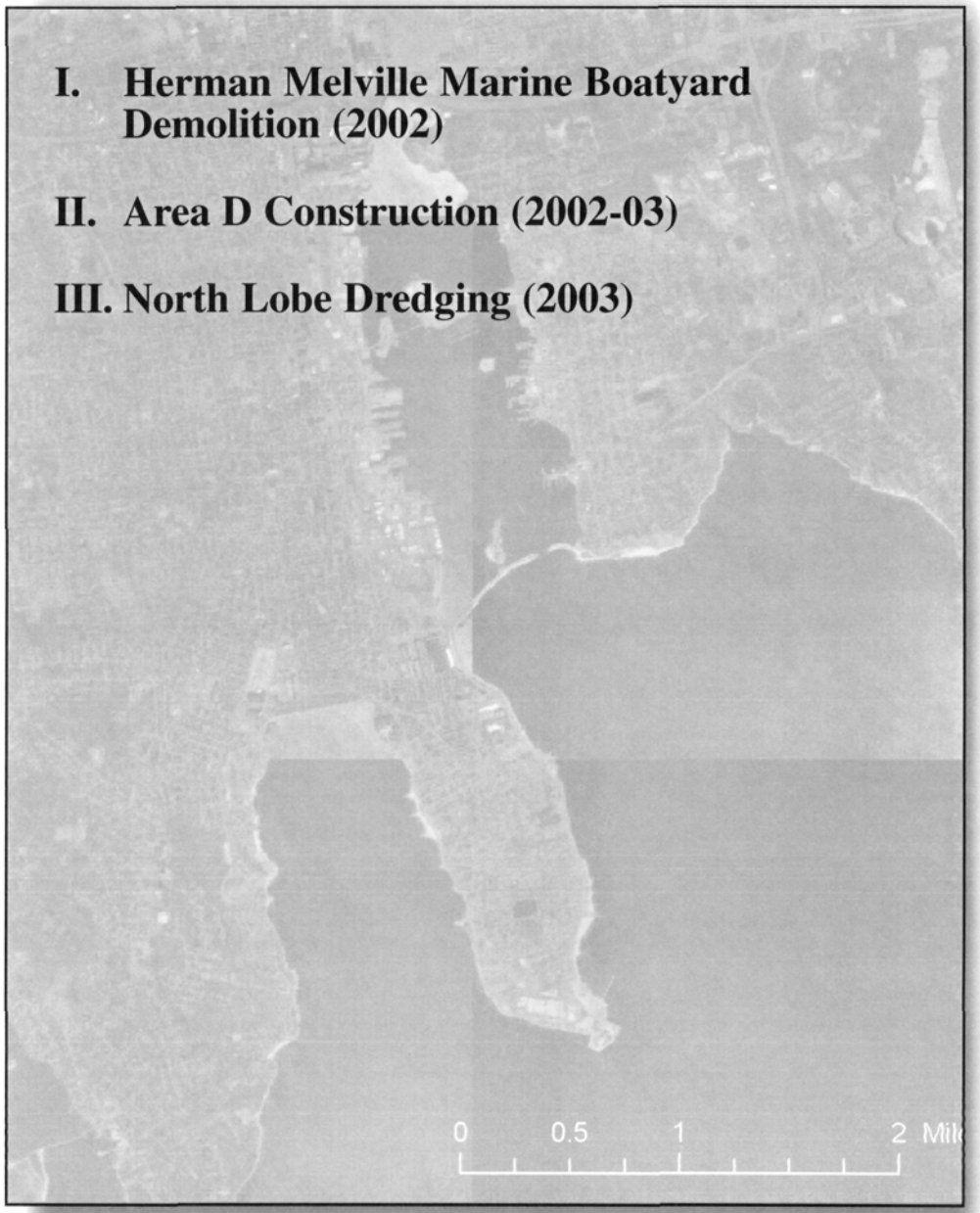
RETURN TO UAO AR INDEX

U.S. Army Corps of Engineers
New England District

U.S. Environmental Protection Agency

Water Quality Monitoring Summary Reports 2002-2003

New Bedford Harbor Superfund Site - New Bedford, Massachusetts



I. Herman Melville Marine Boatyard Demolition (2002)

II. Area D Construction (2002-03)

III. North Lobe Dredging (2003)

Prepared by:

ENSR INTERNATIONAL
ENSR Corporation

Woods Hole Group
Woods Hole Group Environmental Laboratories

CR ENVIRONMENTAL, INC. WBE
CR Environmental

Contracts:
DACW33-02-D-0006
Task Order 0001
DACW33-02-F-0037
ENSR Document No.
09090-024-1000

CV04003d

March 2004

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U.S. Army Corps of Engineers
New England District

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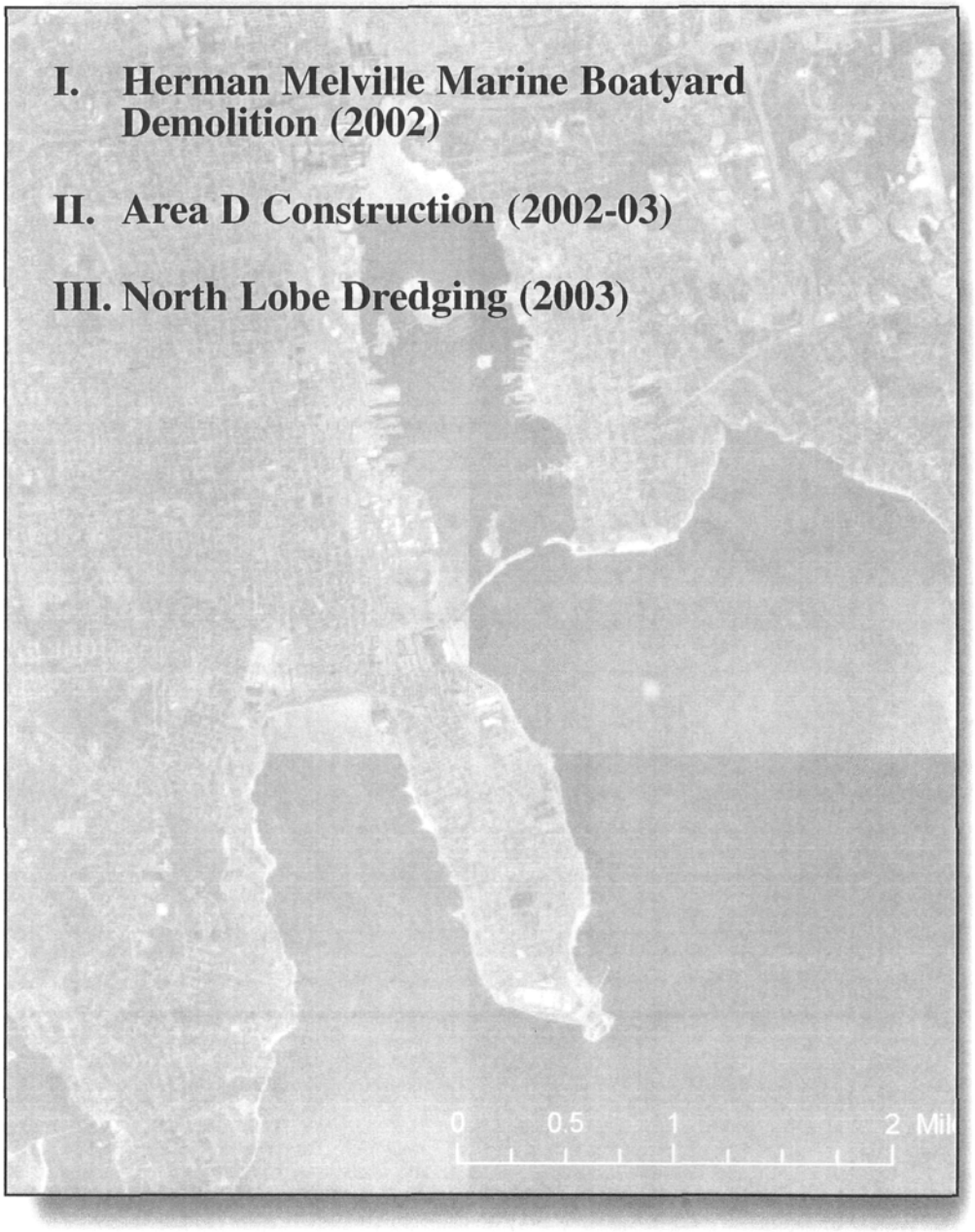

