Environmental Assessment
Finding of No Significant Impact,
Section 404(b)(1) Evaluation,
for Maintenance Dredging

DRAFT

Housatonic River
Federal Navigation Project

Stratford and Milford, Connecticut

US ARMY CORPS
OF ENGINEERS
New England District

June 2012

DRAFT

ENVIRONMENTAL ASSESSMENT

FINDING OF NO SIGNIFICANT IMPACT

HOUSATONIC RIVER

FEDERAL NAVIGATION PROJECT
MAINTENANCE DREDGING

Stratford and Milford, Connecticut

Environmental Resources Section
Engineering/Planning Division
U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

June 2012

TABLE of CONTENTS

I. ENVIRONMENTAL ASSESSMENT

1.0 INTRODUCTION

The purpose of this Environmental Assessment (EA) is to present information on the environmental features of the project area and to review construction information to determine the potential impacts of the proposed project. This Environmental Assessment describes project compliance with the National Environmental Policy Act of 1969 (NEPA) and all appropriate Federal and State environmental regulations, laws and Executive Orders. Methods used to evaluate the environmental resources of the area included biological sampling, sediment analysis, review of available information, and coordination with appropriate environmental agencies and knowledgeable persons. This report provides an assessment of environmental impacts and alternatives considered along with other data applicable to the Clean Water Act Section 404 (b) (1) Evaluation requirements.

2.0 PROJECT AREA

The Housatonic River arises in northwestern Massachusetts, flows in a general southerly direction through Massachusetts and Connecticut for about 120 miles, and enters the north shore of Long Island Sound between Stratford and Milford, at about 60 miles east of New York City. The river is tidal for about 13 miles to the dam in the city of Shelton. The town of Stratford and the city of Milford respectively abut the west and east side of the river's mouth. Farther upstream is the smaller community of Devon, a residential section of Milford. The shoreline of the river below Culvers Bar consists of either undeveloped wetlands or developed residential, boat and docking areas and a municipal airport on the lower west shore. There are marina and yacht clubs along both sides of the Housatonic River. In Stratford there are 7 marinas with a total of 714 slips available, Milford has 3 marina and 246 slips and Shelton also has 3 marinas with 188 slips. There are 87 harbor moorings and 18 residential docks along the river. Additionally eleven commercial fishing vessels use these marinas commercial tugs and barges can be found on the river for repairs and marine construction.

The Housatonic River originates in western Massachusetts and the flows the entire length of western Connecticut before emptying into Long Island Sound. Much of Stratford's approximate 81.5 mile long Housatonic shoreline has been developed. Historically industrial and commercial operations dominated the waterfront, several major industries remain. Newer development consists of residential and water-dependent commercial uses, including marinas. Several marsh islands are upstream in the river.

The Housatonic River Federal Navigation Project (FNP) was authorized by the River and Harbor Act of 1871 and modified by enactments in 1888, 1892, and 1930 (H. Doc. 449, 70th Cong., 2nd Sess.). The existing Federal navigation project provides for an 18-foot deep, 200-foot wide main channel from the mouth of the river to the lower end of Culvers Bar (approximately five miles distance), a 7-foot deep, 100-foot wide channel to Derby and Shelton (a total length of about 13 miles), and three jetties. See Figure 1.

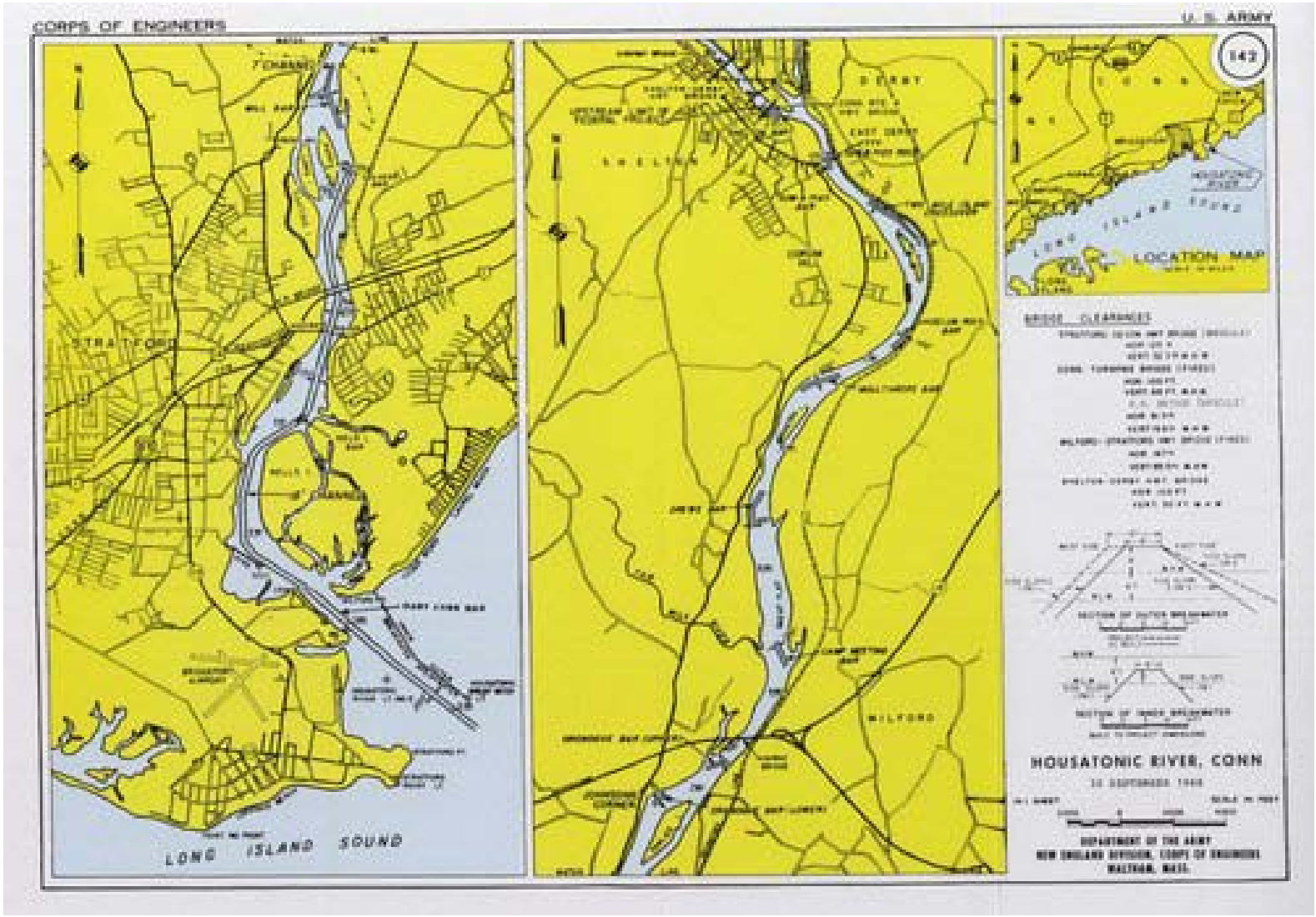


Figure 1. Housatonic River Federal Navigation Project.

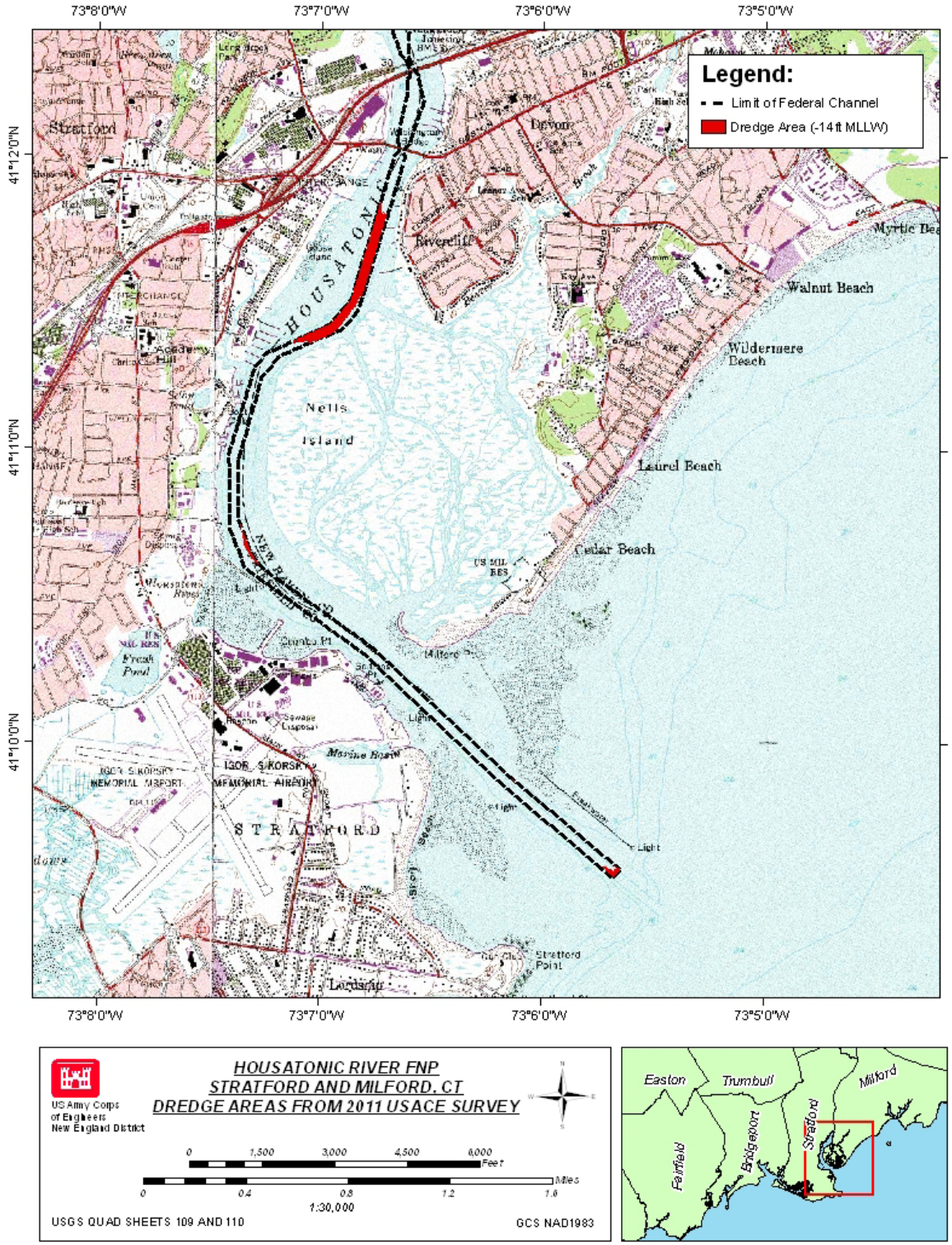


Figure 2. Shoal areas in Housatonic River Federal Navigation Project south of the Route 1 Bridge.

3.0 PURPOSE AND NEED FOR THE PROJECT

The purpose of the proposed action is to meet the navigational needs of the existing commercial and recreational vessel traffic. Natural shoaling processes have reduced the available depths in the 18-foot channel to as shallow as 3.5 feet. Given these conditions and current vessel drafts, shoaling within the project is limiting safe navigation. Maintenance dredging of the project is needed to provide safe access to the project at all tide stages.

Natural tidal action and river flow causes deposition of sediments in the area of the mouth of the Housatonic River Estuary. Maintenance dredging is required to keep the Federal channel open and usable for safe navigation. The project was originally constructed in 1871, and most recently maintained/modified in 1975 & 1976 when 215,000 cubic yards (cy) of shoal material was dredged and disposed of at several upland placement sites (two in Stratford and one in Milford).

3.1 Project Description

The U.S. Army Corps of Engineers proposes to dredge up to 100,000 cubic yards (cy) of predominantly sandy material from shoal areas south of the Route 1 bridge. These shoal areas will be dredged to 14 feet MLLW not to the authorized depth since the current vessel traffic does not require the deeper depths authorized for the Housatonic River FNP. Figure 1 shows the authorized Housatonic FNP and Figure 2 shows the shoal regions that are proposed to be dredged.

The shoal material would be dredged with a government special purpose hopper dredge or a mechanical dredge and placed in the nearshore environment off of Point No Point in Stratford Connecticut. The dredged material will be placed within a constructed berm bounded between the 8 and 11 foot MLLW depth contours (see Figure 3). The quantity of shoal material to be dredged during one dredge event will depend on the available funds at the time of dredging. It is anticipated that funds for only half of the material to be removed will be available in 2012 and this work will be completed using the government-owned special purpose dredge, *Currituck*. The proposed work will be performed over a two to three month period between October 1 and March 31 in the year(s) in which funds become available.

4.0 ALTERNATIVES CONSIDERED

4.1 No Action

The No Action Alternative is required to be evaluated as prescribed by NEPA and the Council on Environmental Quality (CEQ). The No Action Alternative serves as a baseline against which the proposed action and alternatives can be evaluated. Evaluation of the No Action Alternative involves assessing the environmental effects that would result if the proposed action did not take place. Under a No Action Alternative shoal conditions in the Housatonic River Federal navigation channel would continue to increase. Navigation conditions would deteriorate, causing grounding damages to deeper draft vessels and turbidity from prop-wash would increase. Delays to vessel traffic using the harbor may also occur. In view of the number of vessels

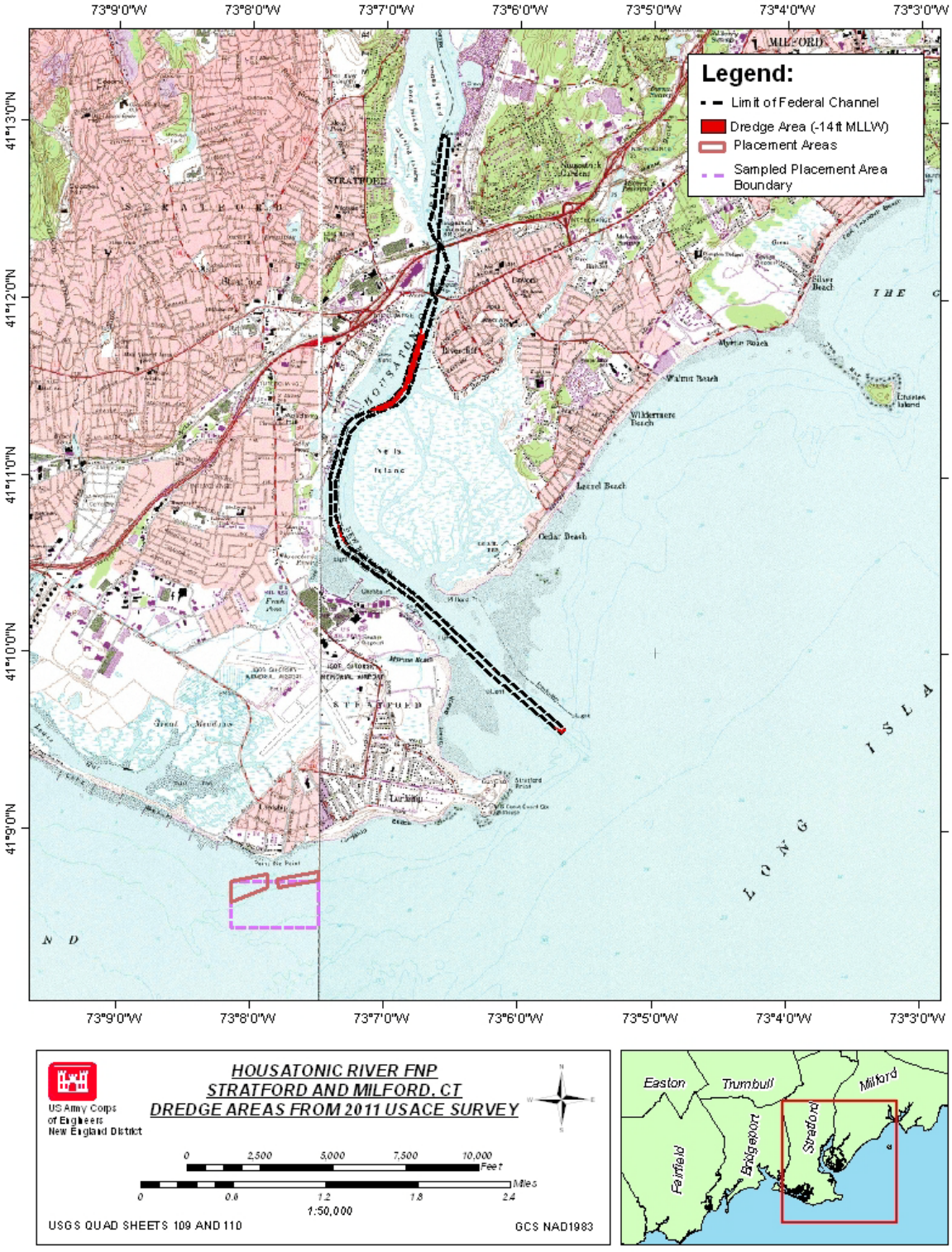


Figure 3. Map of proposed nearshore placement areas off of Point No Point in Stratford, CT.

currently utilizing the project, this alternative is considered unacceptable.

4.2 Dredging Shoal Areas of the Housatonic River FNP

4.2.1 Dredging the Federal Channel to Authorized Depth

Dredging the Housatonic River Federal Navigation Project to authorized depth would require removal of approximately 700,000 cy of material. Most of these shoals do not impact the current navigation traffic that uses the river. Due to the expense to removal material and the need to find a placement site for such a large quantity of material that is not impacting navigation, this alternative was discarded.

4.2.2 Dredging Areas of the Lower Channel to 14 Feet MLLW

This alternative – maintenance dredging of shoal areas south of Route 1 to a depth of 14 feet MLLW is the selected alternative. This alternative provides the greatest public benefits based on the current usage of the FNP, results in no significant, long-term adverse impacts on the environment, and satisfies the Corps of Engineers' Congressionally-mandated authority for maintenance of the Housatonic River Federal project sufficient for project users. Funding constraints may require several dredging events to achieve removal of shoals to 14 feet MLLW.

4.3 Alternative Dredge Methods

Several types of dredges can be used to remove material from navigation channels. The type of dredge proposed for a project is dependent upon the type of material to be dredged and the placement site selected. The three basic types of dredges are hydraulic pipeline or hopper dredge or a mechanical bucket dredge. For this particular project a government owned special purpose hopper dredge or mechanical dredge with associated scows will be used to dredge the Housatonic FNP.

4.3.1 Hydraulic Dredges

4.3.1.1 Cutterhead Pipeline Dredge

A hydraulic cutterhead pipeline dredge consists of a cutterhead on the end of an arm connected to a pump, which loosens the bottom sediments and entrains them in a water slurry that is pumped up from the bottom. The material is then discharged away from the channel (sidecast), or is pumped via pipeline to a dewatering area or placement site. A cutterhead dredge is generally used for sandy material that will be disposed of in an upland area or on a nearby beach, or for pumping any type of unconsolidated material in a confined (diked) placement/dewatering area. Since there are no nearby beaches or upland placement areas available this alternative was removed from consideration.

4.3.1.2 Hopper Dredge

Hopper dredges are not very maneuverable and are best suited, and most productive for

dredging sandy material over long straight reaches (e.g. entrance or bar channels). Hopper dredges work in a "back and forth" motion over the dredge area. A hopper dredge are self-propelled, self-contained, use a suction pump (similar to a hydraulic pipeline dredge) and drag-arms that hang down from the side of the vessel to loosen and remove material from the bottom. The dredged material is drawn up through the drag-arms in a slurry of water and sediment and is deposited into hoppers or holds aboard the dredge vessel. As pumping continues, the sand settles to the bottom of the hopper and excess water flows overboard though troughs (overflow). When the hoppers are full, the drag-arms are raised and the dredge proceeds to the placement site and either releases the material through bottom opening doors to the ocean floor or pumps the material off the dredge from the hoppers into the placement site. The dredge then returns to the dredging area to begin another cycle. Hopper dredges are classified as small, medium and large based on their size and their capacity. Bin (or hopper) capacities range from a few hundred cubic yards to several thousand yards capacity. In New England, hopper dredges are most often used to remove sandy material from harbor entrance channels and deposit the material nearshore off of beaches to nourish littoral bar systems. As mentioned above, the water component of the suctioned slurry is allowed to flow overboard and back into the harbor at the dredging site. For this project a government owned special purpose hopper dredge (*Currituck* or *Murden*) is expected to be used. These are small hopper dredges that are commonly used to dredge sandy entrance channels and place the material in nearshore environments off a beach.

4.3.2 Mechanical Dredge

Mechanical bucket dredging involves the use of a barge-mounted crane, hoe or cable-arm with a bucket to dig the material from the harbor bottom. The material is placed in a scow for transport to the placement site by tug. For open-water or ocean placement, a split-hull scow is usually used for ease of placement and to minimize the discharge plume. Material is typically discharged at a dump buoy, or by using preset coordinates monitored by the tug. The material could be pumped-out of the scow to be placed directly on a beach or some other designated area. A mechanical dredge is a viable dredge alternative for dredging sand from the Housatonic River Estuary, but use of the government-owned special purpose dredge would be more efficient and less expensive than a mechanical dredge.

4.4 Alternative Placement Sites

4.4.1 Upland Placement

In the previous dredging event of 1975/1976, three upland sites were used, a seven acre site within the Short Beach Park area in Stratford, a 6 acre tract on land owned by private citizens in the Town of Strafford by the old spillway near Brookside Drive, Ward Street and Platt Street, and an 7.5 acre area about 6,000 feet upstream of the upper end of the 18 foot channel on land owned by Beard Sand and Gravel Company bounded by Oronoque Road and New Meadow Road in Milford, CT. Depending on where the upland placement site or sites were located, use of any dredge material for upland placement in the State of Connecticut would require additional bulk chemistry testing to meet the Residential Direct Exposure Criteria and GA Ground Water Protection Criteria of the Connecticut Remediation Standard Regulations. Also, SPLP leach testing would also be required to be run on the samples.

Placing sand at an upland site typically requires the use of a hydraulic pipeline dredge or at least pump-out capabilities and a site to dewater the sediments. During the planning process for this maintenance project several upland placement options were investigated. The town proposed beneficial use of the dredged material by use as clean fill on and near the waterfront to establish the desired elevation of the Town's planned linear park in the vicinity of the Stratford Army Engine Plant (SAEP), using the material to help the Army meet its obligations for remediation of the SAEP site, or prepare portions of the SAEP, including the seaplane ramp, for water-dependent development. To date the long-planned project for remediation and redevelopment of the SAEP site has not progressed to the extent that there is any current opportunity for beneficial placement of dredged material on the site. Other opportunities considered that no longer exist include capping the leaf disposal area near Short Beach and the Sikorsky Airport and using the material to help improvements associated the expansion of the Town's wastewater treatment plant. Currently the Planning and Zoning Administrator sees no immediate need or opportunity for using dredged material in the Town (see letter from Bill Rock in Appendix A).

Upland disposal is not the preferred placement alternative since the upland alternatives discussed above are not a viable plan for immediate future and the fact that the dredged sediments are clean sand and use of an upland placement site would remove the material from the littoral system.

4.4.2 Ocean Placement

The Central Long Island Sound (CLIS) Disposal Site is the closest designated open water placement site located approximately 12 nautical miles from the mouth of the Housatonic River. The shoal material to be removed from the project area is sandy and has been found to be suitable for ocean placement. However, disposal of the material at the CLIS disposal site would remove the sediments from the nearshore littoral system while providing limited benefits to the placement site (cap material) while using up valuable capacity of the site; therefore, it is not a preferred alternative.

4.4.3 Beach Placement

The material to be dredged consists of fine-grained sand suitable for beach nourishment. The State of Connecticut requested placement of this material at the Hammonasset State Beach to aid in its erosion repair project. Test results indicate the sediment is suitable for nourishment on Hammonasset State Beach. To implement this alternative the material would need to be pumped onto the beach from either a scow or hopper dredge since the distance from the dredge site is too far for a pipeline cutterhead dredge to pump the material directly from dredge site to placement site. Also, the beach is approximately 29 miles from the mouth of the Housatonic River, so placing the material on the beach would substantially increase the cost and time to complete the project. These costs would need to be cost shared with an identified local sponsor so this alternative is not the preferred alternative. Nearby beaches off of Stratford (Short Beach and Long Beach) and Milford (Cedar Beach, Laurel Beach, Wildermere Beach, Walnut Beach, Myrtle Beach, and Silver Beach) were also investigated, however, a local sponsor would be needed to

pay the additional costs relative to nearshore placement and none have been identified.

4.4.4 Nearshore Placement

There are no previously used nearshore placement sites near the dredge site. Nearshore areas off of Stratford and Milford beaches were also considered. However, placement of dredged material within the nearshore areas off Milford beaches by the mouth of the Housatonic would impact recreational and commercial shellfish beds. Therefore no additional effort was put forth to identify a nearshore placement area off of the Milford beaches for the purposes of potential beach nourishment.

A new nearshore placement site was identified outside the State and Town commercial shellfish beds off Point No Point in Stratford, CT. This large area located between the 6 and 14 foot depth contour was sampled. In general the closer the placement to the shoreline, the better chance for that material to nourish the beach. After modeling sand movements and consideration of the water depth necessary for the dredge, two smaller areas which overlap with the large area were identified as the best sites to create sand berms in the placement area. The proposed nearshore placement areas (see Figure 3) are approximately 3 miles from the mouth of the River. .

As noted above, potential sediment movement was modeled to determine where the sand would move if placed in the nearshore environment off Point No Point (USACE, 2012). These sites are within a reasonable distance to the dredge site that would allow for the use of one of the Government-owned special purpose (hopper) dredges. Placement of the material in these areas would provide for a stable berm while keeping the dredged material within the littoral zone and provide a potential source of beach nourishment material. The sites are bounded between the 8 and 11 foot MLLW depth contours. The more western site is about 17 acres in area and the other site is about 9 acres. Under most wind and wave conditions the berms will be stable and provide a level of protection to the shore from the wave energy. Results of the modeling show that under certain storm and wave conditions the material will move dependent on the direction of the wind and waves (USACE, 2012). If the wind conditions are strong enough and blowing in the correct orientation the material may be transported onto the adjacent beach.

5.0 AFFECTED ENVIRONMENT

5.1 Physical and Chemical Environment

5.1.1 Dredge Site

The area surrounding the Housatonic River Estuary is bordered primarily by wetlands, residential property, and an airport which lies on the lower west shore. In the past the river provided essential waterways and docks for waterborne commerce, which consisted mainly of fossil fuels, sand, gravel, and crushed rock. Presently, the river navigation is primarily recreational.

The Housatonic River is the second largest river that contributes to Long Island Sound, with the Housatonic River watershed covering a 1,950 square mile area. The river contributes an

average annual flow of 3,230 cubic feet per second (cfs) of fresh water, representing about 12% of the total surface water runoff into the Sound. The river is tidal for about 13 miles to the dam in the city of Shelton. Mean tidal range at the mouth of the river is 6.7 feet; 5.5 feet at Stratford; and 5.0 feet at Shelton. Tidal currents at the mouth ranges from slack at one hour after slack and flooding at the Race, to 3.1 knots at three hours after slack and ebbing at the Race. Salinity range for the lower Housatonic has been recorded from 0 to 31 parts per thousand (Aarrestad and Jacobson, 1996).

Water quality in the Housatonic River carries an SB designation. Waters designated SB are deemed suitable for marine fish, shellfish and wildlife habitat, shellfish harvesting for transfer to approved areas for purification prior to human consumption, recreation, industrial and other legitimate uses including navigation.

Except for the navigation channel, the Housatonic River is relatively shallow, with a depth of about 4 feet or less at mean low water.

To assess the physical and chemical features of the project area, sediment samples were collected for grain size and bulk chemistry at twenty-six (26) sites (Appendix B) within the Housatonic River, CT in November of 1999. Several sampling stations were combined to form composite samples for testing (Battelle, 2000). Test results indicated that the majority of material to be dredged in channel is composed predominantly of fine-grained sand. Refer to Appendix B for grain size curves. According to Dave Carey the direction of the Bureau of Aquaculture, there is shell within the entrance of the channel that could be used to improve the oyster habitat in the nearshore placement area.

Bulk chemistry test results (Table 2) indicated that the sediment in the Housatonic River has low levels of contaminants (Category 1) when compared to Connecticut dredge material classification (Table 1).

Based on the results of the bulk chemistry test results, the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency have determined that the maintenance material from the lower Housatonic River FNP is suitable for nearshore and beach placement (see Appendix C). The material will be placed in the nearshore waters located off of Point No Point in Stratford, Connecticut.

Table 1. Connecticut Classification of Dredged Material.

	Category One	Category Two	Category Three
Arsenic (ppm)	< 10	10-20	> 20
Cadmium (ppm)	< 3	3-7	> 7
Chromium (ppm)	< 100	100-300	> 300
Copper (ppm)	< 200	200-400	> 400
Lead (ppm)	< 100	100-200	> 200
Mercury (ppm)	< 0.5	0.5-1.5	> 1.5
Nickel (ppm)	< 50	50-100	> 100
Vanadium (ppm)	< 75	75-125	> 125
Zinc (ppm)	< 200	200-400	> 400
PCBs (ppm)	< 0.5	0.5-1.0	> 1.0

Table 2. Bulk chemistry results from Housatonic River FNP sediments collected November 17-19, 1999.

Core Field ID	(Concentrations in ppm)								(ug/kg)		(%DWt)
	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	Total PCBs	PAHs	TOC
A, A1 Composite	0.621	0.0215	8.02	15.9	0.0293	3.71	4.26	16.1	1.73	Low*	0.12
B	0.857	0.140	16.2	43.7	0.0467	6.23	9.52	35.5	13.82	Low*	.00.27
C, D Composite	1.20	0.438	48.5	154	0.0841	11.4	19.8	95.8	49.42	Low*	0.85
E, F Composite	1.23	0.286	34.3	111	0.0796	9.30	18.0	70.4	41.06	Low*	0.64
G, H Composite	3.84	0.139	33.3	86.6	0.0604	8.56	17.3	69.4	14.38	Low*	0.42
I, J Composite	0.590	0.084	27.6	73.3	0.0507	5.75	11.0	44.2	8.84	Low*	0.34
K	1.00	0.224	37.3	116	0.0708	9.24	22.8	72.5	29.86	Low*	0.64
L, M Composite	1.48	0.336	39.7	119	0.0820	15.7	26.8	105	31.24	Low*	0.94
N, O, P Composite	0.983	0.286	50.2	135	0.0755	10.3	17.1	74.1	83.75	Low*	0.38
Q	0.958	0.338	42.8	157	0.0672	12.2	16.5	92.0	26.95	Low*	0.85
S, T Composite	1.07	0.425	53.3	118	0.0666	12.8	16.9	89.7	91.95	Low*	0.72
U, V Composite	0.756	0.353	43.5	94.7	0.0520	10.4	13.8	77.5	30.52	Low*	0.44
W	0.511	0.345	33.4	61.8	0.0482	8086	9.52	68.0	11.25	Low*	0.49
X	0.825	0.185	28.2	76.2	0.0499	9.13	12.6	64.0	12.19	Low*	0.47
Y	1.44	0.280	36.1	108	0.103	12.0	19.1	90.0	28.58	Low*	1.14

*Refer to Battelle (2000) for the specific concentrations of the various PAHs.

5.1.2 Nearshore Placement Sites

The nearshore waters off of Point No Point are part of Long Island Sound. The tidal range is similar to that for Bridgeport, CT or Stiffens Point in the Housatonic River (mean 6.43 ft -6.74 ft, spring tide 7.33 ft – 7.8 ft). The mean tide level is between 3.46 and 3.8 feet (NOAA, 2011). The waters of Long Island Sound are classified as SA waters. Class SA waters are uniformly good to excellent, designated uses include: fishing, swimming & recreation, healthy marine habitat, direct shellfish consumption, and industrial supply. Allowable wastewater discharges include none other than clean water, drinking water treatment, dredging & dewatering.

Dissolved oxygen levels in the western end of LIS change seasonally. Data from CT DEEP shows oxygen levels can become hypoxic (below 3.0 mg/l) during the summers typically starting in July and ending in early September (CT DEEP, 2011).

Field sampling of the nearshore environment off of Point No Point was conducted by USACE on August 9, 2011. Sediment samples were taken from 6 areas and analyzed for grain size (see Appendices B and F). The nearshore environment is sandy habitat composed of coarse to fine sand with shell fragments (reported as fine gravel in Appendix B) with 1 % or less of fines in any sample. The samples in the northern half of the site (A,B,C) consisted of mostly fine sand with the exception of station C which contained nearly equal parts of medium and fine sized sand particles. The samples the southern half of the site (D,E,F) were predominantly medium sand with significant amounts of coarse and fine sand particles. Grain size curves can be found in Appendix B. Sand waves were present in the north and northwest section of the large site sampled on August 9, 2011 (see Figures 4 & 5). Modeling of the sediments in the nearshore environment showed that a berm built in the northern sections of the large sample area would most likely be stable except the area off the center of Point No Point, sediments placed there had a greater potential to move shoreward (USACE, 2012).

5.2 Biological Environment

5.2.1 Dredge Site

The lower 12 mile section of the river consists of tidal wetlands and salt marshes which provide important habitat for plants, birds, shellfish, finfish and other aquatic life. The Housatonic River is a highly biologically productive area even though the river is moderately polluted. Common species of note which appear seasonally in the estuarine portion of the river include striped bass *(Morone saxatilis),* white perch *(Morone americana),* American smelt *(Osmerus mordax),* bluefish (*Pomatomus saltatrix*), Atlantic mackerel *(Scomber scombrus),* American eel *(Anguilla rostrata),* flounder *(Paralichthys),* tautog *(Tautoga onitis),* black sea bass *(Centropristis striata),* and scup (*Stenotomus chrysops).* Extensive sport fishing exists during the warmer months of the year in the harbor area and along the shore, particularly for stripers and snapper blues. Large schools of striped bass overwinter in the deeper sections of the River north of the Route 15 (Sikorsky) Bridge (upstream from the proposed dredging). Anadromous fish

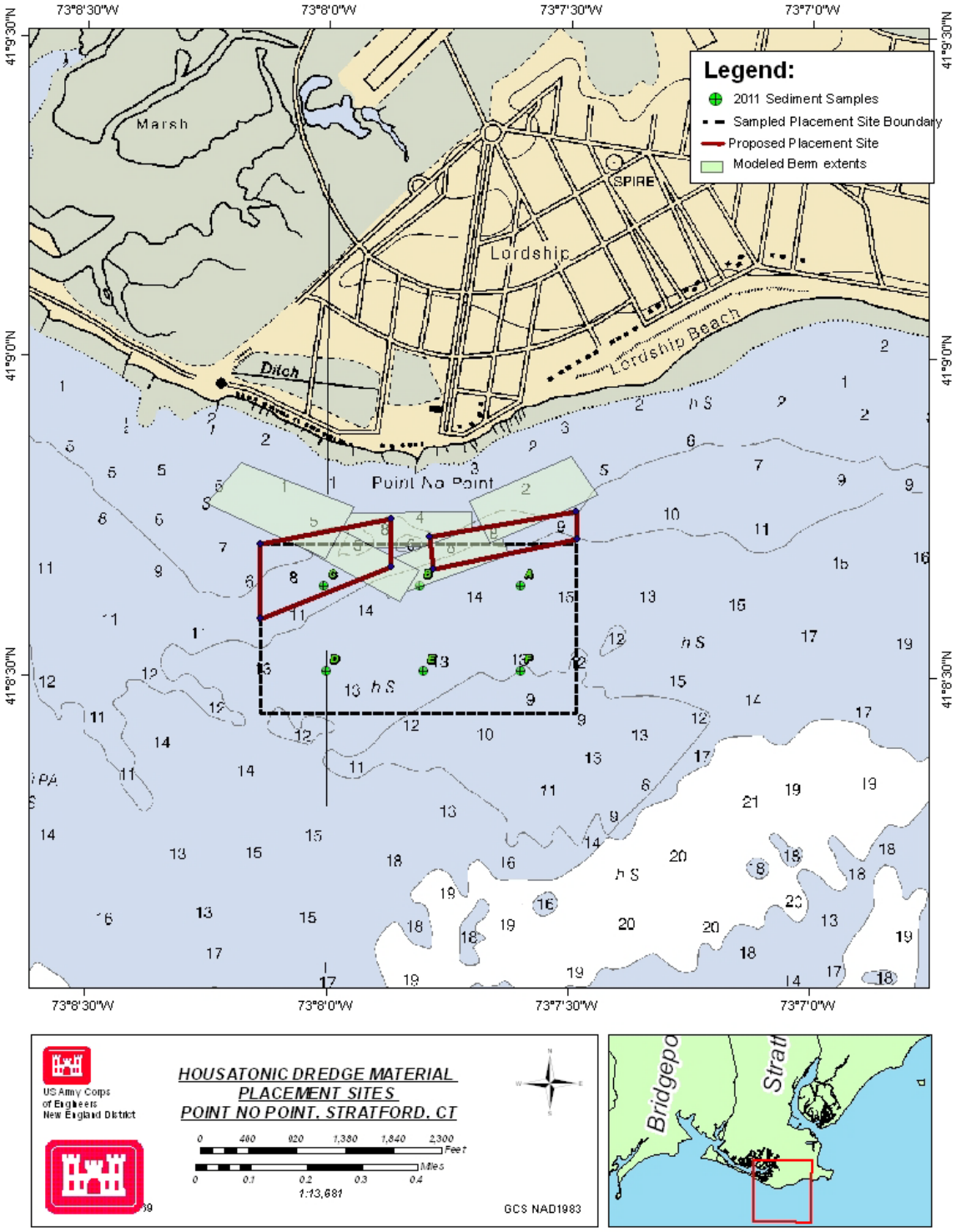


Figure 4. Nearshore area off of Point No Point that was sampled and proposed for placement of material with shell (dashed black rectangle); also shown are regions that were modeled for sediment movement (green boxes), and proposed nearshore placement areas for berms (red outlined areas).

found in the Housatonic include: American shad (*Alosa sapidissima*), sea-run trout (*Salmo trutti)*, alewife (*Alosa pseudoharengus*), and blueback herring (*Alosa aestivalis*) (US FWS and USACE, 1981). River herring (alewife and blueback herring) are candidate species under the Endangered Species Act (NMFS http://www.nero.noaa.gov/nero/regs/frdoc/11/1190dayindingriverherring.pdf) and blueback herring has been listed as a State Species of Concern by Connecticut in July 2010.

The wetlands along the Housatonic Estuary also play an integral part in the ecology of the area. Salt marshes provide sheltering habitat for macro-invertebrates and juvenile fish in addition to providing nutrients to microscopic plants which are the primary source of nourishment for the area's commercially important oyster population. Inside the mouth of the Housatonic River and sheltered from Long Island Sound by Milford Point are intertidal wetlands within the boundaries of the City of Milford, CT. There is a large marsh island (Nell's Island) east of and adjacent to the Housatonic River FNP. A second major wetland area in the Housatonic River is upstream of the I-95 Bridge and consists of several marsh islands (Peacock Island, Carting Island, Long Island and Pope's Island) within Stratford's town boundaries. Also less extensive but ecologically important intertidal areas are found along the towns of Stratford and Milford shorelines.

Benthic samples were obtained from ten shoal areas of the Housatonic River FNP between the entrance and Pope's Island on May 12, 2004. A total of 18 species were identified in the samples. Samples contained as few as two species (station 8) and as many as 8 (stations 1 and 2) (See map of stations in Appendix E, Figure E-1). Station 5 contained the most individuals (2232) but 97.5 % of these individuals consisted of only one species. Station 7 contained the smallest number of individuals (77) in a sample. See Appendix E for specifics about the sample data. *Streblospio benedicti* was the most numerous species and the only species found in every sample. This species is a surface-deposit feeding polychaete. It is relatively tolerant to elevated levels of sediment organics (Reish, 1979), a trait that contributes to its success as a pioneering, opportunistic species. Populations of *S. benedicti* typically thrive in areas where there is reduced competition resulting from stochastic disturbance or environmental stress (Masterson, 2008). In general the benthic community consisted of polychaetes, oligochaetes, mollusks, amphipods, isopods and nematods.

Although the river is a closed shellfish area because of high coliform counts, the estuary is still used to propagate oyster (*Crassostrea virginica*) seeds or spats for subsequent transplant in SA water. The Housatonic River estuary produces one-third of all the seed oysters which are a vital part of Connecticut's commercial shellfish industry. In addition to the oysters, hard-shell (*Mercenaria mercenaria*) and soft-shell (*Mya arenaria*) clams are also plentiful in the Housatonic River estuary. Soft-shell clams are abundant along the Nell's Island marsh, which is also an essential waterfowl habitat. Other valuable waterfowl habitat includes Pope Island, Long Island, Carting Island, Peacock Island, and adjacent marshlands along the west bank of the river which are located about one mile upstream from the Devon anchorage. The Housatonic estuary receives heavy waterfowl use for resting, nesting, and feeding. Mallards (*Anas platyrynchos*), black ducks (*Anas rubripes*), and scaup (*Aythya*) are the predominant species which use the area

while common goldeneye (*Bucephala clangula*), canvas back (*Aythya valisineria*), and bufflehead (*Bucephala albeola*) are frequently seen, and to a lesser extent, teal (*Anas crecca*), and baldpate (*Anas americana*).

5.2.2 Placement Sites

In general, the nearshore environment off of Point No Point is sandy habitat with shell and algae. Field sampling of the nearshore area off of Point No Point was conducted by USACE on August 9, 2011. Underwater video footage showed the bottom habitat to consist of sand and scattered shell with sand waves present in the shallower areas to the north and northwest (see Figure 5). Sand and dense slipper shell was noted in an area approximately 400 feet to the west of the sample site boundary. Scattered clumps of green and red marcoalgae were noted throughout the site.

Benthic sediment samples were collected with a 0.04 m^2 van Veen grab from 6 locations within the sampled area off of Point No Point in Stratford, Connecticut. The number of species per sample ranged from 7 (Station C) to 11 (Station E). The number of individuals ranged from 39 (Station A) to 79 (Station C). Stations C and D had the greatest number of species and the sediments in these two stations consisted of medium and fine sand. Stations A and B consisted of fine sand and stations E and F consisted of medium and coarse sand. See Appendix E for more details.

All of the species/genera identified from the marcobenthic community in the sampled placement area except for Caprellid amphipod and the gastropod *Anachis avara* are found in sandy habitats. These two species live on algae, rocks, plants or other epifauna. The most abundant species were the bivalves *Spisula solidissma* (surf clam) and *Gemma gemma*, both of these species were found in five of the 6 sampling stations. The sampled area, including the proposed placement areas, is within Bridgeport Natural Shellfish Bed so it is not surprising to find juvenile surf clams in the sediment. *Gemma gemma* is an opportunistic species as is the polychaete *Streblospio benedicti*. The other polychaete species with numerous individuals was tube living deposit feeder *Ampharete americana* which was also found in 5 of the 6 sampling stations.

Tellina agilis was the third most abundant species and this species is ubiquitous in sandy habitats, feeding on particles in on the bottom and in suspension. The fourth most abundant species was the amphipod (*Acanthohaustorius millsi*) of the family Haustoridae. Haustorids are adapted for free burrowing in unconsolidated sandy sediments.

5.3 Essential Fish Habitat

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act and amended by the Sustainable Fisheries Act of 1996, an Essential Fish Habitat (EFH) consultation is necessary for this project. EFH is broadly defined as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." Housatonic River, the Federal navigation project, and the proposed nearshore placement sites off of Point No Point all fall into this category and thus have the potential to provide habitat for managed fish species in the area.

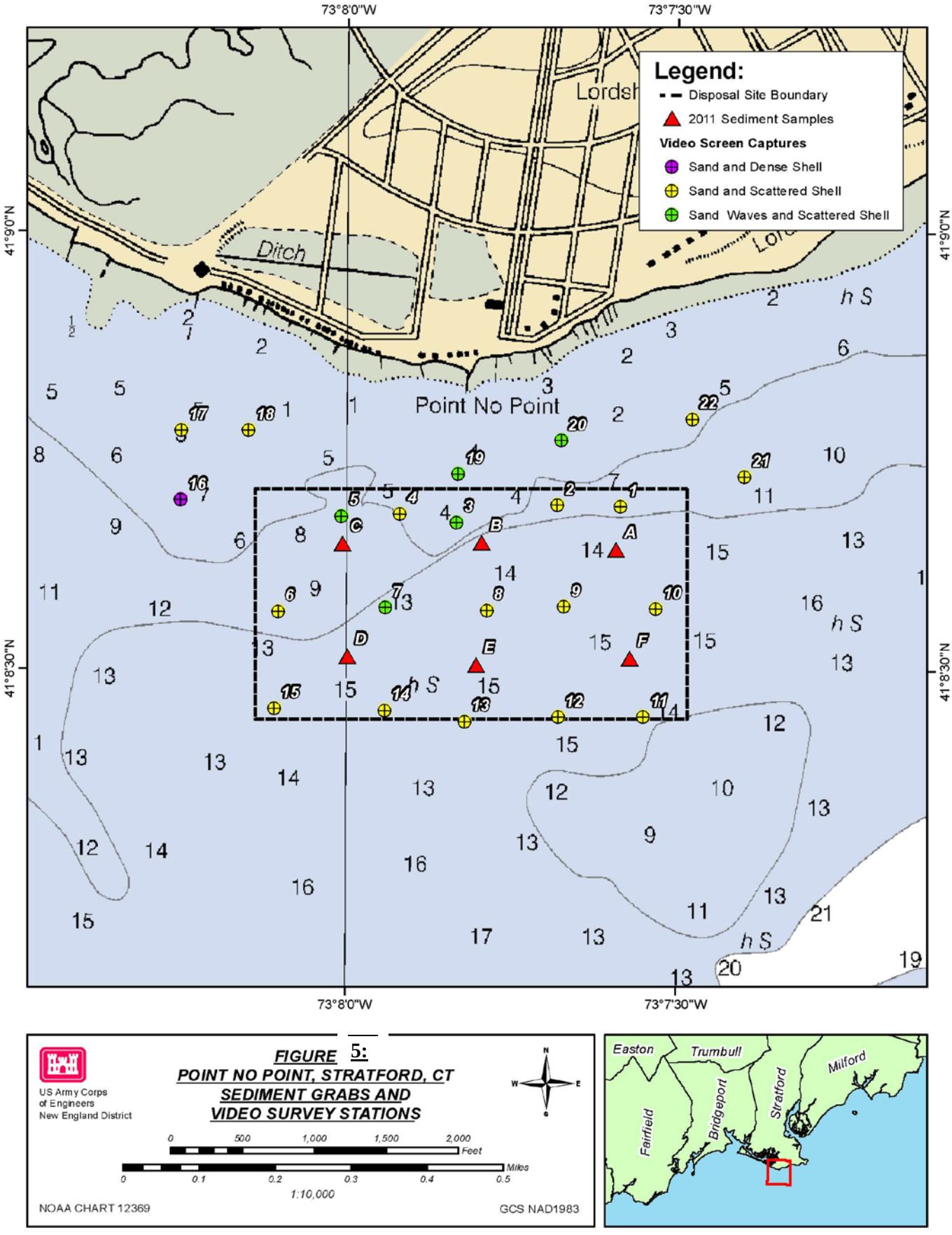


Figure 5. Sediment grab and video survey stations in the nearshore placement site.

5.3.1 Dredge Site

As stated in the NMFS EFH Designation (coordinate boundaries 41° 10.0' N, 73° 00.0' W, 41° 00.0' N, 73° 10.0' W, and 41° 20.0'N, 73° 00.0' W, 41° 10.0' N, 73° 10.0' W), nineteen federally managed species have the potential to occur within or adjacent to the project area. These include: Atlantic salmon (*Salmo salar*), pollack (*Pollachius virens*), whiting *(Merluccius bilinearis),* red hake (*Urophycis chuss*), winter flounder *(Pleuronectes americanus),* windowpane flounder (*Scopthalmus aquosus*), Atlantic sea herring (*Clupea harengus*), bluefish (*Pomatomus saltatrix*), Atlantic mackerel *(Scomber scombrus),* summer flounder *(Paralicthys dentatus),* scup *(Stenotomus chrysops),* black sea bass *(Centropristus striata),* king mackerel *(Scomberomorus cavalla),* Spanish mackerel *(Scomberomorus maculatus),* cobia *(Rachycentron canadum),* sand tiger shark (*Odontaspis taurus*), little skate (*Leucoraja erinacea*) and winter skate (*Leucoraja ocelleata*) . The American plaice *(Hippoglossoides platessoides)* is present within the project area, but only at the entrance to the Housatonic River (the western shore just east of Crimbo Point, south of Stratford.)

5.3.2 Placement Sites

The placement areas are also within the coordinate boundaries of 41° 10.0' N, 73° 00.0' W, 41° 00.0' N, 73° 10.0' W, so the nineteen managed species listed above also have habitat designated in the proposed placement areas.

5.4 Threatened and Endangered Species

5.4.1 Dredge Site

According to the US Fish and Wildlife website the Federally endangered roseate tern (*Sterna dougallii*) may be found on the coastal beaches, islands and Atlantic Ocean in the project area. Four roseate terns were found feeding at the mouth of the Housatonic River on July 8, 2011 (http://www.shorebirder.com/2011/07/stratfordmilford-sandwich-tern.html, accessed on 10/20/2011). The least tern (*Sterna antillarum*) which is listed as threatened in Connecticut was also found feeding in the waters of the mouth of the Housatonic River (http://www.shorebirder.com/2011/07/stratfordmilford-sandwich-tern.html, accessed on 10/20/2011). Also the State threatened bald eagle (*Haliaeetus leucocephalus)* might be a transient species in the project area.

Two species of sturgeon, the state and Federally endangered shortnose sturgeon and Atlantic sturgeon may occur in the river; however, the state has only one confirmed observation for each species, and it is likely that these species are only occasional visitors to the river.

5.4.2 Placement Sites

The roseate tern, least tern, and bald eagle could also be found feeding or transiting within or around the proposed placement areas. The Federally threatened piping plover (*Charadrius melodus*) nests in middle section of Long Beach about a mile the nearest placement area.

No endangered or threatened species of marine mammals or sea turtles regularly occur in Long Island Sound although several species of concern are occasionally present. Infrequent sightings of gray seals, harbor porpoises, and whales have occurred over the years in Sound waters. Threatened or endangered species of sea turtles are also known to occasionally occur in the Sound, particularly the juveniles of Federally threatened loggerhead (*Caretta caretta*) and the Federally endangered Kemp's ridley (*Lepidochelys kempi*) from June 1 through November 30. The Federally endangered leatherback sea turtle (*Dermochelys coriacea*) may also be found in Long Island Sound waters during the warmer months, but are predominantly pelagic. Green sea turtles (*Chelonia mydas*) may also occur sporadically in the project waters, but instances would be rare.

5.5 Historical and Archaeological Resources

5.5.1 Dredge Site

Several pre-Contact archaeological sites are recorded near the project area. It is possible that inundated sites may exist in the nearshore areas, which were gradually submerged following the last glacial retreat. However, the limitation of the proposed project to areas previously dredged will avoid any potential impacts on such sites.

Several historic period shipwrecks, primarily late 19th century barges and schooners, are reported near the river mouth. Similarly, limiting the project to areas already dredged will minimize impacts on those resources.

5.5.2 Placement Areas

Archaeological sites may be located in the vicinity of the proposed disposal site just offshore of Point No Point. This area may have been dry land prior to the retreat of the glaciers. However, a side-scan sonar and underwater video survey of the site did not identify any historic or archaeological features that would suggest the location of a Native American site. Similarly, no evidence of submerged historic properties (i.e. shipwrecks) was discernible in the survey data.

5.6 Socioeconomic Environment

There are marinas and yacht clubs along both sides of the Housatonic River. In Stratford there are 7 marinas with a total of 714 slips available, Milford has 3 marinas and 246 slips and Shelton also has 3 marinas with 188 slips. There are 87 harbor moorings and 18 residential docks along the river. There are 11 commercial fishing vessels that are based in the Stratford marinas. The majority of boats in the river are part of the recreational fleet.

The town of Stratford is located on the southern shore of Connecticut, on Long Island Sound. According to the 2010 US Census, the town had a population of 51,384 and contained 21,091 housing units (http://2010.census.gov/2010census/popmap/ipmtext.php?fl=09). The housing units are primarily year-round, single-family residences. In 2010 the town of Stratford had a total non-farm employment of 24,762 (Connecticut Labor Market Information). The largest employment sectors in the town in 2010 were Manufacturing, Health Care and Social

Assistance, Government, and Retail Trade (Connecticut Labor Department).

5. 7 Air Quality

Ambient air quality is protected by Federal and state regulations. The U.S. Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards (NAAQS) for certain air pollutants, with the NAAQS setting concentration limits that determine the attainment status for each criteria pollutant. The six criteria air pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead.

The entire State of Connecticut is designated as a non-attainment area for ozone and is part of the Northeast Ozone Transport Region which extends northeast from Maryland and includes all six New England states. The EPA designated all counties in Connecticut as moderate non-attainment areas for the 8-hour ozone standard, including Fairfield County where the project is located (U.S. EPA, 2012).

6.0 ENVIRONMENTAL CONSEQUENCES

6.1 No Action Alternative

Under a No Action Alternative, the Housatonic River Federal navigation project would not be dredged. Without a Federal dredging project, shoal conditions in the channel would continue and worsen over time decreasing the water depth, potentially creating tidal delays and safety issues. The bottom sediments would continue to be disrupted by vessels transiting over shoaled areas resulting in sediment resuspension to the water column. This alternative could potentially have an impact on existing habitat type over time due to increased shoaling. The nature of the subtidal community structure has the potential to change with decreasing depths and may eventually result in an overall decrease of subtidal habitat.

6.2 PreferredAlternative

Dredging of up to 100,000 cubic yards of sandy material from the lower Housatonic River Federal navigation project would be performed over a six month period between October and March using the Government-owned special purpose dredge or a mechanical dredge in the year(s) that funding is available. This would result in temporary increases in turbidity and burial of some benthic organisms during dredging and placement activities.

6.2.1 Physical and Chemical Environment

6.2.1.1 Dredge Site

The dredging of the lower section of the Federal channel will have some localized and temporary physical effects on the water and biota of the lower Housatonic River. The sandy sediments in the area have been analyzed and found to contain low levels of contaminants. These sediments have been found to be suitable for nearshore and beach placement (see

suitability determination in Appendix C); therefore, dredging operations are not likely to have any significant effect on the chemical water quality in the area.

The removal of sandy material from the shoal areas in the lower Housatonic River has the potential to temporarily increase turbidity in the project area. An increase in suspended solids levels during dredging is the result of the dredge disturbing the bottom sediments and overflow of the hopper, but the sand will rapidly settle out of the water column. Turbidity impacts primarily affect the performance of visual predators such as fish and birds, the primary production of phytoplankton, growth and survival of benthic organisms (Karel, 1999), and impact other sensitive receptors (e.g. gill abrasion) on the organisms (Kurland *et al*., 1994). Turbidity can alter light regimes (reduce light) which has the potential to impact primary production, species distribution, behavior, feeding ability and movements of fish especially larval fish (Berry *et al*., 2003). However, increased turbidity is not always detrimental to resources. The distribution of several species of juvenile marine fish common in estuaries was influenced by water turbidity (Cyrus and Blader, 1987). Some species prefer more turbid waters, possibly as protection from predators. In terms of dredging, the increases in turbidity over background are short-term (hours, days to weeks) but are usually not continuous due to project scheduling, dredge type or tidal regimes (based on data from water quality monitoring of dredging fine (silty/clayey) sediments from the Boston Harbor Navigation Improvement Project (ENSR, 2002) and Providence River and Harbor Maintenance Dredging Project (USACE, 2003).

Coastal and estuarine organisms are exposed to suspended sediments from tidal flows, currents and naturally occurring storm events; therefore they have adaptive behavioral and physiological mechanisms for dealing with this feature of the habitat. Dredging related suspended sediments or turbidity plumes may differ in scope, timing, duration, and intensity from natural conditions (Clarke and Wilber, 2000). Major storms can displace larger amounts of sediments than dredging operations, and tend to occur one to three times a year. This is more frequent than most dredging operations at a particular area and dredging affects much smaller regions (i.e. a localization of impacts) than these major storms (Wilber and Clarke, 2001). In general the duration and concentration gradients of suspended sediment plumes from dredging are dependent on numerous factors, such as specific dredge plant, sediment characteristics, and environmental conditions (Collins, 1995).

However, the turbidity effects for this project are anticipated to be short-term and localized around the dredge area due to the sandy nature of the material to be removed from the channel. Also, sandy material is generally not associated with high levels organic carbon, and dredging the sandy material from the channel is not likely to result in the release of nutrients or result in any decreases in dissolved oxygen. The majority of resuspended sediments from a hopper dredge are due to overflow of the hoppers into surrounding waters. A hopper dredge without overflow could suspend 25-200 mg/l of silty sediments within 100 to 400 feet down current of the dredge (Hayes, 1986). For the *Currituck* and sandy sediments, suspended sediments above 150 mg/l were only found within small areas of the central portions of the plumes and concentrations above 50 mg/l were generally confined to within 300 feet of the active overflow (draft report Clarke *et al*). Resuspension of sediments from a mechanical dredge is generally due to the dynamic impact of the bucket on the channel bottom, the spillage and leakage from the filled bucket, and the washing action of the empty bucket falling through the water column (Hayes, 1986).

For silty material, an open bucket could resuspend solids concentrations of 150-900 mg/l within 100 feet (30.5 m), 100-600 mg/l within 200 feet (61 m) and 75-350 mg/l within 400 feet (122 m) downstream of the dredge (Hayes, 1986). Since the material to be dredge consists of sandy sediments minimal impacts from resuspension of sediments is expected. Also, no known recent point sources of pollution or any significant spills have occurred in Housatonic River.

6.2.1.2 Placement Sites

The sediments in the Housatonic River FNP are similar to the fine-grained sediment found in the nearshore environment of Long Island Sound. The dredged material will be used to build berms confined to the smaller placement areas depicted in Figure 4. Under most wind and wave conditions the berms will be stable and provide a level of protection to the shore from the wave energy. Under certain storm and wave conditions the berm material maybe transported away from the area dependent on the intensity and direction of wind and waves.

There would be no significant change in habitat type after the placement of dredged material. There will be temporary increases in turbidity at the placement site during disposal operations which could last up to one hour after placement (draft report, Clarke *et al*). However, once disposal is completed, water quality conditions will return to normal with no long-term impacts.

The western end of LIS tends to become hypoxic (below 3.0 mg/l) during the summers typically starting in July and ending in early September (CT DEEP, 2011) which could delay benthic recolonization of the placement areas. The placement of dredged material at Central Long Island Sound Disposal Site (CLIS) has had a negligible impact on the levels of dissolved oxygen levels (USACE 1998), therefore hypoxic conditions are not expected from the placement of sandy dredged material in the nearshore site off of Point No Point. Also the dredging and placement of the sandy material would not occur during the summer months when hypoxic conditions occur.

6.2.2 Biological Environment

6.2.2.1 No Action Alternative

The No Action Alternative would allow the sediments to continue to build up in shoaled areas within the lower Housatonic River FNP channel. This would decrease the water depth, reducing available subtidal habitat and eventually reducing intertidal habitat with the potential for conversion of some areas to upland habitat. During the shoaling process there is the potential to increase shallow habitat availability for some organisms while reducing deeper habitat areas thus excluding resident species (that prefer deeper habitats).

6.2.2.2 Dredge Site

Benthic organisms associated with the sediments being dredged may be destroyed by the dredging process. Mobile organisms living on the surface would be displaced. However, once the dredging is completed the area would be recolonized in a short time by opportunistic species and by organisms living in adjacent areas. The types of organisms that generally inhabit fine

sand substrate, such as in the Housatonic River FNP are adapted for recolonizing in short periods because they adjust to the many rigors and changes of salinity, turbidity, and temperature in an estuarine environment. One significant adaptive characteristic is that these organisms may have several life cycles in a season to produce enough organisms to sustain the population from predation and other stresses (Rhoads *et al*., 1978). After the dredging activity is completed, there will be good opportunity for recolonization during the following growing season. Therefore, no long-term effects from the dredging on the benthos of the channel area are anticipated. Impacts to finfish species are not expected to be significant. Finfish should be able to avoid the area being dredged and return upon completion.

River herring (alewife and blueback) and possibly American shad could be migrating up the river during the spring to spawn. The Inland Fisheries Division typically recommends that dredging be prohibited during the collective migratory period of April 1 to June 30. A government-owned special purpose dredge such as the *Currituck* would have minimal impact on migrating fish due to the sandy nature of the sediments and limited turbidity associated with the dredging, and the non-continuous aspect of hopper dredging. A mechanical dredge would also have minimal impacts on migrating fish due to sandy nature of the sediments and limited turbidity associated with the dredging. Also the width of river would allow the fish to swim around any temporary sediment plume that may be present in the channel. Striped bass are in the river year-round and large schools overwinter in the deeper sections of the river north of the Route 15 (Sikorsky) bridge, therefore dredging the shoal regions of the Housatonic Rivers below the Route 1 Bridge would not impact these fish.

Winter flounder (*Pseudopleuronectes americanus*) spawn in the Housatonic River, but they tend to be found in the marshes and coves; the siltier parts of the river that would not be dredged. The Housatonic River is EFH for winter flounder according the NMFS EFH maps (http://www.nero.noaa.gov/hcd/STATES4/conn_li_ny/41007300.html). The eggs of winter flounder are demersal and are typically found at depths of less than 16.4 feet (5 m) in bottom waters in a broad range of salinities (10 - 30 ‰). Spawning, and therefore the presence of eggs, occurs from February to June. The larvae, juveniles, and adults prefer bottom habitats of mud and fine-grained sandy substrate in waters ranging from 0.3 to 328 feet (0.1-100 m) in depth. The older juveniles and adults are very mobile and would be able to flee from the dredging once activities commenced. Since most of the eggs would be in areas not impacted by dredging activities, only minimal number of eggs and larvae may be affected by sediment removal and the associated turbidity during dredging activities. However, any impacts that occur will be localized and short term. The Connecticut State Inland Fisheries is not recommending a seasonal work restriction during the winter flounder spawning season (pers. comm., Mark Johnson).

The Housatonic estuary is the most consistent producer of seed oysters in the northeast as a public oyster bed, and generates over one-third of all oyster seed available to the state shellfish industry. These beds are not located in the shoal areas of the river that are proposed to be dredged. USACE will attempt to avoid dredging during the oyster spawning season of July 15 through September 30 to limit impacts to any eggs and spat that may be present in the water column.

6.2.2.3 Placement Sites

Burial of benthic organisms will occur at the nearshore placement sites, however, recolonization by benthic species from adjacent areas and new recruitment is expected to occur in a short period of time with no long-term impacts. Any increases in turbidity would be short-term and expected to return to background levels within a short time after any placement event. Any fish in the vicinity of the disposal site would be either be expected to avoid the disturbance or experience increased levels of turbidity for only brief periods, and should realize little, if any, adverse impacts.

6.3 Essential Fish Habitat

6.3.1 No Action Alternative

The No Action Alternative could have an impact on EFH due to changes in available habitat type over time. As stated in Section 6.1, the shoaled area(s) began as subtidal habitat which transitions to intertidal and then potentially to an upland area.

6.3.2 Preferred Alternative

There is little if any potential for significant adverse effects, including cumulative effects, of the proposed action on Essential Fish Habitat. The dredged material has been found to be suitable for disposal at the nearshore disposal site, and the area is well flushed by the daily tides and wave action. Any impacts from dredging and placement activity are expected to be short-term, and localized. Recolonization of any benthic organisms buried by placement of dredged material should occur quickly. An assessment of the Housatonic River project area indicates that there will be no significant impacts to Essential Fish Habitat, as defined by the Magnuson-Stevens Fishery Conservation and Management Act and amended by the Sustainable Fisheries Act of 1996, with this project. Impacts to EFH from this project include temporary increases in turbidity from dredging activities and the temporary loss of benthic organisms associated with the dredged material. Due to the sandy nature of the dredged material, neither the schooling life stages nor spawning and nursery habitats are expected to be significantly impacted by the proposed project. Since these impacts are only temporary this project is not expected to significantly affect any managed species or habitat. Appendix D contains a complete EFH assessment.

6.4 Threatened and Endangered Species

Dredging and placement activities should not affect any feeding or transiting roseate terns, lest terns, or bald eagles that have the potential to be found in the project areas. The project areas are relatively small when compared to the overall potential habitat available for use by these birds. Piping plovers nest on Long Beach but they would not be impacted by any placement of dredged material in the nearshore environment since the place sites are at least a mile away.

Two species of sturgeon, the state and Federally endangered shortnose sturgeon and Atlantic sturgeon may occur in the river; however, the state has only one confirmed observation for each species, and it is likely that these species are only occasional visitors to the river, therefore we do not anticipate any impacts to sturgeon species from this project.

No endangered or threatened species of marine mammals or sea turtles permanently reside in Long Island Sound although transient species do occur. Additionally sea turtles cannot be entrained by the government-owned special purpose dredge *Currituck* and are not known to be vulnerable to capture in a mechanical clamshell bucket dredge. Therefore no adverse impacts to endangered or threatened species are anticipated as a result of this project.

6.5 Historical and Archaeological Resources

The proposed maintenance dredging of the existing Federal navigation project in the Housatonic River and disposal of the dredged material nearshore off of Point No Point in Stratford, CT is unlikely to have an effect upon any structure or site of historic, architectural or archaeological significance as defined by the National Historic Preservation Act of 1966, as amended and 36 CFR 800. The Connecticut State Historical Preservation Officer (SHPO) is expected to concur with this determination.

7.0 AIR QUALITY STATEMENT OF CONFORMITY

U.S. Army Corps of Engineers guidance on air quality compliance is summarized in Appendix C of the Corps Planning Guidance Notebook (ER1105-2-100, Appendix C, Section C-7, pg. C-47). Section 176 (c) of the Clean Air Act (CAA) requires that Federal agencies assure that their activities are in conformance with Federally-approved CAA state implementation plans (SIP) for geographic areas designated as non-attainment and maintenance areas under the CAA. The EPA General Conformity Rule to implement Section 176 (c) is found at 40 CFR Part 93.

Clean Air Act compliance, specifically with EPA's General Conformity Rule, requires that all Federal agencies, including Department of the Army, review new actions and decide whether the actions would worsen an existing NAAQS violation, cause a new NAAQS violation, delay the SIP attainment schedule of the NAAQS, or otherwise contradict the State's SIP.

The State of Connecticut is authorized by the EPA to administer its own air emissions permit program, which is shaped by its State Implementation Plan. The SIP sets the basic strategies for implementation, maintenance, and enforcement of the National Ambient Air Quality Standards (NAAQS). The SIP is the federally enforceable plan that identifies how that state will attain and/or maintain the primary and secondary National Ambient Air Quality Standards (NAAQS) established by the EPA (U.S. Environmental Protection Agency, 2012). In Connecticut, Federal actions must conform to the Connecticut state implementation plan or Federal implementation plan. For non-exempt activities, the Corps must evaluate and determine if the proposed action (construction and operation) will generate air pollution emissions that aggravate a non-attainment problem or jeopardize the maintenance status of the area for ozone. When the total direct and indirect emissions caused by the operation of the Federal action/facility are less than threshold levels established in the rule (40 C.F.R. § 93.153), a Record of Non-

applicability (RONA) is prepared and signed by the facility environmental coordinator.

7.1 General Conformity

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved SIP for their geographic area. However, maintenance dredging projects are exempt from performing a conformity review based on 40 CFR 93.153(c)(2) which states: *The following actions which would result in no emissions increase or an increase in emissions that is clearly de minimis:* (ix) *Maintenance dredging and debris disposal where no new depths are required, applicable permits are secured, and disposal will be at an approved disposal site.*

8.0 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" require federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its program, policies, and activities on minority and low-income populations in the U.S., including Native Americans. The proposed action will not have any disproportionate high or adverse impacts on minority or low-income populations, or any adverse short or long-term environmental justice impacts because the proposed action will be dredging a Federal channel located in the waters of Housatonic River, with placement of the dredged material at a nearshore area located off Point No Point in Stratford, Connecticut in Long Island Sound. No environmental justice populations are located in these areas.

Executive Order 13045, "Protection of Children From Environmental Health Risks and Safety Risks," requires federal agencies to identify and assess environmental health risks and safety risks that may disproportionately affect children. The proposed action will not pose any significant or adverse short or long-term health and safety risks to children because the material has been tested and qualifies as clean sand that does not contain any quantities of contaminants that can be harmful to children. Also, the dredging will take place in waters of the Housatonic River which does not have any playgrounds or schools nearby, and nor do the nearshore placement sites in Long Island Sound.

9.0 CUMULATIVE EFFECTS

Cumulative impacts are those resulting from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions. Past and current activities in the Housatonic River FNP include the maintenance dredging of the Federal Navigation Project, maintenance dredging and other maintenance of private marinas in the area, and navigation in the channel. Reasonably foreseeable future actions include the continuation of current maintenance and navigation activities. The effects of these previous, existing and future actions are generally limited to infrequent disturbances of the benthic communities in the dredging areas. Water quality, air quality, hydrology, and other biological resources are generally not significantly affected by these actions with any disturbance being short-lived. Consequently, the direct effects of

this project are not anticipated to add to impacts from other actions in the area. Therefore, no adverse cumulative impacts are projected as a result of this project.

10.0 ACTIONS TO MINIMIZE ENVIRONMENTAL CONSEQUENCES

To minimize adverse impacts to resources in the Housatonic River and the Point No Point placement area, the following actions will be taken:

1). No dredging between April 1 and June 30 to protect anadromous fish runs.
2). No dredging between July 15 and September 30 to protect shellfish spawning.

11.0 COORDINATION AND PUBLIC INVOLVEMENT

A public notice will be released for this project in the near future and coordination meetings have been held between Federal and State agencies to discuss various aspects of this project. Refer to Appendix B for coordination letters. The following agencies that have been contacted for this project include:

Federal agencies:

U.S. Environmental Protection Agency
Region 1
Boston, MA

U.S. Fish and Wildlife Service
Concord, NH

National Marine Fisheries Service
Gloucester, MA

Federal Indian Tribes

Mashantucket Pequot Tribe
Mohegan Tribe

State agencies:

Connecticut Department of Energy and Environmental Protection
Office of Long Island Sound Programs
Connecticut Department of Agriculture (Aquaculture Division)
Connecticut State Historic Preservation Officer
Connecticut State Archaeologist
Connecticut Coastal Area Management Program

Local agencies:

Towns of Milford and Stratford

12.0 REFERENCES

Aarrestad, P.J., R.A. Jacobson. 1996. Spatial and Temporal Composition of the Fisheries Resources of the Lower Housatonic River Connecticut. State of Connecticut, Department of Environmental Protection, Fisheries Division. Federal Aid in Sport Fish Restoration F-61-T-9, Job 3 Habitat Conservation and Enhancement, Fisheries. April 1, 1991- March 1995, Final Report. 106 pp.

Battelle. 2000. Final Data Report for Vibratory Core Sampling Housatonic River, CT. Submitted to US Army Corps of Engineers, New England District, Concord, MA Contract No. DACW33-96-D-0005, Delivery Order No. 40.

Berry, W., N. Rubinstein, B. Melzian, and B. Hill. 2003. The biological effects of suspended and bedded sediment (SABS) in aquatic systems. Internal Report to US EPA, Office of Research and Development, National Health and Environmental Effects Laboratory, Narragansett, RI.

Clarke, D.G. and D.H. Wilber. 2000. Assessment of potential impacts of dredging operations due to sediment resuspension. DOER Technical Notes Collection (ERDC TN-DOER-E9), U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Clarke, D., K. Reine, and C. Dickerson. (draft report). Suspended Sediment Plumes Associated with Hopper Dredges at Sesuit Harbor, Massachusetts, USACE, ERDC, Vicksburg, MS.

Collins, M.A. 1995. Dredging-induced near-field resuspended sediment concentrations and source strengths. Miscellaneous Paper D-95-2, U.S. Army Engineer Waterways Experimental Station, Vicksburg, MS.

Connecticut Department of Energy and Environmental Protection. 2011. 2011 Long Island Sound Hypoxia Season Review. CT DEEP Hartford, CT, 26 pages.

Cyrus, D.P. and S.J. M. Blaber. 1987. The influence of turbidity on juvenile marine fishes in estuaries. Part 2. Laboratory studies, comparisons with field data and conclusions. *Journal of Experimental Marine Biology and Ecology*. 109: 71-91.

ENSR International. 2002. Boston Harbor Navigation Improvement Project: Phase 2 Summary Report. Prepared for U.S. Army Corps of Engineers, New England District and Massachusetts Port Authority. Document No. 9000-178-000. Contract No. DACW33-96-D-004, Task Order 51. May 2002.

Hayes, Donald F. 1986. Guide to Selecting a Dredge for Minimizing Resuspension of Sediment. Environmental Effects of Dredging Technical Notes EEDP-09-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Karel, E. 1999. Ecological effects of dumping of dredged sediments; options for management. *Journal of Coastal Conservation*. 5: 69-80.

Kurland, J.M., F.M. Ludwig, S.W. Gorski, and C. Mantazaris. 1994. Dredging and dredged-material disposal. In: Langton, R.W., J.B. Pearce, J.A. Gibson. Selected living resources, habitat conditions, and human perturbations of the Gulf of Maine. NOAA Technical Memorandum NMFS-NE-106. pp. 44-47.

Masterson, J. 2008. *Streblospio benedicti*. Webpage (http://www.sms.si.edu/IRLSpec/Streblospio_benedicti.htm), Webpage last updated October 1, 2008; viewed on February 28, 2012.

National Marine Fisheries Service (NMFS). 2001. Essential Fish Habitat Designations. http://www.nmfs.noaa.gov/ess_fish_habitat.htm National Marine Fisheries EFH Homepage.

