

TEST BORING LOG



GZA
GeoEnvironmental, Inc.
Engineers and Scientists

NGRID
Former MGP
Gloucester, Massachusetts

BORING NO.: GZ-501
SHEET: 1 of 2
PROJECT NO.: 01.0025623.10
REVIEWED BY: GS

Drilling Co.: Boart Longyear	Type of Rig: Mini Sonic 100	Boring Location: See Plan	H. Datum: NGVD
Foreman: Kevin Regan	Rig Model: 1416	Ground Surface Elev. (est. ft.): 10.5	V. Datum: NGVD
Logged By: MJD	Drilling Method: Sonic w/SPT	Final Boring Depth (ft.): 59	
		Date Start - Finish: 5/10/2013 - 5/16/2013	
Auger/Casing Type: Automatic Hammer	Sampler Type: SS	Groundwater Depth (ft.)	
I.D./O.D.(in.): 5"/6"	I.D./O.D. (in.): 2.0	Date	Time
Hammer Weight (lb.): vibratory	Sampler Hmr Wt (lb): 140	Water Depth	Casing
Hammer Fall (in.): vibratory	Sampler Hmr Fall (in): 30		Stab. Time
Other:	Other:		

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample		Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
			Pen. (in)	Rec. (in)								
		S-1	0-5	60	8		S-1: CONCRETE, Boulders & Voids, no Soil, poor recovery.	1	0.0	0-3'	CONCRETE	10.2'
5		SS-1	5-7	24	7	2 2 1 1	SS-1: Wet, very loose, brown, fine to coarse SAND, some Gravel.	2	0.0	5'	BOULDER & VOIDS	5.5'
		S-2	7-10	60	13		S-2: Wet, 6-inch & 9-inch GRANITE BLOCK with brown, fine to coarse Sand, little Gravel.		0.0			
10		SS-2	10-12	24	8	36 15 23 68	SS-2: Wet, dense, brown, fine to coarse SAND, some Gravel, trace Silt; granite block fragments.		0.0		FILL WITH GRANITE BLOCK FRAGMENTS	
		S-3	12-15	60	26		S-3: Wet, brown/gray, fine to coarse SAND, some Gravel, little Boulders; granite block fragments.		0.5			
15		SS-3	15-15.1	1	1	100/1"	SS-3: Wet, very dense, brown, fine to coarse SAND, trace Gravel, blebs of product, odor.	3	19.3	17'	VOID	-6.5'
		S-4	15.1-20	60	30		S-4: Wet, brown/black, fine to coarse SAND, some Gravel, little Silt; coated, odor.		9.3	18'	VOID	-7.5'
20		SS-4	20-20.1	1	1	100/1"	SS-4: Wet, very dense, brown/black, fine to coarse SAND, trace Gravel, with blebs of coal tar, odor.		5.2	20'	FILL	-9.5'
		S-5	20.1-25	60	36		S-5: GRANITE Block from 20-22'; wet, brown, Clayey SILT, little fine to coarse Sand, trace Cobbles, granite block fragments; 4-inches fine to medium Sand below an 8-inche Granite block; slight odor.	4	2.0	22'	GRANITE BLOCK	-11.5'
25		SS-5	25-25.5	--	--	43 100/0"	SS-5: Wet, very dense, brown, fine to coarse SAND, some Silt, trace Gravel, slight odor.		2.2	25'	CLAYEY SILT	-14.5'
		S-6	25.5-30	60	30		S-6: Wet, gray, fine to coarse SAND, little Gravel, trace Silt, granite boulders, slight odor.		43.2		TILL	
30												

REMARKS

- Sample Designation: S = Sonic, SS = Split Spoon. SPT Value: R = Refusal
- Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a ThermoEnvironmental 580B organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates not detected above instrument detection limit (<0.1 ppmv). (-) indicates no sample collected for screening.
- Grout to 5 to 15 feet bgs, then bentonite chips to one foot bgs due to grout flowing through wall.
- Boring located proximate to park seawall; penetrated back of wall to 22 feet bgs.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.:
GZ-501