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CV04003d

March 2004

I. HERMAN MELLVILLE

U.S. Army Corps of Engineers
New England District

U.S. Environmental Protection Agency

Water Quality Monitoring Summary Report

I. Herman Melville Marine Boatyard Demolition (March-July 2002)

New Bedford Harbor Superfund Site - New Bedford, Massachusetts

Prepared by:

ENSR INTERNATIONAL
ENSR Corporation

Contract:
DACW33-02-F-0037
ENSR Document No.
09090-024-1000

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Draft Final
November 2003

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EXECUTIVE SUMMARY

As part of preparation for the remediation of the New Bedford Harbor Superfund Site, derelict vessels were removed from the former Herman Melville Marine Boatyard in New Bedford, Massachusetts. Sediments in the vicinity of the Boatyard contain elevated levels of PCBs, other organic compounds, and metals, most notably copper from previous industrial activities in the area. The demolition and removal of the derelict vessels had the potential to release suspended solids and associated contaminants into the water column. As a result, the contractor performing the vessel removal was required to install and maintain a full-depth turbidity curtain/oil-boom around the entire in-water perimeter of the site.

In addition to the turbidity controls, a water quality monitoring program was developed by the USACE and USEPA to ensure that the vessel removal was carried out in a manner that did not result in acute impacts to organisms within the water column adjacent to the construction or in significant transport of contaminated sediments outside of the work zone. The monitoring program included site inspections to help ensure that the construction contractor was implementing site environmental controls such as turbidity curtains and the removal of floating demolition materials. The program also included boat-based water column monitoring to measure turbidity down-current of the work area for comparison against a project specific turbidity criterion (50 NTU above background at 300 ft down-current of the work area). In the event of a turbidity criterion exceedence the collection of water samples for biological testing and chemical analyses were defined by the program.

Demolition/removal activities began in March 2002 and were completed in July 2002. The water quality monitoring revealed that the site controls were successful in limiting suspended sediment transport and protective of water quality. There were no exceedences of the project specific turbidity criterion. Water sampling performed directly within the work zone and follow up toxicity testing revealed that the 50 NTU criterion was ecologically protective.

1.0 INTRODUCTION

New Bedford Harbor is located approximately 50 miles south of Boston on the waters of Buzzards Bay in Bristol County, Massachusetts. The sediments in many areas of the Harbor are contaminated with polychlorinated biphenyl's (PCB's) and metals, primarily from the manufacture of electrical components which occurred in the area between 1940 and the mid-1970's. Based on human health concerns and ecological risk assessments, the U.S. Environmental Protection Agency (USEPA) added New Bedford Harbor to the National Priorities List in 1982 as a designated Superfund Site, and stipulated that remedial measures were required to remove PCB-contaminated sediments from the Harbor. Through an Interagency Agreement between the USEPA and the U.S. Army Corps of Engineers, New England District (USACE), the USACE is responsible for carrying out the design and implementation of the remedial measures.

The New Bedford Harbor Superfund Site extends from the shallow northern reaches of the Acushnet River estuary, south through the commercial harbor of New Bedford and out beyond the City's hurricane barrier into 17,000 adjacent acres of Buzzards Bay. The Superfund Site is divided into three areas: the Upper, Lower and Outer Harbors (Figure 1) defined by geographical features of the Harbor and gradients of sediment contamination. The industrial discharge of PCB contaminated waste, either directly into the Harbor or indirectly through the City's sewer system, was most significant in the Upper Harbor. The location of the associated discharge and the hydrodynamics of the Harbor contributed to the deposition of significant levels of PCB contamination in the Upper Harbor. The highest PCB concentrations or "hot-spots", which contained PCB concentrations in excess of 100,000 ppm, resided in the sediments located in the immediate area of the discharge. These "hot-spot" sediments were removed between 1994 and 1995 as part of the USEPA's first cleanup phase (USEPA, 1997). The remaining sediments in the Upper Harbor, an area of approximately 190 acres, are still heavily contaminated, with PCB concentrations as high as 4,000 ppm.

Future remedial dredging efforts are planned for the Upper Harbor and portions of the Lower Harbor. Until the remedial action has been completed, any in-water construction activities that disturb the contaminated sediments require a water quality monitoring program be developed to ensure that the construction operation is carried out in a manner such that:

- The disturbance of the contaminated sediments does not result in any acute impact to organisms within the water column outside the construction area.

- There is not significant transport and deposition of sediments and their associated contaminants outside the construction zone to uncontaminated areas or areas that have already been remediated.

