Benthic Survey of Cohasset Harbor
Cohasset, Massachusetts

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Introduction

A survey was made of invertebrate organisms living in and on the sediments of the bottom of Cohasset Harbor, MA. The primary goal was to identify effects of proximity to the site of input of sewage treatment plant effluent on the type and density of organisms found. Potential effects could result directly from toxicity, from direct deposition of organic matter, or from stimulation of excessive plant growth by nutrients. The survey was also intended to help assess the overall quality of the harbor environment and suggest whether additional control of contaminants may be required in the future.

There are difficulties in detecting direct effluent effects on benthic organisms in Cohasset Harbor. In some areas where sewage effluent is discharged, benthic community parameters can be explained by simple patterns of dilution with distance from a nearfield area with measurable effects to a far field area where recovery has taken place. These patterns are appropriate for rivers or for uniform marine habitats, but are difficult to apply here. As effluent from James Brook moves in the net current direction towards Massachusetts Bay it is also moving along a gradient of increasing salinity, grain size, and dispersion rate, and decreasing organic matter content. Transport of entrained effluent is complicated by the complex topography of the harbor. Deposition of effluent-derived solids will not be related to distance from the source, but to transporting currents and the location of subareas where low current and wave velocities will not erode fine sediments. Additional complications result from inputs of organic detritus and dissolved organic matter from surrounding marshes and pollutants from street runoff.

The unique topography and hydrography of Cohasset Harbor and the natural variability of shallow water systems makes it hard to identify a reference area which could be used to predict which benthic organisms would have been found there in the absence of sewage effluent and other pollution inputs.

As an alternative to a system in which nearfield and farfield sites can be easily defined, this study was designed to compare the inner cove with two coves, Baileys Creek and the northwest corner of the main anchorage ("Yacht Club Cove"), which are similar in having muddy sediments, freshwater and marsh inputs, and opening into the main anchorage basin. Direct comparisons can be made of organism density, species diversity, and presence of indicator species between the inner cove and these coves. The area north of Bryant Point is sandy and supports beds of eelgrass. This area is transitional between harbor and channel environments. This area was also sampled in order to complete a description of the benthic organisms found in the harbor for comparison with other harbors in the region.

A recent survey of Cohasset Harbor by the U.S. Army Corps of Engineers made on July 25, 1995 (unpublished data) provides information on benthic fauna outside the area sampled in the present study and on seasonal and long term variations in populations.

Methods

Four subareas were chosen within dredged embayments of the harbor with relatively level bottoms away from high velocity flow (Figure 1). Each subarea was gridded and the grids numbered horizontally and vertically. Five sample stations were then located in each subarea by randomly choosing two numbers for each station. The resulting station locations are shown in Figure 2. Samples were obtained on soft, silty bottom in the Inner Cove, Baileys Creek and Yacht Club Cove on May 15, 1996 and on hard sandy bottom in the Northeast Cove on June 10, 1996. Samples obtained on soft bottom were taken with a Ponar Grab (nominal sample area of 0.05 m^2) lowered by rope from the lobster boat *Miss Jane*. Samples were taken by slowly lowering the grab while the boat maintained its position relative to the bottom. Partially filled grabs were discarded and retaken. Sandy bottom samples were obtained with a 0.05 m^2 "Ekman Dredge" grab modified with handles with which it to could be pushed into the sediment from the surface and jaws closed to retain sediment. Deep water samples were taken from the Cohasset Harbormaster's skiff and shallow samples were taken by wading (sampling was carried out at low tide). Both samplers penetrated to between 10 and 15 cm.

When retrieved, the contents of the grabs (sediment and overlying water) were released into a large plastic tray. The sediment surface was described and a small (2.54 cm dia.) core was taken to describe vertical color changes associated with oxygen availability and animal activity. Water from the sample was sieved to 0.5 mm to retain any swimming or suspended organisms. This material and sediment was placed into buckets with tightly sealing lids, transported to the University of Rhode Island Graduate School of Oceanography and sieved to 0.5 mm with filtered sea water. Material retained by the sieve was preserved in 10% formalin with rose bengal dye to mark living organisms.

Preserved material was prepared for removal of organisms by washing out preservative, dye, and silt on 2, 1, and 0.5 mm sieves with fresh water. Large fragments of eelgrass and marsh plants were washed into the sieves with running water. This plant material and detritus retained on a 2 mm screen was sorted without magnification from glass trays. Material retained on 1 mm and 0.5 mm sieves were repeatedly suspended in water in a tall pitcher and decanted to separate organisms and fine plant material from sand and shell. These fractions were examined under low-power dissecting microscopes.

Organisms were identified to species in most cases. Taxa not identified to species include those represented by very small individuals or juveniles (*Crepidula*, *Harmothoe*) and those requiring special preservation or dissection for specific identification (Platyhelminthes, Rhynchocoela, Oligochaeta, *Peloscolex*). Small or damaged specimens which were similar to identified specimens were given that name rather than being reported as "unidentified". Counts of organisms and the volume of sample residue were entered on computer spreadsheets (MS Excel). The species names used in this data report were chosen to generally conform to a recent listing provided to the EPA EMAP Program by Versar Corp. Identified organisms were preserved in 70% alcohol and archived at the University of Rhode Island Graduate School of Oceanography.

Analysis of variance (one way ANOVA; SYSTAT) was used to test for significant differences of mean counts between subareas for each of the major species. Post-hoc tests used the Tukey HSD option for multiple comparisons to evaluate significant differences among each possible pair of subareas.

