WOODS HOLE GROUP

US Army Corps of Engineers
New England District

FINAL REPORT
IN SUPPORT OF
DESIGN AND PERMITTING, BRUSHNECK COVE WARWICK, RHODE ISLAND

Contract No. W912WJ-09-D-0001-0016

Prepared For:
United States Army Corp of Engineers
New England District
696 Virginia Road
Concord, MA 01742

Prepared By:
Woods Hole Group, Inc.
81 Technology Park Drive
East Falmouth, MA 02536

January 2010

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1.0 INTRODUCTION

This sampling effort was conducted under New England District Army Corps of Engineers (NAE) Contract W912WJ-09-D-0001-0016 as defined in the Task Order Statement of Work (SOW) dated April 28, 2009. The objective of this work was to acquire data to support design for the proposed dredging of sediments within Brushneck Cove (Figure 1). The work performed consisted of taking sediment cores according to the depths and locations specified in Table 1 of the SOW from three locations within Brushneck Cove, to be analyzed for the physical and chemical parameters listed in Table 3 of this report. This data was used to characterize the sediments, and to establish the depth from the current water/sediment interface to a layer of sandy material.

2.0 BACKGROUND

Brushneck Cove is located in Warwick, Rhode Island. The study area encompasses Brushneck Cove, Buttonwoods Cove and Oakland Beach. The Coves are tributaries of Greenwich Bay. Warwick is approximately 15 miles southwest of Providence, RI. A total of 11 cores were collected during a 2007 field sampling effort, 7 from Brushneck cove and 4 from Buttonwoods Cove. All of these cores were taken to 10 feet below the water/sediment interface. The sediments from Buttonwoods Cove generally ranged from dark grey, silty clay in the upper portion of the core to fine sand in the lower portion of the core. The sediments from Brushneck Cove generally contained black silt in the upper portion of the core and clay in the bottom. A number of locations also possessed a layer of shell hash.

3.0 SEDIMENT SAMPLING METHODOLOGY AND PROCEDURES

3.1 SAMPLING METHODOLOGY

Mobilization for this effort began on September 30th, 2009. Sampling operations took place on October 1st, 2009 and were conducted by TG&B Marine Services with oversight and support from WHG personnel. Onsite health and safety oversight was provided by WHG employee Dave Walsh. A safety meeting was conducted at the start of field activities, and when personnel changes occurred. The safety briefing logs are provided in Appendix A.

Sediment core samples were collected in Brushneck Cove from a shallow draft barge specially outfitted for vibracoring. The barge was equipped with an A-frame, winches, anchoring spuds, and coring equipment (Figure 2). Coring equipment used in the subaqueous portions of the sampling area consisted of a gasoline engine powered pneumatic vibracoring device. Sample positioning was accomplished using a Leica MX 420 DGPS unit with a Leica Smart antenna (1-3 meter accuracy). All cores were collected in clear polycarbonate liners. The GPS systems accuracy was checked to be within the systems' accuracy margins.

Figure 1 Basemap of the project site with proposed core locations.

Figure 2 **Sediment coring barge equipped with vibracoring rig (in a-frame) and anchoring spuds.**

3.2 SAMPLE COLLECTION

Sediment core samples were collected, to the extent possible, according to the locations, penetration, and recovery lengths specified in the project SOW (Table 1 and Figure 3). The actual sediment core locations, penetration, and recovery core lengths are presented in Table 1.

Sampling equipment was cleaned prior to sampling and between each sample station. The sampling core liners were clean "as-received" direct from the supplier. Upon collection each core sample was immediately capped and kept upright. At the staging area the cores were secured in an upright position to allow suspended sediment to settle. After settling the clear excess water was carefully drained by drilling a small hole into the core tube just above the sediment – water interface. Following draining, the core length was measured using a stadia rod and the data recorded on an Environmental Sampling Log sheet.

3.3 SAMPLE PROCESSING

3.3.1 Analytical Sub-Sampling

Sample processing occurred at a staging area set up in the parking lot of a small boat access ramp to Warwick Cove at the end of Bay Ave. After a core had settled, drained, and measured, it was placed horizontally into a jig and secured by hand. Using electric shears the core liner was cut lengthwise in two places, 180° apart, to effectively split the core liner. Clean stainless steel wire was then used to slice the length of the core into 2 halves. The exposed sample was then placed into clean plastic trays for sampling and examination.

In accordance with the SOW, the sediment cores collected from Brushneck Cove were sampled Total Organic Carbon (TOC), Grain Size and Nutrients: Ammonia, Nitrate, Total Kjeldahl Nitrogen (TKN) and Total Phosphorus (TP). These analytes, and their associated sample containers are outlined in Table 2. Prior to sample collection, sample containers were prepared and labeled. Cores were prepared and processed according to the analytical sampling outlined in the SOW and Table 1.

Immediately after a core was split and exposed to the atmosphere, one half of the core was set aside for physical description and the other for analytical sampling once. Only the top organic layer was taken for analytical sampling. This layer was homogenized in a stainless steel pan and then the sample was divided up into different containers, as specified in Table 2, for grain size, TOC and nutrients. A field duplicate was collected for quality control for grain size, TOC and nutrients; sediment core A was the source of the sediment duplicate.

All sample processing equipment was cleaned between discrete sample collections. Cleaning was performed using an Alconox and tap water solution followed by a fresh water rinse then a deionized water rinse. Each sample composite and/or composite interval was homogenized using clean stainless steel containers, spatulas and spoons before being placed into their respective containers. Each day of sampling on site, sample containers were sealed, Chain of Custody forms completed, and samples placed into coolers with ice while awaiting shipment to

Table 1. Coordinates and field data for sediment cores.

Sample	Date Time	Latitude (DD)	Longitude (DD)	Water Depth (feet)	SOW Core Penetration (feet)	Core Penetration (feet)	Recovered Core Length (feet)	Analytical Sampling Interval (feet)
A	10/1/2009 10:10	41.69514	-71.408637	2.5	20	20	15.7	0-1.36
B	10/1/2009 13:07	41.6933	-71.406122	2.5	20	20	15.9	0-1.10
C	10/1/2009 13:50	41.69092	-71.40447	5.5	20	20	12.6	0-0.94
D*	10/1/2009 15:45	41.6904	-71.404487	6.8	-	20	9.2	na

***See section 3.4 for an explanation of Sample D.**

Table 2. Brushneck Cove sediment analytes, containers, and composite types

Analytical Parameter	Sample Container
TOC	8 oz. glass jar
Ammonia, Nitrate, TKN, TP	
Grain Size	plastic bag

Alpha Analytical Laboratory in Mansfield, MA. Chain of Custody forms are included in Appendix B.

3.3.2 Core Descriptions

The Brushneck Cove sediment cores were described and photographed by a trained sedimentologist once the cores were split. The core description process involved recording the physical sediment characteristics of the core on the Environmental Sampling Logs (Appendix C). Cores were examined from the top of the core, downward to the bottom, using a stadia rod to definite layer thicknesses and depth below the surface (top of core at sediment–water/air interface). The three primary physical sediment characteristics that were described were texture (grain size), sorting, and color. In addition to the grain size characterization, an ASTM soil classification was assigned to each physical sediment layer. The presence of strata (layering), organic material and detritus, and chemical sheen and/or odors were also recorded.

WHG sampling personnel reviewed the cores descriptions with the NAE field representative, when available, to discuss any unique or questionable cores, and to provide guidance with potential impacts to, or changes in the analytical sampling plan. This proactive approach is thought to provide more consistent, less skewed data for the composite grouping, and is the reason why Composite H was modified.

Each Brushneck Cove split core that was described was also photographed. All photos contained the core with the stadia rod for scale, and for referencing the depth below surface. A photograph of the complete core was taken, as well as close-ups of discrete layering down core, and sediment strata horizons/transitions of interest. The photographs of the complete cores are provided in Appendix D.

Figure 3 Location sediment cores at Brushneck Cove.

3.4 SAFETY, TECHNICAL PROBLEMS ENCOUNTERED, SOW MODIFICATIONS DURING FIELD SAMPLING

There were no safety incidents or near misses during the Brushneck Cove field sampling. Sediment sampling was conducted without any major problems. There were two minor issues that did not prevent satisfactory completion of the SOW. These 2 issues are described in more detail below.

1) In some locations, core penetration and recovery did not meet the requirements of the SOW (Table 2). Per the SOW, WHG/TG&B performed three attempts at these locations. In the event that all three attempts came up short for penetration and/or recovery, the longest recovery length was used for sampling.

2) Three attempts were made at Site C and all three core recoveries were well short of the penetration depth. A decision was made to move the barge to a new site, Core D, closer to the mouth of Brushneck Cove in an attempt to obtain a core with better recovery. Unfortunately the recovery was worse than the previous three attempts, however, a well defined sand layer was observed as noted in the corelogs.

4.0 PHYSICAL AND CHEMICAL ANALYSES

This section summarizes the methods used for physical and chemical testing of sediment samples collected from Brushneck Cove. Physical testing included grain size, and percent moisture measurements. Chemical testing included total organic carbon (TOC) and nutrient analyses. The laboratory quality assurance plan that details the specifics of the analytical requirements were developed by Alpha Analytical and is on file at NAE. The complete list of parameters and target detection limits is provided in Table 3. A routine set of quality control (QC) samples was prepared with each set of samples, by parameter and media, to monitor data quality in terms of accuracy and precision.

Table 3. Bulk Sediment Testing Parameters

Parameter(s)		Analytical Method	Reporting Limit
Sieve Analysis	Wet Sieve (#4, 10, 20, 40, 60, 140, 200)	ASTM D422	N/A
Water Content		ASTM D2216	N/A
Nutrients			
Nitrogen, Ammonia		4500NH3-BH	7.5 ppm
Nitrogen, Nitrate		4500NO3-F	1.0 ppm
Total Kjeldahl Nitrogen		4500N-C	150 ppm
Total Phosphorous		4500P-E	6.0 ppm
Total Organic Carbon		9060	0.01%
Percent Moisture		Gravimetric	0.1%

4.1 GRAIN SIZE AND TOC

The three Brushneck Cove sediment samples were analyzed for grain size distribution (sieve # 4, 10, 20, 40, 60, 140 and 200 as well as hydrometer) and percent moisture. Grain size was measured according to ASTM D422 for gravel, sand, silt and clay, using sieve and hydrometer. Water content analysis was performed using method ASTM D2216. Results were reported on a dry-weight basis and included distribution curves for the grain size. TOC was measured according to EPA SW846 Method 9060 by AMS. All TOC samples were analyzed in duplicate. Results for TOC were reported on a dry-weight basis.

4.2 NUTRIENTS

4.2.1 Nutrient Analysis

Ammonia

Ammonia was analyzed following Alpha Analytical SOP *Nitrogen, Ammonia* (SOP 09-14, Rev 1, November, 2009). Sediment samples were buffered at a pH of 9.5 with borate buffer solution then distilled with boric acid solution. The ammonia in the distillate was then determined colorimetrically by phenate reduction.

Nitrate

Nitrate was analyzed following Alpha Analytical SOP *Nitrate, Nitrite and Nitrate/Nitrite Nitrogen* (SOP 7-26, October, 2009). Nitrate was quantitively reduced to nitrite by passage of the sample through a copperized cadmium column. The nitrite was then determined by diazotizing with sulfanilamide and coupling with N-(1-napthyl) ethylendiamine dihydrochloride. Nitrate is calculated as the difference between the reduced and non reduced sample.

Total Kjeldahl Nitrogen

Total Kjeldahl Nitrogen (TKN) was analyzed following Alpha Analytical SOP *Nitrogen, Total Kjeldahl* (SOP 07-15, July, 2009). Organic nitrogen in the sediment samples was converted to ammonia via heating in the presence of concentrated sulfuric acid. The digestate was then distilled and the ammonia distillate was determined colorimetrically by the phenate method.

Total Phosphorous

Total Phosphorous was analyzed following the Alpha Analytical SOP *Total Phosphorous – Dissolved Phosphorous* (SOP 07-35, Rev 1 August, 2009). Sediment samples were digested by persulfate oxidation technique following ASTM method 8M4500P-E. Total phosphate in the digestate was determined colorimetrically.

5.0 PROTOCOL DEVIATIONS DURING CHEMICAL TESTING

5.1 CHEMICAL TESTING DEVIATIONS

The samples were received in accordance with the Chain of Custody (COC) and no significant deviations were encountered during the preparation or analysis unless otherwise noted below. Sample receipt, container information, and the COC are located at the back of the laboratory report in Appendix B.

Total Organic Carbon

The WG383172-4 MS recoveries (67% and 44%) associated with Sample B are below the acceptance criteria (75%-125%). However, all instrument checks (ie., CCV's, CCB's) as well as all applicable batch QC were within criteria. For example, the blank was agreeable and the associated LCS recoveries (94% and 124%) were within the acceptance window of 75%-125%. Additionally, the sample was duplicated and RPD values (5.7% and 5.13%) were within the acceptable window of 25%. Therefore, the data is considered acceptable and no further action was required.

Phosphorus, Total

Samples A, A DUP, B and C have elevated detection limits due to the dilutions required to quantitate the results within the calibration range.

6.0 PHYSICAL AND CHEMICAL TESTING RESULTS

This section summarizes results obtained from physical and chemical testing of sediment from samples collected at Brushneck Cove, RI. Chemistry results were evaluated against the laboratory based method detection limits (MDL) and reporting detection limits (RDL) such that:

- Nutrients not-detected or detected at levels below the MDL were reported as the RDL and U flagged

Results for all analyses along with results of QC samples are provided in Appendix E. Results of all physical and chemical tests are summarized below.

6.1 SEDIMENT CHEMISTRY

This section summarizes results obtained from the physical and chemical analysis of the sediment samples collected from Brushneck Cove, RI. The three (3) sediment samples were analyzed for grain size, TOC, moisture content and nutrients. All data received internal validation following established procedures at the laboratory. In general, the quality of the data is acceptable.

6.1.1 Grain Size

Grain size data for the Brushneck Cove samples showed that the samples were comprised predominantly of silt and clay (ie., passing through the # 200 sieve) with that fraction varying between 59.3-70.3% among the 3 samples (Table 4).

6.1.2 Total Organic Carbon

The total organic carbon (TOC) content varied from 0.814 - 1.79% among the samples analyzed indicating that the organic carbon levels in these sediments are fairly low. The moisture/solids analyses showed the samples had an equal amount (Sample C) or slightly more (Samples A & B) water than solids content (Table 4).

Table 4. Grain Size, Total Organic Carbon and Moisture Content for Brushneck Cove

	General Chemistry		Grain Size Analysis							Total Organic Carbon	
Sample ID	% Solids, Total	% Moisture	Sieve, #4	Sieve, #10	Sieve, #20	Sieve, #40	Sieve, #60	Sieve, #140	Sieve, #200	% Total Organic Carbon (Rep1)	% Total Organic Carbon (Rep2)
A	42.2	58	100	99.1	97.8	96.1	90.4	75.5	70.3	1.4	1.47
B	39.3	57	97.5	96.8	95.6	93.1	87.6	74.6	68.5	0.814	0.862
C	50	50	99.9	99.4	98.5	96.1	89.5	68.5	59.3	1.17	1.37
DUP A	46.2	54	100	99.5	98.3	95.9	89	70.3	64.4	1.79	1.33

6.1.3 Nutrients

The nutrient test results, summarized in Table 5, show ammonia nitrogen to range from 21-81 mg/kg among the three locations. Nitrate nitrogen ranged from non-detectable for Samples B & C to just slightly above the detection limit for Sample A (2.5 mg/kg). Total Kjeldahl nitrogen ranged from 1800-2800 mg/kg and total phosphorus ranged from 440-580 mg/kg for the 3 test samples.