As part of the construction of the Area D de-watering facility in the Lower Harbor that will be used in the overall remediation, the abandoned vessels located at the former Herman Melville Marine Boatyard had to be removed (Figure 2). Sediments at the Boatyard contain elevated levels of PCBs, organic compounds, and metals, most notably copper from previous industrial activities in the area. The activities associated with demolition and removal of the abandoned concrete, steel and wood vessels from the Boatyard had the potential to release contaminants into the water column from sediment disruption. Therefore, the contractor performing the vessel demolition and removal was required to install and maintain a full-depth turbidity curtain/oil-boom around the entire in-water perimeter of the site. A water quality monitoring program was also required to ensure that the environmental goals defined above were met.

Demolition/removal activities began in March 2002 and were completed in July 2002. This work was performed by MAT Marine under contract to the USACE. Performance of the monitoring program and preparation of this summary report were carried out by ENSR, under contract to the USACE. The monitoring revealed that the site controls were successful in meeting the goals defined above and limiting overall impacts to water quality. This report provides a summary of the demolition/removal activities and the associated water quality monitoring program, as well as a summary and discussion of the results of the monitoring.

2.0 CONSTRUCTION SUMMARY

The former Herman Melville Marine Boatyard is located along the western shore of Lower New Bedford Harbor (Figure 1), approximately one-half mile south of the I-195 Bridge. Demolition operations consisted of the removal of 17 vessels from the site, sorting of hazardous materials from the demolition debris, and transportation of materials off site. The abandoned vessels and barges to be removed were in various stages of disrepair ranging from floating to completely sunken and resting on the bottom.

Prior to initiation of the demolition, a full depth silt curtain with boom was installed around the entire work area to contain any sediment, oils or floatables released during demolition activities. Piles were driven around the work area to secure the silt curtain. A work boat was responsible for maintaining the silt curtain/boom, and monitoring for any oil slicks or floating debris. Demolition/removal activities began in March 2002 and were completed in July 2002.

Various techniques were used to remove the abandoned vessels and barges. Removal technique was determined based on vessel/barge material. Concrete and wood vessels were removed with an excavator (Figure 3). Steel vessels were broken into manageable pieces with a guillotine and the pieces removed with an excavator (Figure 4). Hazardous materials such as oil and asbestos contained within the vessels, wood that had been in contact with contaminated Harbor sediments, and stained concrete were removed and segregated from non-hazardous demolition materials.

3.0 WATER QUALITY MONITORING DURING DEMOLITION/REMOVAL ACTIVITIES

3.1 Overview

As described in Section 2, specific site controls were employed to ensure that the vessel removal was performed in a manner to minimize potential release of suspended solids and associated contaminants to the water column. The USEPA and the USACE developed a water quality monitoring program to ensure that the environmental goals outlined in Section 1 were met. The program included a project-specific turbidity criterion that was developed based on a review of previous dredging and monitoring activities at the New Bedford Harbor Superfund Site and on an understanding of sediment contamination and current patterns in the vicinity of the demolition activity. The monitoring program consisted of two components. The first component provided verification that water quality controls (booms/curtains) were in place during demolition activities. The second component was to perform boat-based water quality monitoring and sampling for chemical and biological parameters to ensure that the controls were effective and the project-specific turbidity criterion was protective.

A summary of the Water Quality Monitoring Statement of Work for the Herman Melville Marine Boatyard Demolition (SOW) (Appendix A) is provided below. The monitoring was performed by ENSR under contract to the USACE with support from CR Environmental (vessel services), Woods Hole Group Environmental Laboratories (chemistry), and Environmental Services, Inc. (toxicity).

3.2 Verification of Water Quality Controls

Regular site visits were performed to ensure that water quality controls were in place and to ensure that demolition operations were carried out in accordance with the environmental requirements specified in the work plan. The site visits typically consisted of shoreline observations of the control structure, observation of specific demolition activities under varying tidal conditions, and review of upcoming demolition activities of potential concern.

3.3 Monitoring and Sampling

The monitoring component of the program consisted of boat-based measurements of water column turbidity along transects down-current of project demolition activities. The real-time nature of these measurements allowed for direct correlation between demolition activities and water column impacts. The timing of this monitoring coincided with the project demolition activities deemed to have the greatest potential to affect water quality, including:

- Removal and handling of lead contaminated wood;
- Removal and handling of lead/PCB contaminated wood;
- Removal and handling of PCB contaminated concrete;
- Removal of PCB contaminated metal; and
- General in-water construction activities including the removal of wood, concrete or metal debris, and the installation and removal of the turbidity curtain.

Initially, pre-determined monitoring levels were established based on the stage of demolition and the anticipated intrusiveness of the operation. The monitoring level specified the number of monitoring days and types of sampling required. Schedules were modified as the project progressed, and the monitoring program evolved based on the monitoring results.

On each monitoring day, turbidity measurements were performed periodically along the down-current edge (based on tidal stage) of an established 300 ft mixing zone around the demolition operation (Figure 2). Monitoring was performed at approximately mid-depth in the shallow water column. In addition to the down-current monitoring, background (i.e., reference) measurements were performed outside the influence of project operations, approximately 1000 ft up-current (based on tidal stage) of demolition operations. Background measurements were obtained outside the influence of any localized turbidity sources such as CSO discharges or storm water drains, but were performed in an area representative of the water flowing through the deeper channel areas up-current of the demolition area. Turbidity monitoring was performed using an optical backscatter (OBS) nephelometer. The OBS sensor located underwater is connected to a laptop computer on the monitoring vessel allowing for real-time monitoring of turbidity data.

As part of the monitoring program, a project specific turbidity criterion was set at 50 NTU above background at the edge of the 300 ft mixing zone. The criterion was developed by the USEPA and the USACE based on a review of previous dredging and monitoring activities at the New Bedford Harbor Superfund Site (FWENC, 2001; ENSR, 2003), Harbor sediment contamination levels, and current patterns in the vicinity of the demolition area. A field monitoring protocol was developed to provide guidance on actions to be taken in the event of an exceedence of the turbidity criterion and is summarized in Figure 5. If the turbidity criterion was exceeded at the down-current edge of the 300 ft mixing zone, conditional water samples were to be collected along the edge of the 300 ft mixing zone, at 600 ft down-current and at the up-current reference station. Samples were to be

collected for biological testing and potential chemical analysis. Biological testing included acute toxicity tests using the sea urchin sperm fertilization test (*Arbacia* sp.) and the *Mysid* shrimp (*Mysidopsis* sp.) test. Potential chemical analyses included dissolved copper, total copper and lead, dissolved PCBs, total petroleum hydrocarbons (TPH), oil and grease, total suspended solids (TSS) and turbidity.