Data

Depths of stations and descriptions of the sediment surface appearance, depth of oxidation of sediments and components in sieve residues are given in Table 1. Mean counts per station of major species in each subarea are given in Table 2. Mean total individuals and species found in each subarea are listed at the end of the table. Total counts for all stations are given in Table 3, at the back of this report. The species list in Table 3 is a master list including all species reported in a 1995 U.S. Army Corps of Engineers survey of Cohasset Harbor.

Results

Substrate

At most sample locations within the Inner Cove (IC), Baileys Creek (BC), and Yacht Club Cove (YC) subareas, soft silty sediments allowed full penetration of the Ponar grab sampler. The bottom at two shallow YC stations was hard sand and rocks and the stations were moved to randomly chosen deeper locations.

In the Northeast Cove (NE) subarea, the fine sand bottom was difficult to penetrate and retain in the Ekman sampler. At most stations, several attempts were required before an adequate sample was obtained. It was not possible to obtain a sample at the chosen location of sample NE-3 which appeared to be on a shelly bar. This station was moved about 20 meters into deeper water.

The surface of most of the samples in areas IC, BC, and YC had a similar appearance. The sediment surface had a soft but stable dark brown surface layer (possibly benthic algae) over a 0.5-2 cm layer of light colored (oxidized) sediment over black (anoxic) organic silt. No burrows, tubes, or feeding traces made by benthic organisms could be seen in the field.

In the NE area the sediment surface was fine sand with polychaete burrows with slightly elevated rims spaced somewhat uniformly across the surface. The upper 0.5-3 cm was oxidized. Four of the samples had cohesive surface sediments. A shallow sample (NE-5) had a thin surface layer of wave-washed sand.

Most of the material retained after the samples were sieved was of plant origin. Intact tree leaves, marsh grass and eelgrass fragments were important components of samples IC-1, BC-2,3,4, and NE-2. Many of the samples in areas IC, BC, and YC had only fine plant

material in sieve residues (roots, leaf fragments, and fine fibers). Clean plant fibers were the predominant component of most of the IC samples.

Most of the sand in the NE area was finer than 0.5 mm and passed through the sieve used. Some coarse sand was obtained in the shallow stations (NE-1,5). Intact and broken shells of blue mussels and softshell clams were found in several YC area samples. Intact shells of razor clams, blue mussels, and periwinkles were found in NE area samples.

In this type of study, it is sometimes the case that deposits from poorly filtered sewage treatment effluent can be identified by constituents such as tomato seeds, hair, cigarette filters, and fragments of paper and plastic. In this study, during microscopic sorting, paint chips were seen, but no particles which could be related to sewage were found.

Organisms

A total of 55 taxa were identified in the samples. Twenty-nine species of polychaetes were found. These included species which were numerical dominants in all subareas (*Marenzelleria viridis*, *Streblospio benedicti*, *Polydora cornuta*, and *Capitella capitata*). The most abundant polychaete, *M. viridis*, had significantly higher densities in area NE relative to areas BC and YC. *S. benedicti* had very high density only in sample IC-1. *P. cornuta* and *C. capitata* and several less abundant species had highest densities in area NE. The relatively large and long-lived clam worm (*Neanthes virens*) was present in low numbers in area NE. In all areas infaunal polychaete species greatly predominated over epifaunal species.

Mollusks were not an important component of the benthic assemblage in Cohasset Harbor. A total of 13 species were recovered. The most abundant species was the blue mussel (*M. edulis*) which was represented only by very small juveniles. The few softshell clams (*Mya arenaria*) and surf clams (*Spisula solidissima*) collected were all juveniles less than one year old. A single adult razor clam (*Ensis directus*) was collected in sample NE-3.

Only nine species of crustaceans were collected. The most abundant species was the tube-dwelling amphipod, *Ampelisca abdita*. This species had higher densities in Baileys Creek than any of the other areas at the 90% confidence level. An epifaunal amphipod (*Gammarus lawrencianus*) was most abundant in sample BC-1 which contained a large volume of terrestrial plant material.

Oligochaete worms were abundant in all samples. Significantly higher densities of oligochaetes not identified to species were found in the Inner Cove than in Baileys Creek at the 95% confidence level or the Northeast Cove at the 90% confidence level. The oligochaete genus *Peloscolex* was found in small numbers in the NE area.

Discussion

Stressed benthic communities can be recognized by population parameters and by indicator species. Species richness in the Inner Cove was nearly identical to the physically similar Baileys Creek and Yacht Club Cove and a little less than in Northeast Cove samples.

The number of species in sample taken by the U.S. Army Corps of Engineers in July 1995 were similar to the numbers found here with the exception of one sample in a area of abundant eel grass with 27 species.

In the 1995 Corps of Engineers survey, five samples in the entrance channel were dominated by species adapted for clean, noncohesive sand and fully marine salinity levels. Most of these dominants were absent from all of the harbor samples obtained in 1996. A few channel species were found in the sandy NE area (*Nephtys picta, Spiophanes bombyx*).

Although only five samples were taken in the inner harbor in the Corps of Engineers survey, it offers a basis of comparison with the present study. Overall densities and patterns of abundance of many dominant species (oligochaetes, *P. cornuta, C. capitata, A. abdita*) were similar in both studies, although high density outliers were not collected in the smaller number of samples collected in the Corps of Engineers study. The small fast-growing bivalve, *Tellina agilis* was found in most samples in 1995, but was nearly absent in 1996. The polychaetes *M. viridis* and *S. benedicti* were less abundant in 1996 than 1995.