09.0025623.00 ROCK CORE_GLOUCESTER.GPJ; NGRID_500 SERIES; 8/21/2015

TEST BORING LOG



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BORING NO.: GZ-501
SHEET: 2 of 2
PROJECT NO: 01.0025623.10
REVIEWED BY: GS

Depth (ft)	Casing Blows/ Core Rate	Sample						SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
35		SS-6	30-30.8	10	10	17 200/4"		R	SS-6: Wet, very dense, olive, fine to coarse SAND, little Gravel, trace Silt, odor.		20.8			
		S-7	30.8-35	60	60									
40		SS-7	35-37	24	24	11 18	54		SS-7: Very dense, olive, fine to coarse SAND, little Gravel, 2 1-inch coated seams, odor.		46.4	TILL		
		S-8	37-40	60	24	36 43								
45		SS-8	40-40.6	7	7	80 100/1"	R		SS-8: Wet, very dense, brown/olive, fine to coarse SAND, trace Gravel, trace Silt. Bottom 2-inches saturated, odor.		373			
		S-9	40.6-45	60	40	RQD= 0%								
50									S-9: Top 18": Wet, olive, fine to coarse SAND, little Gravel, trace Silt.	5	197	43'	-32.5'	
		S-10	45-50	60	40	RQD= 53%	S-10: Very hard, fresh, medium to coarse-grained, light brown/white, GRANITE, primary joints are very close to moderately spaced, low angle planar, rough, fresh, partially open secondary joints are similar but high angle, iron staining on upper 5 inches, petroleum-like odor.							
55		S-11	50-59	60	62	RQD= 83%			S-11: Very hard, fresh, medium to coarse-grained, light brown, GRANITE, joints are close to moderately spaced, low angle planar, rough, fresh, partially open.					
		S-12	55-59	48	30	RQD= 63%			S-12: Very hard, fresh, medium to coarse-grained, light brown, GRANITE, joints are close to moderately spaced, low angle planar, rough, fresh, partially open.					
60		Bottom of boring at 59 feet.												

REMARKS

5. NAPL observed in return water when drilling 45 to 50 feet bgs.

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PROJECT NO: 01.0025623.10
REVIEWED BY: GS

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
35		S-7	30-35	60	36		S-7: Wet, olive, fine to coarse SAND, some Silt, little Gravel, trace Cobbles, coated seam 34-34.6 feet, odor. Bottom 4 inches, gray, fine to coarse SAND, little Silt, trace Gravel.		50.0				
		S-8	35-39	48	42		S-8: Top 20": Gray, fine to coarse SAND, little Gravel, trace Silt, trace Cobbles. Bottom 22": Brown, fine to coarse SAND, little Gravel, trace Silt, 12-inch Granite boulder, slight odor.		8.9		TILL		
40		S-9	39-44	60	60	RQD= 100%	S-9: Very hard, fresh, medium to coarse-grained, light brown/white GRANITE, joints are close to moderately spaced, low angle planar, rough, fresh, tight to partially open.			39'		-28.0'	
45		S-10	44-49	60	42	RQD= 33%	S-10: Very hard, fresh, medium to coarse-grained, light brown/white GRANITE, primary joints are very close to moderately spaced, low angle planar, rough, fresh, tight to partially open. Secondary joints are very close to close spaced, high angle to vertical planar, rough, discolored (iron staining) tight to partially open.				BOULDER OR BEDROCK		
50							Bottom of boring at 49 feet.			49'		-38.0'	
55													
60													
65													

REMARKS

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BORING NO.: GZ-503
SHEET: 1 of 2
PROJECT NO.: 01.0025623.10
REVIEWED BY: GS

Drilling Co.: Boart Longyear	Type of Rig: Mini Sonic 100	Boring Location: See Plan	H. Datum: NGVD	
Foreman: Kevin Regan	Rig Model: 1416	Ground Surface Elev. (est. ft.): 11	V. Datum: NGVD	
Logged By: MJD	Drilling Method: Sonic w/SPT	Final Boring Depth (ft.): 60		
		Date Start - Finish: 5/14/2013 - 5/15/2013		
Auger/Casing Type: Automatic Hammer	Sampler Type: SS	Groundwater Depth (ft.)		
I.D./O.D.(in): 5"/6"	I.D./O.D. (in.): 2.0	Date	Time	Water Depth
Hammer Weight (lb.): vibratory	Sampler Hmr Wt (lb): 140			Casing
Hammer Fall (in.): vibratory	Sampler Hmr Fall (in): 30			Stab. Time
Other:				