An analytical protocol was developed to determine when collected water samples would be submitted for biological (toxicity testing) and chemical analysis (Figure 6). If samples did not exhibit toxicity, further analysis was not required. However, poor survivorship in either toxicity test triggered further analytical testing to identify the potential cause of the toxicity. All analyses were performed in accordance with the analytical protocol outlined in the Sampling and Analysis Plan and Quality Assurance Project Plan for Herman Melville Marine Boatyard Demolition Monitoring (SAP/QAPP) (ENSR, 2002). Water quality results were available from 24 hours to 1 week after sampling depending upon the specific test/analysis requirements and relevance to ongoing construction activities. Both field and laboratory data were posted to a password protected web site as soon as they were available.

4.0 RESULTS OF WATER QUALITY MONITORING

4.1 Overview

A summary of the monitoring performed during the Herman Melville Marine Boatyard Demolition is provided in Table 1. The results of daily monitoring activities were recorded on field logs submitted to the USACE at the end of each monitoring event and posted on the project web site. The field logs are attached as Appendix B to this report. Biological and chemical monitoring data were also posted on the project web site and have been included as Appendix C. A series of project updates summarizing the results of the monitoring were also prepared and have been included as Appendix D.

No turbidity exceedences were recorded during the duration of the project. There was good survivorship of test organisms in the *Mysid* test and good fertilization rates for the *Arbacia* test during the toxicity analysis. Chemistry samples associated with the toxicity sampling were not analyzed due to the favorable results of the toxicity samples. Pre-construction water column monitoring (baseline monitoring) for copper yielded slightly elevated concentrations for both the reference and down-current stations.

4.2 Turbidity Field Measurements

Background turbidity values obtained at the reference station were less than 10 NTU for the duration of the project. There were no exceedences of the 50 NTU above background turbidity criterion at the down-current edge of the 300 ft mixing zone during the entire project. Turbidity immediately down-current of the silt curtain was less than 20 NTU above background except on one occasion. On 22 April, elevated turbidity was noted along the silt curtain due to a breach in the curtain's floatation collar. Turbidity values approximately 25 ft down-current of project operations reached 30 NTU. Upon notification, the situation was rectified and the condition soon abated.

4.3 Chemical and Biological testing

In order to assess potential toxicity effects of the project and verify that the greater than 50 NTU turbidity criterion was protective, sampling for biological testing was performed early in the project on 18 April 2002. Water samples were collected at three locations: inside the turbidity curtain, 25 ft down-current of the demolition activities, and at an up-current reference station. The sample inside the turbidity curtain was collected to provide data representative of a worse-case demolition activity scenario. Turbidity associated with the sample collected inside the turbidity curtain was 6 NTU; turbidity at the 25 ft down-current station ranged from 3-4 NTU and turbidity at the reference station was 4 NTU during sample collection. Results revealed good survivorship of test organisms for the *Mysid* test and good fertilization rates for the *Arbacia* test. There were no significant differences in

test results of the samples collected from the up-current reference station, within the boundaries of the turbidity curtain, or at the 25 ft down-current station (Table 2). Based on the favorable results of the toxicity testing the chemistry samples were not analyzed. Since the turbidity criterion was not exceeded during the project, additional sampling for toxicity testing was not performed.

Baseline samples for dissolved copper analysis were collected on 20 March 2002 from an up-current reference station and from 300 ft and 600 ft down-current of the project site before demolition activities began. Concentrations at the three stations were similar, with values ranging from 2.3-2.9 ug/L dissolved copper (Table 3).

5.0 REFERENCES

ENSR. 2002. Sampling and Analysis Plan and Quality Assurance Project Plan: Herman Melville Marine Boatyard Demolition: New Bedford Harbor, New Bedford, MA. March 2001.

ENSR. 2003. Water Quality Monitoring Summary Report – Construction of the Commonwealth Electric Cable Crossing, New Bedford Harbor Superfund Site. August 2003.

Foster-Wheeler Environmental Corp. (FWENC). 2001. Pre-Design Field Test Dredge Technology Evaluation Report. New Bedford Harbor Superfund Site. August 2001.

USEPA. 1997. Report on the Effects of the Hot Spot Dredging Operations – New Bedford Harbor Superfund Site, New Bedford, Massachusetts. October 1997.

TABLES

Table 1. Monitoring Activities during Herman Melville Marine Boatyard Demolition

Date (2002)	Demolition Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
20 March	None	Yes	NA	NA	Collected background Cu samples prior to start of demolition activities
26 March	Installation of silt curtain	No	2-3	2-3	
09 April	Light demolition activities	No	NA	NA	
10 April	Demolition of wood vessel	No	3-5	3-5	
18 April	Demolition	Yes	3-6	3-4	Samples collected within and outside of the silt-curtained area. Samples representative of heavy demolition related to structural lumber removal.
22 April	Demolition	No	3-30	4-7	Elevated turbidity was limited to a localized area of active demolition activities. It was associated with a breach in the silt curtain flotation collar. Contractor rectified situation within 30 minutes.
23 April	Demolition	No	<5	<5	Oil slick noted near site, source tracked to a barge outside of construction area
08 May	No in water work. Sorting wood and steel on pad.	No	NA	NA	Shore based site visit
15 May	Demolition	No	4-15	4-6	Excavator removing debris from Harbor appeared to have damaged a pipe, as liquid from an unknown source began flowing into the Harbor creating a small fountain like effect (approx. 6 inches high) inside the work area. Attempted to collect a sample, but the discharge stopped before it was possible. It was later determined that the release was likely water.

Table 1. (Continued) - Monitoring Activities during Herman Melville Marine Boatyard Demolition

Date (2002)	Demolition Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
04 June	None	No	NA	NA	Shore based site visit
12 June	Demolition using guillotine system	No	3-11	4-5	
13 June	Demolition using guillotine	No	2-11	3-5	
20 June	Demolition	No	2-7	2-7	
25 June	Demolition	No	NA	NA	An undocumented fuel tank was ruptured causing an oil release at the waters' edge. Response was implemented and release was contained.
27 June	Demolition	No	NA	NA	Shore based site visit
05 July	No in water work	No	NA	NA	Shore based site visit
08 July	No in water work, removal of final piece of bulkhead.	No	NA	NA	Shore based site visit

Notes: NA - No turbidity monitoring occurred.

