	1.10E-04
		4	9.90	12.20	2.30	0.19	2.24E-04	1.14E-04
		6.5	10.55	12.20	1.65	0.14	1.89E-04	9.59E-05
		8	10.85	12.20	1.35	0.11	1.90E-04	9.66E-05
		15	11.60	12.20	0.60	0.05	1.65E-04	8.37E-05
10/23/2013		25	11.95	12.20	0.25	0.02	1.24E-04	6.32E-05
	7							
DEAAARKS								

REMARKS

PIEZOMETER NO. B-13P

									BORING	NO.	B-1	3P		
									SHEET	4	OF	4		
PROJEC1		BAY F	PARK ST			FLOOD PR	OTECTIO	NC	FILE NO.		12047	7		
LOCATIO				BAY PAR					SURFACI	E ELEV.		8.8		
BORING I	LOCATIO	N	SE	E BORING	LOCA	ATION PLAI	N		DATUM		NAVD	88		
BORING E	EQUIPME	NT AN	Name and the same		BILIZI	NG BOREHO	<u>DLE</u>							
		_	TYPE OF							1				
TYPE OF E			DURING			CASING				YES	NO			
TRUCK	DIETRICI	H 120	MECHAN			DIA., IN.	4	2	DEPTH, FT			TO 11		
SKID			HYDRAU	LIC		DIA., IN.			_DEPTH, F1			то		
BARGE			OTHER			DIA., IN.			DEPTH, FT	T. FROM		ТО		
OTHER			_											
TV0= 441		_								7				
TYPE AND							MUD USE			YES	NO			
D-SAMPLE		D. SP	LIT SPOOI	V			R OF ROTA		T, IN.		3-7/8			
U-SAMPLE						TYPE OF	DRILLING	MUD			EZ-MUI	D		
S-SAMPLE	-									1				
CORE BAR	REL					AUGER U			X	YES	NO			
CORE BIT	_					TYPE AN	D DIAMETE	ER, IN.			HAND AU	GER		
DRILL ROD	S NWJ										2 2 2 2			
							HAMMER,		140		E FALL, IN.	30		
							R HAMMER		140	AVERAGE	E FALL, IN.	30		
WATER	EVEL 00				_	*USED D	MAH TUNC	MER.						
WAIEHL	EAFT ORS	41111111111111		N BOREHOL										
DATE	TIME		EPTH OF HOLE	DEPTH C		DEPTH TO WATER			CONDITIO	NC OF OR	CEDVATION			
DATE	TIVIE	+	HOLE	CASINO	3	WATER	FER CONDITIONS OF OBSERVATION  NO WATER LEVEL OBSERVATIONS MADE.							
				+	-		-	110	WAICHEEV	LL OBSET	TVATIONS IVI	NUC.		
				-										
					-			-						
	F	1						-	A1					
		-												
PIEZOME	TER INST	AII F	) X	YES	N	o ski	ETCH SHO	אאו כ	M	SE	E SHEET NO	n 2		
TILLOWIL	I LITTINO I		2	_1.C0		o on		) V I V C		- OL	CONCENT	J. 2		
STANDPIPI	Ę.	TYPE	=	PVC		ID, IN.	2	LENG	GTH, FT.	10	TOP ELEV.	+8.5		
INTAKE EL		TYPE		SCREENED	PVC	OD, IN.	2-3/8		GTH, FT.	10	TIP ELEV.	-11.8		
FILTER:	CIVILIVI.		- ERIAL	CLEAN SA		OD, IN.	4		GTH, FT.	16	BOT. ELEV.			
1121211		WALL		OLLANO		OD, IIV.			۵ ، ۱ ، ۱ ، ۱ .	10		-11.0		
PAY QUAI	VITITIES													
3.5" DIA. DI		E ROR	ING	LIN. FT.		15	NO OF 3	" CHEI	BY TUBE SA	AMDI ES				
3.5" DIA. CON				LIN. FT.					STURBED S					
CORE DRIL			DOTTING	LIN. FT.			OTHER:			AWII LLO		6		
OOTIL DITIL	LING IN	JOIN		LIN. FT.			OTTICIT.	יירואט ד	NOGEN			0		
BORING C	CONTRAC	TOD					WADDE	N GEO	RGE, INC.					
DRILLER	ONTIAO	1011		AVE OSUC	ч		HELPER		rial, ino.		RGRANT			
REMARKS	-			74 L 0300	-	DIEZON	METER INS		FD	Jr	CHAN			
		FR			PATDI	CK DONALE		) I ALL		DATE	10	-18-13		
RESIDENT ENGINEER PATE CLASSIFICATION CHECK: CHERYL J. M										10-18-13 CHERYL J. MOSS				
					L 0. W	000	THING OFFICIAL				BORING NO. B-13P			
MRCE Form BS	-1									DUI	TING NO.	ח-וטר		

# MUESER RUTLEDGE CONSULTING ENGINEERS BORING LOG

PROJECT: LOCATION:

BAY PARK STP - PERIMETER FLOOD PROTECTION

BAY PARK, NEW YORK

BORING NO. B-14

SHEET 1 OF 2

FILE NO. 12047

SURFACE ELEV. 9.9

RES. ENGR. PATRICK DONALDSON

		0.4.4			1	1120		PATRICK DUNALDSON
DAILY		SAM					CASING	N THE PROPERTY OF ALL PROPERTY OF
PROGRESS	NO.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	BLOWS	REMARKS
13:10	1HA	0.0	HAND	Brown fine to medium sand, trace silt, gravel,			DRILLED	
10-07-13	0114	2.0	AUGER	coarse sand, concrete, vegetation (SP-SM)			AHEAD	
Monday	2HA	2.0	HAND	Tan brown fine to medium sand, trace gravel,	F	,	4"	
Partly Cloudy		4.0	AUGER	silt (SP-SM)	•			
70°F	ЗНА	4.0	HAND	Tan brown gravelly fine to coarse sand, trace		5		
13:35	- 45	6.0	AUGER	silt (SP)				
09:00	4D	6.0	15-24	Top 8": Brn f-m sand, sm gravel, silt (SM)		6.7		*
10-18-13		8.0	44-49	Bot 10": Blk silty f-m sand, tr c sand, gvl (SM)		-		
Friday	5D	8.0	42-49	Brown fine to medium sand, trace gravel, silt				
Sunny		10.0	31-21	(SP-SM)	l.	10		
65°F	6D	10.0	5-9	Gray fine to coarse sand, some gravel, silt,				
		12.0	8-7	trace vegetation (SM)				50 TOOR - 50 TOO
	7D	12.0	8-14	Brown fine to medium sand, some silt, trace				REC=4"
		14.0	11-14	coarse sand, gravel (SM)				
	8D	14.0	7-8	Tan brown fine to medium sand, trace silt		15		
		16.0	10-9	(SP-SM)				
	9D	16.0	12-20	Brown & light brown fine to medium sand,				
		18.0	18-18	trace gravel, silt (SP-SM)				
	10D	18.0	9-13	Light brown fine to medium sand, trace coarse				
		20.0	12-19	sand, gravel, silt (SP)		20		
	11D	20.0	14-25	Light brown fine to medium sand, trace gravel,	S			
		22.0	27-29	silt (SP-SM)				
	12D	22.0	12-23	Light brown fine to medium sand, trace silt				
		24.0	28-32	(SP-SM)				
	13D	24.0	18-22	Light brown fine to medium sand, trace gravel,		25		
		26.0	24-21	silt (SP-SM)				
	14D	26.0	8-12	Light brown fine sand, trace medium sand,				
		28.0	15-16	silt (SP)				
	15D	28.0	10-15	Light brown fine sand, trace silt, medium sand				
		30.0	12-18	(SP)		30		
	16D	30.0	24-27	Light brown & brown fine to medium sand,				
		32.0	23-48	some gravel, trace silt (SP-SM)				
	17D	32.0	28-26	Brown fine to medium sand, trace gravel, silt				
		34.0	19-20	(SP-SM)		34		**Stratum C from 34'
	18D	34.0	10-14	Top 6": Gray silty clay (CL)	**	34.5		to 34.5'.
Ì		36.0	9-12	Bot 12": Or brn f-m sa, sm si, tr cl pkts, c sa (SM)				18D Top: WC=31
	19D	36.0	17-27	Top 4": Orange brn f-m sand, trace silt (SP-SM)				
		37.9	37-50/5"	Bot 7": Gray m-f sand, trace silt (SP-SM)				
	20D	38.0	20-36	Gray fine to medium sand, trace silt (SP-SM)				
		40.0	21-31	,		40		
	21D	40.0	26-34	Do 20D (SP-SM)				
		42.0	32-40	(5. 5)	_			
	22D	42.0	10-26	Do 20D, trace gravel (SP-SM)	S			
		43.8	40-50/4"	3 - 2 - 3 , was a graver (c. c)				
	23D	44.0	22-35	Gray & orange brown fine to coarse sand, some		45		
		45.8	53-50/3"	gravel, trace silt (SP-SM)				WC=Water Content
	24D	46.0	10-35	Orange brown fine to coarse sand, some				in percent of dry
	2.10	47.3	50/3"	gravel, trace silt (SP-SM)				weight.
	25D	48.0	29-51	Do 24D (SP-SM)				morgrit.
14:00	200	49.3	50/4"	55215 (61-614)		49.3		End of Boring at 49.3'.
		-,5.5	50/4			79.0		Lind of bonning at 45.0.
			10.5 70 8					

							BORING N	10.	B-14	
							SHEET	2	OF	2
PROJEC	T [	BAY PARK S	STP - PERIN	<b>IETER</b>	FLOOD PR	OTECTION	FILE NO.		12047	
LOCATIO	ON		BAY PAF	RK, NE	W YORK		SURFACE	ELEV.	9.9	9
<b>BORING</b>	LOCATION	1 5	SEE BORING	G LOC	ATION PLAI	V	DATUM		NAVD 88	
							_			
<b>BORING</b>	<b>EQUIPMEN</b>	NT AND MET	HODS OF ST	ABILIZI	NG BOREHO	<u>DLE</u>				
		TYPE C	F FEED							
TYPE OF	BORING RIC	DURING	GCORING		CASING I	JSED	X	YES	NO	
TRUCK	MOBILE	B-58 MECHA	NICAL		DIA., IN.	4	DEPTH, FT.	FROM	0 TO	4
SKID		HYDRA	ULIC		DIA., IN.	M. C. Charles	DEPTH, FT.	FROM	то	
BARGE		OTHER			DIA., IN.		DEPTH, FT.	FROM	ТО	
OTHER									,	
TYPE AN	ID SIZE OF	:			DRILLING	MUD USED	X	YES	NO	
D-SAMPLE	ER 2" O.	D. SPLIT SPO	ON		DIAMETE	R OF ROTARY BI	T, IN.		3-7/8	
U-SAMPLE	ER				TYPE OF	DRILLING MUD			EZ-MUD	
S-SAMPLE	ER									
CORE BAI	RREL				AUGER U	SED	X	YES	NO	
CORE BIT					TYPE AN	D DIAMETER, IN.			HAND AUGEF	}
DRILL RO	DS NWJ									
					*CASING	HAMMER, LBS.	140	AVERAGE	FALL, IN.	30
					*SAMPLE	R HAMMER, LBS.	140	AVERAGE	FALL, IN.	30
					*USED SA	AFETY (SAMPLER	& AUTOMA	TIC (CASI	NG) HAMMERS.	
WATERL	LEVEL OBS	ERVATIONS	IN BOREHO	<u>LE</u>						
		DEPTH OF	DEPTH	OF	DEPTH TO					
DATE	TIME	HOLE	CASIN	IG	WATER		CONDITION	IS OF OBS	SERVATION	
						NO I	WATER LEVE	EL OBSEF	IVATIONS MADE	
										-
					35.3		73. 8			
PIEZOME	ETER INST	ALLED	YES	XN	io ske	ETCH SHOWN C	)N			
STANDPIP		TYPE			ID, IN.		GTH, FT.		TOP ELEV.	
INTAKE EL	LEMENT:	TYPE			OD, IN.		STH, FT.		TIP ELEV.	
FILTER:		MATERIAL_			OD, IN.	LENC	ath, ft.		BOT. ELEV.	
DAN/ 0111	. LITIT: = 0									
PAY QUA					100					
	ORY SAMPLE		LIN. FT.		4	NO. OF 3" SHEL			<u> </u>	
		AMPLE BORING	LIN. FT.	3	9.3	NO. OF 3" UNDIS	STURBED SA	MPLES		
CORE DRI	ILLING IN RO	OCK	LIN. FT.			OTHER: HAND A	NUGER		6	
#-7#700 NINGSON	AND APPEAR OF THE STATE OF STATES	700107E-11								
	CONTRAC	90.50.41				WARREN GEO	RGE, INC.			
DRILLER	-	C	AESAR MOR			HELPERS			SAMMY	
REMARK			В	OREHO	DLE TREMIE	GROUTED UPO	N COMPLE	TION.		
	IT ENGINE				ICK DONALD	SON		DATE	10-18	-13
CLASSIFI	ICATION C	HECK:	CHER	YL J. M	OSS	TYPING CHEC	K:	CH	ERYL J. MOSS	
MRCE Form B	S-1							BOF	ING NO.	B-14