National Oceanic and Atmospheric Administration, National Ocean Service (NOAA/NOS). Tide Tables 2011. High and Low Water Predictions; East Coast of North and South American, including Greenland. Silver Spring, MD.

Reish DJ. 1979. Bristle worms (Annelida: Polychaeta). Pp 77-125 in: Hart CW and Fuller SLH (eds). Pollution Ecology of Estuarine Invertebrates. Academic Press, New York.

Rhoads, D. C., P. L. McCall and J. Y. Yingst. September - October 1978. Disturbance and Production on the Estuarine Seafloor. American Scientist, Volume 66, p. 577.

U.S. Army Corps of Engineers (USACE). 1998. Dredge Material Disposal Site Evaluation Report: Long Island Sound, Connecticut and New York. Prepared by ENSR and ASIC for USACE, New England District, November 1998.

USACE. 2003. Submittals to RIDEM, Providence River and Harbor Maintenance Dredging Project. Prepared by Woods Hole Group, CR Environmental, and ENSR Corporation for Corps, New England Division, Concord, MA. November 2003.

USACE. 2012. Housatonic River Nearshore Disposal. New England District, Coastal Engineering, Water Management Section, Concord, Massachusetts. March 2012, pp.38.

U.S. Environmental Protection Agency (EPA). 2012. Website accessed 4/6/12. http://www.epa.gov/airquality/greenbk/gncs.html#connecticut. Last updated March 30, 2012.

U.S. Fish & Wildlife Service and USACE New England Division. 1981. Habitat Evaluation Procedures

Housatonic Demonstration Project: Field Level Evaluation Report Housatonic River Basin Study (Massachusetts Portion). Concord, NH and Waltham, MA March 1981.

Wilber, D.L. and D.G. Clarke. 2001. Biological effects of suspended sediments: A review of suspended sediment impacts on fish and shellfish with relation to dredging activities in estuaries. *North American Journal of Fisheries Management*. 21: 855-875.

13.0 COMPLIANCE WITH ENVIRONMENTAL FEDERAL STATUTES AND EXECUTIVE ORDERS

Federal Statutes

1. Archaeological Resources Protection Act of 1979, as amended, 16 USC 470 et seq.

Compliance: Issuance of a permit from the Federal land manager to excavate or remove archaeological resources located on public or Indian lands signifies compliance.

2. Preservation of Historic and Archeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq.

Compliance: Project has been coordinated with the State Historic Preservation officer. Any impacts to archaeological resources will be mitigated.

3. American Indian Religious Freedom Act of 1978, 42 U.S.C. 1996.

Compliance: Must ensure access by Native Americans to sacred sites, possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

4. Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Compliance: Public notice of the availability of this report to the Environmental Protection Agency is required for compliance pursuant to Sections 176c and 309 of the Clean Air Act.

5. *Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 U.S.C. 1251 et seq.*

Compliance: A Section 404(b)(1) Evaluation and Compliance Review has been incorporated into this Environmental Assessment. An application shall be filed for State Water Quality Certification pursuant to Section 401 of the Clean Water Act.

6. *Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 et seq.*

Compliance: A CZM consistency determination shall be provided to the State for review and concurrence that the proposed project is consistent with the approved State CZM program.

7. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Compliance: Coordination with the U.S. Fish and Wildlife Service (FWS) and/or National Marine Fisheries Service (NMFS) will determine formal consultation requirements pursuant to Section 7 of the Endangered Species Act.

8. Estuary Protection Act, 16 U.S.C. 1221 et seq.

Compliance: Not applicable, as this report is not being submitted to Congress.

9. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Compliance: Public notice of availability to the project report to the National Park Service (NPS) and Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

10. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Compliance: Coordination with the FWS, NMFS, and State fish and wildlife agencies signifies compliance with the Fish and Wildlife Coordination Act.

11. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4 et seq.

Compliance: Public notice of the availability of this report to the National Park Service (NPS) and the Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans signifies compliance with this Act.

12. Marine Protection, Research, and Sanctuaries Act of 1972, as amended, 33 U.S.C. 1401 et seq.

Compliance: Not applicable; project does not involve the transportation nor disposal of dredged material in ocean waters pursuant to Sections 102 and 103 of the Act, respectively.

13. National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.

Compliance: Coordination with the State Historic Preservation Office signifies compliance.

14. Native American Graves Protection and Repatriation Act (NAGPRA), 25 U.S.C. 3000-3013, 18 U.S.C. 1170

Compliance: Regulations implementing NAGPRA will be followed if discovery of human remains and/or funerary items occur during implementation of this project.

15. National Environmental Policy Act of 1969, as amended, 42 U.S.C 4321 et seq.

Compliance: Preparation of an Environmental Assessment signifies partial compliance with

NEPA. Full compliance shall be noted at the time the Finding of No Significant Impact or Record of Decision is issued.

16. Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.

Compliance: No requirements for USACE's projects or programs authorized by Congress. The proposed maintenance dredging has been Congressionally approved under the Rivers and Harbors Acts.

17. Watershed Protection and Flood Prevention Act as amended, 16 U.S.C 1001 et seq.

Compliance: Floodplain impacts must be considered in project planning.

18. Wild and Scenic Rivers Act, as amended, 16 U.S.C 1271 et seq.

Compliance: Not applicable; coordination with the Department of the Interior to determine projects impacts on designated Wild and Scenic Rivers must occur.

19. Magnuson-Stevens Act, as amended, 16 U.S.C. 1801 et seq.

Compliance: Coordination with the National Marine Fisheries Service and preparation of an Essential Fish Habitat (EFH) Assessment signifies compliance with the EFH provisions of the Magnuson-Stevens Act.

Executive Orders

1. Executive Order 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971

Compliance: Coordination with the State Historic Preservation Officer signifies compliance.

2. Executive Order 11988, Floodplain Management, 24 May 1977 amended by Executive Order 12148, 20 July 1979.

Compliance: Public notice of the availability of this report or public review fulfills the requirements of Executive Order 11988, Section 2(a) (2).

3. Executive Order 11990, Protection of Wetlands, 24 May 1977.

Compliance: Public notice of the availability if this report for public review fulfills the requirements of Executive Order 11990, Section 2 (b).

4. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

Compliance: Not applicable to projects located within the United States.

5. Executive Order 12898, Environmental Justice, 11 February 1994.

Compliance: Not applicable, the project is not expected to have a significant impact on minority or low income population, or any other population in the United States.

6. Executive 13007, Accommodation of Sacred Sites, 24 May 1996

Compliance: Not applicable unless on Federal lands, then agencies must accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and avoid adversely affecting the physical integrity of such sacred sites.

7. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. 21 April, 1997.

Compliance: Not applicable, the project would not create a disproportionate environmental health or safety risk for children.

8. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, 6 November 2000.

Compliance: Consultation with Indian Tribal Governments, where applicable, and consistent with executive memoranda, DoD Indian policy, and USACE Tribal Policy Principles signifies compliance.

Executive Memorandum

1. Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

Compliance: Not applicable if the project does not involve or impact agricultural lands.

2. White House Memorandum, Government-to-Government Relations with Indian Tribes, 29 April 1994.

Compliance: Consultation with Federally Recognized Indian Tribes, where appropriate, signifies compliance.

FINDING OF NO SIGNIFICANT IMPACT

MAINTENANCE DREDGING of the HOUSATONIC RIVER, CONNECTICUT

The Housatonic River Federal Navigation Project (FNP) was authorized by the River and Harbor Act of 1871 and modified by enactments in 1888, 1892, and 1930 (H. Doc. 449, 70th Cong., 2nd Sess.). The existing Federal navigation project provides for an 18-foot deep, 200-foot wide main channel from the mouth of the river to the lower end of Culvers Bar (approximately five miles distance), a 7-foot deep, 100-foot wide channel to Derby and Shelton (a total length of about 13 miles), and three jetties.

Maintenance dredging of Housatonic River Federal Navigation Project is proposed to restore the navigation channel to 14 feet MLLW (not to the authorized depth since the current vessel traffic does not require the deeper depths authorized for the Housatonic River FNP) in the lower section of the river below the Route 1 Bridge. This would involve dredging approximately 100,000 cubic yards of predominantly fine-grained sand from the Lower Housatonic River FNP. Figure 1 shows the authorized Housatonic FNP and Figure 2 shows the shoal regions that are proposed to be dredged.

The shoal material would be dredged with a government special purpose hopper dredge or a mechanical dredge and placed in the nearshore environment off of Point No Point in Stratford Connecticut (Figure 3). The quantity of shoal material to be dredged during one dredge event will depend on the available funds at the time of dredging. It is anticipated that funds for only half of the material will be available in 2012 and this work will be completed using the government-owned special purpose dredge, *Currituck*. The proposed work will be performed over a two to three month period between October 1 and March 31 in the year(s) in which funds become available.

The purpose of the proposed action is to meet the navigational needs of the existing commercial and recreational vessel traffic. Natural shoaling processes have reduced the available depths in the 18-foot channel to as little as 3.5 feet and less. Given these conditions and current vessel drafts, shoaling within the project is limiting safe navigation. Maintenance dredging of the project is needed to provide safe access to the project at all tide stages.

Due to the clean sandy nature of the material to be dredged, it has been determined that dredging and placement operations will have no significant long-term adverse impacts upon water quality other than temporary increased turbidity and sedimentation localized to the immediate areas of dredging and placement activities.

The project should have no significant impact on the aquatic resources in the river or nearshore environment. A temporary impact will be caused by removal of benthic organisms from the shoal areas in the channel area by the dredging operations, and by burial from deposition of sediments at the placement site. However, rapid recolonization of impacted areas would be expected from recruitment by opportunistic species and by organisms living in adjacent areas.

I find that based on the evaluation of environmental effects discussed in this document, this project is not a major Federal action significantly affecting the quality of the human environment. Under the Council on Environmental Quality (CEQ) NEPA regulations, "NEPA significance" is a concept dependent upon context and intensity (40 C.F.R. § 1508.27). When considering a site-specific action like the proposed project, significance is measured by the impacts felt at a local scale, as opposed to a regional or nationwide context. The CEQ regulations identify a number of factors to measure the intensity of impact. These factors are discussed below, and none are implicated here to warrant a finding of NEPA significance. A review of these NEPA "intensity" factors reveals that the proposed action would not result in a significant impact—neither beneficial nor detrimental--to the human environment.

Impacts on public health or safety: The project is expected to have no effect on public health and safety.

Unique characteristics: The Housatonic River has no unique characteristics that would be impacted by maintenance dredging of the Federal channel.

Controversy: The proposed project is not controversial. State and federal resource agencies agree with the USACE impact assessment.

Uncertain impacts: The impacts of the proposed project are not uncertain; they are readily understood based on past experiences from this project and other similar USACE projects.

Precedent for future actions: The proposed project is maintenance of an authorized project and will not establish a precedent for future actions other than future maintenance activities.

Cumulative significance: As discussed in the EA, to the extent that other actions are expected to be related to project as proposed, these actions will provide little measurable cumulative impact.

Historic resources: The project will have no known negative impacts on any pre-contact archaeological sites recorded by the State of Connecticut.

Endangered species: The project will have no known positive or negative impacts on any State or Federal threatened or endangered species.

Potential violation of state or federal law: This action will not violate Federal or state laws.

Measures to minimize adverse environmental effects of the proposed action are discussed in Section 10 of the EA.

Based on my review and evaluation of the environmental effects as presented in the

Environmental Assessment, I have determined that the Housatonic River FNP maintenance dredging project in Stratford and Milford, Connecticut is not a major Federal action significantly affecting the quality of the human environment. This project, therefore, is exempt from requirements to prepare an Environmental Impact Statement.

_____ _____

Date

Charles P. Samaris
Colonel, Corps of Engineers
District Engineer

NEW ENGLAND DISTRICT
US ARMY CORPS OF ENGINEERS, CONCORD, MA

CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

PROJECT: Housatonic River Federal Navigation Project Maintenance Dredging

PROJECT MANAGER: Mr. Jack Karalius PHONE NO.: (978) 318-8288

FORM COMPLETED BY: Dr. Valerie Cappola PHONE NO.: (978) 318-8067

DESCRIPTION: The U.S. Army Corps of Engineers proposes maintenance dredging of approximately 100,000 cubic yards of predominantly fine-grained sand from the entrance channel returning the channel to 14 feet MLLW not to the authorized depth of 18 feet

The Housatonic River Federal Navigation Project (FNP) was authorized by the River and Harbor Act of 1871 and modified by enactments in 1888, 1892, and 1930 (H. Doc. 449, 70th Cong., 2nd Sess.). The existing Federal navigation project provides for an 18-foot deep, 200-foot wide main channel from the mouth of the river to the lower end of Culvers Bar (approximately five miles distance), a 7-foot deep, 100-foot wide channel to Derby and Shelton (a total length of about 13 miles), and three jetties.

Maintenance dredging of Housatonic River Federal Navigation Project is proposed to restore the navigation channel to 14 feet MLLW (not to the authorized depth since the current vessel traffic does not require the deeper depths authorized for the Housatonic River FNP) in the lower section of the river below the Route 1 Bridge. This would involve dredging approximately 100,000 cubic yards of predominantly fine-grained sand from the Lower Housatonic River FNP. Figure 1 shows the authorized Housatonic FNP and Figure 2 shows the shoal regions that are proposed to be dredged.

The shoal material would be dredged with a government special purpose hopper dredge or a mechanical dredge and placed in the nearshore environment off of Point No Point in Stratford Connecticut (Figure 3). The quantity of shoal material to be dredged during one dredge event will depend on the available funds at the time of dredging. It is anticipated that funds for only half of the material will be available in 2012 and this work will be completed using the government-owned special purpose dredge, *Currituck*. The proposed work will be performed over a two to three month period between October 1 and March 31 in the year(s) in which funds become available.

The purpose of the proposed action is to meet the navigational needs of the existing commercial and recreational vessel traffic. Natural shoaling processes have reduced the available depths in the 18-foot channel to as little as 3.5 feet and less. Given these conditions

and current vessel drafts, shoaling within the project is limiting safe navigation. Maintenance dredging of the project is needed to provide safe access to the project at all tide stages.

1. Review of Compliance (Section 230.10(a)-(d)).

	YES	NO
a. The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose.	X	
b. The activity does not appear to: 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally listed threatened and endangered species or their habitat; and 3) violate requirements of any Federally designated marine sanctuary.	X	
c. The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values.	X	
d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.	X	

2. Technical Evaluation Factors (Subparts C-F).

		N/A	Not Significant	Significant
a.	Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)			
	1) Substrate		X	
	2) Suspended particulates/turbidity		X	
	3) Water column impacts		X	
	4) Current patterns and water circulation		X	
	5) Normal water fluctuations	X		
	6) Salinity gradients	X		
b.	Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D)			
	1) Threatened and endangered species		X	
	2) Fish, crustaceans, mollusks, and other		X	

		N/A	Not Significant	Significant
	organisms in the aquatic food web			
	3) Other wildlife (mammals, birds, reptiles, and amphibians)		X	
c.	Potential Impacts on Special Aquatic Sites (Subpart E).			
	1) Sanctuaries and refuges	X		
	2) Wetlands	X		
	3) Mud flats		X	
	4) Vegetated shallows		X	
	5) Coral reefs	X		
	6) Riffle and pool complexes	X		
d.	Potential Effects on Human Use Characteristics (Subpart F).			
	1) Municipal and private water supplies	X		
	2) Recreational and commercial fisheries		X	
	3) Water related recreation		X	
	4) Aesthetics impacts		X	
	5) Parks, national and historic monuments, national seashores, wilderness areas, research sites and similar preserves	X		

3. Evaluation and Testing (Subpart G).

a.	The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)	
	1) Physical characteristics	X
	2) Hydrography in relation to known or anticipated sources of contaminants	
	3) Results from previous testing of the material or similar material in the vicinity of the project	X
	4) Known, significant sources of persistent pesticides from land runoff or percolation	
	5) Spill records for petroleum products or designated hazardous substances (Section 311 of CWA)	X
	6) Public records of significant introduction of contaminants from industries, municipalities, or other sources.	X

	7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities	
	8) Other sources (specify)	
	List appropriate references. See Environmental Assessment for Maintenance Dredging of Sagamore Creek Federal Navigation Project,	

		YES	NO
b.	An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredged material is not a carrier of contaminants or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to require constraints. The material meets the testing exclusion criteria.	X	

4. Disposal Site Delineation (Section 230.11(f)).

a.	The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)	
	1) Depth of water at disposal site	X
	2) Current velocity, direction, variability at disposal site	X
	3) Degree of turbulence	
	4) Water column stratification	X
	5) Discharge vessel speed and direction	
	6) Rate of discharge	X
	7) Dredged material characteristics (constituents, amount, and type of material, settling velocities)	X
	8) Number of discharges per unit of time	X
	9) Other factors affecting rates and patterns of mixing (specify)	
	List appropriate references. See Environmental Assessment for Maintenance Dredging of the Housatonic River Federal Navigation Project, Stratford and Milford, CT.	

		YES	NO
b.	An evaluation of the appropriate information factors in 4a above indicated that the disposal sites and/or size of mixing zone are acceptable.	X	

5. Actions to Minimize Adverse Effects (Subpart H).

	YES	NO
All appropriate and practicable steps have been taken, through application of recommendation of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.	X	

List actions taken

Will use the dredge window of October 1 to March 31 to minimize impacts to spawning shellfish, and the anadromous fish migrations

6. Factual Determination (Section 230.11).

A review of appropriate information, as identified in Items 2 – 5 above, indicates there is minimal potential for short or long term environmental effects of the proposed discharge as related to:		
	YES	**NO**
a. Physical substrate at the disposal site (review Sections 2a, 3, 4, and 5 above)	X	
b. Water circulation fluctuation and salinity (review Sections 2a, 3, 4, and 5)	X	
c. Suspended particulates/turbidity (review Sections 2a, 3, 4 and 5)	X	
d. Contaminant availability (review Sections 2a, 3, and 4)	X	
e. Aquatic ecosystem structure, function and organisms (review Sections 2b and 2c, 3, and 5)	X	
f. Proposed disposal site (review Sections 2, 4, and 5)	X	
g. Cumulative effects on the aquatic ecosystem	X	
h. Secondary effects on the aquatic ecosystem	X	

7. . Findings of Compliance or Non-compliance

	YES	NO
The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines.	X	

_____ _____

Date

Charles P. Samaris
Colonel, Corps of Engineers
District Engineer

APPENDIX A - *PERTINENT CORRESPONDENCE*

APPENDIX B - *SEDIMENT GRAIN SIZE*

APPENDIX C - *SUITABILITY DETERMINATION*

APPENDIX D - *ESSENTIAL FISH HABITAT ASSESSMENT*

APPENDIX E - *BENTHIC DATA*

APPENDIX F -*FIELD REPORT FOR NEARSHORE PLACEMENT SITES*

APPENDIX A - *PERTINENT CORRESPONDENCE*

From:	Paiva, Marcos A NAE
To:	Karalius, Jack NAE
Cc:	Cappola, Valerie A NAE
Subject:	FW: ENVIRONMENTAL ASSESSMENT FOR MAINTENANCE DREDGING OF THE HOUSATONIC RIVER FEDERAL NAVIGATION PROJECT (FNP) IN STRATFORD, CT (UNCLASSIFIED)
Date:	Thursday, May 17, 2012 3:32:08 PM

Classification: UNCLASSIFIED
Caveats: NONE

Jack/Val: FYI. Thanks.

-----Original Message-----
From: Knowles, Kathleen [mailto:KKnowles@mptn-nsn.gov]
Sent: Friday, May 11, 2012 4:32 PM
To: Paiva, Marcos A NAE
Cc: Stevens, Sue
Subject: ENVIRONMENTAL ASSESSMENT FOR MAINTENANCE DREDGING OF THE HOUSATONIC RIVER FEDERAL NAVIGATION PROJECT (FNP) IN STRATFORD, CT

Re: ENVIRONMENTAL ASSESSMENT

MAINTENANCE DREDGING OF THE HOUSATONIC RIVER

FEDERAL NAVIGATION PROJECT (FNP)

STRATFORD, CT &

NEARSHORE DISPOSAL OFF POINT NO POINT

We look forward to reviewing the Environmental Assessment when completed, the Mashantucket Pequot Tribe appreciates the opportunity to review and comment on this proposed project.

Kathleen Knowles,

Tribal Historic Preservation Officer

Mashantucket Pequot Tribe

Classification: UNCLASSIFIED
Caveats: NONE

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

May 7, 2012

Engineering/Planning Division
Evaluation Branch

Ms. Kathleen Knowles, THPO
Mashantucket Pequot Museum & Research Center
110 Pequot Trail, Post Office Box 3180
Mashantucket, Connecticut 06338

Dear Ms. Knowles:

The U.S. Army Corps of Engineers, New England District, is preparing an Environmental Assessment for maintenance dredging of the Housatonic River Federal Navigation Project (FNP) in Stratford, Connecticut, and nearshore disposal off Point No Point, approximately 3 miles west of the mouth of the river in Stratford (see enclosed location maps). We would like your formal comments on this undertaking in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended.

The Housatonic River originates in western Massachusetts and the flows the entire length of western Connecticut before emptying into Long Island Sound. Much of Stratford's Housatonic shoreline has been developed. Historically industrial and commercial operations dominated the waterfront, several major industries remain. Newer development consists of residential and water-dependent commercial uses, including marinas. Several marsh islands are upstream in the river.

The Housatonic River Federal Navigation Project (FNP) was authorized by the River and Harbor Act of 1871 and modified by enactments in 1888, 1892, and 1930 (H. Doc. 449, 70th Cong., 2nd Sess.). The existing Federal navigation project provides for an 18-foot deep, 200-foot wide main channel from the mouth of the river to the lower end of Culvers Bar (approximately five miles distance), a 7-foot deep, 100-foot wide channel to Derby and Shelton (a total length of about 13 miles), and three jetties. See dredging location map.

The purpose of the proposed action is to meet the navigational needs of the existing commercial and recreational vessel traffic. Natural shoaling processes have reduced available depths in the 7-foot deep channels to as little as 1.7 feet and less, and the 18-foot channel depths have been reduced to as little as 2.5 feet and less. Given these conditions and current vessel drafts, shoaling within the project is limiting navigation. Maintenance dredging of the project is needed to provide safe access to the project at all tide stages.

The Corps proposes to dredge about 50,000 cubic yards (cy) of predominantly sandy material from several shoal areas south of the Route 1 bridge in Stratford. These shoal areas will be dredged to approximately -14 feet MLLW - which is not the authorized depths, since the current vessel traffic does not require the deeper depths authorized for the Housatonic River FNP. The shoal material would be dredged with a Government-owned special-purpose hopper dredge or a mechanical dredge and placed in a near shore site off Point No Point in Stratford, Connecticut (see disposal area map).

The project area has been previously dredged and as maintenance dredging will not occur below the originally authorized depths, impacts to cultural resources are not expected. Additionally, the shallow depth of the near shore area selected for dredged material disposal likely precludes the presence of submerged historic properties that, if present, would likely have already been removed. A field data survey of the Point No Point disposal site for characterization purposes was conducted last October and utilized both side scan sonar and an underwater video camera. No historic artifacts, features or archaeological resources were identified on either the sonar or video images. However, if during implementation historic properties are encountered, we will implement the provisions for a post- review discovery (36 CFR 800.13) in the Advisory Council on Historic Preservation's implementing regulations (36 CFR 800).

Therefore, we feel that the proposed dredging of the Housatonic River Federal Navigation Project (FNP) in Stratford and near shore disposal off Point No Point will have no effect upon any site or structure or historic, architectural or archaeological significance as defined by Section 106 of the NHPA and 36 CFR 800. We would appreciate your concurrence with this determination.

If you have any questions, please contact Mr. Jack Karalius, the Project Manager at 978-318-8288 or Mr. Marc Paiva, Archaeologist of the Evaluation Branch at 978-318-8796.

Sincerely,

H. Farrell McMillan, P.E.
Chief, Engineering/Planning Division

Enclosures

Copy Furnished (with enclosures):
Dr. Nicholas Bellantoni, State Archaeologist
Office of Connecticut State Archaeology, Unit 4214
University of Connecticut
Storrs, Connecticut 06269-4214

SAME LETTER SENT (with enclosures):

Mr. David Bahlman, Director and SHPO
State Historic Preservation Office
Offices of Culture and Tourism
One Constitution Plaza, 2nd Floor
Hartford, Connecticut 06103

Ms. Melissa Zobel, Historic Preservation Director
Mohegan Tribe Cultural Department
5 Crow Hill Road
Uncasville, Connecticut 06382

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

May 7, 2012

Engineering/Planning Division
Evaluation Branch

Ms. Melissa Zobel, Historic Preservation Director
Mohegan Tribe Cultural Department
5 Crow Hill Road
Uncasville, Connecticut 06382

Dear Ms. Zobel:

The U.S. Army Corps of Engineers, New England District, is preparing an Environmental Assessment for maintenance dredging of the Housatonic River Federal Navigation Project (FNP) in Stratford, Connecticut, and nearshore disposal off Point No Point, approximately 3 miles west of the mouth of the river in Stratford (see enclosed location maps). We would like your formal comments on this undertaking in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended.

The Housatonic River originates in western Massachusetts and the flows the entire length of western Connecticut before emptying into Long Island Sound. Much of Stratford's Housatonic shoreline has been developed. Historically industrial and commercial operations dominated the waterfront, several major industries remain. Newer development consists of residential and water-dependent commercial uses, including marinas. Several marsh islands are upstream in the river.

The Housatonic River Federal Navigation Project (FNP) was authorized by the River and Harbor Act of 1871 and modified by enactments in 1888, 1892, and 1930 (H. Doc. 449, 70th Cong., 2nd Sess.). The existing Federal navigation project provides for an 18-foot deep, 200-foot wide main channel from the mouth of the river to the lower end of Culvers Bar (approximately five miles distance), a 7-foot deep, 100-foot wide channel to Derby and Shelton (a total length of about 13 miles), and three jetties. See dredging location map.

The purpose of the proposed action is to meet the navigational needs of the existing commercial and recreational vessel traffic. Natural shoaling processes have reduced available depths in the 7-foot deep channels to as little as 1.7 feet and less, and the 18-foot channel depths have been reduced to as little as 2.5 feet and less. Given these conditions and current vessel drafts, shoaling within the project is limiting navigation. Maintenance dredging of the project is needed to provide safe access to the project at all tide stages.

The Corps proposes to dredge about 50,000 cubic yards (cy) of predominantly sandy material from several shoal areas south of the Route 1 bridge in Stratford. These shoal areas will be dredged to approximately -14 feet MLLW - which is not the authorized depths, since the current vessel traffic does not require the deeper depths authorized for the Housatonic River FNP. The shoal material would be dredged with a Government-owned special-purpose hopper dredge or a mechanical dredge and placed in a near shore site off Point No Point in Stratford, Connecticut (see disposal area map).

The project area has been previously dredged and as maintenance dredging will not occur below the originally authorized depths, impacts to cultural resources are not expected. Additionally, the shallow depth of the near shore area selected for dredged material disposal likely precludes the presence of submerged historic properties that, if present, would likely have already been removed. A field data survey of the Point No Point disposal site for characterization purposes was conducted last October and utilized both side scan sonar and an underwater video camera. No historic artifacts, features or archaeological resources were identified on either the sonar or video images. However, if during implementation historic properties are encountered, we will implement the provisions for a post- review discovery (36 CFR 800.13) in the Advisory Council on Historic Preservation's implementing regulations (36 CFR 800).

Therefore, we feel that the proposed dredging of the Housatonic River Federal Navigation Project (FNP) in Stratford and near shore disposal off Point No Point will have no effect upon any site or structure or historic, architectural or archaeological significance as defined by Section 106 of the NHPA and 36 CFR 800. We would appreciate your concurrence with this determination.

If you have any questions, please contact Mr. Jack Karalius, the Project Manager at 978-318-8288 or Mr. Marc Paiva, Archaeologist of the Evaluation Branch at 978-318-8796.

Sincerely,

H. Farrell McMillan, P.E.
Chief, Engineering/Planning Division

Enclosures

Copy Furnished (with enclosures):
Dr. Nicholas Bellantoni, State Archaeologist
Office of Connecticut State Archaeology, Unit 4214
University of Connecticut
Storrs, Connecticut 06269-4214

SAME LETTER SENT (with enclosures):

Ms. Kathleen Knowles, THPO
Mashantucket Pequot Museum & Research Center
110 Pequot Trail, Post Office Box 3180
Mashantucket, Connecticut 06338

Mr. David Bahlman, Director and SHPO
State Historic Preservation Office
Offices of Culture and Tourism
One Constitution Plaza, 2nd Floor
Hartford, Connecticut 06103

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

May 7, 2012

Engineering/Planning Division
Evaluation Branch

Mr. David Bahlman, Director and SHPO
State Historic Preservation Office
Offices of Culture and Tourism
One Constitution Plaza, 2nd Floor
Hartford, Connecticut 06103

Dear Mr. Bahlman:

The U.S. Army Corps of Engineers, New England District, is preparing an Environmental Assessment for maintenance dredging of the Housatonic River Federal Navigation Project (FNP) in Stratford, Connecticut, and nearshore disposal off Point No Point, approximately 3 miles west of the mouth of the river in Stratford (see enclosed location maps). We would like your formal comments on this undertaking in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended.

The Housatonic River originates in western Massachusetts and the flows the entire length of western Connecticut before emptying into Long Island Sound. Much of Stratford's Housatonic shoreline has been developed. Historically industrial and commercial operations dominated the waterfront, several major industries remain. Newer development consists of residential and water-dependent commercial uses, including marinas. Several marsh islands are upstream in the river.

The Housatonic River Federal Navigation Project (FNP) was authorized by the River and Harbor Act of 1871 and modified by enactments in 1888, 1892, and 1930 (H. Doc. 449, 70th Cong., 2nd Sess.). The existing Federal navigation project provides for an 18-foot deep, 200-foot wide main channel from the mouth of the river to the lower end of Culvers Bar (approximately five miles distance), a 7-foot deep, 100-foot wide channel to Derby and Shelton (a total length of about 13 miles), and three jetties. See dredging location map.

The purpose of the proposed action is to meet the navigational needs of the existing commercial and recreational vessel traffic. Natural shoaling processes have reduced available depths in the 7-foot deep channels to as little as 1.7 feet and less, and the 18-foot channel depths have been reduced to as little as 2.5 feet and less. Given these conditions and current vessel drafts, shoaling within the project is limiting navigation. Maintenance dredging of the project is needed to provide safe access to the project at all tide stages.

The Corps proposes to dredge about 50,000 cubic yards (cy) of predominantly sandy material from several shoal areas south of the Route 1 bridge in Stratford. These shoal areas will be dredged to approximately -14 feet MLLW - which is not the authorized depths, since the current vessel traffic does not require the deeper depths authorized for the Housatonic River FNP. The shoal material would be dredged with a Government-owned special-purpose hopper dredge or a mechanical dredge and placed in a near shore site off Point No Point in Stratford, Connecticut (see disposal area map).

The project area has been previously dredged and as maintenance dredging will not occur below the originally authorized depths, impacts to cultural resources are not expected. Additionally, the shallow depth of the near shore area selected for dredged material disposal likely precludes the presence of submerged historic properties that, if present, would likely have already been removed. A field data survey of the Point No Point disposal site for characterization purposes was conducted last October and utilized both side scan sonar and an underwater video camera. No historic artifacts, features or archaeological resources were identified on either the sonar or video images. However, if during implementation historic properties are encountered, we will implement the provisions for a post- review discovery (36 CFR 800.13) in the Advisory Council on Historic Preservation's implementing regulations (36 CFR 800).

Therefore, we feel that the proposed dredging of the Housatonic River Federal Navigation Project (FNP) in Stratford and near shore disposal off Point No Point will have no effect upon any site or structure or historic, architectural or archaeological significance as defined by Section 106 of the NHPA and 36 CFR 800. We would appreciate your concurrence with this determination.

If you have any questions, please contact Mr. Jack Karalius, the Project Manager at 978-318-8288 or Mr. Marc Paiva, Archaeologist of the Evaluation Branch at 978-318-8796.

Sincerely,

H. Farrell McMillan, P.E.
Chief, Engineering/Planning Division

Enclosures

Copy Furnished (with enclosures):
Dr. Nicholas Bellantoni, State Archaeologist
Office of Connecticut State Archaeology, Unit 4214
University of Connecticut
Storrs, Connecticut 06269-4214

SAME LETTER SENT (with enclosures):
Ms. Kathleen Knowles, THPO
Mashantucket Pequot Museum & Research Center
110 Pequot Trail, PO Box 3180
Mashantucket, Connecticut 06338

Ms. Melissa Zobel, Historic Preservation Director
Mohegan Tribe Cultural Department
5 Crow Hill Road
Uncasville, Connecticut 06382

TOWN OF STRATFORD
offering more from forest to shore

Waterfront & Harbor Management
2725 Main Street, Stratford CT 06615
www.townofstratford.com

April 19, 2012

Mr. Ed O'Donnell
Chief, Navigation Section
U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, Massachusetts 01742

Subject: Maintenance dredging of the Housatonic River federal navigation channel

Dear Mr. O'Donnell:

The Stratford Waterfront and Harbor Management Commission (WHMC) has reviewed the plans prepared by the U.S. Army Corps of Engineers (USACE) for maintenance dredging of the Housatonic River federal navigation channel (the channel). Completion of those plans, prepared in consultation with and at the request of the WHMC, represents an important milestone in what has been a multi-year planning process to maintain the channel.

Maintenance of the channel has become an increasingly important matter. The channel, which has not been dredged since 1976, is subject to ongoing shoaling as determined by surveys conducted by the Corps. The most recent survey, in 2011, shows that navigable depths in several sections of the channel have been significantly reduced over time, restricting the passage of vessels during a major part of the tide cycle.

As the principal municipal agency with responsibility for pursuing maintenance dredging of the channel, the WHMC recognizes that the viability of many water-dependent activities and businesses in the Town of Stratford depends on continued ease and safety of navigation in the channel. For a number of years the WHMC has been working cooperatively with the USACE to accomplish the needed maintenance dredging in the most economical and environmentally sound manner, with the understanding that the regulatory and funding process for dredging projects involves a number of agencies and is inherently complex and uncertain.

In 2010, following a request by the WHMC, the USACE obtained funds from the USACE's Low Use Navigation Pilot Project to support planning for maintenance dredging of the channel. Funds available through this program can be used by the USACE to evaluate non-traditional ways of achieving maintenance of relatively low-use harbors and waterways served by federal navigation projects. The proposed maintenance dredging plans were then developed through a cooperative process involving the USACE, WHMC, the Office of Long Island Sound Programs (OLISP) of the Connecticut Department of Energy and Environmental Protection (DEEP),

Connecticut Department of Transportation, and the Connecticut Department of Agriculture's Bureau of Aquaculture. (DA/BA).

As now planned, maintenance dredging of specific sections of the channel downstream of the Route 1 bridge would be conducted during the next dredging season which begins on or about October 1, 2012 and will extend into 2013. The proposed maintenance dredging project would be conducted utilizing a USACE hopper dredge, and the dredged material would be placed in a delineated nearshore area of Long Island Sound off the Stratford shoreline in the vicinity of Point No Point. The equipment to be used is specially designed for dredging relatively small volumes of sandy material and therefore is well suited for the planned project which will focus on the most significant areas of shoaling in the Housatonic River channel. Those areas will be restored to depths needed for safe navigation by vessels currently using the channel.

The material to be dredged has undergone rigorous testing by both the USACE and DEEP. It has been determined by the USACE, U.S. Environmental Protection Agency, and DEEP that this material consists of sand suitable for beach nourishment and placement in coastal waters without causing any significant adverse impacts on the natural environment. The nearshore dredged material placement site was identified following surveys and scientific analyses conducted by the USACE to ensure that the dredged material, when placed in this site, will not adversely affect shellfish resources or other marine life in any significant way. The DA/BA, acting as the state agency responsible for managing shellfish resources, participated in the planning to identify the proposed dredged material placement site and supports its use for the intended purpose.

Once it has been approved by the DEEP, the proposed dredged material placement site will be available for use during future maintenance dredging operations in the navigation channel, thereby facilitating future dredging operations.

In March of this year, Stratford Mayor John A. Harkins and the WHMC requested assistance from the Connecticut Department of Transportation for the purpose of obtaining an authorization of dredging funds from the State Bond Commission in the amount of $750,000.00. That amount, if authorized, would be transferred to the USACE and used to conduct the proposed maintenance dredging project. It is estimated by the USACE that the amount requested will cover the cost of dredging approximately 50,000 cubic yards of sediment to restore identified sections of the channel to a depth of approximately 12 feet at Mean Lower Low Water (MLLW).

Areas to be dredged and the proposed nearshore dredged material placement site are shown on plans prepared by the USACE and provided to the WHMC for final review prior to submittal of those plans to the DEEP OLISP by the USACE. State approval of the plans by the DEEP OLISP is needed before the proposed work may proceed. The USACE will seek state approval to dredge up to 100,000 cubic yards of sediment in order to allow for continued maintenance dredging to a channel depth of approximately 14 feet MLLW at such time as additional funds may be obtained.

During its meeting on February 8, 2012, the WHMC considered the dredging plans and approved a motion to support implementation of those plans. The WHMC has determined that the proposed plans are consistent with the Stratford Harbor Management Plan adopted by the Town

Council and approved by the State of Connecticut. In addition, the WHMC finds that implementation of the proposed plans will serve to advance the provisions of the Harbor Management Plan that call for carefully planned maintenance dredging to provide for the continued viability of boating facilities, safe and efficient navigation, and minimal disruption of natural systems and values.

In conclusion, the WHMC is greatly appreciative of the USACE's dedicated efforts, on behalf of the Town of Stratford and other Housatonic River towns, to plan and carry out an economically feasible and environmentally sound maintenance dredging project that will help ensure continued safe and beneficial use of the channel. The WHMC remains committed to working cooperatively with you and to providing additional assistance to the USACE as necessary to implement the dredging plans.

If you require any additional information please contact me (203) 377-6537 or brock@snet.net.

Sincerely,

Bill Rock

Bill Rock. Chairman

Enclosure

cc:
Honorable John A. Harkins, Mayor of Stratford
U.S. Congresswoman Rosa DeLauro
Ms. Kristen Bellantuono, Office of Long Island Sound Programs
Ms.Valerie Cappola, Environmental Section, U.S. Army Corps of Engineers
Mr. Jack Karalius, Project Manager, U.S. Army Corps of Engineers
Commissioner James P. Redeker, Connecticut Department of Transportation
Mr. Joe Salvatore, Dredging Coordinator, Connecticut Department of Transportation
Mr. Brian Thompson, Director, Office of Long Island Sound Programs
Mr. George Wisker, Office of Long Island Sound Programs

APPENDIX B - *SEDIMENT GRAIN SIZE and CHEMISTRY*

Battelle
Putting Technology To Work

US ARMY CORPS
OF ENGINEERS
New England District

Contract No. DACW33-96-0005
Delivery Order No. 40
May 4, 2000

FINAL DATA REPORT

VIBRATORY CORE SAMPLING

Housatonic River, Connecticut

FINAL DATA REPORT

for

VIBRATORY CORE SAMPLING
HOUSATONIC RIVER, CT

Submitted to

Department of the Army
U.S. Army Corps of Engineers
North Atlantic Division
New England District

Contract No. DACW33-96-D-0005
Delivery Order No. 40

May 4, 2000

Prepared by

Battelle Duxbury Operations
397 Washington Street
Duxbury, MA 02332
(781) 934-0571

Battelle
. . . Putting Technology To Work

TABLE OF CONTENTS

TABLES

ATTACHMENTS

1. Introduction

1.1. Sample Collection

On November 17-19, 1999 vibratory core sampling was conducted at 26 stations at Housatonic River, CT. This survey was part of Delivery Order #40 – Laboratory Testing in Support of Environmental Assessment NAE PCS Projects-FY2000. Table 1 provides a summary of the samples collected and the corresponding dates. This report presents the results of the physical and chemical analyses performed on selected sediments. Custody records for all samples collected are provided in Attachment 1. All final data and associated quality control results for grain size, TOC, Metals, PCB/Pest and PAH analyses are provided as attachments to this report. The complete details of the survey operation are provided in the *Final Survey Report, Vibratory Core Sampling in Clinton Harbor, Housatonic River and North Cove, CT,* dated November 1999.

Table 1. Summary of Individual Sediment Cores Collected at Housatonic River, CT.

Sample Core ID	Collection Date
HR-A1	11/18/99
HR-A	11/18/99
HR-B	11/18/99
HR-C	11/18/99
HR-D	11/18/99
HR-E	11/18/99
HR-F	11/18/99
HR-G	11/18/99
HR-H	11/18/99
HR-I	11/18/99
HR-J	11/18/99
HR-K	11/18/99
HR-L	11/18/99
HR-M	11/19/99
HR-N	11/19/99
HR-O	11/19/99
HR-P	11/19/99
HR-Q	11/19/99
HR-R	11/19/99
HR-S	11/17/99
HR-T	11/17/99
HR-U	11/19/99
HR-V	11/17/99
HR-W	11/19/99
HR-X	11/19/99
HR-Y	11/17/99

1.2. Sample Handling and Custody

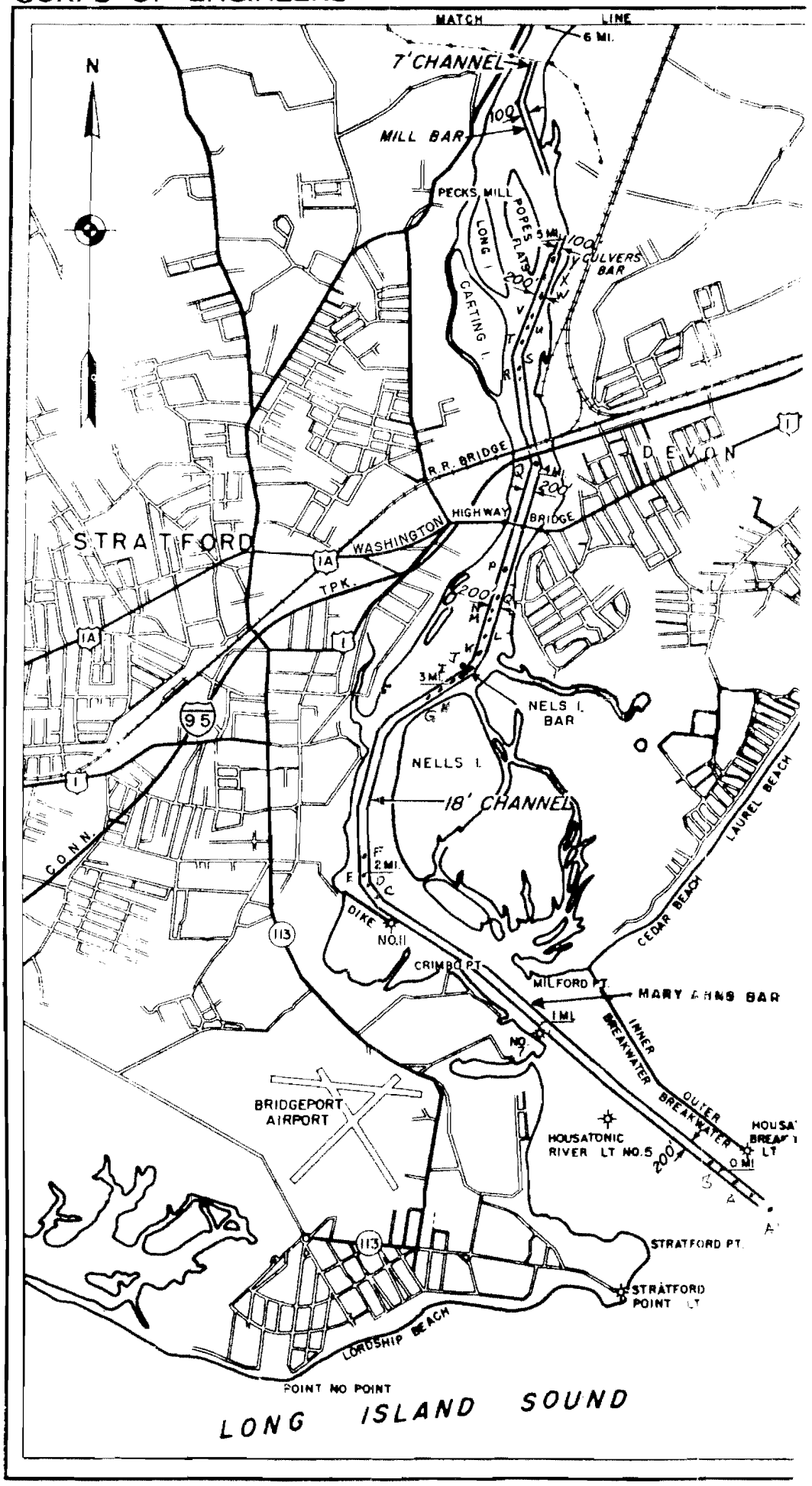
Sediment cores were kept cold and transported to Battelle after completion of sampling. Upon receipt of sediment cores at the laboratory, chain of custody was transferred to the

Battelle staff member responsible for core descriptions and processing. All cores were stored at 4°C until processing, which occurred from 11/29/99 through 12/03/99 (within 14 days of sample collection). Once cores were processed (split, characterized, and homogenized), representative portions of the homogenized cores were placed into appropriate containers for physical and chemical analyses. At this point, custody was transferred to Battelle's sample custodian and samples were then logged into Battelle's log-in system and assigned a unique Battelle ID. All samples were frozen until analysis, with the exception of grain size samples, which were sent directly to the laboratory. Samples remained frozen until instructions for compositing and analyses were provided by NAE (based on results of grain size analyses). Table 2 summarizes the compositing scheme for the Housatonic River, CT sediments.

Table 2. Compositing Scheme for Housatonic River Sediments.

Sample/Composite ID	Cores/Lengths Composited
Composite Core A, A1	HR-A 0-5.0'
	HR-A1 0-2.8'
Core B	HR-B 0-3.0'
Composite Cores C, D	HR-C 0-8.3'
	HR-C 8.3-10.8'
	HR-D 0-6.4'
	HR-D 6.5-7.5'
Composite Cores E, F	HR-E 0-3.7'
	HR-E 3.7-5.8'
	HR-F 0-3.8'
Composite Cores G, H	HR-G 0-3.8'
	HR-H 0-6.3'
Composite Cores I, J	HR-I 0-10.0'
	HR-J 0-11.8'
Core K	HR-K 0-5.6'
	HR-K 5.7-8.8'
Composite Cores L, M	HR-L 0-4.6'
	HR-M 0-3.8'
Composite Cores N, O, P	HR-N 0-4.6'
	HR-O 0-37.'
	HR-P 0-4.8'
Core Q	HR-Q 0-7.8'
Composite Cores S, T	HR-S 0-10.4'
	HR-T 0-7.9'
	HR-T 8.0-12.7'
Composite Cores U, V	HR-U 0-6.0'
	HR-V 0-10.0'
Core W	HR-W 0-7.8'
Core X	HR-X 0-8.2'
Core Y	HR-Y 0-9.8'
	HR-Y 9.8-11.8'

CORPS OF ENGINEERS



2. Methods

Grain size analyses were performed on all core samples collected from the field. Only selected samples (Table 2) were analyzed for the remaining parameters.

2.1. Grain Size Analyses

Water content and grain size distribution were determined by ASTM D-422. Grain size analyses were performed at Applied Marine Sciences (AMS) of League City, Texas.

2.2. Total Organic Carbon Analyses

Total Organic Carbon (TOC) was analyzed according to EPA Method 9060. TOC analyses were performed at Applied Marine Sciences (AMS) of League City, Texas. All samples were analyzed in duplicate and results are reported in % dry wt.

2.3. Metals Analyses

Eight metals were analyzed: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), and zinc (Zn). To prepare the sediments for analysis, they were first freeze-dried then blended in a Spex mixer-mill. For both ICP-MS and CVAA analyses, 0.2-g aliquots of dried, homogeneous sample were digested following the EPA Method 200.3 (EPA 1991) procedure, modified by using a different ratio of nitric to hydrochloric acids for digestion. Hg was analyzed using cold-vapor atomic absorption spectrometry (CVAA) following EPA Method 245.5 (EPA 1991). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) following EPA Method 200.8 (EPA 1991).

2.4. PCB/Pesticide Analyses

PCBs and Pesticides were extracted using methylene chloride. The extract was reduced in volume and cleaned using alumina column chromatography and HPLC. A portion of the extract was exchanged into hexane and analyzed for 22 individual PCB congeners and 19 chlorinated pesticides and toxaphene using gas chromatography/electron capture detection (GC/ECD) following a modified EPA method 8081. Dual column confirmation was performed for all analytes.

2.5. PAH Analyses

PAHs were extracted along with PCB/Pests as described above. Extracts were reduced, cleaned using alumina column chromatography and HPLC, and a portion of the extract analyzed in the selected ion monitoring (SIM) mode using gas chromatography/mass spectrometry (GC/MS) following a modified EPA method 8270.

3. Results

3.1. Grain Size Results

Grain size analysis results, including water content and plots, ere furnished by Applied Marine Sciences, Inc. from League City, Texas and are provided in Attachment 2 along

Dredge Site

with quality control results. The core sediments were generally characterized as olive gray/olive black, fine-grained sand. Table 3 summarizes the grain size distributions of the individual cores.

Seaward

Table 3. Summary of Grain Size Results.

Core	Gravel (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
HR-A 0-5.0'	0.62	1.25	15.85	81.47	0.81	
HR-A1 0-2.8'	1.79	1.76	11.22	85.20	0.04	
HR-B 0-3.0'	5.69	5.90	38.36	49.41	0.63	
HR-C 0-8.3'	0.00	0.05	4.04	93.81	2.11	
HR-C 8.3-10.8'	0.00	0.00	2.32	79.52	11.16	7.00
HR-D 0-6.4'	0.00	0.00	1.53	96.89	1.58	
HR-D 6.5-7.5'	0.00	0.00	1.88	89.12	4.00	5.00
HR-E 0-3.7'	0.00	0.09	2.15	96.17	1.59	
HR-E 3.7-5.8'	0.00	0.92	6.29	78.78	8.01	6.00
HR-F 0-3.8'	0.82	0.20	11.01	87.92	0.05	
HR-G 0-3.8'	0.00	0.02	5.15	89.77	1.86	3.20
HR-H 0-6.3'	0.00	0.18	14.39	83.24	2.20	
HR-I 0-10.0'	0.00	0.25	22.00	74.62	3.13	
HR-J 0-11.8'	0.00	0.40	26.68	71.15	1.78	
HR-K 0-5.6'	0.69	0.19	19.15	77.92	2.05	
HR-K 5.7-8.8'	0.00	0.24	14.87	75.54	4.85	4.50
HR-L 0-4.6'	1.47	0.37	5.11	87.00	1.55	4.50
HR-M 0-3.8'	0.00	0.25	9.44	86.75	3.57	
HR-N 0-4.6'	0.11	0.27	23.89	69.75	2.47	3.50
HR-O 0-37.'	0.00	0.14	17.36	80.96	1.54	
HR-P 0-4.8'	0.18	0.65	14.95	81.64	2.57	
HR-Q 0-7.8'	0.56	0.80	24.13	73.26	1.25	
HR-R 0-4.7'	0.00	0.33	32.79	66.12	0.76	
HR-S 0-10.4'	0.06	0.41	23.73	72.63	3.18	
HR-T 0-7.9'	0.00	0.10	27.20	71.78	0.93	
HR-T 8.0-12.7'	0.00	0.15	15.22	74.02	5.61	5.00
HR-U 0-6.0'	0.00	0.10	27.90	69.77	2.23	
HR-V 0-10.0'	0.00	0.16	27.12	70.00	2.73	
HR-W 0-7.8'	1.66	1.01	39.89	56.01	1.42	
HR-X 0-8.2'	0.15	0.01	7.76	90.52	1.56	
HR-Y 0-9.8'	0.00	0.06	8.79	84.24	2.91	4.00
HR-Y 9.8-11.8'	1.19	0.91	12.93	57.28	20.69	7.00

Up River

Route 1 Bridge

with quality control results. The core sediments were generally characterized as olive gray/olive black, fine-grained sand. Table 3 summarizes the grain size distributions of the individual cores.

Table 3. Summary of Grain Size Results.

Core	Gravel (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
HR-A 0-5.0'	0.62	1.25	15.85	81.47	0.81	
HR-A1 0-2.8'	1.79	1.76	11.22	85.20	0.04	
HR-B 0-3.0'	5.69	5.90	38.36	49.41	0.63	
HR-C 0-8.3'	0.00	0.05	4.04	93.81	2.11	
HR-C 8.3-10.8'	0.00	0.00	2.32	79.52	11.16	7.00
HR-D 0-6.4'	0.00	0.00	1.53	96.89	1.58	
HR-D 6.5-7.5'	0.00	0.00	1.88	89.12	4.00	5.00
HR-E 0-3.7'	0.00	0.09	2.15	96.17	1.59	
HR-E 3.7-5.8'	0.00	0.92	6.29	78.78	8.01	6.00
HR-F 0-3.8'	0.82	0.20	11.01	87.92	0.05	
HR-G 0-3.8'	0.00	0.02	5.15	89.77	1.86	3.20
HR-H 0-6.3'	0.00	0.18	14.39	83.24	2.20	
HR-I 0-10.0'	0.00	0.25	22.00	74.62	3.13	
HR-J 0-11.8'	0.00	0.40	26.68	71.15	1.78	
HR-K 0-5.6'	0.69	0.19	19.15	77.92	2.05	
HR-K 5.7-8.8'	0.00	0.24	14.87	75.54	4.85	4.50
HR-L 0-4.6'	1.47	0.37	5.11	87.00	1.55	4.50
HR-M 0-3.8'	0.00	0.25	9.44	86.75	3.57	
HR-N 0-4.6'	0.11	0.27	23.89	69.75	2.47	3.50
HR-O 0-37.'	0.00	0.14	17.36	80.96	1.54	
HR-P 0-4.8'	0.18	0.65	14.95	81.64	2.57	
HR-Q 0-7.8'	0.56	0.80	24.13	73.26	1.25	
HR-R 0-4.7'	0.00	0.33	32.79	66.12	0.76	
HR-S 0-10.4'	0.06	0.41	23.73	72.63	3.18	
HR-T 0-7.9'	0.00	0.10	27.20	71.78	0.93	
HR-T 8.0-12.7'	0.00	0.15	15.22	74.02	5.61	5.00
HR-U 0-6.0'	0.00	0.10	27.90	69.77	2.23	
HR-V 0-10.0'	0.00	0.16	27.12	70.00	2.73	
HR-W 0-7.8'	1.66	1.01	39.89	56.01	1.42	
HR-X 0-8.2'	0.15	0.01	7.76	90.52	1.56	
HR-Y 0-9.8'	0.00	0.06	8.79	84.24	2.91	4.00
HR-Y 9.8-11.8'	1.19	0.91	12.93	57.28	20.69	7.00

3.2. Total Organic Carbon Results

TOC results for composited core samples are provided in Attachment 3 and summarized in Table 4.

Table 4. Results of TOC Analyses.

Core	TOC [1] (% Dry Wt.)
Composite Core A, A1	0.12
Core B	0.27
Composite Cores C, D	0.85
Composite Cores E, F	0.64
Composite Cores G, H	0.42
Composite Cores I, J	0.34
Core K	0.64
Composite Cores L, M	0.94
Composite Cores N, O, P	0.38
Core Q	0.85
Composite Cores S, T	0.72
Composite Cores U, V	0.44
Core W	0.49
Core X	0.47
Core Y	1.41

[1]**All TOC analyses were performed in duplicate; replicate results are provided in Attachment 3.**

3.3. Metals Results

Eight metals were analyzed. All metals were detected above the target detection limits. Highest concentrations of all metals, except As, were observed in composite C,D. Metals results are provided in Attachment 4.

3.4. PCB/Pest Results

Results of PCB and chlorinated pesticide analyses for all field samples and quality control samples are provided in Attachment 5. PCBs and pesticides were detected in all of the composited field samples. HR Composite Cores S,T had the highest levels of Total PCB (91.95 µg/kg) among the composites tested. All quality control and field samples passed the surrogate recovery criteria. No analytes were detected in the Procedural Blank (PB) at levels above the Target Detection Limit. The Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples were within the recovery and Relative Percent Difference (RPD) criteria. The Percent Difference (PD) criteria were exceeded in the Standard Reference Material (SRM) for 2,4 DDE (49.3%), Cl5(87) (42.4%), Cl7(170) (402%) and Cl7(180) (52.9%). The Sample Duplicates failed the RPD criteria for 3 pesticides and 13 PCB congeners, due to low levels evaluated that were below the Target Detection Limits.

3.5. PAH Results

Results of PAH analyses for all field samples and quality control samples are provided in Attachment 6. PAHs were detected at levels above the Target Detection Limit in all of the composited sediment samples. The predominant PAHs detected were high molecular weight compounds, indicative of a pyrogenic (combusted material) rather than petrogenic (recent petroleum-type source).

Composite C,D, Composite G,H, Composite Q and Composite X all had low recoveries of naphthalene-d8 (24-40%). Method detection limits (MDLs) for naphthalene are approximately 10 times lower that the reported Target Detection limits and naphthalene was not detected at those levels, therefore, reporting naphthalene as not detected below the Target Detection limit, even with the low naphthalene-d8 surrogate recoveries, is accurate. HR Composite Core C,D also had low recoveries for phenanthrene-d10 and chrysene-d12 . This sample was re-extracted and re-analyzed. All three surrogate recoveries were acceptable and results are included in Attachment 6.

4. References

Battelle 1999. *Vibratory Core Sampling in Clinton Harbor, Housatonic River and North Cove, CT,* November 1999.

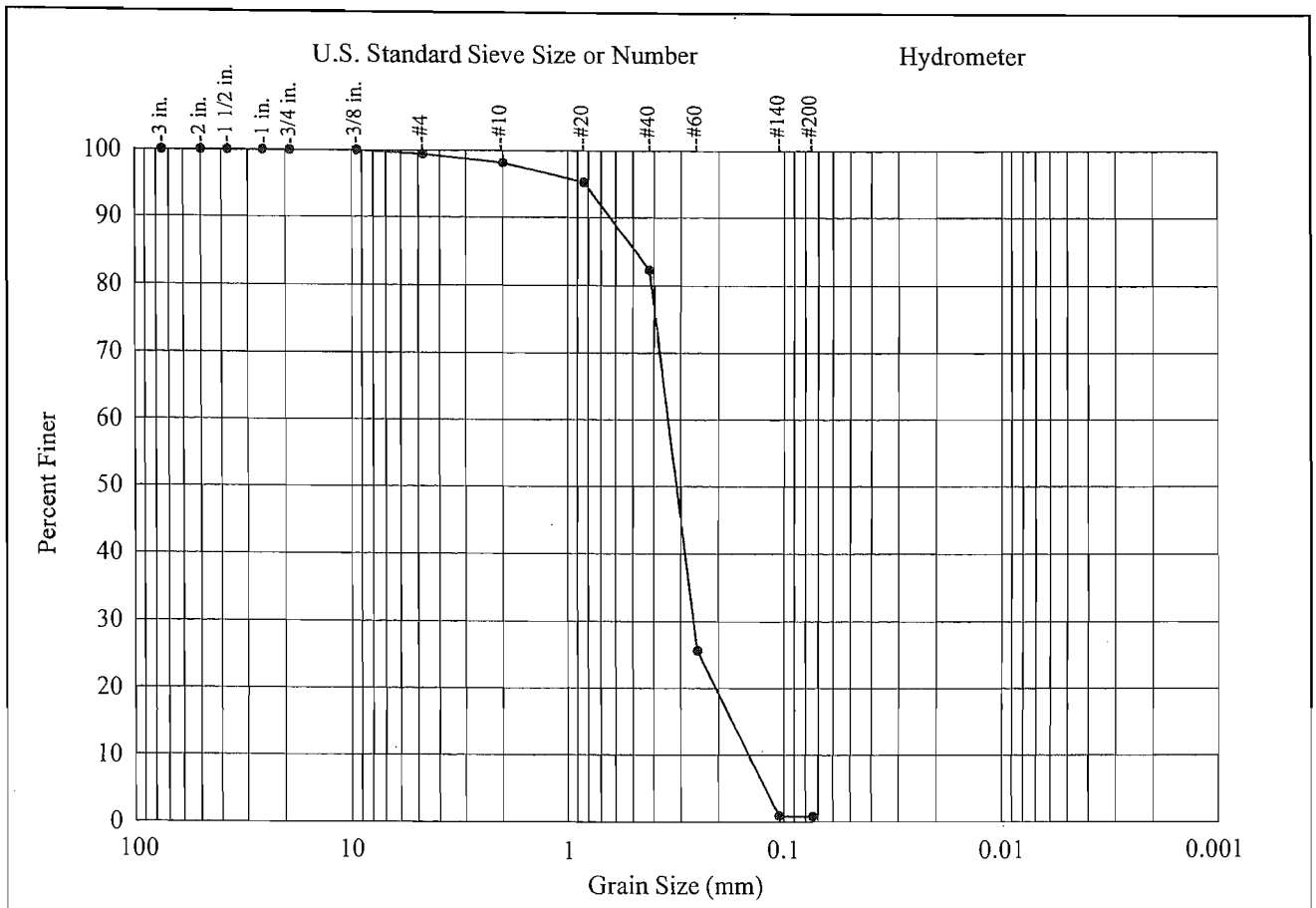
Battelle 1999. Sampling and Analysis Plan for O&M. May 4, 1999.

EPA. 1991. *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010.

Statement of Work. Laboratory Testing in Support of Environmental Assessment. NAE PCS Projects-FY2000, October 6, 1999

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.62	1.25	15.85	81.47	0.81

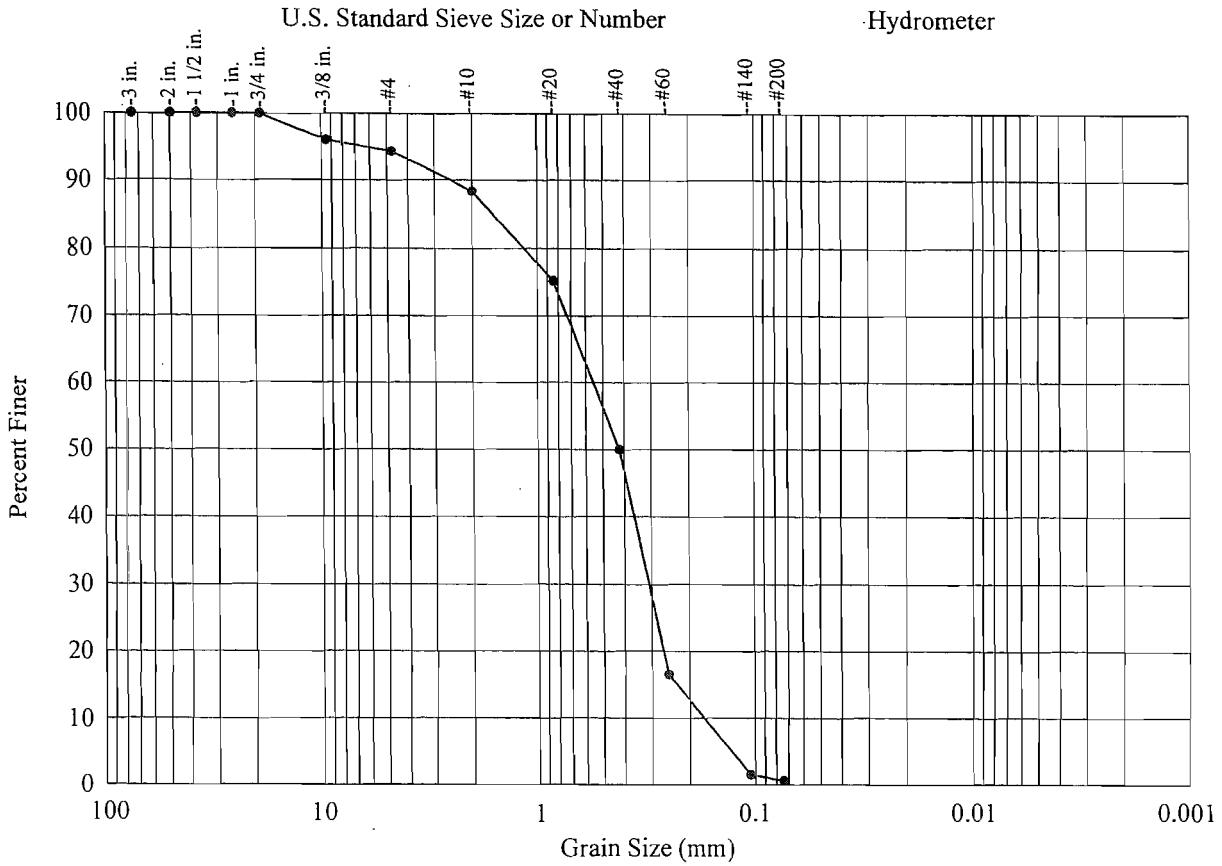
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
14	88			0.49	0.34	0.31	0.26	0.17	0.15	1.33	2.27

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of rock and shell fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core A 0-5.0'	Battelle ID:	HR-A 0-5.0'
	AMS ID:	5142
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	5.69	5.90	38.36	49.41	0.63

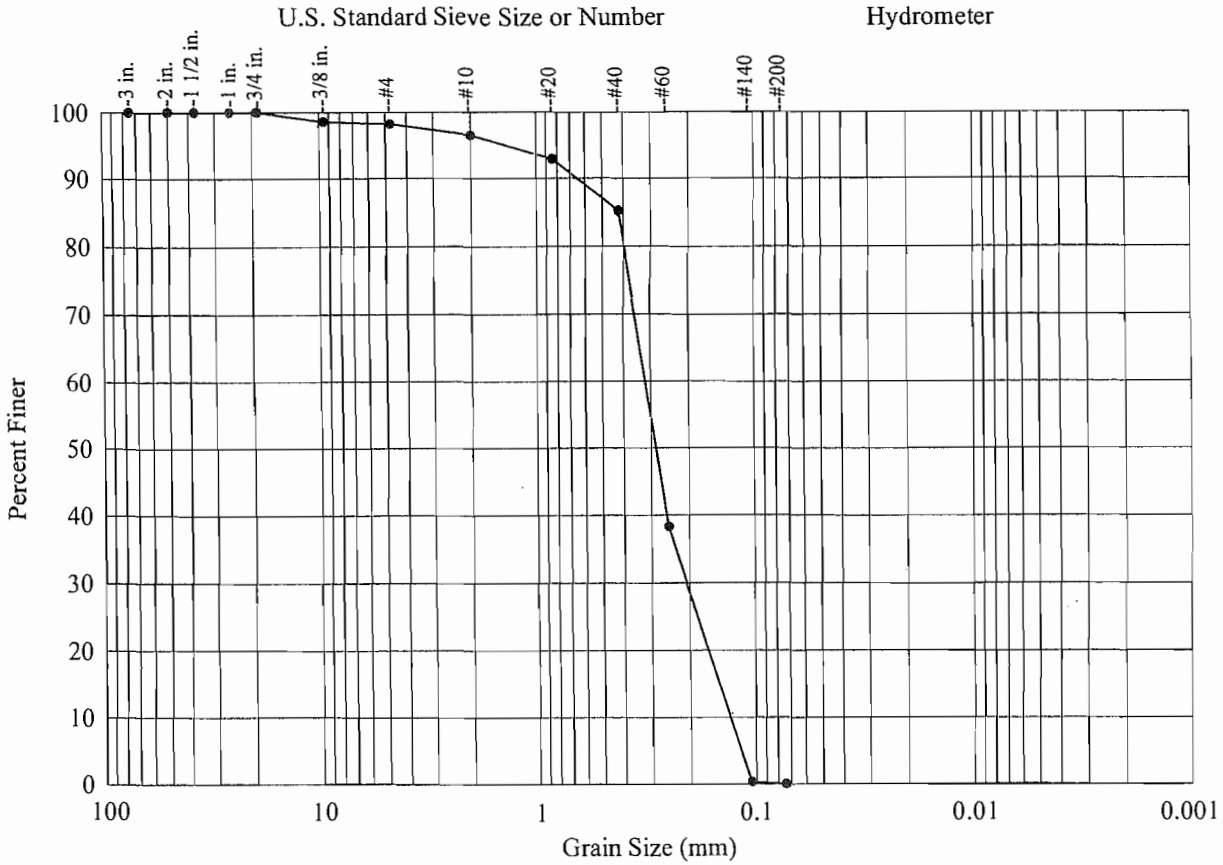
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
21	83			1.60	0.56	0.42	0.31	0.22	0.17	1.01	3.29

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of shell fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core B 0-3.0'	Battelle ID:	HR-B 0-3.0'
	AMS ID:	5163
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	1.79	1.76	11.22	85.20	0.04

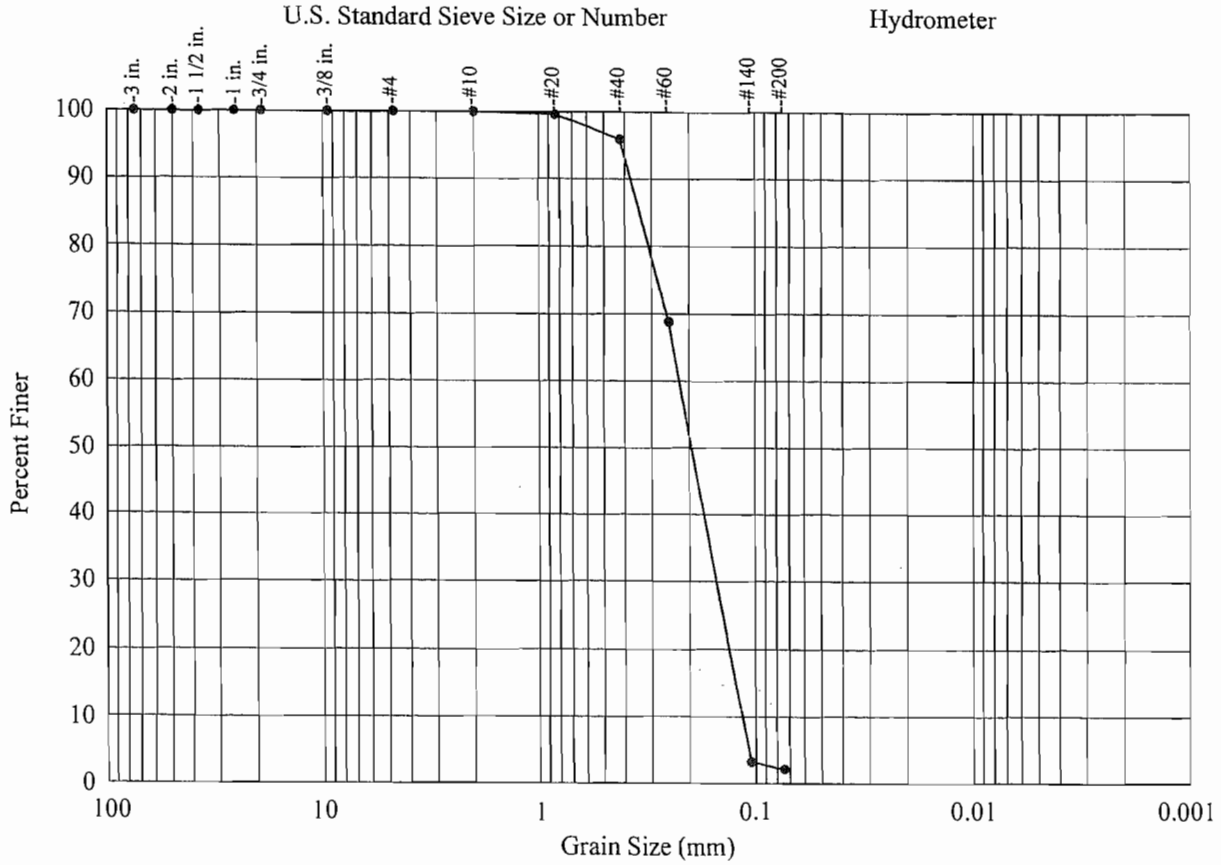
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
17	86			0.41	0.32	0.29	0.21	0.16	0.14	0.98	2.29

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of shell fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core A1 0-2.8'	Battelle ID:	HR-A1 0-2.8'
	AMS ID:	5149
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.05	4.04	93.81	2.11