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample		Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
			Pen. (in)	Rec. (in)								
5		S-1	0-5	60	54		S-1: Top 20": Brown, fine to coarse SAND, little Gravel, trace Silt. Bottom 34": Damp, black, fine to coarse SAND, little Gravel, trace Silt.	1	0.2	0.3'	CONCRETE	10.7'
		SS-1	5-5.1	1	1	75/1"	R	SS-1: Wet, very dense, brown/black, fine to coarse SAND, little Gravel, trace Silt.	0.2	6'	FILL (SAND)	5.0'
10		S-2	5.1-10	60	15		S-2: Wet, black, fine to coarse SAND, little Gravel, little Cobbles and Boulders.	2	0.4			
		SS-2	10-10.0	0	0	75/0"	R	SS-2: No Recovery.	3	8.0		
15		S-3	10-15	60	30		S-3: Wet, black, fine to coarse SAND, little Gravel, trace Silt, 6 and 14 inch granite blocks, slight odor.				FILL WITH GRANITE BLOCKS SEE NOTE 3	
		SS-3	15-17	24	1	32 38 22 8	60	SS-3: Wet, piece of gravel in tip.		0.0		
20		S-4	17-20	60	26		S-4: Wet, black, fine to coarse SAND, some Granite Blocks 4-6", little Gravel, coated.		56.4			
		SS-4	20-21	12	7	8 15 50/0"	R	SS-4: Wet, very dense, brown/black, fine to coarse SAND, little Gravel, trace Wood fragments, coated.		54.6		
25		S-5	21-25	60	60		S-5: Top 24": Black/brown, fine to coarse SAND, little Gravel, trace Silt. Bottom 36": Wet, olive, Silty CLAY, trace fine to coarse Sand, saturated soil at native interface at 22 feet, 3-inch seam.		21.2	22'		-11.0'
		SS-5	25-27	24	24	6 8 14 14	22	SS-5: Wet, very stiff, olive, Silty CLAY, trace fine Sand, odor, no visible staining.		36.8		MARINE CLAY
30		S-6	27-30	60	60		S-6: Olive, Silty CLAY, trace fine Sand, odor, no visible staining.		11.1			

REMARKS

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- Boring encountered buried former seawall.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.:
GZ-503

09.0025623.00 ROCK CORE_GLOUCESTER.GPJ; NGRID_500 SERIES; 8/21/2015

TEST BORING LOG



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Gloucester, Massachusetts

BORING NO.: GZ-504
SHEET: 1 of 2
PROJECT NO: 01.0025623.10
REVIEWED BY: GS

Drilling Co.: Boart Longyear
Foreman: Kevin Regan
Logged By: MJD

Type of Rig: Mini Sonic 100
Rig Model: 1416
Drilling Method: Sonic w/SPT

Boring Location: See Plan
Ground Surface Elev. (est. ft.): 11
Final Boring Depth (ft.): 60
Date Start - Finish: 5/16/2013 - 5/20/2013

H. Datum: NGVD
V. Datum: NGVD

Auger/Casing Type: Automatic Hammer
I.D./O.D.: 5"/6"
Hmr Weight (lb.): vibratory
Hmr Fall (in.): vibratory
Other:

Sampler Type: SS
I.D./O.D (in.): 2.0
Sampler Hmr Wt: 140
Sampler Hmr Fall: 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time