# MUESER RUTLEDGE CONSULTING ENGINEERS BORING LOG

PROJECT: LOCATION:

BAY PARK STP - PERIMETER FLOOD PROTECTION

BAY PARK, NEW YORK

BORING NO. B-15

SHEET 1 OF 2

FILE NO. 12047

SURFACE ELEV. 4.9

**RES. ENGR. PATRICK DONALDSON** 

		CANA		T	1	11120		PATRICK DONALDSON
DAILY	NO	SAMF DEPTH	-	CAMPLE DESCRIPTION	CTDATA	DEDTU	CASING BLOWS	01 102 - 11 001 1 100 1 1 100 0
PROGRESS 14:05	NO. 1HA	0.0	BLOWS/6" HAND	SAMPLE DESCRIPTION  Brown fine to coarse sand, some gravel, trace	SIRAIA	DEPIR	DRILLED	REMARKS
	ITA	2.0	AUGER	100 mg			AHEAD	
10-07-13	2HA	2.0	HAND	silt (SP) Tan brown gravelly fine to coarse sand, trace			4"	
Monday		4.0	AUGER				1	
Partly Cloudy			HAND	silt (SP)	F	5		
70°F	ЗНА	4.0		Dark brown fine sandy organic silt, trace		5		
14:20	40	6.0	AUGER	gravel (OL) Gray fine to medium sand, some gravel, silt,		-		חבר מיי
12:00	4D	6.0	4-2			-		REC=2"
10-18-13		8.0	3-6	trace coarse sand (SM)		8		
Friday	5D	8.0	4-9	Light brown fine to medium sand, trace silt,		10		
Sunny	00	10.0	12-18	coarse sand, gravel (SP-SM)		10		
70°F	6D	10.0	5-4	Tan, dark brown & orange brown fine to medium				
		12.0	5-6	sand, trace silt, coarse sand (SP)				
						15		
	7D	15.0	6-10	Orange brown fine to medium sand, trace				
		17.0	11-16	silt (SP)				
						20		
	8D	20.0	12-15	Do 7D (SP-SM)				
		22.0	17-25					
					i			
i i						25		
	9D	25.0	10-22	Orange brown & tan fine to coarse sand, some				
		27.0	18-7	gravel, trace silt, silty clay seams (SP-SM)				
					S	30		
1	10D	30.0	7-11	Top 12": Gray fine to medium sand, some silt,				
-		32.0	18-24	trace clay, coarse sand (SM)				
				Bot 6": Orange brown fine to medium sand,		-		
				some silt, trace silty clay seams (SM)				
				Some sitt, trade sitty day scams (SW)		35		
1	11D	35.0	18-21	Tan & orange brown fine to medium sand, trace		- 00		
	110	37.0	21-23	silt (SP-SM)				The state of the s
		- 07.0	21-20	Sitt (Ci Civi)				
-								
						40		
	12D	40.0	62-50/4"	Orange brown fine to coarse sand, some		70		
1	120		62-50/4					
		40.8		gravel, trace silt (SP-SM)				
						45		
	400	45.0	FO FO/0"	0		45		
	13D	45.0	53-50/3"	Orange brown fine to medium sand, trace				
		45.8		gravel, silt (SP-SM)				
14:45						50		
	14D	50.0	74-50/2"	Orange brown fine to coarse sand, some		50.7		End of Boring at 50.7'.
		50.7		gravel, trace silt (SP-SM)				

								BORING	NO.	B-15	j
								SHEET	2	OF	2
PROJECT	Γ	BAY F	PARK S	TP - PERIN	NETER	R FLOOD PF	ROTECTION	FILE NO.		12047	
LOCATIO	N			BAY PAF	RK, NE	W YORK		SURFACI	E ELEV.	4	.9
<b>BORING</b>	LOCATIO	V	SI	EE BORIN	G LOC	CATION PLA	N	DATUM		NAVD 88	
BORING I	EQUIPME	NT AN	*		ABILIZ	ZING BOREHO	DLE				
TVD= 0= 0	200410 04	_	TYPE OF			0.40110			WE0		
	BORING RIC		2001-0000000000000000000000000000000000	CORING		CASING			YES	NO	
TRUCK	DIETRIC	H 120				DIA., IN.	4	DEPTH, FT		0TC	
SKID			HYDRAL	JLIC		DIA., IN.		DEPTH, FT			
BARGE			OTHER			DIA., IN.		DEPTH, F1	. FHOM	TC	,
OTHER											
TVDE ANI	ם כודב סב					DDILLING	MUDUCED	V	VEC	NO	
	D SIZE OF		LIT SPOC	\A.i			MUD USED	X X	YES	NO 3-7/8	
D-SAMPLE		D. 3P	LII SPOC	Ж			R OF ROTARY BIT DRILLING MUD	I, IIN.		EZ-MUD	
U-SAMPLE S-SAMPLE						TTPEOF	DHILLING MOD			EZ-1VIOD	
CORE BAF						AUGER L	ICED	V	YES	NO	
CORE BIT							D DIAMETER, IN.	^	123	HAND AUGE	:D
DRILL RO						HELAN	D DIANETEN, IN.			HAND AUGL	.11
Drille NOL	73 14443					*CASING	HAMMER, LBS.	140	AVERAGE	FALL IN	30
							R HAMMER, LBS.		AVERAGE		30
							ONUT HAMMER.	140	AVENAGE	TALL, IIV.	
WATERI	EVEL OR	SERV	ATIONS	IN BOREHO	) F	OGLD D	ONO I I IAMINIEI I.				
***************************************	LVLLOD		PTH OF	DEPTH		DEPTH TO					
DATE	TIME		HOLE	CASI		WATER		CONDITIO	NS OF OBS	SERVATION	
		Ì					NO V	NATER LEV	EL OBSER	VATIONS MAD	E.
								·			
<u>PIEZOME</u>	TER INST	ALLE	2	YES	X	NO SK	ETCH SHOWN C	N			
STANDPIP	E:	TYPE				ID, IN.	LENG	STH, FT.		TOP ELEV.	
INTAKE EL	EMENT:	TYPE				OD, IN.	LENG	3TH, FT.		TIP ELEV.	
FILTER:		MATI	ERIAL			OD, IN.	LENG	STH, FT.		BOT. ELEV.	
PAY QUA	<u>NTITIES</u>										
3.5" DIA. D	RY SAMPL	E BOR	ING	LIN. FT.		56.7	NO. OF 3" SHEL	BY TUBE SA	AMPLES		
3.5" DIA. CO	NTINUOUS S	AMPLE	BORING	LIN. FT.	*		NO. OF 3" UNDIS	STURBED S	AMPLES		
CORE DRI	LLING IN R	OCK		LIN. FT.			OTHER: HAND A	UGER		(	3
BORING (	CONTRAC	TOR					WARREN GEO	RGE, INC.			
DRILLER				DAVE OSU	СН		HELPERS		JR	GRANT	
REMARKS	S			E	OREH	OLE TREMIE	GROUTED UPO	N COMPLE	TION.		
RESIDEN	T ENGINE	ER			PAT	RICK DONALI	DSON		DATE	10-1	8-13
CLASSIFICATION CHECK:				CHEF	CHERYL J. MOSS TYPING CHECK				CHI	ERYL J. MOS	S
MRCE Form BS	S-1								BOF	RING NO.	B-15