Several of the dominant species listed in Table 2 have been suggested as indicators of excess particulate organic matter in estuaries. These species are found in natural habitats such as marsh creeks and mussel beds. They consume organic particles, are able to survive low oxygen, varying temperature and salinity, and grow rapidly in the absence of predators and competitors. Unidentified oligochaete species are most abundant in the Inner Cove, however the oligochaete genus *Peloscolex*, a better known pollution indicator, was found in the NE area. The single high count of the pollution indicator *S. benedicti* at IC-1 is probably related to substrate rather than water or sediment quality. Four stress indicating polychaetes (*P. cornuta*, *C. capitata*, *Tharyx acutus*, and *Pygospio elegans*) are all most abundant in NE area samples.

Ampeliscid amphipods are sensitive to toxic metals and hydrocarbons although they are adapted for high levels of particulate organic matter. The significantly lower levels of *A. abdita* in the Inner Cove and Yacht Club Cove relative to Baileys Creek could be attributed to a toxic material rather than sediment properties. However, *A. abdita* was used in tests of toxicity of Inner Cove sediments by the Corps of Engineers in 1994 (unpublished data) with negative findings. This information and the fact that *A. abdita* has been called a "fugitive" species (Mills, 1969) because of its extreme temporal and spatial variability, makes it difficult to conclude that a pollutant effect is being shown in the Inner Cove.

The fauna in the Northeast area can be distinguished from the rest of the subareas in having relatively high abundance of species which are found throughout the harbor as well as

species unique to the area. Some of the species found in the Northeast area have been identified as indicators of organic enrichment. There is no reason to doubt that detrital food is abundant throughout the harbor. At this location deposit feeders can obtain organic particles from the water column, while a stable bottom provides an opportunity to construct burrows and tubes. The lower densities of some enrichment indicators in soft-bottomed areas may be caused by problems in occupying very high-water content, organic sediments.

The Inner Cove which is nearest the source of treatment plant effluent and the adjacent Yacht Club Cove have high densities of oligochaetes in common. While these are possible indicators of high organic loading, their abundance could also be related to the preferential deposition of fine organic detritus within these areas. These areas are not distinguished from other soft-bottomed areas by differences in total numbers of species or individuals or in relative abundance of any other species. It would be difficult to ascribe the low numbers of NE area species in soft bottom samples to pollutant effects. These species are found in highly contaminated sediments throughout this region and should be able to tolerate the moderate contaminated levels found in the deeper harbor areas. The apparent high rate of deposition of fine organic detritus in Cohasset Harbor is a function of very large salt marsh source areas and retention in dredged channels due to their depth and patterns of circulation in the harbor.

In conclusion, it might be expected that the Inner Cove would show some selectively high indications of stress due to its proximity to the James Brook outlet carrying effluent from the Cohasset WWTF. An indicator of organic enrichment found in the Inner Cove is the higher numbers of oligochaetes, but other indicators are not present. A truly stressed environment could also be expected to have indications such as reduced number of species relative to the other subareas, and this is not found here. Community composition is not indicative of a selectively stressed environment. Species characteristic of toxic and/or hypoxic environments are lacking. The differences we see between the soft bottoms in Cohasset Harbor and other, more undeveloped coves, can be attributed largely to the presence of dredged areas and the resulting sedimentation.

References

Mills, E.L., 1969. The community concept in marine zoology with comments on continua and instability in some marine communities. J. Fish. Res. Bd. Can. 26: 1415-1428.