Table 2. Toxicity Testing Results from Herman Melville Marine Boatyard Demolition Monitoring

Date	Location	*Americamysis bahia* 48hr Survival Assay[1] (Survival after 2 days)	*Arbacia punctulata* Chronic Fertilization Assay[1] (% Fertilized)	Turbidity During Sample Collection (NTU)
18 April 2002	Laboratory Control	100.0%	89.7%	NA
	Inside Silt Curtain	92.5%	80.5%	6
	25 ft down-current of demolition	95.0%	91.3%	3-4
	600 ft up-current (reference)	92.5%	89.4%	4

[1]Complete sample results located in appendix C
NA - Not applicable

Table 3. Analytical Results Prior to Demolition Activities at the Herman Melville Marine Boatyard Demolition Monitoring

Date	Location	Dissolved Copper (ug/L)
20 March 2002	1000 ft up-current (reference)	2.4
20 March 2002	300 ft down-current	2.9
20 March 2002	600 ft down-current	2.5

FIGURES

US Army Corps of Engineers®
New England District

New Bedford Harbor Superfund Site

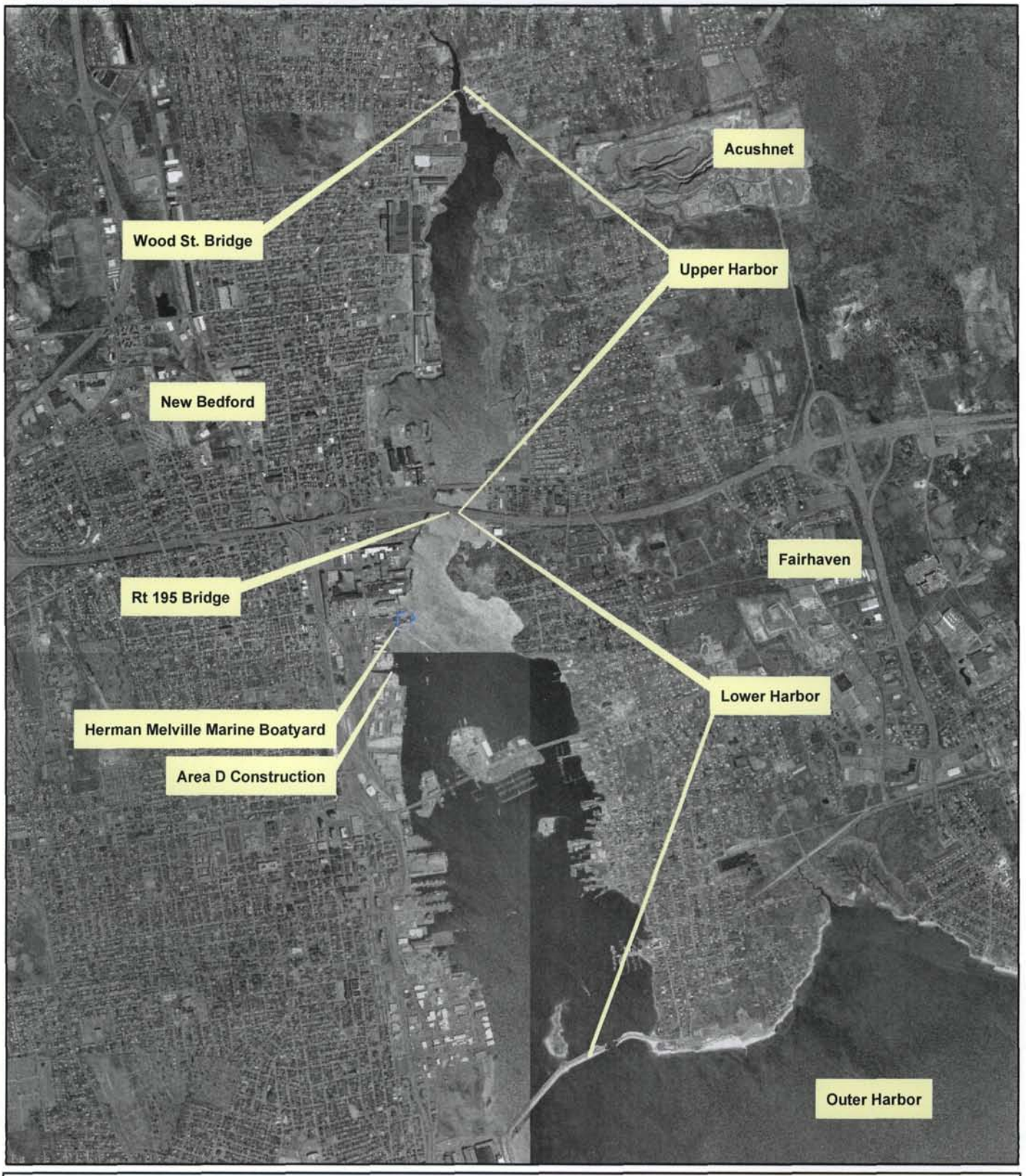

Figure 1. Harbor Overview Showing the Location of the Herman Melville Marine Boatyard

Sources:MassGIS 2-m orthophotos
NAD 83 Mass State Plane m
Date: 20 November 2003
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ENSR

0 0.25 0.5 1 Miles

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US Army Corps of Engineers
New England District