Table 5. Nutrient Test Results for Brushneck Cove

Sample ID	Nitrogen, Ammonia (mg/kg)	Nitrogen, Nitrate (mg/kg)	Nitrogen, Total Kjeldahl (mg/kg)	Total Phosphorus (mg/kg)
A	59	2.5	2200	580
B	-	2.6(U)	-	570
B	81	-	2800	-
C	44	2(U)	1800	440
DUP A	21	2.1(U)	2500	520

APPENDIX A WEEKLY SAFETY BRIEFING

WEEKLY SAFETY MEETING

Date Held: 8 5 1
Time: 10 1109

CONTRACTOR: _____ Contract No.
PERSONNEL PRESENT (check): Contractor ___ Sub. ___ Government ___

SUBJECTS DISCUSSED (check items that were discussed during meeting):

USACE EM385-1-1 _____ (Specific sections: _____)
On-site Accident Prevention Plan (or Site Safety and Health Plan) _____
Individual protective equipment (steel-toed boots, safety glasses, etc..) _____
Prevention of slips/falls _____
Back injury/safe lifting techniques _____
Fire prevention _____
First aid _____
Tripping hazards _____
Equipment inspection and maintenance _____
Hoisting equipment, winch and crane safety _____
Ropes, hooks, chains, and slings _____
Water safety _____
Boat safety _____
HAZMAT, Toxic hazards, contaminated sediments, MSDS, respiratory, ventilation _____
Biological hazards (poison ivy, ticks, wasps, mosquitoes etc) _____
Staging, ladders, concrete forms, safety nets, handrails ____
Hand tools, power tools, machinery, chain saws _____
Vehicle operation safety _____
Electrical grounding, temporary wiring, GFCI _____
Lockouts/safe clearance procedures _____
Welding, cutting _____
Excavation hazards/rescue _____
Loose rock/steep slopes _____
Explosives _____
Sanitation and waste disposal _____
Clean-up, trash _____

Other safety issues of concern specific to contract that was discussed during meeting:

All persons attending meeting the meeting must sign below or on the back of the form.

Contractor Representative Signature _____ Date: _____
CE Inspector/QA (if present at meeting) _____ Date: _____

Accident Prevention Plan
Approval/Signoff Form for
Professional Services Support for
Sampling and Testing In Support of Design and Permitting, Brushneck Cove Section 206 Restoration Project, Warwick, Rhode Island

Contract No. W912WJ-09-D-0001-0016

0851, 10/1/2009 - safety briefing held @ Boat ramp on Bay Hill, Warwick,
I understand, agree to, and will abide by the information set forth in this Accident Prevention Plan, and the information discussed in the Weekly Health and Safety Briefing.

No.	Name	Signature	Date	Company
1	Len Perry	Len Perry	10-1-09	TG+B
2	Charles Perry	Charles Perry	10-1-09	TG+B
3	Mitchell Buck	Mitchell Buck	10-1-09	WHG
4	DAVID WALSH	David Walsh	10/1/09	WHG
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				

Signing of this form acknowledges that I have read, understand, and will comply with all aspects of the Accident Prevention Plan.

APPENDIX B CHAIN OF CUSTODY FORMS

CHAIN OF CUSTODY

PAGE 1 OF 2

ALPHA ANALYTICAL

WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193

MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab:

ALPHA Job #:

Client Information

Client: Woods Hole Group

Address: 81 Technology Park Dr E. Falmouth, MA 02536

Phone: 508-540-8080

Fax: 508-540-1001

Email: mbuck@woodsgrp.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Brushneck Cove

Project Location: Brushneck Cove, RI

Project #: TO-8816

Project Manager: Lee Weishar

ALPHA Quote #:

Turn-Around Time

■ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ■ EMAIL

■ ADEx ☐ Add'l Deliverables

Billing Information

■ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program Criteria

MA MCP PRESUMPTIVE CERTAINTY --- CT REASONABLE CONFIDENCE PROTOCOLS

☐ Yes ☐ No Are MCP Analytical Methods Required?

☐ Yes ☐ No Are CT RCP (Reasonable Confidence Protocols) Required?

Other Project Specific Requirements/Comments/Detection Limits:

SAMPLE HANDLING

Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS: Grain Size	TOC	Ammonia, Nitrate, TKN, NP	Sample Specific Comments	TOTAL # BOTTLES
	A - TOC	10/1/09	1750	S	MAB		X			1
	A - Nutrient	10/1/09	1750	S	MAB			X		1
	A - Grain	10/1/09	1750	S	MAB	X				1
	A DUP - TOC	10/1/09	1806	S	MAB		X			1
	A DUP - Nutrient	10/1/09	1806	S	MAB			X		1
	A DUP - Grain	10/1/09	1806	S	MAB	X				1
	B - TOC	10/1/09	1818	S	MAB		X			1
	B - Nutrient	10/1/09	1818	S	MAB			X		1
	B - Grain	10/1/09	1818	S	MAB	X				1
	C - TOC	10/1/09	1840	S	MAB		X			1
	Container Type					O	G	G		
	Preservative					A	A	A		

PLEASE ANSWER QUESTIONS ABOVE!

IS YOUR PROJECT MA MCP *or* CT RCP?

Relinquished By:	Date/Time	Received By:	Date/Time
Mitchell Buck	10/2/09 - 10:10	Paul Gilbert	10/2/09 10:10

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms. See reverse side.

CHAIN OF CUSTODY

PAGE 2 OF 2

ALPHA ANALYTICAL

WESTBORO, MA
TEL: 508-898-9220
FAX: 508-898-9193

MANSFIELD, MA
TEL: 508-822-9300
FAX: 508-822-3288

Date Rec'd in Lab:

ALPHA Job #:

Client Information

Client: Woods Hole Group
Address: 81 Technology Park Dr
E Falmouth MA 025[illegible]36
Phone: 508-540-8080
Fax: 508-540-1001
Email: mbuck@whgrp.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Brushneck Cove
Project Location: Brushneck Cove, RI
Project #: TO-0016
Project Manager: Lee Weishar
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☒ EMAIL
☒ ADEx ☐ Add'l Deliverables

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program	Criteria

MA MCP PRESUMPTIVE CERTAINTY --- CT REASONABLE CONFIDENCE PROTOCOLS

☐ Yes ☐ No Are MCP Analytical Methods Required?
☐ Yes ☐ No Are CT RCP (Reasonable Confidence Protocols) Required?

Other Project Specific Requirements/Comments/Detection Limits:

SAMPLE HANDLING
Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS: Grain Size	Ammonia/Nitrate/Nitrite/TKN/IP										Sample Specific Comments	TOTAL # BOTTLES
	C-Nutrient	10/1/09	13:40	S	MAB		X											1
	C-Grain	10/1/09	13:40	S	MAB	X												1

Container Type	O	G
Preservative	A	A

PLEASE ANSWER QUESTIONS ABOVE!

IS YOUR PROJECT MA MCP *or* CT RCP?

Relinquished By:	Date/Time	Received By:	Date/Time
Mitchell Buck	10/2/09-10:10	Paul Gilbert	10/2/09 10:10

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms. See reverse side.

FORM NO: 01-01 (rev. 30-JUL-07)

APPENDIX C ENVIRONMENTAL SAMPLING LOGS / CORE DESCRPTIONS

ENVIRONMENTAL SAMPLING LOG

PROJECT: Brushneck Cove, RI Coring DATE: 10/1/2009
SAMPLING PERSONNEL: D.Walsh, M.Buck
SEA STATE: calm WEATHER CODE: sunny, clear
POSITIONING METHOD: DGPS

SAMPLE NUMBER: A SAMPLER TYPE: VC
TIME: 10:10 SOUNDING: 2.5 ft
COORDINATES:
LATITUDE: 41.695142 LONGITUDE: -71.408637

PENETRATION: 20 RECOVERY: 15.7 NO. OF ATTEMPTS: 2

SAMPLE DESCRIPTION: CORE LENGTH = 15.7 (feet)

0-0.5' Black/very dark grey organic clay w/some fine sand
0.5-1.3' Mixture of dark grey & dark olive grey organic clay w/some fine sand. Occassional shell hash, H_2S odor
1.3-3.0' clay w/low % fine sand & organic detritus, some occassional shell frags and whole shells. H_2S odor. Well consolidated/firm, olive grey.
3.0-5.0' clay w/occassional shell frags, some sand (low 100's %). Low organic content. color is olive grey to grey
5.0-10.0' Clay w/occassional shell frags, some trace % sand (fine) and organic detritus. color is grey. Slight H_2S odor.
10.0-11.4' Clay - same description as above
11.4-12.48' Clay with higher % of shell frags and whole shells (oyster) and woody detritus. Clay is grey. oyster shells concentrated at 12.0' & 12.48'
12.48-12.64' Fine to medium sand, well sorted, color is light brown
12.64-14.40' Silt, clayey, color is dark grey. some fine sand, layering. and organic detritus
14.40-14.7 silt, clayey, color is dark greyish brown. organic detritus and some fine sand.
14.7-15.7 Silt & fine sand layered, well sorted. silt is dark brown, sand is light brown - light grey. As a whole, layer is a silty sand - fine sand.

ENVIRONMENTAL SAMPLING LOG

PROJECT: Brushneck Cove, RI Coring DATE: 10/1/2009
SAMPLING PERSONNEL: D.Walsh, M.Buck
SEA STATE: Calm WEATHER CODE: sunny, clear
POSITIONING METHOD: DGPS

SAMPLE NUMBER: B SAMPLER TYPE: VC
TIME: 13:07 SOUNDING: 2.5
COORDINATES:
LATITUDE: 41.693297 LONGITUDE: -71.406122

PENETRATION: 20 RECOVERY: 15.9 NO. OF ATTEMPTS: 3

SAMPLE DESCRIPTION: CORE LENGTH = 15.9 (feet)

0-0.6' - organic clay w/low % sand (trace?). Color is Black/very dark grey.
0.6-1.10' - Olive grey clay w/organics, H_2S odor. clay has low % of sand, sand is fine grained. Large woody plant debris at 1.10'
1.10-5.0' - Olive grey clay w/low % Fine sand. Low organics, but organic detritus and shell frags. H_2S odor. some whole shells. (some sort of snail?). Very consistent layer, clay is well consolidated & firm.
5.0'-10.0' - Grey clay, homogenous w/organic detritus and occasional shell frags. H_2S odor. Very consistent layer. clay is firm.
10.0-15.56' - Grey silty clay w/low % fine sand. Color is grey. silty clay matrix is homogenous, but sand % varies throughout core (down core). Organic detritus.
15.56-15.8' - Clayey silt w/organic detritus (higher %) than overlaying strata. color is grey.
15.8-15.9' - Silty sand to fine sand w/organic detritus, color is dark greyish brown, well sorted.

ENVIRONMENTAL SAMPLING LOG

PROJECT: Brushneck Cove, RI Coring DATE: 10/1/2009
SAMPLING PERSONNEL: D.Walsh, M.Buck
SEA STATE: calm WEATHER CODE: sunny, clear
POSITIONING METHOD: DGPS

SAMPLE NUMBER: C SAMPLER TYPE: VC
TIME: 13:50 SOUNDING: 5.5
COORDINATES:
LATITUDE: 41.699917 LONGITUDE: -71.404470

PENETRATION: 20 RECOVERY: 12.6 NO. OF ATTEMPTS: 3

SAMPLE DESCRIPTION: CORE LENGTH = 12.6 (feet)

0-0.4' Black to very dark grey sandy clay w/ organic decay - no visible veg. frags. some shell Hash

0.4-1.66' Grey to olive grey sandy clay / clayey sand(?), H_2S odor. clay matrix is moderately well consolidated, Firm.

1.66-3.0' grey/olive grey sandy clay - low % sand then overlaying layer at 0.4-1.66'. H_2S odor.

3.0'-5.0' clay. Olive grey color. clay is firm, more consolidated than overlaying clay. clay has a low % of fine sand, but much lower than clay matrix b/t 0.4-3.0'.

5-10.0' silty clay w/ firm sand (low %, <5%). color is grey. fine sand % varies throughout core, Low % organic detritus. clay-silty clay matrix is homogenous

10.0-12.6' clay matrix, homogenous w/ fine sand lenses (< 0.02' thick) occaisionally throughout core. Large shell frag at 11.26'. Organic detritus throughout. fine sand at 12.6'. sand is well sorted.

ENVIRONMENTAL SAMPLING LOG

PROJECT: Brushneck Cove, RI Coring DATE: 10/1/2009
SAMPLING PERSONNEL: D.Walsh, M.Buck
SEA STATE: calm WEATHER CODE: sunny, clear
POSITIONING METHOD: DGPS

SAMPLE NUMBER: D SAMPLER TYPE: VC
TIME: 15:45 SOUNDING: 6.8
COORDINATES:
LATITUDE: 41.690395 LONGITUDE: -71.404487

PENETRATION: 20 RECOVERY: 9.2 NO. OF ATTEMPTS: ~~3~~ 1

SAMPLE DESCRIPTION: CORE LENGTH = 9.2 (feet)

0-0.3' fine to medium grained sand, well sorted, organic debris: (grasses) and large shell frags. ~~Co~~. color is dark grey to very dark grey.

0.3-5.0' clay w/ low % fine-medium ~~s~~ sand. organic detritus. color is grey

5.0-6.96' clay matrix w/fine to medium sand (well sorted) and organic detritus. color is grey.

6.96-7.38' clayey sand - sand w/low % clay. (Transition layer) * sand is well sorted. color is grey to brownish grey.

7.38'-7.76' sand. fine grained, very well sorted. color is brown to orange brown (FE-ox ~~stain~~ stain)

7.76-9.2' sand. fine grained, very well sorted. color is light brown. core washout starts at 9.2'.

APPENDIX D PHOTOGRAPHS OF SEDIMENT CORES

Figure D1 Core A, 0-5 ft (top)

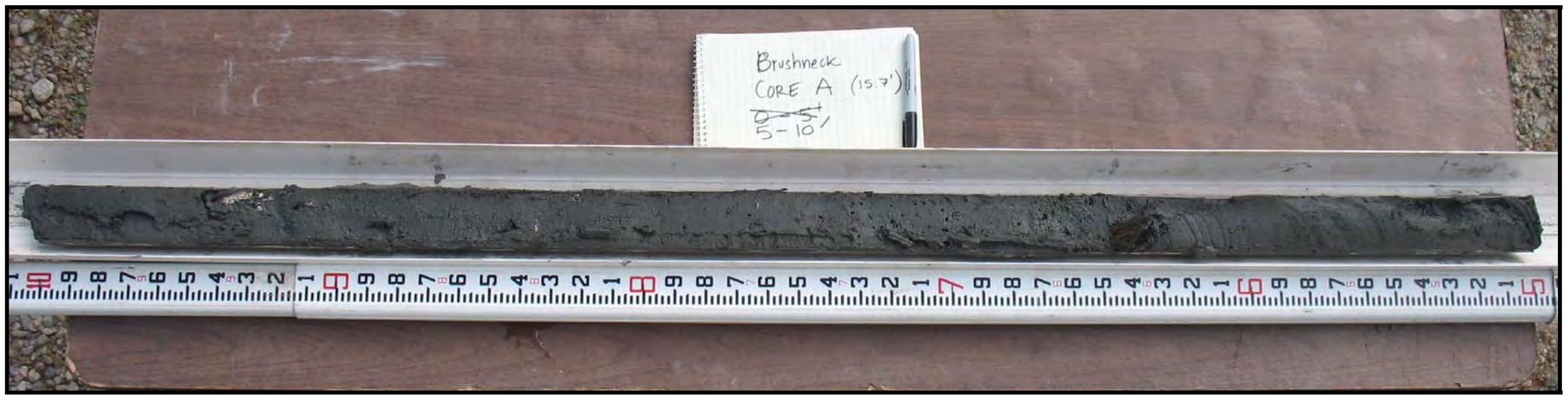


Figure D2 Core A, 5-10ft (middle)

Figure D3 Core A, 10-15.7ft (bottom)

Figure D4 Core B, 0-5ft (top)

Figure D5 Core B, 5-10ft (middle)

Figure D6 Core B, 10-15.9ft (bottom)

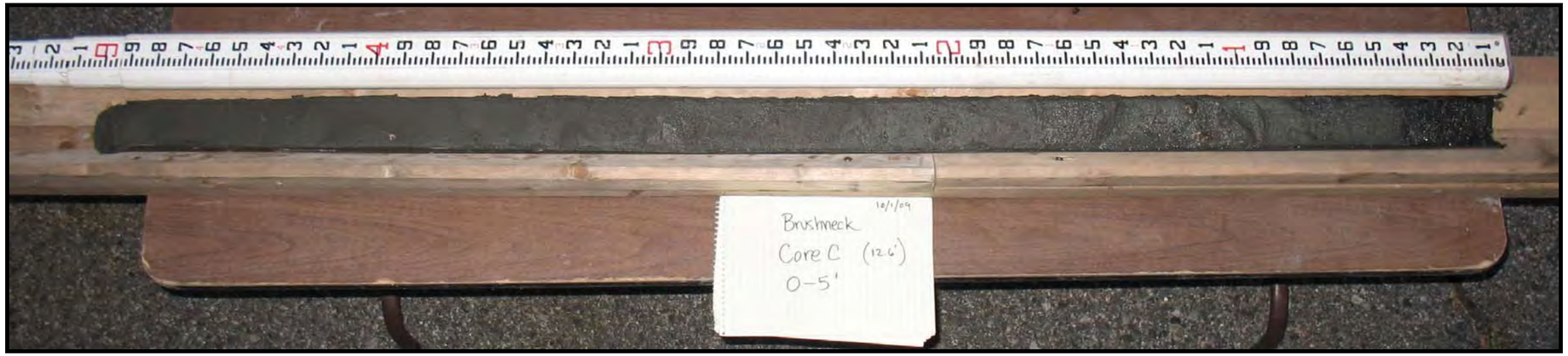


Figure D7 Core C, 0-5ft (top)

Figure D8 Core C, 5-10ft (middle)

Figure D9 Core C, 10-12.6ft (bottom)

Figure D10 Core D, 0-5ft (top)

Figure D11 Core D, 5-9.2ft (bottom)

APPENDIX E LABORATORY REPORT

ANALYTICAL REPORT

Lab Number:	L0914033
Client:	Woods Hole Group 81 Technology Park Drive East Falmouth, MA 02536
ATTN:	Lee Weishar
Project Name:	BRUSHNECK COVE
Project Number:	TO-0016
Report Date:	11/02/09

Certifications & Approvals: MA (M-MA030), NY (11627), CT (PH-0141), NH (2206), NJ (MA015), RI (LAO00299), ME (MA0030), PA (Registration #68-02089), LA NELAC (03090), FL NELAC (E87814), US Army Corps of Engineers.