# MUESER RUTLEDGE CONSULTING ENGINEERS BORING LOG

PROJECT: LOCATION:

**BAY PARK STP - PERIMETER FLOOD PROTECTION** 

BAY PARK, NEW YORK

BORING NO. B-16

SHEET 1 OF 2

FILE NO. 12047

SURFACE ELEV. 5.4

RES. ENGR. PATRICK DONALDSON

								PATRICK DONALDSO	
DAILY		SAME		CAMPLE DECORPTION	070474	DEDTI	CASING	DEMARKS	
PROGRESS	NO.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	SIHAIA	DEPTH	BLOWS	REMARKS	
14:35	1HA	0.0	HAND	Brown fine to medium sand, some gravel, silt,			DRILLED		
10-07-13	OLIA	2.0	AUGER	trace vegetation (SM)			AHEAD 4"		
Monday	2HA	2.0	HAND	Brown fine to coarse sand, some gravel, trace	F		4"		
Partly Cloudy		4.0	AUGER	silt (SW-SM)					
70°F	ЗНА	4.0	HAND	Gray & tan fine to coarse sand, some silt,		5 6			
14:55	40	6.0	AUGER	gravel (SM)		0	₩		
11:00	4D	6.0	4-6	Brown fine to coarse sand, trace gravel, silt					
10-21-13	- CD	8.0	7-8	(SP-SM)					
Monday	5D	8.0	5-9	Brown fine to coarse sand, trace gravel, silt		10			
Sunny	CD.	10.0	11-16	(SP)		10			
70°F	6D	10.0	6-13	Tan brown medium to fine sand, trace gravel,					
		12.0	14-16	coarse sand, silt (SP)					
	7D	12.0	8-13	Tan brown fine to medium sand, trace coarse					
		14.0	12-18	sand, silt, gravel (SP)					
	8D	14.0	8-12	Tan brown fine to medium sand, some silt,		15			
		16.0	13-12	trace gravel (SM)					
	9D	16.0	9-17	Tan brown fine to medium sand, trace silt,	S				
		18.0	21-22	coarse sand (SP)	3				
	10D	18.0	8-14	Tan brown fine to medium sand, trace silt (SP)					
		20.0	14-19			20			
	11D	20.0	10-20	Do 9D (SP-SM)					
		22.0	18-19						
	12D	22.0	10-15	Tan brown & gray fine to medium sand, trace					
		24.0	13-26	silt (SP-SM)					
	13D	24.0	14-19	Tan brown & gray fine to medium sand, trace		25			
		26.0	8-5	silt (SP-SM)					
	14D	26.0	11-6	Brown fine to coarse sand, trace silt, gravel					
		28.0	2-3	(SP)					
	15D	28.0	3-3	Top 7": Do 14D (SP-SM), Mid 8": Gray si cl (CL)	С	28.6			
		30.0	5-3	Bot 6": Gray f-m sand, sm silt, tr clay (SM)		29.3		15D Bot: WC=39	
	16D	30.0	17-27	Light brown fine to medium sand, trace silt					
		32.0	25-53	(SP-SM)					
	17D	32.0	36-45	Do 16D (SP-SM)					
		33.4	50/5"						
	18D	34.0	13-19	Light brown & tan fine to medium sand, trace		35			
		36.0	18-13	silt (SP-SM)					
	19D	36.0	16-41	Orange brown gravelly fine to medium sand,					
		37.8	45-50/4"	trace silt, coarse sand (SP-SM)					
	20D	38.0	28-45	Do 19D (SP-SM)	s				
		39.8	62-50/3"		3	40			
	21D	40.0	50-50/3"	Do 19D (SP-SM)					
		40.8							
	22D	42.0	46-50/3"	Tan gravelly fine to coarse sand, trace silt				REC=6"	
		42.8		(SP-SM)					
	23D	44.0	9-24	Tan fine to coarse sand, some gravel, trace		45		WC=Water Content	
Ī		46.0	46-70	silt (SP)				in percent of dry	
	24D	46.0	12-20	Do 22D (SP-SM)	5			weight.	
		48.0	23-37						
15:15	25D	48.0	30-60/5"	Do 22D (SP-SM)		48.9		End of Boring at 48.9'.	
		48.9		500		50			
Ì									
Ī									