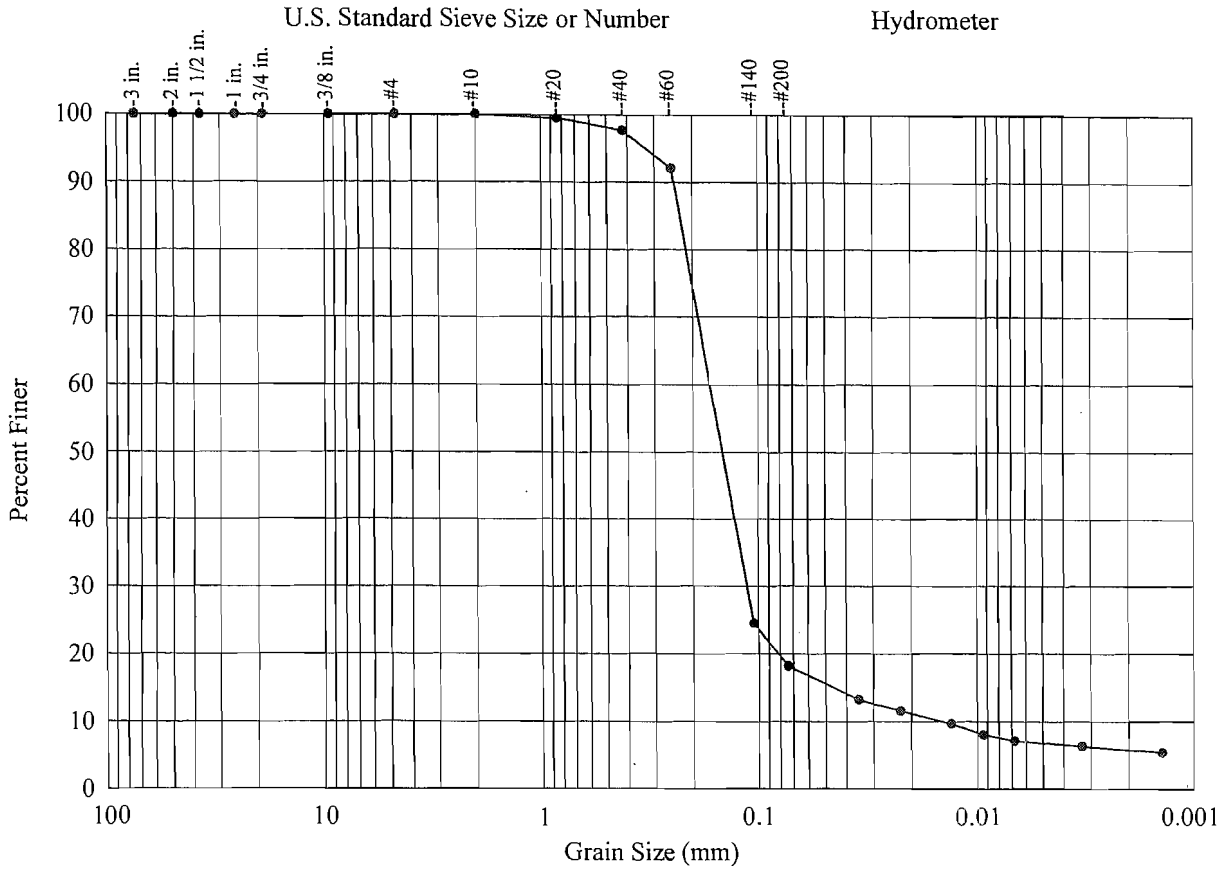
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
23	82			0.35	0.22	0.19	0.16	0.13	0.12	0.97	1.83

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core C 0-8.3'	Battelle ID:	HR-C 0-8.3'
	AMS ID:	5155
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	0.00	0.00	2.32	79.52	11.16	7.00

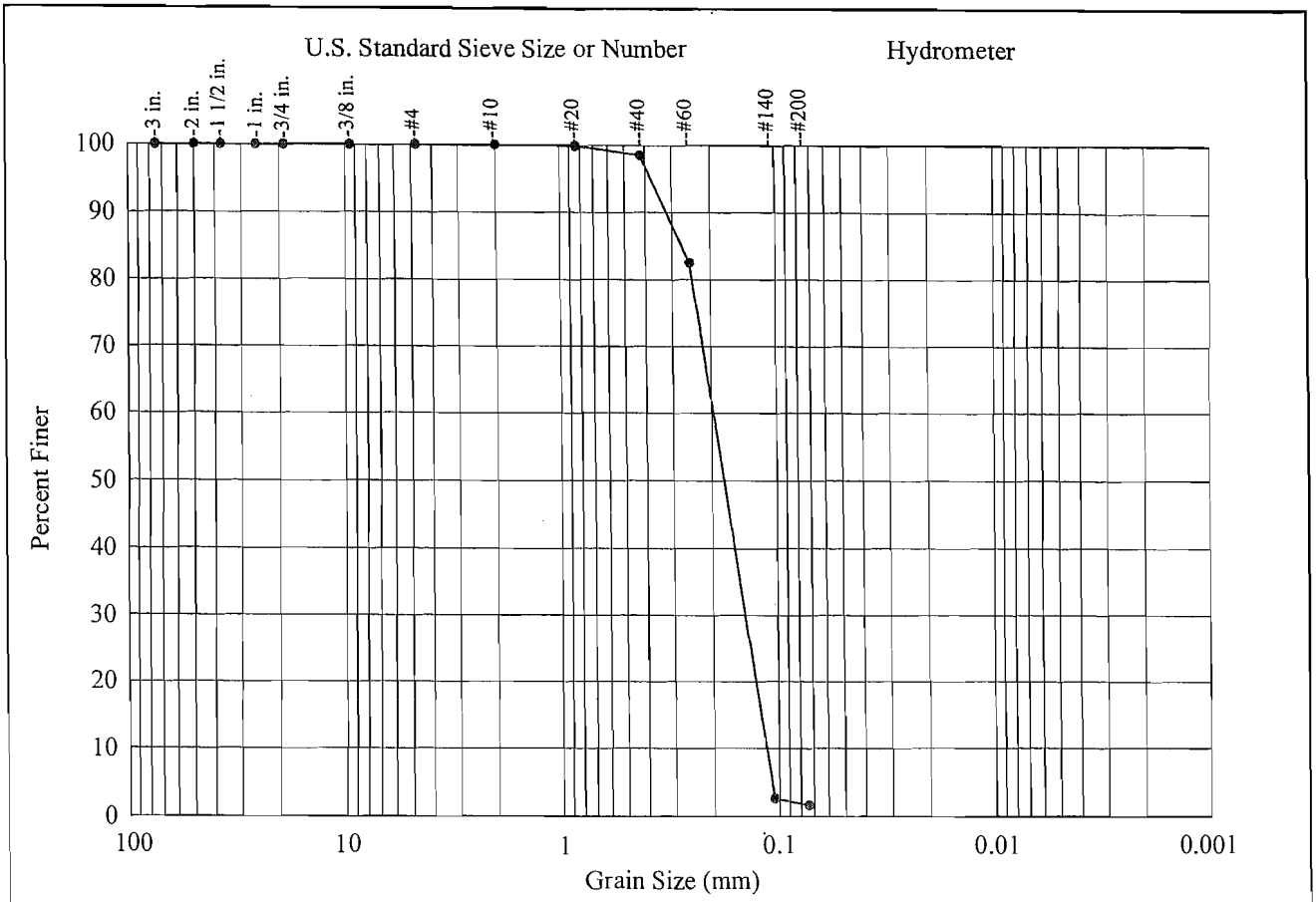
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
46	69			0.23	0.17	0.16	0.12	0.040	0.015	5.65	11.33

Material Description	USCS
Grayish Black, Silty, Clayey Fine-Grained Sand Faint hydrocarbon odor	SC-SM

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core C 8.3-10.8'	Battelle ID:	HR-C 8.3-10.8'
	AMS ID:	5156
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.00	1.53	96.89	1.58

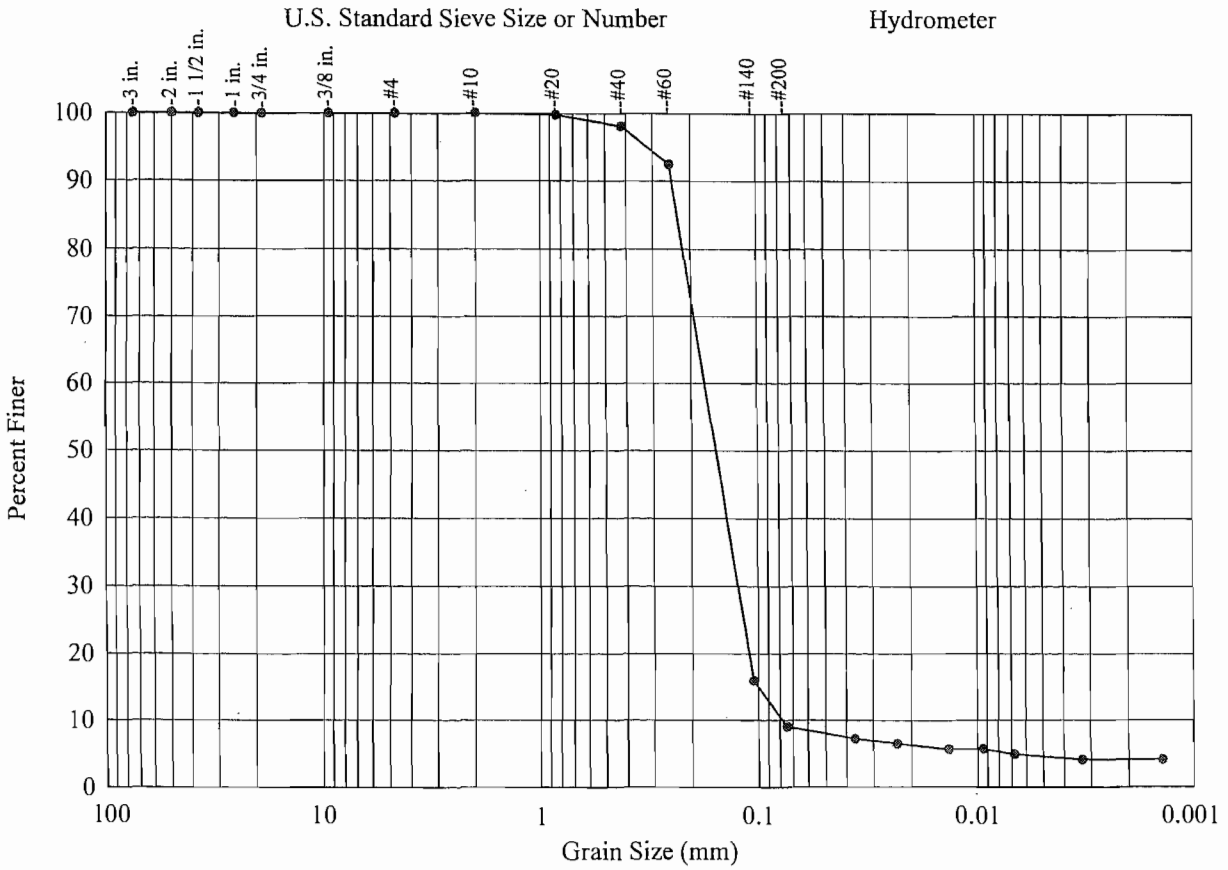
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
18	85			0.27	0.19	0.18	0.15	0.13	0.12	0.99	1.58

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core D 0-6.4'	Battelle ID:	HR-D 0-6.4'
	AMS ID:	5153
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	0.00	0.00	1.88	89.12	4.00	5.00

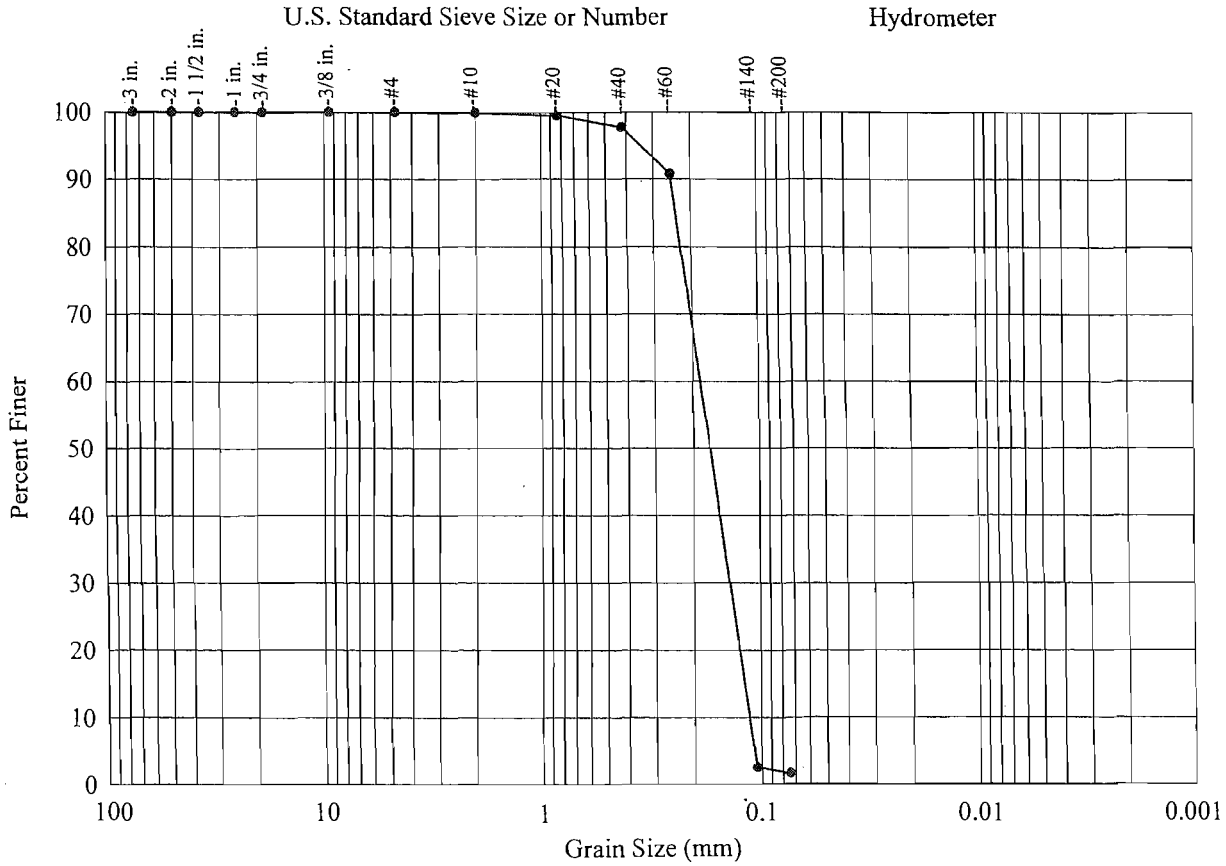
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
38	72			0.23	0.18	0.17	0.13	0.096	0.078	1.20	2.31

Material Description	USCS
Olive Black, Poorly-Graded, Fine-Grained Sand with Silty Clay	SP-SC

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core D 6.5-7.5'	Battelle ID:	HR-D 6.5-7.5'
	AMS ID:	5154
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.09	2.15	96.17	1.59

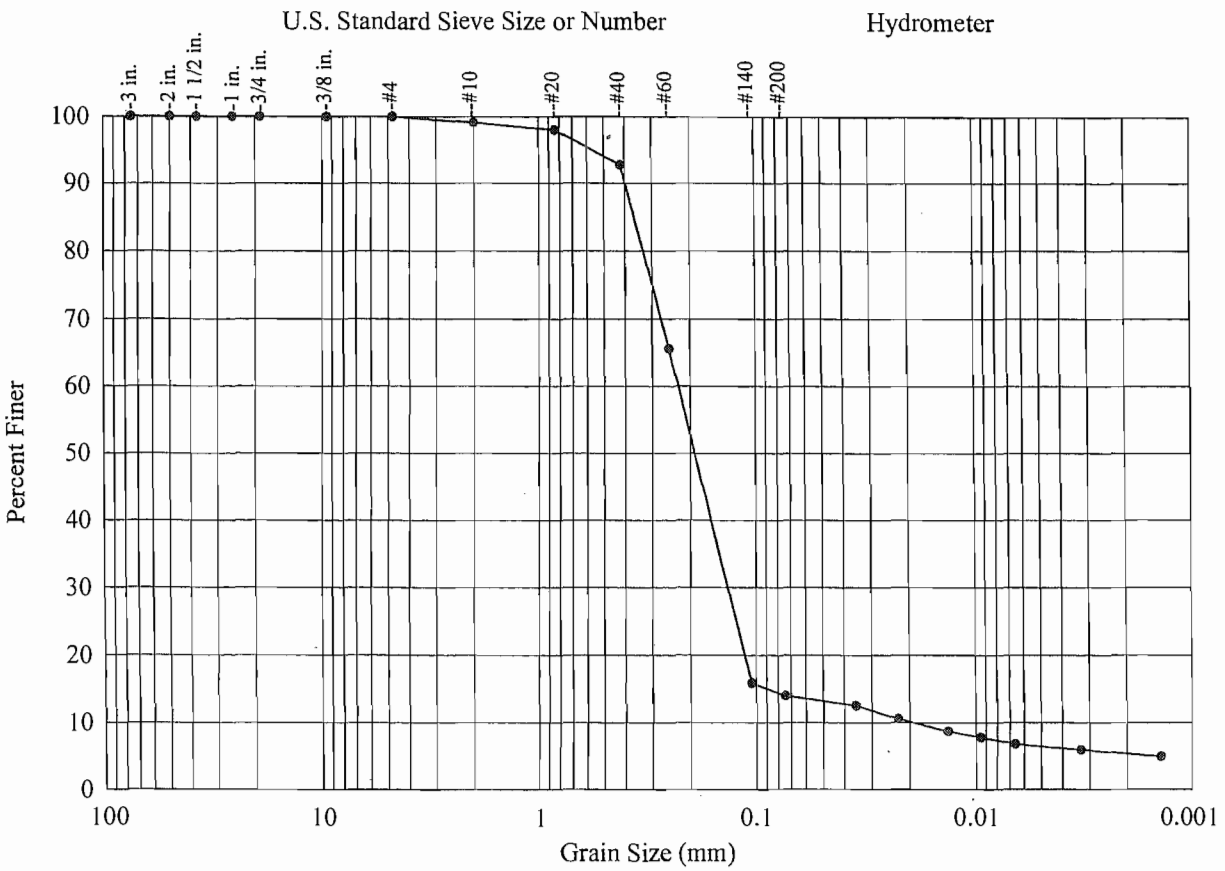
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
26	79			0.24	0.18	0.17	0.15	0.13	0.12	1.04	1.50

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core E 0-3.7'	Battelle ID:	HR-E 0-3.7'
	AMS ID:	5165
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	0.00	0.92	6.29	78.78	8.01	6.00

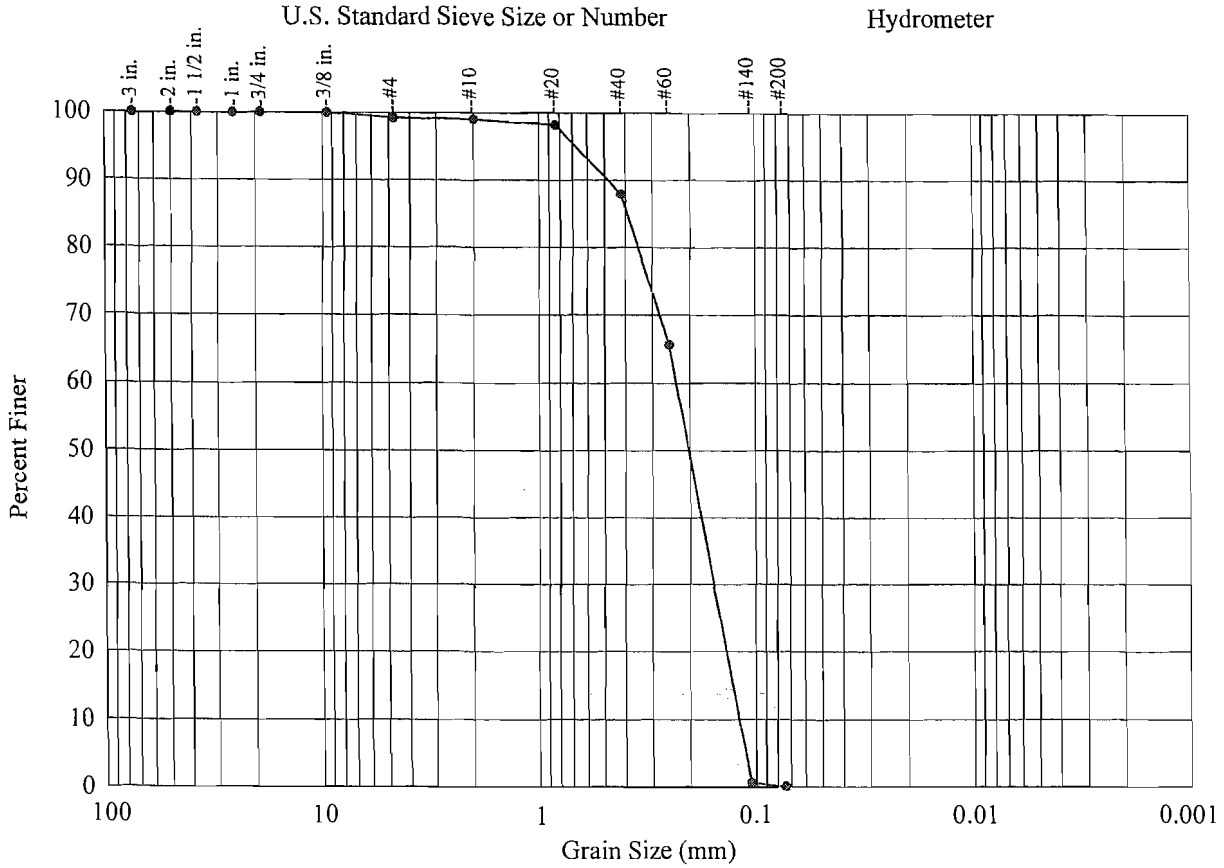
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
35	74			0.38	0.23	0.19	0.15	0.07	0.02	4.89	11.50

Material Description	USCS
Black, Silty, Fine-Grained Sand	SM

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core E 3.7-5.8'	Battelle ID:	HR-E 3.7-5.8'
	AMS ID:	5166
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.82	0.20	11.01	87.92	0.05

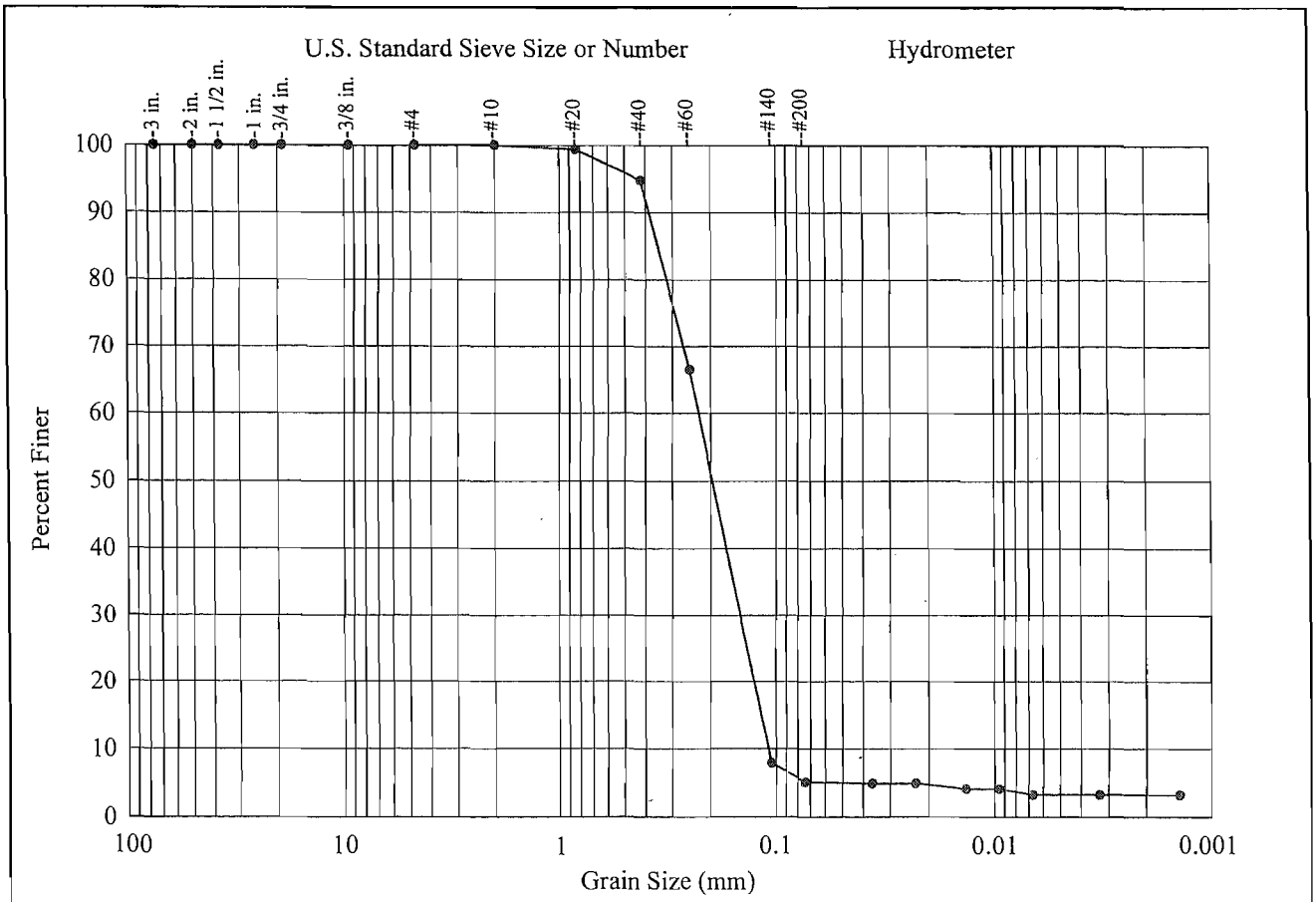
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
25	80			0.39	0.24	0.21	0.17	0.14	0.13	0.93	1.85

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP
Gravel fraction was composed of rock fragments	

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core F 0-3.8'	Battelle ID:	HR-F 0-3.8'
	AMS ID:	5139
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	0.00	0.02	5.15	89.77	1.86	3.20

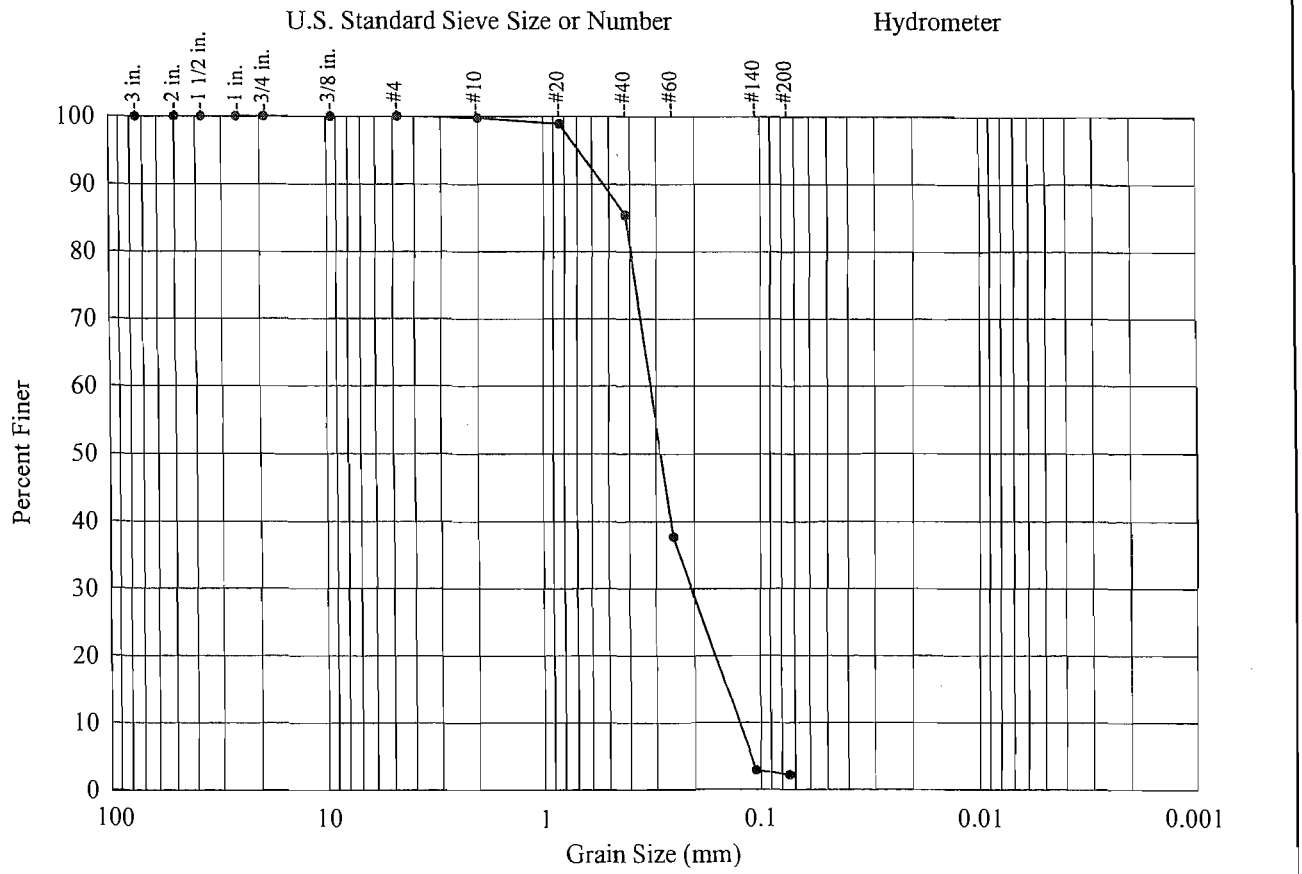
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
28	78			0.35	0.24	0.19	0.16	0.13	0.11	0.97	2.18

Material Description	USCS
Olive Black, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core G 0-3.8'	Battelle ID:	HR-G 0-3.8'
	AMS ID:	5132
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.18	14.39	83.24	2.20

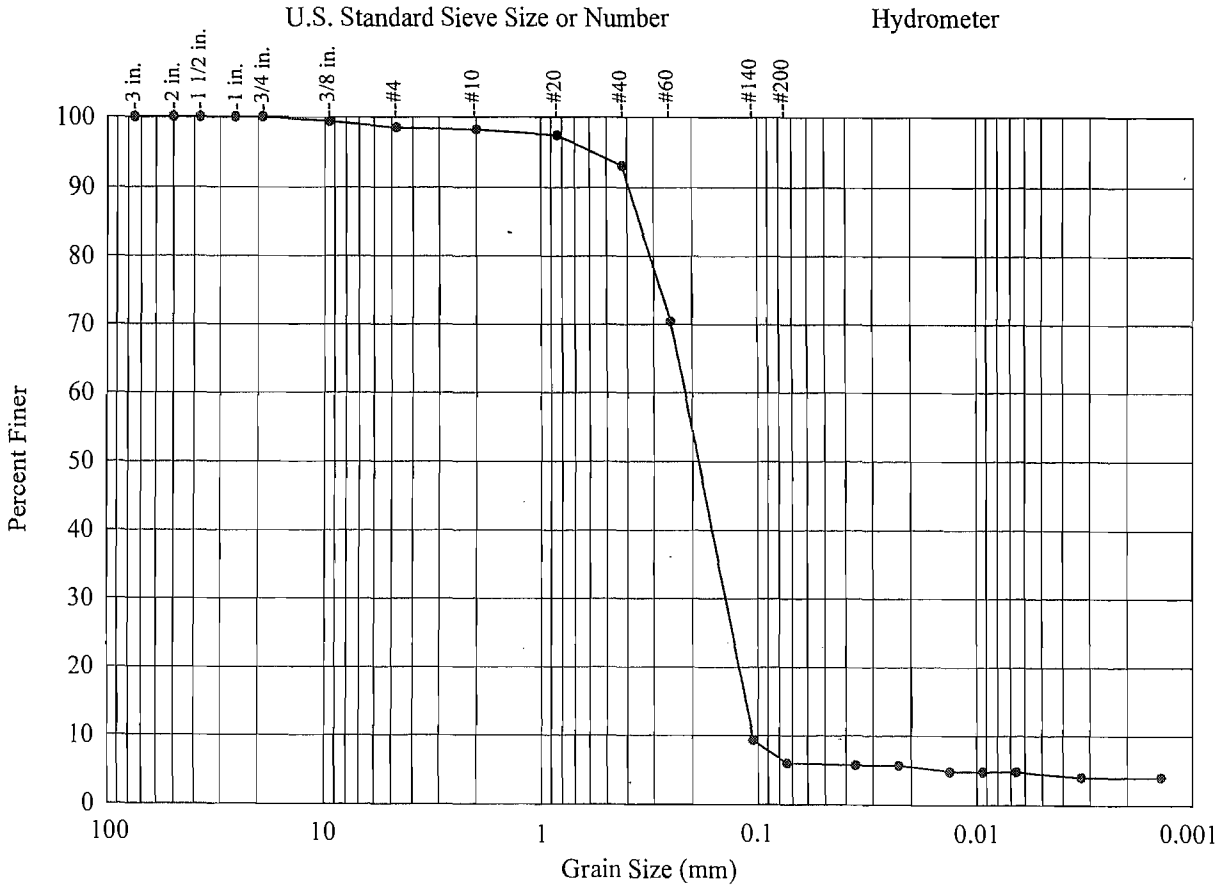
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
22	82			0.41	0.32	0.29	0.21	0.15	0.14	0.98	2.29

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core H 0-6.3'	Battelle ID:	HR-H 0-6.3'
	AMS ID:	5143
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	1.47	0.37	5.11	87.00	1.55	4.50

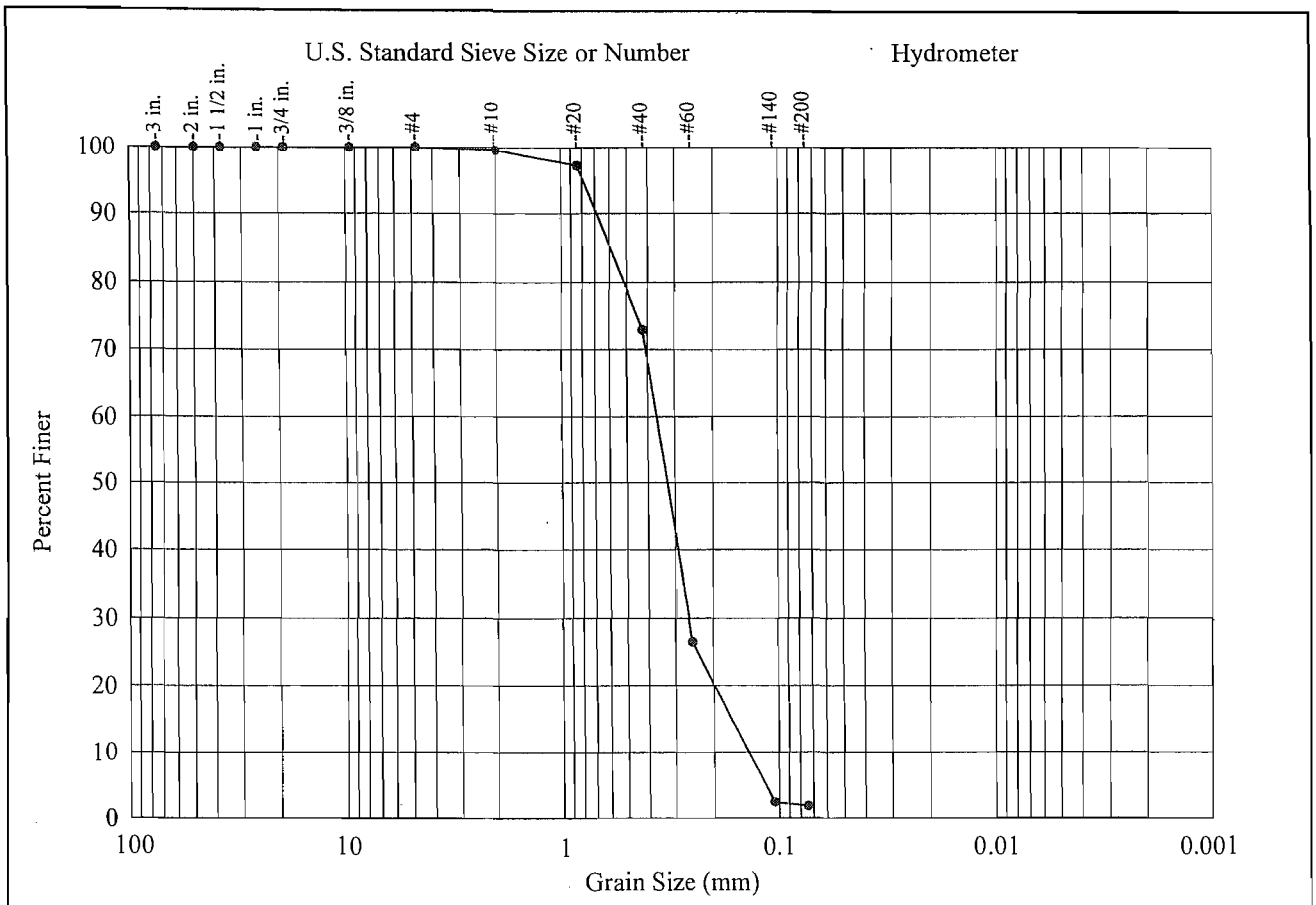
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
30	77			0.35	0.22	0.19	0.15	0.12	0.11	0.93	2.00

Material Description	USCS
Olive Black, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of shell fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core L 0-4.6'	Battelle ID:	HR-L 0-4.6'
	AMS ID:	5133
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.40	26.68	71.15	1.78

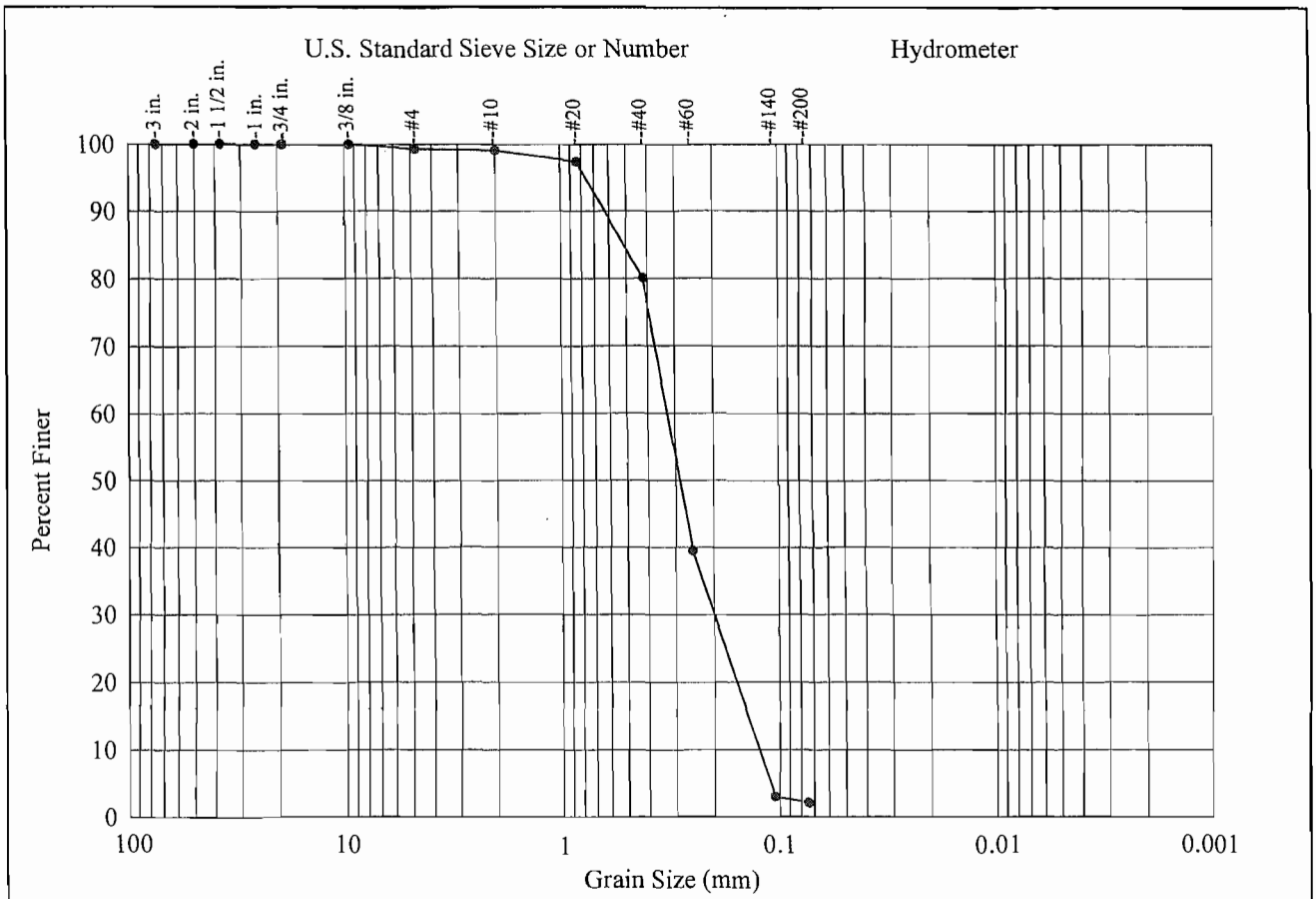
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
15	87			0.60	0.36	0.33	0.26	0.16	0.15	1.25	2.40

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core J 0-11.8'	Battelle ID:	HR-J 0-11.8'
	AMS ID:	5138
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.69	0.19	19.15	77.92	2.05

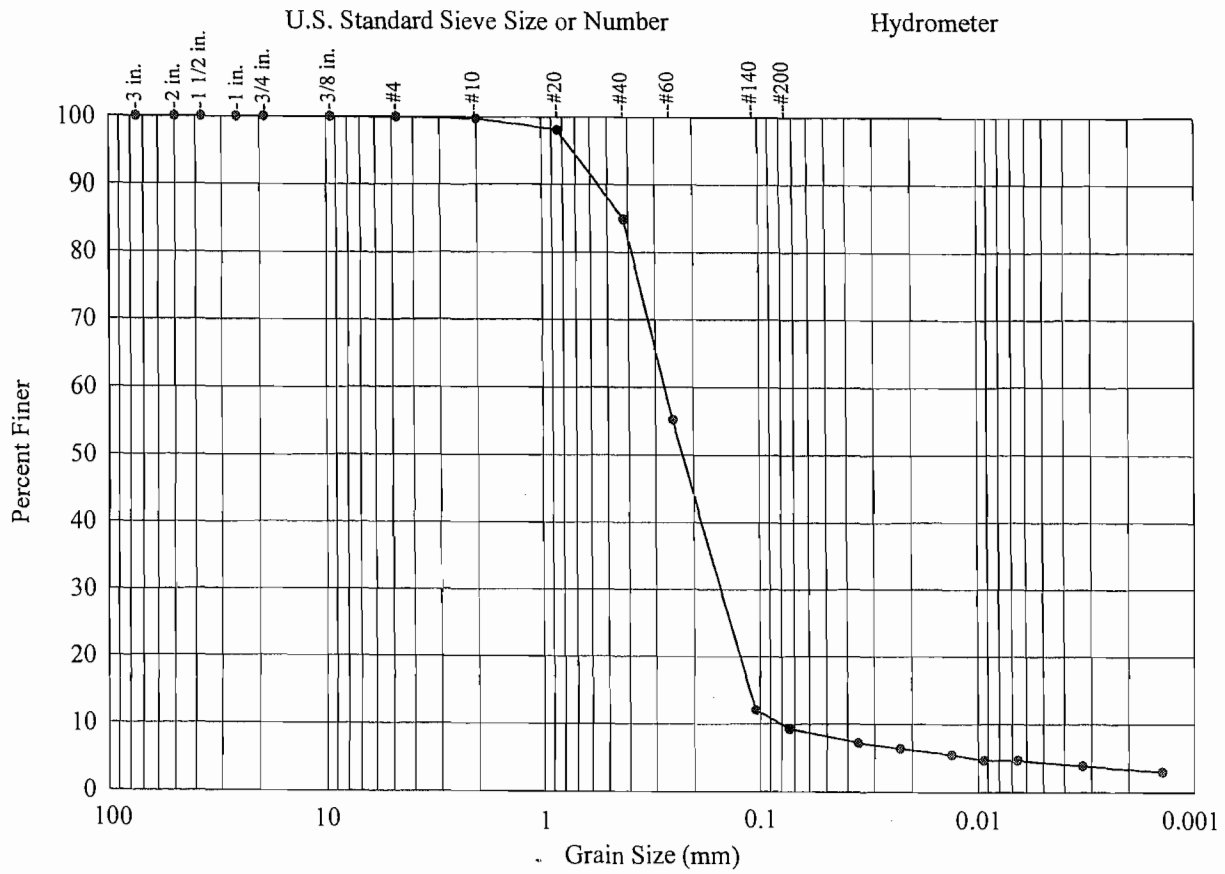
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
20	83			0.50	0.34	0.29	0.20	0.15	0.14	0.84	2.43

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of rock fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core K 0-5.6'	Battelle ID:	HR-K 0-5.6'
	AMS ID:	5134
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	0.00	0.24	14.87	75.54	4.85	4.50

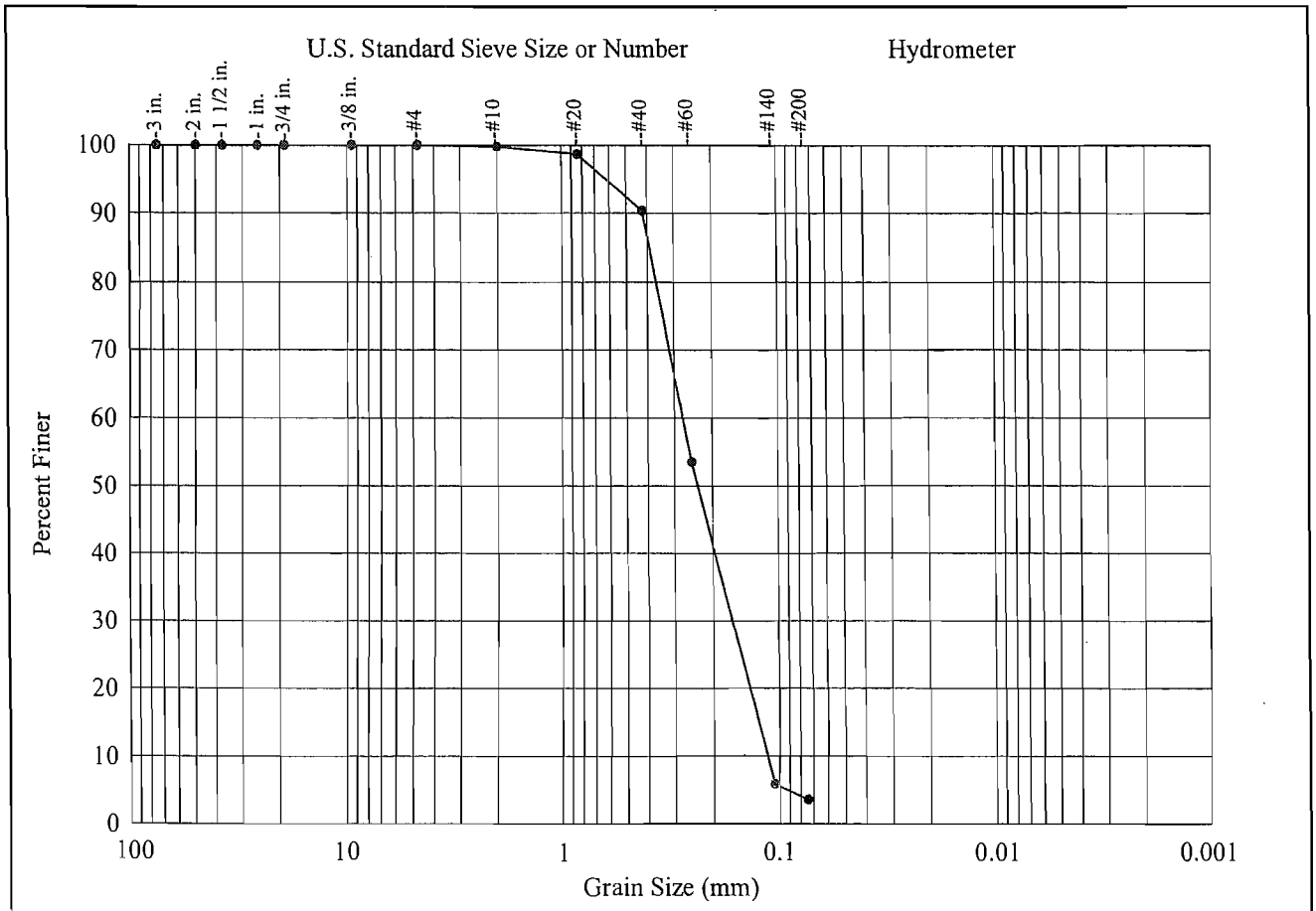
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
31	76			0.42	0.28	0.23	0.17	0.12	0.08	1.29	3.50

Material Description	USCS
Black, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core K 5.7-8.8'	Battelle ID:	HR-K 5.7-8.8'
	AMS ID:	5135
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.25	9.44	86.75	3.57

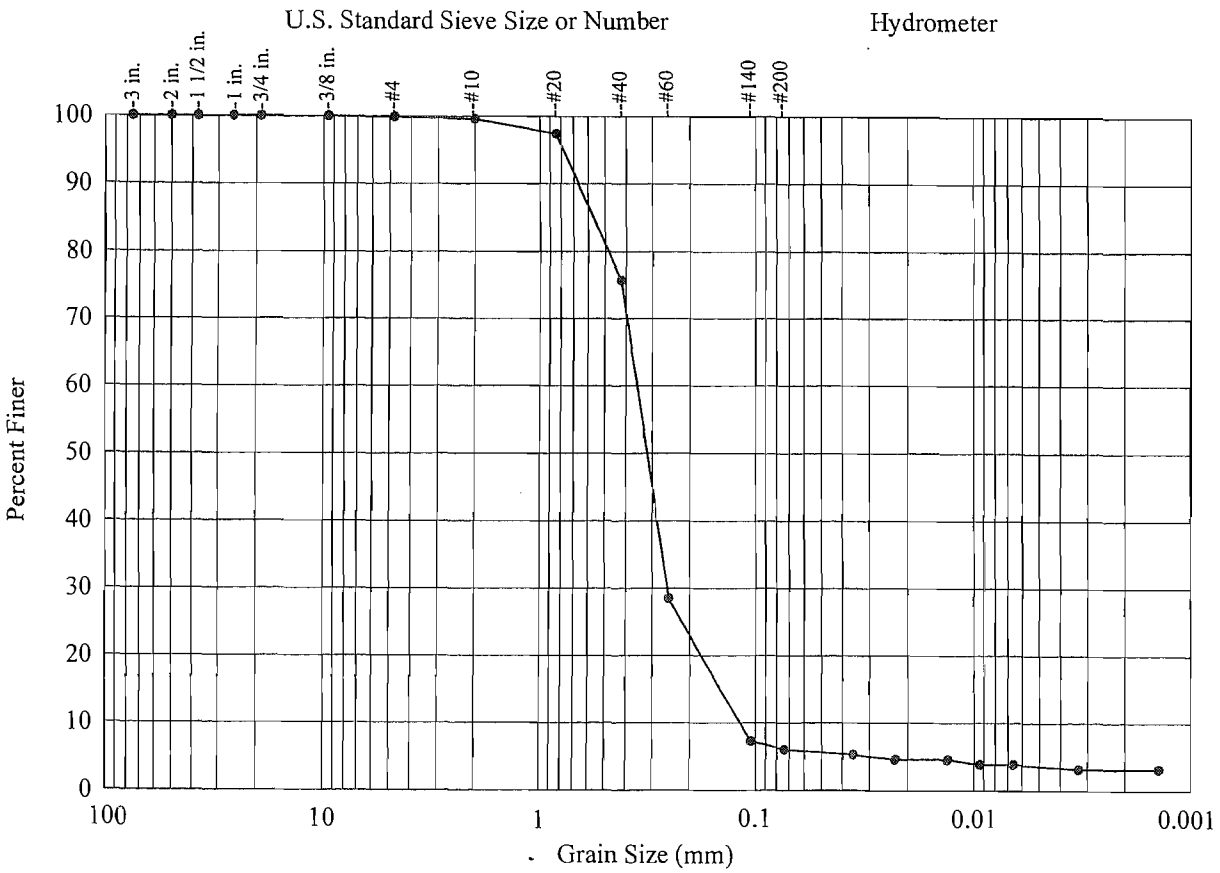
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
21	82			0.39	0.28	0.24	0.17	0.14	0.12	0.86	2.33

Material Description	USCS
Dark Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core M 0-3.8'	Battelle ID:	HR-M 0-3.8'
	AMS ID:	5164
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	0.11	0.27	23.89	69.75	2.47	3.50

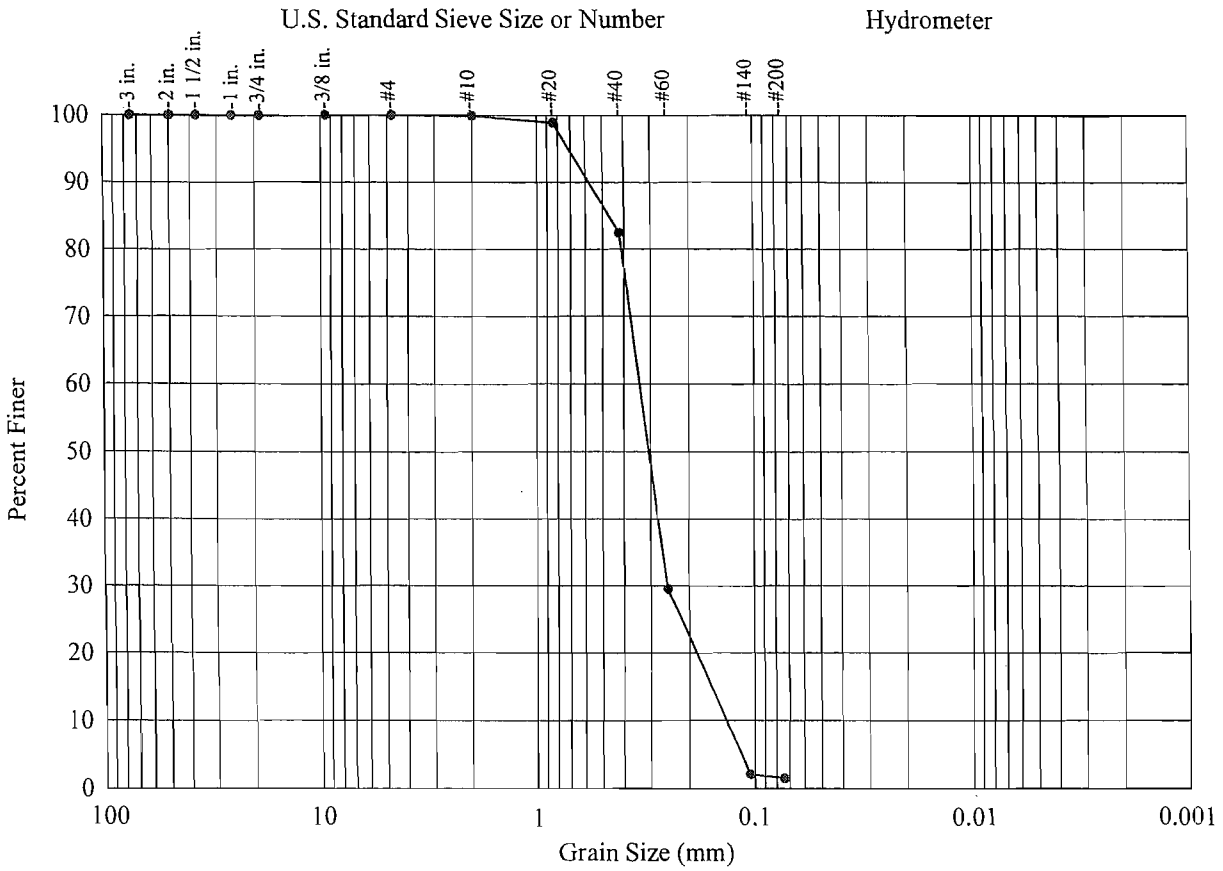
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
24	80			0.55	0.36	0.32	0.26	0.16	0.13	1.44	2.77

Material Description	USCS
Grayish Black, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of rock fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core N 0-4.6'	Battelle ID:	HR-N 0-4.6'
	AMS ID:	5140
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.14	17.36	80.96	1.54

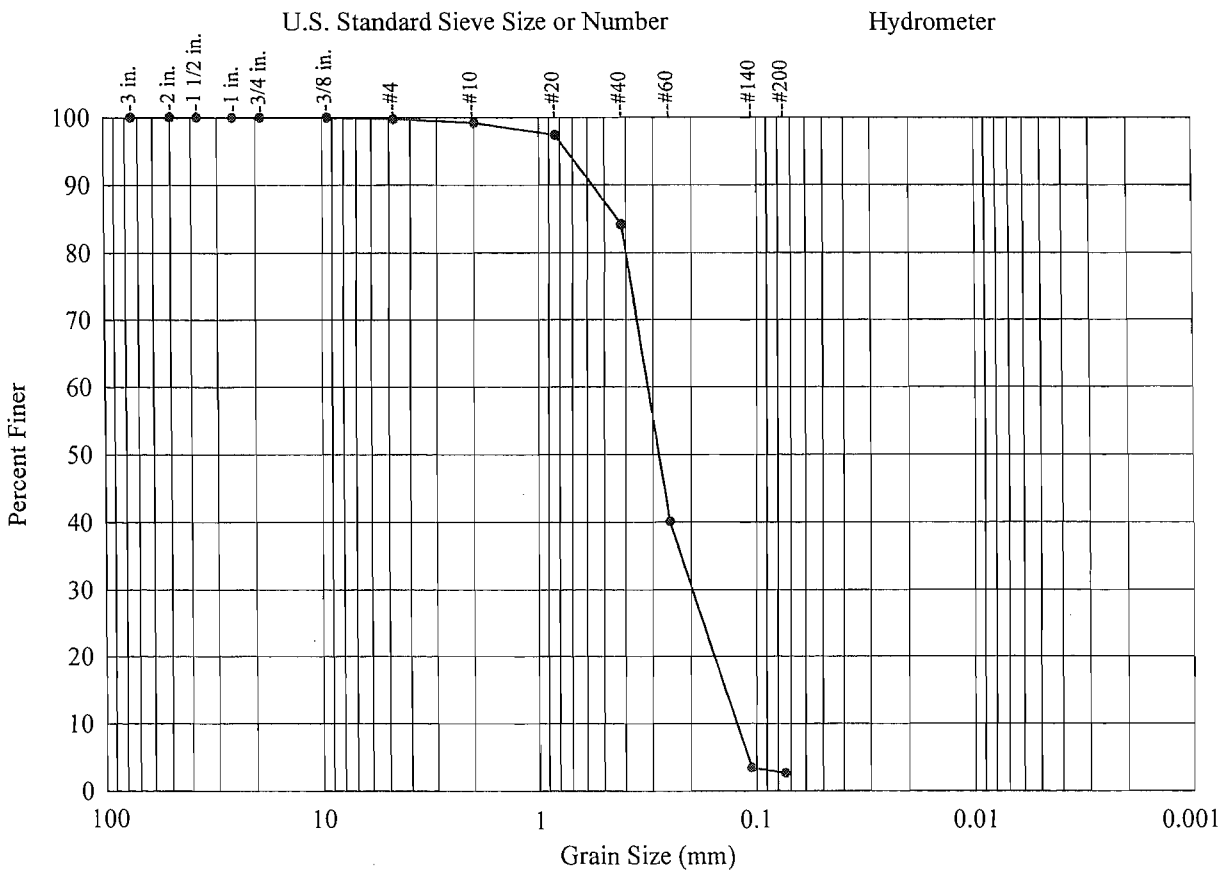
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
22	82			0.45	0.35	0.31	0.25	0.17	0.14	1.28	2.50

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core O 0-3.7'	Battelle ID:	HR-O 0-3.7'
	AMS ID:	5148
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.18	0.65	14.95	81.64	2.57

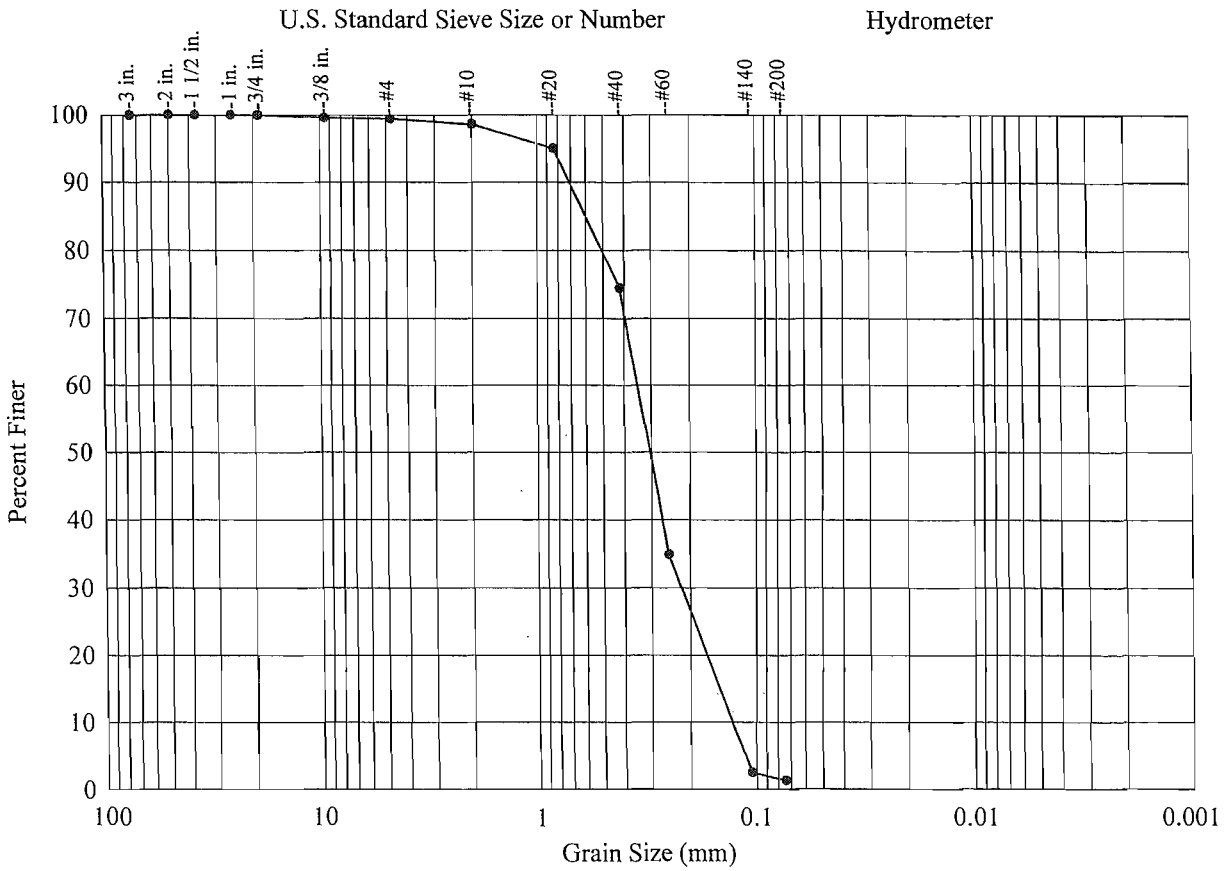
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
20	83			0.43	0.32	0.28	0.20	0.15	0.13	0.96	2.46

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of shell fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core P 0-4.8'	Battelle ID:	HR-P 0-4.8'
	AMS ID:	5137
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.56	0.80	24.13	73.26	1.25

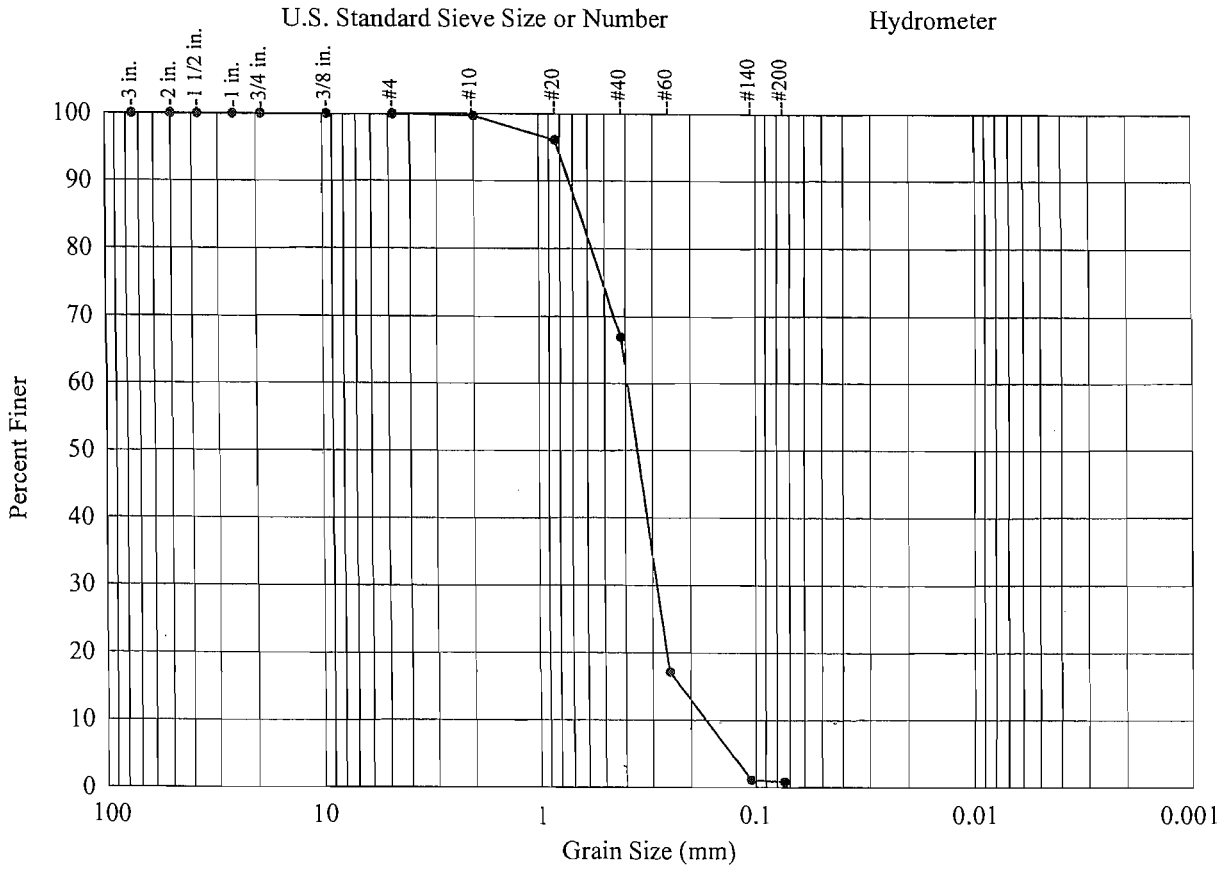
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
22	82			0.60	0.35	0.30	0.23	0.16	0.14	1.08	2.50

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core Q 0-7.8'	Battelle ID:	HR-Q 0-7.8'
	AMS ID:	5145
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.33	32.79	66.12	0.76

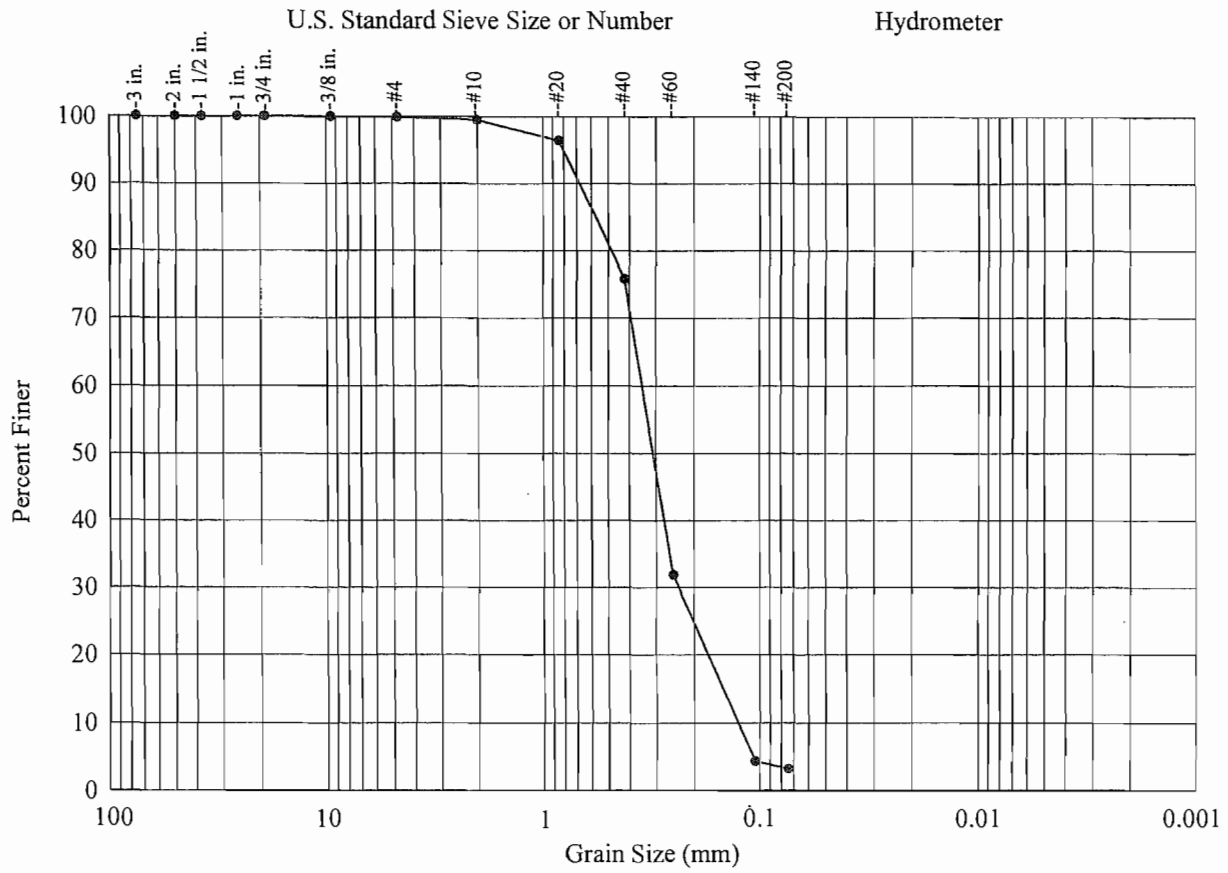
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
22	82			0.65	0.39	0.35	0.29	0.22	0.18	1.20	2.17

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core R 0-4.7'	Battelle ID:	HR-R 0-4.7'
	AMS ID:	5157
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.06	0.41	23.73	72.63	3.18

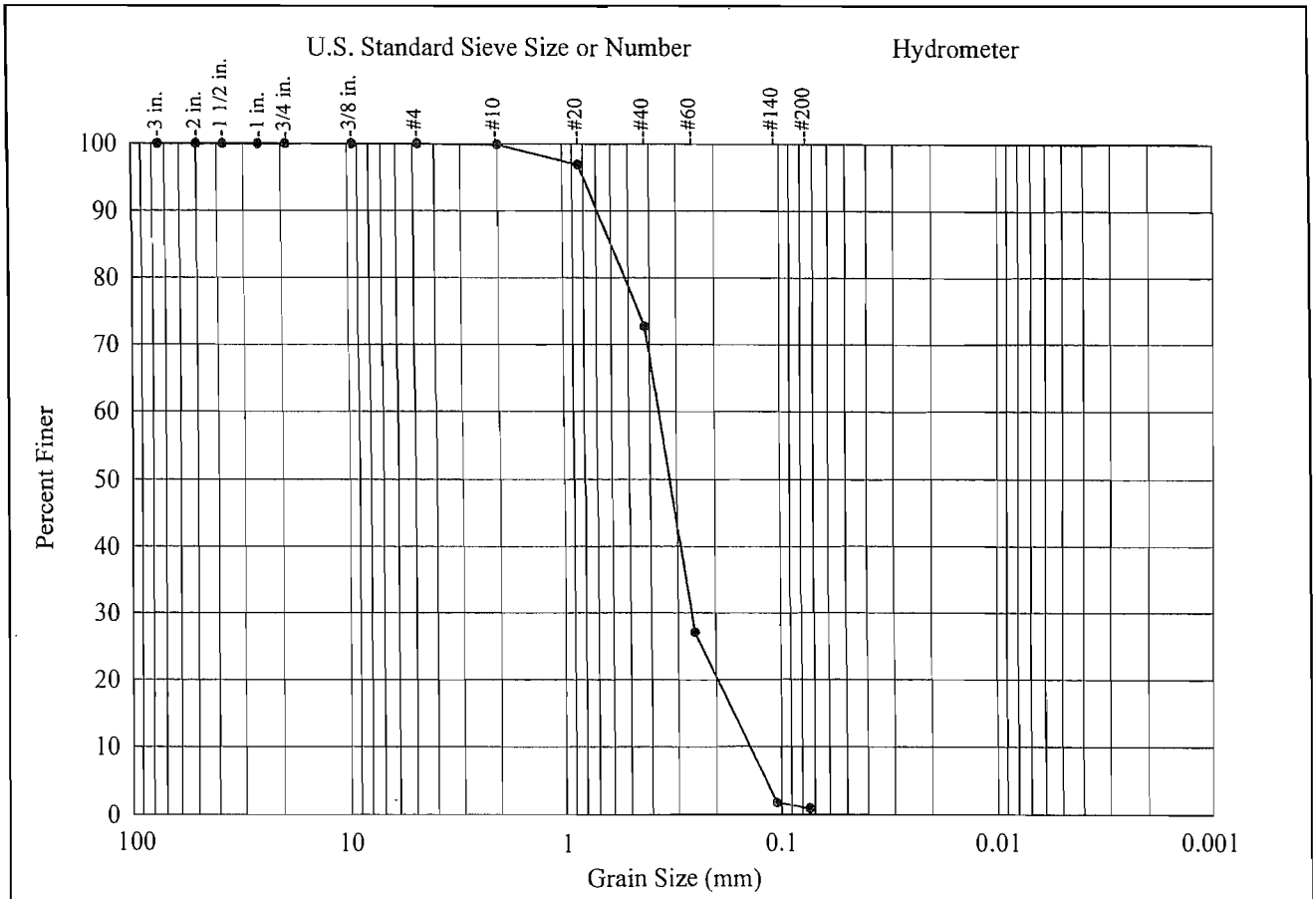
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
16	86			0.55	0.35	0.31	0.25	0.15	0.14	1.28	2.50