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: BRUSHNECK COVE
Project Number: TO-0016

Lab Number: L0914033
Report Date: 11/02/09

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L0914033-01	A	BRUSHNECK COVE, RI	10/01/09 17:50
L0914033-02	A DUP	BRUSHNECK COVE, RI	10/01/09 18:06
L0914033-03	B	BRUSHNECK COVE, RI	10/01/09 18:18
L0914033-04	C	BRUSHNECK COVE, RI	10/01/09 18:40

Project Name:	BRUSHNECK COVE	**Lab Number:**	L0914033
Project Number:	TO-0016	**Report Date:**	11/02/09

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

For additional information, please contact Client Services at 800-624-9220.

Report Submission

This report replaces the report issued on 10/26/09. Per client request, excess sediment from sample L0914033-03 (initially collected for TOC analysis) was analyzed for grain size with hydrometer and percent moisture. Sufficient sediment was available to include duplicate analysis. These data are reported.

Sample Receipt

The samples were frozen from October 2, 2009 through October 4, 2009.

Total Organic Carbon

Project Name:	BRUSHNECK COVE	**Lab Number:**	L0914033
Project Number:	TO-0016	**Report Date:**	11/02/09

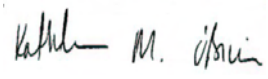
Case Narrative (continued)

The WG383172-4 MS recoveries (67% and 44%), associated with L0914033-03, are below the acceptance criteria, possibly due to the sample matrix. The associated LCS recovery is within criteria. No further action was required.

Phosphorus, Total

L0914033-01 through -04 have elevated detection limits due to the dilutions required to quantitate the results within the calibration range.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: 

Title: Technical Director/Representative Date: 11/02/09

INORGANICS
&
MISCELLANEOUS

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

SAMPLE RESULTS

Lab ID: L0914033-01
Client ID: A
Sample Location: BRUSHNECK COVE, RI
Matrix: Sediment

Date Collected: 10/01/09 17:50
Date Received: 10/02/09
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab									
Total Organic Carbon (Rep1)	1.40		%	0.010	1	-	10/23/09 18:00	1,9060	ES
Total Organic Carbon (Rep2)	1.47		%	0.010	1	-	10/23/09 18:00	1,9060	ES
Grain Size Analysis - Mansfield Lab									
Sieve, #4	100		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #10	99.1		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #20	97.8		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #40	96.1		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #60	90.4		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #140	75.5		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #200	70.3		%	0.100	1	-	10/05/09 00:00	12,D422	SE
General Chemistry - Westborough Lab									
Nitrogen, Ammonia	59		mg/kg	16	1	10/13/09 15:15	10/13/09 22:56	30,4500NH3-BH	AT
Nitrogen, Nitrate	2.5		mg/kg	2.4	1	10/06/09 22:00	10/07/09 01:39	30,4500NO3-F	DD
Nitrogen, Total Kjeldahl	2200		mg/kg	260	1	10/13/09 14:30	10/13/09 23:40	30,4500N-C	AT
Phosphorus, Total	580		mg/kg	32	2.7	-	10/12/09 15:45	30,4500P-E	NM
General Chemistry - Mansfield Lab									
Solids, Total	42.2		%	0.100	1	-	10/08/09 11:55	30,2540G	KB

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

SAMPLE RESULTS

Lab ID: L0914033-01
Client ID: A
Sample Location: BRUSHNECK COVE, RI
Matrix: Sediment

Date Collected: 10/01/09 17:50
Date Received: 10/02/09
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab									
Moisture	58		%	0.10	1	-	10/08/09 11:55	30,2540G	KB

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

SAMPLE RESULTS

Lab ID: L0914033-02
Client ID: A DUP
Sample Location: BRUSHNECK COVE, RI
Matrix: Sediment

Date Collected: 10/01/09 18:06
Date Received: 10/02/09
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab									
Total Organic Carbon (Rep1)	1.79		%	0.010	1	-	10/23/09 18:00	1,9060	ES
Total Organic Carbon (Rep2)	1.33		%	0.010	1	-	10/23/09 18:00	1,9060	ES
Grain Size Analysis - Mansfield Lab									
Sieve, #4	100		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #10	99.5		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #20	98.3		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #40	95.9		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #60	89.0		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #140	70.3		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #200	64.4		%	0.100	1	-	10/05/09 00:00	12,D422	SE
General Chemistry - Westborough Lab									
Nitrogen, Ammonia	21		mg/kg	14	1	10/13/09 15:15	10/13/09 22:37	30,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/kg	2.1	1	10/06/09 22:00	10/07/09 01:40	30,4500NO3-F	DD
Nitrogen, Total Kjeldahl	2500		mg/kg	280	1	10/13/09 14:30	10/13/09 23:41	30,4500N-C	AT
Phosphorus, Total	520		mg/kg	23	2.1	-	10/12/09 15:45	30,4500P-E	NM
General Chemistry - Mansfield Lab									
Solids, Total	46.2		%	0.100	1	-	10/08/09 11:55	30,2540G	KB

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

SAMPLE RESULTS

Lab ID: L0914033-02
Client ID: A DUP
Sample Location: BRUSHNECK COVE, RI
Matrix: Sediment
Date Collected: 10/01/09 18:06
Date Received: 10/02/09
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab									
Moisture	54		%	0.10	1	-	10/08/09 11:55	30,2540G	KB

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

SAMPLE RESULTS

Lab ID: L0914033-03
Client ID: B
Sample Location: BRUSHNECK COVE, RI
Matrix: Sediment

Date Collected: 10/01/09 18:18
Date Received: 10/02/09
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab									
Total Organic Carbon (Rep1)	0.814		%	0.010	1	-	10/23/09 18:00	1,9060	ES
Total Organic Carbon (Rep2)	0.862		%	0.010	1	-	10/23/09 18:00	1,9060	ES
Grain Size Analysis - Mansfield Lab									
Sieve, #4	97.5		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #10	96.8		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #20	95.6		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #40	93.1		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #60	87.6		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #140	74.6		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #200	68.5		%	0.100	1	-	10/05/09 00:00	12,D422	SE
General Chemistry - Westborough Lab									
Nitrogen, Ammonia	81		mg/kg	18	1	10/14/09 11:20	10/15/09 22:08	30,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/kg	2.6	1	10/06/09 22:00	10/07/09 01:41	30,4500NO3-F	DD
Nitrogen, Total Kjeldahl	2800		mg/kg	370	1	10/14/09 14:35	10/15/09 21:47	30,4500N-C	AT
Phosphorus, Total	570		mg/kg	32	2.5	-	10/12/09 15:45	30,4500P-E	NM
General Chemistry - Mansfield Lab									
Solids, Total	39.3		%	0.100	1	-	10/08/09 11:55	30,2540G	KB

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

SAMPLE RESULTS

Lab ID: L0914033-03
Client ID: B
Sample Location: BRUSHNECK COVE, RI
Matrix: Sediment
Date Collected: 10/01/09 18:18
Date Received: 10/02/09
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab									
Moisture	57		%	0.10	1	-	10/08/09 11:55	30,2540G	KB

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

SAMPLE RESULTS

Lab ID: L0914033-04
Client ID: C
Sample Location: BRUSHNECK COVE, RI
Matrix: Sediment

Date Collected: 10/01/09 18:40
Date Received: 10/02/09
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab									
Total Organic Carbon (Rep1)	1.17		%	0.010	1	-	10/23/09 18:00	1,9060	ES
Total Organic Carbon (Rep2)	1.37		%	0.010	1	-	10/23/09 18:00	1,9060	ES
Grain Size Analysis - Mansfield Lab									
Sieve, #4	99.9		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #10	99.4		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #20	98.5		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #40	96.1		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #60	89.5		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #140	68.5		%	0.100	1	-	10/05/09 00:00	12,D422	SE
Sieve, #200	59.3		%	0.100	1	-	10/05/09 00:00	12,D422	SE
General Chemistry - Westborough Lab									
Nitrogen, Ammonia	44		mg/kg	14	1	10/13/09 15:15	10/13/09 22:38	30,4500NH3-BH	AT
Nitrogen, Nitrate	ND		mg/kg	2.0	1	10/06/09 22:00	10/07/09 01:42	30,4500NO3-F	DD
Nitrogen, Total Kjeldahl	1800		mg/kg	230	1	10/13/09 14:30	10/13/09 23:47	30,4500N-C	AT
Phosphorus, Total	440		mg/kg	20	2	-	10/12/09 15:45	30,4500P-E	NM
General Chemistry - Mansfield Lab									
Solids, Total	50.0		%	0.100	1	-	10/08/09 11:55	30,2540G	KB

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

SAMPLE RESULTS

Lab ID: L0914033-04
Client ID: C
Sample Location: BRUSHNECK COVE, RI
Matrix: Sediment
Date Collected: 10/01/09 18:40
Date Received: 10/02/09
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab									
Moisture	50		%	0.10	1	-	10/08/09 11:55	30,2540G	KB

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab for sample(s): 01-04 Batch: WG383172-1									
Total Organic Carbon (Rep1)	ND		%	0.010	1	-	10/23/09 18:00	1,9060	ES
Total Organic Carbon (Rep2)	ND		%	0.010	1	-	10/23/09 18:00	1,9060	ES
General Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG383184-2									
Nitrogen, Nitrate	ND		mg/kg	1.0	1	10/06/09 22:00	10/07/09 01:37	30,4500NO3-F	DD
General Chemistry - Westborough Lab for sample(s): 01-04 Batch: WG383989-1									
Phosphorus, Total	ND		mg/kg	6.0	1.2	-	10/12/09 15:45	30,4500P-E	NM
General Chemistry - Westborough Lab for sample(s): 01-02,04 Batch: WG384198-1									
Nitrogen, Ammonia	ND		mg/kg	7.5	1	10/13/09 15:15	10/13/09 22:21	30,4500NH3-BH	AT
General Chemistry - Westborough Lab for sample(s): 01-02,04 Batch: WG384202-1									
Nitrogen, Total Kjeldahl	ND		mg/kg	150	1	10/13/09 14:30	10/13/09 23:26	30,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 03 Batch: WG384334-1									
Nitrogen, Total Kjeldahl	ND		mg/kg	150	1	10/14/09 14:35	10/15/09 21:44	30,4500N-C	AT
General Chemistry - Westborough Lab for sample(s): 03 Batch: WG384371-1									
Nitrogen, Ammonia	ND		mg/kg	7.5	1	10/14/09 11:20	10/15/09 22:05	30,4500NH3-BH	AT

Lab Control Sample Analysis

Batch Quality Control

Project Name: BRUSHNECK COVE
Project Number: TO-0016

Lab Number: L0914033
Report Date: 11/02/09

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG383184-1								
Nitrogen, Nitrate	99		-			-		
General Chemistry - Westborough Lab Associated sample(s): 01-04 Batch: WG383989-2								
Phosphorus, Total	113		-		75-128	-		
General Chemistry - Westborough Lab Associated sample(s): 01-02,04 Batch: WG384198-2								
Nitrogen, Ammonia	93		-			-		
General Chemistry - Westborough Lab Associated sample(s): 01-02,04 Batch: WG384202-2								
Nitrogen, Total Kjeldahl	92		-			-		
General Chemistry - Westborough Lab Associated sample(s): 03 Batch: WG384334-2								
Nitrogen, Total Kjeldahl	88		-			-		
General Chemistry - Westborough Lab Associated sample(s): 03 Batch: WG384371-2								
Nitrogen, Ammonia	96		-			-		

Matrix Spike Analysis
Batch Quality Control

Project Name: BRUSHNECK COVE
Project Number: TO-0016

Lab Number: L0914033
Report Date: 11/02/09

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG383172-4 QC Sample: L0914033-03 Client ID: B												
Total Organic Carbon (Rep1)	0.814	2.8	2.70	**67**	Q	-	-		75-125	-		25
Total Organic Carbon (Rep2)	0.862	3.8	2.47	**44**	Q	-	-		75-125	-		25
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG383184-3 QC Sample: L0914033-03 Client ID: B												
Nitrogen, Nitrate	ND	207	200	95		-	-			-		
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG383989-4 QC Sample: L0914033-03 Client ID: B												
Phosphorus, Total	570	2850	3200	92		-	-			-		
General Chemistry - Westborough Lab Associated sample(s): 01-02,04 QC Batch ID: WG384198-4 QC Sample: L0914033-04 Client ID: C												
Nitrogen, Ammonia	44	790	790	94		-	-			-		
General Chemistry - Westborough Lab Associated sample(s): 01-02,04 QC Batch ID: WG384202-4 QC Sample: L0914033-02 Client ID: A DUP												
Nitrogen, Total Kjeldahl	2500	7139	9000	90		-	-			-		
General Chemistry - Westborough Lab Associated sample(s): 03 QC Batch ID: WG384334-3 QC Sample: L0914033-03 Client ID: B												
Nitrogen, Total Kjeldahl	2800	9959	12000	96		-	-			-		
General Chemistry - Westborough Lab Associated sample(s): 03 QC Batch ID: WG384371-3 QC Sample: L0914033-03 Client ID: B												
Nitrogen, Ammonia	81	1000	1000	91		-	-			-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: BRUSHNECK COVE
Project Number: TO-0016

Lab Number: L0914033
Report Date: 11/02/09

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Grain Size Analysis - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG382969-1 QC Sample: L0914033-03 Client ID: B						
Sieve, #4	97.5	97.4	%	0		20
Sieve, #10	96.8	96.7	%	0		20
Sieve, #20	95.6	95.9	%	0		20
Sieve, #40	93.1	93.1	%	0		20
Sieve, #60	87.6	88.1	%	1		20
Sieve, #140	74.6	77.4	%	4		20
Sieve, #200	68.5	72.3	%	5		20
Total Organic Carbon - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG383172-3 QC Sample: L0914033-03 Client ID: B						
Total Organic Carbon (Rep1)	0.814	0.779	%	4		25
Total Organic Carbon (Rep2)	0.862	0.820	%	5		25
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG383184-4 QC Sample: L0914033-03 Client ID: B						
Nitrogen, Nitrate	ND	ND	mg/kg	NC		
General Chemistry - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG383480-1 QC Sample: L0914033-01 Client ID: A						
Solids, Total	42.2	42.5	%	1		20
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG383989-3 QC Sample: L0914033-03 Client ID: B						
Phosphorus, Total	570	560	mg/kg	2		
General Chemistry - Westborough Lab Associated sample(s): 01-02,04 QC Batch ID: WG384198-3 QC Sample: L0913863-43 Client ID: DUP Sample						
Nitrogen, Ammonia	27	25	mg/kg	8		