								BORING	NO.	B-16	
								SHEET	2	OF	2
PROJECT	· E	BAY P	ARK ST	STP - PERIMETER FLOOD PROTECTION				FILE NO.		12047	
LOCATIO				BAY PARK, NEW YORK				SURFACI	.4		
BORING I	LOCATION	1	SE	E BORING	G LOC	CATION PLA	N	DATUM		NAVD 88	
BORING E	<u>EQUIPMEN</u>	IT ANI	O METHO	DS OF ST	ABILIZ	ING BOREHO	<u>DLE</u>				
			TYPE OF	FEED					7		
TYPE OF E	BORING RIG	ì	DURING (	CORING		CASING	USED	X	YES	NO	
TRUCK	MOBILE	B-58	MECHAN	CAL		DIA., IN.	4	DEPTH, F	Γ. FROM	0 TC	6
SKID			HYDRAUL	IC		DIA., IN.		DEPTH, F		TC	
BARGE			OTHER	***		DIA., IN.		DEPTH, F	r. From	TC	
OTHER	-										
								T	1		
	D SIZE OF						MUD USED		YES	NO	
D-SAMPLE		D. SPL	IT SPOOM	J			R OF ROTARY BI	T, IN.		3-7/8, 2-15/1	6
U-SAMPLE						TYPE OF	DRILLING MUD			EZ-MUD	
S-SAMPLE									1		
CORE BAR	REL					AUGER U		X	YES	NO	_
CORE BIT						TYPE AN	D DIAMETER, IN.			HAND AUGE	R
DRILL ROD	DS NWJ					40.400.10					
							HAMMER, LBS.	140	AVERAGE		30
							R HAMMER, LBS.	140	AVERAGE		30
WATERI	EVEL OBS	·ED\/A	TIONS IN	LBOBEHO	u =	.02ED 2	AFETY (SAMPLEF	i) & AUTONI	ATIC (CASII	NG) HAWWERS	
WAILHL	EVEL OBS	1	PTH OF	DEPTH		DEPTH TO					
DATE	TIME		HOLE	CASIN	1000	WATER		CONDITIO	NS OF OBS	SERVATION	
							NO			VATIONS MAD	E.
						40					
,											
<b>PIEZOME</b>	TER INSTA	ALLED		YES	X	NO SK	ETCH SHOWN C	ON			
STANDPIP	E:	TYPE				ID, IN.	LEN	GTH, FT.		TOP ELEV.	
INTAKE EL	EMENT:	TYPE	-			OD, IN.	LEN	GTH, FT.		TIP ELEV.	
FILTER:		MATE	RIAL			OD, IN.	LEN	GTH, FT.		BOT. ELEV.	
PAY QUAI	<u>NTITIES</u>										
3.5" DIA. DI	RY SAMPLE	BORI	NG	LIN. FT.		4	NO. OF 3" SHEL	BY TUBE SA	AMPLES		
3.5" DIA. CONTINUOUS SAMPLE BORING LIN. FT.					38.9	NO. OF 3" UND	DISTURBED SAMPLES				
CORE DRIL	LING IN RO	CK		LIN. FT.			OTHER: HAND	AUGER		6	
00 W	1.00										
BORING C	CONTRAC	TOR					WARREN GEO	PRGE, INC.			
DRILLER			CAE	SAR MOR			HELPERS			CDAVIDSON	
REMARKS				В			GROUTED UPC	N COMPLE			
RESIDEN						RICK DONALI			DATE	10-2	
CLASSIFIC	CATION C	HECK:		CHEF	YL J. I	MOSS	TYPING CHEC	K:		ERYL J. MOS	
MRCE Form BS	i-1								BOR	ING NO.	B-16

# MUESER RUTLEDGE CONSULTING ENGINEERS BORING LOG

PROJECT: LOCATION:

BAY PARK STP - PERIMETER FLOOD PROTECTION

BAY PARK, NEW YORK

BORING NO. B-17
SHEET 1 OF 2
FILE NO. 12047
SURFACE ELEV. 3.6

RES. ENGR. PATRICK DONALDSON

DAWY		SAME	01 =				CASING	PATRICK DONALDSON
PROGRESS	NO.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	BLOWS	REMARKS
07:25	1HA	0.0	HAND	Brown gravelly fine to coarse sand, some silt,	0.,		DRILLED	
10-08-13		2.0	AUGER	trace vegetation (SM)	_		AHEAD	
Tuesday	2HA	2.0	HAND	Brown fine to medium sand, some silt, trace	F		4"	
Clear		4.0	AUGER	gravel, concrete (SM)		4	i	
60°F	ЗНА	4.0	HAND	Tan brown fine to coarse sand, trace gravel,		5		
07:50	J	6.0	AUGER	silt (SP)				
09:45	4D	6.0	7-9	Light brown fine to coarse sand, trace gravel,				
10-22-13		8.0	13-13	silt (SP-SM)				
Tuesday	5D	8.0	13-13	Light brown fine to medium sand, trace gravel,				
Sunny		10.0	14-16	silt (SP-SM)		10		
65°F	6D	10.0	2-7	Light brown fine to coarse sand, trace gravel,				
001	- 00	12.0	11-12	silt (SP)				
	7D	15.0	8-9	Gray brown fine to medium sand, trace silt		15		
11:30 09:00	8D	20.0 22.0	9-8 14-19	Orange brown fine to medium sand, trace silt coarse sand (SP)		20		
10-23-13						- 05		
Wednesday	0.0	05.0	10.10	T 01 0 f		25		
Overcast	9D	25.0	19-10	Top 8": Orange brown fine to coarse sand,				
55°F		27.0	12-16	trace gravel, silt, silty clay seams (SP-SM)	1			
				Bot 8': Gray clayey fine to medium sand (SC)	S			
						30		
,	10D		Tan fine to medium sand, trace silt (SP-SM)					
		32.0	30-37					
					ļ			
						35		
	11D	35.0	15-16	Orange brown fine to coarse sandy gravel, trace				
		37.0	37-36	silt (GP-GM)				
						40		
	12D	40.0	32-34	Orange brown fine to medium sand, trace				
		41.7	50-50/2"	silt, gravel, coarse sand (SP-SM)				
						45		
Ī	13D	45.0	9-5	Tan fine sand, some silt (SM)				
ĺ		47.0	7-8					
						50		
Ī	14D	50.0	7-9	Top 12": Do 13D (SM)				
11:45		52.0	10-10	Bot 12": Tan f-m sand, sm silt, tr gravel (SM)		52		End of Boring at 52'.