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of rock fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core S 0-10.4'	Battelle ID:	HR-S 0-10.4'
	AMS ID:	5146
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.10	27.20	71.78	0.93

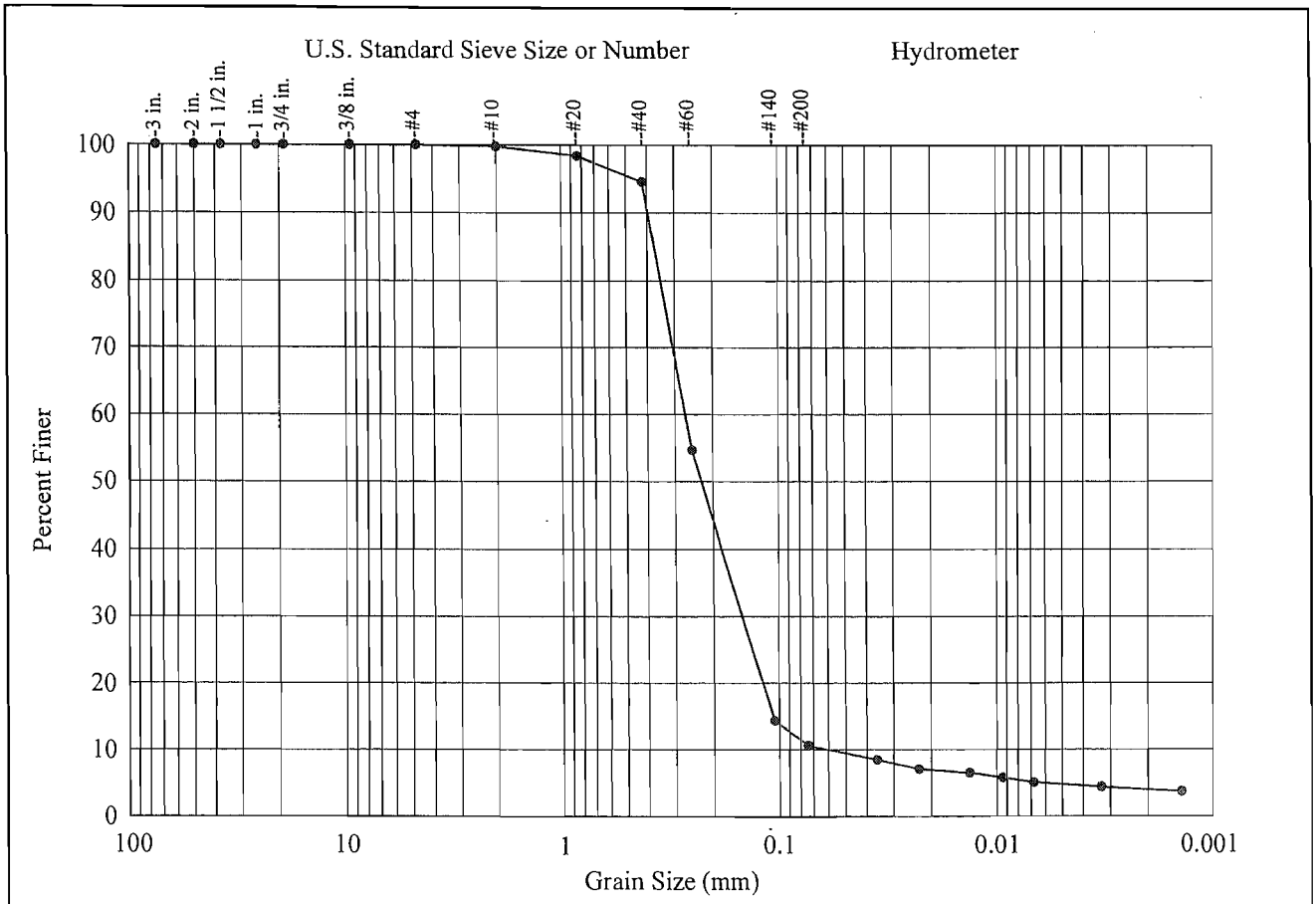
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
11	90			0.59	0.36	0.32	0.26	0.17	0.15	1.25	2.40

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core T 0-7.9'	Battelle ID:	HR-T 0-7.9'
	AMS ID:	5158
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	0.00	0.15	15.22	74.02	5.61	5.00

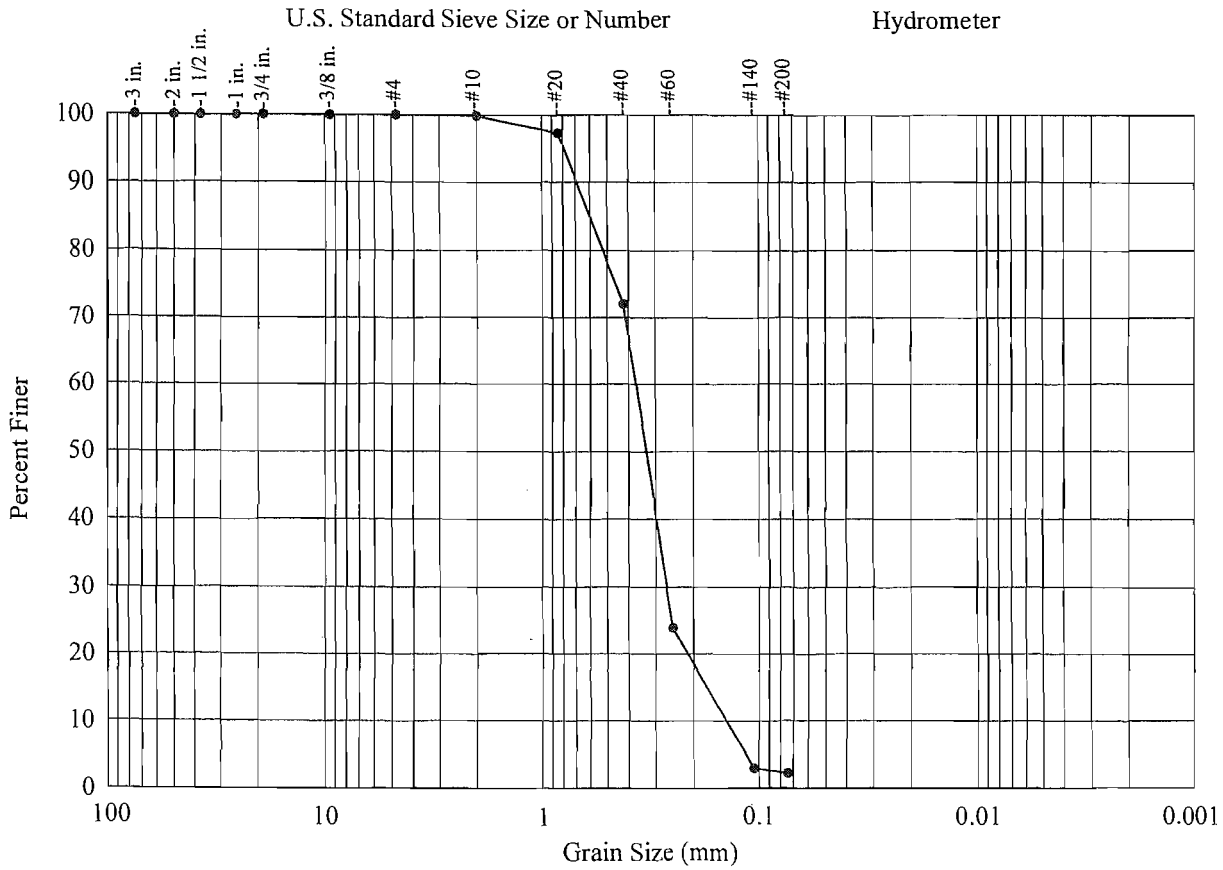
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
26	80			0.41	0.28	0.22	0.16	0.12	0.06	1.52	4.67

Material Description	USCS
Grayish Black, Poorly-Graded, Fine-Grained Sand with Silt Faint hydrocarbon odor	SP-SM

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core T 8.0-12.7'	Battelle ID:	HR-T 8.0-12.7'
	AMS ID:	5159
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.10	27.90	69.77	2.23

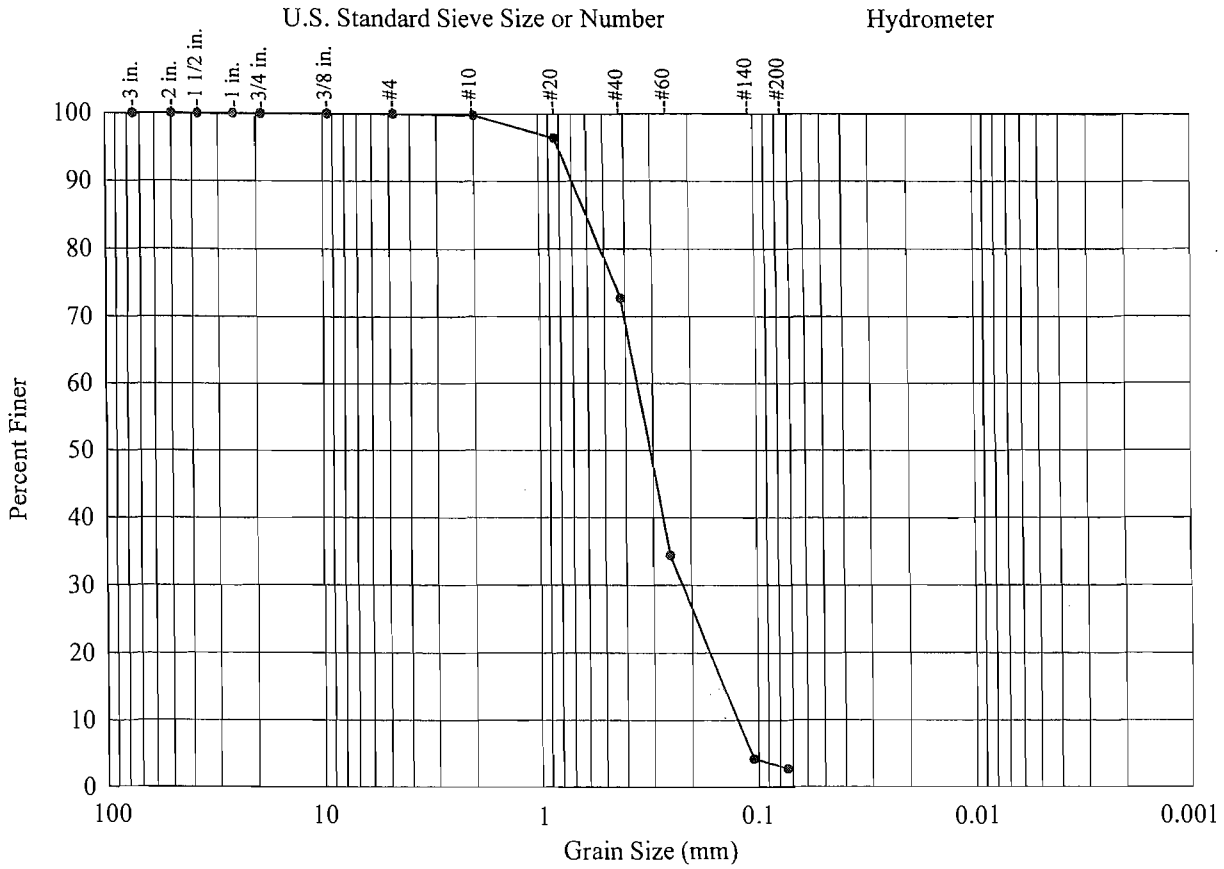
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
22	82			0.60	0.38	0.34	0.27	0.18	0.15	1.28	2.53

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core U 0-6.0'	Battelle ID:	HR-U 0-6.0'
	AMS ID:	5136
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	0.00	0.16	27.12	70.00	2.73

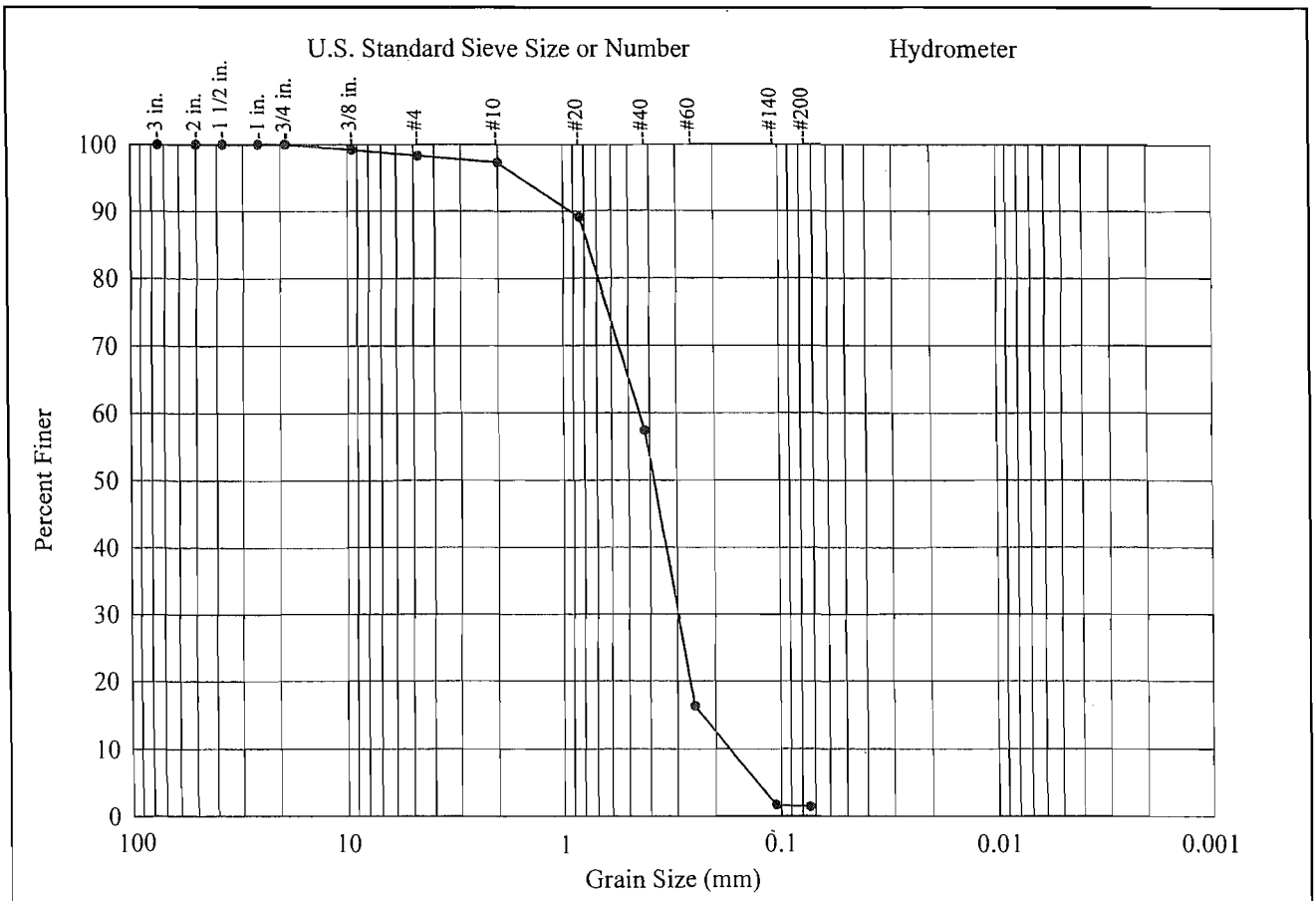
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
22	82			0.60	0.36	0.31	0.22	0.15	0.14	0.96	2.57

Material Description	USCS
Olive Gray to Olive Black, Poorly-Graded, Fine-Grained Sand	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core V 0-10.0"	Battelle ID:	HR-V 0-10.0'
	AMS ID:	5150
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	1.66	1.01	39.89	56.01	1.42

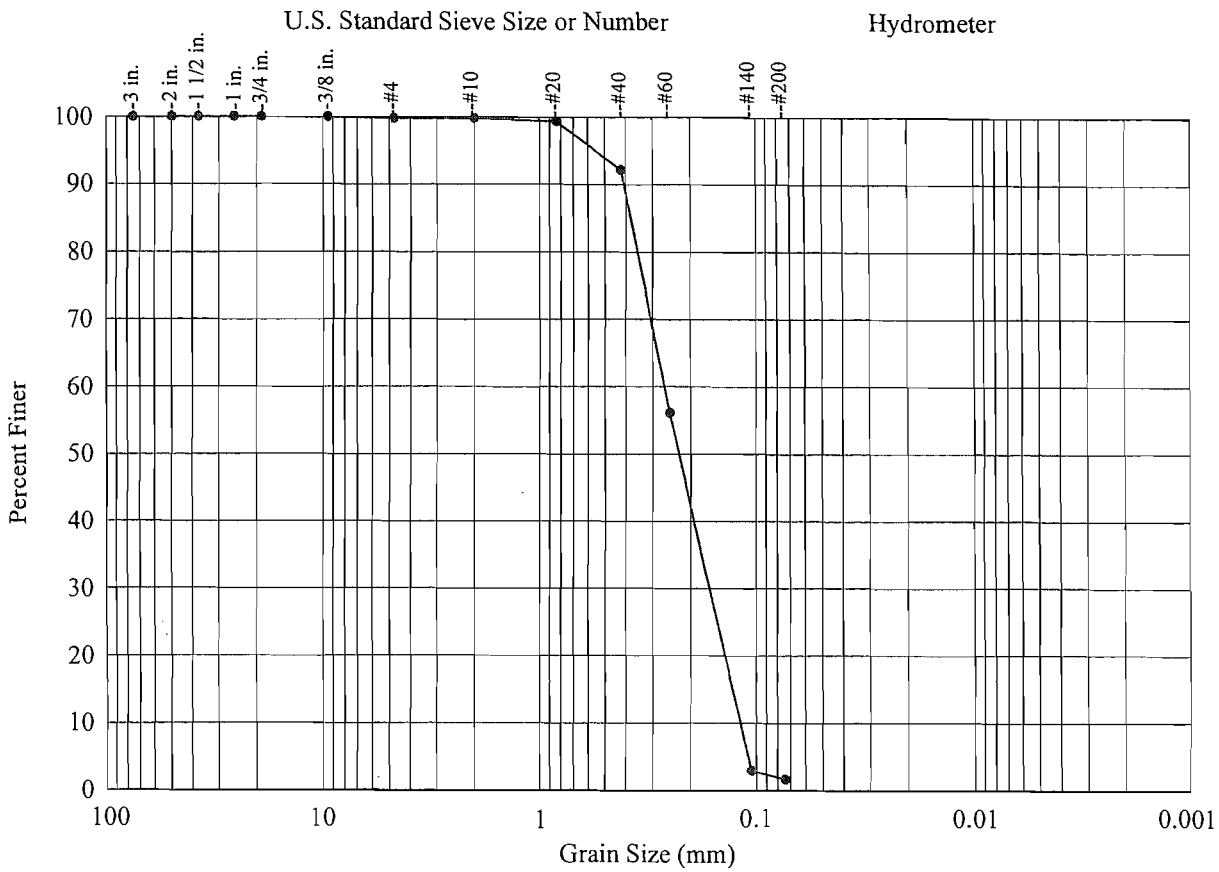
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
20	83			0.76	0.45	0.39	0.30	0.22	0.17	1.18	2.65

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of rock fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core W 0-7.8'	Battelle ID:	HR-W 0-7.8'
	AMS ID:	5141
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074
0.00	0.15	0.01	7.76	90.52	1.56

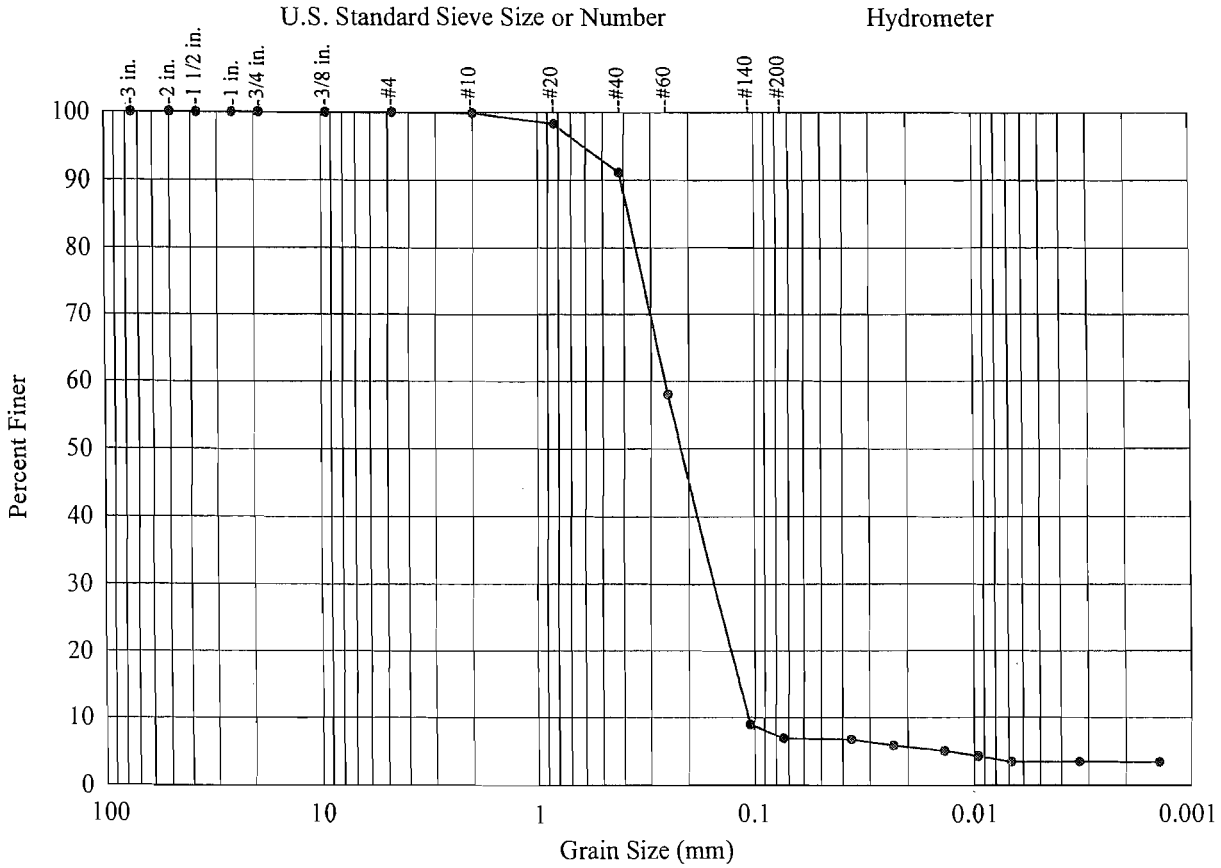
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
19	84			0.38	0.27	0.24	0.17	0.13	0.12	0.89	2.25

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of rock fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core X 0-8.2"	Battelle ID:	HR-X 0-8.2'
	AMS ID:	5152
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	0.00	0.06	8.79	84.24	2.91	4.00

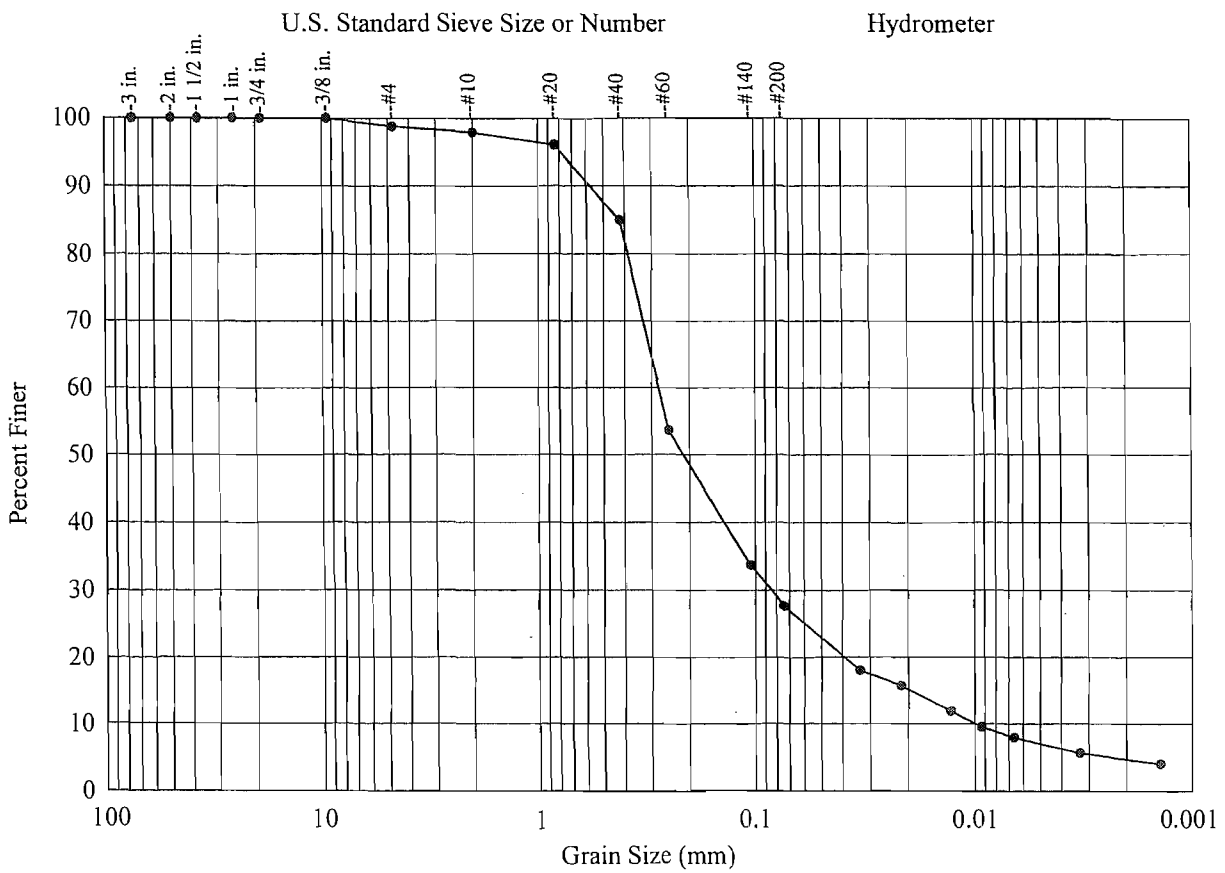
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
39	72			0.38	0.27	0.22	0.16	0.12	0.11	0.86	2.45

Material Description	USCS
Grayish Black, Poorly-Graded, Fine-Grained Sand, with Clay Large quantity of plant fibers and wood chips present	SP-SC

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core Y 0-9.8'	Battelle ID:	HR-Y 0-9.8'
	AMS ID:	5160
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines	
		Coarse	Medium	Fine	% Silt	% Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	0.074-0.005 mm	<0.005 mm
0.00	1.19	0.91	12.93	57.28	20.69	7.00

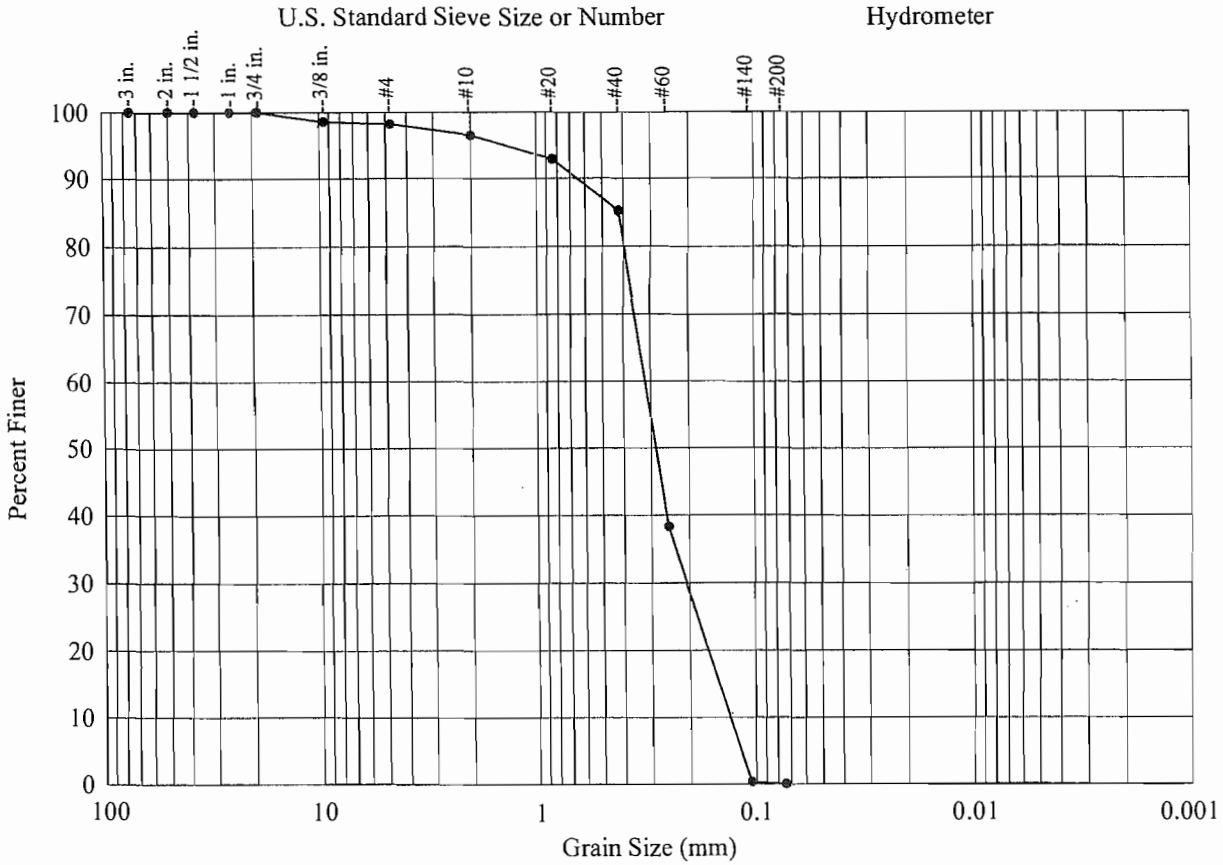
Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
40	71			0.41	0.28	0.22	0.09	0.02	0.01	2.58	28.00

Material Description	USCS
Brownish Black, Silty, Fine-Grained Sand Gravel fraction was composed of rock fragments	SM

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core Y 9.8-11.8'	Battelle ID:	HR-Y 9.8-11.8'
	AMS ID:	5162
	Date:	1/4/2000

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356



ASTM D422 (Particle-Size Analysis of Soils)

% Cobble	% Gravel	% Sand			% Fines
		Coarse	Medium	Fine	% Silt/Clay
>3"	<3" - #4	#10	#20-#40	#60-#200	<0.074 mm
0.00	1.79	1.76	11.22	85.20	0.04

Water Cont. (%)	Tot. Solids (%)	LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
17	86			0.41	0.32	0.29	0.21	0.16	0.14	0.98	2.29

Material Description	USCS
Olive Gray, Poorly-Graded, Fine-Grained Sand Gravel fraction was composed of shell fragments	SP

Project Description		
USACE-New England District, O&M Projects	Client P/N:	N/A
Housatonic River Cores	AMS P/N:	9903-37
Client ID: Core A1 0-2.8'	Battelle ID:	HR-A1 0-2.8'
	AMS ID:	5149
	Date:	1/4/2000

QUALITY CONTROL DOCUMENTATION

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

AMS QUALITY CONTROL REPORT

Project Number:	N/A	AMS Project Number:	9903-37
Project Title:	USACE NAE	Date Sampled:	12/2/99
	Housatonic River Cores	Date Received:	12/7/99
Client:	Battelle-Duxbury Operations	Date Analyzed:	12/27/99
Battelle Sample ID:	HR-O 0-3.7'	Matrix:	Soil
Client Sample ID:	Core O 0-3.7'	Method:	ASTM D422
AMS Sample ID:	5148		

Replicate Analysis

Size Class	U.S. Standard Sieve Size	Diameter (mm)	Sample Result %	Duplicate Result %	RPD %	QC Limits % RPD
Gravel	No. 4	>4.75	0.00	0.00	0.00	<25
Coarse Sand	No. 10	2.00	0.14	0.14	0.00	<25
Medium Sand	No. 40	0.42	17.36	15.79	9.47	<25
Fine Sand	No. 200	0.074	80.96	82.25	1.58	<25
Silt/Clay		<0.074	1.54	1.82	16.67	<25

Samples in Batch (AMS ID):

5132	5136	5140	5144
5133	5137	5141	5145
5134	5138	5142	5146
5135	5139	5143	5148

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

AMS QUALITY CONTROL REPORT

Project Number:	N/A	AMS Project Number:	9903-37
Project Title:	USACE NAE	Date Sampled:	12/3/99
	Housatonic River Cores	Date Received:	12/7/99
Client:	Battelle-Duxbury Operations	Date Analyzed:	1/3/00
Battelle Sample ID:	HR-E 3.7-5.8'	Matrix:	Soil
Client Sample ID:	Core E 3.7-5.8'	Method:	ASTM D422
AMS Sample ID:	5166		

Replicate Analysis

Size Class	U.S. Standard Sieve Size	Diameter (mm)	Sample Result %	Duplicate Result %	RPD %	QC Limits % RPD
Gravel	No. 4	>4.75	0.00	0.00	0.00	<25
Coarse Sand	No. 10	2.00	0.92	0.76	19.05	<25
Medium Sand	No. 40	0.42	6.29	6.15	2.25	<25
Fine Sand	No. 200	0.074	78.78	79.54	0.96	<25
Silt		0.074-0.005	8.01	7.55	5.91	<25
Clay		<0.005	6.00	6.00	0.00	<25

Samples in Batch (AMS ID):

5149	5154	5158	5163
5150	5155	5159	5164
5152	5156	5160	5165
5153	5157	5162	5166

AMS, Inc. Project Manager

GRAINSIZE

Battelle
. . . Putting Technology To Work

Chain of Custody

1 of 2

Proj. No	Proj. Name
	Housatonic River Cores

SAMPLERS: Signature

ANALYSIS REQUESTED → "NUMBER OF CONTAINERS"

DATE	TIME	BATTELLE ID	CLIENT ID	SAMPLE DESCRIPTION	PEST	PCB	TPH FINGERPRINT	PAH	VOA	TBT	METALS	OTHER GRAINSIZE	ACIDIFIED	PRESERVED	Total Number of Containers
11/29/99	11:40	✓	HR-G-0-45 MS	Housatonic River core G 0-45 inches								X			1
11/29/99	13:20	✓	HR-L-0-55	core L 0-55 inches								X			1
11/29/99	14:15	✓	HR-K-0-67	core K 0-67 inches								X			1
11/29/99	14:15	✓	HR-K-68-105	core K 68-105 inches								X			1
11/29/99	15:30	✓	HR-U-0-72	core U 0-72 inches								X			1
11/29/99	16:25	✓	HR-P-0-58	core P 0-58 inches								X			1
11/30/99	14:20	✓	HR-J-0-141	core J 0-141 inches								X			1
11/30/99	15:20	✓	HR-F 0-46	core F 0-46 inches								X			1
11/30/99	15:50	✓	HR-N 0-55	core N 0-55 inches								X			1
11/30/99	16:20	✓	HR-W 0-93	core W 0-93 inches								X			1
12/01/99	10:00	✓	HR-A-0-60	core A 0-60 inches								X			1
12/01/99	11:00	✓	HR-H 0-70.5	core H 0-70.5 inches								X			1
12/01/99	13:45	✓	HR-I-0-120	core I 0-120 inches								X			1
12/01/99	15:00	✓	HR-Q-0-94	core Q 0-94 inches								X			1
12/02/99	10:30	✓	HR-S-0-90	core S 0-90 inches								X			1
12/02/99	10:30	✓	HR-S 91-124.5	core S 91-124.5 inches								X			1
12/02/99	11:05	✓	HR-O-0-44	core O 0-44 inches								X			1

Relinquished by:	Date/Time	Received by:	Date/Time
MELISSA SWANSON SAIC	12/03/99 15:30		12/3/99 15:30
Relinquished by:	Date/Time	Received by:	Date/Time
	12/6/99 4:00p		12/7/99 1100

Comments:

ORIGINAL

Grain Size
2 of 2

Battelle
. . . Putting Technology To Work

Chain of Custody

Proj. No	Proj. Name
	Housatonic River Cores

SAMPLERS: Signature

ANALYSIS REQUESTED → "NUMBER OF CONTAINERS"

DATE	TIME	BATTELLE ID	CLIENT ID	SAMPLE DESCRIPTION	PEST	PCB	TPH FINGERPRINT	PAH	VOA	TBT	METALS	OTHER Grain Size	ACIDIFIED	PRESERVED	Total Number of Containers
12/02/99	11:30	✓	HR-A1-0-33.5	Housatonic River core A1 0-33.5 inches								X			1
12/02/99	13:50	✓	HR-V-0-86	Core V 0-86 inches								X			1
12/02/99	13:50	✓	HR-V-87.5-120.5	core V 87.5-120.5 inches								X			1
12/02/99	15:00	✓	HR-X-0-98	core X 0-98 inches								X			1
12/02/99	15:45	✓	HR-D-0-77	core D 0-77 inches								X			1
12/02/99	15:45	✓	HR-D-78-90	core D 78-90 inches								X			1
12/03/99	10:15	✓	HR-C 0-99	core C 0-99 inches								X			1
12/03/99	10:15	✓	HR-C 100-129.25	core C 100-129.25 inches								X			1
12/03/99	11:00	✓	HR-R 0-56	core R 0-56 inches								X			1
12/03/99	11:40	✓	HR-I-0-95	core I 0-95 inches								X			1
12/03/99	11:40	✓	HR-I 96-152.25	core I 96-152.25 inches								X			1
12/03/99	13:20	✓	HR-4-0-40	core 4 0-40 inches								X			1
12/03/99	13:20	✓	HR-4-40-117	core 4 40-118 inches								X			1
12/03/99	13:20	✓	HR-4-118-141.5	core 4 118-141.5 inches								X			1
12/03/99	14:00	✓	HR-B-0-36.5	core B 0-36.5 inches								X			1
12/03/99	14:00	✓	HR-M-0-46	core M 0-46 inches								X			1
		✓	HR-E-0-43"	CORE E 0-43 inches								X			X
		✓	HR-E-44-70"	not on original COC 12/6/99 CORE E 44-70"								X			X

Relinquished by:	Date/Time	Received by:	Date/Time
MELISSA SWANSON SAIC	12/03/99 15:30		12/3/99 15:30
Relinquished by:	Date/Time	Received by:	Date/Time
	12/6/99 4:00p	KSD	12/7/99 1100

Comments:

ORIGINAL

Housatonic Cores

Cores	Depth (inches)		Depth (feet)		Required Depth (feet)	Compositing for GS (amounts in grams) 400 g total composite
A	0	61	0	5.0	6.1	
B	0	37	0	3.0	4.6	
C	0	99	0	8.3		
	100	129	8.3	10.8	11.5	
D	0	77	0.0	6.4		
	78	90	6.5	7.5	8.5	
E	0	44	0.0	3.7		
	44	70	3.7	5.8	5.4	
F	0	46	0.0	3.8	4.1	
G	0	45	0.0	3.8	3.9	
H	0	76	0.0	6.3	6.3	
I	0	120	0.0	10.0	10.0	
J	0	141	0.0	11.8	13.6	
K	0	67	0.0	5.6		
	68	105	5.7	8.8	9.6	
L	0	55	0.0	4.6	4.5	
M	0	46	0.0	3.8	3.9	
N	0	55	0.0	4.6	4.7	
O	0	44	0.0	3.7	3.6	
P	0	58	0.0	4.8	4.8	
Q	0	94	0.0	7.8	9.6	
R	0	56	0.0	4.7	6.3	
S*	0	90	0.0	7.5		289 g
	91	125	7.6	10.4	11.2	111 g
T	0	95	0.0	7.9		
	96	152	8.0	12.7	12.8	
U	0	72	0.0	6.0	7.8	
V*	0	86	0.0	7.2		285 g
	87.5	121	7.3	10.0	11.2	115 g
W	0	93	0.0	7.8		
X	0	98	0.0	8.2	7.9	
Y**	0	40	0.0	3.3		137 g
	40	117	3.3	9.8		263 g
	117	142	9.8	11.8	13.7	
A1	0	34	0.0	2.8	4.0	

Not Recovered down to proposed dredge depth??

* Composite both sections into one composite for Grain Size Analysis

** Combine top two layers into one composite for Grain Size Analysis.

Attachment 3

Total Organic Carbon Results

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/20/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Field Sample ID	Battelle Sample ID	AMS Sample ID	TOC-Replicate 1 (%)	TOC-Replicate 2 (%)	MDL (%)	Date Analyzed
HR-B 0-36.5	X3780	5474	0.27	0.27	0.01	2/8/00
HR-Q 0-94	X3791	5475	0.85	0.83	0.01	2/8/00
HR-W 0-93	X4059	5476	0.49	0.48	0.01	2/8/00
HR-X 0-98	X3769	5477	0.47	0.43	0.01	2/8/00
HR-A 0-60, HR-A1 0-33.5	XM06	5478	0.12	0.12	0.01	2/8/00
HR-C 0-99, HR-C 100-129.25 HR-D 0-77, HR-D 78-90	XM07	5479	0.85	0.82	0.01	2/8/00
HR-E 0-44, HR-E 44-70 HR-F 0-46	XM08	5480	0.64	0.61	0.01	2/8/00
HR-G 0-45, HR-H 0-70.5	XM09	5481	0.42	0.44	0.01	2/8/00
HR-I 0-120, HR-J 0-141	XM10	5482	0.34	0.34	0.01	2/8/00
HR-K 0-67, HR-K 68-105	XM11	5483	0.64	0.66	0.01	2/8/00
HR-L 0-55, HR-M 0-46	XM12	5484	0.94	1.00	0.01	2/8/00
HR-N 0-55, HR-O 0-44 HR-P 0-58	XM13	5485	0.38	0.36	0.01	2/8/00
HR-S 0-90, HR-S 91-124.5 HR-T 0-95, HR-T 96-152.25	XM14	5486	0.72	0.74	0.01	2/8/00
HR-U 0-72, HR-V 0-86 HR-V 87.5-120.5	XM15	5487	0.44	0.47	0.01	2/8/00
HR-Y 0-40, HR-Y 40-117 HR-Y 118-141.5	XM16	5488	1.41	1.48	0.01	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: X3780
Field Samp ID: HR-B 0-36.5
AMS Samp ID: 5474

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.27	0.27	0.00	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: X3791
Field Samp ID: HR-Q 0-94
AMS Samp ID: 5475

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.85	0.83	2.38	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: X4059
Field Samp ID: HR-W 0-93
AMS Samp ID: 5476

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.49	0.48	2.06	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: X3769
Field Samp ID: HR-X 0-98
AMS Samp ID: 5477

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.47	0.43	8.89	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

KSD

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM06
Field Samp ID: HR-A 0-60, HR-A1 0-33.5
AMS Samp ID: 5478

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.12	0.12	0.00	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM07
Field Samp ID: HR-C 0-129.25, HR-D 0-90
AMS Samp ID: 5479

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.85	0.82	3.59	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM08
Field Samp ID: HR-E 0-70, HR-F 0-46
AMS Samp ID: 5480

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.64	0.61	4.80	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM09
Field Samp ID: HR-G 0-45, HR-H 0-70.5
AMS Samp ID: 5481

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.42	0.44	4.65	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM10
Field Samp ID: HR-I 0-120, HR-J 0-141
AMS Samp ID: 5482

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.34	0.34	0.00	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM11
Field Samp ID: HR-K 0-105
AMS Samp ID: 5483

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.64	0.66	3.08	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

KSD

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM12
Field Samp ID: HR-L 0-55, HR-M 0-46
AMS Samp ID: 5484

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.94	1.00	6.19	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM13
Field Samp ID: HR-N 0-55, HR-O 0-44, HR-P 0-58
AMS Samp ID: 5485

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.38	0.36	5.41	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM14
Field Samp ID: HR-S 0-124.5, HR-T 0-152.25
AMS Samp ID: 5486

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.72	0.74	2.74	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM15
Field Samp ID: HR-U 0-72, HR-V 0-120.5
AMS Samp ID: 5487

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
0.44	0.47	6.59	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Project Number: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations
Battelle Samp ID: XM16
Field Samp ID: HR-Y 0-141.5
AMS Samp ID: 5488

AMS Project Number: 2000-03-02
Date Sampled: N/A
Date Received: 1/12/00
Matrix: Soil

Total Organic Carbon (EPA SW9060)

Result	Duplicate	RPD	MDL	Unit	Date Analyzed
1.41	1.48	4.84	0.01	%	2/8/00

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

QUALITY CONTROL DOCUMENTATION

Applied Marine Sciences, Inc.

502 N. Highway 3, Suite B • League City, TX 77573 • (281) 554-7272 • Fax (281) 554-6356

Quality Control Report

Project No.: G339640-0006
Project Title: USACE O&M NAE
5 Sites in CT-Phase 1 (Housatonic River)
Client: Battelle-Duxbury Operations

AMS Project No.: 2000-03-02
Date Analyzed: 2/8/00
Matrix: Soil
Methods: EPA SW9060

Continuing Calibration Data

AMS Sample ID	Parameter	SRM Result %	SRM Theoretical %	RPD %	QC Limits % RPD
CC1	TOC	4.82	4.80	0.42	<5

TOC Method Blank

AMS Sample ID	Weight (g)	Result (ug CO2)	TOC (%)	TDL (%)
CB1	0.5457	31.0	ND	0.01

Samples in Batch (AMS ID): 5474 5476 5478 5480 5482 5484 5486 5488
5475 5477 5479 5481 5483 5485 5487 5503

Quality Assurance: These analyses were performed in accordance with EPA guidelines for quality assurance.

AMS, Inc. Project Manager

CHAIN OF CUSTODY

Battelle
. . . Putting Technology To Work

Sample Split and Transfer Log

Project Number	6335640-0006
Date of Work	1/19/00
Project Title	5 Sites in CT - Phase 1 (Housatonic River)
Analysis Type(s)	TOC
Splitting Procedure	Well mixed sample transferred to 4oz I Chem jar
	(include description of amount or weight of split, packaging, storage)
Name	E. Fitts
Date	1/19/00

Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID
X3780	XM12				
X3791	XM13				
X4059	XM14				
X3769	XM15				
XM06	XM16				
XM07					
XM08					
XM09					
XM10					
XM11					

Released	Received
Signature/Date: E. Fitts 1/19/00	Signature/Date: [illegible] 1/19/00
Storage Location/Conditions:	Storage Location/Conditions:
Released	**Received**
Signature/Date: [illegible] 1/19/00	Signature/Date: KSD 1/20/00
Storage Location/Conditions: Cooler / FROZEN BLUE ICE	Storage Location/Conditions: Freezer #1 0°C

ORIGINAL

Project Name : 5 Sites in CT Phase I;Housatonic River
Project# G339640-0006
Batch# 00-012
Matrix: Sediment
Composites

Prep Task Leader : E.Kitson EIC 1/19/00
Sample's Assigned by : E.Kitson
Today's Date : 01/19/2000

	Field ID		g SAMPLE
X3780	HR-B-0-36.5		
X3791	HR-Q-0-94		
X4059	HR-W-0-93		
X3769	HR-X-0-98		
XM06	HR-A-0-60	X3788	*
	HR-A1-0-33.5	X3766	*
XM07	HR-C-0-99	X3772	153.5
	HR-C-100-129-25	X3773	46.5
	HR-D-0-77	X3770	171
	HR-D-78-90	X3771	29
XM08	HR-E-0-44	X3795	251
	HR-E-44-70	X3796	149
	HR-F-0-46	X4057	400
XM09	HR-G-0-45	X3782	*
	HR-H-0-70.5	X3789	*
XM10	HR-I-0-120	X3790	*
	HR-J-0-141	X4056	*
XM11	HR-K-0-67	X3784	255
	HR-K-68-105	X3785	145
XM12	HR-L-0-55	X3783	*
	HR-M-0-46	X3781	*
XM13	HR-N-0-55	X4058	*
	HR-O-0-44	X3794	*
	HR-P-0-58	X3787	*
XM14	HR-S-0-90	X3792	289
	HR-S-91-124.5	X3793	111
	HR-T-0-95	X3775	250
	HR-T-96-152.25	X3776	150
XM15	HR-U-0-72	X3786	200
	HR-V-0-86	X3767	142.5
	HR-V-87.5-120.5	X3768	57.5
XM16	HR-Y-0-40	X3777	113
	HR-Y-40-117	X3778	218
	HR-Y-118-141.5	X3779	69

* Equal amounts of sample composited

Attachment 4

Metals Results

QA/QC NARRATIVE

PROJECT: Connecticut 5-Sites Project: Housatonic River
PARAMETER: Metals
LABORATORY: Battelle, Sequim, Washington
MATRIX: Sediment

SAMPLE CUSTODY: Fifteen sediment samples were received on 1/20/00. Samples were received in good condition. The cooler temperature on arrival was 0.1 °C. Samples were assigned a Battelle Central File (CF) identification number (1439) and were entered into Battelle's log-in system.

QA/QC DATA QUALITY OBJECTIVES:

	Analytical Method	Range of Recovery	SRM Accuracy	Relative Precision	Target Detection Limit (µg/g dry wt.)
Arsenic	ICP-MS	70-130%	≤20%	≤30%	0.5
Cadmium	ICP-MS	70-130%	≤20%	≤30%	0.1
Chromium	ICP-MS	70-130%	≤20%	≤30%	1.0
Copper	ICP-MS	70-130%	≤20%	≤30%	1.0
Lead	ICP-MS	70-130%	≤20%	≤30%	1.0
Mercury	CVAA	70-130%	≤20%	≤30%	0.02
Nickel	ICP-MS	70-130%	≤20%	≤30%	1.0
Zinc	ICP-MS	70-130%	≤20%	≤30%	1.0

METHOD: Eight metals were analyzed: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), and zinc (Zn). To prepare the sediments for analysis, they were first freeze-dried then blended in a Spex mixer-mill. For both ICP-MS and CVAA analyses, 0.2-g aliquots of dried, homogeneous sample were digested following the EPA Method 200.3 (EPA 1991a) procedure, modified by using nitric acid only for the digestion acid. Hg was analyzed using cold-vapor atomic absorption spectrometry (CVAA) following EPA Method 245.5 (EPA 1991b). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) following EPA Method 200.8 (EPA 1991c).

HOLDING TIMES: Samples were received on 1/20/00, frozen to -68°C, and subsequently freeze dried. Samples were prepared and analyzed on the following dates:

Digestion	1/28/00
CVAA analysis	2/2/00
ICP/MS analysis	1/31/00

METHOD BLANKS: One method blank was analyzed with the set of samples. All metals were undetected in the blank. The data were not blank-corrected.

BLANK SPIKES: One blank sample was spiked at three concentrations: 1 µg/g for Hg; 25 µg/g for As, Cd, Cr, Cu, Ni and Pb; and 50 µg/g for Zn. Recoveries of all metals were within the QC limits of 70% to 130%.

QA/QC NARRATIVE

MATRIX SPIKE/ MATRIX SPIKE DUPLICATE:

One sample was selected as a matrix spike and spiked at three concentrations in duplicate: 1 µg/g for Hg; 25 µg/g for As, Cd, Cr, Cu, Ni and Pb; and 50 µg/g for Zn. Recoveries of all metals were within the QC limits of 70% to 130% with the exception of Cu in the MS (54%). Precision of duplicate analyses, expressed as the relative percent difference (RPD) between the MS and MSD results, was within the QC limits of ±30% for all metals except Cu (35%).

REPLICATES:

One sample was digested and analyzed in duplicate. Precision of duplicate analyses, expressed as RPD of replicate results, was within the QC limits of ±30% for all metals.

SRM:

SRM 2704 was analyzed for all metals. Results were within the QC limits for accuracy of ±20% of the certified values for Cd, Cu, Hg, Ni, and Pb. Results for As (35%), Cr (39%), and Zn (23%) exceeded accuracy limits. No corrective action was taken.

SRM 1643d, an aqueous sample analyzed directly on the ICP-MS as a laboratory control sample, was analyzed for all ICP-MS metals. Results were within the QC limits for accuracy of ±20% of the certified values for all metals except Ni (24%).

REFERENCES:

EPA. 1991a. *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. Method 200.3. Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements in Biological Tissues. Environmental Protection Agency, Environmental Services Division, Monitoring Management Branch. Cincinnati, Ohio.

EPA. 1991b. *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. Method 245.5. Determination of Mercury in Sediments by Cold Vapor Atomic Absorption Spectrometry. Environmental Protection Agency, Environmental Services Division, Monitoring Management Branch. Cincinnati, Ohio.

EPA. 1991c. *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. Method 200.8. Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry. Environmental Protection Agency, Environmental Services Division, Monitoring Management Branch. Cincinnati, Ohio.

BATTELLE MARINE SCIENCES LABORATORIES
1529 West Sequim Bay Road
Sequim, Washington 98382-9099
360/681-3643

CONNECTICUT 5-SITES
Housatonic River
METALS IN SEDIMENT
(Samples received - 1/20/00)

Data Set: 013100b

Field ID	Battelle ID	Percent Dry Wt	(concentrations in µg/g dry wt - not blank corrected) As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Composite Core A, A1	XM06	87.4	0.621	0.0215	8.02	15.9	0.0293	3.71	4.26	16.1
Core B	X3780	83.4	0.857	0.140	16.2	43.7	0.0467	6.23	9.52	35.5
Composite Cores C, D	XM07	80.4	1.20	0.438	48.5	154	0.0841	11.4	19.8	95.8
Composite Cores E, F	XM08	77.4	1.23	0.286	34.3	111	0.0796	9.30	18.0	70.4
Composite Cores G, H	XM09	78.8	3.84	0.139	33.3	86.6	0.0604	8.56	17.3	64.9
Composite Cores I, J	XM10	87.0	0.590	0.084	27.6	73.3	0.0507	5.75	11.0	44.2
Core K	XM11	79.1	1.00	0.224	37.3	116	0.0708	9.24	22.8	72.5
Composite Cores L, M	XM12 rep 1	78.0	1.48	0.336	39.7	119	0.0820	15.7	26.8	105
Composite Cores L, M	XM12 rep 2	78.0	1.26	0.318	38.9	135	0.0813	12.1	20.6	86.7
Composite Cores N, O, P	XM13	80.1	0.983	0.286	50.2	135	0.0755	10.3	17.1	74.1
Core Q	X3791	83.0	0.958	0.338	42.8	157	0.0672	12.2	16.5	92.0
Composite Cores S, T	XM14	85.1	1.07	0.425	53.3	118	0.0666	12.8	16.9	89.7
Composite Cores U, V	XM15	81.5	0.765	0.353	43.5	94.7	0.0520	10.4	13.8	77.5
Core W	X4059	81.8	0.511	0.345	33.4	61.8	0.0482	8.86	9.52	68.0
Core X	X3769	84.0	0.825	0.185	28.2	76.2	0.0499	9.13	12.6	64.0
Core Y	XM16	68.4	1.44	0.280	36.1	108	0.103	12.0	19.1	90.0
Blank 3870	Housatonic		0.5 U	0.1 U	1.0 U	1.0 U	0.02 U	1.0 U	1.0 U	1.0 U
DETECTION LIMITS			0.5	0.1	1.0	1.0	0.02	1.0	1.0	1.0
BLANK SPIKE RESULTS										
Concentration Spiked			25.0	25.0	25.0	25.0	1.0	25.0	25.0	50.0
Blank 3870	Housatonic		0.5 U	0.1 U	1.0 U	1.0 U	0.02 U	1.0 U	1.0 U	1.0 U
Blank Sp 3870			24.1	22.8	24.6	24.9	0.849	25.0	28.2	42.8
Concentration Recovered			24.1	22.8	24.6	24.9	0.8	25.0	28.2	42.8
Percent Recovery			**96%**	**91%**	**98%**	**100%**	**85%**	**100%**	**113%**	**86%**

BATTELLE MARINE SCIENCES LABORATORIES
1529 West Sequim Bay Road
Sequim, Washington 98382-9099
360/681-3643

CONNECTICUT 5-SITES
Housatonic River
METALS IN SEDIMENT
(Samples received - 1/20/00)

Data Set: 013100b

Field ID	Battelle ID	Percent Dry Wt	(concentrations in µg/g dry wt - not blank corrected) As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
MATRIX SPIKE RESULTS										
Concentration Spiked			25.0	25.0	25.0	25.0	1.0	25.0	25.0	50.0
Comp L, M (mean)	Housatonic		1.37	0.327	39.3	127	0.0817	13.9	23.7	95.6
Comp L, M (MS)			24.9	23.4	63.3	141	1.07	35.6	48.7	138
Concentration Recovered			23.5	23.1	24.0	13.6	0.991	21.7	25.0	42.0
Percent Recovery			**94%**	**92%**	**96%**	**54% &**	**99%**	**87%**	**100%**	**84%**
Concentration Spiked			25.0	25.0	25.0	25.0	1.0	25.0	25.0	50.0
Comp L, M (mean)	Housatonic		1.37	0.327	39.3	127	0.0817	13.9	23.7	95.6
Comp L, M (MSD)			25.1	23.6	65.2	146	1.11	36.5	51.3	145
Concentration Recovered			23.7	23.2	25.9	19.4	1.0	22.6	27.6	49.8
Percent Recovery			**95%**	**93%**	**104%**	**77%**	**102%**	**90%**	**111%**	**100%**
RPD			**1%**	**1%**	**8%**	**35% &**	**3%**	**4%**	**10%**	**17%**
REPLICATE ANALYSIS RESULTS										
Comp L, M rep 1	Housatonic		1.48	0.336	39.7	119	0.0820	15.7	26.8	105
Comp L, M rep 2			1.26	0.318	38.9	135	0.0813	12.1	20.6	86.7
RPD			**16%**	**6%**	**2%**	**12%**	**1%**	**26%**	**26%**	**19%**
STANDARD REFERENCE MATERIAL										
2704 3870	Housatonic		15.2	3.19	82.1	81.8	1.40	36.1	173	335
Certified Value			23.4	3.45	135	98.6	1.44	44.1	161	438
Range			±0.8	±0.22	±5	±5.0	±0.07	±3.0	±17	±12
Percent Difference			**35% &**	**8%**	**39% &**	**17%**	**3%**	**18%**	**7%**	**23% &**
1643d Direct	Housatonic		56.9	6.4	16.6	18.7	--	53.7	20.5	79.9
Certified Value			56.0	6.47	18.5	20.5	--	58.1	18.2	72.5
Range			±0.73	±0.37	±0.20	±3.8	--	±0.64	±2.7	±0.65
Percent Difference			**2%**	**1%**	**10%**	**9%**	--	**24% &**	**4%**	**10%**

U Undetected at or above detection limit shown.
& QC value outside the accuracy or precision criteria goal: spike accuracy ± 30% recovery; replicate precision ≤30% (RPD); SRM accuracy ≤20% (PD).

Attachment 5

PCB/Pesticide Results

PCB/Pesticide Sediment QA/QC SUMMARY

PROJECT: 5 Sites in CT Project: Housatonic River, CT.
PARAMETER: PCB/Pesticides
LABORATORY: Battelle/Duxbury Operations, Duxbury, MA
MATRIX: Sediment

SAMPLE CUSTODY: Sediment cores were collected on 11/17–11/19/99 and stored cold (4°C) until processed and homogenized. Aliquots for chemistry were frozen (-20°C) until analysis.

All samples were assigned Battelle IDs and were entered into Battelle's log-in system.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Achieved Detection Limit (ng/g dry weight)	Target Detection Limit (ng/g dry weight)
PCB/Pest	GC/ECD NOAA 1993 EPA 8081	Surr 40-120% MS 50-150% (if >5X sample specific MDL)	≤30% PD on average if >5X sample specific MDL	≤30%RPD	~0.1	PCBs - 1 Pest - 20

METHOD: Sediment samples were extracted using methylene chloride. The extract was reduced, processed through an Al column, concentrated, and a portion of the extract was cleaned by HPLC. The final extract was analyzed for 22 individual PCB congeners and 20 chlorinated pesticides, including toxaphene, using gas chromatography/electron capture detection (GC/ECD) following a modified EPA method 8081. Dual column confirmation was performed for all analytes.

HOLDING TIMES: Upon receipt at the lab, samples were stored frozen at (-20°C) until analysis. Samples were prepared for analysis in a single analytical batch. Samples were analyzed within 40 days of extraction.

Batch	Collection Date	Extraction Date	Analysis Date
00-012	11/17-11/19/99	01/19/00	02/01-02/04/00

DETECTION LIMITS: Only results detected above the Target Detection Limits were reported. Total PCBs were calculated by summing detections above the Target Detection Limits and multiplying the sum by 2.

BLANKS: A procedural blank (PB) was prepared with the analytical batch. No analytes were detected in the PB.

PCB/Pesticide Sediment QA/QC SUMMARY

MATRIX SPIKES: One set of matrix spike/matrix spike duplicate (MS/MSD) samples was prepared with the analytical batch. Recoveries were within the control limits of 50-150%.

BLANK SPIKES: One blank spike (BS) was prepared with the analytical batch. Recoveries for all compounds were within the control limits of 40-120%.

ANALYTICAL DUPLICATE: One sample was prepared in duplicate with the analytical batch. Precision was determined by calculating the relative percent difference (RPD) between duplicate results. RPDs for 3 pesticides and 13 PCB congeners were outside the control limits. RPDs were calculated using all detections above the Method Detection Limits (MDLs). Comparison of very low values resulted in high RPDs.

Precision was also measured by determining the RPD between the MS and MSD samples. RPDs between spike recoveries were within the control limits.

SURROGATES: Two surrogate compounds were added prior to analyses: Cl3(34) and Cl5(112). All surrogate recoveries were within the control limits of 40-120%.

SRM: One SRM (NIST 1941a) was prepared with the analytical batch. Precision for SRM analysis is reported by calculating the percent difference (PD) between the SRM results and the SRM certified values. PDs were outside the control limits for 2,4 DDE (49.3%), Cl5(87) (42.4%), Cl7(170) (402%) and Cl7(180) (52.9%).

REFERENCES:

NOAA 1993. Peven, C.S. and A.D. Uhler. Analytical procedures to quantify organic contaminants. In Sampling and Analytical Methods of the National Status and Trends Program National Benthic Surveillance and Mussel Watch Project. Volume IV. NOAA Technical Memorandum NOS ORCA 71. National Oceanic and Atmospheric Administration, Silver Spring, MD.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640

Client Description:	Composite Core A, A1 Core A 0-5.0' and Core A1-0-2.8'	Core B Core B 0-3.0'	Composite Cores C, D Core C 0-8.3', 8.3-10.8', Core D 0-6.4', 6.5-7.5'
Battelle ID:	XM06	X3780	XM07
Batch ID:	00-012	00-012	00-012
Matrix:	Sediment	Sediment	Sediment
Extraction Date:	19-Jan-00	19-Jan-00	19-Jan-00
Analysis Date:	03-Feb-00	02-Feb-00	03-Feb-00
Sample Wt. (g, dry):	26.84	24.97	24.70
% Moisture (%):	11.66	16.94	19.00
Units:	ug/kg	ug/kg	ug/kg
Aldrin	0.05 U	0.05 U	0.05 U
a-BHC	0.17 U	0.18 U	0.18 U
b-BHC	0.05 U	0.05 U	0.05 U
d-BHC	0.05 U	0.05 U	0.05 U
g-BHC	0.06 U	0.06 U	0.06 U
cis Chlordane	0.01 J	0.22	0.42
g-Chlordane	0.04 U	0.23 ME	0.45 ME
Dieldrin	0.07 J	0.32	0.55
Endosulfan I	0.11 U,E	0.12 U,E	0.12 U,E
Endosulfan II	0.04 U	0.04 U	0.04 U
Endosulfan sulfate	0.04 U	0.04 U	0.04 U
Endrin	0.17 U	0.19 U	0.19 U
Endrin aldehyde	0.17 U,E	0.19 U,E	0.19 U,E
Heptachlor	0.05 U	0.05 U	0.05 U
Heptachlor epoxide	0.05 U	0.06 U	0.06 U
Methoxychlor	0.11 U	0.12 U	0.12 U
2,4 DDD	0.09	3.80	3.14
4,4 DDD	0.08	2.46	3.21
2,4 DDE	0.21 U,E	0.23 U,E	0.05 J,E
4,4 DDE	0.02 J	0.25	0.52
2,4 DDT	0.25 U,E	0.27 U,E	0.22 J,E
4,4 DDT	0.08 U	0.15	1.01
Toxaphene	13.34 U	13.34 U	13.34 U
Cl2(08)	0.46 U	0.49 U	1.10
Cl3(18)	0.05 U	0.35	2.64
Cl3(28)	0.04 U	0.28	2.68
Cl4(44)	0.02 J	0.50	2.74
Cl4(49)	0.05 U	0.44	2.01
Cl4(52)	0.05 U	0.64	2.99
Cl4(66)	0.03 J	0.55	2.52
Cl5(87)	0.03 J	0.32	0.85
Cl5(101)	0.05	0.64	1.90
Cl5(105)	0.01 J	0.20	0.62
Cl5(118)	0.04 J	0.54	1.46
Cl6(128)	0.07 U	0.06 J	0.13
Cl6(138)	0.10	0.57	1.27
Cl6(153)	0.08	0.84	1.71
Cl7(170)	0.04 J	0.32	0.58
Cl7(180)	0.07	0.47	1.01
Cl7(183)	0.05 U	0.14	0.32
Cl7(184)	0.07 U	0.07 U	0.07 U
Cl7(187)	0.04 J	0.28	0.73
Cl8(195)	0.01 J	0.14	0.22
Cl9(206)	0.02 J	0.18	0.18
Cl10(209)	0.02 J	0.11	0.22
Total PCB (1)	1.73	13.82	49.42
Surrogate Recoveries:			
Cl3(34)	76	97	53
Cl5(112)	82	87	41

Notes:
E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.
(1) Total PCB = 2 x sum of selected congeners.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640

Client Description:	Composite Cores E, F Core E 0-3.7', 3.7-5.8' and Core F 0-3.8'	Composite Cores G, H Core G 0-3.8' and Core H 0-6.3'	Composite Cores I, J Core I 0-10.0' and Core J 0-11.8'
Battelle ID:	XM08	XM09	XM10
Batch ID:	00-012	00-012	00-012
Matrix:	Sediment	Sediment	Sediment
Extraction Date:	19-Jan-00	19-Jan-00	19-Jan-00
Analysis Date:	03-Feb-00	03-Feb-00	03-Feb-00
Sample Wt. (g, dry):	25.35	23.68	26.27
% Moisture (%):	22.65	21.01	12.59
Units:	ug/kg	ug/kg	ug/kg
Aldrin	0.05 U	0.05 U	0.05 U
a-BHC	0.18 U	0.19 U	0.17 U
b-BHC	0.05 U	0.05 U	0.05 U
d-BHC	0.05 U	0.05 U	0.05 U
g-BHC	0.06 U	0.06 U	0.06 U
cis Chlordane	0.63	0.13	0.10
g-Chlordane	0.74 ME	0.32 ME	0.15 ME
Dieldrin	0.73	0.37	0.16
Endosulfan I	0.11 U,E	0.12 U,E	0.11 U,E
Endosulfan II	0.04 U	0.04 U	0.04 U
Endosulfan sulfate	0.04 U	0.05 U	0.04 U
Endrin	0.18 U	0.20 U	0.18 U
Endrin aldehyde	0.18 U,E	0.20 U,E	0.18 U,E
Heptachlor	0.05 U	0.06 U	0.05 U
Heptachlor epoxide	0.05 U	0.06 U	0.05 U
Methoxychlor	0.12 U	0.13 U	0.12 U
2,4 DDD	25.82	2.15	1.21
4,4 DDD	23.08	1.76	1.16
2,4 DDE	0.15 J,E	0.03 J,E	0.04 J,E
4,4 DDE	2.04	0.28	0.22
2,4 DDT	1.36 E	0.11 J,E	1.00 E
4,4 DDT	5.13	0.34	3.23
Toxaphene	13.34 U	13.34 U	13.34 U
Cl2(08)	0.45 J	0.52 U	0.47 U
Cl3(18)	1.73	0.58	0.27
Cl3(28)	1.58	0.30	0.19
Cl4(44)	1.86	0.34	0.26
Cl4(49)	1.42	0.30	0.24
Cl4(52)	2.37	0.42	0.38
Cl4(66)	1.80	0.33	0.24
Cl5(87)	0.80	0.24	0.17
Cl5(101)	1.96	0.64	0.42
Cl5(105)	0.58	0.15	0.11
Cl5(118)	1.44	0.47	0.37
Cl6(128)	0.09	0.08 J	0.06 J
Cl6(138)	1.54	0.52	0.39
Cl6(153)	2.11	0.96	0.52
Cl7(170)	0.67	0.37	0.17
Cl7(180)	1.07	0.57	0.26
Cl7(183)	0.39	0.22	0.10
Cl7(184)	0.07 U	0.07 U	0.07 U
Cl7(187)	0.76	0.50	0.20
Cl8(195)	0.18	0.19	0.10
Cl9(206)	0.20	0.34	0.14
Cl10(209)	0.15	0.17	0.11
Total PCB (1)	41.06	14.38	8.84
Surrogate Recoveries:			
Cl3(34)	85	87	87
Cl5(112)	79	78	79

Notes:
E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.
(1) Total PCB = 2 x sum of selected congeners.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640

Client Description:	Core K Core K 0-5.6' and Core K 5.7-8.8'	Composite Cores L, M Core L 0-4.6' and Core M 0-3.8'	Composite Cores N, O, P Core N 0-4.6', Core O 0-3.7' and Core P 0-4.8'
Battelle ID:	XM11	XM12	XM13
Batch ID:	00-012	00-012	00-012
Matrix:	Sediment	Sediment	Sediment
Extraction Date:	19-Jan-00	19-Jan-00	19-Jan-00
Analysis Date:	03-Feb-00	03-Feb-00	03-Feb-00
Sample Wt. (g, dry):	24.10	23.44	25.21
% Moisture (%):	20.03	22.22	19.71
Units:	ug/kg	ug/kg	ug/kg
Aldrin	0.05 U	0.05 U	0.05 U
a-BHC	0.18 U	0.19 U	0.18 U
b-BHC	0.05 U	0.05 U	0.05 U
d-BHC	0.05 U	0.05 U	0.05 U
g-BHC	0.06 U	0.06 U	0.06 U
cis Chlordane	0.34	0.32	0.27
g-Chlordane	0.43 ME	0.97 ME	0.30 ME
Dieldrin	0.49	0.83	1.04
Endosulfan I	0.12 U,E	0.12 U,E	0.12 U,E
Endosulfan II	0.04 U	0.04 U	0.04 U
Endosulfan sulfate	0.05 U	0.05 U	0.04 U
Endrin	0.19 U	0.20 U	0.19 U
Endrin aldehyde	0.19 U,E	0.20 U,E	0.18 U,E
Heptachlor	0.06 U	0.06 U	0.05 U
Heptachlor epoxide	0.06 U	0.06 U	0.05 U
Methoxychlor	0.13 U	0.13 U	0.12 U
2,4 DDD	2.78	4.19	1.59
4,4 DDD	2.91	3.84	2.07
2,4 DDE	0.08 J,E	0.08 J,E	0.22 U,E
4,4 DDE	0.51	0.65	0.51
2,4 DDT	0.30 E	1.02 E	0.17 J,E
4,4 DDT	0.44	2.08	0.31
Toxaphene	13.34 U	13.34 U	13.34 U
Cl2(08)	0.51 U	0.52 U	0.49 U
Cl3(18)	0.86	0.92	2.58
Cl3(28)	0.81	0.85	3.15
Cl4(44)	0.94	1.15	5.49
Cl4(49)	0.85	0.98	4.04
Cl4(52)	1.28	1.41	6.39
Cl4(66)	1.11	1.22	5.44
Cl5(87)	0.63	0.58	2.02
Cl5(101)	1.50	1.58	3.64
Cl5(105)	0.46	0.44	1.88
Cl5(118)	1.21	1.21	3.46
Cl6(128)	0.16	0.12	0.28
Cl6(138)	1.40	1.34	2.17
Cl6(153)	1.91	2.01	2.52
Cl7(170)	0.61	0.70	0.81
Cl7(180)	0.99	0.87	1.62
Cl7(183)	0.28	0.29	0.49
Cl7(184)	0.07 U	0.07 U	0.07 U
Cl7(187)	0.73	0.78	1.17
Cl8(195)	0.19	0.23	0.34
Cl9(206)	0.26	0.29	0.54
Cl10(209)	0.25	0.24	0.15
Total PCB (1)	29.86	31.24	83.75
Surrogate Recoveries:			
Cl3(34)	85	89	85
Cl5(112)	82	81	85

Notes:
E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.
(1) Total PCB = 2 x sum of selected congeners.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640

	Core Q	Composite Cores S, T	Composite Cores U, V
Client Description:	Core Q 0-7.8'	Core S 0-7.5' and 7.6-10.4' Core T 0-7.9' and 8.0-12.7'	Core U 0-6.0', Core V 0-7.2' and Core V 7.3-10.0'
Battelle ID:	X3791	XM14	XM15
Batch ID:	00-012	00-012	00-012
Matrix:	Sediment	Sediment	Sediment
Extraction Date:	19-Jan-00	19-Jan-00	19-Jan-00
Analysis Date:	02-Feb-00	03-Feb-00	04-Feb-00
Sample Wt. (g, dry):	25.07	25.53	25.12
% Moisture (%):	17.80	15.14	18.23
Units:	ug/kg	ug/kg	ug/kg
Aldrin	0.05 U	0.05 U	0.05 U
a-BHC	0.18 U	0.17 U	0.18 U
b-BHC	0.05 U	0.05 U	0.05 U
d-BHC	0.05 U	0.05 U	0.05 U
g-BHC	0.06 U	0.06 U	0.06 U
cis Chlordane	0.22	0.41	0.17
g-Chlordane	0.67 ME	0.27 ME	0.76 ME
Dieldrin	0.60	1.23	0.49
Endosulfan I	0.12 U,E	0.11 U,E	0.12 U,E
Endosulfan II	0.04 U	0.04 U	0.04 U
Endosulfan sulfate	0.04 U	0.04 U	0.04 U
Endrin	0.19 U	0.18 U	0.19 U
Endrin aldehyde	0.19 U,E	0.18 U,E	0.19 U,E
Heptachlor	0.05 U	0.05 U	0.05 U
Heptachlor epoxide	0.06 U	0.05 U	0.05 U
Methoxychlor	0.12 U	0.12 U	0.12 U
2,4 DDD	4.01	5.36	3.15
4,4 DDD	3.46	6.47	2.56
2,4 DDE	0.10 J,E	0.22 U,E	0.22 U,E
4,4 DDE	0.52	1.02	0.38
2,4 DDT	0.78 E	2.20 E	0.17 J,E
4,4 DDT	2.03	6.15	0.56
Toxaphene	13.34 U	13.34 U	13.34 U
Cl2(08)	0.49 U	0.55	0.49 U
Cl3(18)	1.05	3.70	1.16
Cl3(28)	0.90	4.19	1.13
Cl4(44)	1.10	6.84	1.59
Cl4(49)	0.99	4.78	1.28
Cl4(52)	1.37	7.97	1.86
Cl4(66)	1.10	5.67	1.62
Cl5(87)	0.52	2.05	0.58
Cl5(101)	1.33	3.85	1.38
Cl5(105)	0.43	1.88	0.56
Cl5(118)	0.97	3.28	1.16
Cl6(128)	0.11	0.27	0.10
Cl6(138)	1.03	1.99	0.92
Cl6(153)	1.49	2.49	1.28
Cl7(170)	0.46	0.67	0.45
Cl7(180)	0.66	1.09	0.69
Cl7(183)	0.24	0.43	0.21
Cl7(184)	0.07 U	0.07 U	0.07 U
Cl7(187)	0.48	0.85	0.56
Cl8(195)	0.22	0.24	0.17
Cl9(206)	0.18	0.23	0.20
Cl10(209)	0.36	0.22	0.18
Total PCB (1)	26.95	91.95	30.52
Surrogate Recoveries:			
Cl3(34)	82	87	79
Cl5(112)	69	72	81

Notes:
E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.
(1) Total PCB = 2 x sum of selected congeners.