Lab Duplicate Analysis
Batch Quality Control

Project Name: BRUSHNECK COVE
Project Number: TO-0016

Lab Number: L0914033
Report Date: 11/02/09

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-02,04 QC Batch ID: WG384202-3 QC Sample: L0913863-43 Client ID: DUP Sample					
Nitrogen, Total Kjeldahl	1500	1400	mg/kg	7	
General Chemistry - Westborough Lab Associated sample(s): 03 QC Batch ID: WG384334-4 QC Sample: L0914033-03 Client ID: B					
Nitrogen, Total Kjeldahl	2800	2900	mg/kg	4	
General Chemistry - Westborough Lab Associated sample(s): 03 QC Batch ID: WG384371-4 QC Sample: L0914033-03 Client ID: B					
Nitrogen, Ammonia	81	78	mg/kg	4	
General Chemistry - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG385959-1 QC Sample: L0914033-03 Client ID: B					
Moisture	57.3	57	%	6	10

Project Name: BRUSHNECK COVE
Project Number: TO-0016
Lab Number: L0914033
Report Date: 11/02/09

S.R.M. Standard Quality Control

Standard Reference Material (SRM): WG383172-2

Parameter	% Recovery	Qual	QC Criteria
Total Organic Carbon (Rep1)	94		75-125
Total Organic Carbon (Rep2)	124		75-125

Project Name: BRUSHNECK COVE
Project Number: TO-0016

Lab Number: L0914033
Report Date: 11/02/09

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis
L0914033-01A	Glass 250ml unpreserved	A	N/A	2.5	Y	Absent	A2-MOISTURE-2540(7),A2-TS(7),A2-TOC-9060-2REPS(28)
L0914033-01B	Bag	A	N/A	2.5	Y	Absent	A2-HYDROMETER(),A2-SIEVE_#10(7),A2-SIEVE_#140(7),A2-SIEVE_#60(7),A2-SIEVE_#4(7),A2-SIEVE_#40(7),A2-SIEVE_#20(7),A2-SIEVE_#200(7)
L0914033-01C	Amber 250ml unpreserved	A	N/A	2.5	Y	Absent	TKN-4500(28),TPHOS-4500(28),NO3-4500(2),NH3-4500(28)
L0914033-02A	Glass 250ml unpreserved	A	N/A	2.5	Y	Absent	A2-MOISTURE-2540(7),A2-TS(7),A2-TOC-9060-2REPS(28)
L0914033-02B	Bag	A	N/A	2.5	Y	Absent	A2-HYDROMETER(),A2-SIEVE_#10(7),A2-SIEVE_#140(7),A2-SIEVE_#60(7),A2-SIEVE_#4(7),A2-SIEVE_#40(7),A2-SIEVE_#20(7),A2-SIEVE_#200(7)
L0914033-02C	Amber 250ml unpreserved	A	N/A	2.5	Y	Absent	TKN-4500(28),NO3-4500(2),NH3-4500(28)
L0914033-03A	Glass 250ml unpreserved	A	N/A	2.5	Y	Absent	A2-MOISTURE-2540(7),A2-TS(7),A2-TOC-9060-2REPS(28)
L0914033-03B	Bag	A	N/A	2.5	Y	Absent	A2-HYDROMETER(),A2-SIEVE_#10(7),A2-SIEVE_#140(7),A2-SIEVE_#60(7),A2-SIEVE_#4(7),A2-SIEVE_#40(7),A2-SIEVE_#20(7),A2-SIEVE_#200(7)
L0914033-03C	Amber 250ml unpreserved	A	N/A	2.5	Y	Absent	TKN-4500(28),NO3-4500(2),NH3-4500(28)
L0914033-04A	Glass 250ml unpreserved	A	N/A	2.5	Y	Absent	A2-MOISTURE-2540(7),A2-TS(7),A2-TOC-9060-2REPS(28)
L0914033-04B	Bag	A	N/A	2.5	Y	Absent	A2-HYDROMETER(),A2-SIEVE_#10(7),A2-SIEVE_#140(7),A2-SIEVE_#60(7),A2-SIEVE_#4(7),A2-SIEVE_#40(7),A2-SIEVE_#20(7),A2-SIEVE_#200(7)
L0914033-04C	Amber 250ml unpreserved	A	N/A	2.5	Y	Absent	TKN-4500(28),NO3-4500(2),NH3-4500(28)

*Hold days indicated by values in parentheses

Project Name:	BRUSHNECK COVE	**Lab Number:**	L0914033
Project Number:	TO-0016	**Report Date:**	11/02/09

GLOSSARY

Acronyms

EPA · Environmental Protection Agency.

LCS · Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD · Laboratory Control Sample Duplicate: Refer to LCS.

MS · Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD · Matrix Spike Sample Duplicate: Refer to MS.

NA · Not Applicable.

NC · Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

ND · Not detected at the reported detection limit for the sample.

NI · Not Ignitable.

RDL · Reported Detection Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD · Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than five times (5x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RDL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

Report Format: Data Usability Report

Project Name:	BRUSHNECK COVE	**Lab Number:**	L0914033
Project Number:	TO-0016	**Report Date:**	11/02/09

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IIIA, 1997.

12 Annual Book of ASTM Standards. American Society for Testing and Materials.

30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

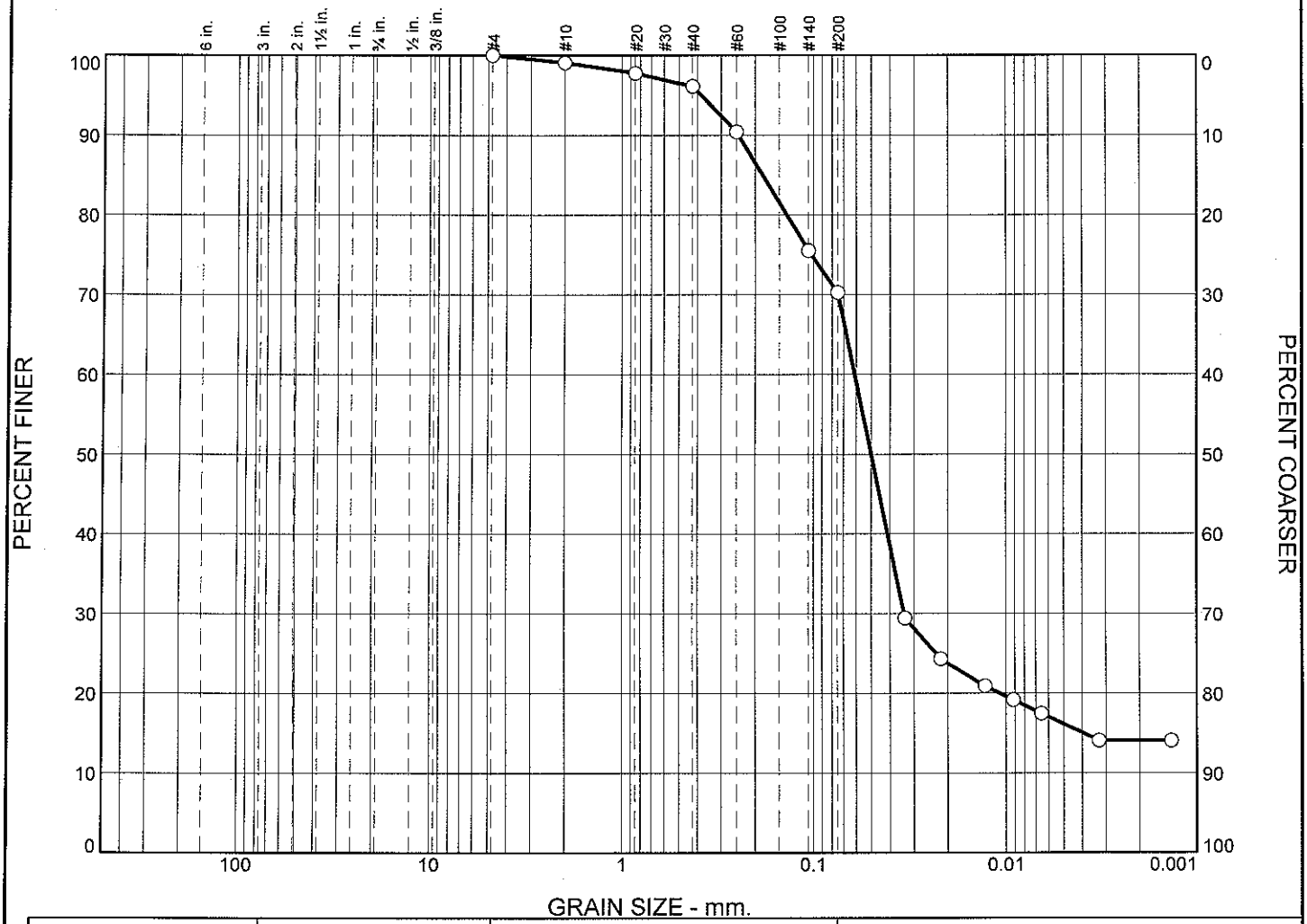
LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Woods Hole Labs shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Woods Hole Labs.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Wet Sieve Hydrometer
ASTM 422D

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.9	3.0	25.8	54.2	16.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1830	0.0612	0.0502	0.0338	0.0040			

Material Description	USCS	AASHTO
○		

Project No. L0914033 **Client:** Woods Hole Group

Project: Brushneck Cove

○ **Source of Sample:** A **Sample Number:** L0914033-01

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

10/26/2009

Client: Woods Hole Group
Project: Brushneck Cove
Project Number: L0914033
Location: A
Sample Number: L0914033-01
Sieve opening list: BS Bulk Sieve

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare** = 25.26
Tare Wt. = 4.55
Minus #200 from wash = 68.6%

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
66.00	0.00	#4	520.83	520.83	100.0	0.0
		#10	482.71	482.09	99.1	0.9
		#20	411.91	411.05	97.8	2.2
		#40	379.04	377.96	96.1	3.9
		#60	373.90	370.13	90.4	9.6
		#140	357.19	347.37	75.5	24.5
		#200	350.03	346.56	70.3	29.7

Hydrometer Test Data

Hydrometer test uses material passing #200
Percent passing #200 based upon complete sample = 70.3
Weight of hydrometer sample =66.00
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -0.04
Meniscus correction only = -3.0
Specific gravity of solids = 2.65
Hydrometer type = 151H
Hydrometer effective depth equation: L = 16.294964 - 0.2645 x Rm

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
2.00	22.0	1.0170	1.0172	0.0133	14.0	12.6	0.0334	29.4	70.6
5.00	22.0	1.0140	1.0142	0.0133	11.0	13.4	0.0218	24.3	75.7
15.00	22.0	1.0120	1.0122	0.0133	9.0	13.9	0.0128	20.9	79.1
30.00	22.0	1.0110	1.0112	0.0133	8.0	14.2	0.0092	19.2	80.8
60.00	22.0	1.0100	1.0102	0.0133	7.0	14.4	0.0065	17.5	82.5
250.00	22.0	1.0080	1.0082	0.0133	5.0	15.0	0.0033	14.0	86.0
1440.00	22.0	1.0080	1.0082	0.0133	5.0	15.0	0.0014	14.0	86.0

Fractional Components

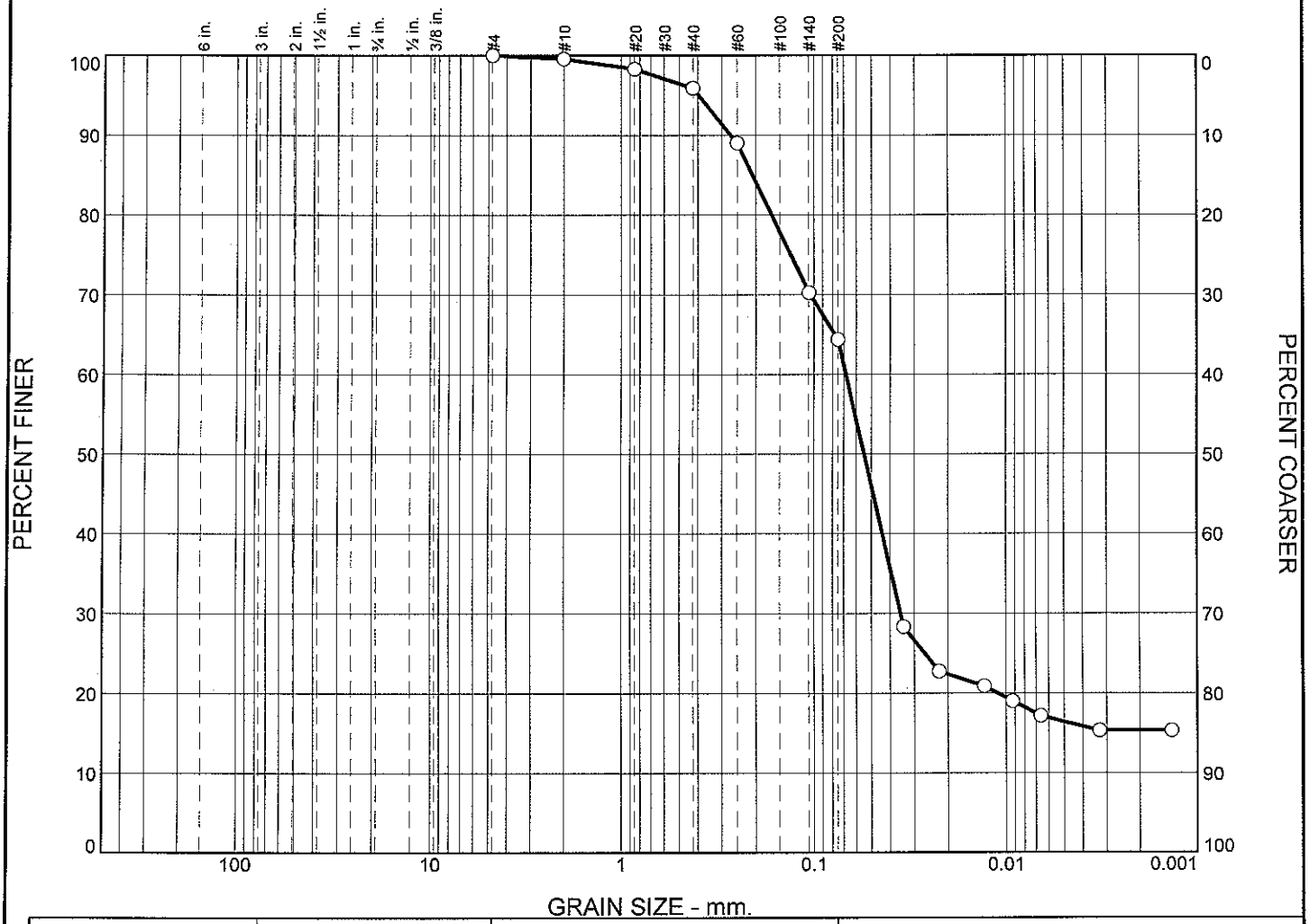
Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.9	3.0	25.8	29.7	54.2	16.1	70.3

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0040	0.0108	0.0338	0.0502	0.0612	0.1372	0.1830	0.2441	0.3829

Fineness Modulus
0.32

Alpha Analytical

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.5	3.6	31.5	48.0	16.4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2081	0.0681	0.0548	0.0354				