BORING NO. B-17

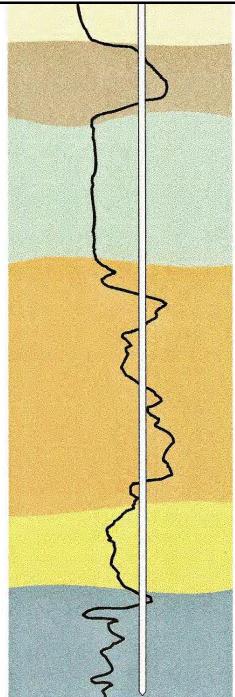
						BORING N		B-17	
						SHEET	2	OF	2
PROJECT	ΓΕ	BAY PARK ST	P - PERIMETE	R FLOOD PR	OTECTION	FILE NO.		12047	
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<b>BORING I</b>	LOCATION	I SE	E BORING LO	CATION PLAN	١	<b>DATUM</b>		NAVD 88	}
<b>BORING</b>	EQUIPMEN	NT AND METHO	DS OF STABILI	ZING BOREHO	<u>)LE</u>				
		TYPE OF	FEED						
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OTHER									
		and the second s							
TYPE ANI	D SIZE OF	:		DRILLING	MUD USED	X	YES	NO	
D-SAMPLE	R 2" O.	D. SPLIT SPOON	I	DIAMETE	R OF ROTARY BI			3-7/8	
U-SAMPLE	R			TYPE OF	DRILLING MUD			EZ-MUD	
S-SAMPLE	R					-			
CORE BAR				AUGER U	SED	X	YES	NO	
CORE BIT					D DIAMETER, IN.			HAND AUGE	:R
DRILL ROD	S NWJ				· · · · · · · · · · · · · · · · · ·	-			
				*CASING	HAMMER, LBS.	140	AVERAGE	FALL, IN.	30
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STANDPIP	F:	TYPE		ID, IN.	LENG	GTH, FT.		TOP ELEV.	
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,,_,_,,						J. 1. 1.		DO 1. ELEV.	
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# **APPENDIX B**

**CONETEC FIELD REPORT** 







Geotechnical and Environmental In Situ Testing Contractors

# ConeTec Field Report

Presentation of In Situ Test Results for:

Bay Park Sewage Treatment Plant Bay Park, New York

Presented to: ARCADIS

Date: October 21<sup>st</sup>, 2013

Presented by: ConeTec, Inc.

436 Commerce Lane

Unit C

West Berlin, NJ 08091

(856) 767-8600

### PRESENTATION OF IN SITU TESTING PROGRAM RESULTS

## Bay Park Sewage Treatment Plant Bay Park, New York

October 7<sup>th</sup>, 2013 through October 17<sup>th</sup>, 2013

Prepared for:

ARCADIS Long Island City, New York

> Prepared by: ConeTec Inc. West Berlin, NJ

October 21<sup>st</sup>, 2013

## TABLE OF CONTENTS

#### 1.0 INTRODUCTION

This report presents the results of a piezocone penetrometer testing (CPTU) program carried out at the Bay Park Sewage Treatment Plant located Bay Park, New York. The work was performed under subcontract to ARCADIS of Long Island City, New York. The CPTU program took place from October 7<sup>th</sup>, 2013 through October 17<sup>th</sup>, 2013.

A total of thirty nine soundings were completed at thirty nine different sounding locations. The CPT testing was performed to evaluate insitu geotechnical criteria of the soils.

CPT sounding locations were selected and numbered under the direction and supervision of Mueser personnel (Mr. Patrick Donaldson).

#### 2.0 FIELD EQUIPMENT AND PROCEDURES

#### 2.1 CONE PENETRATION TESTING

The cone penetrometer tests were carried out using an integrated electronic piezocone manufactured by ConeTec in Vancouver, Canada. The piezocone used was a compression model cone penetrometer with a 15 cm² tip and a 225 cm² friction sleeve. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.80. The piezocone dimensions and the operating procedure were in accordance with ASTM Standard D-5778-12. A diagram of the cone penetrometer used for this project is shown as Figure 1.

Pore pressure filter elements, made of porous plastic, were saturated under a vacuum using silicone as the saturating fluid. The pore pressure element was six millimeters thick and was located immediately behind the tip (the  $u_2$  location) for all soundings.

The cone was advanced using ConeTec's, unitized, 25-ton CPT truck rig. The following data were recorded onto magnetic media every five centimeters (approximately every two inches) as the cone was advanced into the ground:

- Tip Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u<sub>t</sub>)

Before each sounding a complete set of analog baseline readings are taken with a multimeter and compared with the digitized value on the computer screen. This provides a check on the analog to digital conversion board.

Evaluation of the analog baselines is key to consistent readings. The baseline data should be stable and should not wander excessively during the course of a sounding. Baseline data can be used to apply corrections to the cone data where necessary. For this project, the baseline shift from sounding to sounding was small, typically less than 0.1% of full scale, and no data corrections were applied.

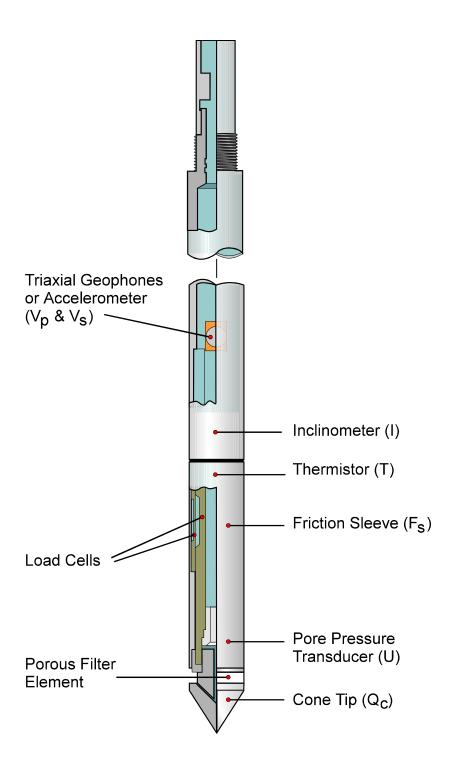


FIGURE 1 - TYPICAL CONE PENETROMETER

#### 2.2 PORE PRESSURE DISSIPATION TESTS

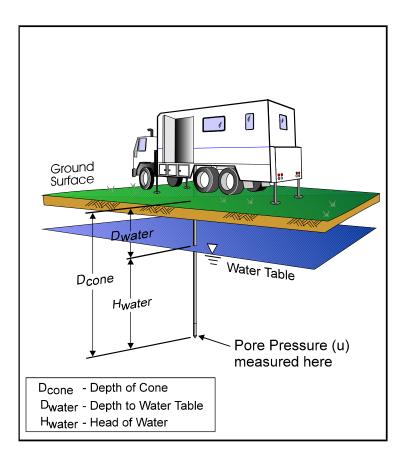
When cone penetration is stopped, the piezocone essentially becomes a piezometer. While stopped, pore water pressures are automatically recorded at five-second intervals and the readings are stored in a dissipation file (.ppd). Dissipation data can then be plotted onto a dissipation curve consisting of pore water pressure (u) verses time (t). The shapes of dissipation curves are very useful in evaluating soil type, drainage and in situ static water level.