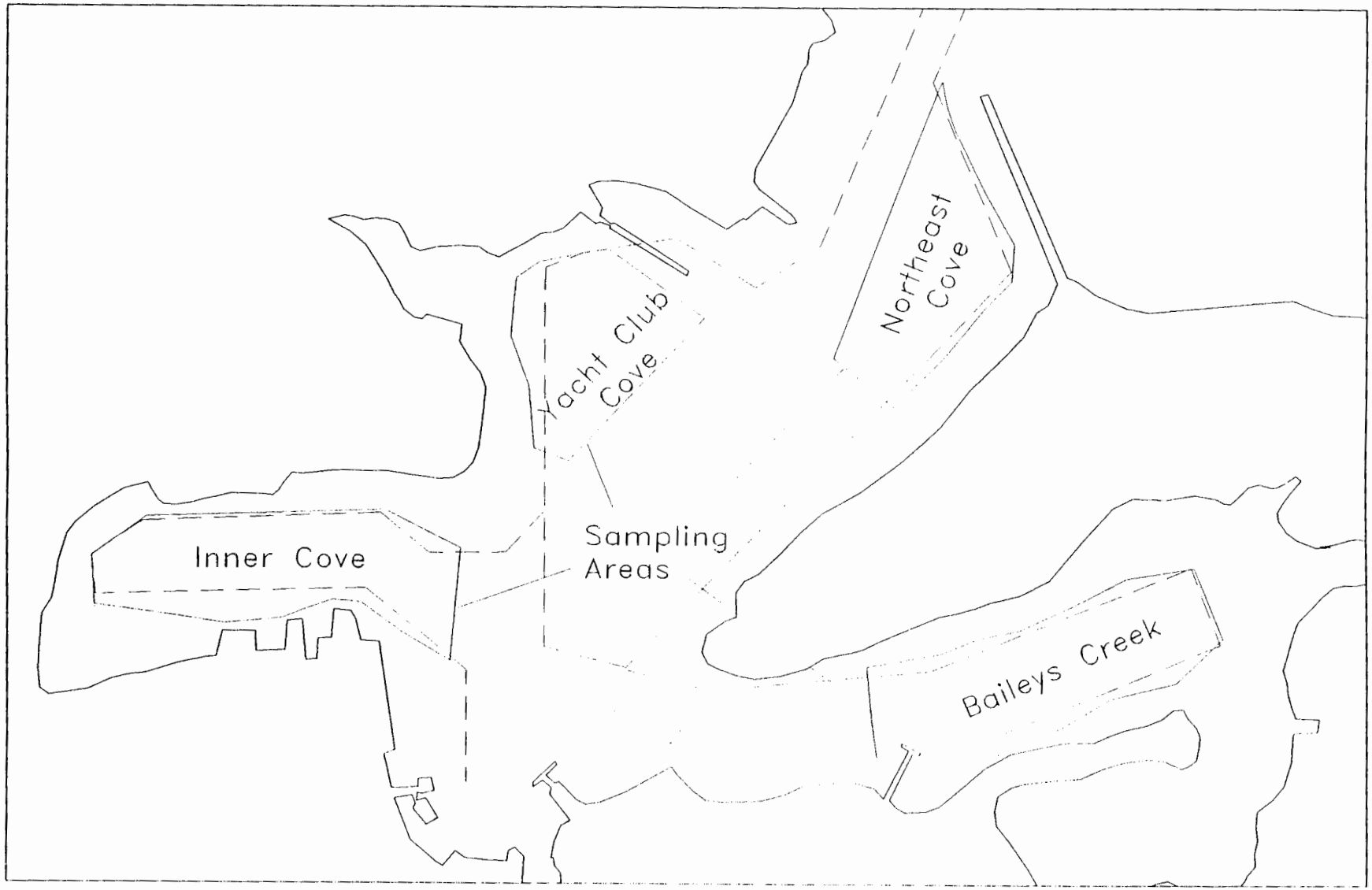


Figure 1. Sampling areas used for the Cohasset Harbor benthic survey.