	Material Description	USCS	AASHTO
○			

Project No. L0914033 **Client:** Woods Hole Group

Project: Brushneck Cove

○ **Source of Sample:** A DUP **Sample Number:** L0914033-02

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

10/26/2009

Client: Woods Hole Group
Project: Brushneck Cove
Project Number: L0914033
Location: A DUP
Sample Number: L0914033-02
Sieve opening list: BS Bulk Sieve

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 25.08
Tare Wt. = 4.55
Minus #200 from wash = 63.0%

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
55.52	0.00	#4	521.72	521.72	100.0	0.0
		#10	484.97	484.72	99.5	0.5
		#20	406.13	405.44	98.3	1.7
		#40	362.98	361.64	95.9	4.1
		#60	370.31	366.49	89.0	11.0
		#140	353.34	342.93	70.3	29.7
		#200	348.47	345.21	64.4	35.6

Hydrometer Test Data

Hydrometer test uses material passing #200
Percent passing #200 based upon complete sample = 64.4
Weight of hydrometer sample =55.52
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -0.04
Meniscus correction only = -3.0
Specific gravity of solids = 2.65
Hydrometer type = 151H
Hydrometer effective depth equation: L = 16.294964 - 0.2645 x Rm

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
2.00	22.0	1.0150	1.0152	0.0133	12.0	13.1	0.0341	28.3	71.7
5.00	22.0	1.0120	1.0122	0.0133	9.0	13.9	0.0222	22.7	77.3
15.00	22.0	1.0110	1.0112	0.0133	8.0	14.2	0.0129	20.9	79.1
30.00	22.0	1.0100	1.0102	0.0133	7.0	14.4	0.0092	19.0	81.0
60.00	22.0	1.0090	1.0092	0.0133	6.0	14.7	0.0066	17.2	82.8
250.00	22.0	1.0080	1.0082	0.0133	5.0	15.0	0.0033	15.3	84.7
1440.00	22.0	1.0080	1.0082	0.0133	5.0	15.0	0.0014	15.3	84.7

Fractional Components

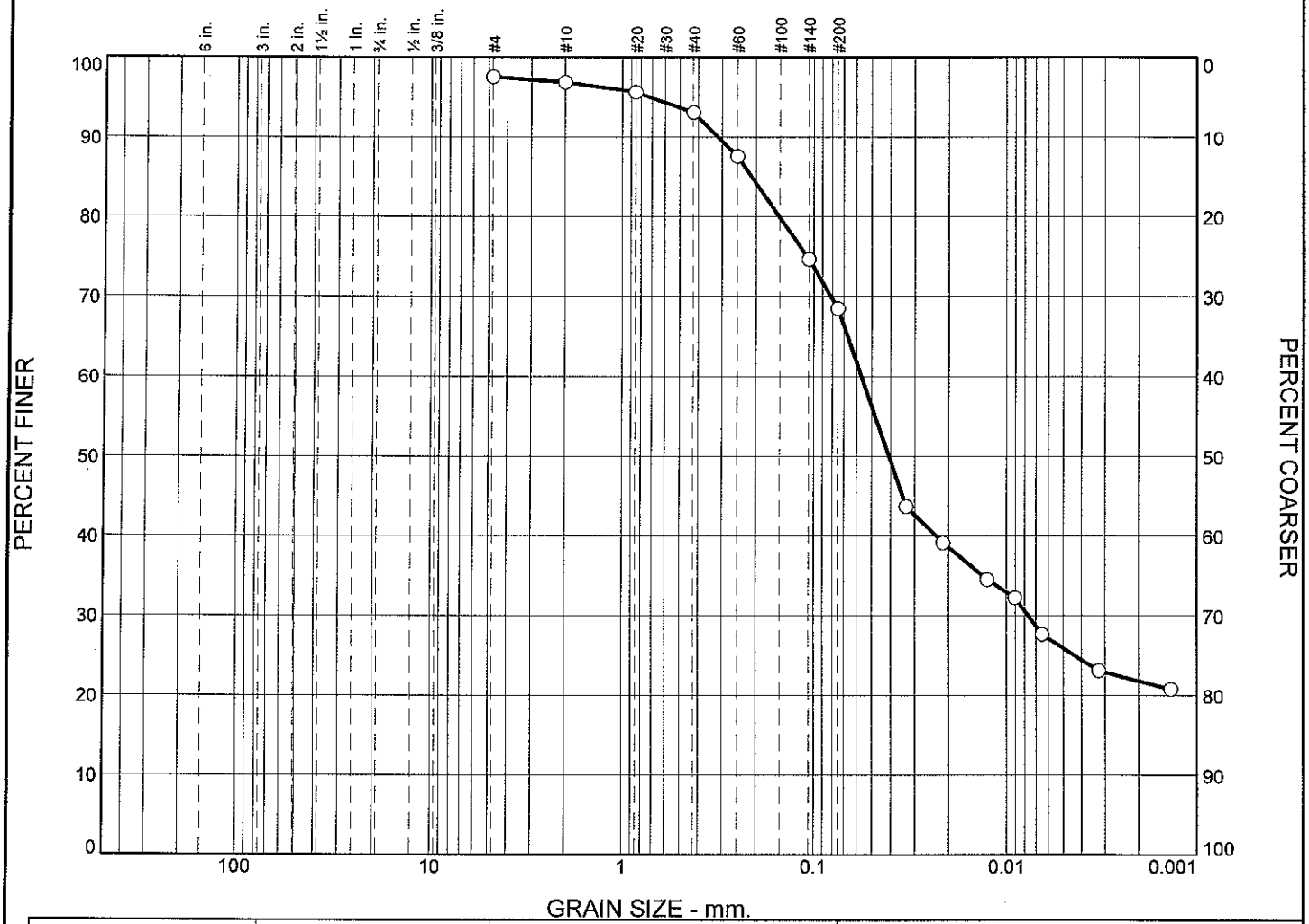
Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.5	3.6	31.5	35.6	48.0	16.4	64.4

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
		0.0110	0.0354	0.0548	0.0681	0.1655	0.2081	0.2698	0.3967

Fineness Modulus
0.35

Alpha Analytical

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				0.7	3.7	24.6	42.6	25.9

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2108	0.0567	0.0408	0.0077				

Material Description	USCS	AASHTO
○		

Project No. L0914033 **Client:** Woods Hole Group

Project: Brushneck Cove

○ **Source of Sample:** B **Sample Number:** L0914033-03

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

11/2/2009

Client: Woods Hole Group
Project: Brushneck Cove
Project Number: L0914033
Location: B
Sample Number: L0914033-03
Sieve opening list: BS Bulk Sieve

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
48.02	0.00	#4	521.98	520.79	97.5	2.5
		#10	482.33	482.00	96.8	3.2
		#20	411.59	411.01	95.6	4.4
		#40	379.21	377.98	93.1	6.9
		#60	372.61	369.97	87.6	12.4
		#140	353.44	347.23	74.6	25.4
		#200	349.44	346.49	68.5	31.5

Hydrometer Test Data

Hydrometer test uses material passing #200
Percent passing #200 based upon complete sample = 68.5
Weight of hydrometer sample =48.02
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -0.04
Meniscus correction only = -3.0
Specific gravity of solids = 2.65
Hydrometer type = 151H
Hydrometer effective depth equation: L = 16.294964 - 0.2645 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
2.00	21.0	1.0190	1.0191	0.0135	16.0	12.1	0.0331	43.7	56.3
5.00	21.0	1.0170	1.0171	0.0135	14.0	12.6	0.0214	39.1	60.9
15.00	21.0	1.0150	1.0151	0.0135	12.0	13.1	0.0126	34.5	65.5
30.00	21.0	1.0140	1.0141	0.0135	11.0	13.4	0.0090	32.2	67.8
60.00	21.0	1.0120	1.0121	0.0135	9.0	13.9	0.0065	27.6	72.4
250.00	21.0	1.0100	1.0101	0.0135	7.0	14.4	0.0032	23.1	76.9
1440.00	21.0	1.0090	1.0091	0.0135	6.0	14.7	0.0014	20.8	79.2

Fractional Components

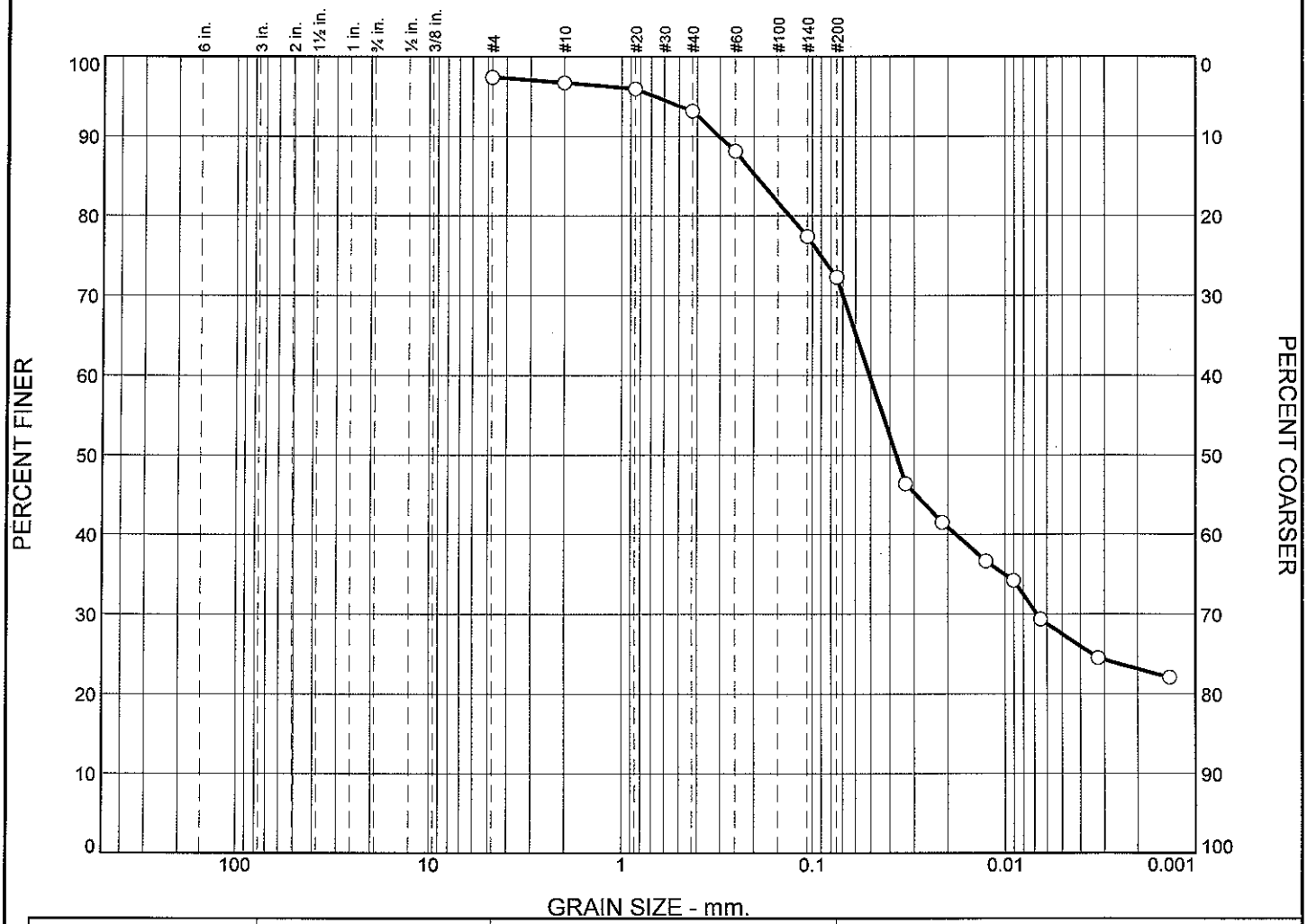
Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
				0.7	3.7	24.6	29.0	42.6	25.9	68.5

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.0077	0.0408	0.0567	0.1513	0.2108	0.3162	0.7174

Fineness Modulus
0.46

Alpha Analytical

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				0.7	3.6	20.8	44.8	27.5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1951	0.0509	0.0371	0.0068				

Material Description	USCS	AASHTO
○		

Project No. L0914033 **Client:** Woods Hole Group

Project: Brushneck Cove

○ **Source of Sample:** B **Sample Number:** WG382969-1

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

11/2/2009

Client: Woods Hole Group
Project: Brushneck Cove
Project Number: L0914033
Location: B
Sample Number: WG382969-1
Sieve opening list: BS Bulk Sieve

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
47.73	0.00	#4	522.94	521.70	97.4	2.6
		#10	485.01	484.68	96.7	3.3
		#20	484.79	484.42	95.9	4.1
		#40	362.99	361.66	93.1	6.9
		#60	368.73	366.32	88.1	11.9
		#140	348.00	342.89	77.4	22.6
		#200	347.59	345.15	72.3	27.7

Hydrometer Test Data

Hydrometer test uses material passing #200
Percent passing #200 based upon complete sample = 72.3
Weight of hydrometer sample =47.73
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -0.04
Meniscus correction only = -3.0
Specific gravity of solids = 2.65
Hydrometer type = 151H
Hydrometer effective depth equation: L = 16.294964 - 0.2645 x Rm

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
2.00	21.0	1.0190	1.0191	0.0135	16.0	12.1	0.0331	46.4	53.6
5.00	21.0	1.0170	1.0171	0.0135	14.0	12.6	0.0214	41.5	58.5
15.00	21.0	1.0150	1.0151	0.0135	12.0	13.1	0.0126	36.6	63.4
30.00	21.0	1.0140	1.0141	0.0135	11.0	13.4	0.0090	34.2	65.8
60.00	21.0	1.0120	1.0121	0.0135	9.0	13.9	0.0065	29.3	70.7
250.00	21.0	1.0100	1.0101	0.0135	7.0	14.4	0.0032	24.5	75.5
1440.00	21.0	1.0090	1.0091	0.0135	6.0	14.7	0.0014	22.1	77.9

Fractional Components

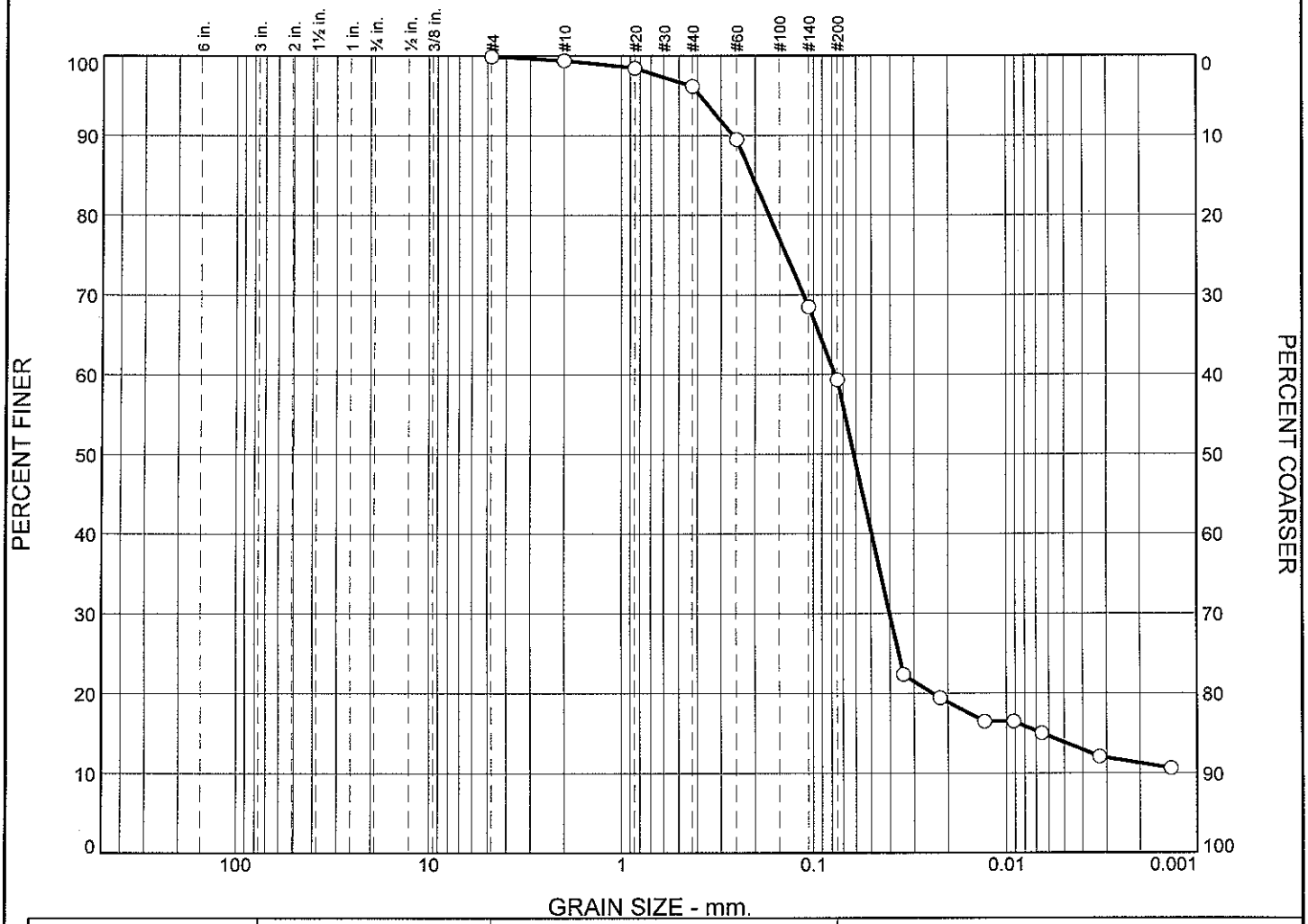
Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
				0.7	3.6	20.8	25.1	44.8	27.5	72.3