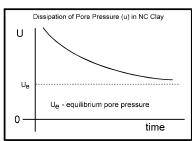
A flat curve that stabilizes quickly (i.e. less than 30 seconds) is typical of a free draining sand. In this case, the final measured pore water pressure is the static in situ water pressure.

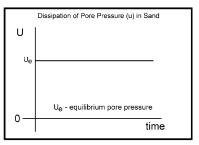
Soils that generate excess dynamic pore water pressure during penetration will dissipate this excess pressure when penetration stops. The shape of the dissipation curve and the time of dissipation can be used to estimate  $C_h$ , the coefficient of consolidation that can in turn be used to calculate  $K_h$ , the horizontal permeability.

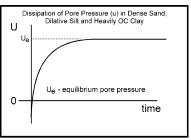
Figure 2 shows some idealized shapes of various pore water pressure dissipation curves. The reader is referred Robertson et. al., 1990 to reference dissipation test data analytical techniques.

# Estimation of Ground Water Table from CPT Dissipation Tests









Water Table Calculation

# Dwater = Dcone - Hwater

where  $H_{water} = U_e$  (depth units)

Useful Conversion Factors: 1psi = 0.704m = 2.31 feet (water)

1 tsf = 0.958 bar = 13.9 psi

1m = 3.28 feet

#### FIGURE 2 - TYPICAL DISSIPATION TESTS

#### 3.0 CONE PENETRATION TEST DATA AND INTERPRETATION

#### 3.1 ANALYSIS OF PIEZOCONE DATA - GENERAL

A total of thirty nine CPT soundings, involving 2,155.32 feet of testing, were completed.

The interpretation of cone data is based on the relationship between cone bearing, qc, sleeve friction, fs, and penetration pore water pressure, u. The friction ratio, Rf, (sleeve friction divided by cone bearing) is a calculated parameter which is used to infer soil behavior type. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

The interpretation of soils encountered on this project was carried out using correlations developed by Robertson, 1989. It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. Occasionally soils will fall within different soil categories on the classification charts. In these situations, experience and judgment and an assessment of the pore pressure dissipation data should be used to infer the soil behavior type. Computer tabulations of the interpreted soil types along with certain other geotechnical parameters for each cone hole is presented in Appendix B.

Each of the parameters measured in the sounding is discussed briefly below. A detailed explanation of CPTU testing and interpretation of the results can be found in Robertson, 1989.

TIP RESISTANCE (q<sub>c</sub>): The resistance to penetration, measured at the cone tip, provides an accurate profile of subsurface strata. The recorded tip resistance is a composite of the penetration resistance of the soils located five to ten cone diameters (7 to 14 inches) in front of and behind the tip. The actual resistance "sensed" by the tip depends on the soil properties and on the relative stiffness of the layers encountered. Tip resistance is often corrected for pore pressure effects when testing in soft saturated cohesive soils.

For this project the correction was made and the tip resistance shown,  $q_t$  is the corrected tip resistance.

The correction used is:  $q_t = q_c + (1-a)u$ 

Where:  $q_t =$ corrected tip resistance

q<sub>c</sub> = measured tip resistance

a = net area ratio for cone (0.80 for this project)

u = dynamic pore water pressure measured behind tip

SLEEVE FRICTION (f<sub>s</sub>) The resistance recorded on the friction sleeve, is a measure of the remolded strength of the soil. Values of sleeve friction in very soft soils (such as peat) may fluctuate due to the measured force being small relative to the capacity of the measuring load cell.

 $FRICTION\ RATIO\ (R_f)$  The ratio of sleeve friction to tip resistance expressed as a percentage, is an indicator of soil type. Cohesive soils generally have friction ratios that are greater than two, while sands and non-plastic silts have friction ratios that are lower than two.

PORE PRESSURE (u) Dynamic pore water pressure is measured during penetration. (dynamic pore water pressure data can be found in the .cor, and .xls files. Static pore water pressure is measured when cone penetration is stopped (static pore water pressure data can be found in the .ppd files). The measured dynamic pore water pressure changes with the location of the porous filter and negative readings are possible when the filter is located behind the tip.

It is important to note that the CPT classifies soil by physical behavior, not by grain size; therefore, the CPT classification should be verified against samples obtained from a conventional drilling program. While the CPT soil classification may not always be accurate in terms of the actual label it applies to a particular soil, it is very accurate in grouping soils with similar mechanical properties.

#### 3.2 CONE PLOTS

The data from each sounding was plotted using the computer program SCREENzW. The plots are included in Appendix A. SCREENzW was developed by ConeTec Inc. and it incorporates soil behavior type (SBT) classification as part of the plot. The soil classification is based on the classification chart reproduced chart in Appendix B.

#### 3.3 PORE PRESSURE DISSIPATION TEST RESULTS

Pore water pressure dissipation data are collected and automatically recorded during pauses in penetration. The pore water pressure data is recorded at five second intervals. Numerous pore water pressure dissipation tests were performed on this project. Those plots can be found in Appendix C.

#### 3.4 CPT DATA PROCESSING

The electronic data files were processed using the program SCREENzW. SCREENzW is a program developed by ConeTec to calculate common engineering parameters from CPT data. The processed data file summery sheet is attached in Appendix B. The files (IFI.xls) are included in the electronic data package. The calculations used are summarized in the table at the front of the Appendix. Each calculation is derived according to the referenced article.

For this project, the piezometric surface used was determined from the pore water pressure dissipation tests and the dynamic pore water pressure responses recorded during the CPT. The exact depth used can be found in the headers of the ifi.xls files.