Procedural Blank Data

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Client ID:	NA
Client Description:	NA
Battelle ID:	XL99PB
Batch ID:	00-012
Matrix:	Sediment
Extraction Date:	19-Jan-00
Analysis Date:	01-Feb-00
Sample Wt. (g, dry):	25.00
% Moisture (%):	NA
Units:	ug/kg

Aldrin	0.05 U
a-BHC	0.18 U
b-BHC	0.05 U
d-BHC	0.05 U
g-BHC	0.06 U
cis Chlordane	0.05 U
g-Chlordane	0.04 U
Dieldrin	0.12 U
Endosulfan I	0.12 U,E
Endosulfan II	0.04 U
Endosulfan sulfate	0.04 U
Endrin	0.19 U
Endrin aldehyde	0.19 U,E
Heptachlor	0.05 U
Heptachlor epoxide	0.06 U
Methoxychlor	0.12 U
2,4 DDD	0.05 U
4,4 DDD	0.04 U
2,4 DDE	0.23 U,E
4,4 DDE	0.06 U
2,4 DDT	0.27 U,E
4,4 DDT	0.08 U
Toxaphene	13.34 U
Cl2(08)	0.49 U
Cl3(18)	0.05 U
Cl3(28)	0.04 U
Cl4(44)	0.05 U
Cl4(49)	0.05 U
Cl4(52)	0.05 U
Cl4(66)	0.06 U
Cl5(87)	0.05 U
Cl5(101)	0.05 U
Cl5(105)	0.05 U
Cl5(118)	0.06 U
Cl6(128)	0.08 U
Cl6(138)	0.07 U
Cl6(153)	0.06 U
Cl7(170)	0.06 U
Cl7(180)	0.07 U
Cl7(183)	0.06 U
Cl7(184)	0.07 U
Cl7(187)	0.05 U
Cl8(195)	0.05 U
Cl9(206)	0.06 U
Cl10(209)	0.06 U
Total PCB	1.46 U

Surrogate Recoveries (%):	
Cl3(34)	83
Cl5(112)	95

E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640

Client Description:	Core W Core W 0-7.8'	Core X Core X 0-8.2'	Core Y Core Y 0-3.3', 3.3 -9.8'and 9.8-11.8'
Battelle ID:	X4059	X3769	XM16
Batch ID:	00-012	00-012	00-012
Matrix:	Sediment	Sediment	Sediment
Extraction Date:	19-Jan-00	19-Jan-00	19-Jan-00
Analysis Date:	02-Feb-00	02-Feb-00	04-Feb-00
Sample Wt. (g, dry):	25.14	26.03	21.29
% Moisture (%):	16.85	16.01	30.47
Units:	ug/kg	ug/kg	ug/kg
Aldrin	0.05 U	0.05 U	0.06 U
a-BHC	0.18 U	0.17 U	0.21 U
b-BHC	0.05 U	0.05 U	0.06 U
d-BHC	0.05 U	0.05 U	0.06 U
g-BHC	0.06 U	0.06 U	0.07 U
cis Chlordane	0.08	0.10	0.44
g-Chlordane	0.44 ME	0.47 ME	0.41 ME
Dieldrin	0.60	0.40	0.62
Endosulfan I	0.12 U,E	0.11 U,E	0.14 U,E
Endosulfan II	0.04 U	0.04 U	0.04 U
Endosulfan sulfate	0.04 U	0.04 U	0.05 U
Endrin	0.19 U	0.18 U	0.22 U
Endrin aldehyde	0.19 U,E	0.18 U,E	0.22 U,E
Heptachlor	0.05 U	0.05 U	0.06 U
Heptachlor epoxide	0.05 U	0.05 U	0.06 U
Methoxychlor	0.12 U	0.12 U	0.14 U
2,4 DDD	2.17	1.69	4.63
4,4 DDD	1.84	1.71	4.88
2,4 DDE	0.03 J,E	0.22 U,E	0.26 U,E
4,4 DDE	0.26	0.24	0.69
2,4 DDT	3.10 E	0.20 J,E	0.74 E
4,4 DDT	3.52	2.44	2.96
Toxaphene	13.34 U	13.34 U	13.34 U
Cl2(08)	0.49 U	0.47 U	0.19 J
Cl3(18)	0.45	0.34	0.73
Cl3(28)	0.28	0.20	0.60
Cl4(44)	0.49	0.24	0.90
Cl4(49)	0.29	0.29	0.78
Cl4(52)	0.45	0.33	1.22
Cl4(66)	0.27	0.25	1.03
Cl5(87)	0.28	0.18	0.56
Cl5(101)	0.50	0.54	1.38
Cl5(105)	0.14	0.12	0.38
Cl5(118)	0.44	0.45	1.07
Cl6(128)	0.05 J	0.07 J	0.14
Cl6(138)	0.42	0.55	1.45
Cl6(153)	0.69	0.87	1.95
Cl7(170)	0.27	0.50	0.67
Cl7(180)	0.29	0.46	1.10
Cl7(183)	0.11	0.13	0.39
Cl7(184)	0.07 U	0.07 U	0.08 U
Cl7(187)	0.24	0.37	0.72
Cl8(195)	0.11	0.18	0.21
Cl9(206)	0.13	0.21	0.32
Cl10(209)	0.15	0.18	0.25
Total PCB (1)	11.25	12.19	28.58
Surrogate Recoveries:			
Cl3(34)	87	81	83
Cl5(112)	93	75	85

Notes:
E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.
(1) Total PCB = 2 x sum of selected congeners.

Sample Duplicate Data

Battelle
... Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Client Description:	HR Composite Cores N, O, P Core N 0-4.6', Core O 0-3.7' and Core P 0-4.8'	HR Composite Cores N, O, P Core N 0-4.6', Core O 0-3.7' and Core P 0-4.8'		
Battelle ID:	XM13	XM13DUP		
Batch ID:	00-012	00-012		
Matrix:	Sediment	Sediment		
Extraction Date:	19-Jan-00	19-Jan-00		
Analysis Date:	03-Feb-00	02-Feb-00		
Sample Wt. (g, dry):	25.21	25.23		
% Moisture (%):	19.71	19.71		
Units:	ug/kg	ug/kg	RPD	
Aldrin	0.05 U	0.05 U	NA	
a-BHC	0.18 U	0.18 U	NA	
b-BHC	0.05 U	0.05 U	NA	
d-BHC	0.05 U	0.05 U	NA	
g-BHC	0.06 U	0.06 U	NA	
cis Chlordane	0.27	0.22	19.7	
g-Chlordane	0.30 ME	0.51 ME	53.0	&
Dieldrin	1.04	0.74	33.5	&
Endosulfan I	0.12 U,E	0.12 U,E	NA	
Endosulfan II	0.04 U	0.04 U	NA	
Endosulfan sulfate	0.04 U	0.04 U	NA	
Endrin	0.19 U	0.19 U	NA	
Endrin aldehyde	0.18 U,E	0.18 U,E	NA	
Heptachlor	0.05 U	0.05 U	NA	
Heptachlor epoxide	0.05 U	0.05 U	NA	
Methoxychlor	0.12 U	0.12 U	NA	
2,4 DDD	1.59	1.97	21.6	
4,4 DDD	2.07	2.13	2.9	
2,4 DDE	0.22 U,E	0.05 J,E	NA	
4,4 DDE	0.51	0.43	16.7	
2,4 DDT	0.17 J,E	0.08 J,E	70.7	&
4,4 DDT	0.31	0.24	24.9	
Toxaphene	13.34 U	13.34 U	NA	
Cl2(08)	0.49 U	0.49 U	NA	
Cl3(18)	2.58	2.02	24.7	
Cl3(28)	3.15	2.16	37.2	&
Cl4(44)	5.49	3.55	43.0	&
Cl4(49)	4.04	2.49	47.5	&
Cl4(52)	6.39	3.77	51.7	&
Cl4(66)	5.44	3.39	46.4	&
Cl5(87)	2.02	1.19	51.4	&
Cl5(101)	3.64	2.51	36.7	&
Cl5(105)	1.88	1.12	50.5	&
Cl5(118)	3.46	2.24	42.8	&
Cl6(128)	0.28	0.20	31.7	&
Cl6(138)	2.17	1.62	29.2	
Cl6(153)	2.52	2.02	22.1	
Cl7(170)	0.81	0.73	9.7	
Cl7(180)	1.62	1.31	21.3	
Cl7(183)	0.49	0.35	33.9	&
Cl7(184)	0.07 U	0.07 U	NA	
Cl7(187)	1.17	1.00	15.9	
Cl8(195)	0.34	0.27	24.3	
Cl9(206)	0.54	0.31	54.2	&
Cl10(209)	0.15	0.18	18.5	
Total PCB	83.75	57.27	37.6	&
Surrogate Recoveries:				
Cl3(34)	85	74		
Cl5(112)	85	73		

E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.

Standard Reference Material Data
VS
SIS

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Client ID:	Nist 1941a
Client Description:	NA
Battelle ID:	XM04SRM
Batch ID:	00-012
Matrix:	Sediment
Extraction Date:	19-Jan-00
Analysis Date:	01-Feb-00
Sample Wt. (g, dry):	4.90
% Moisture (%):	2.21
Units:	ug/kg

		% Difference		Certified Range ug/kg, dry wt.	
4,4 DDD	5.22	0.0		5.64	4.48
2,4 DDE	0.31 J,E	49.3	&	0.84	0.62
4,4 DDE	4.73	21.6		7.15	6.03
Cl4(44)	4.88	0.0		5.42	4.18
Cl4(49)	5.29	28.6		11.6	7.4
Cl4(52)	5.91	6.7		7.45	6.33
Cl4(66)	7.36	0.0		8.2	5.4
Cl5(87)	3.65	42.4	&	7.07	6.33
Cl5(101)	10.34	0.0		12.6	9.4
Cl5(105)	3.01	10.9		3.92	3.38
Cl5(118)	8.45	5.1		11.1	8.9
Cl6(128)	1.17	24.4		2.19	1.55
Cl6(138)	11.82	4.8		14.35	12.41
Cl6(153)	14.05	10.5		19.5	15.7
Cl7(170)	17.37	402.0	&	3.46	2.54
Cl7(180)	9.80	52.9	&	6.41	5.25
Cl9(206)	2.70	3.7		4.54	2.8
Cl10(209)	6.61	15.7		8.83	7.85

Surrogate Recoveries:

Cl3(34)	82
Cl5(112)	73

E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.

Sample Duplicate Data

Battelle
... Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Client Description:	HR Composite Cores N, O, P Core N 0-4.6', Core O 0-3.7' and Core P 0-4.8'	HR Composite Cores N, O, P Core N 0-4.6', Core O 0-3.7' and Core P 0-4.8'		
Battelle ID:	XM13	XM13DUP		
Batch ID:	00-012	00-012		
Matrix:	Sediment	Sediment		
Extraction Date:	19-Jan-00	19-Jan-00		
Analysis Date:	03-Feb-00	02-Feb-00		
Sample Wt. (g, dry):	25.21	25.23		
% Moisture (%):	19.71	19.71		
Units:	ug/kg	ug/kg	RPD	
Aldrin	0.05 U	0.05 U	NA	
a-BHC	0.18 U	0.18 U	NA	
b-BHC	0.05 U	0.05 U	NA	
d-BHC	0.05 U	0.05 U	NA	
g-BHC	0.06 U	0.06 U	NA	
cis Chlordane	0.27	0.22	19.7	
g-Chlordane	0.30 ME	0.51 ME	53.0	&
Dieldrin	1.04	0.74	33.5	&
Endosulfan I	0.12 U,E	0.12 U,E	NA	
Endosulfan II	0.04 U	0.04 U	NA	
Endosulfan sulfate	0.04 U	0.04 U	NA	
Endrin	0.19 U	0.19 U	NA	
Endrin aldehyde	0.18 U,E	0.18 U,E	NA	
Heptachlor	0.05 U	0.05 U	NA	
Heptachlor epoxide	0.05 U	0.05 U	NA	
Methoxychlor	0.12 U	0.12 U	NA	
2,4 DDD	1.59	1.97	21.6	
4,4 DDD	2.07	2.13	2.9	
2,4 DDE	0.22 U,E	0.05 J,E	NA	
4,4 DDE	0.51	0.43	16.7	
2,4 DDT	0.17 J,E	0.08 J,E	70.7	&
4,4 DDT	0.31	0.24	24.9	
Toxaphene	13.34 U	13.34 U	NA	
Cl2(08)	0.49 U	0.49 U	NA	
Cl3(18)	2.58	2.02	24.7	
Cl3(28)	3.15	2.16	37.2	&
Cl4(44)	5.49	3.55	43.0	&
Cl4(49)	4.04	2.49	47.5	&
Cl4(52)	6.39	3.77	51.7	&
Cl4(66)	5.44	3.39	46.4	&
Cl5(87)	2.02	1.19	51.4	&
Cl5(101)	3.64	2.51	36.7	&
Cl5(105)	1.88	1.12	50.5	&
Cl5(118)	3.46	2.24	42.8	&
Cl6(128)	0.28	0.20	31.7	&
Cl6(138)	2.17	1.62	29.2	
Cl6(153)	2.52	2.02	22.1	
Cl7(170)	0.81	0.73	9.7	
Cl7(180)	1.62	1.31	21.3	
Cl7(183)	0.49	0.35	33.9	&
Cl7(184)	0.07 U	0.07 U	NA	
Cl7(187)	1.17	1.00	15.9	
Cl8(195)	0.34	0.27	24.3	
Cl9(206)	0.54	0.31	54.2	&
Cl10(209)	0.15	0.18	18.5	
Total PCB	83.75	57.27	37.6	&
Surrogate Recoveries:				
Cl3(34)	85	74		
Cl5(112)	85	73		

E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.

Matrix Spike Data

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

		HR Core Q	HR Core Q -MS		HR Core Q - MSD		
Client ID:		HR-Q-0-7.8	HR-Q-0-7.8		HR-Q-0-7.8		
Client Description:		Core Q 0-7.8'	Core Q 0-7.8'		Core Q 0-7.8'		
Battelle ID:		X3791	XM02MS		XM03MSD		
Batch ID:		00-012	00-012		00-012		
Matrix:		Sediment	Sediment		Sediment		
Extraction Date:		19-Jan-00	19-Jan-00		19-Jan-00		
Analysis Date:		02-Feb-00	01-Feb-00		01-Feb-00		
Sample Wt. (g, dry):		25.07	18.25		18.08		
% Moisture (%):		17.80	17.80		17.80		
Units:	FB34	ug/kg	ug/kg	% Recovery	ug/kg	% Recovery	RPD
Aldrin	160.264	0.05 U	6.87	78	6.79	77	2.2
a-BHC	160.160	0.18 U	7.16	82	6.98	79	3.5
b-BHC	160.200	0.05 U	6.58	75	6.75	76	1.5
d-BHC	160.224	0.05 U	7.08	81	7.04	79	1.5
g-BHC	160.352	0.06 U	7.23	82	7.12	80	2.3
cis Chlordane	161.152	0.22	6.78	74	6.84	74	0.0
g-Chlordane	160.944	0.67 ME	7.80 MI	81	8.06 ME	83	2.7
Dieldrin	160.168	0.60	6.84	71	6.95	72	0.9
Endosulfan I	160.224	0.12 U,E	5.27 E	59	5.60 E	62	5.2
Endosulfan II	160.264	0.04 U	5.08	58	5.77	65	11.7
Endosulfan sulfate	160.280	0.04 U	6.27	71	6.77	76	6.8
Endrin	160.320	0.19 U	6.59	75	6.66	75	0.2
Endrin aldehyde	160.216	0.19 U,E	3.82 E	41	4.31 E	47	11.8
Heptachlor	160.184	0.05 U	7.27	83	7.10	80	3.4
Heptachlor epoxide	160.320	0.06 U	5.29	60	5.30	60	0.7
Methoxychlor	160.224	0.12 U	7.07	80	7.94	90	10.7
2,4 DDD	160.000	4.01	10.47	74	12.57	97	27.1
4,4 DDD	160.232	3.46	9.86	73	11.87	95	26.3
2,4 DDE	157.804	0.10 J,E	7.12 E	81	6.84 E	77	5.1
4,4 DDE	160.240	0.52	6.97	73	7.36	77	4.9
2,4 DDT	157.020	0.78 E	4.80 E	47	4.59 E	44	6.4
4,4 DDT	160.216	2.03	7.74	65	8.21	70	6.9
Toxaphene	NA	13.34 U	13.34 U	NA	13.34 U	NA	NA
Cl2(08)	160.160	0.49 U	6.96	79	7.01	79	0.3
Cl3(18)	160.000	1.05	8.47	85	8.68	86	1.8
Cl3(28)	160.000	0.90	7.99	81	8.14	82	1.1
Cl4(44)	160.000	1.10	7.78	76	8.15	80	4.5
Cl4(49)	150.000	0.99	7.17	75	7.33	76	1.6
Cl4(52)	160.160	1.37	7.61	71	8.21	77	8.2
Cl4(66)	160.000	1.10	7.36	71	7.54	73	2.0
Cl5(87)	150.000	0.52	6.11	68	6.61	73	7.7
Cl5(101)	160.160	1.33	7.70	73	8.06	76	4.5
Cl5(105)	160.160	0.43	6.61	70	7.23	77	8.6
Cl5(118)	160.160	0.97	6.95	68	7.55	74	8.6
Cl6(128)	160.000	0.11	6.03	68	6.39	71	4.8
Cl6(138)	160.160	1.03	7.37	72	6.71	64	11.9
Cl6(153)	160.000	1.49	7.61	70	8.21	76	8.4
Cl7(170)	160.160	0.46	5.58	58	6.55	69	16.3
Cl7(180)	160.160	0.66	6.24	64	6.72	68	7.3
Cl7(183)	150.000	0.24	5.57	65	5.95	69	5.9
Cl7(184)	150.600	0.07 U	5.75	70	5.75	69	1.1
Cl7(187)	160.160	0.48	6.56	69	6.30	66	5.3
Cl8(195)	160.000	0.22	4.77	52	5.43	59	12.6
Cl9(206)	160.000	0.18	4.11	45	4.94	54	18.2
Cl10(209)	160.000	0.36	4.66	49	5.32	56	13.3
Total PCB	5762.88	26.95	240.78	68	254.31	71	5.2
Surrogate Recoveries:							
Cl3(34)		82	77		79		
Cl5(112)		69	72		74		

E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.

Laboratory Control Spike Data

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Client ID:	NA
Client Description:	NA
Battelle ID:	XM01LCS
Batch ID:	00-012
Matrix:	Sediment
Extraction Date:	19-Jan-00
Analysis Date:	01-Feb-00
Sample Wt. (g, dry):	NA
% Moisture (%):	NA
Units:	ng

	FB34		% Recovery
Aldrin	160.264	119.45	75
a-BHC	160.160	112.82	70
b-BHC	160.200	124.65	78
d-BHC	160.224	123.69	77
g-BHC	160.352	117.25	73
cis Chlordane	161.152	132.85	82
g-Chlordane	160.944	127.72 ME	79
Dieldrin	160.168	138.97	87
Endosulfan I	160.224	105.37 E	66
Endosulfan II	160.264	83.88	52
Endosulfan sulfate	160.280	129.95	81
Endrin	160.320	129.27	81
Endrin aldehyde	160.216	74.92 E	47
Heptachlor	160.184	115.78	72
Heptachlor epoxide	160.320	111.90	70
Methoxychlor	160.224	124.25	78
2,4 DDD	160.000	133.66	84
4,4 DDD	160.232	131.47	82
2,4 DDE	157.804	136.31 E	86
4,4 DDE	160.240	129.80	81
2,4 DDT	157.020	83.49 E	53
4,4 DDT	160.216	129.96	81
Toxaphene	NA	13.34 U	NA
Cl2(08)	160.160	99.82	62
Cl3(18)	160.000	120.42	75
Cl3(28)	160.000	117.13	73
Cl4(44)	160.000	123.30	77
Cl4(49)	150.000	114.78	77
Cl4(52)	160.160	122.83	77
Cl4(66)	160.000	125.90	79
Cl5(87)	150.000	119.24	79
Cl5(101)	160.160	127.78	80
Cl5(105)	160.160	127.96	80
Cl5(118)	160.160	128.20	80
Cl6(128)	160.000	129.23	81
Cl6(138)	160.160	130.22	81
Cl6(153)	160.000	137.75	86
Cl7(170)	160.160	122.40	76
Cl7(180)	160.160	125.01	78
Cl7(183)	150.000	119.95	80
Cl7(184)	150.600	113.62	75
Cl7(187)	160.160	128.98	81
Cl8(195)	160.000	106.69	67
Cl9(206)	160.000	99.70	62
Cl10(209)	160.000	99.13	62
Total PCB	5762.88	4344.91	75

Surrogate Recoveries:

Cl3(34)	75
Cl5(112)	88

E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Client ID:		NA		
Client Description:		NA		
Battelle ID:		XM05IC		
Batch ID:		00-012		
Matrix:		Sediment		
Extraction Date:		NA		
Analysis Date:		01-Feb-00		
Sample Wt. (g, dry):		NA		
% Moisture (%):		NA		
Units:		ng		%
	FB34			Difference
Aldrin	64.106	63.26		1.3
a-BHC	64.064	63.72		0.5
b-BHC	64.080	64.77		1.1
d-BHC	64.090	65.75		2.6
g-BHC	64.141	63.76		0.6
cis Chlordane	64.461	65.71		1.9
g-Chlordane	64.378	63.30	ME	1.7
Dieldrin	64.067	67.71		5.7
Endosulfan I	64.090	64.80	E	1.1
Endosulfan II	64.106	63.63		0.7
Endosulfan sulfate	64.112	62.73		2.2
Endrin	64.128	57.10		11.0
Endrin aldehyde	64.086	56.60	E	11.7
Heptachlor	64.074	63.27		1.3
Heptachlor epoxide	64.128	56.28		12.2
Methoxychlor	64.090	62.70		2.2
2,4 DDD	64.000	66.52		3.9
4,4 DDD	64.093	65.61		2.4
2,4 DDE	63.122	64.36	E	2.0
4,4 DDE	64.096	65.13		1.6
2,4 DDT	62.808	63.28	E	0.8
4,4 DDT	64.086	64.54		0.7
Toxaphene	NA	13.34	U	NA
Cl2(08)	64.064	55.02		14.1
Cl3(18)	64.000	66.99		4.7
Cl3(28)	64.000	63.62		0.6
Cl4(44)	64.000	64.04		0.1
Cl4(49)	60.000	60.16		0.3
Cl4(52)	64.064	63.66		0.6
Cl4(66)	64.000	65.37		2.1
Cl5(87)	60.000	60.07		0.1
Cl5(101)	64.064	64.39		0.5
Cl5(105)	64.064	65.79		2.7
Cl5(118)	64.064	64.99		1.5
Cl6(128)	64.000	64.51		0.8
Cl6(138)	64.064	64.33		0.4
Cl6(153)	64.000	65.05		1.6
Cl7(170)	64.064	62.92		1.8
Cl7(180)	64.064	63.31		1.2
Cl7(183)	60.000	59.97		0.1
Cl7(184)	60.240	58.48		2.9
Cl7(187)	64.064	63.43		1.0
Cl8(195)	64.000	60.44		5.6
Cl9(206)	64.000	57.26		10.5
Cl10(209)	64.000	56.78		11.3
Total PCB	2305.152	2263.79		1.8

Surrogate Recoveries:

Cl3(34)	102
Cl5(112)	103

E - Value estimated due to coelution
ME - Estimate, significant matrix interference.
B - Analyte detected at >5X the MDL.
U - Not detected; sample specific MDL reported.
& - Recovery outside QC criteria goal
J - Detected below sample specific MDL.

Attachment 6
PAH Results

PAH Sediment QA/QC SUMMARY

PROJECT: 5 Sites in CT Project: Housatonic River, CT.
PARAMETER: PAH
LABORATORY: Battelle/Duxbury Operations, Duxbury, MA
MATRIX: Sediment

SAMPLE CUSTODY: Sediment cores were collected on 11/17-11/19/99 and stored cold (4°C) until processed and homogenized. Aliquots for chemistry were frozen (-20°C) until analysis.

All samples were assigned Battelle IDs and were entered into Battelle's log-in system.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Achieved Detection Limit (ng/g dry weight)	Target Detection Limit (ng/g dry weight)
PAH	GC/MS EPA 8270	Surr 40-120% MS 50-150% (if >5X sample specific MDL)	≤30% PD on average if >5X sample specific MDL	≤30%RPD	~0.1	PAH - 20

METHOD: Sediment samples were extracted using methylene chloride. Extracts were reduced, cleaned using alumina column chromatography and HPLC, and a portion of the final extract analyzed in the selected ion monitoring (SIM) mode using gas chromatography/mass spectrometry (GC/MS) following a modified EPA method 8270.

HOLDING TIMES: Upon receipt at the lab, samples were stored at 4°C for a maximum of 14 days until processing and then frozen at (-20°C) until analysis. Samples were prepared for analysis in a single analytical batch. Samples were analyzed within 40 days of extraction.

Batch	Collection Date	Extraction Date	Analysis Date
00-012	11/17-11/19/99	01/19/00	02/03-02/10/00

DETECTION LIMITS: All data were qualified using the Target Detection Limit of 20 µg/kg dry weight for PAHs.

BLANKS: A procedural blank (PB) was prepared with the analytical batch. No analytes were detected in the PB.

PAH Sediment QA/QC SUMMARY

MATRIX SPIKES:

One set of matrix spike/matrix spike duplicate (MS/MSD) samples was prepared with the analytical batch. Recoveries were outside the control limits (49-364% and 0-34%, respectively). The spike amount for the MS/MSD samples was too low relative to the native concentrations in the sediment. Consequently, accurate quantitation of spike recoveries was not possible.

BLANK SPIKES:

One blank spike (BS) was prepared with the analytical batch. Recoveries for all compounds were within the control limits of 40-120%.

ANALYTICAL DUPLICATE:

One sample was prepared in duplicate with the analytical batch. Precision was determined by calculating the relative percent difference (RPD) between duplicate results. RPDs between sample replicates were outside the control limits for 10 analytes (33.9-129.8%).

Precision was also measured by determining the RPD between the MS and MSD samples. RPDs between spike recoveries were outside the control limits for 14 analytes, due to inaccurate quantitation from the low spike amounts initially added to the MS/MSD samples.

SURROGATES:

Three surrogate compounds were added prior to analysis: Naphthalene-d8, Phenanthrene-d10, and Chrysene-d12. Composite C,D; Composite G,H; Core Q, and Core X all had low recoveries for naphthalene-d8 (24-40%). Naphthalene concentrations in these samples may be biased low. Since only one of the three surrogates was out of control in these samples, no corrective action was taken.

Composite C,D also had low recoveries for phenanthrene-d10 (40%) and chrysene-d12 (37%). Sediment from Composite C,D was re-extracted and re-analyzed and surrogate recoveries for all three surrogate compounds were within control limits.

SRM:

One SRM (NIST 1941a) was prepared with the analytical batch. Precision for SRM analysis is reported by calculating the percent difference (PD) between the SRM results and the SRM certified values. PDs, including the Average PD, were within the control limits for all certified PAHs, except for fluorene (44%).

REFERENCES:

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640

Client ID:	Core A Core A 0-5.0' and Core A1 0-2.8'	Core B Core B 0-3.0'	Composite Cores C, D Core C 0-8.3', Core C 8.3-10.8', Core D 0-6.4' and Core D 6.5-7.5'	Composite Cores E, F Core E 0-3.7', Core E 3.7-5.8', and Core F 0-3.8'
Battelle ID:	XM06	X3780	XM07-1	XM08
Batch ID:	00-012	00-012	00-103	00-012
Matrix:	Sediment	Sediment	Sediment	Sediment
Extraction Date:	19-Jan-00	19-Jan-00	27-Mar-00	19-Jan-00
Analysis Date:	4-Feb-00	3-Feb-00	15-Apr-00	10-Feb-00
Sample Wt. (g, dry):	26.84	24.97	23.69	25.35
Percent Moisture (%):	11.66	16.94	19.00	22.65
Units:	ug/kg, dry wt.	ug/kg, dry wt.	ug/kg, dry wt.	ug/kg, dry wt.
Naphthalene	20.00 U	20.00 U	41.24	30.67
2-Methylnaphthalene	20.00 U	20.00 U	36.61	23.59
1-Methylnaphthalene	20.00 U	20.00 U	20.28	20.00 U
2,6-Dimethylnaphthalene	20.00 U	20.00 U	20.00 U	20.00 U
Biphenyl	20.00 U	20.00 U	20.00 U	20.00 U
Acenaphthylene	20.00 U	24.31	89.66	78.18
Acenaphthene	20.00 U	20.00 U	20.00 U	20.00 U
Fluorene	20.00 U	20.00 U	25.09	25.25
Phenanthrene	20.00 U	82.53	278.11	331.79
Anthracene	20.00 U	30.73	126.58	137.16
1-Methylphenanthrene	20.00 U	20.00 U	93.89	56.69
Fluoranthene	20.00 U	189.28	650.44	686.83
Pyrene	20.61	286.13	890.34	890.93
Benz(a)anthracene	20.00 U	127.23	391.60	351.80
Chrysene	20.00 U	160.58	467.21	393.99
Benzo(b)fluoranthene	20.00 U	97.78	396.87	322.19
Benzo(k)fluoranthene	20.00 U	113.05	378.05	344.96
Benzo(e)pyrene	20.00 U	89.15	325.35	270.90
Benzo(a)pyrene	20.00 U	147.82	469.28	443.25
Perylene	20.00 U	35.21	102.76	98.32
Indeno(1,2,3-c,d)pyrene	20.00 U	83.05	321.83	268.58
Dibenz(a,h)anthracene	20.00 U	20.49	72.77	62.79
Benzo(g,h,i)perylene	20.00 U	84.63	291.06	252.33
Surrogate Recoveries (%):				
Naphthalene-d8	43	41	57	50
Phenanthrene-d10	66	74	84	75
Chrysene-d12	69	76	93	72

Notes:
U = Analyte not detected / detected below Target Detection Limit, Target Detection Limit reported.
& = QC value outside the accuracy or precision criteria goal.
NA = Not Applicable.

Battelle
. . . Putting Technology To Work

ect Name: Housatonic River
ect Number: G339640

it ID:	Composite Cores G, H Core G 0-3.8' and Core H 0-6.3'	Composite Cores I, J Core I 0-10.0' and Core J 0-11.8'	Core K Core K 0-5.6' and Core K 5.7-8.8'	Composite Cores L, M Core L 0-4.6' and Core M 0-3.8'
elle ID:	XM09	XM10	XM11	XM12
h ID:	00-012	00-012	00-012	00-012
ix:	Sediment	Sediment	Sediment	Sediment
action Date:	19-Jan-00	19-Jan-00	19-Jan-00	19-Jan-00
ysis Date:	4-Feb-00	4-Feb-00	4-Feb-00	11-Feb-00
ple Wt. (g, dry):	23.68	26.27	24.10	23.44
ent Moisture (%):	21.01	12.59	20.03	22.22
s:	ug/kg, dry wt.	ug/kg, dry wt.	ug/kg, dry wt.	ug/kg, dry wt.
nthalene	20.00 U	20.00 U	21.06	31.36
thylnaphthalene	20.00 U	20.00 U	20.00 U	20.00 U
thylnaphthalene	20.00 U	20.00 U	20.00 U	20.00 U
Dimethylnaphthalene	20.00 U	20.00 U	20.00 U	20.00 U
enyl	20.00 U	20.00 U	20.00 U	20.00 U
naphthylene	60.83	21.06	54.71	88.14
naphthene	20.00 U	20.00 U	20.00 U	20.00 U
rene	20.00 U	20.00 U	20.00 U	31.98
nanthrene	257.26	48.76	138.37	384.51
racene	109.90	22.45	64.86	133.93
thylphenanthrene	37.57	20.00 U	42.36	58.22
ranthene	672.76	112.56	361.88	665.59
ne	739.39	161.13	575.40	846.97
(a)anthracene	362.33	66.42	244.29	357.48
sene	391.99	79.79	307.33	425.05
o(b)fluoranthene	299.65	69.97	251.05	341.03
o(k)fluoranthene	316.78	72.93	259.24	357.75
o(e)pyrene	241.79	59.56	213.08	286.22
o(a)pyrene	437.97	94.74	333.40	459.06
lene	95.98	20.00 U	69.41	95.73
no(1,2,3-c,d)pyrene	259.56	57.25	184.11	283.02
nz(a,h)anthracene	52.69	20.00 U	43.24	69.46
o(g,h,i)perylene	246.06	57.68	179.33	269.09
ogate Recoveries (%):				
nthalene-d8 2	39 &	42	47	45
nanthrene-d10 3	71	66	73	75
sene-d12 4	74	66	79	74

s:
Analyte not detected / detected below Target
ction Limit, Target Detection Limit reported.
QC value outside the accuracy or precision
ria goal.
: Not Applicable.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640

Client ID:	Composite Cores N, O, P Core N 0-4.6', Core O 0-3.7' and Core P 0-4.8'	Core Q Core Q 0-7.8'	Composite Cores S, T Core S 0-7.5', Core S 7.6-10.4', Core T 0-7.9' and Core T 8.0-12.7'	Composite Cores U, V Core U 0-6.0', Core V 0-7.2' and Core V 7.3-10.0'
Battelle ID:	XM13	X3791	XM14	XM15
Batch ID:	00-012	00-012	00-012	00-012
Matrix:	Sediment	Sediment	Sediment	Sediment
Extraction Date:	19-Jan-00	19-Jan-00	19-Jan-00	19-Jan-00
Analysis Date:	4-Feb-00	10-Feb-00	11-Feb-00	11-Feb-00
Sample Wt. (g, dry):	25.21	25.07	25.53	25.12
Percent Moisture (%):	19.71	17.80	15.14	18.23
Units:	ug/kg, dry wt.	ug/kg, dry wt.	ug/kg, dry wt.	ug/kg, dry wt.
Naphthalene	20.00 U	39.83	42.84	33.71
2-Methylnaphthalene	20.00 U	28.78	30.16	20.00 U
1-Methylnaphthalene	20.00 U	21.78	20.00 U	20.00 U
2,6-Dimethylnaphthalene	20.00 U	25.20	20.00 U	20.00 U
Biphenyl	20.00 U	20.00 U	20.00 U	20.00 U
Acenaphthylene	44.83	93.96	163.82	76.28
Acenaphthene	20.00 U	20.00 U	20.00 U	20.52
Fluorene	20.00 U	21.86	20.00 U	37.37
Phenanthrene	91.04	300.20	147.37	516.84
Anthracene	48.69	147.49	119.23	151.20
1-Methylphenanthrene	22.68	75.43	116.83	64.47
Fluoranthene	240.80	667.44	843.93	869.73
Pyrene	442.74	1035.53	1882.59	897.73
Benz(a)anthracene	204.08	428.77	967.51	388.13
Chrysene	237.47	442.35	948.55	404.81
Benzo(b)fluoranthene	177.37	344.74	583.99	326.04
Benzo(k)fluoranthene	197.14	378.54	724.99	343.45
Benzo(e)pyrene	165.19	312.26	621.90	257.01
Benzo(a)pyrene	282.52	558.50	1288.02	433.20
Perylene	50.17	100.12	194.41	98.36
Indeno(1,2,3-c,d)pyrene	145.22	297.68	575.01	269.34
Dibenz(a,h)anthracene	34.53	71.59	141.44	60.93
Benzo(g,h,i)perylene	149.53	288.72	589.60	247.14
Surrogate Recoveries (%):				
Naphthalene-d8	47	36 &	50	46
Phenanthrene-d10	77	72	71	73
Chrysene-d12	82	68	68	71

Notes:
U = Analyte not detected / detected below Target Detection Limit, Target Detection Limit reported.
& = QC value outside the accuracy or precision criteria goal.
NA = Not Applicable.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640

Client ID:	Core W Core W 0-7.8'	Core X Core X 0-8.2'	Core Y Core Y 0-3.3', Core Y 3.3-9.8' and Core Y 9.8-11.8'
Battelle ID:	X4059	X3769	XM16
Batch ID:	00-012	00-012	00-012
Matrix:	Sediment	Sediment	Sediment
Extraction Date:	19-Jan-00	19-Jan-00	19-Jan-00
Analysis Date:	3-Feb-00	4-Feb-00	4-Feb-00
Sample Wt. (g, dry):	25.14	26.03	21.29
Percent Moisture (%):	16.85	16.01	30.47
Units:	ug/kg, dry wt.	ug/kg, dry wt.	ug/kg, dry wt.
Naphthalene	56.06	20.00 U	34.19
2-Methylnaphthalene	30.89	20.00 U	24.70
1-Methylnaphthalene	20.00 U	20.00 U	20.00 U
2,6-Dimethylnaphthalene	20.00 U	20.00 U	20.00 U
Biphenyl	20.00 U	20.00 U	20.00 U
Acenaphthylene	58.56	53.04	66.12
Acenaphthene	20.00 U	20.00 U	20.00 U
Fluorene	20.00 U	20.00 U	23.11
Phenanthrene	115.84	177.05	205.08
Anthracene	54.23	52.51	100.80
1-Methylphenanthrene	48.59	37.13	41.42
Fluoranthene	350.48	357.30	546.84
Pyrene	516.36	400.04	755.39
Benz(a)anthracene	324.54	163.66	370.04
Chrysene	352.04	219.13	397.61
Benzo(b)fluoranthene	204.84	173.08	304.38
Benzo(k)fluoranthene	270.82	185.38	363.77
Benzo(e)pyrene	199.06	143.30	263.72
Benzo(a)pyrene	373.02	220.54	464.13
Perylene	64.85	44.83	101.80
Indeno(1,2,3-c,d)pyrene	183.78	140.60	240.83
Dibenz(a,h)anthracene	49.35	32.85	59.24
Benzo(g,h,i)perylene	173.08	137.94	230.31
Surrogate Recoveries (%):			
Naphthalene-d8	41	40 &	46
Phenanthrene-d10	73	72	73
Chrysene-d12	74	76	77

Notes:
U = Analyte not detected / detected below Target Detection Limit, Target Detection Limit reported.
& = QC value outside the accuracy or precision criteria goal.
NA = Not Applicable.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Procedural Blank Data
Non-Surrogate Corrected

Client ID:	NA
Client Description:	NA
Battelle ID:	XL99PB-R
Batch ID:	00-012
Matrix:	Sediment
Extraction Date:	19-Jan-00
Analysis Date:	03-Feb-00
Sample Wt. (g, dry):	25.00
Percent Moisture (%):	NA
Units:	ug/kg, dry wt.
Naphthalene	20.00 U
2-Methylnaphthalene	20.00 U
1-Methylnaphthalene	20.00 U
2,6-Dimethylnaphthalene	20.00 U
Biphenyl	20.00 U
Acenaphthylene	20.00 U
Acenaphthene	20.00 U
Fluorene	20.00 U
Phenanthrene	20.00 U
Anthracene	20.00 U
1-Methylphenanthrene	20.00 U
Fluoranthene	20.00 U
Pyrene	20.00 U
Benz(a)anthracene	20.00 U
Chrysene	20.00 U
Benzo(b)fluoranthene	20.00 U
Benzo(k)fluoranthene	20.00 U
Benzo(e)pyrene	20.00 U
Benzo(a)pyrene	20.00 U
Perylene	20.00 U
Indeno(1,2,3-c,d)pyrene	20.00 U
Dibenz(a,h)anthracene	20.00 U
Benzo(g,h,i)perylene	20.00 U
Surrogate Recoveries (%):	
Naphthalene-d8	64
Phenanthrene-d10	63
Chrysene-d12	69

U = Analyte not detected / detected below Target Detection Limit, Target Detection Limit reported.
& = QC value outside the accuracy or precision criteria goal.
NA = Not Applicable.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Laboratory Control Spike Data
Non-Surrogate Corrected

Client ID:		NA	
Client Description:		NA	
Battelle ID:		XM01LCS	
Batch ID:		00-012	
Matrix:		Sediment	
Extraction Date:		19-Jan-00	
Analysis Date:		03-Feb-00	
Sample Wt. (g, dry):		NA	
Percent Moisture (%):	FB34	NA	(%)
Units:	(ng)	ng	Recovery
Naphthalene	2506.25	1615.46	64
2-Methylnaphthalene	2501.75	1647.71	66
1-Methylnaphthalene	2513.50	1620.39	64
2,6-Dimethylnaphthalene	2516.00	1715.75	68
Biphenyl	2514.00	1574.84	63
Acenaphthylene	2506.25	1673.54	67
Acenaphthene	2503.75	1677.42	67
Fluorene	2505.00	1720.59	69
Phenanthrene	2506.25	1811.22	72
Anthracene	2505.00	1804.58	72
1-Methylphenanthrene	2509.00	1821.23	73
Fluoranthene	2505.00	1944.75	78
Pyrene	2563.75	1993.70	78
Benz(a)anthracene	2506.25	1988.09	79
Chrysene	2502.50	2008.60	80
Benzo(b)fluoranthene	2502.50	2066.87	83
Benzo(k)fluoranthene	2502.50	2065.96	83
Benzo(e)pyrene	2526.00	2097.71	83
Benzo(a)pyrene	2505.00	1949.70	78
Perylene	2513.00	1926.01	77
Indeno(1,2,3-c,d)pyrene	2505.00	2053.29	82
Dibenz(a,h)anthracene	2505.00	1932.53	77
Benzo(g,h,i)perylene	2503.75	2063.90	82

Surrogate Recoveries (%):

Naphthalene-d8	67
Phenanthrene-d10	70
Chrysene-d12	79

& = QC value outside the accuracy or precision criteria goal.
NA = Not Applicable.

Battelle
... Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Matrix Spike / Matrix Spike Duplicate Data
Non-Surrogate Corrected

Client ID:		Background HR-Q-0-7.8	HR-Q-0-7.8			HR-Q-0-7.8			
Client Description:		Core Q 0-7.8'	Core Q 0-7.8'			Core Q 0-7.8'			
Battelle ID:		X3791 (1)	XM02MS			XM03MSD			
Batch ID:		00-012	00-012			00-012			
Matrix:		Sediment	Sediment			Sediment			
Extraction Date:		19-Jan-00	19-Jan-00			19-Jan-00			
Analysis Date:		10-Feb-00	03-Feb-00			03-Feb-00			
Sample Wt. (g, dry):		25.07	18.25			18.08			
Percent Moisture (%):	FB34	17.80	17.80	(%)		17.80	(%)		(%)
Units:	(ng)	ug/kg, dry wt.	ug/kg, dry wt.	Recovery		ug/kg, dry wt.	Recovery		RPD
Naphthalene	2506.25	39.83	120.23	59		110.27	51		14.2
2-Methylnaphthalene	2501.75	28.78	106.87	57		108.96	58		1.7
1-Methylnaphthalene	2513.50	21.78	88.72	49	*	91.47	50		3.1
2,6-Dimethylnaphthalene	2516.00	25.20	104.13	57		105.23	57		0.4
Biphenyl	2514.00	11.04	81.42	51		81.50	51		0.8
Acenaphthylene	2506.25	93.96	187.66	68		176.33	59		13.8
Acenaphthene	2503.75	16.08	101.52	62		99.82	60		3.0
Fluorene	2505.00	21.86	131.54	80		116.17	68		16.0
Phenanthrene	2506.25	300.20	428.04	93		314.08	10	*	161.2 *
Anthracene	2505.00	147.49	240.90	68		193.48	33	*	68.9 *
1-Methylphenanthrene	2509.00	75.43	168.95	68		175.87	72		6.2
Fluoranthene	2505.00	667.44	969.14	220	*	630.69	0	*	200.0 *
Pyrene	2563.75	1035.53	1206.91	122		973.30	0	*	200.0 *
Benz(a)anthracene	2506.25	428.77	895.70	340	*	511.34	60		140.4 *
Chrysene	2502.50	442.35	878.35	318	*	602.21	115		93.4 *
Benzo(b)fluoranthene	2502.50	344.74	733.59	284	*	461.16	84		108.5 *
Benzo(k)fluoranthene	2502.50	378.54	877.29	364	*	473.12	68		136.7 *
Benzo(e)pyrene	2526.00	312.26	576.19	191	*	415.12	74		88.6 *
Benzo(a)pyrene	2505.00	558.50	1036.76	348	*	606.27	34	*	164.0 *
Perylene	2513.00	100.12	285.45	135		210.18	79		51.8 *
Indeno(1,2,3-c,d)pyrene	2505.00	297.68	640.64	250	*	383.03	62		120.9 *
Dibenz(a,h)anthracene	2505.00	71.59	214.42	104		166.75	69		41.0 *
Benzo(g,h,i)perylene	2503.75	288.72	552.13	192	*	383.01	68		95.3 *
Surrogate Recoveries (%):									
Naphthalene-d8		36 &	41			45			
Phenanthrene-d10		72	75			72			
Chrysene-d12		68	77			73			

U = Analyte not detected / detected below Target Detection Limit, Target Detection Limit reported.
& = QC value outside the accuracy or precision criteria goal.
* = Spike amount less than 5 times Background concentration.
(1) = These are actual analyte detection amounts reported in this format to facilitate background subtraction of MS / MSD samples.

Battelle
... Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Standard Reference Material Data
Surrogate Corrected

Client ID:	NA					
Client Description:	NA					
Battelle ID:	XM04SRM					
Batch ID:	00-012					
Matrix:	Sediment					
Extraction Date:	19-Jan-00					
Analysis Date:	03-Feb-00					
Sample Wt. (g, dry):	4.90					
Percent Moisture (%):	2.21		(%)		Certified Range	
Units:	ug/kg, dry wt.		Difference		(ug/kg, dry weight)	
Naphthalene	688.02		20.9		870.0	1150.0
Fluorene	49.63		44.0	&	88.7	105.9
Phenanthrene	392.04		15.9		466.0	512.0
Anthracene	162.01		4.7		170.0	198.0
Fluoranthene	769.27		14.8		903.0	1059.0
Pyrene	600.71		23.7		787.0	835.0
Benz(a)anthracene	335.43		16.6		402.0	452.0
Chrysene	514.96	A	5.0		542.0	612.0
Benzo(b)fluoranthene	647.33		0.0		630.0	850.0
Benzo(k)fluoranthene	561.39	C	15.2		662.0	742.0
Benzo(e)pyrene	492.53		0.3		494.0	612.0
Benzo(a)pyrene	441.86		23.3		576.0	680.0
Perylene	279.69		29.0		394.0	510.0
Indeno(1,2,3-c,d)pyrene	474.65		0.0		429.0	573.0
Dibenz(a,h)anthracene	105.73	E	0.0		103.6	130.4
Benzo(g,h,i)perylene	458.42		0.0		458.0	592.0

Surrogate Recoveries (%):

Naphthalene-d8	63	Average PD =	13.3
Phenanthrene-d10	75		
Chrysene-d12	73		

A = Combined certified concentrations of Chrysene (380 +/- 24 ug/kg) and Triphenylene (197 +/- 11 ug/kg).
C = Combined concentrations of Benzo[k]fluoranthene (361 +/- 18 ug/kg, certified)
and of Benzo[j]fluoranthene (341 +/- 22 ug/kg, noncertified).
E = Combined certifed concentrations for Dibenz[a,h]anthracene (73.9 +/- 9.7 ug/kg)
and Dibenz[a,c]anthracene (43.1 +/- 3.7 ug/kg).
U = Analyte not detected / detected below Target Detection Limit, Target Detection Limit reported.
& = QC value outside the accuracy or precision criteria goal.
NA = Not Applicable.

Battelle
... Putting Technology To Work

Project Name: Housatonic River
Project Number: G339640-0006

Duplicate Data
Non-Surrogate Corrected

Client ID:	HR-N-0-4.6, HR-O-0-3.7, HR-P-0-4.8	HR-N-0-4.6, HR-O-0-3.7, HR-P-0-4.8		
Client Description:	Composite of Core N 0-4.6' and Core O 0-3.7', Core P 0-4.8'	Composite of Core N 0-4.6' and Core O 0-3.7', Core P 0-4.8'		
Battelle ID:	XM13	XM13Dup		
Batch ID:	00-012	00-012		
Matrix:	Sediment	Sediment		
Extraction Date:	19-Jan-00	19-Jan-00		
Analysis Date:	04-Feb-00	04-Feb-00		
Sample Wt. (g, dry):	25.21	25.23		
Percent Moisture (%):	19.71	19.71	(%)	
Units:	ug/kg, dry wt.	ug/kg, dry wt.	RPD	
Naphthalene	20.00 U	30.79	NA	
2-Methylnaphthalene	20.00 U	20.00 U	NA	
1-Methylnaphthalene	20.00 U	20.00 U	NA	
2,6-Dimethylnaphthalene	20.00 U	20.00 U	NA	
Biphenyl	20.00 U	20.00 U	NA	
Acenaphthylene	44.83	42.16	6.1	
Acenaphthene	20.00 U	27.37	NA	
Fluorene	20.00 U	42.65	NA	
Phenanthrene	91.04	427.53	129.8	&
Anthracene	48.69	111.52	78.4	&
1-Methylphenanthrene	22.68	41.40	58.4	&
Fluoranthene	240.80	638.93	90.5	&
Pyrene	442.74	713.03	46.8	&
Benz(a)anthracene	204.08	302.09	38.7	&
Chrysene	237.47	339.80	35.5	&
Benzo(b)fluoranthene	177.37	265.54	39.8	&
Benzo(k)fluoranthene	197.14	284.89	36.4	&
Benzo(e)pyrene	165.19	203.69	20.9	
Benzo(a)pyrene	282.52	335.28	17.1	
Perylene	50.17	70.63	33.9	&
Indeno(1,2,3-c,d)pyrene	145.22	194.35	28.9	
Dibenz(a,h)anthracene	34.53	45.59	27.6	
Benzo(g,h,i)perylene	149.53	179.03	18.0	
Surrogate Recoveries (%):				
Naphthalene-d8	47	41		
Phenanthrene-d10	77	70		
Chrysene-d12	82	75		

U = Analyte not detected / detected below Target Detection Limit, Target Detection Limit reported.
& = QC value outside the accuracy or precision criteria goal.
NA = Not Applicable.

Battelle
. . . Putting Technology To Work

Project Name: Housatonic River Sediment Re-analysis
Project Number: G339640-0005

Procedural Blank Data

Client ID:	NA
Battelle ID:	XS57PB
Batch ID:	00-103
Matrix:	Sediment
Sample Dry wt. (g):	24.00
% Dry wt:	NA
Units:	ug/kg, dry wt.
Naphthalene	20.00 U
2-Methylnaphthalene	20.00 U
1-Methylnaphthalene	20.00 U
2,6-Dimethylnaphthalene	20.00 U
Biphenyl	20.00 U
Acenaphthylene	20.00 U
Acenaphthene	20.00 U
Fluorene	20.00 U
Phenanthrene	20.00 U
Anthracene	20.00 U
1-Methylphenanthrene	20.00 U
Fluoranthene	20.00 U
Pyrene	20.00 U
Benz(a)anthracene	20.00 U
Chrysene	20.00 U
Benzo(b)fluoranthene	20.00 U
Benzo(k)fluoranthene	20.00 U
Benzo(e)pyrene	20.00 U
Benzo(a)pyrene	20.00 U
Perylene	21.34
Indeno(1,2,3-c,d)pyrene	20.00 U
Dibenz(a,h)anthracene	20.00 U
Benzo(g,h,i)perylene	20.00 U
Surrogate Recovery (%)	
Naphthalene-d8	46
Phenanthrene-d10	56
Chrysene-d12	71

U = Analyte not detected/detected below Target Detection Limit, Target Detection Limi
B = Analyte Detected at >5X the Target Detection Limit in the Procedural Blank.
& = QC data outside of Data Quality Objectives.
NA = Not Applicable.

Battelle
... Putting Technology To Work

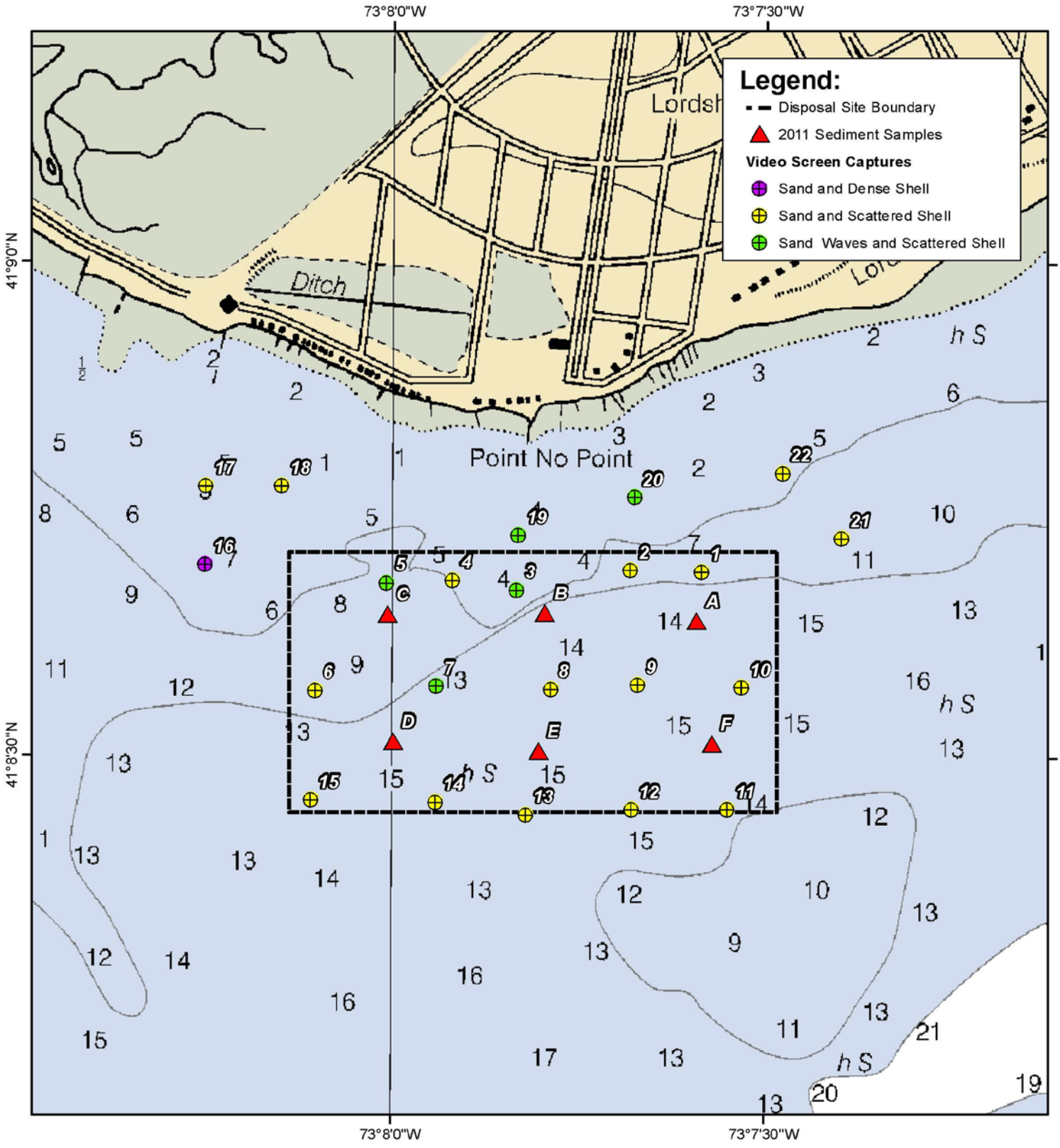
Project Name: Housatonic River Sediment Re-analysis
Project Number: G339640-0005

Laboratory Control Spike Data

Client ID:		NA	
Battelle ID:		XS58LCS	
Batch ID:		00-103	
Matrix:		Sediment	
Sample Dry wt. (g):	Amount	NA	Percent
% Dry wt:	Spiked	NA	Recovery
Units:	(ng)	ng	(%)
Naphthalene	1002.50	525.49	52
2-Methylnaphthalene	1000.70	503.70	50
1-Methylnaphthalene	1005.40	500.34	50
2,6-Dimethylnaphthalene	1006.40	528.08	52
Biphenyl	1005.60	503.65	50
Acenaphthylene	1002.50	548.85	55
Acenaphthene	1001.50	578.21	58
Fluorene	1002.00	625.25	62
Phenanthrene	1002.50	741.45	74
Anthracene	1002.00	694.70	69
1-Methylphenanthrene	1003.60	788.25	79
Fluoranthene	1002.00	867.83	87
Pyrene	1025.50	881.03	86
Benz(a)anthracene	1002.50	835.99	83
Chrysene	1001.00	858.80	86
Benzo(b)fluoranthene	1001.00	825.29	82
Benzo(k)fluoranthene	1001.00	870.13	87
Benzo(e)pyrene	1010.40	832.44	82
Benzo(a)pyrene	1002.00	745.16	74
Perylene	1005.20	718.39	71
Indeno(1,2,3-c,d)pyrene	1002.00	773.75	77
Dibenz(a,h)anthracene	1002.00	772.73	77
Benzo(g,h,i)perylene	1001.50	752.81	75
Surrogate Recovery (%)			
Naphthalene-d8		51	
Phenanthrene-d10		65	
Chrysene-d12		81	

& = QC data outside of Data Quality Objectives.
B = Analyte Detected at >5X the Target Detection Limit in the Procedural Blank.
NA = Not Applicable.

PLACEMENT AREA GRAIN SIZE



US Army Corps of Engineers
New England District

FIGURE 2:
POINT NO POINT, STRATFORD, CT
SEDIMENT GRABS AND
VIDEO SURVEY STATIONS

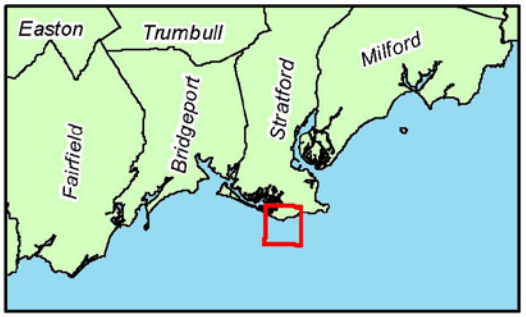
0 500 1,000 1,500 2,000 Feet

0 0.1 0.2 0.3 0.4 0.5 Miles

1:10,000

NOAA CHART 12369

GCS NAD1983



ANALYTICAL REPORT

Lab Number:	L1114232
Client:	U.S. Army Corps of Engineers 696 Virginia Road Concord, MA 01742-2751
ATTN:	Richard Loyd
Phone:	(978) 318-8048
Project Name:	POINT-NO-POINT
Project Number:	Not Specified
Report Date:	09/23/11

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: POINT-NO-POINT
Project Number: Not Specified

Lab Number: L1114232
Report Date: 09/23/11

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L1114232-01	A	STRATFORD, CT	08/09/11 00:00
L1114232-02	B	STRATFORD, CT	08/09/11 00:00
L1114232-03	C	STRATFORD, CT	08/09/11 00:00
L1114232-04	D	STRATFORD, CT	08/09/11 00:00
L1114232-05	E	STRATFORD, CT	08/09/11 00:00
L1114232-06	F	STRATFORD, CT	08/09/11 00:00

Project Name: POINT-NO-POINT **Lab Number:** L1114232
Project Number: Not Specified **Report Date:** 09/23/11

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. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of 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.

Grain Size:

The WG490467-1 Laboratory Duplicate RPD, performed on L1114232-01, is outside the acceptance criteria for % fine gravel (63%),% gravel (63%),% coarse sand (48%),% medium sand (53%),% fines (56%). The elevated RPD has been attributed to the non-homogeneous nature of the sample utilized for the laboratory duplicate.

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: Christopher J Anderson

Title: Technical Director/Representative Date: 09/23/11

INORGANICS
&
MISCELLANEOUS

Project Name: POINT-NO-POINT
Project Number: Not Specified

Lab Number: L1114232
Report Date: 09/23/11

SAMPLE RESULTS

Lab ID: L1114232-01
Client ID: A
Sample Location: STRATFORD, CT
Matrix: Sediment

Date Collected: 08/09/11 00:00
Date Received: 09/09/11
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
RIM Grain Size Analysis - Mansfield Lab										
% Cobbles	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Gravel	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Gravel	1.18		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Sand	0.600		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Medium Sand	12.6		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Sand	84.5		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Total Fines	1.07		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE

Project Name: POINT-NO-POINT
Project Number: Not Specified

Lab Number: L1114232
Report Date: 09/23/11

SAMPLE RESULTS

Lab ID: L1114232-02
Client ID: B
Sample Location: STRATFORD, CT
Matrix: Sediment

Date Collected: 08/09/11 00:00
Date Received: 09/09/11
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
RIM Grain Size Analysis - Mansfield Lab										
% Cobbles	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Gravel	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Gravel	0.410		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Sand	0.410		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Medium Sand	6.38		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Sand	92.3		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Total Fines	0.500		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE

Project Name: POINT-NO-POINT
Project Number: Not Specified

Lab Number: L1114232
Report Date: 09/23/11

SAMPLE RESULTS

Lab ID: L1114232-03
Client ID: C
Sample Location: STRATFORD, CT
Matrix: Sediment

Date Collected: 08/09/11 00:00
Date Received: 09/09/11
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
RIM Grain Size Analysis - Mansfield Lab										
% Cobbles	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Gravel	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Gravel	5.79		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Sand	2.81		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Medium Sand	43.8		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Sand	47.3		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Total Fines	0.330		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE

Project Name: POINT-NO-POINT
Project Number: Not Specified

Lab Number: L1114232
Report Date: 09/23/11

SAMPLE RESULTS

Lab ID: L1114232-04
Client ID: D
Sample Location: STRATFORD, CT
Matrix: Sediment

Date Collected: 08/09/11 00:00
Date Received: 09/09/11
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
RIM Grain Size Analysis - Mansfield Lab										
% Cobbles	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Gravel	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Gravel	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Sand	1.92		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Medium Sand	65.3		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Sand	32.6		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Total Fines	0.100		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE

Project Name: POINT-NO-POINT
Project Number: Not Specified

Lab Number: L1114232
Report Date: 09/23/11

SAMPLE RESULTS

Lab ID: L1114232-05
Client ID: E
Sample Location: STRATFORD, CT
Matrix: Sediment

Date Collected: 08/09/11 00:00
Date Received: 09/09/11
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
RIM Grain Size Analysis - Mansfield Lab										
% Cobbles	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Gravel	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Gravel	10.1		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Sand	18.4		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Medium Sand	54.7		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Sand	16.6		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Total Fines	0.160		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE

Project Name: POINT-NO-POINT
Project Number: Not Specified

Lab Number: L1114232
Report Date: 09/23/11

SAMPLE RESULTS

Lab ID: L1114232-06
Client ID: F
Sample Location: STRATFORD, CT
Matrix: Sediment

Date Collected: 08/09/11 00:00
Date Received: 09/09/11
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
RIM Grain Size Analysis - Mansfield Lab										
% Cobbles	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Gravel	ND		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Gravel	3.94		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Coarse Sand	19.7		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Medium Sand	67.2		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Fine Sand	8.67		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE
% Total Fines	0.490		%	0.100	NA	1	-	09/16/11 00:00	12,D422	SE

Lab Duplicate Analysis
Batch Quality Control

Project Name: POINT-NO-POINT
Project Number: Not Specified

Lab Number: L1114232
Report Date: 09/23/11

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
RIM Grain Size Analysis - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG490467-1 QC Sample: L1114232-01 Client ID: A						
% Cobbles	ND	ND	%	NC		25
% Coarse Gravel	ND	ND	%	NC		25
% Fine Gravel	1.1	2.27	%	**63**	Q	25
% Coarse Sand	0.6	0.980	%	**48**	Q	25
% Medium Sand	12.6	21.6	%	**53**	Q	25
% Fine Sand	84.5	74.5	%	13		25
% Total Fines	1.0	0.600	%	**56**	Q	25

Project Name: POINT-NO-POINT
Project Number: Not Specified

Lab Number: L1114232
Report Date: 09/23/11

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1114232-01A	Bag	A	N/A	15.3	Y	Absent	A2-RIMHYDRO-CSAND(),A2-RIMHYDRO-MSAND(),A2-RIMHYDRO-COBBLES(),A2-RIMHYDRO-TFINE(),A2-RIMHYDRO-FGRAVEL(),A2-RIMHYDRO-FSAND(),A2-RIMHYDRO-CGRAVEL()
L1114232-02A	Bag	A	N/A	15.3	Y	Absent	A2-RIMHYDRO-CSAND(),A2-RIMHYDRO-MSAND(),A2-RIMHYDRO-COBBLES(),A2-RIMHYDRO-TFINE(),A2-RIMHYDRO-FGRAVEL(),A2-RIMHYDRO-FSAND(),A2-RIMHYDRO-CGRAVEL()
L1114232-03A	Bag	A	N/A	15.3	Y	Absent	A2-RIMHYDRO-CSAND(),A2-RIMHYDRO-MSAND(),A2-RIMHYDRO-COBBLES(),A2-RIMHYDRO-TFINE(),A2-RIMHYDRO-FGRAVEL(),A2-RIMHYDRO-FSAND(),A2-RIMHYDRO-CGRAVEL()
L1114232-04A	Bag	A	N/A	15.3	Y	Absent	A2-RIMHYDRO-CSAND(),A2-RIMHYDRO-MSAND(),A2-RIMHYDRO-COBBLES(),A2-RIMHYDRO-TFINE(),A2-RIMHYDRO-FGRAVEL(),A2-RIMHYDRO-FSAND(),A2-RIMHYDRO-CGRAVEL()
L1114232-05A	Bag	A	N/A	15.3	Y	Absent	A2-RIMHYDRO-CSAND(),A2-RIMHYDRO-MSAND(),A2-RIMHYDRO-COBBLES(),A2-RIMHYDRO-TFINE(),A2-RIMHYDRO-FGRAVEL(),A2-RIMHYDRO-FSAND(),A2-RIMHYDRO-CGRAVEL()
L1114232-06A	Bag	A	N/A	15.3	Y	Absent	A2-RIMHYDRO-CSAND(),A2-RIMHYDRO-MSAND(),A2-RIMHYDRO-COBBLES(),A2-RIMHYDRO-TFINE(),A2-RIMHYDRO-FGRAVEL(),A2-RIMHYDRO-FSAND(),A2-RIMHYDRO-CGRAVEL()

*Values in parentheses indicate holding time in days

Project Name:	POINT-NO-POINT	**Lab Number:**	L1114232
Project Number:	Not Specified	**Report Date:**	09/23/11

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.
LFB	- Laboratory Fortified Blank: 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.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
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.
NI	- Not Ignitable.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL 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.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

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 MCP-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. 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. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit.
C	- Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
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.
G	- The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.
H	- The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
I	- The RPD between the results for the two columns exceeds the method-specified criteria; however, the lower value has been reported due to obvious interference.
M	- Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
NJ	- Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

Report Format: Data Usability Report

Project Name:	POINT-NO-POINT	**Lab Number:**	L1114232
Project Number:	Not Specified	**Report Date:**	09/23/11

Data Qualifiers

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 RL. (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).

ND - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report

REFERENCES

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

LIMITATION OF LIABILITIES

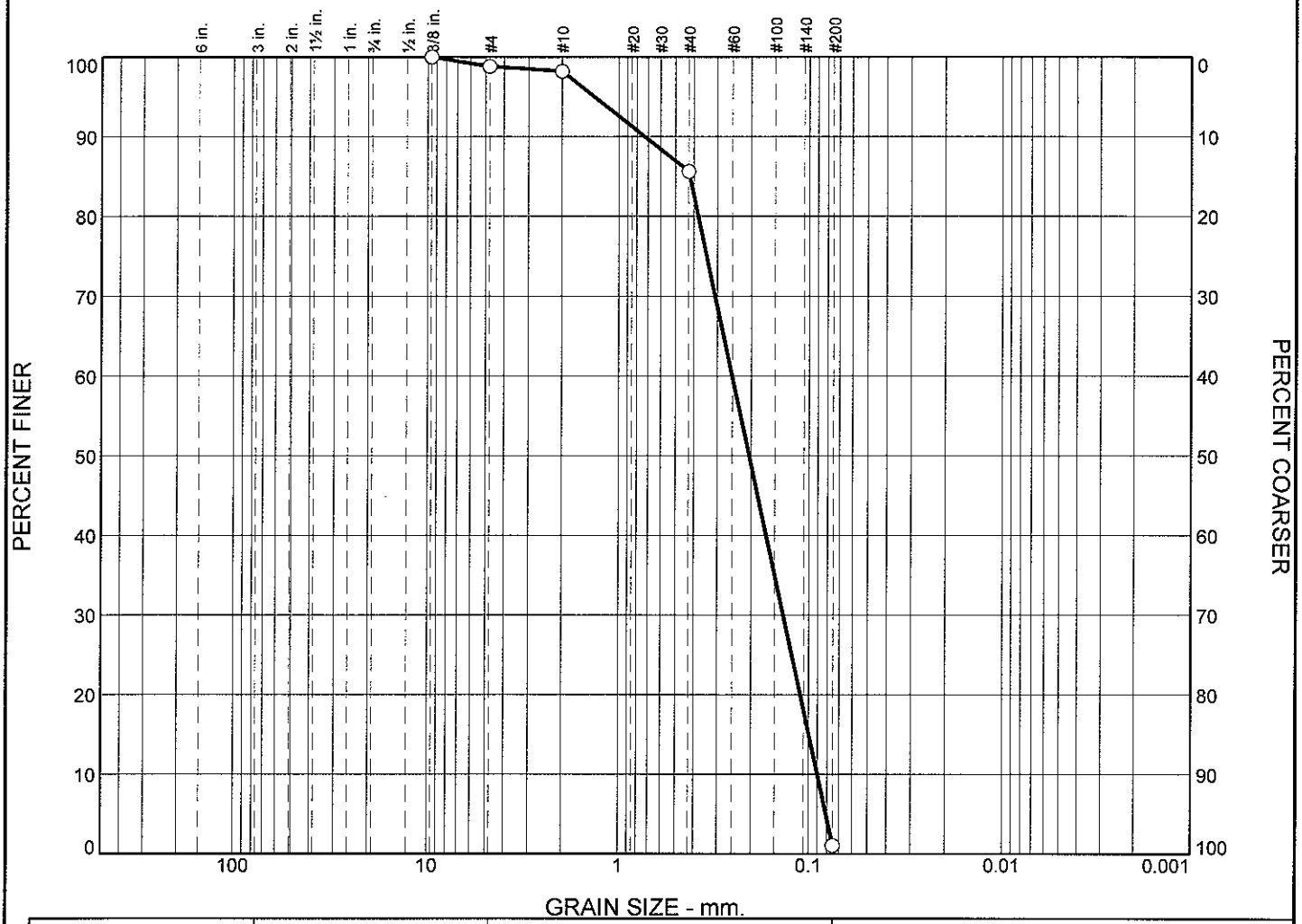
Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held 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 Analytical.

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.