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.0068	0.0371	0.0509	0.1307	0.1951	0.3055	0.6739

Fineness Modulus
0.43

Alpha Analytical

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				0.5	3.3	36.8	45.4	13.9

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.2082	0.0770	0.0615	0.0402	0.0065			

Material Description	USCS	AASHTO
○		

Project No. L0914033 **Client:** Woods Hole Group

Project: Brushneck Cove

○ **Source of Sample:** C **Sample Number:** L0914033-04

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

10/26/2009

Client: Woods Hole Group
Project: Brushneck Cove
Project Number: L0914033
Location: C
Sample Number: L0914033-04
Sieve opening list: BS Bulk Sieve

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 32.18
Tare Wt. = 4.62
Minus #200 from wash = 57.5%

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
64.85	0.00	#4	521.78	521.72	99.9	0.1
		#10	485.06	484.72	99.4	0.6
		#20	406.04	405.44	98.5	1.5
		#40	363.14	361.64	96.1	3.9
		#60	370.81	366.49	89.5	10.5
		#140	356.56	342.93	68.5	31.5
		#200	351.16	345.21	59.3	40.7

Hydrometer Test Data

Hydrometer test uses material passing #200
Percent passing #200 based upon complete sample = 59.3
Weight of hydrometer sample =64.85
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -0.04
Meniscus correction only = -3.0
Specific gravity of solids = 2.65
Hydrometer type = 151H
Hydrometer effective depth equation: L = 16.294964 - 0.2645 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
2.00	22.0	1.0150	1.0152	0.0133	12.0	13.1	0.0341	22.3	77.7
5.00	22.0	1.0130	1.0132	0.0133	10.0	13.6	0.0220	19.4	80.6
15.00	22.0	1.0110	1.0112	0.0133	8.0	14.2	0.0129	16.5	83.5
30.00	22.0	1.0110	1.0112	0.0133	8.0	14.2	0.0092	16.5	83.5
60.00	22.0	1.0100	1.0102	0.0133	7.0	14.4	0.0065	15.0	85.0
250.00	22.0	1.0080	1.0082	0.0133	5.0	15.0	0.0033	12.1	87.9
1440.00	22.0	1.0070	1.0072	0.0133	4.0	15.2	0.0014	10.6	89.4

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
				0.5	3.3	36.8	40.6	45.4	13.9	59.3

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0065	0.0241	0.0402	0.0615	0.0770	0.1697	0.2082	0.2605	0.3880

Fineness Modulus
0.36

Alpha Analytical

Certificate/Approval Program Summary

Last revised June 17, 2009 – Mansfield Facility

The following list includes only those analytes/methods for which certification/approval is currently held.
For a complete listing of analytes for the referenced methods, please contact your Alpha Customer Service Representative.

Connecticut Department of Public Health Certificate/Lab ID: PH-0141.

Wastewater/Non-Potable Water (Inorganic Parameters: pH, Turbidity, Conductivity, Alkalinity, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Strontium, Thallium, Tin, Vanadium, Zinc, Total Residue (Solids), Total Suspended Solids (non-filterable), Total Cyanide. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Acid Extractables, Benzidines, Phthalate Esters, Nitrosamines, Nitroaromatics & Isophorone, PAHs, Haloethers, Chlorinated Hydrocarbons, Volatile Organics.)

Solid Waste/Soil (Inorganic Parameters: pH, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, Zinc, Total Organic Carbon, Total Cyanide, Corrosivity, TCLP 1311. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Volatile Organics, Acid Extractables, Benzidines, Phthalates, Nitrosamines, Nitroaromatics & Cyclic Ketones, PAHs, Haloethers, Chlorinated Hydrocarbons.)

Florida Department of Health Certificate/Lab ID: E87814. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: SM2320B, 4500NH3-F, EPA 120.1, SM2510B, 2340B, EPA 245.1, EPA 150.1, EPA 160.2, SM2540D, EPA 335.2, 420.1, SM2540G, EPA 180.1. Organic Parameters: EPA 625, 608.)

Solid & Chemical Materials (Inorganic Parameters: 6020, 7470, 7471, 9045, 9014. Organic Parameters: EPA 8260, 8270, 8082, 8081.)

Air & Emissions (EPA TO-15.)

Louisiana Department of Environmental Quality Certificate/Lab ID: 03090. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: EPA 120.1, 150.1, 160.2, 180.1, 200.8, 245.1, 310.1, 335.2, 608, 625, 1631, 3010, 3015, 3020, 6020, 9010, 9014, 9040, SM2320B, 2510B, 2540D, 2540G, 4500CN-E, 4500H-B, Organic Parameters: EPA 3510, 3580, 3630, 3640, 3660, 3665, 5030, 8015 (mod), 3570, 8081, 8082, 8260, 8270,)

Solid & Chemical Materials (Inorganic Parameters: 6020, 7196, 7470, 7471, 7474, 9010, 9014, 9040, 9045, 9060. Organic Parameters: EPA 8015 (mod), EPA 3570, 1311, 3050, 3051, 3060, 3580, 3630, 3640, 3660, 3665, 5035, 8081, 8082, 8260, 8270.)

Biological Tissue (Inorganic Parameters: EPA 6020. Organic Parameters: EPA 3570, 3510, 3610, 3630, 3640, 8270.)

Maine Department of Human Services Certificate/Lab ID: MA0030.

Wastewater (Inorganic Parameters: EPA 120.1, 300.0, SM 2320, 2510B, 2540C, 2540D, EPA 245.1. Organic Parameters: 608, 624.)

Massachusetts Department of Environmental Protection Certificate/Lab ID: M-MA030.

Non-Potable Water (Inorganic Parameters: SM4500H+B. Organic Parameters: EPA 624.)

New Hampshire Department of Environmental Services Certificate/Lab ID: 2206. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: EPA 200.8, 245.1, 1631E, 120.1, 150.1, 180.1, 310.1, 335.2, 160.2, SM2540D, 2540G, 4500CN-E, 4500H+B, 2320B, 2510B. Organic Parameters: EPA 625, 608.)

New Jersey Department of Environmental Protection Certificate/Lab ID: MA015. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: SW-846 1312, 3010, 3020A, 3015, 6020, SM2320B, EPA 200.8, SM2540C, 2540D, 2540G, EPA 120.1, SM2510B, EPA 180.1, 245.1, 1631E, SW-846 9040B, 6020, 9010B, 9014 Organic Parameters: EPA 608, 625, SW-846 3510C, 3580A, 5030B, 3035L, 5035H, 3630C, 3640A, 3660B, 3665A, 8081A, 8082 8260B, 8270C)

Solid & Chemical Materials (Inorganic Parameters: SW-846 6020, 9010B, 9014, 1311, 1312, 3050B, 3051, 3060A, 7196A, 7470A, 7471A, 9045C, 9060. Organic Parameters: SW-846 3580A, 5030B, 3035L, 5035H, 3630C, 3640A, 3660B, 3665A, 8081A, 8082, 8260B, 8270C, 3570, 8015B.)

Atmospheric Organic Parameters (EPA TO-15)

Biological Tissue (Inorganic Parameters: SW-846 6020 Organic Parameters: SW-846 8270C, 3510C, 3570, 3610B, 3630C, 3640A)

New York Department of Health Certificate/Lab ID: 11627. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: EPA 310.1, SM2320B, EPA 365.2, 160.1, EPA 160.2, SM2540D, EPA 200.8, 6020, 1631E, 245.1, 335.2, 9014, 150.1, 9040B, 120.1, SM2510B, EPA 376.2, 180.1, 9010B. Organic Parameters: EPA 624, 8260B, 8270C, 608, 8081A, 625, 8082, 3510C, 3511, 5030B.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 9040B, 9045C, SW-846 Ch7 Sec 7.3, EPA 6020, 7196A, 7471A, 7474, 9014, 9040B, 9045C, 9010B. Organic Parameters: EPA 8260B, 8270C, 8081A, DRO 8015B, 8082, 1311, 3050B, 3580, 3050B, 3035, 3570, 3051, 5035, 5030B.)

Air & Emissions (EPA TO-15.)

Pennsylvania Department of Environmental Protection Certificate/Lab ID: 68-02089. ***NELAP Accredited.***

Non-Potable Water (Organic Parameters: EPA 5030B, EPA 8260)

Rhode Island Department of Health Certificate/Lab ID: LAO00299. ***NELAP Accredited via LA-DEQ.***

Refer to MA-DEP Certificate for Non-Potable Water.

Refer to LA-DEQ Certificate for Non-Potable Water.

Texas Commission of Environmental Quality Certificate/Lab ID: T104704419-08-TX. ***NELAP Accredited.***

Solid & Chemical Materials (Inorganic Parameters: EPA 6020, 7471. Organic Parameters: EPA 8015, 8270.)

U.S. Army Corps of Engineers

Certificate/Approval Program Summary

Last revised October 22, 2009 - Westboro Facility

The following list includes only those analytes/methods for which certification/approval is currently held.
For a complete listing of analytes for the referenced methods, please contact your Alpha Customer Service Representative.

Connecticut Department of Public Health Certificate/Lab ID: PH-0574. ***NELAP Accredited Solid Waste/Soil.***

Drinking Water (Inorganic Parameters: Color, pH, Turbidity, Conductivity, Alkalinity, Chloride, Free Residual Chlorine, Fluoride, Calcium Hardness, Sulfate, Nitrate, Nitrite, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, Zinc, Total Dissolved Solids, Total Organic Carbon, Total Cyanide, Perchlorate. Organic Parameters: Haloacetic Acids, Volatile Organics 524.2, Total Trihalomethanes 524.2, 1,2-Dibromo-3-chloropropane (DBCP), Ethylene Dibromide (EDB).)
Wastewater/Non-Potable Water (Inorganic Parameters: Color, pH, Conductivity, Acidity, Alkalinity, Chloride, Total Residual Chlorine, Fluoride, Total Hardness, Calcium Hardness, Silica, Sulfate, Sulfide, Ammonia, Kjeldahl Nitrogen, Nitrate, Nitrite, O-Phosphate, Total Phosphorus, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, Zinc, Total Residue (Solids), Total Dissolved Solids, Total Suspended Solids (non-filterable), BOD, CBOD, COD, TOC, Total Cyanide, Phenolics, Foaming Agents (MBAS), Bromide, Oil and Grease. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, 2,4-D, 2,4,5-T, 2,4,5-TP(Silvex), Acid Extractables (Phenols), Benzidines, Phthalate Esters, Nitrosamines, Nitroaromatics & Isophorone, Polynuclear Aromatic Hydrocarbons, Haloethers, Chlorinated Hydrocarbons, Volatile Organics, Extractable Petroleum Hydrocarbons (ETPH), MA-EPH, MA-VPH.)
Solid Waste/Soil (Inorganic Parameters: Lead in Paint, pH, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Tin, Vanadium, Zinc, Total Cyanide, Ignitability, Phenolics, Corrosivity, TCLP Leach (1311), Reactivity. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Extractable Petroleum Hydrocarbons (ETPH), MA-EPH, MA-VPH, Dicamba, 2,4-D, 2,4,5-T, 2,4,5-TP(Silvex), Volatile Organics, Acid Extractables (Phenols), 3.3'-Dichlorobenzidine, Phthalates, Nitrosamines, Nitroaromatics & Cyclic Ketones, PAHs, Haloethers, Chlorinated Hydrocarbons.)

Maine Department of Human Services Certificate/Lab ID: 2009024.
Drinking Water (Inorganic Parameters: SM9215B, 9221E, 9222B, 9222D, 9223B, EPA 180.1, 300.0, 353.2, SM2130B, 2320B, 4500Cl-D, 4500CN-C, 4500CN-E, 4500F-C, 4500H+B,4500NO3-F, EPA 200.7, EPA 200.8, 245.1. Organic Parameters: 504.1, 524.2, SM 6251B.)
Wastewater/Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664A, 350.1, 351.1, 353.2, 410.4, 420.1, Lachat 10-107-06-1-B, SM2320B, 2340B, 2510B, 2540C, 2540D, 426C, 4500Cl-D, 4500Cl-E, 4500CN-C, 4500CN-E, 4500F-B, 4500F-C, 4500H+B, 4500Norg-B, 4500Norg-C, 4500NH3-B, 4500NH3-G, 4500NH3-H, 4500NO3-F, 4500P-B.5, 4500P-E, 5210B, 5220D, 5310C, EPA 200.7, 200.8, 245.1. Organic Parameters: 608, 624.)

Massachusetts Department of Environmental Protection Certificate/Lab ID: M-MA086.
Drinking Water
Inorganic Parameters: (EPA 200.8 for: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl)
(EPA 200.7 for: Ba,Be,Ca,Cd,Cr,Cu,Na,Ni) 245.1, (300.0 for: Nitrate-N, Fluoride, Sulfate)
353.2 for: Nitrate-N, Nitrite-N; SM4500NO3-F, 4500F-C, 4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, 2320B, SM2540C, SM4500H-B.
Organic Parameters: (EPA 524.2 for: Trihalomethanes, Volatile Organics)
(504.1 for: 1,2-Dibromoethane, 1,2-Dibromo-3-Chloropropane), 314.0, 332.
Microbiology Parameters: SM9215B; MF-SM9222B; ENZ. SUB. SM9223; EC-SM9221E; MF-SM9222D
Non-Potable Water
Inorganic Parameters:, (EPA 200.8 for: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn)
(EPA 200.7 for: Al,Sb,As,Be,Cd,Cr,Co,Cu,Fe,Pb,Mn,Mo,Ni,Se,Ag,Sr,Tl,Ti,V,Zn,Ca,Mg,Na,K)
245.1, SM4500H,B, EPA 120.1, SM2510B, 2540C, 2540B, 2340B, 2320B, 4500CL-E, 4500F-BC, 426C, SM4500NH3-BH, (EPA 350.1 for: Ammonia-N), LACHAT 10-107-06-1-B for Ammonia-N, SM4500NO3-F, 353.2 for Nitrate-N, SM4500NH3-B,C-Titr, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, 4500P-B,E, 5220D, EPA 410.4, SM 5210B, 5310C, 4500CN-CE, 2540D, 4500CL-D, EPA 1664, SM14 510AC, EPA 420.1
Organic Parameters: (EPA 624 for Volatile Halocarbons, Volatile Aromatics)
(608 for: Chlordane, Aldrin, Dieldrin, DDD, DDE, DDT, Heptachlor, Heptachlor Epoxide, PCBs-Water), EPA 625 for SVOC Acid Extractables and SVOC Base/Neutral Extractables, 600/4-81-045-PCB-Oil

New Hampshire Department of Environmental Services Certificate/Lab ID: 200307. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM6215B, 9222B, 9223B Colilert, EPA 200.7, 200.8, 245.2, 120.1, 300.0, 314.0, SM4500CN-E, 4500H+B, 4500NO3-F, 2320B, 2510B, 2540C, 4500F-C, 5310C, 2120B, EPA 331.0. Organic Parameters: 504.1, 524.2, SM6251B.)
Non-Potable Water (Inorganic Parameters: SM9222D, 9221B, 9222B, 9221E-EC, EPA 200.7, 200.8, 245.1, 245.2, SW-846 6010B, 6020, 7196A, 7470A, SM3500-CR-D, EPA 120.1, 300.0, 350.1, 351.1, 353.2, 420.1, 1664A, SW-846 9010, 9030, 9040B, SM426C, SM2310B, 2540B, 2540D, 4500H+B, 4500NH3-H, 4500NH3-E, 4500NO2-B, 4500P-E, 4500-S2-D, 5210B, 2320B, 2540C, 4500F-C, 5310C, 5540C, LACHAT 10-117-07-1-B, LACHAT 10-107-06-1-B, LACHAT 10-107-04-1-C, LACHAT 10-107-04-1-J, LACHAT 10-117-07-1-A, SM4500CL-E, LACHAT 10-204-00-1-A, LACHAT 10-107-06-2-D. Organic Parameters: SW-846 3005A, 3015A, 3510C, 5030B, 8021B, 8260B, 8270C, 8330, EPA 624, 625, 608, SW-846 8082, 8081A.)
Solid & Chemical Materials (Inorganic Parameters: SW-846 6010B, 7196A, 7471A, 7.3.3.2, 7.3.4.2, 1010, 1030, 9010, 9012A, 9014, 9030B, 9040, 9045C, 9050C, 1311, 3005A, 3050B, 3051A. Organic Parameters: SW-846 3540C, 3545, 3580A, 5030B, 5035, 8021B, 8260B, 8270C, 8330, 8151A, 8082, 8081A.)