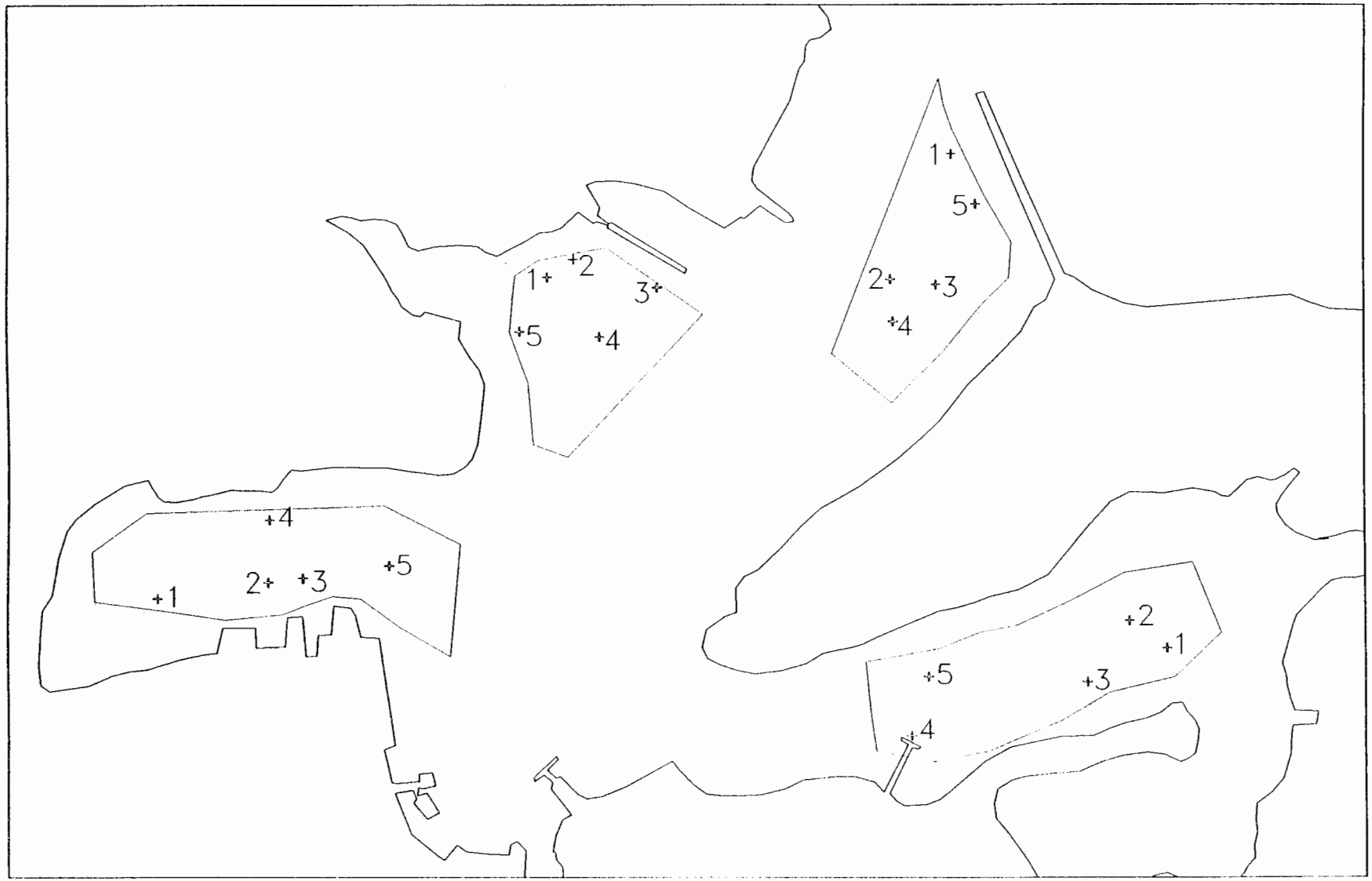


Figure 2. Locations of sampling stations for Cohasset Harbor benthic survey

Table 1. Observations on benthic samples taken from Cohasset Harbor

Sample No.	Depth (feet, MLW)	Comments on sample	Sieve residues	
			Volume (cm^3)	Constituents (in order of abundance)
Inner Cove				
1	1	~0.5 cm tan layer over black mud	700	Tree leaves; plant particles; sand
2	8	2 cm tan layer over black mud	100	Plant fibers
3	6	Dark brown film (algae?) overlies 1.3 cm tan layer over black mud	150	Plant fibers
4	5	Dark brown film over 2 cm tan layer over black mud	50	Plant fibers; plant particles
5	7	0.5 cm tan layer over 2.5 cm gray layer over black mud	175	Plant roots and fibers; traces sand, gravel
Baileys Creek				
1	1	Rather liquid; marsh detritus over sand	250	Organic sediment particles, sand, tr. fine shells
2	6	Sparse dark brown layer over 0.5 cm tan layer over black mud	340	Coarse plant fibers/particles; fine plant material
3	6	Some dark film on surface; 0.5 cm tan layer over black mud	300	Coarse plant material; fine plant material
4	5	1.8 cm tan layer over black mud	235	Coarse (oak leaves/marsh grass/Zostera), fine plant material
5	6	Dark brown film over 1 cm tan layer over black mud	200	Coarse plant material; fine plant material
Yacht Club Cove				
1	6	Dark brown film over 1 cm tan layer	300	Shell hash (Mytilus, Mya); plant fibers
2	5	0.5 cm tan layer over black mud	575	Shell hash; tree leaves; plant particles/fibers
3	7	Dark brown film over 0.5 cm tan layer; gray down to 2 cm	300	Plant roots, particles; few Zostera
4	7	Dark brown film, 0.5 cm tan, 1 cm gray over black mud	350	Sand; Mytilus shells; plant rhizomes, particles
5	1	Shallow sample of dense substrate; 1.5 cm oxidized layer (gray, not tan)	200	Organic sediment particles; pebbles; rock
Northeast Cove				
1	1	1 cm light gray over dark gray sand	160	Granules; sand; plant particles; plant fibers
2	7	0.5 cm light gray over dark gray sand; elevated tube openings at surface	300	Zostera leaves and fragments; plant particles; Ensis shells
3	4	3 cm light gray over dark gray sand; elevated tube openings at surface	150	Coarse sand; Ensis shells; plant particles; Littorina shell
4	4	0.5 cm light gray over dark gray sand; elevated tube openings at surface	150	Plant particles; Mytilus shell
5	1	1 cm light gray over dark gray sand; loose sandy surface	340	Medium sand; coarse sand; granules; plant particles

Table 2. Mean and standard deviation of counts of major species of benthic fauna from each of the sample areas for the Cohasset Harbor benthic study, May/June, 1996.

	Inner Cove		Yacht Club Cove		Baileys Creek		Northeast Cove		
	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.	Significant Differences
MOLLUSCA									
BIVALVIA									
Mytilus edulis spat	4.2	3.4	7.6	8.3	6.4	9.3	0.2	0.4	
POLYCHAETA									
Capitella capitata	18.8	24.9	7	6.6	17	12.9	48.6	40.6	
Leitoscoloplos fragilis	2.2	3.9	0.6	1.3	1.8	1.8	0.6	0.5	
Marenzelleria viridis	141.8	255.6	33.2	22.5	7.4	6.4	333.6	192.6	NE>YC**,BC**
Neanthes virens	0	0.0	0.5	0.6	0.4	0.5	2.8	3.8	
Polydora cornuta	3.6	4.1	1.2	1.8	1.4	1.5	200.8	344.9	
Pygospio elegans	0.6	0.9	0.4	0.5	0	0.0	5.6	5.6	NE>IC*,YC**,BC**
Spiophanes bombyx	0.2	0.4	0	0.0	0	0.0	8.4	14.5	
Streblospio benidicti	296.6	645.9	7.4	5.2	19	19.1	3.6	3.0	
Tharyx acutus	3	2.5	1.4	1.3	0.4	0.5	3.4	1.1	BC<IC*,NE**
OLIGOCHAETA	436	357.4	165.6	101.0	54	29.3	57.6	55.5	IC>BC**,NE**
Peloscolex	0.6	0.9	0.2	0.4	0.2	0.4	1.6	2.1	
CRUSTACEA									
AMPHIPODA									
Ampelisca vadorum/abdita	3.8	2.7	2	1.2	35.2	38.6	1.6	2.1	BC>IC*,YC*,NE*
Gammarus lawrencianus	0.8	1.1	1.6	2.2	4.2	9.4	0	0.0	
number of species	12.4	1.8	12.2	3.7	12.2	3.3	14.6	2.7	
number of individuals	916.8	870.9	234.8	105.5	158.6	57.9	679	409.0	