Depth (ft)	Casing Blows/Core Rate	Sample				Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description		Equipment Installed	
		No.	Depth (ft.)	Pen. (in)	Rec. (in)						Depth (ft)	Elev. (ft)		
5 10 15 20 25 30	S-1	0-5	60	46	S-1: Top 20": Dry, brown, fine to coarse SAND, little Gravel. Bottom 26": Damp, black, fine to coarse SAND, little Gravel, trace Cobbles.	1	0.0	0.4'	TOPSOIL	10.6'	12" Flush Mounted Roadbox w/ 2x2' Concrete Pad	Sand 0-1'	Concrete 1-2'	
		5-10	60	14			2'	BROWN FILL	9.0'	Riser 0-26'				
		10-15	60	30			5'	BLACK FILL	6.0'	Bentonite 2-11'				
		15-20	60	60			71.2	GRANITE BLOCKS & FILL SEE NOTE 3	Grout 11-20'					
		20-22	24	24			18.8	S-5: Wet, gray/light brown, GRANITE BLOCK 2 to 10 inches thick, blebs, odor.	4	18.8	Bentonite 20-24'			
		22-25	36	30			269	S-6: Wet, light brown/white, GRANITE BLOCK, gray, fine to coarse Sand, some Gravel, little Silt, blebs, odor.	5	269	Sand 24-41.5'			
		25-30	60	54			36.1	S-7: Wet, gray, fine to coarse SAND, some Gravel, little Silt, trace Boulders, top 12 inches coated, odor.	6	36.1	25'	-14.0'	TILL	Wellscreen 26-41'

REMARKS

1. Sample Designation: S = Sonic, SS = Split Spoon. SPT Value: R = Refusal
2. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a ThermoEnvironmental 580B organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates not detected above instrument detection limit (<0.1 ppmv). (-) indicates no sample collected for screening.
3. Boring encountered buried former seawall.
4. Sheen observed in harbor, boom deployed.

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Boring No.:
GZ-504

09.0025623.00 ROCK CORE_GLOUCESTER.GPJ; NGRID_500 SERIES EQUIPMENT; 8/21/2015

TEST BORING LOG



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NGRID
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Gloucester, Massachusetts

BORING NO.: GZ-504
SHEET: 2 of 2
PROJECT NO.: 01.0025623.10
REVIEWED BY: GS

Depth (ft)	Casing Blows/ Core Rate	Sample						Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description	Equipment Installed
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value					
35		S-8	30-35	60	54			S-8: Wet, gray, fine to coarse SAND, some Gravel, little Silt, trace Cobbles, coated bottom 2 feet, odor.	128		<p style="text-align: right;">Well screen 26-41'</p> <p style="text-align: right;">Sand 24-41.5'</p> <p style="text-align: right;">Bentonite 41.5-60'</p>	
40		S-9	35-40	60	48			S-9: Wet, gray/brown, fine to coarse SAND, some Gravel, little Silt, trace Cobbles, bottom 12 inches product coated, petroleum-like odor.		TILL		
45		S-10	40-45	60	58	RQD=97%		S-10: Very hard, fresh, medium to coarse-grained, light brown/white GRANITE, joints are close to moderately spaced, low angle planar, rough, fresh, tight to partially open.		BOULDER		
50		S-11	45-50	60	60	RQD=83%		S-11: Very hard, fresh, medium to coarse-grained, light brown/white GRANITE, joints are close to wide spacing, low angle planar, rough, fresh, tight.				
55		S-12	50-55	60	54	RQD=90%		S-12: Very hard, fresh, medium to coarse-grained, light brown/white GRANITE, joints are close to moderately spaced, low angle planar, rough, fresh, tight.		SAND SEAM		
60		S-13	55-60	60	46	RQD=63%		S-13: Very hard, fresh, medium to coarse-grained, light brown/white GRANITE, joints are close to wide spaced, low angle planar, rough, fresh, tight.		GRANITE ROCK		
60								Bottom of boring at 60 feet.				

REMARKS

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TEST BORING LOG



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Gloucester, Massachusetts

BORING NO.: GZ-508
SHEET: 1 of 2
PROJECT NO.: 01.0025623.10
REVIEWED BY: GS

Drilling Co.: Boart Longyear	Type of Rig: Mini Sonic 100	Boring Location: See Plan	H. Datum: NGVD
Foreman: Kevin Regan	Rig Model: 1416	Ground Surface Elev. (est. ft.): 11	V. Datum: NGVD
Logged By: MJD	Drilling Method: Sonic w/SPT	Final Boring Depth (ft.): 40	
		Date Start - Finish: 5/22/2013 - 5/23/2013	