New Jersey Department of Environmental Protection Certificate/Lab ID: MA935. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM9222B, 9221E, 9223B, 9215B, 4500NO3-F, 4500F-C, EPA 300.0, 200.7, 2540C, 2320B, 314.0, SM2120B, 2510B, 5310C, SM4500H-B, EPA 200.8, 245.2. Organic Parameters: 504.1, SM6251B, 524.2.)
Non-Potable Water (Inorganic Parameters: SM5210B, EPA 410.4, SM5220D, 4500Cl-D, EPA 300.0, SM2120B, SM4500F-BC, EPA 200.7, 351.1, LACHAT 10-107-06-2-D, EPA 353.2, SM4500NO3-F, 4500NO2-B, EPA 1664A, SM5310B, C or D, 4500-PE, EPA 420.1, SM4500P-B5+E, 2540B, 2540C, 2540D, EPA 120.1, SM2510B, SM15 426C, SM9221CE, 9222D, 9221B, 9222B, 9215B, 2310B, 2320B, 4500NH3-H, 4500-S D, EPA 350.1, SM5210B, SW-846 3015, 6020, 7470A, 5540C, 4500H-B, EPA 200.8, SM3500Cr-D, EPA 245.1, 245.2, SW-846 9040B, 3005A, EPA 6010B, 7196A, SW-846 9010B, 9030B. Organic Parameters: SW-846 8260B, 8270C, 3510C, EPA 608, 624, 625, SW-846 5030B, 8021B, 8081A, 8082, 8151A, 8330, NJ OQA-QAM-025 Rev.7.)
Solid & Chemical Materials (Inorganic Parameters: SW-846 9040B, 3005A, 6010B, 7196A, 5030B, 9010B, 9030B, 1030, 1311, 3050B, 3051, 7471A, 9014, 9012A, 9045C, 9050A, 9065. Organic Parameters: SW-846 8021B, 8081A, 8082, 8151A, 8330, 8260B, 8270C, 1311, 1312, 3540C, 3545, 3550B, 3580A, 5035L, 5035H, NJ OQA-QAM-025 Rev.7.)

New York Department of Health Certificate/Lab ID: 11148. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM9223B, 9222B, 9215B, EPA 200.8, 200.7, 245.2, SM5310C, EPA 314.0, 332.0, SM2320B, EPA 300.0, SM2120B, 4500CN-E, 4500F-C, 4500H-B, 4500NO3-F, 2540C, EPA 120.1, SM 2510B. Organic Parameters: EPA 524.2, 504.1.)
Non-Potable Water (Inorganic Parameters: SM9221E, 9222D, 9221B, 9222B, 9215B, 5210B, EPA 410.4, SM5220D, 2310B-4a, 2320B, EPA 200.7, 300.0, LACHAT 10-117-07-1A or B, SM4500Cl-E, 4500F-C, SM15 426C, EPA 350.1, LACHAT 10-107-06-1-B, SM4500NH3-H, EPA 351.1, LACHAT 10-107-06-2, EPA 353.2, LACHAT 10-107-041-C, SM4500-NO3-F, 4500-NO2-B, 4500P-E, 2540C, 2540B, 2540D, EPA 200.8, EPA 6010B, 6020, EPA 7196A, S\M3500Cr-D, EPA 245.1, 245.2, 7470A, SM2120B, SM4500-CN-E LACHAT 10-204-00-1-A, EPA 9040B, SM4500-HB, EPA 1664A, SM5310C, EPA 420.1, SM14 510C, EPA 120.1, SM2510B, SM4500S-D, SM5540C, EPA 3005A, 3015. Organic Parameters: EPA 624, 8260B, 8270C, 625, 608, 8081A, 8151A, 8330, 8082, EPA 3510C, 5030B, 9010B, 9030B.)
Solid & Hazardous Waste (Inorganic Parameters: 1010, 1030, SW-846 Ch 7 Sec 7.3, EPA 6010B, 7196A, 7471A, 9012A, 9014, 9040B, 9045C, 9065, 9050, EPA 1311, 1312, 3005A, 3050B, 9010B, 9030B. Organic Parameters: EPA 8260B, 8270C, 8081A, 8151A, 8330, 8082, 3540C, 3545, 3546, 3580, 5030B, 5035.)

North Carolina Department of the Environment and Natural Resources Certificate/Lab ID : 666. Organic Parameters: MA-EPH, MA-VPH.

Pennsylvania Department of Environmental Protection Certificate/Lab ID : 68-03671. ***NELAP Accredited.***
Non-Potable Water (Organic Parameters: EPA 3510C, 5030B, 625, 624. 608, 8081A, 8082, 8151A, 8260B, 8270C, 8330)
Solid & Hazardous Waste (Inorganic Parameters: EPA 1010, 1030, 1311, 3050B, 3051, 6010B, EPA 7.3.3.2, EPA 7.3.4.2, 7196A, 7471A, 9010B, 9012A, 9014, 9040B, 9045C, 9050, 9065. Organic Parameters: 3540C, 3545, 3580A, 5035, 8021B, 8081A, 8082, 8151A, 8260B, 8270C, 8330)

Rhode Island Department of Health Certificate/Lab ID: LAO00065. ***NELAP Accredited via NY-DOH.***
Refer to MA-DEP Certificate for Potable and Non-Potable Water.
Refer to NY-DOH Certificate for Potable and Non-Potable Water.

Utah Department of Health Certificate/Lab ID: AAMA. ***NELAP Accredited.***
Non-Potable Water (Inorganic Parameters: Chloride EPA 300.0)

Analytes Not Accredited by NELAP

Certification is not available by NELAP for the following analytes: **EPA 8260B:** Freon-113, 1,2,4,5-Tetramethylbenzene. **EPA 8330A:** PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT. **EPA 8270C:** Methyl naphthalene, Dimethyl naphthalene, Total Methylnapthalenes, Total Dimethylnaphthalenes. **EPA 625:** 4-Chloroaniline. **EPA 350.1** for Ammonia in a Soil matrix.

CHAIN OF CUSTODY

PAGE 1 OF 2

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd In Lab:

ALPHA Job #: L0914033

Client Information

Client: Woods Hole Group
Address: 81 Technology Park Dr
E. Falmouth, MA 02536
Phone: 508-540-8080
Fax: 508-540-1001
Email: mbuck@whgrp.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Brushneck Cove
Project Location: Brushneck Cove, RI
Project #: TO-0816
Project Manager: Lee Weishar
ALPHA Quote #:

Turn-Around Time

■ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

Report Information - Data Deliverables

☐ FAX ■ EMAIL
■ ADEx ☐ Add'l Deliverables

Billing Information

■ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program | Criteria

MA MCP PRESUMPTIVE CERTAINTY --- CT REASONABLE CONFIDENCE PROTOCOLS

☐ Yes ☐ No Are MCP Analytical Methods Required?
☐ Yes ☐ No Are CT RCP (Reasonable Confidence Protocols) Required?

Other Project Specific Requirements/Comments/Detection Limits:

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS: Grain Size	TOC	Ammonia/Nitrate/TKN/P	SAMPLE HANDLING	Sample Specific Comments	TOTAL # BOTTLES
-1	A - TOC	10/1/09	1750	S	MAB		X				1
	A - Nutrient	10/1/09	1750	S	MAB			X			1
	A - Grain	10/1/09	1750	S	MAB	X					1
-2	A DUP-TOC	10/1/09	1806	S	MAB		X				1
	A DUP - Nutrient	10/1/09	1806	S	MAB			X			1
	A DUP - Grain	10/1/09	1806	S	MAB	X					1
-3	B - TOC	10/1/09	1818	S	MAB		X				1
	B - Nutrient	10/1/09	1818	S	MAB			X			1
	B - Grain	10/1/09	1818	S	MAB	X					1
-4	C - TOC	10/1/09	1840	S	MAB		X				1

SAMPLE HANDLING
Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

Container Type	O	G	G
Preservative	A	A	A

PLEASE ANSWER QUESTIONS ABOVE!

IS YOUR PROJECT MA MCP or CT RCP?

Relinquished By:	Date/Time	Received By:	Date/Time
Mitchell Buck	10/2/09 - 10:10	Paul Dillon	10/2/09 10:10
Paul Dillon	10/2/09 16:00		10/2/09 1600

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms. See reverse side.

FORM NO: 01-01 (rev. 30-JUL-07)

CHAIN OF CUSTODY

PAGE 2 OF 2

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab:

ALPHA Job #: L0914033

Client Information

Client: Woods Hole Group
Address: 81 Technology Park Dr
E. Falmouth, MA 02536
Phone: 508-540-8080
Fax: 508-540-1001
Email: mbuck@whgrp.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Brushneck Cove
Project Location: Brushneck Cove, RI
Project #: TO-0016
Project Manager: Lee Weishar
ALPHA Quote #:

Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☑ EMAIL
☑ ADEx ☐ Add'l Deliverables

Billing Information

■ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program Criteria

MA MCP PRESUMPTIVE CERTAINTY --- CT REASONABLE CONFIDENCE PROTOCOLS

☐ Yes ☐ No Are MCP Analytical Methods Required?
☐ Yes ☐ No Are CT RCP (Reasonable Confidence Protocols) Required?

Other Project Specific Requirements/Comments/Detection Limits:

SAMPLE HANDLING

Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS: Grain Size	ANALYSIS: Ammonia/Nitrate/TKN/TP	Sample Specific Comments	TOTAL # BOTTLES
-4	C-TNutrient	10/1/09	1840	S	MAB		X		1
-1	C-Grain	10/1/09	1840	S	MAB	X			1

Container Type	O	G
Preservative	A	A

PLEASE ANSWER QUESTIONS ABOVE!

IS YOUR PROJECT MA MCP or CT RCP?

Relinquished By:	Date/Time	Received By:	Date/Time
Mitchell Buck	10/2/09-10:10	Paul Gillett	10/2/09 10:10
Paul Gillett	10/2/09 16:00		10/2/09 16:00

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CHAIN OF CUSTODY

PAGE 1 OF 2

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
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Date Rec'd in Lab:

ALPHA Job #: L0914033

Client Information

Client: Woods Hole Group
Address: 81 Technology Park Dr E. Falmouth, MA 02536
Phone: 508-540-8080
Fax: 508-540-1001
Email: mbuck@whgrp.com
☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Brushneck Cove
Project Location: Brushneck Cove, RI
Project #: TO-0816
Project Manager: Lee Weishar
ALPHA Quote #:

Turn-Around Time

■ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

Report Information - Data Deliverables

☐ FAX ■ EMAIL
■ ADEx ☐ Add'l Deliverables

Billing Information

■ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program | Criteria

MA MCP PRESUMPTIVE CERTAINTY — CT REASONABLE CONFIDENCE PROTOCOLS

☐ Yes ☐ No Are MCP Analytical Methocs Required?
☐ Yes ☐ No Are CT RCP (Reasonable Confidence Protocols) Required?

Other Project Specific Requirements/Comments/Detection Limits:

SAMPLE HANDLING
Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	Grain Size	TOC	Ammonia/Nitrate/TKN/P	Sample Specific Comments	TOTAL # BOTTLES
-1	A - TOC	10/1/09	1750	S	MAB		X			1
	A - Nutrient	10/1/09	1750	S	MAB			X		1
	A - Grain	10/1/09	1750	S	MAB	X				1
-2	A DUP-TOC	10/1/09	1806	S	MAB		X			1
	A DUP - Nutrient	10/1/09	1806	S	MAB			X		1
	A DUP - Grain	10/1/09	1806	S	MAB	X				1
-3	B - TOC	10/1/09	1818	S	MAB		X			1
	B - Nutrient	10/1/09	1818	S	MAB			X		1
	B - Grain	10/1/09	1818	S	MAB	X				1
-4	C - TOC	10/1/09	1840	S	MAB		X			1
	Container Type					O	G	G		
	Preservative					A	A	A		

PLEASE ANSWER QUESTIONS ABOVE!

IS YOUR PROJECT MA MCP or CT RCP?

Relinquished By:	Date/Time	Received By:	Date/Time
Mitchell Buck	10/2/09 - 10:10	Paul Gillett	10/2/09 10:10
Paul Gillett	10/2/09 1600		10/2/09 1600
	10/5/09 1300		10/5/09 1300
	10/5/09 1835		10/5/09 1835

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms. See reverse side.

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Date Rec'd in Lab:

ALPHA Job #: L0914033

Client Information

Client: Woods Hole Group
Address: 81 Technology Park Dr
E. Falmouth, MA 025[illegible]36
Phone: 508-540-8080
Fax: 508-540-1001
Email: mbuck@whgrp.com
☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Brushneck Cove
Project Location: Brushneck Cove, RI
Project #: TO-0016
Project Manager: Lee Weishar
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

Report Information - Data Deliverables

☐ FAX ☒ EMAIL
☒ ADEx ☐ Add'l Deliverables

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program | Criteria

MA MCP PRESUMPTIVE CERTAINTY --- CT REASONABLE CONFIDENCE PROTOCOLS

☐ Yes ☐ No Are MCP Analytical Methods Required?
☐ Yes ☐ No Are CT RCP (Reasonable Confidence Protocols) Required?

Other Project Specific Requirements/Comments/Detection Limits:

SAMPLE HANDLING
Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS: ~~Grain Size~~	Ammonia/Nitrate/TKN/P	Sample Specific Comments	TOTAL # BOTTLES
-4	C-Nutrient	10/1/09	1840	S	MAB		X		1
↓	C-Grain	10/1/09	1840	S	MAB	X			1

Container Type	O	G
Preservative	A	A

PLEASE ANSWER QUESTIONS ABOVE!

IS YOUR PROJECT MA MCP or CT RCP?

Relinquished By:	Date/Time	Received By:	Date/Time
Mitchell Buck	10/2/09-10:10	Paul Gillett	10/2/09 10:10
Paul Gillett	10/2/09 16:00	[illegible]	10/2/09 1600
[illegible]	10/5/09 1300	[illegible]	10/5/09 1300
[illegible]	10/5/09 1835	[illegible]	10/5/09 1835

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms. See reverse side.

FORM NO: 01-01 (rev. 30-JUL-07)

Appendix B

Benthic Invertebrate Data

Assessment of marine and estuarine habitats in Rhode Island: benthic organisms from Brush Neck Cove, Warwick, RI.