* Indicates significant difference at the 5% to 10% level from the indicated station

** Indicates significant difference at the less than 5% level from the indicated station

Table 3. Counts of benthic fauna from Cohasset Harbor benthic study, May/June, 1996

	Inner Cove					Yacht Club Cove				
	1	2	3	4	5	1	2	3	4	5
Sample Number	1	2	3	4	5	6	7	8	9	10
PLATYHELMINTHES		1								
RHYNCHOCOELA										
Cerebratulus										
Micura										
Rhynchocoela spp.							1			
MOLLUSCA										
GASTROPODA										
Crepidula sp.										
Littorina littorea										5
Lunatia heros										
Nassarius trivittatus									1	
BIVALVIA										
Ensis directus			1						1	
Gemma gemma										
Hiatella arctica										
Macoma balthica										
Mulinia lateralis							1			
Mya arenaria	3						1			
Mytilus edulis spat	1	4	9	6	1	2	20	12	4	
Spisula solidissima										
Tellina agilis										
POLYCHAETA										
Amastigos caperatus										
Arenicola			1							
Aricidea catherinae		1							1	2
Asabellides oculata	1									
Capitella capitata	63	5	13	5	8	15	13	5	1	1
Clymenella torquata										
Eteone heteropoda	1									
Eteone longa										
Eulalia viridis							2			
Exogone hebes										
Glycera dibranchiata	1									
Harmothoe sp							1	2		
Leitoscoloplos fragilis	9				2					3
Lumbrineries tenuis										
Macroclymene zonalis										
Marenzelleria viridis		39	598	30	42	65	20	29	45	7
Micropththalamus abberans					1					
Neanthes succinea							1			
Neanthes virens						1			1	
Nephtys neotenis				1	5				1	
Nephtys picta										
Nephtys caeca?						1		1		
Orbinia sp										

Table 3. (Continued)

	Inner Cove					Yacht Club Cove				
	1	2	3	4	5	1	2	3	4	5
Sample Number	1	2	3	4	5	6	7	8	9	10
Paraonis fulgens										
Phloe minuta										
Phyllodoce arenea										
Phyllodoce sp.										
Polycirrus sp.										
Polydora cornuta	8		8	2			2			4
Polydora quadrilobata					1	1				
Polydora socialis					2					
Pygospio elegans	1		2			1	1			
Scolelepsis squamata										
Spiophanes bombyx			1							
Spio sp.										
Stauroneries rudolfi										
Streblospio benidicti	1452	7	5	7	12	2	5	7	7	16
Streptosyllis varians										
Tharyx acutus	1	1	4	2	7	2			3	2
Tharyx sp.									1	
Nicolea zostericola							5			
OLIGOCHAETA	830	92	158	291	809	74	262	88	287	117
Peloscolex	1				2				1	
CRUSTACEA										
CUMACEA										
Diastylis sculpta										
Oxyurostylis smithi										
AMPHIPODA										
Acanthohaustorius intermedius										
Ampelisca vadorum/abdita	2	8	2	2	5	3	2		3	2
Corophium insidiosum				1						
Gammarus lawrencianus		2		2			4	4		
Ischyrocerus anguipes										
Hemiaegina minuta										
Melita dentata				1						
Microdeutopus gryllotalpa							1			
Protohaustorius deichmannae										
Unciola irrorata										
DECAPODA										
Carcinus maenas	1									
Crangon septemspinosus									1	
Pagurus longicarpus										
ECHINODERMATA										
Echinoidea sp.										
number of species	15	10	12	12	13	11	17	8	15	10
number of individuals	2375	160	802	350	897	167	342	148	358	159

Table 3. (Continued)

	Baileys Creek					Northeast Cove				
	1	2	3	4	5	1	2	3	4	5
Sample Number	11	12	13	14	15	16	17	18	19	20
PLATYHELMINTHES										
RHYNCHOCOELA										
Cerebratulus						1				
Micura				1						
Rhynchocoela spp.		1						1		
MOLLUSCA										
GASTROPODA										
Crepidula sp.						1				
Littorina littorea										
Lunatia heros										
Nassarius trivittatus							1			
BIVALVIA										
Ensis directus					1			1		
Gemma gemma	4			1						
Hiatella arctica										
Macoma balthica										
Mulinia lateralis						1				1
Mya arenaria	1	1			2					
Mytilus edulis spat	2	4	2	23	1			1		
Spisula solidissima								7	3	
Tellina agilis	1									
POLYCHAETA										
Amastigos caperatus										
Arenicola										
Aricidea catherinae										
Asabellides oculata										
Capitella capitata		9	31	28	17	18	8	110	63	44
Clymenella torquata										
Eteone heteropoda										
Eteone longa										3
Eulalia viridis						1				
Exogone hebes						2				
Glycera dibranchiata									1	
Harmothoe sp	1			2				1		
Leitoscoloplos fragilis	2	4	3				1	1	1	
Lumbrineries tenuis	8									
Macroclymene zonalis										
Marenzelleria viridis	2	8	6	3	18	214	264	676	267	247
Micropththalamus abberans	17	1								
Neanthes succinea	9				1		4			
Neanthes virens	1			1			4	1	9	
Nephtys neotenis										
Nephtys picta								3		
Nephtys caeca?										
Orbinia sp										

Table 3. (Continued)