New Bedford Harbor Superfund Site

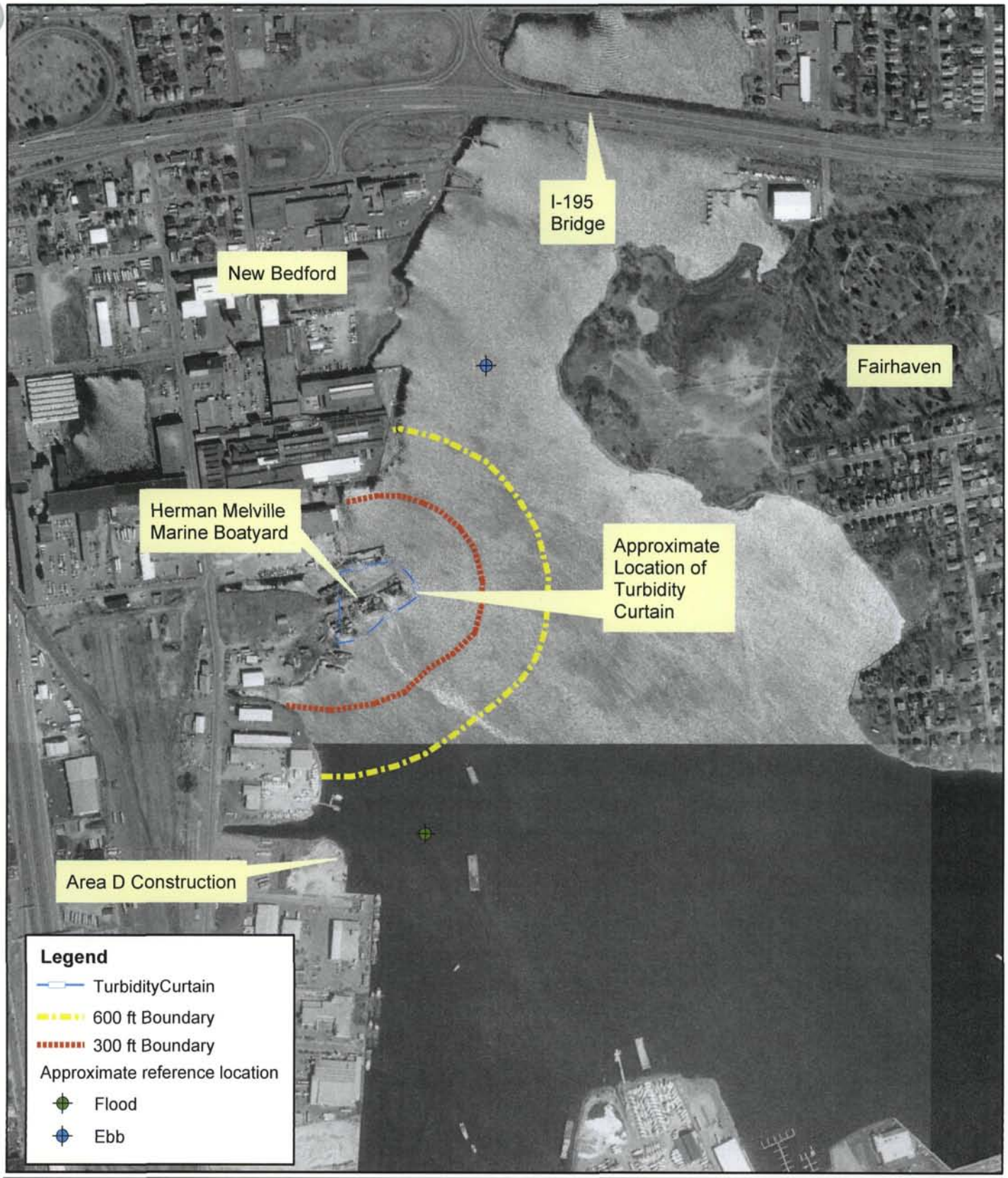

Figure 2. Location of Vessel Removal from Herman Melville Marine Boatyard

Sources:MassGIS 1-m orthophotos
NAD 83 Mass State Plan m
Date 20 November 2003
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Feet
0 250 500 1,000

ENSR

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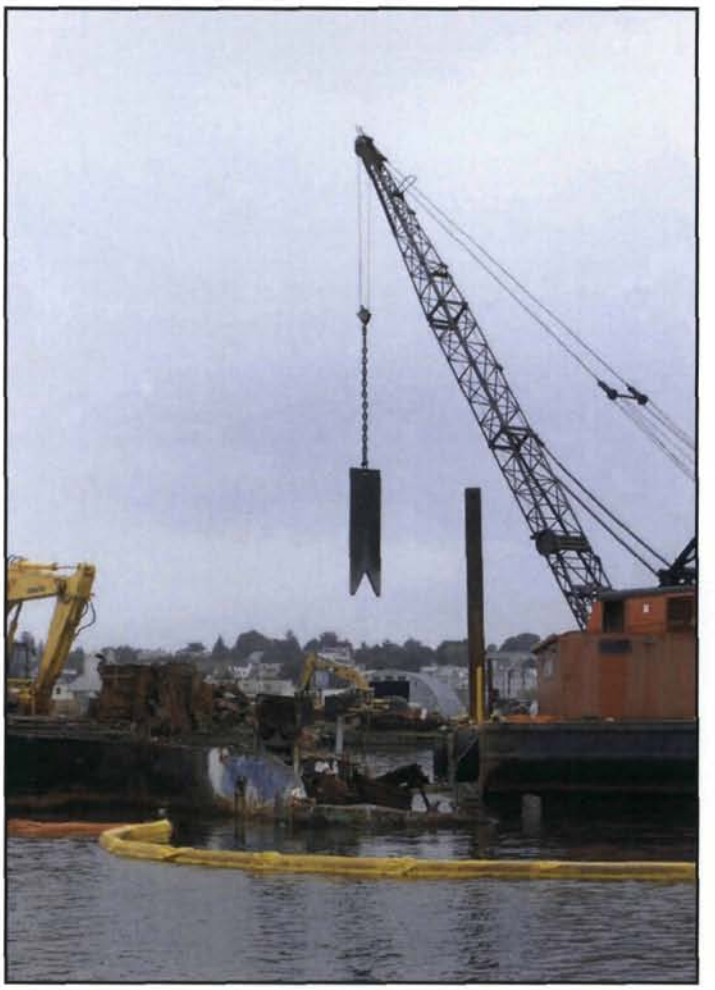
Figure 3. Excavator Demolition Operations