Sheldon D. Pratt
Graduate School of Oceanography
University of Rhode Island
Narragansett, RI 02882

July 28, 2006

Background

The Department of the Army, NE District, Corps of Engineers is carrying out studies to aid in restoration of Brush Neck Cove and Buttonwoods Cove, Warwick RI. The coves share an entrance on the north side of Greenwich Bay. They extend north, 1 mile and northwest, 0.75 miles, respectively. A bar built by long shore sediment transport narrows the entrance to the Bay.

Benthic invertebrates are important components of shallow estuarine systems and will respond to changes in salinity, oxygen concentration, water depth, sediment grain size, and sediment organic matter concentration. The benthos includes fisheries resource species and indicators of habitat quality.

Corps of Engineers personnel obtained seven samples in the Brush Neck Cove area on August 30 2005. The samples were preserved in 10% formaldehyde solution and delivered to the University of Rhode Island, Graduate School of Oceanography in 2006. Location and elevation of stations were not provided.

Procedure

At the Graduate School of Oceanography the preserved samples were prepared for removal of organisms by washing through 2.0mm and 0.5mm sieves. In each size fraction low-density materials (polychaetes, crustaceans, algae) were separated from high-density materials (sand, shell, mollusks) by suspension and decantation in a tall pitcher. Coarse high-density particles were examined in trays without magnification. All remaining material was examined under low-power dissecting microscopes. Most individuals were identified to the species level. Counts of organisms were entered on computer spreadsheets (MS Excel). Organisms were preserved in 70% alcohol and archived. The volume and constituents of sieve residues were recorded.

Results

Sieve residue

Sand and shell hash (greater than 0.5mm) was retained in samples 4 and 7. Mya and Ilyanassa shells were major constituents in samples 2,3,5, and 6. Organic detritus was the most abundant constituent in sample 1. Ulva fragments were relatively abundant in samples 1 and 2. Unoccupied tubes of ampeliscid amphipods were found in sample 2.

Organisms

Counts of invertebrate organisms recovered from Brush Neck Cove samples are given in Table 1. A total of 32 taxa were identified in seven samples. Each major group (mollusks, annelids and crustaceans) was represented by similar numbers of taxa. The number of individuals varied greatly between major groups, however. There were 937 mollusks, 155 annelids and 58 crustaceans in all samples combined.

Numbers of species and individuals per sample were not correlated. Low numbers of species (3-5) were found in samples 1, 2, 3 and 5. More species (12-16) were found in samples 4, 6, and 7. Large numbers of individuals were found in samples 1, 4, 6, and 7 (132-175), while few individuals were found in samples 2 and 3 (3, 4).

Mollusks: The soft shell clam, *Mya arenaria*, was the most abundant organism collected, with 456 juvenile individuals found in sample 4. Single clams were found in samples 2 and 5. Two living clams and the siphons of 77 dead clams were found in sample 6.

Mature mud snails (*Ilyanassa obsoleta*) were found in high densities in samples with both low and high-diversity faunal assemblages. The slipper limpet (Cripidula fornicata) and the gem clam, *Gemma gemma* was found in samples 4, 6, and 7 with sandy sediments and relatively diverse fauna. *Mya*, *Crepidula* and *Gemma* are suspension feeders. *Ilyanassa* is a deposit feeder and scavenger.

Annelids: Only a few annelid taxa were found in Samples 1-5. *Capitella capitata* was relatively abundant in samples 4 and 5. A greater number of annelid taxa were found in samples 6 and 7. *Heteromastus filliformis*, *Neanthes* spp., *Soclelepis squamata*, S*treblospio benedicti,* and *oligochaetes* were relatively abundant in the samples. The taxa include selective and unselective deposit feeders and predators.

Crustaceans: Only three crustaceans were found in significant densities in this study: the amphipod *Elasmopus levis*, a mud crab, *Eurypanopeus depressus*, and a hermit crab *Pagurus longicarpus*. Empty tubes of the amphipod, *Ampelisca abdita,* were found in sample 3.

Discussion

Distribution of benthos within Brush Neck Cove: Oviatt et al (1975) sampled infauna (300 cm^2 box cores, 0.5mm mesh sieve) and clams (1m^2 quadrats, 2.54 cm mesh screen) along the length of Brush Neck Cove. Dominant fauna at the head of the cove included species that in this region are restricted to low salinity environments (*Hobsonia florida, Cyathura polita*, and *Macoma balthica*). Other species were important throughout the length of the cove (*Heteromastus filliformis, Capitella capitata, Polydora cornuta*, and *Streblospio benedicti*). The most diverse fauna was found in the cove mouth (18 and 21species).

The samples obtained in the present study include most of the species that were found near the cove mouth in 1975. The present study did not sample the brackish water species found at the cove head. The densities of *C. capitata, P. cornuta*, and *S. benedicti* found in 2005 are lower by an order of magnitude than those obtained in 1975. These species are indicators of organically enriched habitats and a decrease in their numbers could indicate improved water quality over time. The generally low numbers of individuals and species richness in 2005 samples could also be the result of some other deleterious effect such as overgrowth by sea lettuce (*Ulva lact*uca). Pratt and Seavey (1981) found reduced numbers organisms under *Ulva* in nearby Apponaug Cove. They noted that the mud snail *I. obsoleta* was one of the few benthic species found where *Ulva* was abundant.

Mortality of *Mya arenaria*: A very high density of *Mya* was found in a single sample. There is evidence that *Mya* recruited throughout the study area in June or July and suffered mortality at many locations before samples were taken in late August. The large number of *Mya* found in sample 4 was all young-of-the year with a median shell length of 12.5 mm. *Mya* siphons in sample 6 indicate that mortality had taken place a short time before sampling. Shells of *Mya* found in the sieve residues of five other samples indicate that mortality had also taken place earlier in the summer (most shells in sample 2 were between 1.5 and 2.1mm long; the largest was 5mm lon).

In this region recruitment of high densities of *Mya* are frequently followed by high mortalities throughout their first year. Predation, high or low temperatures, and unsuitable sediment types are possible causes of mortality. Negative effects of dense *Ulva* on *Mya* was observed by Pratt (Applied Bio-Systems,1997) in Stillhouse Cove, RI. In the present study small particles of *Ulva* were recorded in the residues from sample 1 and 2.

Table 1. Benthic organisms from Brush Neck Cove, August 30 2005

529 cm^2 sample, 0.5mm sieve

SAMPLE	1	2	3	4	5	6	7
PLATYHELMINTHES							
platyhelminthes unk						1	
MOLLUSCA							
GASTROPODA							
Crepidula fornicata				22		24	9
Ilyanassa obsoleta	102		1	114	9	40	31
Odostomia trifida	28					1	
Nassarius trivittatus				1		4	
BIVALVIA							
Gemma gemma				3		18	67
Mercenaria mercenaria		1					
Mulinea lateralis		1					
Mya arenaria		1		456	1	2	
ANNELIDA							
POLYCHAETA							
Capitella capitata			2	23	23	2	2
Glycera dibranchiata							2
Heteroeteone heteropoda						1	3
Heteromastus filliformis						22	3
Leitoscoloplos fragilis							6
Neanthes arenacedonta							11
Neanthes succinea						1	
Polydora cornuta			1	1			
Scolelepis squamata						1	15
Streblospio benedicti						2	10
Tharyx acutus							3
OLIGOCHAETA							
oligochaete unk.						12	9
CRUSTACEA							
OSTACODA							
Ostracoda sp	1						
HARPACTICOIDA							
harpacticoid unk.				1			
CUMACEA							
Oxyurostylis						1	
ISOPODA							
Edotea triloba							2
AMPHIPODA							
Corophium unk.				1	1		
Elsasmopus levis				2	2	14	

Table 1 continued. Benthic organisms from Brush Neck Cove, August 30 2005

529 cm^2 sample, 0.5mm sieve

SAMPLE	1	2	3	4	5	6	7
Microdeutopus gryllotalpa							1
Microprotopus raneyi							1
Mucrogammarus mucronatus						1	
DECAPODA							
Eurypanopeus depressus	1			2		4	
Pagurus longicarpus				21		2	
Total Number of Individuals	132	3	4	647	36	153	175
Total Number of Species	4	3	3	12	5	19	16
Mya arenaria siphons						77	
Sieve Residue (vol cc)	400	400	150	40	10	100	300
Constituents	org detritu	Mya sh.	Mya sh.	sand	Ilyanassa.	Mya sh.	sand
	Mya sh.	Pectinaria	org detrit	shell hash	Mya sh.	sand	shell hash
	Ulva	Ulva	Amp tubes		org detrit		Mya sh.

References

Hoff, J.G. and S. Moss 1978. Apponaug Cove – Greenwich Bay Environmental Survey. Report to New England Division, Corps of Engineers, Waltham MA, Southeastern Massachusetts University, North Dartmouth MA. 43 pp.

Oviatt**,** C.A,. S. Nixon, E. Evans, and B.Wicklow 1975. Environmental assessment of a plan for improving boating and boating facilities at Brush Neck Cove, Greenwich Bay, RI. Report to Gordon R. Archibald, Providence RI, 59 pp

Pratt, S.D.and G. Seavey 1981. The environment of Apponaug Inner Cove and the impact of development on the Cove. Report to Robinson Green Beretta Corp. Providence RI. University of Rhode Island, Kingston RI. 61 pp.

Applied Bio-Systems 1996. Environmental assessment of the Stillhouse Cove dredge project for the Rhode Island Yacht Club…. Prepared by Applied Bio-Systems, 42 North Rd, South Kingstown RI 10 pp.

Benthic Sample Stations.
Stations A-G correspond with the above report Stations 1-7 (A=1, B=2, C=3 etc)

Brush Neck Cove Benthic Samples, July 2006

Legend

- Benthic Sample Station

N
W E
S

0 300 600 1,200 1,800 2,400 Feet

1:12,087

Brush Neck Cove - Benthic Grab Locations			
Station	LAT	Long	Water Depth (ft)
A	41.69861	71.41615	1.5
B	41.69738	71.41338	1.5
C	41.69619	71.41060	2
D	41.68705	71.40351	3.5
E	41.68577	71.40251	4.5
F	41.68469	71.40384	1
G	41.68316	71.39987	2

Appendix C

Historic and Archaeological Resources
(Summaries from websites)

A Brief History of Warwick, Rhode Island

Warwick was founded in 1642 by Samuel Gorton when Narragansett Indian Chief Sachem Miantonomi agreed to accept 144 fathoms of *Wampumpeague* for what was known as “The Shawhomett Purchase.” This included the present day towns of Coventry and West Warwick.

In 1648, Gorton was granted a Charter by Robert Rich, *Earl of Warwicke and Governour in Chiefe for the Colonies*. Because of this, the name of the settlement was changed from Shawomett to Warwick.

In 1772, Warwick was the scene for the first violent act against the Crown when local patriots boarded the British revenue cutter *HMS Gaspee*. It was here that the first English blood of the American Revolution was spilled when the commanding officer of the Gaspee, Lt. Duddingston, was shot with a musket ball while resisting the taking of his ship. The patriots then stripped the Gaspee of all cannon and arms before setting her afire.

During the Revolution, Warwick Militiamen participated in the battles of Montreal, Quebec, Saratoga, Monmouth, Trenton, Rhode Island, and were present for the surrender at Yorktown.

After the war, Warwick and the rest of Rhode Island voted against ratification of the Constitution as it lacked a "Bill of Rights" as was found in Rhode Island's State Constitution. Thus, when the newly inaugurated President George Washington left New York City to travel to Boston, he was required to detour around "The State of Rhode Island and Providence Plantations" as it was an "Independent and Sovereign Republic".

Abundant supplies of water power enabled Warwick to enter the Industrial Revolution and emerge as a major textile manufacturing center. The "Fruit of the Loom Company" was founded in Warwick at the B.B. & R. Knight Mill on the Pawtuxet River.

By the close of the 19th century, Warwick was one of the wealthiest communities in the State. Warwick's 39 miles of coastline are graced with many beautiful stretches of beachfront. This magnificent shore lured many of America's wealthiest citizens into spending their summers in Conimicut, Warwick Neck, Oakland Beach, and Buttonwoods. Before the Great Depression and the Great New England Hurricane of 1938, more millionaires called Warwick their summer home than any other location in the country.

In 1929, the State of Rhode Island began construction of Hillsgrove State Airport in the center of Warwick. When it was completed, it was called "The Most Modern Airport in the Nation". Now known as Theodore Francis Green State Airport, the airport has recently undergone major renovations and is now a work of art to be seen.

Since the original purchase of land from Miantonomi, Warwick increased in size twice and was reduced in size twice and yet remains the second largest city in the State.

In 1654, the Potowomut peninsula was purchased from Taxxomann for grazing of the settlers livestock. In 1696, the settlement in Pawtuxet was added to the town.

By 1741, the residents of the western portion of the town felt that communications with those in the east made efficient government nearly impossible and formed the Town of Coventry.

In 1913, the bulk of the town's population was centered around the textile mills on the west side of the Pawtuxet River. Local politicians seeking to secure their power created the movement to create the new town of West Warwick leaving the eastern portion of the town to the farmers living there.

Warwick was incorporated as a City in 1931 and elected its first Mayor, Pierce Brereton, in 1932.

By the 1950's the textile industry had left New England and the post-war housing boom was underway. Warwick farms became subdivisions as people left cities for life in the suburbs.

Today, Warwick is "the Crossroads of Southern New England" with a major airport and a modern interstate highway and rail system poised to lead the way into the 21st century.

[From: http://www.warwickri.gov/heritage/generalhistory.htm, accessed on December 21, 2007.]

Buttonwoods, Warwick, Rhode Island

Located in the West Bay area of Warwick, the Old Buttonwoods section was founded as a summer colony in 1871 by Rev. Moses Bixby of Providence's Cranston Street Baptist Church who was looking for a serene vacation retreat for his congregation.

He envisioned a community that would be similar to Oak Bluffs on Martha's Vineyard where the Methodists established a summer campground in 1835. Today, this coastal community on Greenwich Bay is home to people of many different religious backgrounds.

This residential neighborhood is small, about 170 homes, and most of the houses are historic, with many Victorian cottages and larger shingled bungalows in the Arts and Crafts style. The waterfront along Promenade Avenue has many mature trees on their streets.

There is a neighborhood group, the Buttonwoods Beach Association, that organizes activities and celebrations for residents, many held at an association-owned building called the Casino. The Casino has a stage and two bowling alleys. Tennis courts and a playground are also nearby. Potluck dinners, seasonal parties, and arts and crafts lessons for children take place there. Association members can use the hall for private parties. The Association owns a non-denominational chapel at Ninth Avenue and Janice Road.

Buttonwoods is also home to Warwick City Park which includes three baseball fields, picnic areas and shelters, three miles of paved bicycle paths and tennis courts among other amenities.

[From http://en.wikipedia.org/wiki/Buttonwoods; accessed on Dec. 10, 2007 and dated May 2007]

Oakland Beach, Warwick, Rhode Island

Oakland Beach is a neighborhood located in the south central area of Warwick on Greenwich Bay, a tributary of Narragansett Bay. This densely populated community of small cottages was developed after World War I as a summer colony, largely for nearby Providence's middle class Irish and Italian communities. Oakland Beach reached its heyday in the 1930's when it boasted a bathing beach, boat docks and restaurants, as well as a Ferris Wheel, and rail service to Providence and other nearby summer colonies.

The New England Hurricane of 1938, however, destroyed most of Oakland Beach. The area never fully recovered and Hurricane Carol in 1954 sent the neighborhood in further decline. By the late 1960's and into the 1970's the area had fallen into decline and became notorious for street fights, drug dealing, and house break-ins. Today, Oakland Beach shows some signs of revitalization as several upscale homes have been built near the shore to take advantage of the panorama of Greenwich Bay and Narragansett Bay. In the summer, hundreds of people flock to Oakland Beach restaurants like Iggy's for clam cakes and chowder, a Rhode Island favorite.

[From http://en.wikipedia.org/wiki/Oakland_Beach_Rhode_Island; last modified on Nov. 21, 2007 and accessed on Dec. 10, 2007]