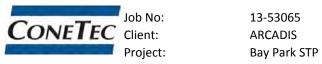
#### 3.5 ELECTRONIC DATA FILES

Along with the report, all of the project data can be downloaded from ConeTec's "ConeTec Data Services" (CDS) website (<a href="www.conetecdataservices.com">www.conetecdataservices.com</a>) using a secure, project-specific user name and password. These electronic files contain all important project information including tabular data (.xls and ASCII formats), GPS coordinates of approximate sounding locations, dynamic and static pore water pressure and some basic interpretation files in Microsoft<sup>TM</sup> Excel format (.xls). Information regarding the digital file formats of the electronic files is included in Appendix D.

### 5.0 REFERENCES

- **Robertson, P.K.**, 1989, "Soil Classification using the Cone Penetration Test", Canadian Geotechnical Journal, vol. 27, pages 151-158.
- Robertson, P.K., Sully, J., Woeller, D.G., Lunne, T., Powell, J.M., and Gillespie, D.J., 1992, "Estimating Coefficient of Consolidation from Piezocone Tests", Canadian Geotechnical Journal, vol. 29, pages 539-550.

# Appendix A



Date: October 7, 2013 through October 17, 2013

TABLE 1 Summary of CPT Soundings											
CPT Sounding	File Name	Date	Cone	Assumed Phreatic Surface (ft)	Final Depth (ft)	Northing UTM Zone 18	Easting UTM Zone 18				
CPTu-01	13-53065_CP01	10/14/2013	206:T1500F15U500	4.65	43.96	4498984	613106				
CPTu-02	13-53065_CP02	10/16/2013	206:T1500F15U500	5.60	48.56	4498978	613118				
CPTu-03	13-53065_CP03	10/16/2013	206:T1500F15U500	9.98	56.76	4498942	613156				
CPTu-04	13-53065_CP04	10/14/2013	206:T1500F15U500	6.20	46.42	4498977	613129				
CPTu-05	13-53065_CP05	10/7/2013	206:T1500F15U500	6.83	51.02	4498909	613185				
CPTu-06	13-53065_CP06	10/7/2013	206:T1500F15U500	7.05	47.41	4498855	613182				
CPTu-07	13-53065_CP07	10/15/2013	206:T1500F15U500	4.50	44.29	4498841	613200				
CPTu-08	13-53065_CP08	10/8/2013	206:T1500F15U500	5.44	57.25	4498789	613174				
CPTu-09	13-53065_CP09	10/8/2013	206:T1500F15U500	5.60	46.92	4498695	613140				
CPTu-10	13-53065_CP10	10/8/2013	206:T1500F15U500	5.81	47.74	4498649	613120				
CPTu-11	13-53065_CP11	10/15/2013	206:T1500F15U500	7.00	48.72	4498642	613126				
CPTu-12	13-53065_CP12	10/8/2013	206:T1500F15U500	5.00	48.23	4498594	613158				
CPTu-13	13-53065_CP13	10/8/2013	206:T1500F15U500	6.00	64.47	4498553	613160				
CPTu-14	13-53065_CP14	10/9/2013	206:T1500F15U500	6.72	42.65	4498474	613179				
CPTu-15	13-53065_CP15	10/9/2013	206:T1500F15U500	5.00	46.42	4498414	613135				
CPTu-16	13-53065_CP16	10/17/2013	206:T1500F15U500	3.84	43.31	4498433	613190				
CPTu-17	13-53065_CP17	10/14/2013	206:T1500F15U500	5.00	51.67	4498388	613132				
CPTu-18	13-53065_CP18	10/9/2013	206:T1500F15U500	4.41	50.69	4498412	613119				
CPTu-19	13-53065_CP19	10/9/2013	206:T1500F15U500	5.00	52.82	4498424	613076				
CPTu-20	13-53065_CP20	10/15/2013	206:T1500F15U500	7.90	65.12	4498440	612991				
CPTu-21	13-53065_CP21	10/9/2013	206:T1500F15U500	4.79	67.58	4498483	612921				

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CPTu-22	13-53065_CP22	10/17/2013	206:T1500F15U500	7.30	66.11	4498466	612928
CPTu-23	13-53065_CP23	10/10/2013	206:T1500F15U500	8.44	75.13	4498512	612857
CPTu-24	13-53065_CP24	10/15/2013	206:T1500F15U500	8.50	75.13	4498513	612822
CPTu-25	13-53065_CP25	10/10/2013	206:T1500F15U500	9.56	54.95	4498549	612847
CPTu-26	13-53065_CP26	10/15/2013	206:T1500F15U500	10.10	75.13	4498602	612811
CPTu-27	13-53065_CP27	10/10/2013	206:T1500F15U500	10.20	75.13	4498624	612838
CPTu-28	13-53065_CP28	10/17/2013	206:T1500F15U500	3.00	48.88	4498723	612865
CPTu-29	13-53065_CP29	10/17/2013	206:T1500F15U500	13.33	52.17	4498784	612888
CPTu-30	13-53065_CP30	10/16/2013	206:T1500F15U500	13.31	56.27	4498872	612923
CPTu-31	13-53065_CP31	10/17/2013	206:T1500F15U500	13.30	50.36	4498891	612888
CPTu-32	13-53065_CP32	10/10/2013	206:T1500F15U500	11.76	51.35	4498957	612933
CPTu-33	13-53065_CP33	10/10/2013	206:T1500F15U500	7.00	75.13	4498987	612874
CPTu-34	13-53065_CP34	10/11/2013	206:T1500F15U500	5.17	41.34	4499055	612900
CPTu-35	13-53065_CP35	10/11/2013	206:T1500F15U500	7.00	69.39	4499030	612966
CPTu-37	13-53065_CP37	10/11/2013	206:T1500F15U500	4.00	57.58	4499107	612923
CPTu-38	13-53065_CP38	10/11/2013	206:T1500F15U500	3.68	40.03	4499104	612999
CPTu-39	13-53065_CP39	10/14/2013	206:T1500F15U500	3.90	44.13	4499111	613069
CPTu-40	13-53065_CP40	10/14/2013	206:T1500F15U500	3.20	75.13	4499072	613107
Totals:	39				2155.32		

Note: Hydrostatic water table assumed for interpretation tables and based on pore pressure dissipations.

# **Non-Normalized CPT Plots**