ASTM 422D-63

Grain Size Analysis

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.00	0.00	1.18	0.60	12.62	84.53	1.07	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.4198	0.2513	0.2047	0.1358	0.0998	0.0901	0.81	2.79

	Material Description	USCS	AASHTO
○		SP	

Project No. L1114232 **Client:** US Army Corps of Eng.
Project: Point-No-Point

○ **Source of Sample:** A **Sample Number:** L1114232-01

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

9/22/2011

Client: US Army Corps of Eng.
Project: Point-No-Point
Project Number: L1114232
Location: A
Sample Number: L1114232-01
USCS Classification: SP

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
315.22	8.06	0.375	553.64	553.64	100.00	0.00
		#4	530.36	526.74	98.82	1.18
		#10	494.35	492.49	98.22	1.78
		#40	414.67	375.92	85.60	14.40
		#200	575.61	315.96	1.07	98.93

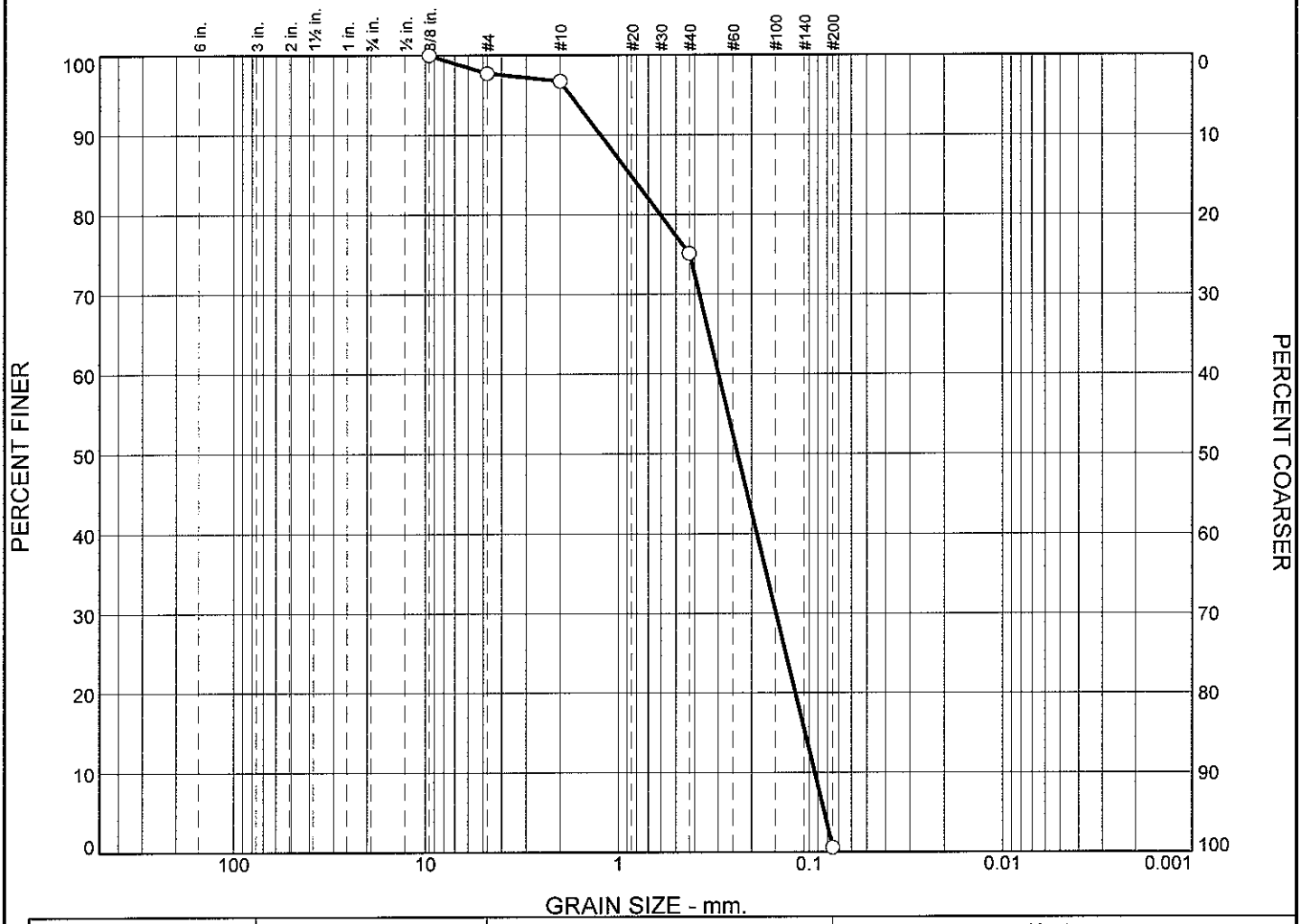
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.00	0.00	1.18	1.18	0.60	12.62	84.53	97.75			1.07

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0901	0.0998	0.1106	0.1358	0.2047	0.2513	0.3789	0.4198	0.7294	1.3476

Fineness Modulus	C_u	C_c
1.17	2.79	0.81

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.00	0.00	2.27	0.98	21.64	74.51	0.60	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.8628	0.2990	0.2369	0.1487	0.1049	0.0933	0.79	3.20

	Material Description	USCS	AASHTO
○		SP	

Project No. L1114232 **Client:** US Army Corps of Eng.
Project: Point-No-Point

○ **Source of Sample:** A **Sample Number:** WG490467-1

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

9/22/2011

Client: US Army Corps of Eng.
Project: Point-No-Point
Project Number: L1114232
Location: A
Sample Number: WG490467-1
USCS Classification: SP

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
220.98	7.60	.375	553.64	553.64	100.00	0.00
		#4	531.46	526.61	97.73	2.27
		#10	494.85	492.76	96.75	3.25
		#40	420.43	374.25	75.11	24.89
		#200	497.06	338.08	0.60	99.40

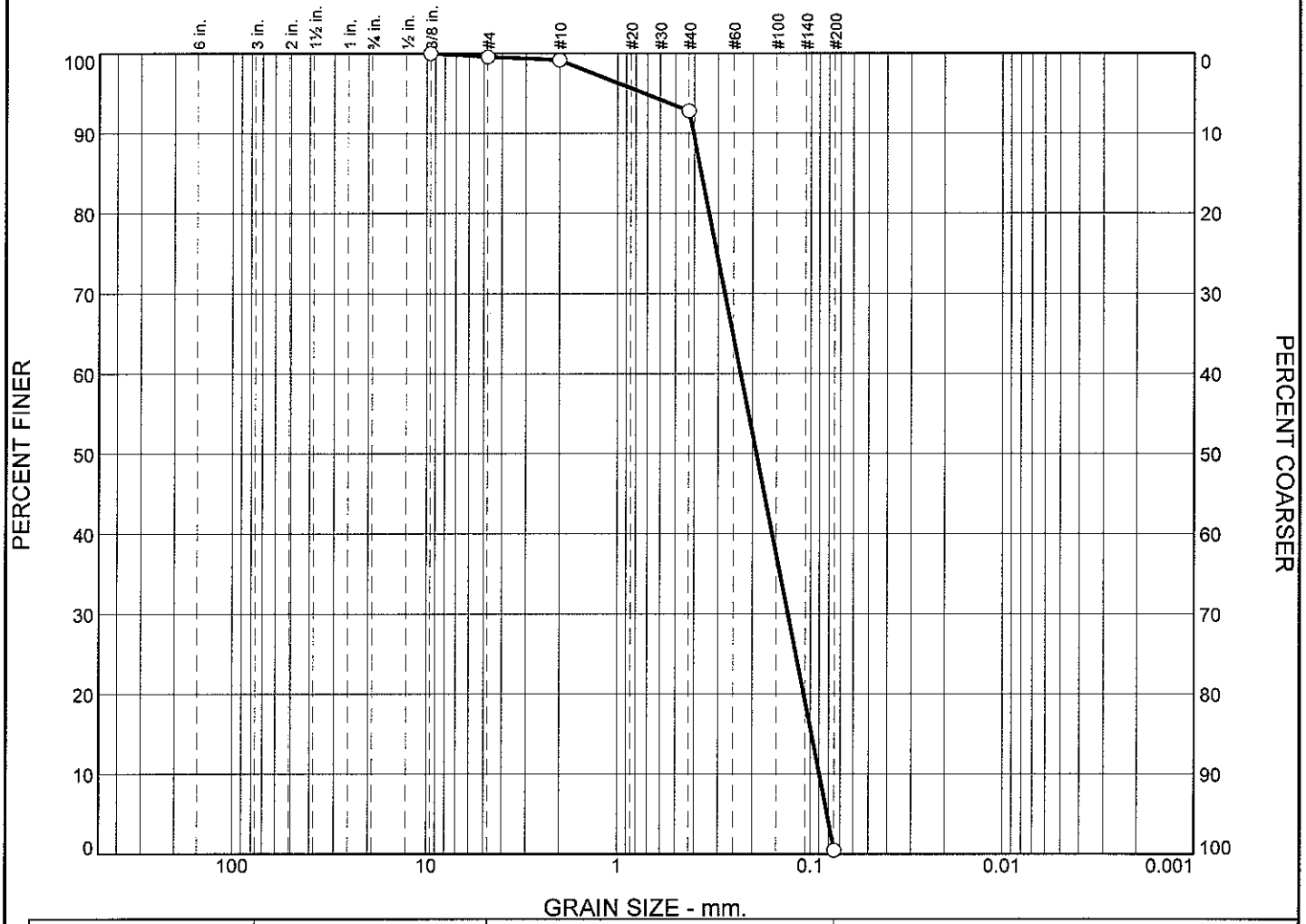
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.00	0.00	2.27	2.27	0.98	21.64	74.51	97.13			0.60

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0933	0.1049	0.1178	0.1487	0.2369	0.2990	0.6033	0.8628	1.2340	1.7649

Fineness Modulus	C_u	C_c
1.46	3.20	0.79

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.00	0.00	0.41	0.41	6.38	92.30	0.50	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.3671	0.2295	0.1901	0.1306	0.0985	0.0897	0.83	2.56

	Material Description	USCS	AASHTO
○		SP	

Project No. L1114232 **Client:** US Army Corps of Eng.

Project: Point-No-Point

○ **Source of Sample:** B **Sample Number:** L1114232-02

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

9/22/2011

Client: US Army Corps of Eng.
Project: Point-No-Point
Project Number: L1114232
Location: B
Sample Number: L1114232-02
USCS Classification: SP

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
381.31	7.34	0.375	553.64	553.64	100.00	0.00
		#4	528.27	526.74	99.59	0.41
		#10	494.01	492.49	99.18	0.82
		#40	399.80	375.92	92.80	7.20
		#200	661.14	315.96	0.50	99.50

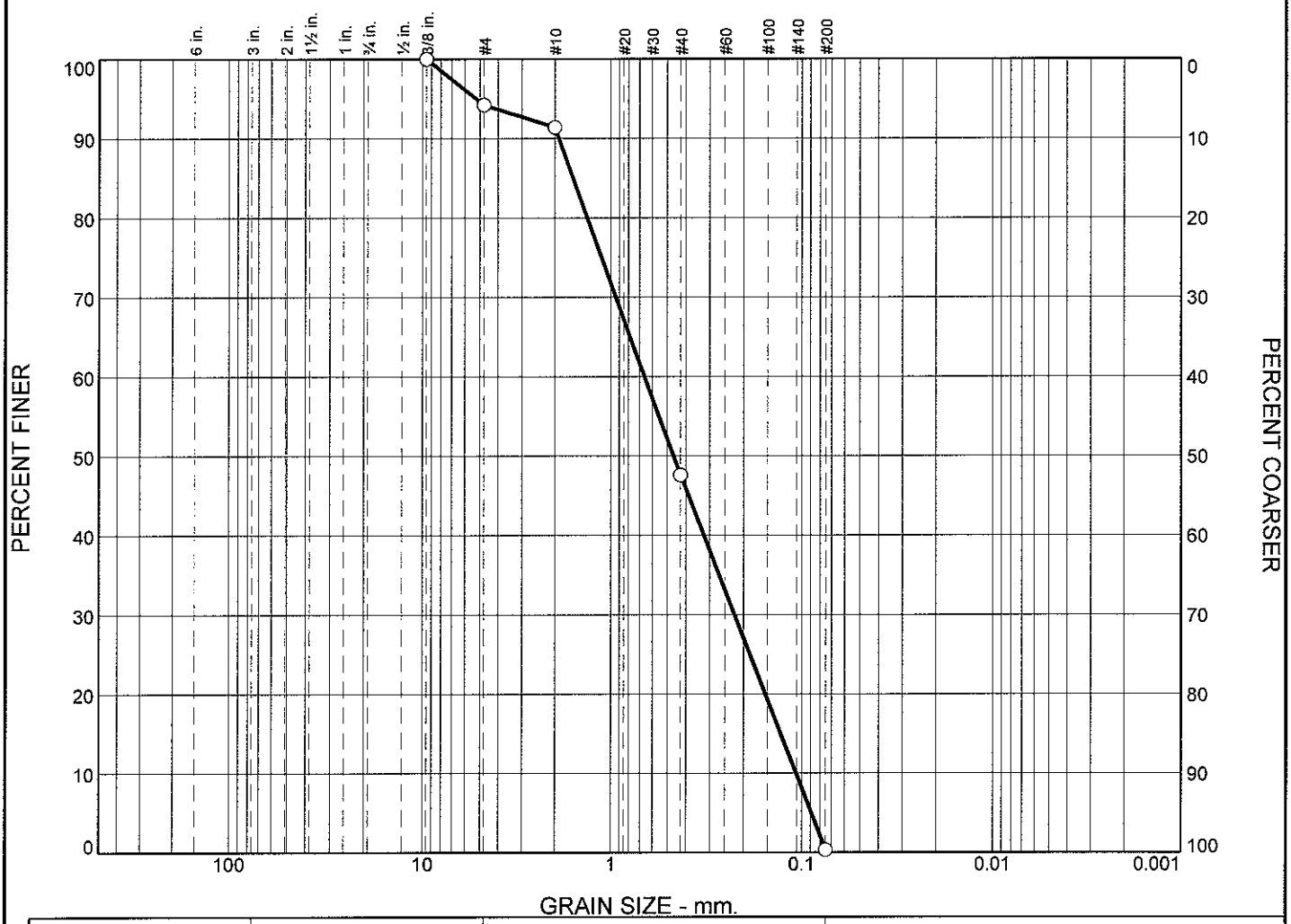
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.00	0.00	0.41	0.41	0.41	6.38	92.30	99.09			0.50

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0897	0.0985	0.1082	0.1306	0.1901	0.2295	0.3341	0.3671	0.4032	0.7249

Fineness Modulus	C_u	C_c
0.98	2.56	0.83

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.00	0.00	5.79	2.81	43.81	47.26	0.33	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.5950	0.6591	0.4628	0.2228	0.1285	0.1069	0.70	6.16

	Material Description	USCS	AASHTO
○		SP	

Project No. L1114232 **Client:** US Army Corps of Eng.
Project: Point-No-Point

○ **Source of Sample:** C **Sample Number:** L1114232-03

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

9/22/2011

Client: US Army Corps of Eng.
Project: Point-No-Point
Project Number: L1114232
Location: C
Sample Number: L1114232-03
USCS Classification: SP

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
549.26	8.70	0.375	553.64	553.64	100.00	0.00
		#4	557.93	526.61	94.21	5.79
		#10	507.92	492.76	91.40	8.60
		#40	611.08	374.25	47.59	52.41
		#200	593.52	338.08	0.33	99.67

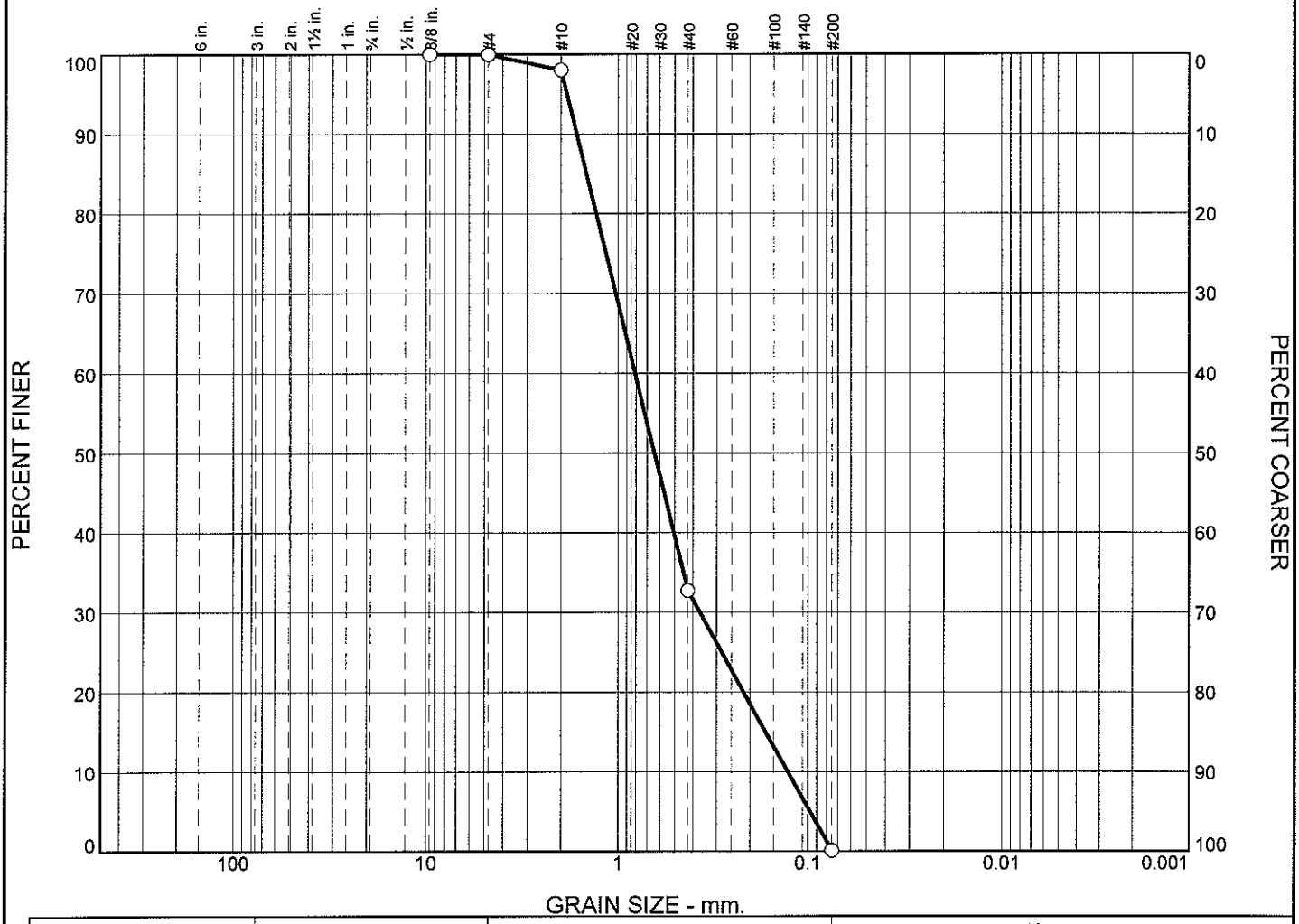
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.00	0.00	5.79	5.79	2.81	43.81	47.26	93.88			0.33

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.1069	0.1285	0.1544	0.2228	0.4628	0.6591	1.3365	1.5950	1.9033	5.2252

Fineness Modulus	C_u	C_c
2.23	6.16	0.70

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.00	0.00	0.03	1.92	65.31	32.64	0.10	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.4678	0.8113	0.6400	0.3675	0.1656	0.1269	1.31	6.39

	Material Description	USCS	AASHTO
○		SW	

Project No. L1114232 **Client:** US Army Corps of Eng.
Project: Point-No-Point

○ **Source of Sample:** D **Sample Number:** L1114232-04

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

9/22/2011

Client: US Army Corps of Eng.
Project: Point-No-Point
Project Number: L1114232
Location: D
Sample Number: L1114232-04
USCS Classification: SW

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
537.30	7.69	0.375	553.64	553.64	100.00	0.00
		#4	526.91	526.74	99.97	0.03
		#10	502.67	492.49	98.05	1.95
		#40	721.81	375.92	32.74	67.26
		#200	488.78	315.96	0.10	99.90

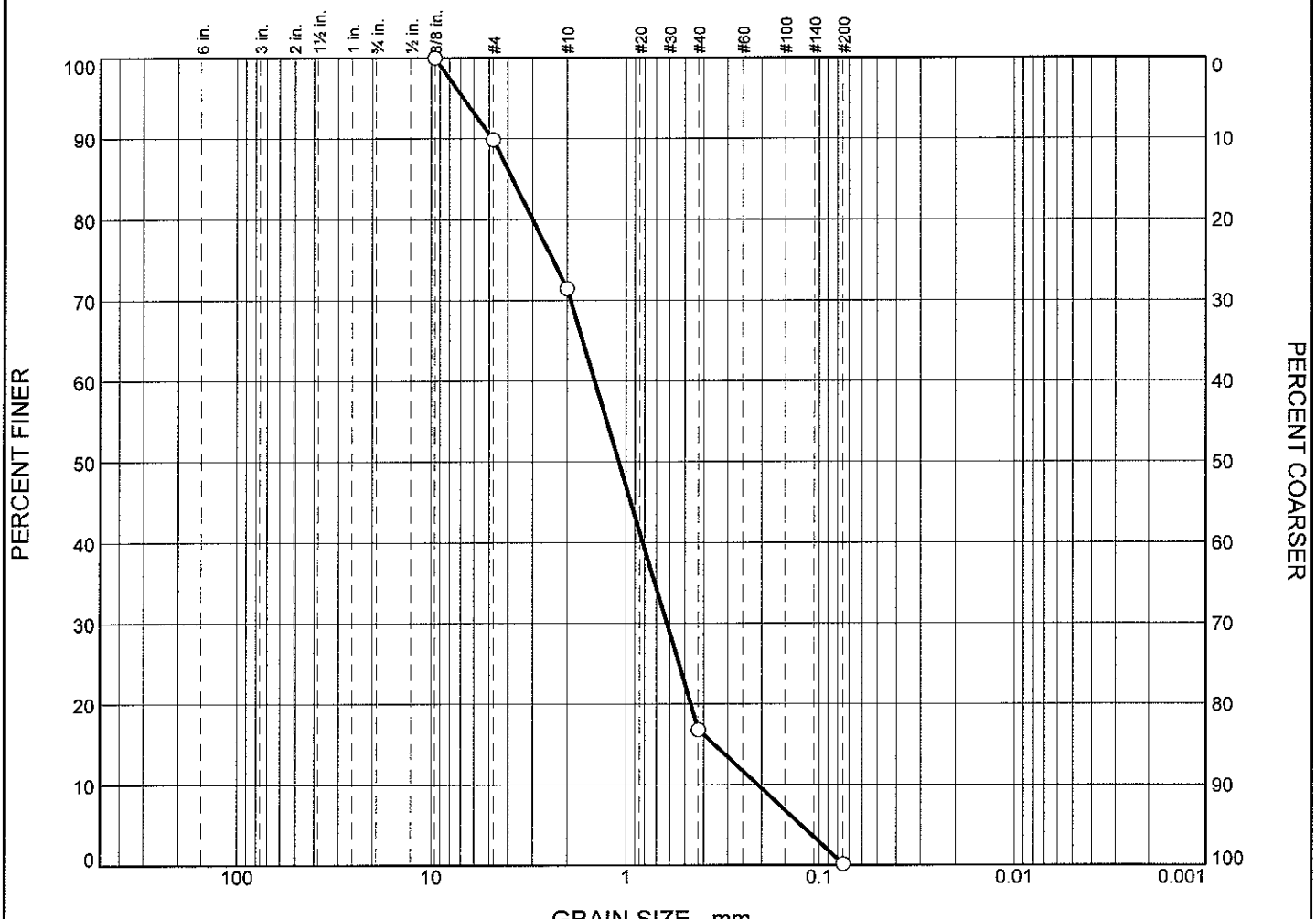
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.00	0.00	0.03	0.03	1.92	65.31	32.64	99.87			0.10

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.1269	0.1656	0.2160	0.3675	0.6400	0.8113	1.3037	1.4678	1.6526	1.8606

Fineness Modulus	C_u	C_c
2.39	6.39	1.31

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.00	0.00	10.14	18.40	54.67	16.63	0.16	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			3.7792	1.4455	1.0889	0.6179	0.3526	0.2093	1.26	6.91

	Material Description	USCS	AASHTO
○		SW	

Project No. L1114232 **Client:** US Army Corps of Eng.
Project: Point-No-Point

○ **Source of Sample:** E **Sample Number:** L1114232-05

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

9/22/2011

Client: US Army Corps of Eng.
Project: Point-No-Point
Project Number: L1114232
Location: E
Sample Number: L1114232-05
USCS Classification: SW

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
494.02	7.43	0.375	553.64	553.64	100.00	0.00
		#4	575.93	526.61	89.86	10.14
		#10	582.31	492.76	71.46	28.54
		#40	640.27	374.25	16.79	83.21
		#200	419.00	338.08	0.16	99.84

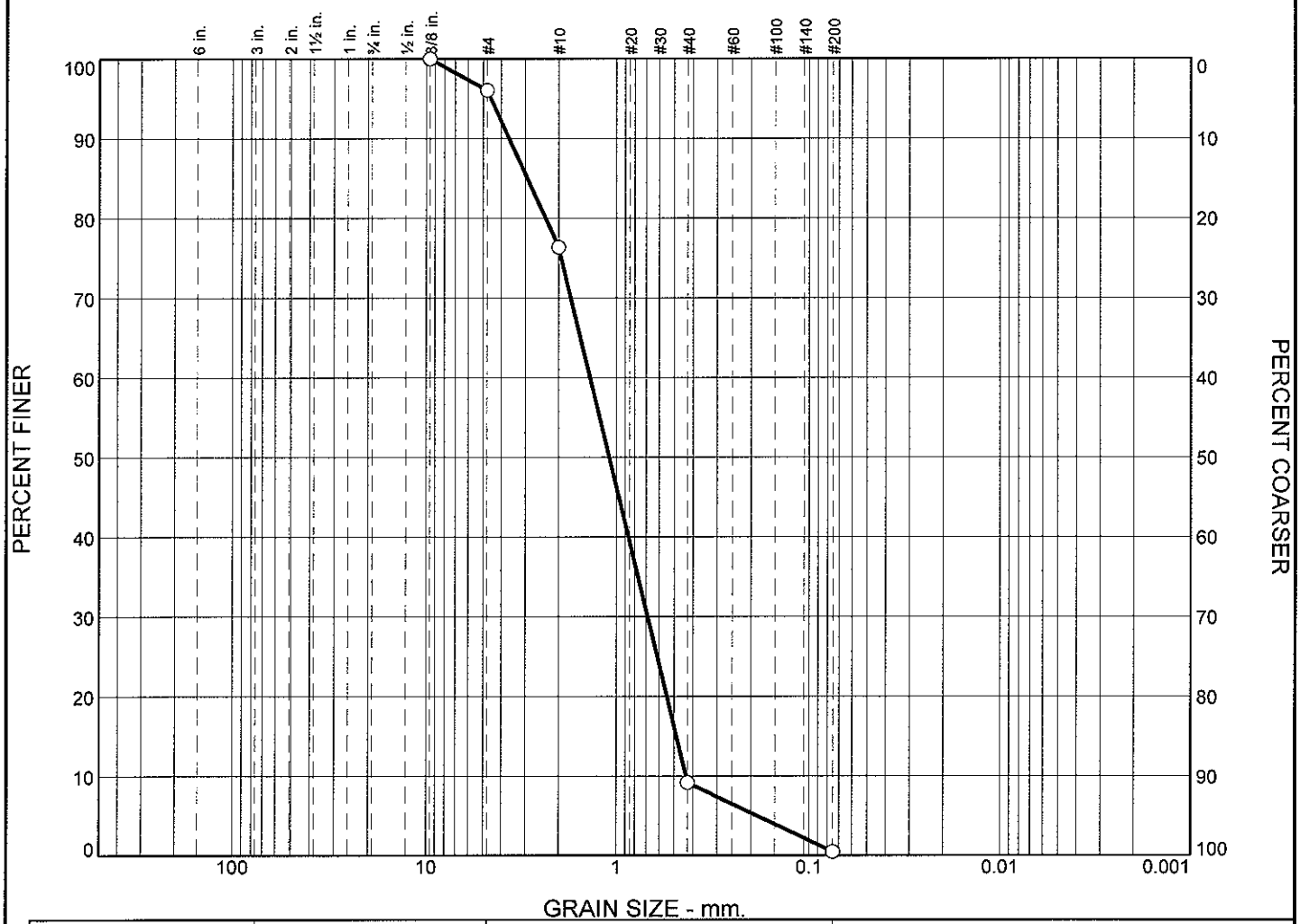
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.00	0.00	10.14	10.14	18.40	54.67	16.63	89.70			0.16

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.2093	0.3526	0.4655	0.6179	1.0889	1.4455	2.9877	3.7792	4.7945	6.7578

Fineness Modulus	C_u	C_c
3.33	6.91	1.26

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.00	0.00	3.94	19.69	67.21	8.67	0.49	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			2.9221	1.3716	1.0893	0.6870	0.4862	0.4333	0.79	3.17

	Material Description	USCS	AASHTO
○		SP	

Project No. L1114232 **Client:** US Army Corps of Eng.
Project: Point-No-Point

○ **Source of Sample:** F **Sample Number:** L1114232-06

Remarks:

Alpha Analytical

Mansfield, MA

Figure

GRAIN SIZE DISTRIBUTION TEST DATA

9/22/2011

Client: US Army Corps of Eng.
Project: Point-No-Point
Project Number: L1114232
Location: F
Sample Number: L1114232-06
USCS Classification: SP

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
454.11	7.34	0.375	553.64	553.64	100.00	0.00
		#4	544.33	526.74	96.06	3.94
		#10	580.49	492.49	76.37	23.63
		#40	676.17	375.92	9.16	90.84
		#200	354.71	315.96	0.49	99.51

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.00	0.00	3.94	3.94	19.69	67.21	8.67	95.57			0.49

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.4333	0.4862	0.5456	0.6870	1.0893	1.3716	2.3461	2.9221	3.6397	4.5334

Fineness Modulus	C_u	C_c
3.35	3.17	0.79

Certificate/Approval Program Summary

Last revised September 19, 2011 – 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, SM2540D, SM2540G.)

Solid & Chemical Materials (Inorganic Parameters: 6020, 7470, 7471, 9045. 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 180.1, 245.7, 1631E, 3020, 6020A, 7470A, 9040, 9050A, SM2320B, 2540D, 2540G, 4500H-B, Organic Parameters: EPA 3510C, 3580A, 3630C, 3640A, 3660B, 3665A, 5030B, 8015D, 3570, 8081B, 8082A, 8260B, 8270C, 8270D.)

Solid & Chemical Materials (Inorganic Parameters: EPA 1311, 3050, 3051A, 3060A, 6020A, 7196A, 7470A, 7471B, 7474, 9040B, 9045C, 9060. Organic Parameters: EPA 3540C, 3570B, 3580A, 3630C, 3640A, 3660, 3665A, 5035, 8015D, 8081B, 8082A, 8260B, 8270C, 8270D.)

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

Air & Emissions (EPA TO-15.)

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

Non-Potable Water (Inorganic Parameters: EPA 245.7, 1631E, 6020A, 7470A, 9040B, 9050A, SM2540D, 2540G, 4500H+B, 2320B. Organic Parameters: EPA 8081B, 8082A, 8260B, 8270C, 8015D.)

Solid & Chemical Materials (Inorganic Parameters: SW-846 1311, 1312, 3050B, 3051A, 3060A, 6020A, 7471A, 9040B, 9045C, 7196A. Organic Parameters: SW-846 3540C, 3580A, 3630C, 3640A, 3660B, 3665A, 5035, 8260B, 8270C, 8015D, 8082A, 8081B.)

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

Non-Potable Water (Inorganic Parameters: SW-846 1312, 3010, 3020A, 3015, SM2320B, SM2540D, 2540G, , EPA 180.1, 1631E, SW-846 7470A, 9040B, 6020. Organic Parameters: SW-846 3510C, 3580A, 5030B, 5035L, 5035H, 3630C, 3640C, 3660B, 3665A, 8015B 8081A, 8082, 8260B, 8270C)

Solid & Chemical Materials (Inorganic Parameters: SW-846 6020, 1311, 1312, 3050B, 3051, 3060A, 7196A, 7470A, 7471A, 9040B, 9045C, 9050A, 9060. Organic Parameters: SW-846 3540C, 3570, 3580A, 5030B, 5035L, 5035H, 3630C, 3640A, 3660B, 3665A, 8081A, 8082, 8260B, 8270C, 8015B.)

Atmospheric Organic Parameters (EPA TO-15)

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

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

Non-Potable Water (Inorganic Parameters: SM2320B, SM2540D, EPA 200.8, 6020, 1631E, 245.1, 245.7, 7470A, 9014, 9040B, 9050, 120.1, 4500CN-E, 4500H-B, EPA 376.2, 180.1, 3020A. Organic Parameters: EPA 8260B, 8270C, 8081A, 8082, 3510C, 5030B.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 6020, 7196A, 3060A, 7471A, 7474, 9014, 9040B, 9045C, 9010B. Organic Parameters: EPA 8260B, 8270C, 8081A, DRO 8015B, 8082, 1311, 1312, 3050B, 3580, 3570, 3051, 5035, 5030B.)

Air & Emissions (EPA TO-15.)

Pennsylvania Certificate/Lab ID: 68-02089 ***NELAP Accredited***

Solid & Hazardous Waste (Inorganic Parameters: EPA 6020A,7471B, 7474. Organic Parameters: EPA3050B, 3540C, 3630C, 8270C, 8081B, 8082A.)

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

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, 7470, 7471, 1311, 7196, 9040, 9045, 9060. Organic Parameters: EPA 8015, 8270, 8260, 8081, 8082.)

Air (Organic Parameters: EPA TO-15)

Washington State Department of Ecology Certificate/Lab ID: C954. *Non-Potable Water* (Inorganic Parameters: SM2540D, 2510B, EPA 120.1, 180.1, 1631E, 245.7.)

Solid & Chemical Materials (Inorganic Parameters: EPA 9040, 9060, 6020, 7470, 7471, 7474. Organic Parameters: EPA 8081, 8082, 8015 Mod, 8270, 8260.)

U.S. Army Corps of Engineers

Department of Defense Certificate/Lab ID: L2217.01.

Non-Potable Water (Inorganic Parameters: EPA 6020A, SM4500H-B. Organic Parameters: 3020A, 3510C, 5030B, 8260B, 8270C, 8270C-ALK-PAH, 8082, 8081A, 8015D-SHC.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1311, 1312, 3050B, 6020A, 7471A, 9045C, 9060, SM 2540G, ASTM D422-63. Organic Parameters: EPA 3580A, 3570, 3540C, 5035A, 8260B, 8270C, 8270-ALK-PAH, 8082, 8081A, 8015D-SHC, 8015-DRO.

Air & Emissions (EPA TO-15.)

Analytes Not Accredited by NELAP
Certification is not available by NELAP for the following analytes: **8270C:** Biphenyl. **TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 2-Methylnaphthalene, 1-Methylnaphthalene.

CHAIN OF CUSTODY

PAGE 1 OF 1

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 #: L1114232

Client Information

Client: US Army Corps of Engineers
Address: 696 Virginia Rd
Concord, MA 01742
Phone: 617 697 0573
Fax: 978 318 8560
Email: Richard.B.Loyd@usace.army.mil

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: Point-No-Point
Project Location: Stratford, Ct
Project #:
Project Manager: Ben Loyd
ALPHA Quote #: 20110974AM

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

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: Grain size (sieve only)

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	Total # Bottles	Sample Specific Comments
L1114232-1	A	8/9/11		SE	RBL	1	Please Retain Material for Corps pickup
2	B					1	
3	C					1	
4	D					1	
5	E					1	
6	F					1	

Container Type	O
Preservative	A

Relinquished By:	Date/Time	Received By:	Date/Time
Maura Snider	9-9-11 1630	Maura Snider	9-9-11 1330
	9/10/11 0853		9/9/11 1605
			9/10/11 0845

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 Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

APPENDIX C - *SUITABILITY DETERMINATION*

From:	Nimeskern, Phillip W NAE
To:	O"Donnell, Edward G NAE; Cappola, Valerie A NAE
Subject:	FW: Housatonic Samples (UNCLASSIFIED)
Date:	Tuesday, April 03, 2012 10:56:05 AM
Attachments:	200102381sd.doc

Classification: UNCLASSIFIED
Caveats: NONE

Hello,

This is the last SD I did for the Housatonic River FNP. Attached is the first one. If you or Valerie wish to discuss them with me, you know where to find me.

Phill Nimeskern
US Army, Corps of Engineers
(978) 318-8660

-----Original Message-----
From: Nimeskern, Phillip W NAE
Sent: Friday, April 27, 2007 1:57 PM
To: O'Donnell, Edward G NAE
Cc: Ladd, Ruth M NAE; Karalius, Jack NAE
Subject: RE: Housatonic Samples

Hello,

I have reviewed the new bulk sediment chemistry data on the Housatonic River sediments that Jack provided. CENAE is proposing to dredge sandy material from the Housatonic River FNP and use it to nourish Hammonasset Beach in Madison, CT.

In 25 October 2001, I prepared a suitability determination for this material that found it suitable for upland or beach disposal. This determination was based on 1999 bulk sediment chemistry results. The river sediments were all sands, with fines ranging from 0.43% to 8.65% and TOC ranging from 0.12% to 1.45%.

The new, 2007 data parallels the 1999 data, both in the location of sampling points and the trend of analyte concentrations. The 2007 data does have higher Detection Limits than in the 1999 data and lacks grain size data. It also has more analytes. The TOC is also low, ranging from <0.01% to 0.25%. The concentrations of PAHs increase as the stations move upriver, particularly in the reach between the I95 and I1 bridges. Even in this sediment however, I am not concerned about the PAH concentrations when used for beach nourishment. The metal concentrations are all low. No chemical concentration jumps out as being a problem to me.

Therefore, my best professional judgment is that the sandy material is still suitable for use as beach nourishment.

If you have any questions, please contact me.

Phill Nimeskern
US Army, Corps of Engineers
(978) 318-8660

-----Original Message-----
From: O'Donnell, Edward G NAE

CENAE-R-PT (1145-2-303B) October 25, 2001

MEMORANDUM FOR RECORD

SUBJECT: Housatonic River Federal Navigation Project, Stratford, CT, Project Number 2001-02381

1. The CENAE is proposing to dredge approximately 500,000 cy of sandy material from the Housatonic River Federal Navigation Project (FNP) from Long Island Sound to Culver's Bar. This material is proposed for disposal on either beach or upland. The exact disposal site is undetermined at this time.

2. A sampling plan was developed for this project by Paula Kullberg on August 2, 1999. The river sediments were sampled in November 1999 and analyzed in January 2000. The data generated were described in a report titled "Vibratory Core Sampling – Housatonic River, CT" and dated March 30, 2000.

3. The sediment grain size analyses showed that the sediments were all predominantly sand, ranging from 0.43% fines to 8.65% fines. The Total Organic Carbon was quite low, ranging from 0.12% to 1.45%. The metals concentrations were all "low" when compared with the classification guidelines in the "Interim Plan" (NERBC, 1980). The concentrations of pesticides and PCB's were all below or only slightly above the detection limits. The concentrations of PAHs ranged from below detection limits to 890 ppb. None of these values are high, in my estimation, when considering beach or upland disposal.

4. Based upon the above information, I have no concerns about the proposed disposal of the dredged material.

Phillip Nimeskern
Senior Project Manager
Marine Analysis Section

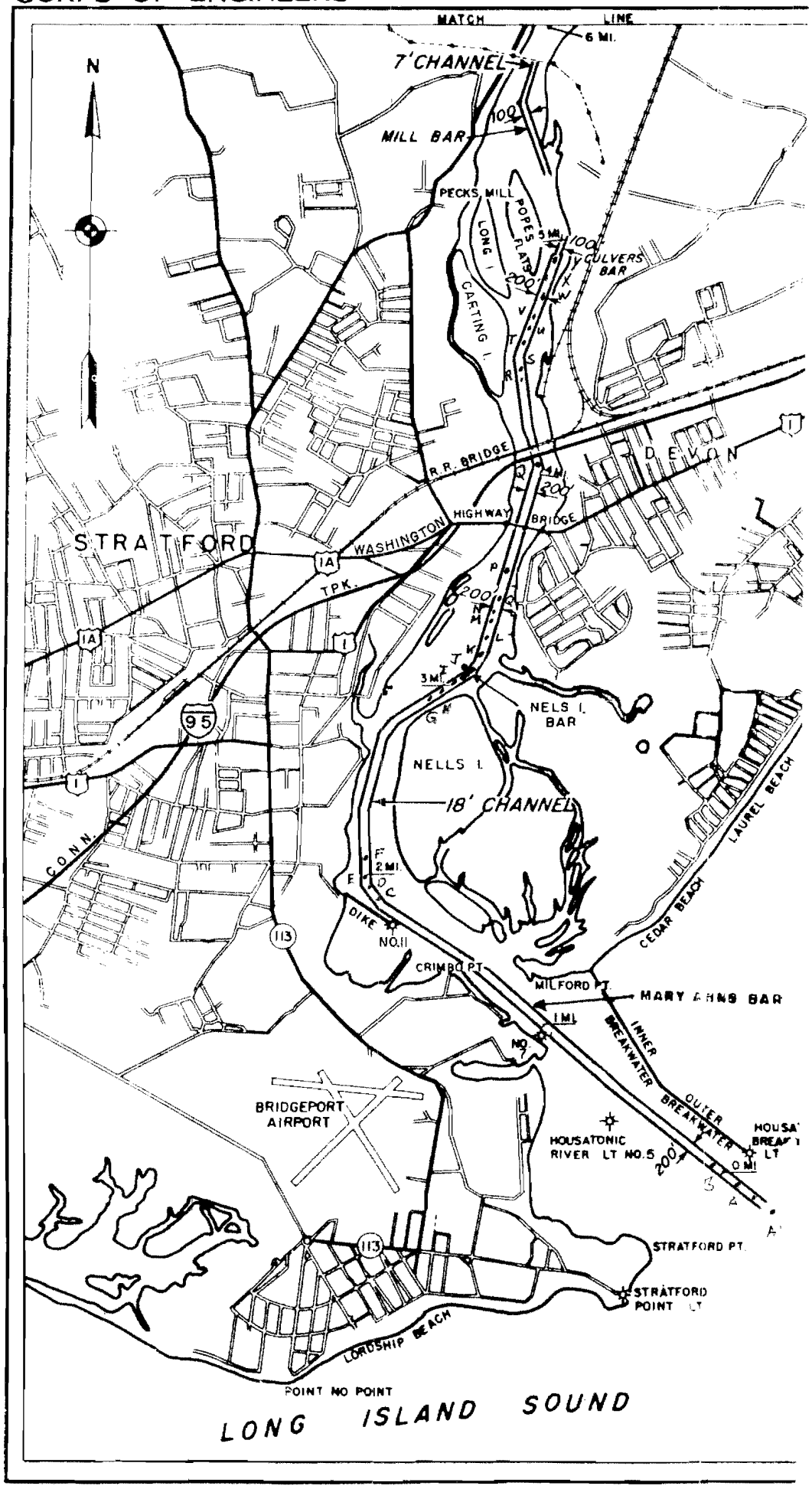
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	Contaminant concentrations																								
2	**HOUSATONIC RIVER FNP**																								
3	**November 1999 sampling**																								
4																									
5	Sample Site		CLIS		**Comp A, A1**			**Core B**			**Comp. C,D**			**Comp. E,F**			**Comp. G, H**			**Comp. I, J**			**Core K**		
6			mean + 2sd		Raw Data			Raw Data			Raw Data			Raw Data			Raw Data			Raw Data			Raw Data		
7	**METALS (ppm)**																								
8	Arsenic		6.30		0.62		ok	0.86		ok	1.20		ok	1.23		ok	3.84		ok	0.59		ok	1.00		ok
9	Cadmium		0.28		0.02		ok	0.14		ok	0.44		*	0.29		*	0.14		ok	0.08		ok	0.22		ok
10	Chromium		45.10		8.02		ok	16.20		ok	48.50		*	34.30		ok	33.30		ok	27.60		ok	37.30		ok
11	Copper		42.10		15.90		ok	43.70		*	154.00		*	111.00		*	86.60		*	73.30		*	116.00		*
12	Mercury		0.17		0.03		ok	0.05		ok	0.08		ok	0.08		ok	0.06		ok	0.05		ok	0.07		ok
13	Nickel		41.00		3.71		ok	6.23		ok	11.40		ok	9.30		ok	8.56		ok	5.75		ok	9.24		ok
14	Lead		82.20		4.26		ok	9.52		ok	19.80		ok	18.00		ok	17.30		ok	11.00		ok	22.80		ok
15	Zinc		181.00		16.10		ok	35.50		ok	95.80		ok	70.40		ok	64.90		ok	44.20		ok	72.50		ok
16																									
17	**% fines**				**0.43**			**0.63**			**4.32**			**2.88**			**2.37**			**2.46**			**3.37**		
18																									
19	**PAHs (ppb)**					Normalized			Normalized			Normalized			Normalized			Normalized			Normalized			Normalized	
20	Fluorene		20.00		10.00	83.33	*	10.00	37.04	*	25.09	30.05	*	25.25	40.40	*	10.00	23.26	*	10.00	29.41	*	10.00	15.38	ok
21	Phenanthrene		183.00		10.00	83.33	ok	82.53	305.67	*	278.11	333.07	*	331.79	530.86	*	257.26	598.28	*	48.76	143.41	ok	138.37	212.88	*
22	Anthracene		56.00		10.00	83.33	*	30.73	113.81	*	126.58	151.59	*	137.16	219.46	*	109.90	255.58	*	22.45	66.03	*	64.86	99.78	*
23	Naphthalene		94.00		10.00	83.33	ok	10.00	37.04	ok	41.24	49.39	ok	30.67	49.07	ok	10.00	23.26	ok	10.00	29.41	ok	21.06	32.40	ok
24	Acenaphthylene		39.00		10.00	83.33	*	24.31	90.04	*	89.66	107.38	*	78.18	125.09	*	60.83	141.47	*	21.06	61.94	*	54.71	84.17	*
25	Acenaphthene		12.00		10.00	83.33	*	10.00	37.04	*	10.00	11.98	ok	10.00	16.00	*	10.00	23.26	*	10.00	29.41	*	10.00	15.38	*
26																									
27	Fluoranthene		320.00		10.00	83.33	ok	189.28	701.04	*	650.44	778.97	*	686.83	1098.93	*	672.76	1564.56	*	112.56	331.06	*	361.88	556.74	*
28	Pyrene		459.00		20.61	171.75	ok	286.13	1059.74	*	890.34	1066.28	*	890.93	1425.49	*	739.39	1719.51	*	161.13	473.91	*	575.40	885.23	*
29	Benzo(a)anthracene		194.00		10.00	83.33	ok	127.23	471.22	*	391.60	468.98	*	351.80	562.88	*	362.33	842.63	*	66.42	195.35	*	244.29	375.83	*
30	Chrysene		217.00		10.00	83.33	ok	160.58	594.74	*	467.21	559.53	*	393.99	630.38	*	391.99	911.60	*	79.79	234.68	*	307.33	472.82	*
31	Total Benzofluoranthenes		446.00		20.00	166.67	ok	210.83	780.85	*	774.92	928.05	*	667.15	1067.44	*	616.43	1433.56	*	142.90	420.29	ok	510.29	785.06	*
32	Benzo(a)pyrene		217.00		10.00	83.33	ok	147.82	547.48	*	469.28	562.01	*	443.25	709.20	*	437.97	1018.53	*	94.74	278.65	*	333.40	512.92	*
33	Dibenzo(a,h)anthracene		12.00		10.00	83.33	*	20.49	75.89	*	72.77	87.15	*	62.79	100.46	*	52.69	122.53	*	10.00	29.41	*	43.24	66.52	*
34	Benzo(g,h,i)perylene		216.00		10.00	83.33	ok	84.63	313.44	*	291.06	348.57	*	252.33	403.73	*	246.06	572.23	*	57.68	169.65	ok	179.33	275.89	*
35	Ideno(123-cd)pyrene		92.00		10.00	83.33	ok	83.05	307.59	*	321.83	385.43	*	268.58	429.73	*	259.56	603.63	*	57.25	168.38	*	184.11	283.25	*
36																									
37	Sum of PAH's		2577.00		**170.61**	**1421.75**	ok	**1477.61**	**5472.63**	*	**4900.13**	**5868.42**	*	**4630.70**	**7409.12**	*	**4237.17**	**9853.88**	*	**904.74**	**2661.00**	*	**3038.27**	**4674.26**	*
38																									
39	% TOC (mean, n=2)				**0.12**			**0.27**			**0.84**			**0.63**			**0.43**			**0.34**			**0.65**		
40																									
41	PCBS (ppm)																								
42	2,4' diCB	8	0.00		0.00023			0.00025			0.00110			0.00045			0.00026			0.00024			0.00026		
43	2,2',5 triCB	18	0.00		0.00003			0.00035			0.00264			0.00173			0.00058			0.00027			0.00086		
44	2,4,4' triCB	28	0.00		0.00002			0.00028			0.00268			0.00158			0.00030			0.00019			0.00081		
45	2,2',3,5' tetraCB	44	0.00		0.00002			0.00050			0.00274			0.00186			0.00034			0.00026			0.00094		
46	2,2',4',5 tetraCB	49	0.00		0.00003			0.00044			0.00201			0.00142			0.00030			0.00024			0.00085		
47	2,2',5,5' tetraCB	52	0.00		0.00003			0.00064			0.00299			0.00237			0.00042			0.00038			0.00128		
48	2,3',4,4' tetraCB	66	0.00		0.00003			0.00055			0.00252			0.00180			0.00033			0.00024			0.00111		
49	2,2',3,4,5' pentaCB	87	0.00		0.00003			0.00032			0.00085			0.00080			0.00024			0.00017			0.00063		

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
50	2,2',4,5,5' pentaCB	101	0.00		0.00005			0.00064			0.00190			0.00196			0.00064			0.00042			0.00150		
51	2,3,3',4,4' pentaCB	105	0.00		0.00001			0.00020			0.00062			0.00058			0.00015			0.00011			0.00046		
52	2,3',4,4',5 pentaCB	118	0.00		0.00004			0.00054			0.00146			0.00144			0.00047			0.00037			0.00121		
53	2,3,3',4,4' pentaCB	128	0.00		0.00004			0.00006			0.00013			0.00009			0.00008			0.00006			0.00016		
54	2,2',3,4,4',5' hexaCB	138	0.00		0.00010			0.00057			0.00127			0.00154			0.00052			0.00039			0.00140		
55	2,2',4,4',5,5' hexaCB	153	0.00		0.00008			0.00084			0.00171			0.00211			0.00096			0.00052			0.00191		
56	2,2',3,3',4,4',5 heptaCB	170	0.00		0.00004			0.00032			0.00058			0.00067			0.00037			0.00017			0.00061		
57	2,2',3,4,4',5,5' heptaCB	180	0.00		0.00007			0.00047			0.00101			0.00107			0.00057			0.00026			0.00099		
58	2,2',3,4,4',5',6 heptaCB	183	0.00		0.00003			0.00014			0.00032			0.00039			0.00022			0.00010			0.00028		
59	2,2',3,4,4',6,6' heptaCB	184	0.00		0.00004			0.00004			0.00004			0.00004			0.00004			0.00004			0.00004		
60	2,2', 3,4',5,5',6 heptaCB	187	0.00		0.00004			0.00028			0.00073			0.00076			0.00050			0.00020			0.00073		
61	2,2',3,3'4,4',5,6 octaCB	195	0.00		0.00001			0.00014			0.00022			0.00018			0.00019			0.00010			0.00019		
62	2,2',3,3',4,4',5,5',6 nonaCB	206	0.00		0.00002			0.00018			0.00018			0.00020			0.00034			0.00014			0.00026		
63	2,2',3,3',4,4',5,5',6,6' decaCB	209	0.00		0.00002			0.00011			0.00022			0.00015			0.00017			0.00011			0.00025		
64																									
65	Total PCBs		0.01		**0.00098**			**0.00785**			**0.02792**			**0.02319**			**0.00799**			**0.00497**			**0.01672**		
66	Sum of Congeners																								
67																									
68	PESTICIDES (ppb)																								
69	alpha-BHC		0.60		0.09			0.09			0.09			0.09			0.10			0.09			0.09		
70	gamma-BHC (lindane)		0.48		0.03			0.03			0.03			0.03			0.03			0.03			0.03		
71	beta-BHC		0.60		0.03			0.03			0.03			0.03			0.03			0.03			0.03		
72	heptachlor		0.60		0.03			0.03			0.03			0.03			0.03			0.03			0.03		
73	delta-BHC		0.70		0.03			0.03			0.03			0.03			0.03			0.03			0.03		
74	aldrin		0.50		0.03			0.03			0.03			0.03			0.03			0.03			0.03		
75	heptachlor epoxide		0.70		0.03			0.03			0.03			0.03			0.03			0.03			0.03		
76	gamma chlordane		1.00		0.02			0.23			0.45			0.74			0.32			0.15			0.43		
77	alpha chlordane		1.00		0.01			0.22			0.42			0.63			0.13			0.10			0.34		
78	endosulfan I		0.80		0.06			0.06			0.06			0.06			0.06			0.06			0.06		
79	4,4'-DDE		18.00		0.02			0.25			0.52			2.04			0.28			0.22			0.51		
80	dieldrin		0.90		0.07			0.32			0.55			0.73			0.37			0.16			0.49		
81	endrin		1.80		0.09			0.10			0.10			0.09			0.10			0.09			0.10		
82	4,4'-DDD		11.00		0.08			2.46			3.21			23.08			1.76			1.16			2.91		
83	endosulfan II		0.70		0.02			0.02			0.02			0.02			0.02			0.02			0.02		
84	4,4'-DDT		10.00		0.08			0.15			1.01			5.13			0.34			3.23			0.44		
85	endrin aldehyde		0.70		0.09			0.10			0.10			0.09			0.10			0.09			0.10		
86	endosulfan sulfate		0.70		0.02			0.02			0.02			0.02			0.03			0.02			0.03		
87	methoxychlor		0.70		0.06			0.06			0.06			0.06			0.07			0.06			0.07		
88	endrin ketone		5.30																						
89	toxaphene		42.00		6.67			6.67			6.67			6.67			6.67			6.67			6.67		
90																									
91	Total pesticides		98.78		**7.51**			**10.90**			**13.43**			**39.60**			**10.50**			**12.27**			**12.41**		
92																									
93																									
94																									
95																									
96																									
97																									
98																									
99																									
100																									
101	* = > mean + 2sd																								
102	ok = <mean + 2sd																								

	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW
1																								
2																								
3																								
4																								
5	**Comp. L,M**			**Comp. N,O,P**			**Core Q**			**Comp. S,T**			**Comp. U,V**			**Core W**			**Core X**			**Core Y**		
6	Raw Data			Raw Data			Raw Data			Raw Data			Raw Data			Raw Data			Raw Data			Raw Data		
7																								
8	1.48		ok	0.98		ok	0.96		ok	1.07		ok	0.77		ok	0.51		ok	0.83		ok	1.44		ok
9	0.34		*	0.29		*	0.34		*	0.43		*	0.35		*	0.35		*	0.19		ok	0.28		ok
10	39.70		ok	50.20		*	42.60		ok	53.30		*	43.50		ok	33.40		ok	28.20		ok	36.10		ok
11	119.00		*	135.00		*	157.00		*	118.00		*	94.70		*	61.80		*	76.20		*	108.00		*
12	0.08		ok	0.08		ok	0.07		ok	0.07		ok	0.05		ok	0.05		ok	0.05		ok	0.10		ok
13	15.70		ok	10.30		ok	12.20		ok	12.80		ok	10.40		ok	8.86		ok	9.13		ok	12.00		ok
14	26.80		ok	17.10		ok	16.50		ok	16.90		ok	13.80		ok	9.52		ok	12.60		ok	19.10		ok
15	105.00		ok	74.10		ok	92.00		ok	89.70		ok	77.50		ok	66.00		ok	64.00		ok	90.00		ok
16																								
17	**3.30**			**2.37**			**1.25**			**3.14**			**2.48**			**1.42**			**1.56**			**8.65**		
18																								
19		Normalized			Normalized			Normalized			Normalized			Normalized			Normalized			Normalized			Normalized	
20	31.98	32.97	*	10.00	27.03	*	21.86	26.02	*	10.00	13.70	ok	37.37	82.13	*	10.00	20.62	*	10.00	22.22	*	23.11	15.99	ok
21	384.51	396.40	*	91.04	246.05	*	300.20	357.38	*	147.37	201.88	*	516.84	1135.91	*	115.84	238.85	*	177.05	393.44	*	205.08	141.92	ok
22	133.93	138.07	*	48.69	131.59	*	147.49	175.58	*	119.23	163.33	*	151.20	332.31	*	54.23	111.81	*	52.51	116.69	*	100.80	69.76	*
23	31.36	32.33	ok	10.00	27.03	ok	39.83	47.42	ok	42.84	58.68	ok	33.71	74.09	ok	56.06	115.59	*	10.00	22.22	ok	34.19	23.66	ok
24	88.14	90.87	*	44.83	121.16	*	93.96	111.86	*	163.82	224.41	*	76.28	167.65	*	58.56	120.74	*	53.04	117.87	*	66.12	45.76	*
25	10.00	10.31	ok	10.00	27.03	*	10.00	11.90	ok	10.00	13.70	*	20.52	45.10	*	10.00	20.62	*	10.00	22.22	*	10.00	6.92	ok
26																								
27	665.59	686.18	*	240.80	650.81	*	667.44	794.57	*	843.93	1156.07	*	869.73	1911.49	*	350.48	722.64	*	357.30	794.00	*	546.84	378.44	*
28	846.97	873.16	*	442.74	1196.59	*	1035.53	1232.77	*	1882.59	2578.89	*	897.73	1973.03	*	516.36	1064.66	*	400.04	888.98	*	755.39	522.76	*
29	357.48	368.54	*	204.08	551.57	*	428.77	510.44	*	967.51	1325.36	*	368.13	853.03	*	324.54	669.15	*	163.66	363.69	*	370.04	256.08	*
30	425.05	438.20	*	237.47	641.81	*	442.35	526.61	*	948.55	1299.38	*	404.81	889.69	*	352.04	725.86	*	219.13	486.96	*	397.61	275.16	*
31	698.78	720.39	*	374.51	1012.19	*	723.28	861.05	*	1308.98	1793.12	*	669.49	1471.41	*	475.66	980.74	*	358.46	796.58	*	668.15	462.39	*
32	459.06	473.26	*	282.52	763.57	*	558.50	664.88	*	1288.02	1764.41	*	433.20	952.09	*	373.02	769.11	*	220.54	490.09	*	464.13	321.20	*
33	69.46	71.61	*	34.53	93.32	*	71.59	85.23	*	141.44	193.75	*	60.93	133.91	*	49.35	101.75	*	32.85	73.00	*	59.24	41.00	*
34	269.09	277.41	*	149.53	404.14	*	288.72	343.71	*	589.60	807.67	*	247.14	543.16	*	173.08	356.87	*	137.94	306.53	*	230.31	159.38	ok
35	283.02	291.77	*	145.22	392.49	*	297.68	354.38	*	575.01	787.68	*	269.34	591.96	*	183.78	378.93	*	140.60	312.44	*	240.83	166.66	*
36																								
37	**4754.42**	**4901.46**	*	**2325.96**	**6286.38**	*	**5127.20**	**6103.81**	*	**9038.89**	**12382.04**	*	**5076.42**	**11156.97**	*	**3103.00**	**6397.94**	*	**2343.12**	**5206.93**	*	**4171.84**	**2887.09**	*
38																								
39	**0.97**			**0.37**			**0.84**			**0.73**			**0.46**			**0.49**			**0.45**			**1.45**		
40																								
41																								
42	0.00026			0.00025			0.00025			0.00055			0.00025			0.00025			0.00024			0.00019		
43	0.00092			0.00258			0.00105			0.00370			0.00116			0.00045			0.00034			0.00073		
44	0.00085			0.00315			0.00090			0.00419			0.00113			0.00028			0.00020			0.00060		
45	0.00115			0.00549			0.00110			0.00684			0.00159			0.00049			0.00024			0.00090		
46	0.00098			0.00404			0.00099			0.00478			0.00128			0.00029			0.00029			0.00078		
47	0.00141			0.00639			0.00137			0.00797			0.00186			0.00045			0.00033			0.00122		
48	0.00122			0.00544			0.00110			0.00567			0.00162			0.00027			0.00025			0.00103		
49	0.00058			0.00202			0.00052			0.00205			0.00058			0.00028			0.00018			0.00056		

	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW
50	0.00158			0.00364			0.00133			0.00385			0.00138			0.00050			0.00054			0.00138		
51	0.00044			0.00188			0.00043			0.00188			0.00056			0.00014			0.00012			0.00038		
52	0.00121			0.00346			0.00097			0.00328			0.00116			0.00044			0.00045			0.00107		
53	0.00012			0.00028			0.00011			0.00027			0.00010			0.00005			0.00007			0.00014		
54	0.00134			0.00217			0.00103			0.00199			0.00092			0.00042			0.00055			0.00145		
55	0.00201			0.00252			0.00149			0.00249			0.00128			0.00069			0.00087			0.00195		
56	0.00070			0.00081			0.00046			0.00067			0.00045			0.00027			0.00050			0.00067		
57	0.00087			0.00162			0.00066			0.00109			0.00069			0.00029			0.00046			0.00110		
58	0.00029			0.00049			0.00024			0.00043			0.00021			0.00011			0.00013			0.00039		
59	0.00004			0.00004			0.00004			0.00004			0.00004			0.00004			0.00004			0.00004		
60	0.00078			0.00117			0.00048			0.00085			0.00056			0.00024			0.00037			0.00072		
61	0.00023			0.00034			0.00022			0.00024			0.00017			0.00011			0.00018			0.00021		
62	0.00029			0.00054			0.00018			0.00023			0.00020			0.00013			0.00021			0.00032		
63	0.00024			0.00015			0.00036			0.00022			0.00018			0.00015			0.00018			0.00025		
64																								
65	**0.01751**			**0.04846**			**0.01527**			**0.05328**			**0.01736**			**0.00633**			**0.00673**			**0.01608**		
66																								
67																								
68																								
69	0.10			0.09			0.09			0.09			0.09			0.09			0.09			0.11		
70	0.03			0.03			0.03			0.03			0.03			0.03			0.03			0.04		
71	0.03			0.03			0.03			0.03			0.03			0.03			0.03			0.03		
72	0.03			0.03			0.03			0.03			0.03			0.03			0.03			0.03		
73	0.03			0.03			0.03			0.03			0.03			0.03			0.03			0.03		
74	0.03			0.03			0.03			0.03			0.03			0.03			0.03			0.03		
75	0.03			0.03			0.03			0.03			0.03			0.03			0.03			0.03		
76	0.97			0.30			0.67			0.27			0.76			0.44			0.47			0.41		
77	0.32			0.27			0.22			0.41			0.17			0.08			0.10			0.44		
78	0.06			0.06			0.06			0.06			0.06			0.06			0.06			0.07		
79	0.65			0.51			0.52			1.02			0.38			0.26			0.24			0.69		
80	0.83			1.04			0.60			1.23			0.49			0.60			0.40			0.62		
81	0.10			0.10			0.10			0.09			0.10			0.10			0.09			0.11		
82	3.84			2.07			3.46			6.47			2.56			1.84			1.71			4.68		
83	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
84	2.08			0.31			2.03			6.15			0.56			3.52			2.44			2.96		
85	0.10			0.10			0.10			0.09			0.10			0.10			0.09			0.11		
86	0.03			0.02			0.02			0.02			0.02			0.02			0.02			0.03		
87	0.17			0.06			0.06			0.06			0.06			0.06			0.06			0.07		
88																								
89	6.67			6.67			6.67			6.67			6.67			6.67			6.67			6.67		
90																								
91	**16.09**			**11.78**			**14.77**			**22.80**			**12.19**			**14.01**			**12.81**			**17.37**		
92																								
93																								
94																								
95																								
96																								
97																								
98																								
99																								
100																								
101																								
102																								

CORPS OF ENGINEERS



Nimeskern, Phillip W NAE

From: Nimeskern, Phillip W NAE
Sent: Friday, April 27, 2007 1:57 PM
To: O'Donnell, Edward G NAE
Cc: Ladd, Ruth M NAE; Karalius, Jack NAE
Subject: RE: Housatonic Samples

Hello,

I have reviewed the new bulk sediment chemistry data on the Housatonic River sediments that Jack provided. CENAE is proposing to dredge sandy material from the Housatonic River FNP and use it to nourish Hammonasset Beach in Madison, CT.

In 25 October 2001, I prepared a suitability determination for this material that found it suitable for upland or beach disposal. This determination was based on 1999 bulk sediment chemistry results. The river sediments were all sands, with fines ranging from 0.43% to 8.65% and TOC ranging from 0.12% to 1.45%.

The new, 2007 data parallels the 1999 data, both in the location of sampling points and the trend of analyte concentrations. The 2007 data does have higher Detection Limits than in the 1999 data and lacks grain size data. It also has more analytes. The TOC is also low, ranging from <0.01% to 0.25%. The concentrations of PAHs increase as the stations move upriver, particularly in the reach between the I95 and I1 bridges. Even in this sediment however, I am not concerned about the PAH concentrations when used for beach nourishment. The metal concentrations are all low. No chemical concentration jumps out as being a problem to me.

Therefore, my best professional judgment is that the sandy material is still suitable for use as beach nourishment.

If you have any questions, please contact me.

Phill Nimeskern
US Army, Corps of Engineers
(978) 318-8660

-----Original Message-----
From: O'Donnell, Edward G NAE
Sent: Monday, April 09, 2007 1:51 PM
To: Nimeskern, Phillip W NAE
Cc: Ladd, Ruth M NAE; Karalius, Jack NAE
Subject: RE: Housatonic Samples

Phil:
Just a little more info to put this in context. We have told the State that we believe the material to be dredged from the Federal project in the Housatonic is suitable for beach nourishment based on our testing to date. Because this is going on a heavily used public State beach, the State wanted to go another step and do some more detailed testing and is paying for this round of analysis (overkill as far as I'm concerned). I don't think they necessarily have any standard, at least that I'm aware of, that they are following to determine suitability, but if you can just look it over and see if any of the results jump out at you as being a problem due to elevated levels of contaminants. I don't know without something to go by but use your best judgment. We want to be able to give a response in case they see a problem or at least check over the data for any problems. I don't know if some of the constituents tested for are the same as we had done, but if so it'd be nice to see how they compare with our test results. Let me know what you need and I'll get you a labor code.

EOD

-----Original Message-----

From: Karalius, Jack NAE
Sent: Monday, April 09, 2007 1:38 PM
To: Nimeskern, Phillip W NAE
Cc: O'Donnell, Edward G NAE
Subject: FW: Housatonic Samples

Phill,

Could you please look at this sampling & testing data, and let me know if the sand is suitable for disposal on Hammonasset Beach.

You may remember ages ago (1999-2000) we took about 26 vibracore samples and analyzed them for grain size and chemistry and determined that the 600,000 cy of material was suitable for upland or beach disposal.