Demolition of Steel Barge June 2002

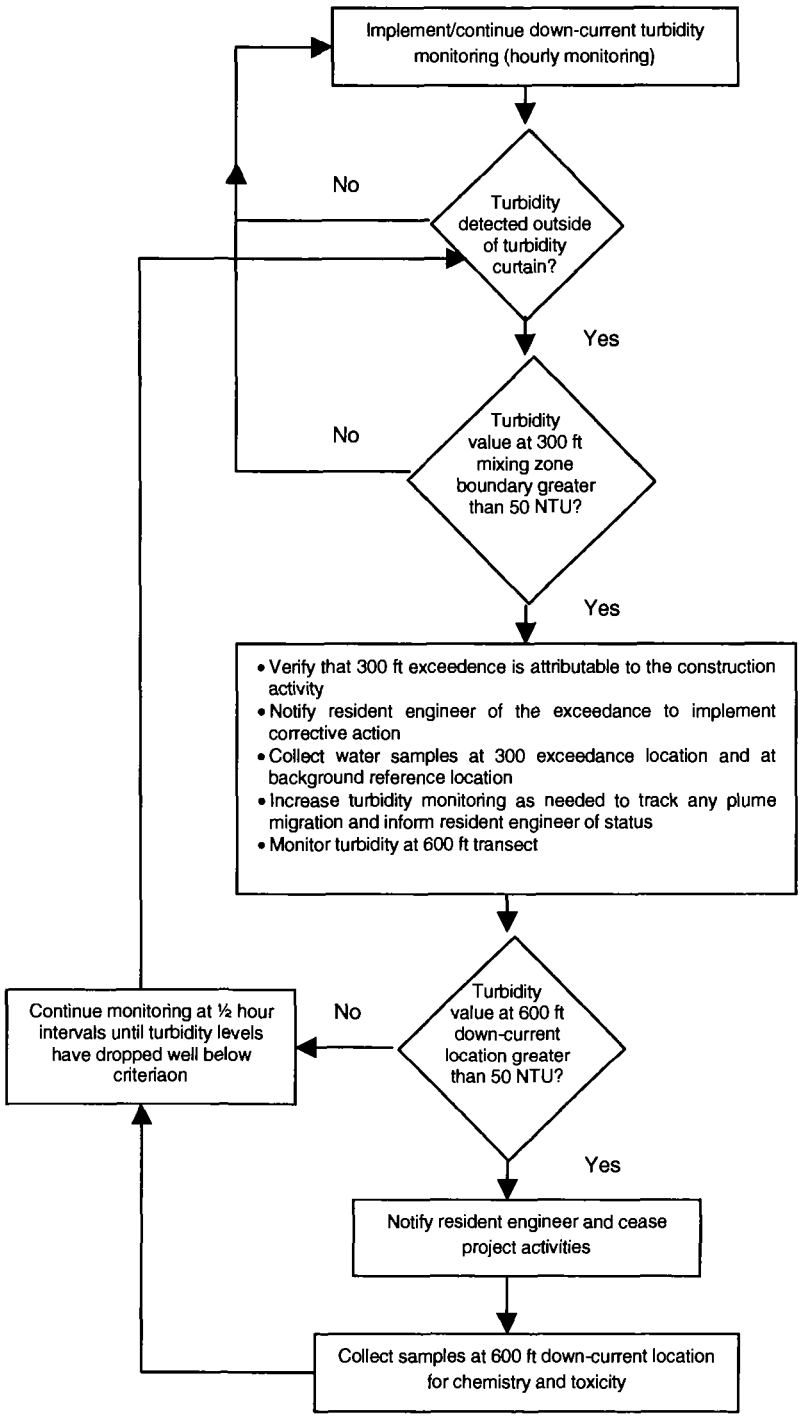
Demolition of Concrete Barge May 2002

Figure 4. Guillotine Demolition Operations



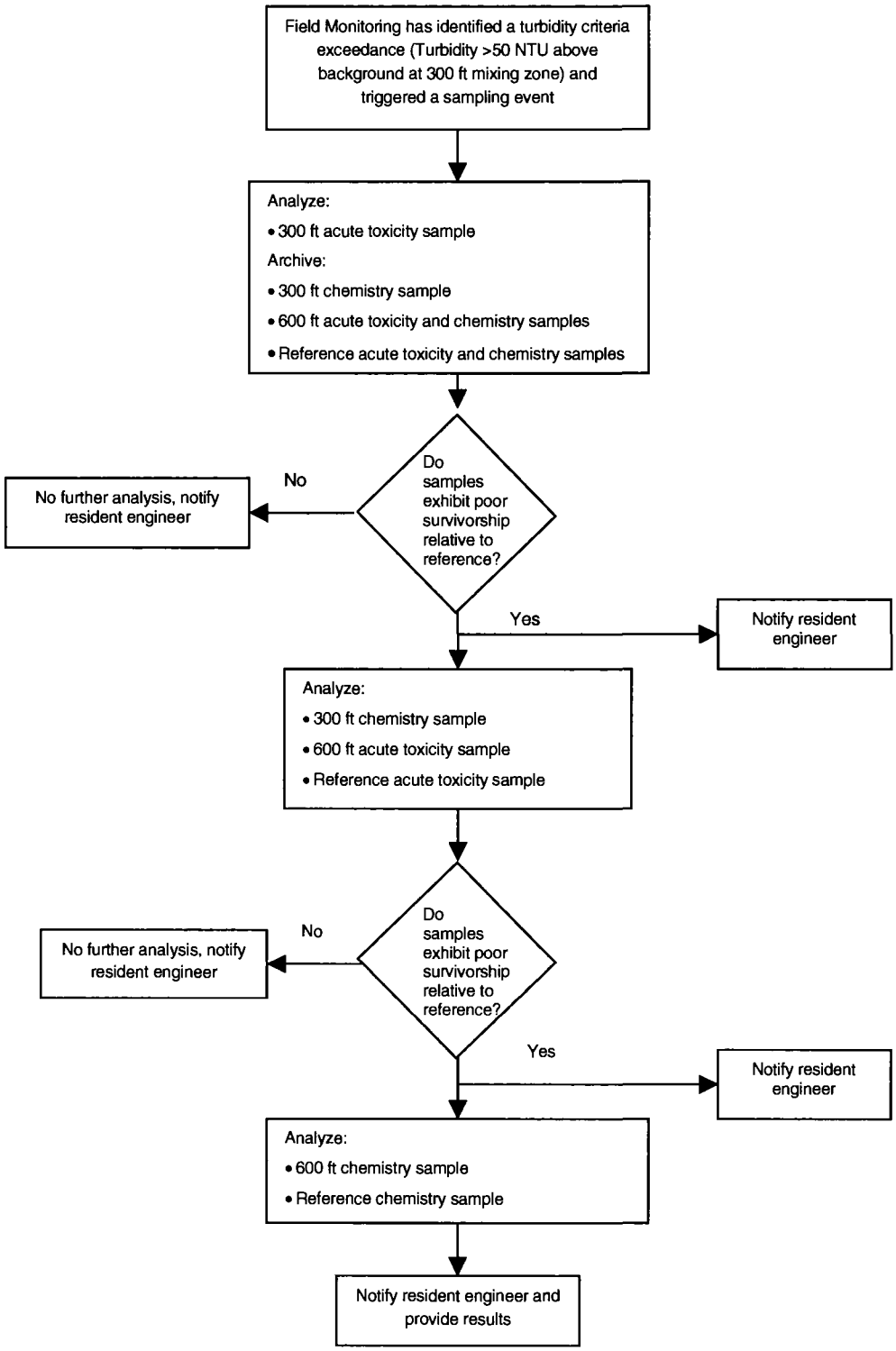
Guillotine Operations June 2002

Figure 5. Water Quality Monitoring Decision Sequence



Notes
1: 50 NTU value is defined as 50 NTU above the background turbidity level
2: The presence and extent of any visible oil sheen emanating from project area, even though project turbidity limits have not been exceeded should be brought to the attention of resident engineer, and a surface grab sample shall be collected for potential analysis.