	Baileys Creek					Northeast Cove				
	1	2	3	4	5	1	2	3	4	5
Sample Number	11	12	13	14	15	16	17	18	19	20
Paraonis fulgens										
Phloe minuta										
Phyllodoce arenea										
Phyllodoce sp.									11	
Polycirrus sp.										
Polydora cornuta	3	3	1			10	20	120	813	41
Polydora quadrilobata					1					
Polydora socialis							2			
Pygospio elegans							5	15	5	3
Scolelepsis squamata										
Spiophanes bombyx								6	34	2
Spio sp.										
Stauroneries rudolfi										
Streblospio benidicti	24	8	50	2	11		4	4	2	8
Streptosyllis varians										
Tharyx acutus	1	1				3	2	4	3	5
Tharyx sp.										
Nicolea zostericola										
OLIGOCHAETA	98	68	33	26	45	16	143	31	14	84
Peloscolex			1				5	2		1
CRUSTACEA										
CUMACEA										
Diastylis sculpta		1								1
Oxyurostylis smithi										
AMPHIPODA										
Acanthohaustorius intermedius										
Ampelisca vadorum/abdita	28	102	23	2	21			2	5	1
Corophium insidiosum		1		1		1				
Gammarus lawrencianus	21									
Ischyrocerus anguipes							3			
Hemiaegina minuta										
Melita dentata										
Microdeutopus gryllotalpa										
Protohaustorius deichmannae										
Unciola irrorata							1	1		
DECAPODA										
Carcinus maenas										
Crangon septemspinosus						1				
Pagurus longicarpus										
ECHINODERMATA										
Echinoidea sp.										
number of species	17	14	9	11	10	12	15	19	14	13
number of individuals	223	212	150	90	118	269	467	987	1231	441

SECTION 3-A

SEDIMENT TESTING IN COHASSET COVE

NOVEMBER 16, 1995

SEDIMENT TESTING IN COHASSET COVE

Prepared for

TUTELA ENGINEERING

Prepared by

NUCCI VINE ASSOCIATES, INC.
NEWBURYPORT, MA

NOVEMBER 16, 1995

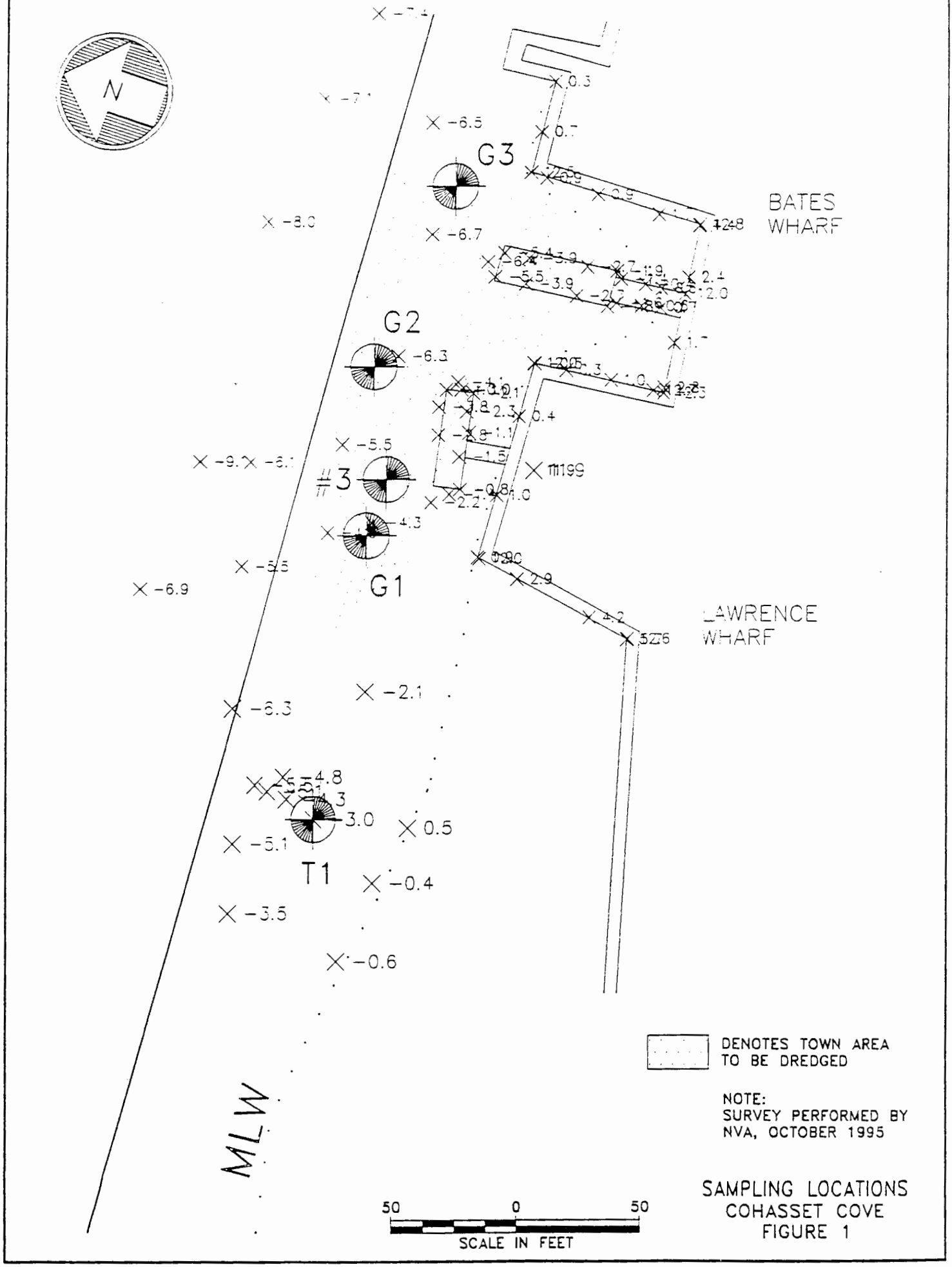
Report for Tutela Engineering on
Sediment Testing in Cohasset Cove