Thanks,
Jack

TABLE 1

Soil Analytical Data
Housatonic River
Sediment Sampling

March 2007

Parameter	Remediation Standard Regulations Residential Direct Exposure Criteria	Units	Sample Location	HB-A	HB-B	HB-C	HB-D	HB-E	HB-F	HB-G	HB-H	HB-I	HB-J	HB-K	HB-L	HB-M	HB-N	HB-O
			Depth (feet)	0.5-1	5-7	4-7	0-3.5	0-3	0-3.4	0-5.4	0-5.1	0-4.5	0-3.7	0-4.5	0-4.2	0-6.5	0-1.2	0-3.5
			EMO Sample ID	AC37932-04	AC37932-05	AC37932-01	AC37932-02	AC37932-03	AC37932-06	AC37932-07	AC37932-08	AC37932-09	AC37932-10	AC37932-12	AC37932-13	AC37932-14	AC37932-15	AC37932-16
			Date	3/26/2007	3/26/2007	3/21/2007	3/26/2007	3/26/2007	3/26/2007	3/26/2007	3/26/2007	3/26/2007	3/20/2007	3/22/2007	3/22/2007	3/22/2007	3/22/2007	3/22/2007
Residential Direct Exposure Criteria																		
VOCs 8260		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SVOCs 8270		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND		ND			ND		
Anthracene	1,000,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	480	ND
Benzo(a)anthracene	1,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	540	470	ND	1200	ND
Benzo(a)pyrene	1,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	1300	ND	620	890	ND	830	550
Benzo(b)fluoranthene	1,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	530	ND	740	590	ND	1000	580
Benzo(g,h,i)perylene		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	890	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	8,400	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	440	ND
Benzyl butyl phthalate	1,000,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	44,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	950	ND	ND	ND	ND
Chrysene		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	520	ND	970	450
Dibenzo(a,h)anthracene		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	900	ND	ND	ND	ND	ND	ND
Fluoranthene	1,000,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	800	730	ND	2000	760
Indeno(1,2,3-cd)pyrene		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	1,000,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2000	800
Pyrene	1,000,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	800	730	ND	2000	820
Pesticides 8081		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Herbicides 8151		ug/Kg		ND<80	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pesticides 8141*		ug/Kg		ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80
PCBs	1,000	ug/Kg		ND<250	ND<250	ND<240	ND<260	ND<280	ND<260	ND<270	ND<250	ND<270	ND<270	ND<270	ND<260	ND<260	ND<250	ND<240
ETPH	500	mg/Kg		ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10
Antimony	27	mg/Kg		<0.39	<0.4	<0.43	<0.44	<0.46	<0.47	<0.41	<0.41	<0.46	<0.42	<0.4	1.44	1.25	<0.4	1.85
Arsenic	10	mg/Kg		<0.78	<0.8	<0.86	<0.88	<0.91	<0.94	<0.82	<0.82	<0.91	1.24	<0.8	<0.89	<0.88	<0.79	<0.84
Asbestos		%		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	2	mg/Kg		<0.31	<0.32	<0.34	<0.35	<0.37	<0.38	<0.33	<0.33	<0.37	<0.33	<0.32	<0.35	<0.35	<0.32	<0.33
Cadmium	34	mg/Kg		<0.39	<0.4	<0.43	<0.44	<0.46	<0.47	<0.41	<0.41	<0.46	<0.42	<0.4	<0.44	<0.44	<0.4	<0.42
Total Chromium		mg/Kg		3.56	5.8	4.39	12.8	23.2	28.1	17.5	14.5	24.2	28.1	23.2	25	17.7	14.6	22
Trivalent Chromium	3,900	mg/Kg		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hexavalent Chromium	100	mg/Kg		<0.50	<0.57	<0.56	<0.59	<0.62	<0.55	<0.61	<0.58	<0.60	<0.60	<0.57	<0.58	<0.59	<0.57	<0.56
Copper	2,500	mg/Kg		4.96	11.5	8.8	20.5	40.6	39	30.5	28.9	42	50.5	36.5	37	49.2	25.3	54.6
Total Cyanide	1,400	mg/Kg		<0.63	<0.64	<0.62	0.67	<0.69	<0.67	<0.68	<0.65	<0.68	<0.68	<0.64	<0.65	<0.67	<0.64	<0.63
Lead	400	mg/Kg		1.72	2.56	1.5	3.55	7.07	6.54	8.37	5.02	5.81	11.8	7.75	7.71	6.22	5.6	7.64
Mercury	20	mg/Kg		<0.10	<0.10	<0.10	<0.11	<0.11	<0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nickel	1,400	mg/Kg		2.48	2.79	2.58	3.95	6.67	7.47	5.77	4.72	8.51	9.75	6.65	5.89	5.43	4.66	6.59
Selenium	340	mg/Kg		<1.55	<2	<2.14	<2.07	1.13	<2.33	<2.04	<2.05	<2.28	<2.09	<2	<2.17	<2.15	<1.98	<2.09
Silver	340	mg/Kg		<0.39	<0.4	<0.43	<0.44	<0.46	<0.47	<0.41	<0.41	<0.46	<0.42	<0.4	<0.44	<0.44	<0.4	<0.42
Thallium	5	mg/Kg		<3.55	<4.03	<4.28	<4.35	<4.57	<4.65	<4.09	<4.11	<4.57	1.2	<2	<4.39	<4.39	<3.96	<4.18
Vanadium	470	mg/Kg		4.45	4.37	4.01	8.68	7.14	8.57	8.17	4.95	8.09	10.4	7.69	7.48	4.71	4.85	6.13
Zinc	20,000	mg/Kg		10.8	13.4	8.38	28.8	61.5	48.4	45.8	56	80.7	56.8	55	45.1	42.6	30.3	52.6
Percent Solid		%		75	78	80	75	72	75	73	77	74	74	78	77	75	78	82
Total Organic Carbon		mg/Kg		<100	<100	<100	<100	<100	<100	460	<100	1100	1300	1600	700	2500	320	400
Salinity		ppt		2.8	2.1	2.1	3.5	3.7	3.7	3.5	2.5	3.6	2.4	2.7	3	2.4	1.6	1.4

Notes:

* Results Pending

ND = not detected above analytical detection limit

BDL = Below Detection Limit

TABLE 1

Soil Analytical Data
Housatonic River
Sediment Sampling

March 2007

Parameter	Remediation Standard Regulations / Residential Direct Exposure Criteria		Sample Location	HR-O	HR-P	HR-Q	HR-R	HR-S	HR-T	HR-U	HR-V	HR-V'	HR-W
			Depth (feet)	0-2.5	0-5.5	0-3.5	0-4.5	0-5.5	0-4.5	0-3.0	0-4.0	0-4.0	0-5.5
			F&O Sample ID	867070322-17	867070322-18	867070322-19	867070322-20	867070322-21	867070322-22	867070322-23	867070322-24	867070322-25	867070322-26
			Date	3/22/2007	3/22/2007	3/22/2007	3/22/2007	3/22/2007	3/22/2007	3/22/2007	3/22/2007	3/22/2007	3/22/2007
Residential Direct Exposure Criteria													
VOCs 8260		ug/Kg		ND	ND	ND	ND	ND	ND	ND	*	ND	ND
TVOCs 8270		ug/Kg							ND	ND	ND		
Antimony	1,000,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	1,000	ug/Kg		650	1200	910	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	1,000	ug/Kg		640	1100	1000	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	1,000	ug/Kg		680	950	900	ND	ND	ND	ND	ND	ND	ND
Benzo(ghi)perylene		ug/Kg		ND	640	560	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	8,400	ug/Kg		ND	720	640	ND	ND	ND	ND	ND	ND	ND
Benzyl butyl phthalate	1,000,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	3100	ND
Bis(2-ethylhexyl)phthalate	44,000	ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	440000	ND
Chrysene		ug/Kg		660	1200	820	ND	ND	ND	ND	ND	ND	ND
Dibenz(a,h)anthracene		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	1,000,000	ug/Kg		1400	2200	1400	860	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene		ug/Kg		ND	550	470	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	1,000,000	ug/Kg		100	1400	1300	720	ND	ND	ND	ND	ND	ND
Pyrene	1,000,000	ug/Kg		1400	2600	2300	810	470	ND	ND	ND	ND	510
Pesticides 8081		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Herbicides 8151		ug/Kg		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pesticide 8141		ug/Kg		ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80	ND<80
PCBs	1,000	ug/Kg		ND<240	ND<240	ND<250	ND<250	ND<240	ND<240	ND<240	ND<240	ND<240	ND<250
EPH	500	mg/Kg		ND<10	ND<10	140	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10
Antimony	22	mg/Kg		<0.38	<0.41	<0.39	1.08	1.36	<0.42	<0.37	1.03	1.1	1.08
Arsenic	10	mg/Kg		<0.76	<0.81	1.17	<0.84	<0.83	<0.84	<0.73	<0.85	<0.75	1.07
Asbestos		%		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Beryllium	2	mg/Kg		<0.31	<0.33	<0.31	<0.34	<0.33	<0.32	<0.33	<0.29	<0.34	<0.33
Cadmium	34	mg/Kg		<0.38	<0.41	<0.39	<0.42	<0.41	<0.42	<0.37	<0.42	<0.38	<0.41
Total Chromium		mg/Kg		24.9	30.7	39.3	20.8	18.7	20.1	13.7	15.1	18.9	29.7
Trivalent Chromium	3,000	mg/Kg		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hexavalent Chromium	100	mg/Kg		<0.95	<0.54	<0.50	<0.53	<0.55	<0.54	<0.48	<0.54	<0.50	<0.56
Copper	2,500	mg/Kg		24.6	86.6	119	59.5	58	54.3	17.8	16.9	17.7	102
Total Cyanide	1,400	mg/Kg		<0.60	<0.61	<0.63	<0.69	<0.62	<0.61	<0.62	<0.60	<0.62	<0.65
Lead	500	mg/Kg		13.2	13.2	15.4	5.51	3.63	5.29	4.33	4.35	4.75	12
Mercury	20	mg/Kg		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nickel	1,400	mg/Kg		6.53	10.4	15.5	6.29	6.1	4.95	4.76	4.98	5	11.5
Selenium	340	mg/Kg		<1.91	<2.03	<1.95	<2.1	<2.03	<2.09	<1.84	<2.12	<1.88	<2.03
Silver	340	mg/Kg		<0.38	<0.41	<0.39	<0.42	<0.41	<0.42	<0.37	<0.42	<0.38	<0.41
Thallium	5	mg/Kg		<3.82	<4.07	<3.91	<4.19	<4.06	<4.18	<3.67	<4.24	<3.76	<4.06
Vanadium	470	mg/Kg		5.49	7.68	8.28	4.78	5.75	4.59	3.93	4.34	4.04	7.27
Zinc	20,000	mg/Kg		57.4	97.3	92.3	53.6	54.1	40.9	31.6	37.2	36.1	90.9
Percent Solid		%		84	82	79	84	83	82	81	83	81	79
Total Organic Carbon		mg/Kg		900	1700	2700	400	600	800	300	<100	<100	600
Salinity		ppt		1.5	1.8	1.8	1.6	1.4	1.8	1.6	2	1.5	1.2

Notes:

* Results Pending

ND = not detected above analytical detection limit

BDL = Below Detection Limit

TABLE 5

Sediment Analytical Data
Housatonic River
Sediment Sampling

March 2007

Parameter	Ule Area Groundwater Protection Criteria		Sample Location:	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Depth (ft):	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			F&O Sample ID:	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			Date:	1/25/2007	1/25/2007	1/26/2007	1/25/2007	1/25/2007	1/26/2007	1/25/2007	1/25/2007	1/25/2007	1/25/2007
GA Groundwater Protection Criteria													
[illegible]		ug/L		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
[illegible]	200	ug/L		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
[illegible]		ug/L		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
[illegible]		ug/L		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
[illegible]		ug/L		ND<16	ND<16	ND<16	ND<16	ND<16	ND<16	ND<16	ND<16	ND<16	ND<16
[illegible]	0.1	ug/L		ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<0.50	ND<0.50
[illegible]	0.500	mg/L		ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25
[illegible]	0.006	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0048
[illegible]	0.020	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
[illegible]	1.000	mg/L		0.063	0.051	<0.01	0.013	<0.01	0.01	<0.01	<0.01	<0.01	0.012
[illegible]	0.004	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
[illegible]	0.005	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
[illegible]	0.050	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.014
[illegible]	1.300	mg/L		0.156	0.028	<0.01	0.014	0.013	0.012	<0.01	<0.01	<0.01	0.064
[illegible]	0.100	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
[illegible]	0.015	mg/L		<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
[illegible]	0.002	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
[illegible]	0.700	mg/L		<0.01	<0.01	0.019	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
[illegible]	0.050	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
[illegible]	0.010	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
[illegible]	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
[illegible]	0.020	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
[illegible]	1.000	mg/L		0.024	0.023	0.013	0.017	0.032	0.012	0.011	<0.01	0.01	0.03

Notes:

* Results Pending

ND = not detected above analytical detection limit

RCS = Reuse Constraint Level

TABLE 1

Sediment Analytical Data
Hammamsic River
Sediment Sampling

March 2007

Parameters	GA Area Groundwater Protection Criteria	Sample Location:	HR-A	HR-B	HR-C	HR-D	HR-E	HR-F	HR-G	HR-H	HR-I	HR-J	HR-K	HR-K	HR-L	HR-M	HR-N
		Depth (feet)	0-0.4	0-1	0-2	0-0.5	0-0	0-0.4	0-0.6	0-0.2	0-0.1	0-0.7	0-0.2	0-0.2	0-0.2	0-0.5	0-0.5
		FB03 Sample ID	80707023-04	80707023-09	80707023-03	80707023-02	80707023-01	80707023-06	80707023-07	80707023-08	80707023-10	80707023-11	80707023-12	80707023-13	80707023-14	80707023-15	80707023-16
		Date	1/26/2007	1/26/2007	1/25/2007	1/26/2007	1/26/2007	1/26/2007	1/26/2007	1/26/2007	1/26/2007	1/26/2007	1/25/2007	1/25/2007	1/25/2007	1/25/2007	1/25/2007
GA Groundwater Protection Criteria																	
EPA TVOCs 1,2,3		mg/L	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thiacetilene	200	mg/L	ND	ND	ND	ND	0.24	ND	ND	ND	ND	0.16	ND	ND	ND	ND	ND
EPA Pesticide 8081		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EPA Herbicide 8151		mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
EPA Pesticide 4141		mg/L	ND<10	ND<10	*	*	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10	ND<10
EPA PCBs	0.5	mg/L	ND<0.3	ND<0.3	ND<0.4	ND<0.3	ND<0.3	ND<0.3	ND<0.4	ND<0.3	ND<0.3	ND<0.3	ND<0.3	ND<0.3	ND<0.50	ND<0.50	ND<0.50	ND<0.50
EPA ETPH	0.200	mg/L	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25	ND<0.25
EPA Antimony	0.008	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005
EPA Arsenic	0.010	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPA Barium	1.000	mg/L	<0.01	<0.01	<0.01	0.014	<0.01	0.01	<0.01	<0.01	0.011	0.011	0.013	0.013	0.013	0.03	0.03	0.03
EPA Beryllium	0.004	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
EPA Cadmium	0.005	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	BL	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
EPA Chromium	0.050	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01
EPA Copper	1.300	mg/L	<0.01	<0.01	<0.02	0.013	0.033	0.01	0.011	<0.01	0.018	0.079	0.052	0.028	0.02	0.039	0.029	
EPA Lead	0.300	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPA Mercury	0.002	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
EPA Nickel	0.100	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPA Selenium	0.050	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
EPA Silver	0.036	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPA Thallium	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
EPA Vanadium	0.030	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	<0.01	0.013	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPA Zinc	0.900	mg/L	0.01	<0.01	<0.01	0.013	0.013	<0.01	0.014	<0.01	0.022	0.134	0.113	0.023	0.017	0.04	0.031	

Notes:

- Results Pending
- ND = not detected above analytical detection limit
- BDL = Below Detection Limit

CENED-OD-R (1145-2-303b) Date: 7/19/94

MEMORANDUM FOR: Marine Analysis Section

SUBJECT: Request for Review of Dredging Project

1. The attached project file and the following information is provided for your review and comment.

2. Project Name and Location:

Project Name: Housatonic River FNP

Applicant Name: N/A

Application Number: N/A

City or Town & State: Stratford

Waterway: Housatonic

3. Description of Dredging and Dredge Areas:

___ Plan View ___ Cross Section

Amount of Material: 300,000 - 400,000 cu. yds. Area: ___ sq. ft.

Dredging Depth: -18' MLW Existing Depth: -8 - -17

Purpose of Dredging: ___ new ___ maintenance ___ both

Type of Dredging Equipment: ___ mechanical ___ hydraulic

Substrate: ___ rock ___ sand ___ silt ___ clay
___ shellfish beds ___ vegetated ___ unknown

upland of deep pois still a possibility

4. Disposal Area: ? open water, site ___ ___ upland ___ beach
___ wetland ___ backfill ___ other ___

Dewatering Area: N/A plan view ___ cross section, capacity ___
runback control methods: ___

5. Test Data: ___ grain size (1992-94) ___ chemical (1992-94) ___ bio. (1994) ___ elutriate ___ none

6. PSD and Spills: ___ outfall nearby ___ recent spill ___ unknown ___ none (1mile upstream)

Description and Source of Above Information: ___

7. Other Comments: (write on back)

___ P.M.
Permits Branch ___

CENED-OD-R· (1145-2-303b) Date: 7/19/99

MEMORANDUM FOR: Marine Analysis Section

SUBJECT: Request for Review of Dredging Project

1. The attached project file and the following information is provided for your review and comment.

2. Project Name and Location:

Project Name: Housatonic River FNP

Applicant Name: N/A

Application Number: N/A

City or Town & State: Stratford

Waterway: Housatonic

3. Description of Dredging and Dredge Areas:

✓ Plan View _____ Cross Section

Amount of Material: 300,000 - 400,000 cu. yds. Area: _____ sq. ft.

Dredging Depth: -18' MLW Existing Depth: -8 - -17

Purpose of Dredging: ___ new ✓ maintenance ___ both

Type of Dredging Equipment: ✓ mechanical ___ hydraulic

Substrate: ___ rock ✓ sand ✓ silt ✓ clay

___ shellfish beds ___ vegetated ___ unknown

4. Disposal Area: ? open water, site _____ ___ upland ___ beach

___ wetland ___ backfill ___ other _____

upland or "deep hole" still a possibility

Dewatering Area: N/A plan view ___ cross section, capacity _____

runback control methods: _____

5. Test Data: ✓ grain size (1992-94) ✓ chemical (1992-94) ✓ bio. (1984) ___ elutriate ___ none

6. PSD and Spills: ___ outfall nearby ___ recent spill ✓ unknown ___ none (info pending)

Description and Source of Above Information: _____

7. Other Comments: (write on back)

_____ P.M.

Permits Branch _____

CENED-OD-R (1145-2-303B) September 16, 1996

MEMORANDUM THRU

Chief, Compliance Branch 9/17/96

Chief, Permits Branch B

FOR: Diane Ray

SUBJECT: Suitability Determination for Dan Beard, Inc., Application #1993-00759, Housatonic River, Connecticut.

1. This in response to your request, originally of April 12, 1996 and more recently of 17 July 1996, when all necessary information was received, for a determination of suitability for a proposed modification of the above project. Dan Beard, Inc. received a permit to mine approximately 428,000 cu. yd. of sand from the Housatonic River Federal Channel and process it for sale as construction material. Upon the commencement of the dredging, the applicant discovered that some of the material was not suitable for construction purposes and decided that it could be used for capping material for projects proposed for disposal at Central Long Island Sound Disposal Site (CLIS). They are proposing to dredge approximately 50,000 cu. yd. from the areas off the outer breakwater and off Nells Island for this purpose.

2. The previous suitability determination (Hogan, 4/19/93) stated there were no outfalls and no known significant spills in the vicinity of the project's dredge areas. I conferred with the agent, Valery Ferro, who said that her company keeps tabs with the local harbormasters and that she knew of no spills occurring in the vicinity since the permit was issued. I also contacted George Wisker of the CT DEP, who said that he knew of no spills.

3. A sampling and testing plan for the original project was developed by Roger Hogan in conjunction with George Wisker of the CT DEP on January 7, 1994. Stations 5 and 6 of that plan sampled the areas proposed to be dredged for cap material. That plan called for the analysis of the usual parameters on Table 1A and 1B, plus asbestos and PCB 1268. Also, these areas were sampled by CENED in 1992. Samples A, B, C, D, F and G of that study are in the areas proposed to be dredged for cap material. These samples were analyzed only for grain size.

4. The results of the sediment grain size analysis showed the sediment at Station 5 to have a mean of 70% silt and clay (93, 25 and 91% silt-clay) and a Total Organic Carbon (TOC) concentration of 2.36%. Samples G and F of the 1992 Corps study are in this same area and were 0.2% and 0.1% silt-clay. The sediment at Station 6 had a mean of 1.4% silt-clay (1.4, 1.4 and 1.4% silt-

clay) and a TOC concentration of 0.67%. Samples A, B, C and D of the 1992 Corps study were in the same area and were 0.4%, 0.1%, 0.0% and 0.3% silt-clay.

5. Results of the bulk sediment chemistry analyses indicated "low" concentrations of the metals tested, when compared to the classification guidelines in the "Interim Plan" (NERBC, 1980).

When the concentrations of the metals are compared to data for CLIS in the "DAMOS Disposal Site Reference Area Chemistry Data Summary", all are less than the mean plus twice the standard deviation, with the exception of copper at Sample 6, which was slightly higher (46.6 ppm versus 42.1 ppm for the reference) and not meaningful.

The concentrations of PAH's were reported as all being less than the required detection limit of 20 ppb. When the concentrations of the PAH's are normalized by dividing by the percent TOC, using half of the detection limit for the concentration when a value was reported to be less than the detection limit, and the resulting value is compared to data for CLIS in the "DAMOS Disposal Site Reference Area Chemistry Data Summary", all are less than the mean plus twice the standard deviation, with the exceptions of acenaphthene and dibenzo(a,h)anthracene at Sample 6. These were only slightly higher, 14.9 versus 12 for both PAH's, and not meaningful.

6. Based upon the above information, we find the material to be suitable for unconfined disposal as proposed at CLIS.

7. Copies of the above mentioned data and of the draft suitability determination were sent to the US EPA and US NMFS for their review. They each responded to say they have no objections.

8. If you have any questions, please contact me at 78660.

Phillip W. Nimeskern, Jr.

PHILLIP W. NIMESKERN, JR.
Project Manager
Marine Analysis Section

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION I
J.F.K. Federal Building, Boston, MA 02203-2211

MEMORANDUM

Date: September 12, 1996

Subj: Dan Beard, Inc. proposed dredging in Housatonic River, Application #1993-00759

From: Matthew Liebman, CWQ

To: File

Project History:
Dan Beard, Inc. proposes to dredge about 60,000 cubic yards of sediment from the Federal Navigation Channel at the mouth of the Housatonic river and dispose at CLIS. Project depth is 18 to 20 feet below sea level.

I received in the office on September 6, 1996 data from sampling stations 5 and 6 collected in 1994.

On September 11, I requested clarification of the suitability determination prepared by Phil Nimeskern of NED.

On September 12, I spoke with Mr. Nimeskern and we clarified these issues. I concurred with his determination that these sediment are suitable for open water disposal at CLIS, based on the low levels of chemical toxicants measured in the proposed dredged material.

Background:
Stations 5 and 6 are at the mouth of the Housatonic River. They are cores 8 and 10 ft deep in the sediment respectively, representing project depth. Although there was some stratigraphy in the cores, the sediments were homongenized for chemical testing. Asbestos and PCBs are a potential issue here because these stations are downstream from the Raymark Superfund site in Stratford, CT.

Physical and chemical results:
Core 5 represents about 30,000 cy of proposed dredged material.
It is primarily fine sand and silt, with, on average, 70% fine material.
All metals were below the CLIS reference+2sd values.
All PAHs, pesticides and PCBS were below detection limits of 10 or 20 ppb.
Asbestos was below detection limit of 1%, although I am not sure what this means.

Core 6 represents about 30,000 cy of dredged material.
It is primarily sand, with about 1.4% fine material.

All metals were below the CLIS refernce+2sd values, except for copper, which was equal to the reference+2sd value.
All PAHs, pesticides and PCBS were below detection limits of 10 or 20 ppb.
Asbestos was below detection limit of 1%, although I am not sure what this means.

Conclusions:
The evidence suggests that this material is substantially free of contamination and suitable for open ocean disposal at CLIS.

cc: Phil Nimeskern, George Wisker, Cori Rose

Nimeskern, Phillip W NAE

From: Karalius, Jack NAE
Sent: Wednesday, April 11, 2007 7:44 AM
To: Nimeskern, Phillip W NAE
Cc: O'Donnell, Edward G NAE
Subject: FW: Housatonic River Sediment Sampling Results

Follow Up Flag: Follow up
Flag Status: Blue

Attachments: Sediment 2007.xls

Sediment 2007.xls
(102 KB)

Phill,

Here is some more Housatonic/Hammonasset testing data for you to look at. Please let me know if the material is acceptable for beach nourishment.

Thanks,
Jack

-----Original Message-----
From: Talbot, Tammy [mailto:Tammy.Talbot@po.state.ct.us]
Sent: Tuesday, April 10, 2007 11:25 AM
To: Ott, Eric
Cc: Karalius, Jack NAE
Subject: FW: Housatonic River Sediment Sampling Results

From: Erik Mas [mailto:EMas@fando.com]
Sent: Tuesday, April 10, 2007 11:08 AM
To: Talbot, Tammy
Cc: Phil Moreschi; Wisker, George; Kirk Bosma <kbosma@whgrp.com
Subject: Housatonic River Sediment Sampling Results

Tammy -

Attached is a summary table of the preliminary sediment sampling data from Phoenix and a map showing the sample locations. Overall these results look pretty good. There were only a few modest exceedances of the Residential DEC for some SVOCs and one exceedance of the GWPC for Antimony in one sample. The preliminary data does not include grain size resu

- Erik

Erik V. Mas, P.E.
Fuss & O'Neill, Inc.
78 Interstate Drive
West Springfield, MA 01089

413.452.0445 x4433 (phone)
800.286.2469 (phone)
413.846.0497 (fax)
emas@fando.com <mailto:emas@fando.com>

Erik V. Mas, P.E.
Fuss & O'Neill, Inc.
78 Interstate Drive
West Springfield, MA 01089

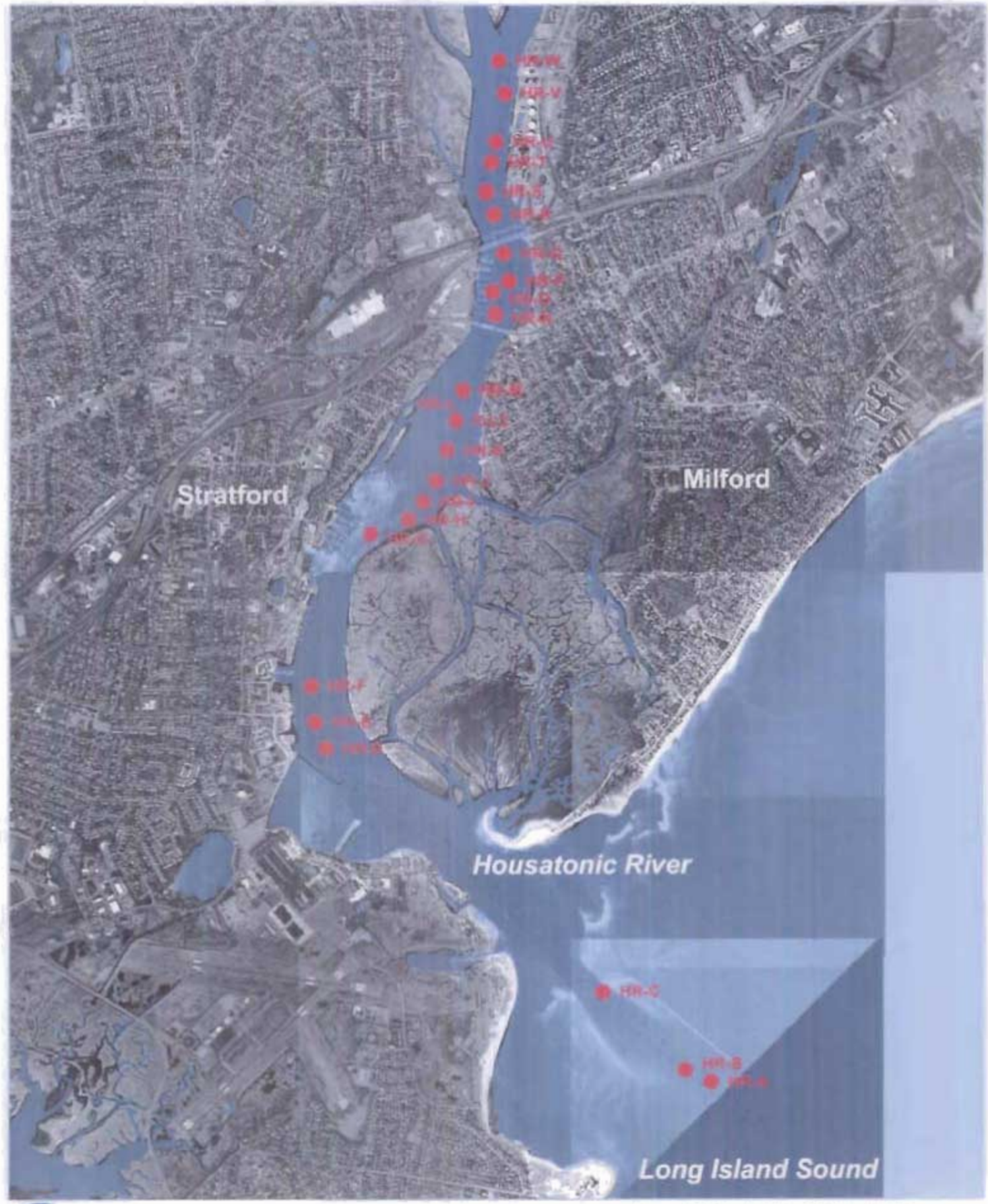
413.452.0445 x4433 (phone)
800.286.2469 (phone)
413.846.0497 (fax)
emas@fando.com <mailto:emas@fando.com>
www.fando.com <http://www.fando.com/>

>>> <deb@phoenixlabs.com> 4/3/2007 12:09 PM >>>

Erik,

Here are the preliminary results for the dredge sampling. We are still waiting for t
Sieve results for all of the samples and several of the samples are pending SPLP 8141
These results have not been reviewed and may change slightly but we wanted you to hav
some information for your upcoming meeting.

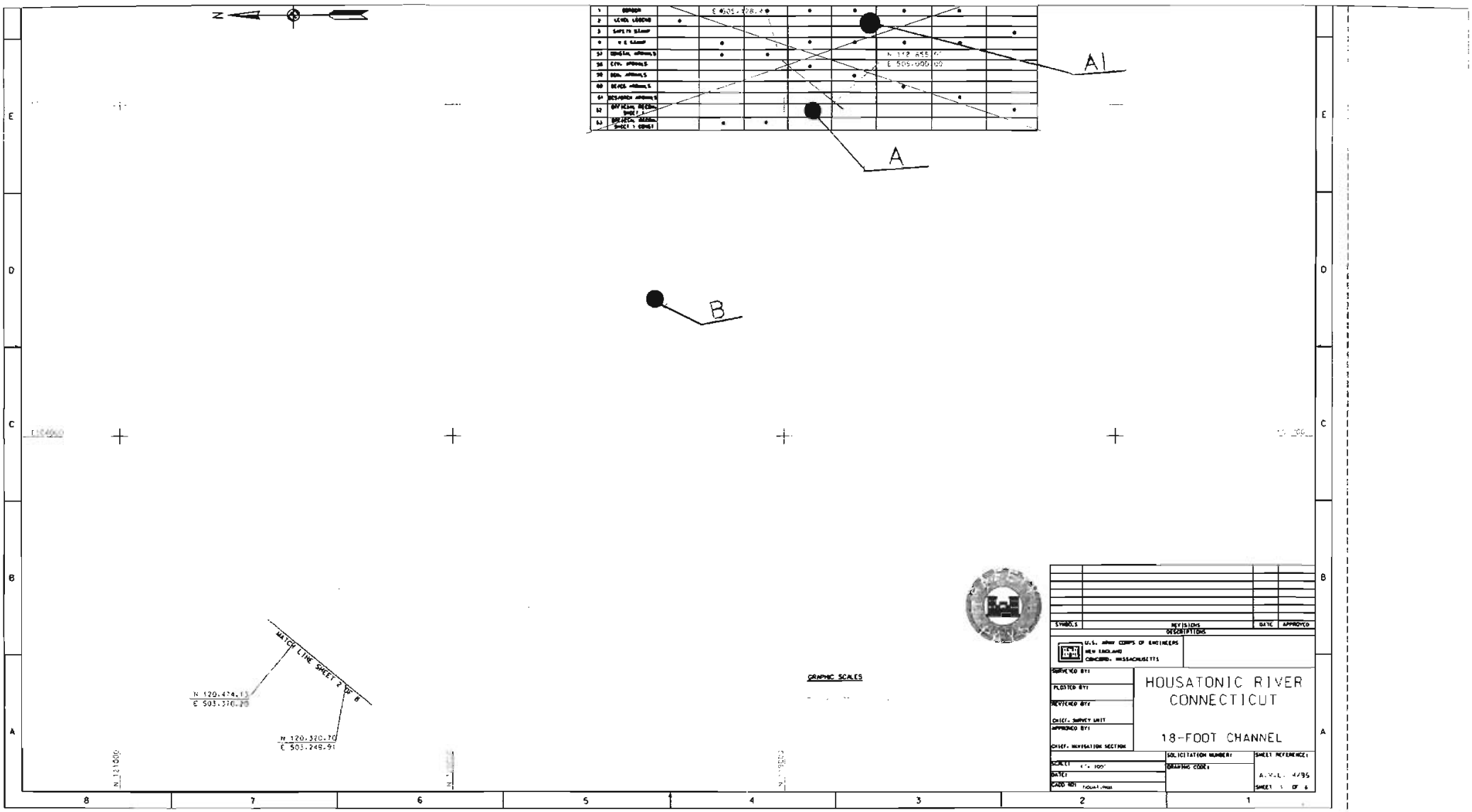
Deb Lawrie
Client Service Representative
Phoenix Environmental Laboratories
860-645-3219



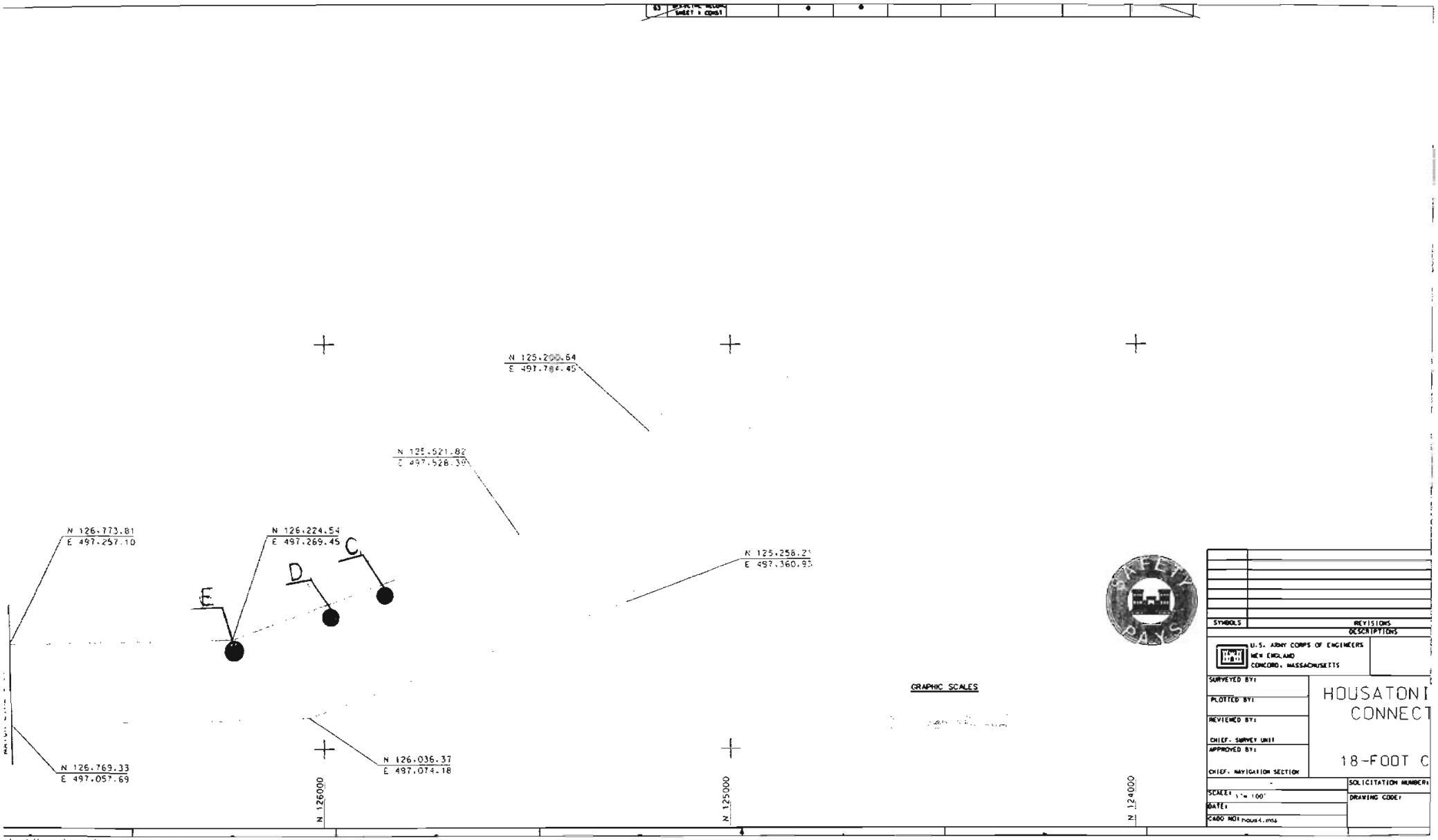
FUSS & O'NEILL
Disciplines to Deliver

0 1,200 2,400 3,600 4,800
Feet

Core Samples Water Navigation Channel

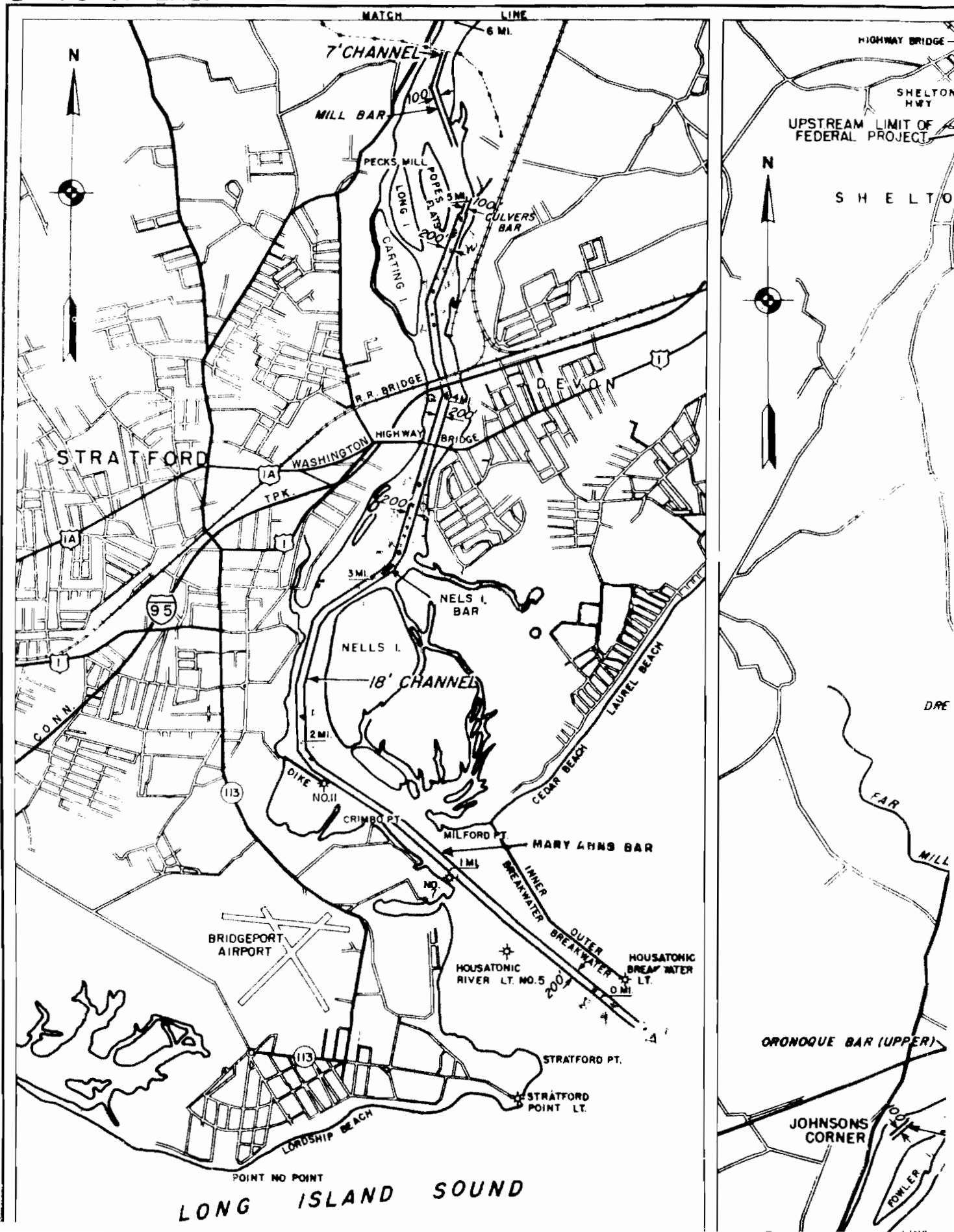


charts\housimas.dgn Mar. 27, 2000 11:42:23



charts\hous4mas.dgn Mar. 27, 2000 13:13:28

CORPS OF ENGINEERS



APPENDIX D - *ESSENTIAL FISH HABITAT ASSESSMENT*

ESSENTIAL FISH HABITAT ASSESSMENT
FOR THE
MAINTENANCE DREDGING OF THE HOUSATONIC RIVER
FEDERAL NAVIGATION PROJECT

May 2012

Prepared by

U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, Massachusetts 01742-2751

I. INTRODUCTION

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act require that an Essential Fish Habitat (EFH) consultation be conducted for activities that may adversely affect important habitats of federally managed marine and anadromous fish species. EFH includes "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Housatonic River Federal Navigation Project (FNP) and nearshore disposal area in Long Island Sound fall into this category and have the potential to provide habitat for fish species in the area. The following is an assessment of the EFH for the maintenance dredging of the lower Housatonic River FNP with nearshore disposal off of Point No Point in Stratford, CT.

II. PROPOSED ACTION: Dredging and Disposal

The Housatonic River Federal Navigation Project (FNP) was authorized by the River and Harbor Act of 1871 and modified by enactments in 1888, 1892, and 1930 (H. Doc. 449, 70th Cong., 2nd Sess.). The existing Federal navigation project provides for an 18-foot deep, 200-foot wide main channel from the mouth of the river to the lower end of Culvers Bar (approximately five miles distance), a 7-foot deep, 100-foot wide channel to Derby and Shelton (a total length of about 13 miles), and three jetties..

The U.S. Army Corps of Engineers proposes to dredge about 100,000 cubic yards (cy) of predominantly sandy material from shoal areas south of the Route 1 bridge. These shoal areas will be dredged to 14 feet MLLW not to the authorized depth since the current vessel traffic does not require the deeper depths authorized for the Housatonic River FNP. See Figure E-1 for shoal areas of the authorized Housatonic FNP that are proposed to be dredged. The shoal material would be dredged with a government special purpose hopper dredge or a mechanical dredge and placed in the nearshore environment off of Point No Point in Stratford Connecticut.

A new nearshore placement site was identified outside the State and Town commercial shellfish beds off Point No Point in Stratford, CT. This large area located between the 6 and 14 foot depth contour was sampled. In general the closer the placement to the shoreline, the better chance for that material to nourish the beach. After modeling sand movements and consideration of the water depth necessary for the dredge, two smaller areas which overlap with the large area were identified as the best sites to create sand berms in the placement area. The proposed nearshore placement areas (see Figure F-2) are approximately 3 miles from the mouth of the River.

The quantity of shoal material to be dredged during one dredge event will depend on the available funds at the time of dredging. It is anticipated that funds for only half of the material will be available in 2012 and this work will be completed using the government-owned special purpose dredge, *Currituck*. The proposed work will be performed over a two to three month period between October 1 and March 31 in the year(s) in which funds become available.

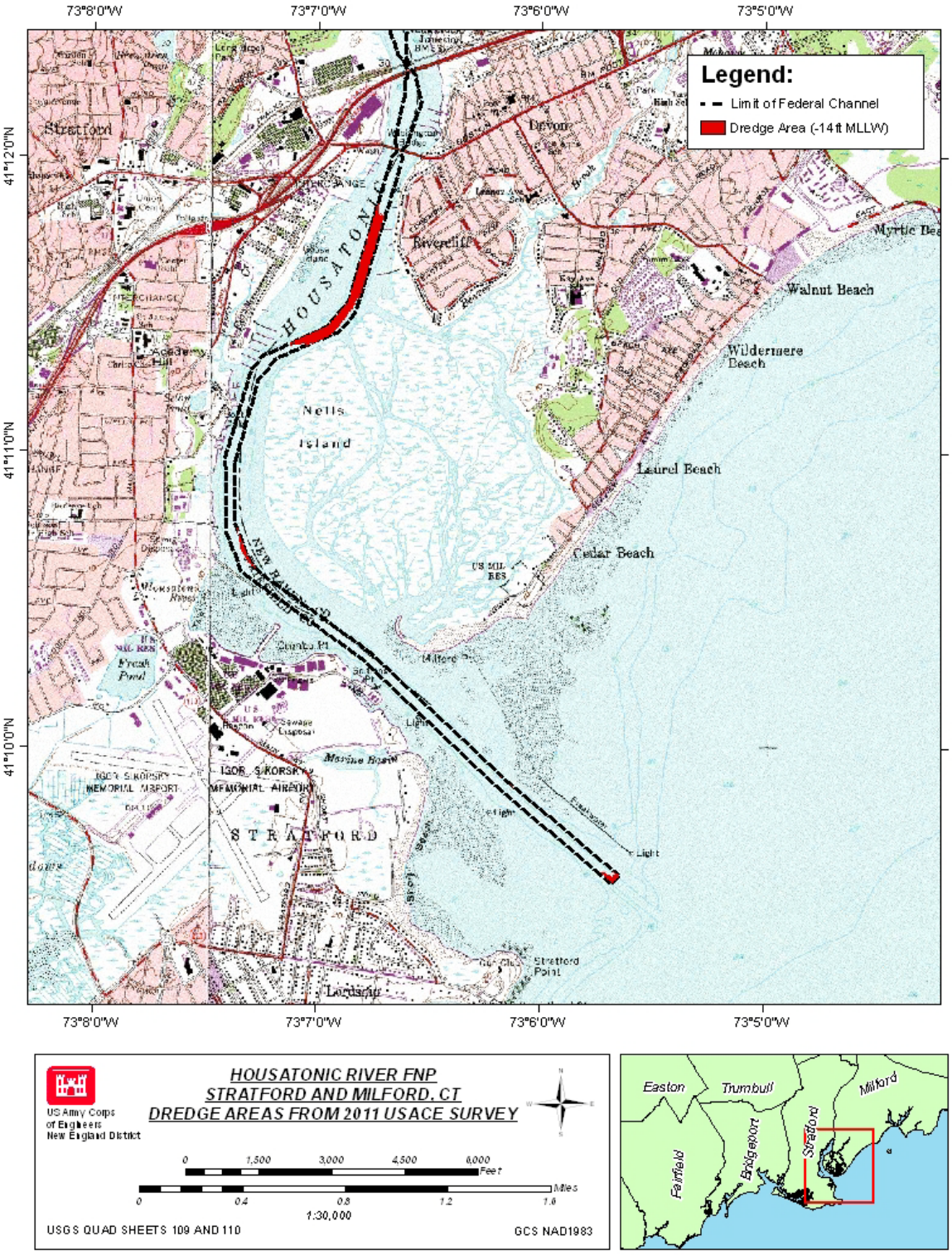


Figure E-1. Housatonic River Federal Navigation Project with shoal regions that are proposed to be dredged. Only shoals south of Route 1 Bridge will be dredged.

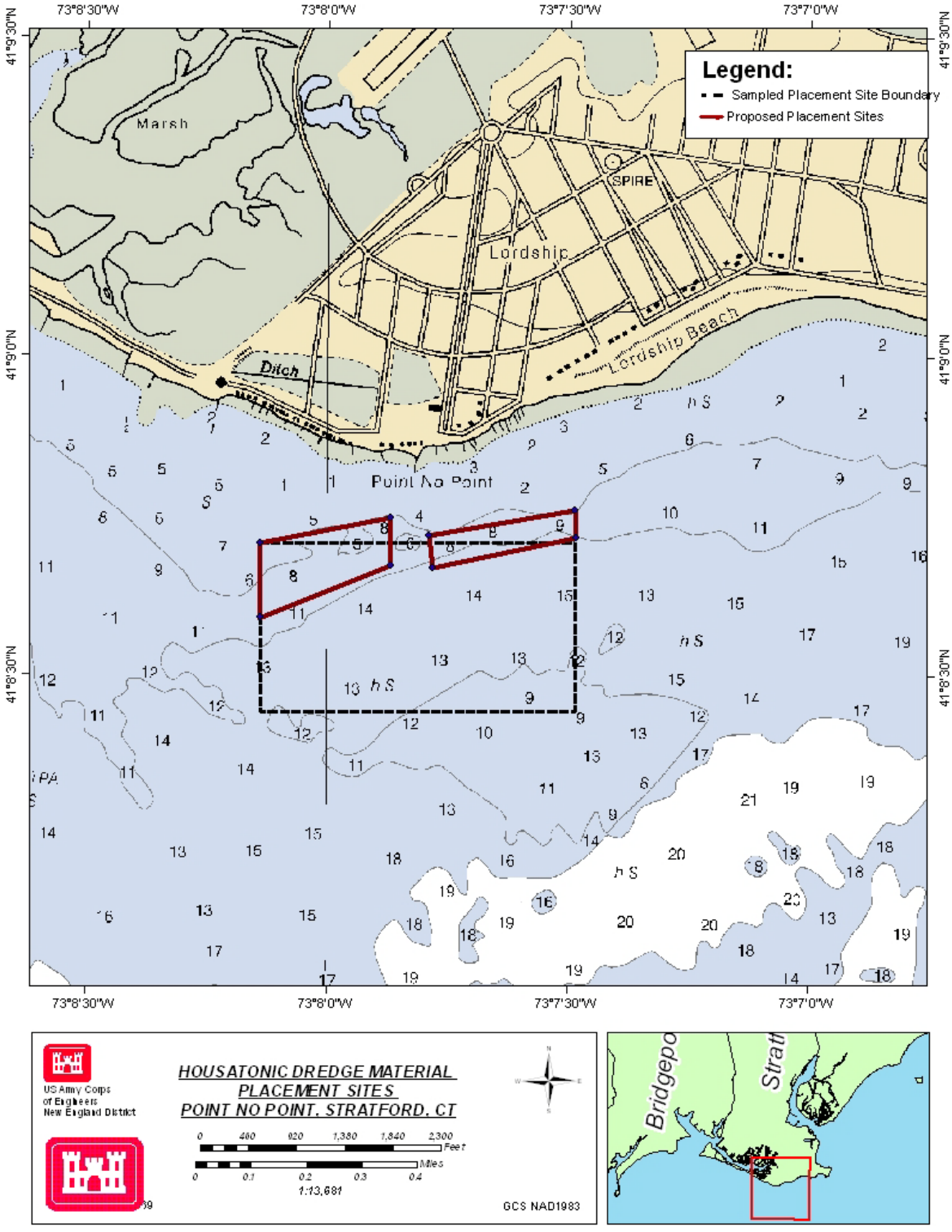


Figure E-2. Proposed placement sites for material dredged from the Housatonic River. Sandy material will be place in the smaller areas for berm creation and material from the entrance with shell may be spread within the larger area to enhance habitat for oyster spat.

III. ANALYSIS OF IMPACTS

Impacts to EFH from any dredging and placement activity include potential changes in the physical and chemical properties of the water column, changes in sediment types both within the channel and at adjacent areas, and changes in water depth. Consequently, changes in the abundance and/or distribution of prey species may also result from both dredging and placement activities. These impacts may range from both short-term, (i.e. impacts to the water column (increases in turbidity and total suspended solids) to longer term impacts (i.e. changes in bathymetry as a result of dredging within the channel and deposition at the placement site).

A. Physical Environment

Water Quality — Any impacts from the dredging of the Housatonic River FNP on water quality are expected to be temporary, short-term, and limited to the immediate project area. Water quality impacts would be primarily a result of increased suspended sediment (TSS) loads within the water column as a result of both the dredging and placement operations.

Water Quality - The impacts of dredging the Housatonic River FNP on water quality are expected to be localized and short-term. The sediment to be dredged is sand, therefore it will rapidly settle out of the water column and there is little organic matter present to affect water quality. It is unlikely that dissolved oxygen (DO) would be altered during the actual dredging and disposal activities since there is little to no organic material associated with the sand. If any changes occur, they are likely to be temporary and will return to "pre-project" conditions upon completion of the project.

Short-term water quality impacts will be mostly due to increased total suspended sediment (TSS) loads in the water column. Potential releases of TSS will be minimized by using appropriate dredging equipment and techniques and the coarse material rapidly settles out of the water column.

Bathymetry/Water Depth — Other impacts from the proposed project include changes in the bathymetry of the areas to be dredged and the disposal site due to the removal and placement of sediment. Areas within the Housatonic River FNP that are to be dredged will result in deeper waters in those areas. Impacts to fish species will likely differ from species to species depending on life history, habitat use, distribution and abundance, but the depth difference would only be several feet in the most shoaled areas. Likewise, depth will also change at the disposal site where the dredge material is placed. Water depth at the proposed disposal site will become shallower in the area of the disposal, but wave action move the material towards the shoreline.

B. Biological Environment

Prey Species — The abundance and/or distribution of prey species, for which EFH has been designated, may be impacted from dredging and placement activities conducted for the Housatonic River FNP. Many of these fish feed on organisms that live in or on the sediment. At locations that are to be dredged, these prey species will be disrupted and or destroyed during the dredging process. During disposal operations, prey species are likely to be buried. However, the substrate types in both dredging and disposal locations following project completion are

expected to be similar to pre-project conditions thus promoting rapid recolonization by organisms from adjacent areas. Therefore, any impacts to fish species using these areas for forage, would be expected to be temporary.

Prey species that live in the water column are also likely to be impacted during dredging and disposal activities. The increased suspended sediments resulting from dredging and disposal activities have the potential to destroy/disrupt planktonic species in the vicinity of the TSS plume. However, given the short-lived and transient nature of these water column disturbances, it is expected that any impacts would be of a temporary nature and return to ambient conditions upon cessation of operational activities. Thus any impacts would not be expected to have any significant long-term affects on prey species within the project area.

Anadromous fish, specifically American shad (*Alosa sapidissima*), sea-run trout (*Salmo trutti),* alewife (*Alosa pseudoharengus*), and blueback herring (*Alosa aestivalis*) are present in Housatonic River (US FWS and USACE, 1981), but the migration to freshwater rivers would not be impacted by dredging of the Federal channel because of the width of the channel, but we will attempt to avoid the dredging during the migration window.

Anadromous fish may serve as prey for some of the EFH species found in the Housatonic River area and Long Island Sound. During the late winter through spring, both shad and river herring migrate upriver to spawn. LaSalle *et al.* (1991) reviewed the literature on studies of suspended sediments and fish. They concluded that all life stages of anadromous fish species appear fairly tolerant of elevated suspended sediment concentrations. LaSalle et al. (1991) concluded that a conservative safe level at which no impact would be anticipated would be 500 mg/l. However, the turbidity effects for this project are anticipated to be short-term and localized around the dredge area due to the sandy nature of the material to be removed from the channel. The majority of resuspended sediments from a hopper dredge are due to overflow of the hoppers into surrounding waters. For the *Currituck* and sandy sediments, suspended sediments above 150 mg/l were only found within small volumes of the central portions of the plumes and concentrations above 50 mg/l were generally confined to within 300 feet of the active overflow (draft report Clarke *et al*). Resuspension of sediments from a mechanical dredge is generally due to the dynamic impact of the bucket on the channel bottom, the spillage and leakage from the filled bucket, and the washing action of the empty bucket falling through the water column (Hayes, 1986). For silty material, an open bucket could resuspend solids concentrations of 150-900 mg/l within 100 feet (30.5 m), 100-600 mg/l within 200 feet (61 m) and 75-350 mg/l within 400 feet (122 m) downstream of the dredge (Hayes, 1986). Since the material to be dredge consists of sandy sediments minimal impacts from resuspension of sediments is expected. Also USACE will attempt to avoid dredging during the migration season of March 1- June 30 for anadromous fish. Therefore, impacts to EFH species that prey on the river herring or shad would not be significantly impacted in the Housatonic River.

Shellfish also serve as prey items for EFH species. Although the river is a closed shellfish area because of high coliform counts, the estuary is still used to propagate oyster (*Crassostrea virginica*) seeds or spats for subsequent transplant in SA water. The Housatonic River estuary produces one-third of all the seed oysters which are a vital part of Connecticut's commercial shellfish industry. In addition to the oysters, hard-shell (*Mercenaria mercenaria*) and soft-shell

(Mya arenaria) clams are also plentiful in the Housatonic River estuary. Soft-shell clams are abundant along the Nell's Island marsh. Shellfish are naturally exposed to increased suspended sediments in the water column due to storm events. Besides a reduction in the time spent filtering, Foster-Smith (1975) reported two strategies adopted by bivalve species to control ingestion at high particle concentrations: a reduction in clearance rate, and an increase in pseudofaecal production. Bricelj and Malouf (1984) found increasing sediment loads exerted a more negative effect on the clearance rate of hard clams than on that of surf clams, oysters and mussels. Any increases in turbidity would be short-term and localized to the areas near the channel. Additionally, it is unlikely that any dredging will occur during the summer spawning season, which would serve to minimize any indirect impacts to adjacent populations. At the nearshore placement areas off of Point No point, benthic samples contained juvenile surf clams. If the material with shell is spread out over the larger placement area it will bury a larger area of the benthos, but surf clams found in the area should be able to burrow up through the sediments and the shell would enhance the habitat for oyster spat settlement. Consequently, no significant adverse impacts are expected to occur within the shellfish populations of the Housatonic River or the nearshore placement areas located off of Point No Point in Stratford, CT as a result of project operations.

IV. Life History of EFH Species

A. Selection of EFH Species

The National Marine Fisheries Service Guide to Essential Fish Habitat web site was used to determine which species have designated EFH in the Housatonic River and surrounding areas including the nearshore area off of Point No Point. The location of this website is http://www.nero.nmfs.gov/ro/doc/webintro.html. The species and the life stages of those species, that have EFH in the study area was determined by using the quick reference 10 x 10 minute squares of latitude and longitude. The coordinates of the 10 x 10 minute squares that are representative of the geographic area of the proposed dredging and disposal activities are provided in Table 1 below.

Table 2 presents a list of the species that have designated EFH within Housatonic River and the Point No Point nearshore placement sites. A short summary of the EFH for each life stage of each particular species is described in the sections below. Information on the species was taken from the NMFS "Guide to EFH Species Designations" located at http://www.nero.nmfs.gov/ro/doc/list.htm.

Summary of Essential Fish Habitat (EFH) Designation

Table 1. 10' x 10' Square Coordinates: Housatonic River and Nearshore off Point No Point, Stratford, CT

North	East	South	West
41° 20.0'N 41° 10.0' N	73° 00.0' W 73° 00.0'W	41° 10.0'N 41° 00.0' N	73° 10.0'W 73° 10.0' W

Square Description (Dredge Site): The waters within Long Island Sound within the square affecting south of the following: from Woodmont, CT., to the Housatonic River (the western shore east of Crimbo Point), including waters affecting Milford, CT., Pond Point, CT., Pond Pt., Milford Beaches, Charles I., Crimbo Pt., Milford Pt., and Nells I.

Square Description (Placement Site): Atlantic Ocean waters within the square within Long Island Sound affecting south of the following: from the entrance to the Housatonic River (the western shore just east of Crimbo Point, south of Stratfrod, CT..), west past Stratford Pt., Lordship, CT., Point No Pt., to the tip of Long Beach south of East Bridgeport, CT.,, including Lewis Gut,. Also affected are Stratford Shoal and Middle Ground.

Table 2. Species and their respective life stages designated Essential Fish Habitat for the areas described above (Square Descriptions), X for both areas, W for western area only (placement area).

Species	Eggs	Larvae	Juveniles	Adults
Atlantic salmon *(Salmo salar)*			X	X
pollock *(Pollachius virens)*			X	X
whiting *(Merluccius bilinearis)*				X
red hake *(Urophycis chuss)*	X	X	X	X
winter flounder *(Pseudopleuronectes americanus)*	X	X	X	X
windowpane flounder *(Scophthalmus aquosus)*	X	X	X	X
American plaice *(Hippoglossoides platessoides)*			W	W
Atlantic sea herring *(Clupea harengus)*			X	X
bluefish *(Pomatomus saltatrix)*			X	X
Atlantic mackerel *(Scomber scombrus)*	X	X	X	X
summer flounder *(Paralichthys dentatus)*			X	
scup *(Stenotomus chrysops)*	X	X	X	X
black sea bass *(Centropristis striata)*	n/a		X	
king mackerel *(Scomberomorus cavalla)*	X	X	X	X
Spanish mackerel *(Scomberomorus maculatus)*	X	X	X	X
cobia *(Rachycentron canadum)*	X	X	X	X
sand tiger shark *(Carcharias taurus)*		X		

little skate (*Leucoraja erinacea*)			X	X
winter skate (*Leucoraja ocelleata*)			X	X

B. EFH Species

Atlantic Salmon

EFH for juvenile and adult Atlantic salmon (*Salmo salar*) is designated in the project area. Salmon are generally found in estuarine areas during their migrations to and from upstream freshwater natal and spawning habitats. Juvenile Atlantic salmon are found in regions with bottom habitats ranging from shallow gravel and cobble riffles to deeper riffles and pools in rivers and estuaries. Juveniles are found in water temperatures below 25º. C, at depths from 10 to 61 cm, in clean, well-oxygenated fresh water. Atlantic salmon smolts require downstream access to make their way to the ocean. Adult Atlantic salmon returning to spawn need access to their natal streams and spawning grounds. Spawning grounds are located at river and estuary resting and holding pools with water temperatures below 22.8º. C, and dissolved oxygen above 5 ppm. Long Island Sound but not the Housatonic River is not listed in NMFS salmon descriptions (http://www.nero.noaa.gov/ro/doc /salmon.pdf) as an aquatic habitat that is historically or currently accessible for salmon migration. Therefore, no significant impacts to Atlantic salmon EFH are expected as a result of the Housatonic River dredging activities and any juveniles or adult salmon in the placement area can leave the area of disturbance due to their mobility.

Pollock

EFH is designated in the dredge and placement areas for the juveniles and adults of pollock (*Pollachius virens*). The juveniles have been reported over a wide variety of substrates, including sand, mud, or rocky bottom, and vegetation. Most commonly juveniles are found at depths of 82 to 246 feet (25-75 m) although they can be found from the surface to 410 feet deep (125 m). Adults show little preference for bottom type and they inhabit a wide range of depths from 115 to 1197 feet (35-365 m). This project is expected to have minimal effects on EFH of pollock since the juveniles and adults are all commonly found at depths deeper than that found in the project areas. Therefore, no more than minimal impacts on pollock EFH would be anticipated as a result of this project.

Whiting

EFH is designated within both the dredging and placement areas for adult whiting (*Merluccius bilinearis*). Adult whiting are found on bottom habitats of all substrate types with water temperatures below 22° C and depths between 98 to 1,066 feet (30-325 m). This species is broadly distributed in the northwest Atlantic from the Gulf of Maine to Cape Hatteras. This project is expected to have minimal effects on EFH of whiting since adults are commonly found at depths deeper then the project areas. Therefore, no more than minimal impacts on whiting EFH would be anticipated as a result of this project.

Red Hake

EFH is designated in project areas for all life stages of red hake (*Urophucis albidus*). The eggs are found in surface waters with temperatures below 10° C, during the months from May - November, with peaks in June and July. Larvae are most often observed from May

through December, with peaks in September - October, in surface waters with temperatures below 19° C, water depths less than 656 feet (200 m), and salinity greater than 0.5 ‰. The juveniles are found on bottom habitats with a substrate of shell fragments, including areas with an abundance of live scallops, when water temperatures are below 16° C, depths less than 328.1 ft (100 m), and a salinity range from 31 to 33 ‰. Adults are found in bottom habitats with depressions having a substrate of sand and mud (but generally not in open sandy bottoms), with water temperatures below 12° C, depths from 33 to 426.5 feet (10-130 m), and salinities of 33 to 34 ‰. Although EFH for red hake is within the project area, this species is broadly distributed in north and mid-Atlantic waters from the Gulf of Maine to Cape Hatteras. Any disruption of EFH will be temporary and not significant to the overall population due to their wide geographical range and broad habitat requirements. Juveniles and adults should be able to avoid any potential impacts due to their mobility. Eggs and larvae will only have the potential to be impacted by localized, short-term turbidity associated with the dredging and disposal activities. Therefore, no more than minimal impacts on red hake EFH would be anticipated as a result of this project.

Winter Flounder

EFH is designated within the Housatonic River and nearshore placement areas for all life stages of the winter flounder (*Pseudopleuronectes americanus*). The eggs of winter flounder, which are demersal, are typically found at depths of less than 16.4 feet (5 m) in bottom waters in a broad range of salinities (10 - 30 ‰). Spawning, and therefore the presence of eggs, occurs from February to June. EFH for larvae, juveniles, and adults includes bottom habitats of mud and fine-grained sandy substrate in waters ranging from 0.3 to 328 feet (0.1-100 m) in depth. Spawning adults are typically associated with similar substrates in less than 19 feet (6 m) of water. Although winter flounder EFH is located within the project areas, older juveniles and adults are very mobile and would be able to flee from the dredging or placement areas once activities commence. The Connecticut State Fisheries does not consider a time of year restriction for winter flounder necessary for this project (pers. comm.. Mark Johnson). Any potential impacts that occur will be localized and short term. Therefore, no more than minimal impacts on all life stages of the winter flounder EFH would be anticipated as a result of this project.

Windowpane flounder

EFH is designated in within the Housatonic River area and nearshore placement site located off of Point No Point for all life stages of windowpane flounder (*Scopthalmus aquosus*). Eggs are buoyant and typically found in the water column at water depths of 3 to 230 feet (1-70 m). Larvae are found in pelagic waters. Juveniles and adults prefer bottom habitats of mud or fine-grained sand and can be found in salinities ranging from 5.5 ‰ to 36 ‰. Seasonal occurrences in the project area are generally from February to November, with peaks in occurring May and October. Although EFH for the windowpane is within the project area, this species is broadly distributed in north and mid-Atlantic waters from the Gulf of Maine to Cape Hatteras. Consequently, any disruption of windowpane flounder EFH will be temporary and not significant due to their wide geographic range and broad habitat. Windowpane flounder adults and juveniles should be able to avoid any potential impacts because of their mobility. Eggs and larvae will only have the potential to be impacted by localized, short-term turbidity associated with the project activities. Therefore, no more than minimal impacts on all life stages of windowpane flounder EFH would be anticipated as a result of this project.

American Plaice

EFH is designated within the placement areas for juvenile and adult stages of American plaice (*Hippoglossoides platessoides*). The juveniles and adults prefer bottom habitats with fine-grained sediments or a substrate of sand or gravel, water temperatures below 17° C, depths between 147 and 492 feet (45 and 150 meters) and a wide range of salinities. This project is expected to have minimal effects on EFH for American plaice as the placement areas are shallower and than their preferred habitat. Therefore, no significant long-term impacts to EFH would be expected as a result of this project.

Atlantic Sea Herring

EFH is designated within the dredge and placement areas for juveniles and adults of Atlantic sea herring (*Clupea harengus*). Juvenile and adults are found in bottom habitats with depths of 49 to 443 feet (15-135 m) and water temperatures below 10° C. Juveniles and adults sea herring prefer depths that are deeper than those found in the project areas. Therefore, no more than minimal impacts would be expected to occur to Atlantic sea herring EFH as a result of this project.

Bluefish

EFH is designated within the Houstonic River area and the placement sites for bluefish (*Pomatomus saltatrix*) juveniles and adults. Although juveniles and adults are found in the surface waters of mid-Atlantic estuaries from May through October, EFH for this species is mostly pelagic waters over the Continental Shelf. Bluefish adults are highly migratory. Both adults and juveniles should be able to avoid any areas of disturbances caused by dredging activities. Therefore, no more than minimal impacts on bluefish EFH would be anticipated as a result of the proposed project.

Atlantic Mackerel

EFH is designated within the dredge and placement areas for all life stages of Atlantic mackerel (*Scomber scombrus*). Since all life stages of Atlantic mackerel are generally found offshore, no impacts to Atlantic mackerel EFH are expected within the dredging area. The eggs are pelagic and occur in water having salinities greater then 34 ‰, floating in surface waters above the thermocline or in the upper 33 to 49 feet (10-15 m). Larvae are primarily distributed at depths between 33 feet and 425 feet (10-129.5 m). The juveniles and adults change depth seasonally. Atlantic mackerel is a pelagic schooling species distributed in the northwest Atlantic from the Gulf of St. Lawrence to Cape Lookout, North Carolina. The eggs and larvae tend to be found in waters deeper than the dredge or placement areas. The adults and juveniles should be able to avoid any potential impacts because of their mobility. Therefore, no more than minimal impacts on all life stages of Atlantic mackerel EFH would be anticipated as a result of this project.

Summer flounder

EFH is designated within the dredge and placement areas for juvenile summer flounder (*Paralicthys dentatus*). In general, juveniles use several estuarine habitats as nursery areas, including salt marsh creeks, seagrass beds, mudflats, and open bay areas in water temperatures greater than 37^{o}F and salinities from 10 to 30 ‰ range. If present in the Housatonic River would

most likely be found outside the channel areas, any juveniles present should be able to avoid any potential impacts because of their mobility. Therefore, no more than minimal impacts on summer flounder EFH would be anticipated as a result of this project.

Scup

EFH is designated within the Housatonic River area and placement sites for all life stages of Scup (*Stenotomus chrysops*). In general scup eggs are found from May through August in southern New England to coastal Virginia, in waters between 55 and 73^{o}F and in salinities greater than 15 ppt. Scup larvae are most abundant nearshore from May through September, in waters between 55 and 73^{o}F and in salinities greater than 15 ppt. Scup juveniles and adults have the potential to occur in estuarine systems during the spring and summer months. All life stages of scup prefer salinities greater than 15 ‰. Juveniles and adults use structured areas for foraging and refuge, which do not exist in the project area. Scup are highly mobile species and would be expected to have the ability to avoid dredging activities. Although EFH for the scup is within the project area, this species is broadly distributed in north and mid-Atlantic waters from the Gulf of Maine to Cape Hatteras. Consequently, any disruption of scup EFH will be temporary and not significant due to their wide geographic range and broad habitat. Eggs and larvae will only have the potential to be impacted by localized, short-term turbidity associated with the project activities. Therefore, no more than minimal impacts to Scup EFH would be anticipated as a result of this project.

Back Sea Bass

EFH is designated for black sea bass (*Centropristus striata*) juveniles within the Housatonic River area and nearshore placement sites. Juvenile black sea bass are usually found in association with rough bottom, shellfish and eelgrass beds, man-made structures in sandy-shelly areas; offshore clam beds and shell patches may also be used during the wintering. Although sea bass may occur in the project area, the bottom habit of the dredge and placement areas are not the preferred substrate for juveniles. Also both juvenile should be able to avoid any potential impacts because of their mobility. Therefore, no more than minimal impacts to black sea bass EFH are anticipated as a result of this project.

Coastal Migratory Species

EFH is designated in the project area for all life stages of the following coastal migratory species: king mackeral (*Scomberomorus cavalla*), Spanish mackeral (*Scomberomorus maculatus*), and cobia *(Rachycentron canadum*). EFH for coastal migratory pelagic species includes sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters from the surf to the shelf break zone, all coastal inlets, and all state-designated nursery habitats of particular importance to coastal migratory pelagics. These species prefer warm water about 20° C. It would be summer before these species would be found in the area, the juveniles and adults can swim away from any disturbances. Therefore, no more than minimal impacts to coastal migratory species EFH are anticipated as a result of this project.

Sand Tiger Shark

The project areas are designated for neonate/early juveniles of the sand tiger shark *(Odontaspis taurus*). According to the NOAA website this life stage of the tiger shark is found

in **s**hallow coastal waters from Barnegat Inlet, NJ south to Cape Canaveral, FL to the 25 m isobath. Therefore, no impacts to sand tiger sharks are anticipated as a result of this project.

Little Skate

EFH is designated within the dredge and placementl areas for juvenile and adult little skates (*Leucoraja erinacea)*. The little skate has a coastal distribution; and is found in habitats with sandy, gravelly, or mud substrates of the shallow water in the western Atlantic from Nova Scotia, Canada to North Carolina, USA. This species can tolerate a wide range of temperatures and salinity ranges from 27 to 33.8 ppt. They are found from the surface waters to depths of 295 feet (90 m). The little skate does not appear to have large-scale migrations but they do move to shallower water during the summer and move to deeper water in fall or early winter. The skates are motile should be able to swim from any areas of disturbance. Therefore, no more than minimal impacts to little skate EFH are anticipated as a result of this project.

Winter Skate

EFH is designated in the dredge and disposal areas for juvenile and adult winter skates (*Leucoraja ocellata*). The winter skate also has a coastal distribution; and is found in habitats with sand and gravel for juveniles and sandy, gravelly, or mud substrates for adults. This species is found in the shallow water in the western Atlantic from Newfoundland Banks and southern Gulf of St. Lawrence in Canada to North Carolina, USA from the surface to depths of 295 feet (90 m). The skates are motile and should be able to swim from any areas of disturbance. Therefore, no more than minimal impacts to little skate EFH are anticipated as a result of this project.

V. CUMULATIVE EFFECTS

Cumulative impacts are those resulting from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions. Past and current activities in Housatonic River include the maintenance dredging of the Federal Navigation Project as well as private dredging of marinas and docks. Reasonably foreseeable future actions include the continuation of current maintenance and navigation activities.

The effects of these previous and existing actions are generally limited to infrequent disturbances of the benthic communities in the dredged areas. Water quality, air quality, hydrology, and other biological resources are generally not significantly affected by these actions. The direct effects of this project are not anticipated to add to impacts from other actions in the area. Therefore, no adverse cumulative impacts to EFH species are anticipated as a result of this project.

VI. SUMMARY OF EFFECTS

The dredging activities proposed for maintenance dredging of the lower Housatonic River Federal Navigation Project could potentially have some limited temporary impacts on EFH species found within the vicinity of the Housatonic River and nearshore placement areas located off of Point No Point in Stratford, CT. In general, eggs and larvae are more susceptible to impacts than juveniles and adults (Sherk *et al*., 1975) which can avoid dredging and disposal

related disturbance. Demersal species such as flounders are more susceptible to impacts than pelagic species since most dredging related disturbance occurs near the bottom, but they tend to be the most tolerant to suspended solids (Sherk *et al*., 1975). Consequently, the EFH species with the greatest potential to be affected by the Housatonic River maintenance dredging project are those with demersal eggs (winter flounder), the eggs can be dredged or buried by disposal. Species with planktonic eggs and larvae suspended in the water column (red hake, windowpane flounder, and scup) have less potential to be impacted by dredging operations. These eggs and larvae may be physically damaged or killed from exposure to elevated concentrations of suspended solids.

Conclusions

Although there is the potential for project activities to impact EFH of species which may occur in the dredging and placement areas, any impacts are expected to be of short-term and limited to the immediate project area. Hydrological conditions such as tides and currents will not change as a result of the project. Any changes to water quality (TSS, DO) will be temporary and water quality will return to pre-project conditions when the project is complete. Prey species destroyed or otherwise impacted during the dredging and disposal processes are expected to return following project completion.

Additionally, not all areas designated, as EFH for the various species will be impacted. Most species with designated EFH in the lower Housatonic River and nearshore placement areas also have EFH in the Long Island Sound. The effects of dredging and placement will be confined to limited areas of maintenance dredging and placement of dredged material. Therefore, the species at these locations will be able to sustain the population of their respective species in this geographic region.

VI. REFERENCES

Bricelj, V.M. and R.E. Malouf. 1984. Influence of algal and suspended sediment concentrations on the feeding physiology of the hard clam *Mercenaria mercenaria*. *Marine Biology*. 84: 155-165.

Clarke, D., K. Reine, and C. Dickerson. (draft report). Suspended Sediment Plumes Associated with Hopper Dredges at Sesuit Harbor, Massachusetts, USACE, ERDC, Vicksburg, MS.

Foster-Smith, R.L. 1975. The effect of concentration of suspense on the filtration rates and pseudofaecal production for *Mytilus edulis* L., *Cerastoderma edule* (L.) and *Venerupis pullastra* (Montagu). *J. Exp. Mar. Biol. Ecol*. 17: 1-22.

Hayes, Donald F. 1986. Guide to Selecting a Dredge for Minimizing Resuspension of Sediment. Environmental Effects of Dredging Technical Notes EEDP-09-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

LaSalle, M. W., D. G. Clarke, J. Homziak, J.D. Lunz, and T.J. Fredette. 1991. A framework for assessing the need for seasonal restrictions on dredging and disposal operations.

Technical Report D-91-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A240 567.

Sherk, J.A., J.M. O'Connor, and D.A. Neumann. 1975. Effects of suspended and deposited sediments on estuarine environments. *Estuarine Research*. 2:541-558.

U.S. Fish & Wildlife Service (US FWS) and U.S. Army Corps of Engineers (USACE) New England Division. 1981. Habitat Evaluation Procedures Housatonic Demonstration Project: Field Level Evaluation Report Housatonic River Basin Study (Massachusetts Portion). Concord, NH and Waltham, MA March 1981.

APPENDIX E - *BENTHIC DATA*

HOUSATONIC FEDERAL NAVIGATION PROJECT

CHANNEL BENTHIC DATA

Figure E-1. Map of Housatonic Federal Navigation Project with sites for grab samples used to identify benthic community in the channel.