Depth (ft)	Casing Blows/Core Rate	Sample No.	Sample				Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Groundwater Depth (ft.)	
			Depth (ft.)	Pen. (in)	Rec. (in)							Date	Time
5		S-1	0-5	60	45			S-1: Top 24": Dry, brown, fine to coarse SAND. little Gravel, trace Silt. Bottom 21": Dry, black, fine to coarse SAND, little Gravel, trace Silt.	1	1.1	0.3'	CONCRETE	10.7'
		SS-1	5-7	24	0	3 4		SS-1: No Recovery.	2			FILL (SAND)	
10		S-2	5-10	60	7	4 2	8	S-2: Wet, brown, GRANITE BOULDER.	3	0.0	5'		6.0'
		SS-2	10-10.3	4	3	76/4"	R	SS-2: Wet, very dense, gray, fine to coarse SAND, some Gravel, trace Silt.	4	0.6		SAND FILL WITH BOULDERS AND VOIDS	
15		S-3	10.3-15	60	20			S-3: Wet, gray/black, fine to coarse SAND, some Gravel, some Cobbles, coated, odor.	5	6.2			
		SS-3	15-17	24	3	1 1	2	SS-3: Wet, very loose, black, fine to coarse SAND, some Gravel, trace Silt, saturated, odor.		12.9	17'	NO RECOVERY	-6.0'
20		S-4	17-20	60	0			S-4: No Recovery.					
		SS-4	20-22	24	15	45 4	10	SS-4: Top 12": Loose, brown, fine to coarse SAND, trace Gravel, trace Silt, coated, odor. Bottom 3": Wet, brown, SILT, trace fine to medium Sand.		153	20'		-9.0'
25		S-5	22-23	12				S-5: Wet, gray, fine to coarse SAND, little Gravel, trace Silt, trace Cobbles, odor.		24.4			
		S-6	23-27	48	48			S-6: GRANITE BOULDER 23 to 27 feet.				FILL (SAND & BOULDERS)	
30		SS-5	27.5-29.5	24	24	14 20	34	SS-5: Top 18": Dense, gray, fine to coarse SAND, trace Gravel, slight odor. Bottom 6": Wet, brown, fine to medium SAND, little Silt.		8.6	28'		-17.0'
			29.5-30.5							3.2		MARINE DEPOSITS/CLAYS	

REMARKS

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3. Possibly pushing boulder with casing.
4. 16 blows for 3 inches, 60/1"
5. Boring encountered openwork rubble, likely remnants of former seawall and historical filling.

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Boring No.:
GZ-508

09.0025623.00 ROCK CORE_GLOUCESTER.GPJ; NGRID_500 SERIES; 8/21/2015

TEST BORING LOG



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BORING NO.: GZ-508
SHEET: 2 of 2
PROJECT NO: 01.0025623.10
REVIEWED BY: GS

Depth (ft)	Casing Blows/ Core Rate	Sample						SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
35		S-7	30.5-32.5	36	40	3 9 10 11	19	S-7: Top 10": Gray to brown, fine to coarse SAND, some Silty Clay, trace Gravel. Bottom 30": Wet, brown, Silty CLAY with 3 to 6-inch fine to medium sand seams approximately 8 to 12 inches apart. SS-6: Wet, very stiff, olive, CLAY and SILT with 2 to 4 inch fine to medium sand seams 6 inches apart. S-8: Top 18": Olive, CLAY and SILT, trace fine to medium Sand. Bottom 38": Wet, brown, fine to coarse SAND, some Gravel, little to some Silt. SS-7: Wet, very dense, brown, fine to coarse SAND, some Gravel, little Silt. S-9: Very hard, fresh, medium to coarse-grained, light brown/white GRANITE, joints are very close to moderately spaced, low angle planar, rough, fresh, open.	6	5.9	32'	MARINE DEPOSITS/CLAYS	-21.0'	
		SS-6		24	24									
		S-8	32.5-35	60	56					3.3	TILL			
		SS-7	35-37	24	12	45 72 41 46	R			37.5'	-26.5'			
40		S-9	37-40	60	30						40'	ROCK/BOULDER	-29.0'	
45								Bottom of boring at 40 feet.						

REMARKS

6. 2.5 TSF pocket penetrometer.

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