As requested by the Town of Cohasset and Tutela Engineering, Inc., Nucci Vine Associates, Inc. (NVA) recovered one sediment sample (identified as T-1 on Figure 1) in Cohasset Cove on October 18, 1995. This sample was collected while NVA was performing other related work for the Town of Cohasset Harbor Dredging Project. This sediment sample, along with three others taken from the Lawrence Wharf area of the cove, were forwarded to ThermoAnalytical Lab in Waltham, MA for chemical analysis.

The sample T-1 was tested for eight (8) metals, including arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc, as well as for total petroleum hydrocarbons (TPH), polyaromatic hydrocarbons (PAH), PCBs, and volatile organic compounds (VOC). The test results are included in Attachment A and are summarized in Table I.

As shown on Table II, according to the DEP Criteria for Classification of Dredge Material (314 CMR 9.07), sample T-1 is classified as Category Two, with elevated levels of arsenic, lead, and mercury. This finding is consistent with other samples gathered by NVA in Cohasset Cove, which would also be classified as Category Two. (See Table III for summary of other sample data.)

This recent testing in the cove area supports the findings of the Army Corps of Engineers (ACOE) which tested sediments in the Federal Navigation area of the cove in 1993 and 1994. The sediments they tested were also found to be Category Two with elevated mercury and lead levels. Category Two material is considered questionable for ocean disposal and additional biological testing is often required if ocean disposal is to be pursued. In the case of the ACOE, they performed the additional biological testing and it showed that the material in the Federal portion of the cove was unlikely to bioaccumulate in marine life and was, therefore, suitable for ocean disposal. Similar biological testing would need to be performed on the sediments in the Town-controlled sections of the cove before the suitability of these sediments for ocean disposal could be determined by the regulatory agencies.



SAMPLING LOCATIONS
COHASSET COVE
FIGURE 1

TABLE I

SUMMARY OF TEST RESULTS FOR SAMPLE T-1

COHASSET COVE
November 1995

Sample No. T-1. Sample recovered on October 18, 1995 by hand auger, as located on attached site plan. Sample taken to approximate depth of -6 MLW.

Results of Laboratory Analysis:

Parameter	Result	Detection Limit	Units
Arsenic	15.1	2.01	mg/kg
Cadmium	undetected	2.01	mg/kg
Chromium	94.3	8.04	mg/kg
Copper	80.3	4.02	mg/kg
Lead	170	2.01	mg/kg
Mercury	0.93	0.20	mg/kg
Nickel	24.1	6.03	mg/kg
Zinc	180	8.04	mg/kg
TPH	834	26.3	mg/kg
PAH	11,000 (pyrene)	7,600	ug/kg
PCB	undetected	150	ug/kg
VOC	300 (acetone)	26	ug/kg

TABLE II

SAMPLE T-1

Evaluation of Test Results in Relation to DEP Criteria for Classification of Dredge Material (314 CMR 9.07)

Arsenic	Category Two	(10-20 ppm)
Cadmium	Category One	(< 5 ppm)
Chromium	Category One	(< 100 ppm)
Copper	Category One	(< 200 ppm)
Lead	Category Two	(100 - 200 ppm)
Mercury	Category Two	(0.5 - 1.5 ppm)
Nickel	Category One	(< 50 ppm)
Zinc	Category One	(< 200 ppm)
PCB	Category One	(< 0.5 ppm)
VOC	Category One	(< 5%)
TPH	Category One	(< 0.5%)
PAH	No classification	

General Classification - Category Two

Since grain size was not performed on this sample, % silt/clay is uncertain; however, based on other recent samples taken near sample site T-1, it is presumed material would be Type A with less than 60% silt/clay fraction.

TABLE III

SUMMARY OF OTHER RECENT SAMPLE DATA
FROM COHASSET COVE

Parameter	Sample Number			
	G-1	G-2	G-3	#3
Arsenic (mg/kg)	5.49	11.5	9.91	8.6
Cadmium (mg/kg)	u	u	u	2.7
Chromium (mg/kg)	20.4	88.0	70.2	89
Lead (mg/kg)	38.8	145	96.6	181
Mercury (mg/kg)	0.49	0.22	0.87	0.3
Copper (mg/kg)	--	--	--	101
Nickel (mg/kg)	--	--	--	21
Zinc (mg/kg)	--	--	--	213
TPH (mg/kg)	174	522	249	700
PCB (ug/kg)	u	u	u	18
PAH (ug/kg)	2,000	4,600	3,600	22,000
VOC (ug/kg)	14	300	490	--
Moisture (%)	--	--	--	54%
Oil & Grease (ppm)	--	--	--	1,000
% Silt/Clay	--	--	--	17.8%

Note: Samples G-1, G-2, and G-3 were recovered 10/18/95.
Sample #3 was recovered 3/22/95.