Table E-1. Coordinates of Benthic grab samples

Station #	Latitude	Longitude
1	41.157778	-73.092222
2	41.159722	-73.095278
3	41.177222	-73.122778
4	41.189444	-73.117222
5	41.190278	-73.115278
6	41.193056	-73.113056
7	41.202778	-73.109722
8	41.209613	-73.110262
9	41.213903	-73.109691
10	41.217500	-73.108056

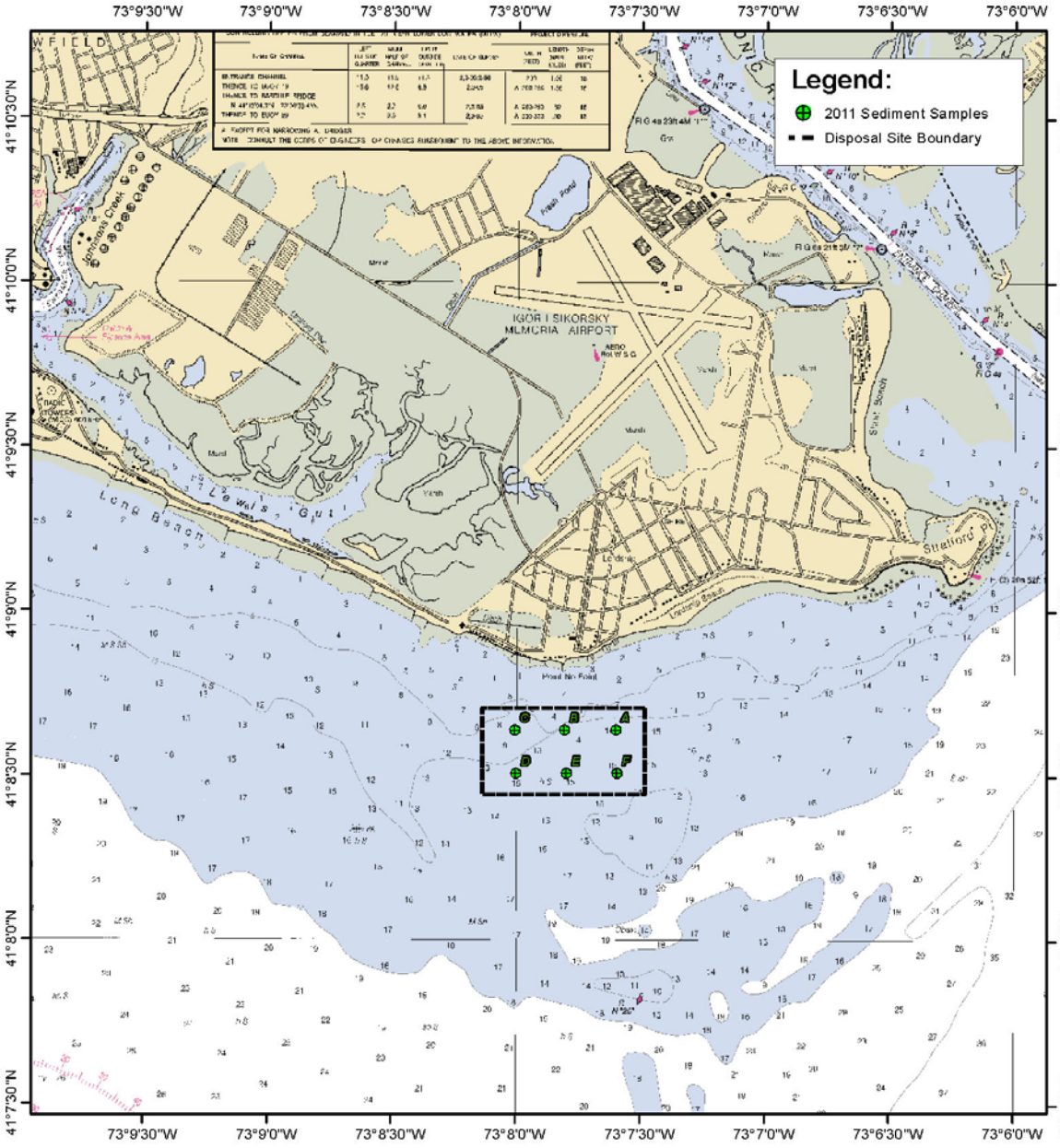
The benthic community within the Federal channel consists of

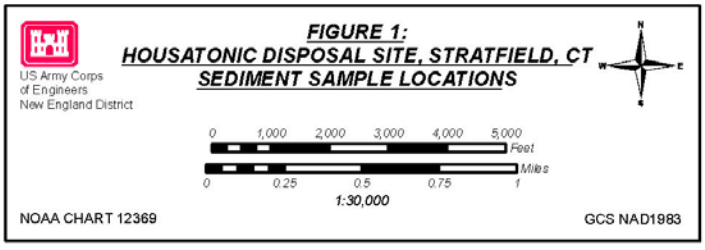
Table E-2. Housatonic River Benthic Data, Samples collected May 12, 2004.

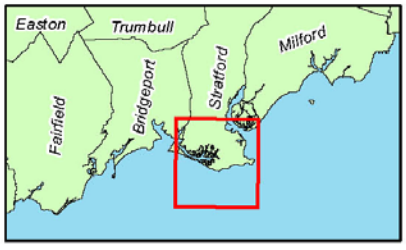
SPECIES	Station 1 medium sands	Station 2 coarse sand	Station 3 coarse sand	Station 4 silty sand	Station 5 silty sand	Station 6 silty sand	Station 7 sand	Station 8 sand	Station 9 silty sand	Station 10 silty sand
ANNELIDA										
POLYCHAETA										
Nephtys picta	2	1	*	*	1	1	*	*	1	1
Streblospio benedicti	166	4	1	1156	2175	750	23	178	1200	527
Paraonis fulgens	2	*	*	2	*	5	25	*	2	*
Capitella sp.	*	*	*	2	*	*	1	*	*	*
Mediomastus ambiseta	*	*	*	*	51	*	*	*	1	5
Hobsonia sp	*	*	*	*	*	*	*	*	*	1
Leitoscoloplos robustus	*	*	*	*	*	*	1	3	*	*
OLIGOCHAETA										
Unidentified Oligochaete	1	*	*	24	*	3	*	*	25	9
MOLLUSCA										
Gemma gemma	*	23	*	*	*	*	*	*	*	*
Tellina agilis	2	*	*	*	*	*	*	*	*	*
Nassarius trivitatus	1	*	*	*	3	*	*	*	1	*
Mulinia lateralis	*	*	*	*	1	*	*	*	*	*
ARTHROPODA										
Caprella sp	1	20	*	*	1	7	*	*	*	*
Haustorius canadensis	*	26	4	1	*	*	2	*	*	*
Chirodotea sp.	*	3	17	1	*	*	4	*	*	*
Unidentified Gammarid Amphipod	*	1	1	*	*	*	*	*	*	*
Pagurus longicarpus	1	*	*	*	*	*	*	*	*	*
NEMATODA										
Unidentified Nematode	*	1	61	*	*	*	21	*	*	*

PROPOSED NEARSHORE PLACEMENT AREA

OFF POINT NO POINT, STRATFORD, CT


73°9'30"W
73°9'0"W
73°8'30"W
73°8'0"W
73°7'30"W
73°7'0"W
73°6'30"W
73°6'0"W
41°10'30"N
41°10'0"N
41°9'30"N
41°9'0"N
41°8'30"N
41°8'0"N
41°7'30"N
Legend:
2011 Sediment Samples
Disposal Site Boundary
IGOR I SIKORSKY MEMORIAL AIRPORT
Long Beach
Lewis Gut
Stratford Pt
A
B
C
D
E
F


US Army Corps
of Engineers
New England District
FIGURE 1:
HOUSATONIC DISPOSAL SITE, STRATFIELD, CT
SEDIMENT SAMPLE LOCATIONS
N
W
E
0 1,000 2,000 3,000 4,000 5,000 Feet
0 0.25 0.5 0.75 1 Miles
1:30,000
NOAA CHART 12369
GCS NAD1983


Easton
Trumbull
Milford
Fairfield
Bridgeport
Stratford

Sediment Grabs from Nearshore area off of Point No Point, Stratford, CT for Benthic Analysis

Table 1: Summary of Sediment Collection Data

Station ID	Latitude (NAD 83)	Longitude (NAD 83)	Time (EDT)	Measured Water Depth (FT)	Notes
A	41.143958	-73.126531	12:01	16.5	Fine sand
B	41.144080	-73.129921	12:09	12.5	Fine sand w/ shell frag
C	41.144053	-73.133436	12:14	14.0	Medium/fine sand
D	41.141908	-73.133301	11:50	16.5	Medium sand
E	41.141752	-73.130056	11:41	17.5	Mostly coarse sand w/ shell frag
F	41.141881	-73.126189	11:34	18.0	Mostly coarse sand w/ shell frag

Table 1. Macrobenthic Community Structure of a Nearshore Area off Point No Point (Stratford, CT) (Numbers per $0.04m^2$) Collected on August 9, 2011.

Species	Station A	Station B	Station C	Station D	Station E	Station F
ANNELIDA						
POLYCHAETEA						
Glycera americana	2	*	*	*	*	*
Euclymene sp.	1	1	*	1	*	2
Syllides sp.	*	*	*	*	*	1
Ampharete americana	3	2	*	3	2	5
Streblospio benedicti	*	*	8	*	*	3
Owenia fusiformis	*	*	*	*	1	*
Nephtys caeca	*	*	*	*	1	*
Phyllodoce maculata	*	*	*	2	*	*
MOLLUSCA						
GASTROPODA						
Nassarius trivitattus	1	1	*	2	2	1
Polinices duplicatus	*	1	*	*	*	*
Anachis avara	*	*	*	*	1	*
BIVALVIA						
Tellina agilis	10	*	*	2	*	15
Spisula solidissma	*	9	34	14	21	11
Mulinia lateralis	6	*	*	*	*	*
Gemma gemma	9	27	11	41	4	*
Anadara transversa	*	*	*	*	2	1
Lyonsia hyalina	*	*	*	*	*	1
ARTHROPODA						
AMPHIPODA						
Trichophoxus epistomus	2	1	6	*	*	*
Caprella sp.	1	*	*	*	*	*
Acanthohaustorius millsi	*	*	17	3	2	*
Corophium sp.	4	*	*	*	*	*
TANAIDACEA						
Tanais cavolini	*	*	2	1	3	*
ISOPODA						
Chiridotea almyra	*	*	*	*	*	1
DECAPODA						
Pagurus longicarpus	*	*	*	*	1	*

RHYNCHOCOELA						
Species A	*	1	1	2	*	*
TOTALS						
# of Species	10	8	7	10	11	10
# of Individuals	39	43	79	71	40	41

On August 9, 2011 the USACE collected sediment grab samples from 6 locations within a proposed nearshore disposal site off of Point No Point in Stratford, Connecticut. The samples were collected with a 0.04 m^2 van Veen grab sampler. The number of species per sample ranged from 7 (Station C) to 11 (Station E). The number of individuals ranged from 39 (Station A) to 79 (Station C). Stations C and D had the most species and the sediments in these two stations consisted of medium and fine sand. Stations A and B were fine sand and stations E and F consisted of medium and coarse sand.

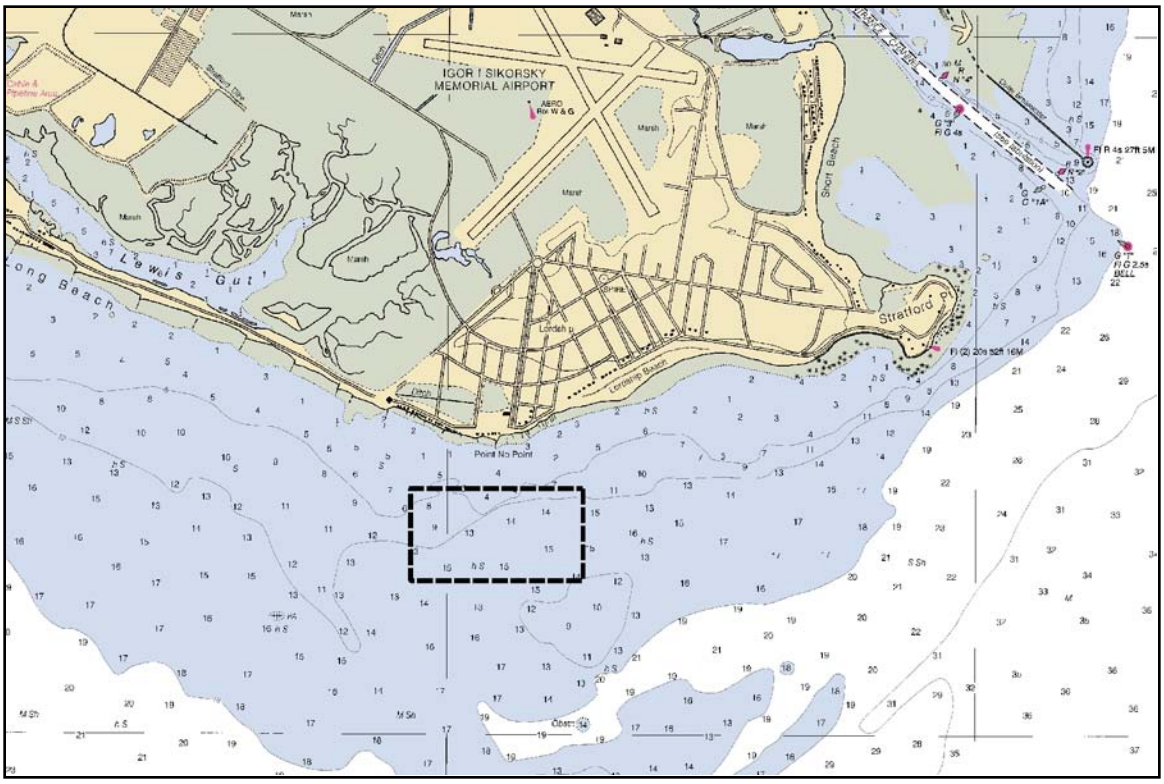
All of the species/genera identified except for Caprellid amphipod and the gastropod *Anachis avara* are found in sandy habitats. These two species live on algae, rocks, plants or other epifauna. The most abundant species were the bivalves *Spisula solidissma* (surf clam) and *Gemma gemma*, both of these species were found in five of the 6 sampling stations. The proposed disposal area is within Bridgeport Natural Shellfish Bed so it is not surprising to find juvenile surf clams in the sediment. *Gemma gemma* is an opportunistic species as is the polycheate *Streblospio benedicti*. The other polycheate species with numerous individuals was tube living deposit feeder *Ampharete americana* which was also found in 5 of the 6 sampling stations.

Tellina agilis was the third most abundant species and this species is ubiquitous in sandy habitats, feeding on particles in on the bottom and in suspension. The fourth most abundant species was the amphipod (*Acanthohaustorius millsi*) of the family Haustoridae. Haustorids are adapted for free burrowing in unconsolidated sandy sediments.

APPENDIX F -*FIELD REPORT FOR NEARSHORE PLACEMENT SITES*

Field Data Collection
In Support Of Disposal
Site Characterization FINAL

Point No Point
Nearshore Disposal Site
Stratford, CT



US Army Corps
of Engineers ®
New England District

October 2011

FIELD DATA COLLECTION

IN SUPPORT OF

DISPOSAL SITE CHARACTERIZATION

POINT NO POINT

NEARSHORE DISPOSAL SITE

STRAFTFORD, CONNECTICUT

October, 2011

Prepared by:

Engineering/Planning Division
Environmental Resources Section
U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

The New England District of the Army Corps of Engineers (NAE) is evaluating the suitability of using the nearshore area off of Point No Point in Stratford, CT for placement of dredged sediments from the Housatonic River. It is likely that a government owed special purpose hopper dredge (e.g., the Currituck) will be used to dredge the material. Since no dredging will occur during transit to the disposal area, it is preferred to use a disposal area as close to the dredge site as possible. The material to be dredged is predominantly sandy and NAE would like to keep the material in the littoral zone. Long Beach is located west of the disposal area and the net sediment transport for the area is towards the west; therefore the dredged material has the potential to move towards and onto the beach.

The proposed disposal area is approximately 3 miles from the mouth of the River and 6 miles from the farthest upstream section proposed to be dredged. The proposed site boundary is a 1600 x 3000 foot rectangle with the longer sides oriented from East to West (Figure 1). The inshore side of the site is situated along the 6 foot bathymetric contour, approximately 900 feet from the shoreline at the closest point. Currently there is no information available on the physical or biological resources in the proposed nearshore disposal area.

The purpose of the field effort described in this report was to collect data to evaluate site suitability and document physical conditions at the proposed Point No Point nearshore disposal site. This report describes the field methods employed, site conditions encountered, and the results of grain size analysis of sediments collected from the site along with the interpretation of video and side scan sonar survey data.

2.0 MATERIALS AND METHODS

Video and acoustic surveys as well as sediment sampling efforts were conducted on August 9, 2011. In attendance were NAE ecologists Ben Loyd, Todd Randall, and Valerie Cappola. Work was carried out onboard the R/V Sea Robin, a 23 foot Sea Ark cathedral hull workboat outfitted with a davit and electric pot hauler. Positioning was achieved using a WAAS enabled Lowrance HDS-10 sonar/chart plotter with external LGC-4000 GPS receiver antenna, and verified with a Trimble GeoXM Differential Global Positioning System (DGPS) with an accuracy of 3 meters or less. Depth measurements were made using the HDS-10 unit and 200 kHz transducer.

Sediment grabs for grain size analysis were collected from six locations (Figure 2) using a $0.04m^2$ Van Veen grab which was deployed and retrieved with the davit and pot hauler on the port side of the vessel. The material from each station was transferred to sample containers upon collection and shipped to Alpha Analytical Laboratory in Mansfield, MA at the conclusion of field activities. Chain of Custody forms are presented in Appendix A.

Video footage was collected using a Sea Viewer Sea-Drop 950 Underwater Video Camera and recorded to a portable DVR system outfitted with an LCD monitor for real time viewing. The Camera was weighted with a 5lb downrigger weight and deployed off the port side of the vessel. The position of the camera was maintained close to vertical relative to the boat by adjusting speed and heading to account for currents. Depth and directional adjustments of the camera were made manually by USACE personnel positioned on deck. Video footage was collected at 22 locations (Figure 2) determined in the field by NAE ecologists to provide adequate coverage of the proposed disposal site and the area immediately inshore.

Side scan and down scan sonar data was collected using a Lowrance LSS-1 Structure Scan System with a 800 kHz transducer. The transducer was mounted to the stern of the boat on the starboard side using an adjustable bracket. Sonar data was viewed in real time and recorded to a memory card using the Lowrance HDS-10. Survey transects were pre-planned in ESRI ArcGIS 10 and transferred to the Lowrance chartplotter for navigation in the field. Transects were laid out to provide adequate coverage of the area with a spacing of 100 feet in an East-West orientation corresponding to the disposal site boundary, roughly perpendicular to the shore line.

3.0 DATA PROCESSING

In addition to the results of grain size analysis, three datasets were generated from the field activities conducted on August 9th; a series of video files in .avi format, a vessel track log with sonar data from the 200 kHz transducer, vessel position information, and field waypoints in .slg format, and a sonar log from the 800 kHz transducer with multiple channels for side scan, down scan, and associated vessel track information in .xtf format. All three datasets were processed and interpreted in order to produce to support the characterization of the proposed disposal site.

Video files were reviewed using CyberLink PowerDirector video editing software. Screen captures were taken from each video station to represent typical bottom conditions at that location. The name of each screen capture, coordinates of the video station waypoint from the vessel track log, and a brief description of the image content were recorded in a Microsoft Excel spreadsheet. This spreadsheet was used to create an ESRI shape file with points separated into classes based on the visual interpretation of each screen capture (Table 3). This enabled the position and class of each screen capture to be viewed on a site map (Figure 2) in conjunction with other data to aid in the interpretation of the existing site conditions.

The .xtf files with side scan sonar and vessel position data were processed using the SonarWiz5 software package. Post processing was accomplished by applying slant range correction for removal of the water column and transformation of range distance to horizontal distance. Geometrical gain corrections were applied to equalize the effects of the transducer response and the incident angle dependence in sonar back scatter. Filters were also applied to the recorded depth vales to make any noise in the water column close to the track of the vessel less erratic. A side scan mosaic was created from the

processed data and exported as a georeferenced image for use in ArcGIS (Figure 3). Sonar data was examined in detail as a scrolling waterfall in Sonarwiz5 and as a mosaic in ArcGIS.

4.0 RESULTS AND DISCUSSION

Depths in the vicinity of the proposed disposal area ranged from 6.5 to 26 feet during the described field effort with the shallowest areas to the northwest. Surface conditions were cloudy with 10-12 mph winds from the east and 1-2.5 foot short period waves. The recorded air temperature was 77 F. Surface water temperature was 74 F.

Grain size analysis of sediments from the six stations (Figure 2) from the proposed disposal area indicates a bottom of coarse to fine sand with shell fragments (reported as fine gravel). The samples in the northern half of the site (A,B,C) consisted of mostly fine sand with the exception of station C which contained nearly equal parts of medium and fine sized sand particles. The samples the southern half of the site (D,E,F) were predominantly medium sand with significant amounts of coarse and fine sand particles. Sediment sample collection data is presented in Table 1. The results of grain size analysis are summarized in Table 2. Grain size curves, chain of custody sheets and laboratory information can be found in the analytical report presented as Appendix A.

Interpretation of the screen captures from the video survey enabled the video survey stations to be divided into three classes including; sand and dense shell, sand and scattered shell, and sand waves with scattered shell. The bottom type within the proposed disposal site consisted of sand and scattered shell with sand waves present in the shallower areas to the northwest. Sand and dense slipper shell was noted in one area approximately 400 feet to the west of the proposed site boundary. Scattered clumps of green and red macroalgae were noted throughout the site. No eelgrass was observed in the survey area. The position and class of each video survey station is presented in Figure 2. A summary of the video screen capture database is presented in Table 1. Individual screen captures can be found in Appendix B.

Interpretation of side scan sonar data collected from the proposed disposal area revealed a featureless bottom with no large or notable features. Analysis of backscatter data indicated relatively uniform reflectance and texture throughout the area. It should be noted that the choppy sea state during the side scan survey resulted in a significant amount of noise in the water column and a number of artifacts in the side scan mosaic. These artifacts were identified and ruled out as actual bottom features. The side scan mosaic produced from the processed sonar data is presented in Figure 3.

Table 1: Summary of Sediment Collection Data

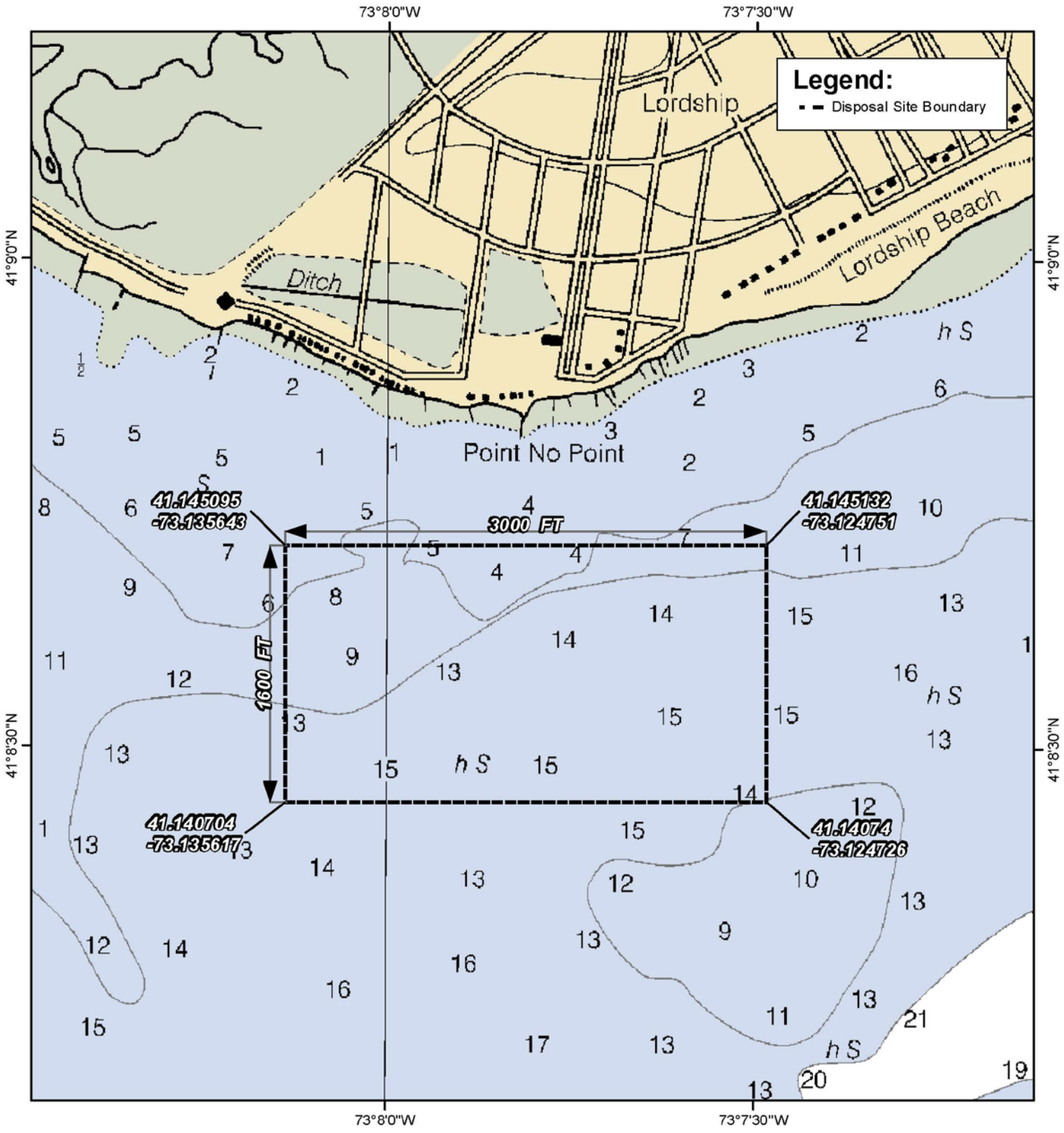
Station ID	Latitude (NAD 83)	Longitude (NAD 83)	Time (EDT)	Measured Water Depth (FT)	Notes
A	41.143958	-73.126531	12:01	16.5	Fine sand
B	41.144080	-73.129921	12:09	12.5	Fine sand w/ shell frag
C	41.144053	-73.133436	12:14	14.0	Medium/fine sand
D	41.141908	-73.133301	11:50	16.5	Medium sand
E	41.141752	-73.130056	11:41	17.5	Mostly coarse sand w/ shell frag
F	41.141881	-73.126189	11:34	18.0	Mostly coarse sand w/ shell frag

Table 2: Summary of Grain Size Results

Parameter	A	B	C	D	E	F
% Cobbles	NA	NA	NA	NA	NA	NA
% Coarse Gravel	NA	NA	NA	NA	NA	NA
% Fine Gravel	1.18	0.41	5.79	NA	10.1	3.94
% Coarse Sand	0.6	0.41	2.81	1.92	18.4	19.7
% Medium Sand	12.6	6.38	43.8	65.3	54.7	67.2
% Fine Sand	84.5	92.3	47.3	32.6	16.6	8.67
% Total Fines	1.07	0.5	0.33	0.1	0.16	0.49

Table 3: Summary of Video Screen Captures

Station ID	Latitude (NAD 83)	Longitude (NAD 83)	Time (EDT)	Measured Water Depth (FT)	Notes
1	41.144793	-73.126414	12:31	13.0	Sand, scattered shell, and clumps of green algae
2	41.144820	-73.128010	12:37	11.0	Sand with scattered shell, sea lettuce and other green algae
3	41.144481	-73.130542	12:41	5.7	Sand waves, scattered shell, and green algae
4	41.144644	-73.131976	12:42	6.8	Sand, scattered shell, and green algae. 1 crab noted
5	41.144596	-73.133454	12:43	6.7	Sand waves, scattered shell, and green algae
6	41.142777	-73.135040	12:46	13.3	Sand, scattered shell, and green algae
7	41.142852	-73.132345	12:49	15.1	Sand waves, scattered shell.
8	41.142811	-73.129776	12:50	16.5	Sand and scattered shell. 2 crabs noted
9	41.142886	-73.127838	12:51	17.0	Sand and scattered shell with green algae
10	41.142845	-73.125513	13:59	16.0	Sand and shell with green algae
11	41.140788	-73.125828	14:02	15.5	Sand and scattered shell with green algae
12	41.140775	-73.127974	14:04	15.0	Sand and shell with green algae
13	41.140686	-73.130335	14:05	15.0	Sand and scattered shell with green algae
14	41.140890	-73.132354	14:07	15.0	Sand and shell with green algae. 1 crab noted.
15	41.140924	-73.135139	14:09	14.0	Sand and scattered shell with green algae
16	41.144895	-73.137510	14:13	7.0	Sand and dense slipper shell
17	41.146218	-73.137492	14:15	6.5	Sand and shell with red and green algae
18	41.146225	-73.135806	14:19	6.6	Sand and scattered shell with sea lettuce and other red and green algae
19	41.145404	-73.130515	14:21	3.0	Sand waves and scattered shell frag
20	41.146055	-73.127929	14:23	6.0	Sand waves and scattered shell frag and sparse clumps of floating red and green algae
21	41.145370	-73.123287	14:27	10.0	Sand and scattered shell with sparse red and green algae
22	41.146470	-73.124621	14:30	7.5	Sand and scattered shell with sea lettuce and other green algae



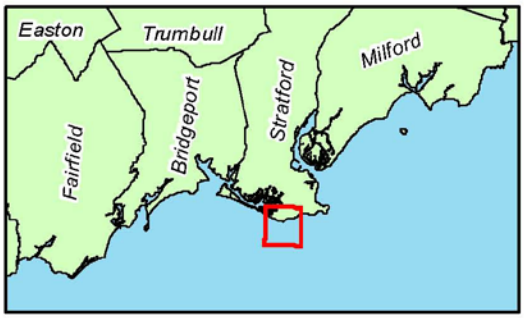
US Army Corps of Engineers
New England District

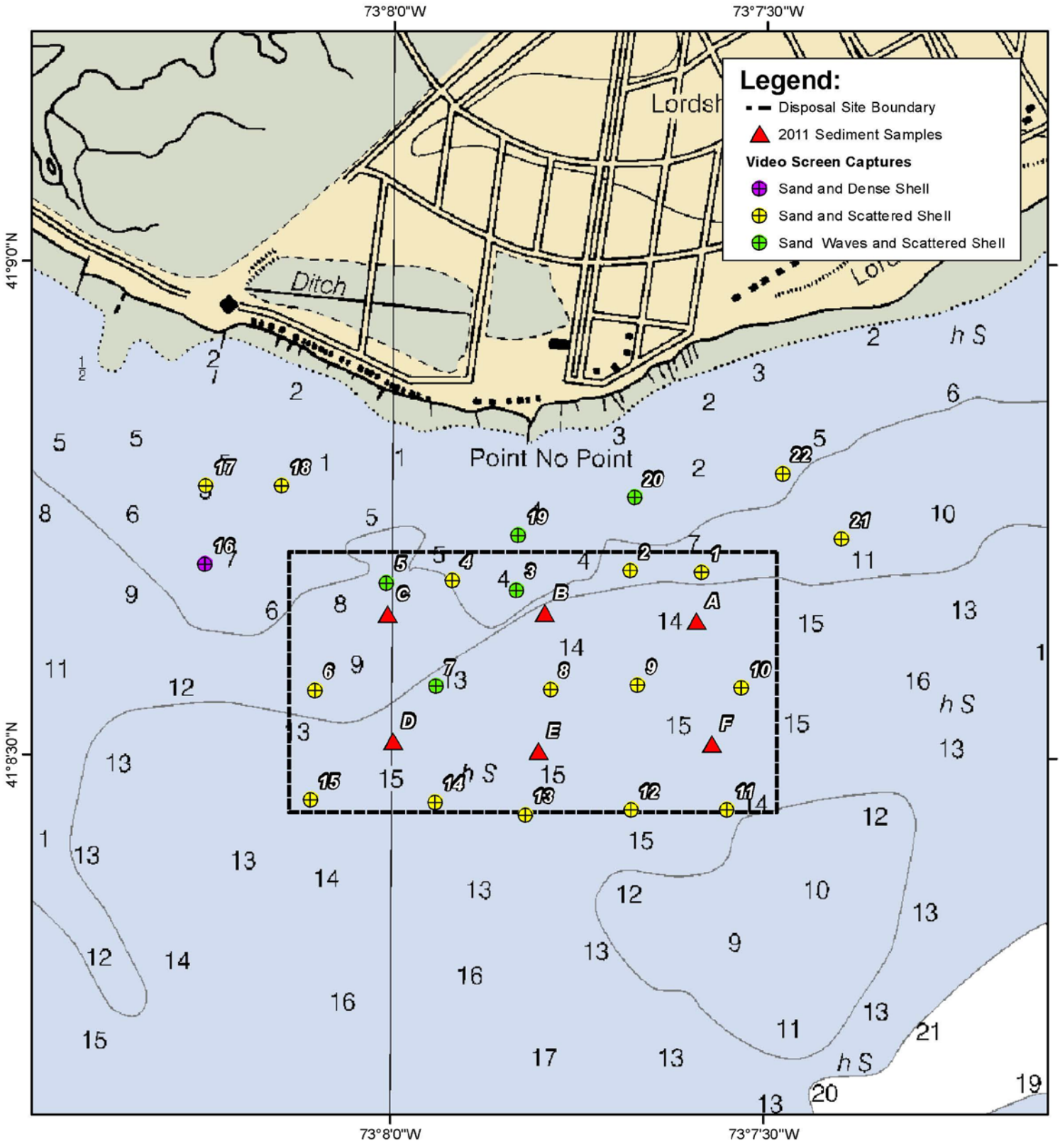
FIGURE 1:
POINT NO POINT, STRATFORD, CT
PROPOSED NEARSHORE DISPOSAL SITE

0 500 1,000 1,500 2,000 Feet
0 0.1 0.2 0.3 0.4 0.5 Miles
1:10,000

NOAA CHART 12369

GCS NAD1983





US Army Corps of Engineers
New England District

FIGURE 2:
POINT NO POINT, STRATFORD, CT
SEDIMENT GRABS AND
VIDEO SURVEY STATIONS

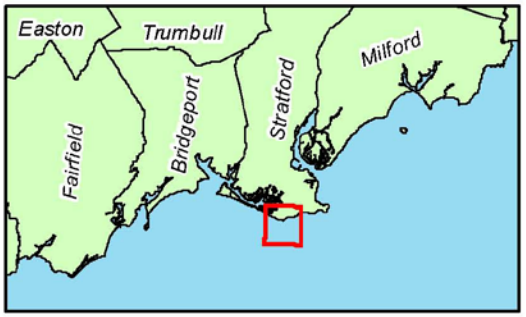
0 500 1,000 1,500 2,000 Feet

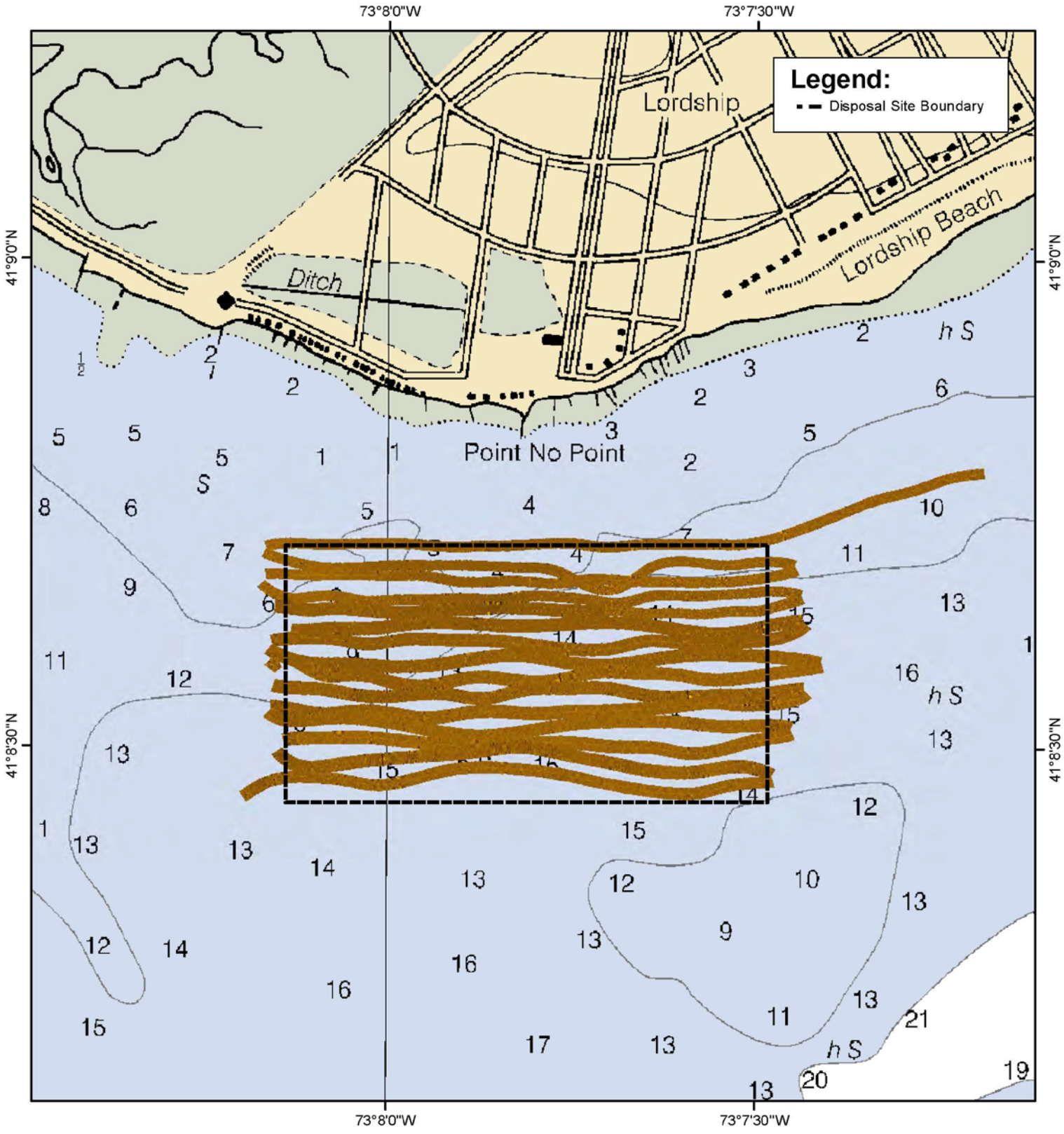
0 0.1 0.2 0.3 0.4 0.5 Miles

1:10,000

NOAA CHART 12369

GCS NAD1983





US Army Corps of Engineers
New England District

FIGURE 3:
POINT NO POINT, STRATFORD, CT
SIDE SCAN SONAR MOSAIC

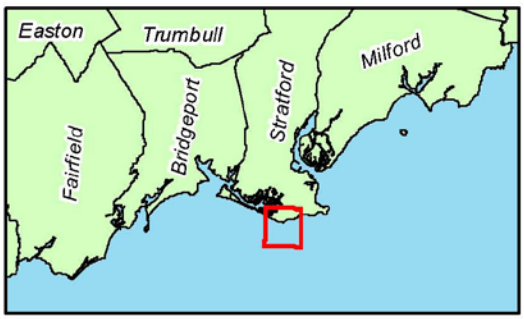
0 500 1,000 1,500 2,000 Feet

0 0.1 0.2 0.3 0.4 0.5 Miles

1:10,000

NOAA CHART 12369

GCS NAD1983



APPENDIX A

ANALYTICAL REPORT

See Appendix B of EA

APPENDIX B

VIDEO SCREEN CAPTURE LIBRARY

Appendix B: Video Survey Screen Captures

PNP-1

PNP-2

Appendix B: Video Survey Screen Captures

PNP-3

PNP-4

Appendix B: Video Survey Screen Captures

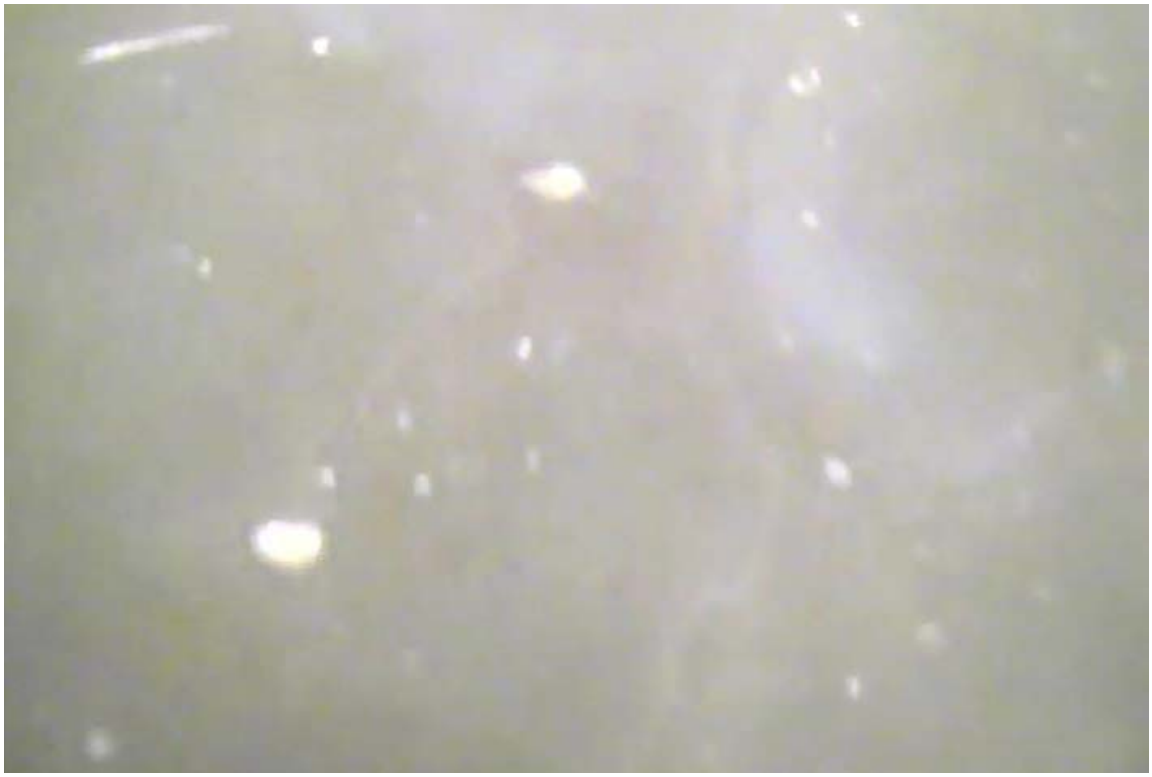
PNP-5

PNP-6

Appendix B: Video Survey Screen Captures

PNP-7

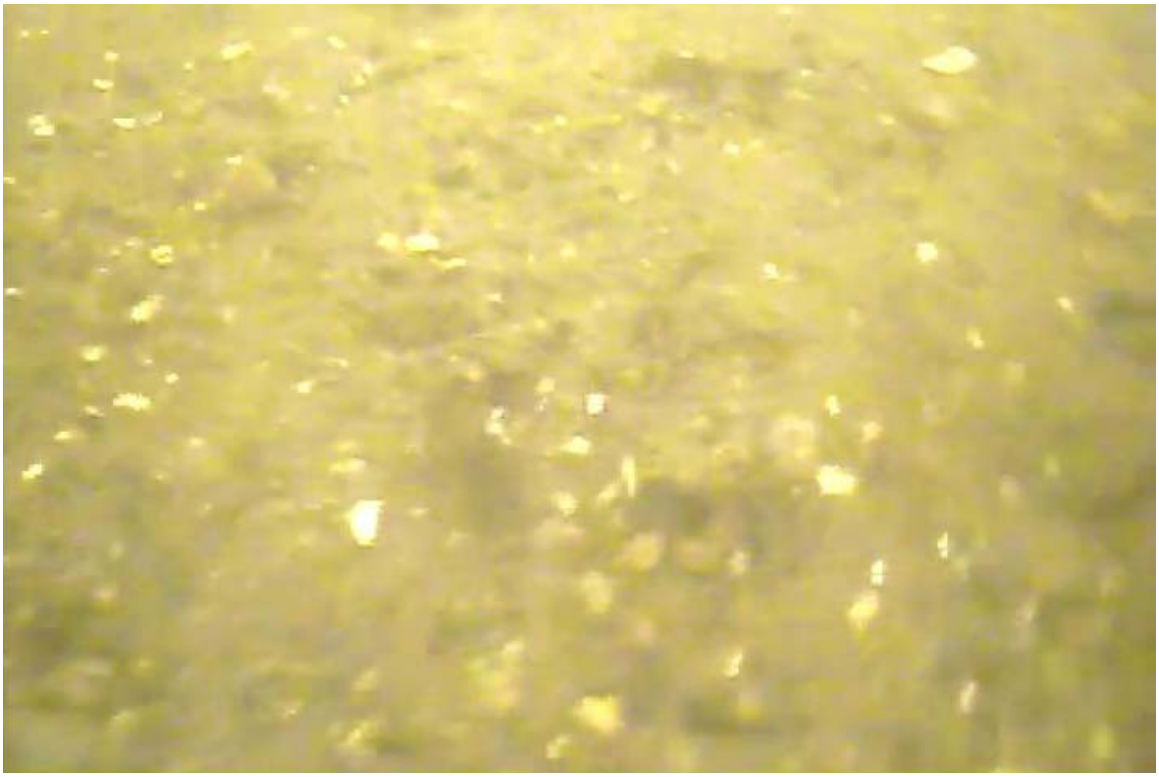
PNP-8



Appendix B: Video Survey Screen Captures

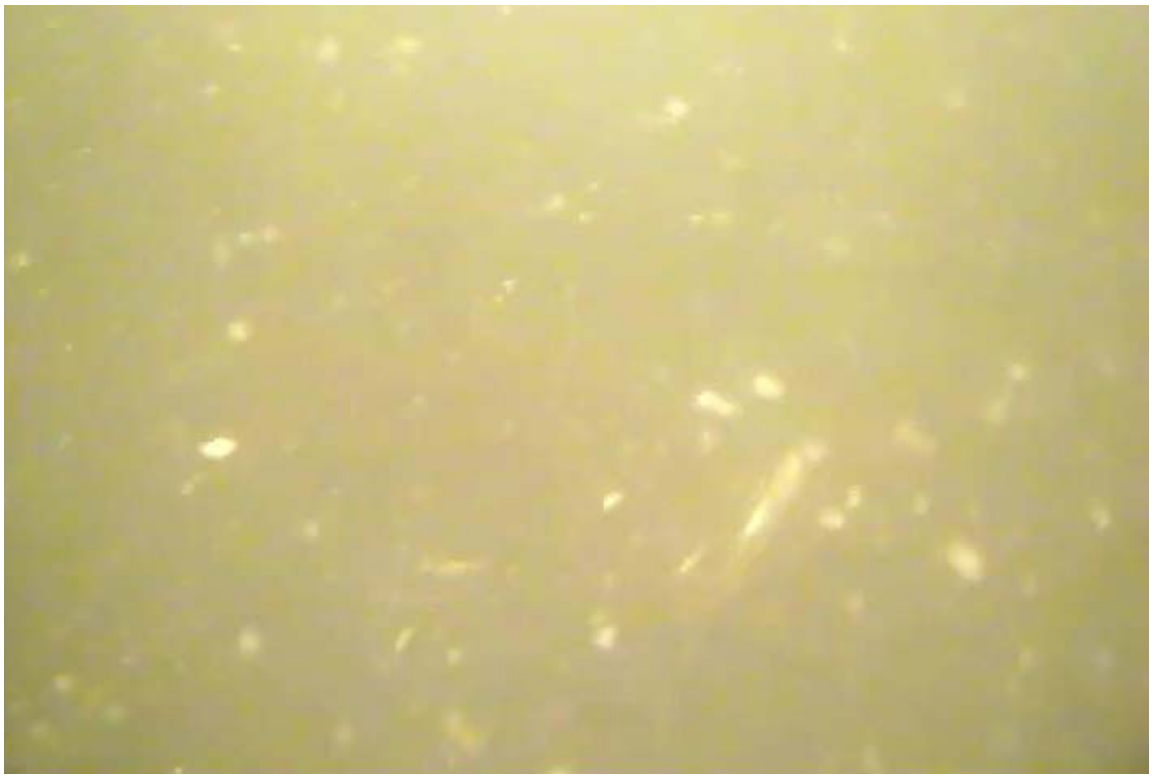
PNP-9

PNP-10

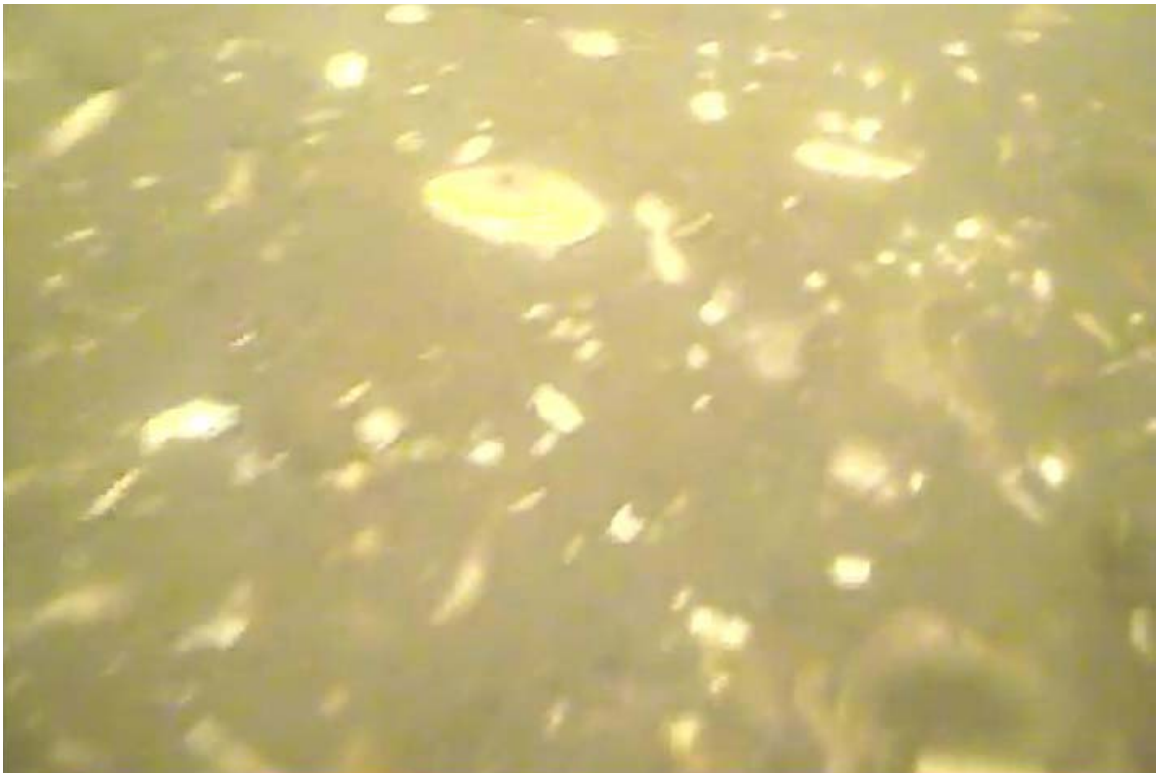


Appendix B: Video Survey Screen Captures

PNP-11

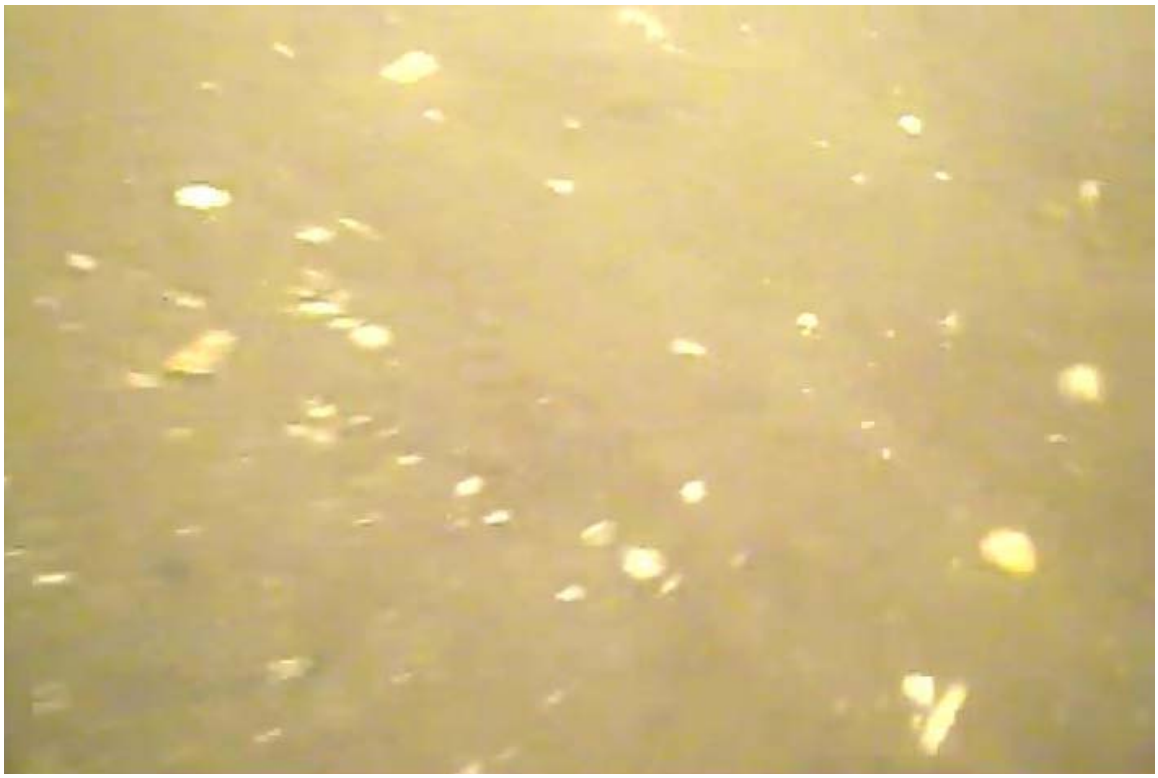


PNP-12



Appendix B: Video Survey Screen Captures

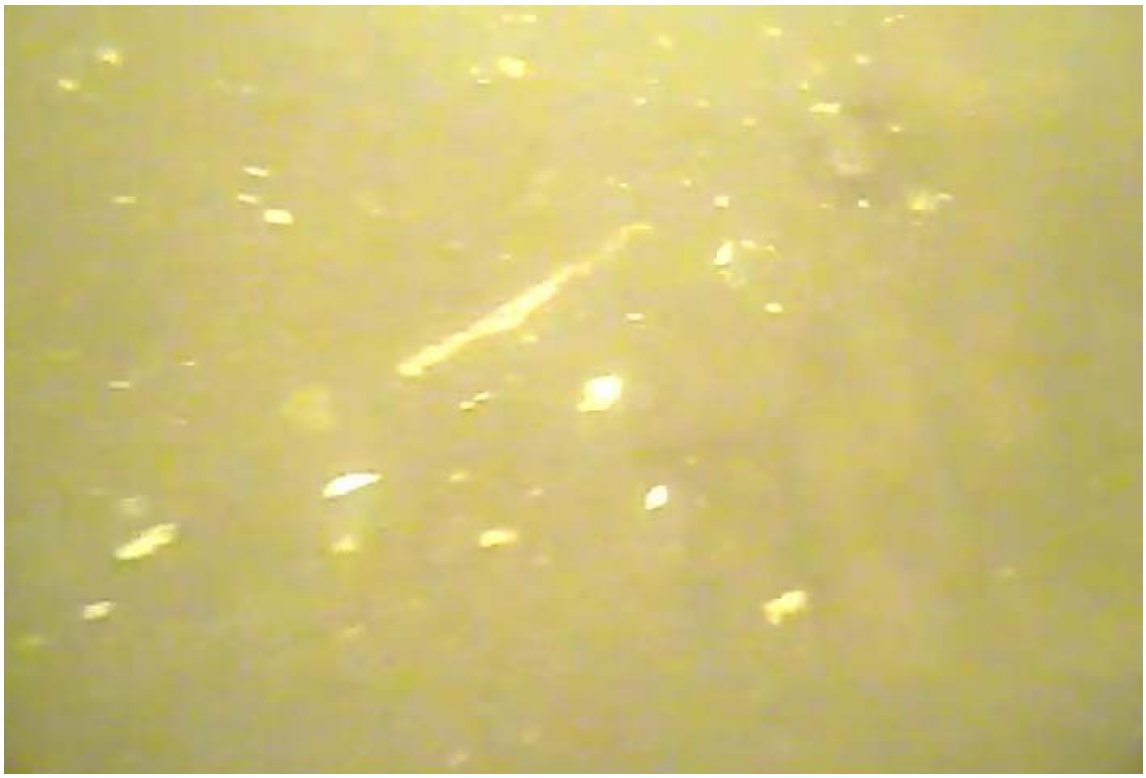
PNP-13



PNP-14

Appendix B: Video Survey Screen Captures

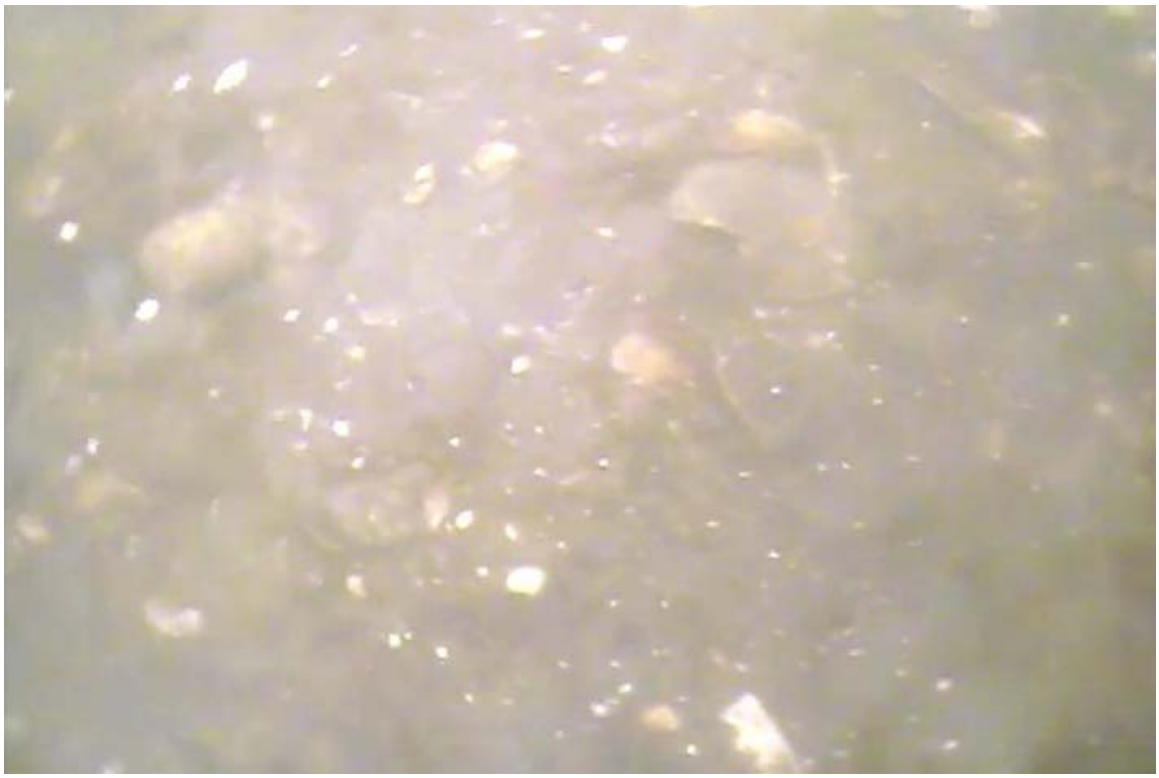
PNP-15



PNP-16

Appendix B: Video Survey Screen Captures

PNP-17



PNP-18

Appendix B: Video Survey Screen Captures

PNP-19

PNP-20

Appendix B: Video Survey Screen Captures

PNP-21

PNP-22

Connecticut Department of
Energy & Environmental Protection
Bureau of Water Protection & Land Reuse
Office of Long Island Sound Programs

ATTACHMENT F: DEPARTMENT OF AGRICULTURE / BUREAU OF AQUACULTURE

DEEP ~~PERMIT~~ CONSULTATION FORM

You need to complete and submit this form only if the subject site is located along the coastal area or in the municipalities as follows: south of Lyme or Essex on the Connecticut River; south of Orange and Derby/Ansonia on the Housatonic River; south of Norwich and Preston on the Thames River; or Lyme, Essex, Orange, Derby/Ansonia, Norwich or Preston and the activity includes dredging.

To the applicant- Prior to the submission of your permit application to the Connecticut Department of Energy and Environmental Protection- Office of Long Island Sound Programs (DEEP- OLISP), please complete Part I and submit this form to the Department of Agriculture, Bureau of Aquaculture ("DOA/BOA") (P.O. Box 97, Milford, CT 06460 or by facsimile at 203-783-9976) with a location map of your site and project plans. Once the DOA/BOA returns the completed form to you, please submit it along with your permit application to the DEEP.

Part I: *To be completed by APPLICANT*

1. List applicant information.

Name: **US Army Corps of Engineers**
Mailing Address: **696 Virginia Rd**
City/Town: **Concord** State: **MA** Zip Code: **01742**
Business Phone: **97*8-318-806** ext. Fax: **978-3188560**
Contact Person: **Valerie Cappola** Title: **Marine Ecologist**
E-mail: **valerie.a.cappola@usace.army.mil**

2. List engineer/surveyor/agent information.

Name:
Mailing Address:
City/Town: State: Zip Code:
Business Phone: ext. Fax:
Contact Person: Title:
Service Provided:

3. Site Location:

Street Address or Location Description: **Housatonic River and nearshore location off Point No Point**
City/Town: **Stratford** State: **CT** Zip Code:
Tax Assessor's Reference: Map Block Lot

4. Are plans attached? ☒ Yes ☐ No If Yes, provide date of plans:

Part I: *To be completed by APPLICANT (continued)*

5. **Provide or attach a brief, but thorough description of the project. Maintenance dredging of the Housatonic River of up to 100,000 cubic yards (cy) of predominantly sandy material from shoal areas south of the Route 1 bridge. These shoal areas could be dredged as deep as to - 14 feet MLLW but not to the authorized depth. Dredge material will be placed in the nearshore environment off of Point No Point, Stratford, CT. Shell material will be spread out and sandy material will be placed in berm (see map). Current available funding will most likely limit dredging to 50,000 cy and it will take approximatley 2-3 months to dredge between Oct 1 and March 31. Dredging will be completed with the Government-owned special purpose (hopper) dredge, Currituck, in 2012 and either the Currituck or a mechanical dredge will be used for future dredging when funding is available.**

Part II: *To be completed by DEPARTMENT OF AGRICULTURE / BUREAU OF AQUACULTURE*

This consultation form is required to be submitted as part of an application for a Structures, Dredging & Fill permit (section 22a-361 CGS) and/or Tidal Wetlands permit (section 22a-32 CGS) to the DEEP- OLISP. The application has not yet been submitted to the DEEP. Please review the enclosed materials and determine whether the project will significantly impact shellfish beds. You may also provide comments or recommendations regarding the proposal. Should you have any questions regarding this process, please call DEEP-OLISP at (860) 424-3034 to speak with the analyst assigned to the town in which the work is proposed. **Please return the completed form to the applicant.**

Section 22a-361(b) CGS requires that the Commissioner of the DEEP shall hold a public hearing on permit applications submitted pursuant to section 22a-361 CGS provided that a petition requesting such hearing signed by 25 or more persons is received **and** if the project will significantly impact any shellfish area, as determined by the Director of the Bureau of Aquaculture at the Department of Agriculture.

DEPARTMENT OF AGRICULTURE/ BUREAU OF AQUACULTURE DETERMINATION:

Project located on (check one): ☐ natural bed ☐ state bed ☐ local bed ☐ none
☐ other, please specify:

If project is located upon a franchised or leased shellfish bed, please provide the owner or lessee's contact information below.

Check one of the following:

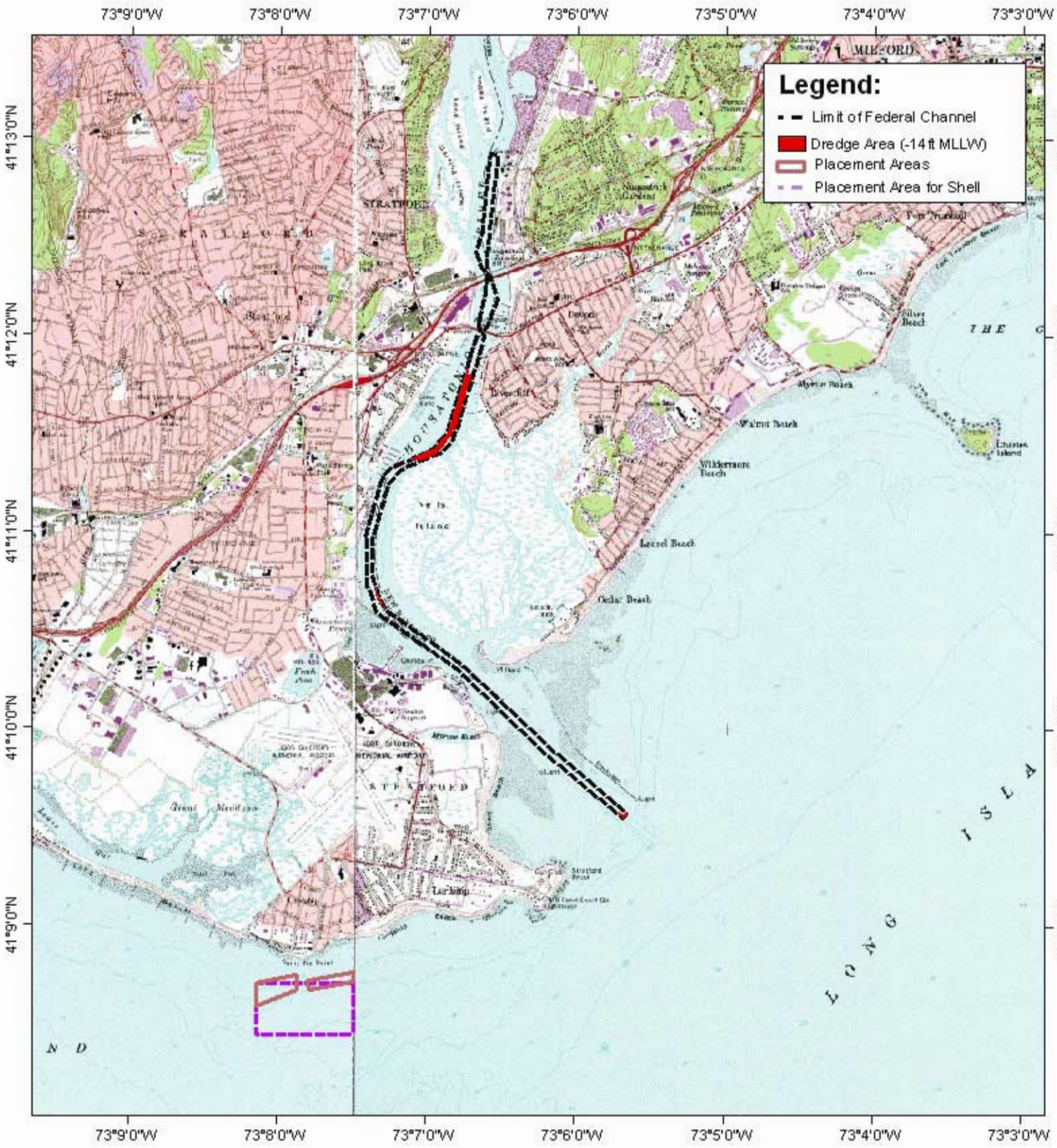
☐ I have determined that the work described in Part I of this form and attachments **WILL NOT** significantly impact any shellfish area.

☐ I have determined that the work described in Part I of this form and attachments **WILL** significantly impact any shellfish area and that a public hearing must be held if the DEP issues a public notice for the project as currently designed and a qualified petition is received.

COMMENTS/RECOMMENDATIONS (or check here if attached: ☐):

Signature of Commission Representative _____ Date _____

Print Name of Commission Representative	Title



US Army Corps of Engineers
New England District

HOUSATONIC RIVER FNP
STRATFORD AND MILFORD, CT
DREDGE AREAS FROM 2011 USACE SURVEY

0 2,500 5,000 7,500 10,000 Feet

0 0.8 1.2 1.8 2.4 Miles

1:50,000

USGS QUAD SHEETS 109 AND 110

GCS NAD1983

Attachment F: USACE -Department of Aqriculture Form

STATE OF CONNECTICUT
DEPARTMENT OF AGRICULTURE
BUREAU OF AQUACULTURE & LABORATORY

CONNECTICUT GROWN
THE LOCAL FLAVOR.

Valerie A. Cappola, Ph.D.
Marine Ecologist
U.S. Army Corps of Engineers
696 Virginia Road
Concord, MA 01742
valerie.a.cappola@usace.army.mil

May 24, 2012

Dear Valerie A. Cappola, Ph.D.

The Department of Agriculture Bureau of Aquaculture (DA/BA) has made a determination regarding the Housatonic River Federal Navigation Channel dredge project. The project anticipates achieving an approximate 12' MLW depth throughout the channel, which lies within the Town of Stratford's historic Public Natural Seed Oyster Bed, one of Long Island Sound's most productive natural seed beds. Although a dredge project such as this has the potential to severely impact oyster stocks and seed production within the river, it may be possible to minimize some of the adverse environmental impacts to the shellfish beds resulting from the dredging.

Background:

Oyster larvae are free swimming for two to three weeks. The oyster larvae respond to temperature, light, salinity and chemical cues in the water as to the locations that they will "set" or attach to a substrate, clean oyster shell being the preferred substrate. Survival of larvae depends on many factors including the presence or absence of appropriate types of plankton to feed on, presence or absence of harmful algal blooms, temperature fluctuations, salinity fluctuations, and distribution or displacement of larvae, just to name a few, however, properly managed and enhanced natural beds have a much greater likelihood of producing significant sets of oysters . Siltation and lack of clean oyster shell are the greatest deterrents to oyster setting.

Mitigation of Dredge Impacts in the Housatonic River:

The Bureau of Aquaculture in consultation with the Stratford Shellfish Commission Chairperson, Tim Barber has come up with a plan to at least partially mitigate impacts from this project, requiring several stages of work; 1) remove oysters from the channel prior to dredging, 2) use a private commercial suction vessel to remove a portion of shell from the channel and reserve the reclaimed shell outside of the channel, 3) transplant reclaimed oysters to several important Natural Beds to create protected spawning areas, and 4) move shell back into channel to reestablish shelled bottom in the dredged area. Three spawning beds would be created on the Bridgeport/Stratford State Natural Bed, an expansive bed which lies south of Lordship Beach and Long Beach, another in Fairfield State Natural Bed, and one on the Fish Island State Natural Bed in Darien. The creation of protected spawning beds would preserve existing mature and seed Housatonic oysters from the channel, rather than allowing them to be dredged and buried along with the sediment. However, due to the limitations of funding for the reclamation, not *all* shell will be able to be removed from the channel prior to the dredging, and some shell will be lost and buried with the creation of the berms. Upon completion of the dredge project, and after sufficient time has passed to allow the transport of any unconsolidated materials downstream, the DA/BA and Stratford Shellfish commission intend to place the oyster cultch back onto the dredged federal channel to reestablish the shelled bottom. This shelled substrate is essential to catching set again during subsequent spawning seasons. The placement of cultch is the preferred method to enhance and mitigate the dredging impacts and recreate a favorable habitat to reestablish oysters within that disturbed area.

Attachment F: USACE -Department of Aqriculture Form

Timing of the Dredging:

The transportation and deposition of sediments during July- September can significantly impact recruitment and retention of juvenile oyster spat, as even a thin layer of sediment on shells can prevent the larval oyster from setting. The ACOE dredge project is scheduled tentatively to begin after October 1st and be completed before the next shellfish spawning season.

Dredged Material Placement on the Stratford Natural Oyster Bed:

The DA/BA has consulted with ACOE for the past year on the possible placement of the dredged material, primarily fine and coarse sand, shell fragments, and shell. An initial proposal of beach nourishment in the area of "Point No Point", Stratford was abandoned due to the design limitations of the Currituck and the environmental conditions preclude accomplishing nourishment in this area. The proposal that was eventually agreed upon involves the creation of two berms using the dredged material including remaining oyster shell to enhance the eastern portion of the Stratford State Public Natural oyster seed Bed in an area just south of "Point No Point". In the area extending from just west of "Point No Point" to Stratford Point at the Housatonic River entrance, high energy conditions, swift currents and harsh wave action have removed most unconsolidated material from this area. The placement of fine and coarse sand is similar to what currently exists within the area, and additional shell fragments, shell and oysters can provide ecosystem services resulting from the increased structure. DA/BA and the Stratford Shellfish Commission would create a protected oyster spawning bed, in order to enhance the likelihood of juvenile oyster recruitment in the area. The development of a productive oyster bed in this area would assist in stabilizing the shoreline in this area, which is currently subject to severe erosion during storm events, and would provide additional water quality and habitat ecosystem services.

DA/BA has reviewed the ACOE modeling to justify the construction of the two berms off the shoreline of Point No Point for shoreline stabilization. The ACOE model note references that extreme storm events have the capacity to change the behavior of the berms and move sediments, and those types of simulations were not modeled. This specific area of Long Island Sound from "Point No Point" to Stratford Point is a dynamic environment, subject to significant wave action and high energies that has created severe shoreline erosion in the area. The DA/BA believes that the modeling should have looked at the project area under the conditions most likely to significantly impact the berm and distribution of the materials. However, in our best professional judgment, we believe that under extreme storm conditions the berms will erode and transport the berm material (consisting of oyster shell, fragments, and coarse grain material) within the overall described project area south of two berms. The distribution of this material throughout the project area would still create additional beneficial ecosystem services by providing additional surface area and structure and promoting habitat utilization and species diversity.

Determination of "No Impact" from Dredged Material Placement:

DA/BA cannot document, as requested by DEEP OLSIP, that no unacceptable impacts to shellfish beds would result from the dredged material placement in a wider distribution outside of the two berms during storm events. DA/BA lacks the resources to model or study the proposed work at the level necessary to document that the proposed activity will have no impact or comparable impact to a natural storm event. DA/BA cannot provide documentation to DEEP OLSIP that the placement of dredged material in the proposed project area would create NO unacceptable impacts to shellfish or finfish.

DA/BA has made a determination, based upon our best professional judgment, that short-term negative impacts due to the placement of dredge materials would be offset by the ecosystem services provided by the oyster shell and subsequent enhancement of oyster recruitment through the establishment of spawning beds. DA/BA has withdrawn our earlier request to ACOE to reclaim and redistribute the oyster shell south of the two proposed berms. The burial of oyster shell within the berms, and subsequent loss of associated ecosystem services may be short-lived, as disruption and redistribution of the berm materials by currents and storm surges is likely to redistribute the oyster shell.

Sincerely,

David H. Carey
Director