Figure 6. Analytical Protocol Decision Sequence



APPENDIX

APPENDIX A

Water Quality Monitoring Statement of Work

Water Quality Monitoring during the Demolition of The Herman Melville Marine Boatyard New Bedford Harbor Superfund Site 28 February 2002

Background

The sediments within many areas of the New Bedford Harbor Superfund Site are contaminated with high concentrations of many pollutants, including polychlorinated biphenyl's (PCB's) and heavy metals, from industrial and urban development surrounding the harbor. One of the required steps in preparing for the full-scale remedial dredging of the Harbor is the removal and demolition of abandoned boats and barges located at the former Herman Melville Marine Boatyard. The site is located along the western shore of New Bedford Harbor, approximately one-half mile south of the I-195 Bridge (Figure 1). The sediments in this area contain elevated levels of PCBs, organic compounds, and metals; most notably Cu from previous industrial activities in the area. Release of these sediments to the water column in an uncontrolled manner has the potential to cause significant environmental impacts. For this reason, the contractor performing the vessel demolition and removal will be required to install and maintain a full-depth turbidity curtain/oil-boom around the entire in-water perimeter of the site.

The following monitoring program shall be conducted by the Environmental Oversight Contractor on behalf of the USACE-NED during the duration of the Project as discussed below. The project is expected to require 13 weeks for completion.

I. Monitoring Approach

A. Water Quality Monitoring

Boat-based monitoring shall be performed during in-water operations that have the potential to disturb significant quantities of sediment. The purpose of this monitoring is to ensure that acute impacts to the water column do not extend beyond the designated mixing zone established for the project and that contaminants are not transported away from the operations area at unacceptable levels to other portions of the harbor.

A tiered monitoring approach will include field turbidity measurements, with additional "conditional" laboratory-based acute toxicity testing and water column chemistry during any portion of the demolition effort that may result in unacceptable environmental impact to the water column. The activities identified in the Statement of Work for the Herman Melville Marine Boatyard Demolition (Foster Wheeler-January 2002) that may have potential negative water column impacts, thus requiring additional monitoring or oversight, include but may not be limited to the following:

- removal and handling of lead contaminated wood;
- removal and handling of lead/PCB contaminated wood;
- removal and handling of PCB contaminated concrete;
- removal PCB contaminated metal; and
- general in-water construction activities including the removal of wood, concrete or metal debris, and the installation and removal of the turbidity curtain.

The overall approach of the water quality monitoring program will consist of boat-based measurements of water column turbidity along transects within the vicinity of the project site. The real-time nature of these measurements allows for direct correlation between project activities and water column impacts. The turbidity monitoring will be conducted periodically during project operations along the downstream edge of established mixing zones and compared to an upper-level decision criterion. The timing of this monitoring will coincide with those project activities deemed to have the greatest potential to affect water quality.

Turbidity monitoring will be supplemented with water samples to undergo physical/chemical and biological (biotoxicity) testing to assess the extent and degree of ecological impact to the surrounding harbor waters. These "conditional samples" will be collected when turbidity criteria have either been approached or exceeded. Biological testing will involve acute toxicity tests using the sea urchin sperm fertilization test (*Arbacia* sp.) and the Mysid shrimp (*Mysidopsis* sp.) with the physical/chemical analysis contingent upon the results of the toxicity testing. Samples, which do not exhibit toxicity, will not require further analysis. However, poor survivorship in either toxicity test will require further analytical testing to identify the cause of toxicity. This analysis will include total suspended solids (TSS), total petroleum hydrocarbons (TPH), oil and grease, total PCB's and heavy metals including Copper (Cu) and Lead (Pb).

B. Environmental Oversight during Demolition Activities

The Environmental Oversight Contractor shall maintain a regular site presence to monitor environmental conditions during demolition activities to ensure that operations are conducted in accordance with the environmental requirements as outlined in this scope of work. This effort involves coordinating boat-based monitoring activities, results notification to appropriate personnel, and tracking and assessing any oil sheen or other conditions that could potentially affect water quality within New Bedford Harbor.

II. Monitoring Measurements

Equipment - Turbidity monitoring shall be performed using an optical back scatter (OBS) nephelometer with an underwater sensor and direct surface readout or other instrumentation having similar capabilities. The OBS sensor unit shall be sensitive over an approximate operating range of 0-500 NTU, and shall be calibrated on a regular basis using analytical standards.

Location – Turbidity monitoring shall occur along the down-current edge of a pre-determined "Mixing Zone." The term "Mixing Zone", as shown on Figure 1, has been established approximately 300 feet outside the boundary of the turbidity curtain. The down-current edge is defined in relation to tidal direction (ebb/flood tide) from standard tide tables for New Bedford, as well as observations on site. A second "compliance zone" has been established at a range of 600 feet outside the boundary of the turbidity curtain. This outer boundary will be monitored and/or sampled in the event a project criteria exceedence is recorded at the 300-foot mixing zone to determine the potential range of water column effects.

Turbidity shall be measured around the perimeter of the 300-foot boundary at a point roughly mid-depth in the water column. When water depths are greater than 10 feet, additional vertical profiles shall be made between the surface and 3 feet above the bottom to detect sub-surface plume migration. In addition to the turbidity monitoring along the boundary of the mixing zone, background (i.e., reference) measurements will be collected approximately 1000 feet up-current

of demolition operations. This location shall be outside the influence of any localized turbidity sources (ex. CSO discharges or storm water drains), but still representative of the water flowing through the deeper channel areas up-current of the demolition area.

Frequency – For the purposes of this scope of work, the Environmental Oversight Contractor should conduct environmental monitoring activities according to the schedule shown below. The table outlines the number of days each week, for each monitoring activity, that the Contractor will be responsible for conducting during the course of the expected 13-week project.

Week Number	Boat-Based Turbidity Monitoring (Days/Week)	Boat-Based Sampling for Biological and Chemical Testing (Days/Week)	Shore-Based Coordination (Days/Week)
1	2	Conditional	1
2	--	--	--
3	--	--	1
4	3	1	--
5	3	Conditional	1
6	3	Conditional	1
7	2	Conditional	--
8	2	1	1
9	1	Conditional	--
10	1	Conditional	1
11	1	Conditional	--
12	1	1	1
13	--	--	1
TOTAL	19	3	8

Description – The demolition activities are expected to vary over the course of the project, and a general description of the expected monitoring is provided below. The Environmental Oversight Contractor shall coordinate with the USACE Resident Engineer prior to and during the course of the project to review planned operations and to identify specific activities that require monitoring.

Site Mobilization (weeks 1-3) – Much of the mobilization and site preparation work will be performed on land during this initial period and will not require boat-based monitoring. Prior to commencement of in-water activities, the Environmental Oversight Contractor shall perform one day of boat-based monitoring and sample collection to determine typical values of background turbidity and dissolved Cu in the area. As mobilization proceeds to in-water activities (pile driving and installation of the turbidity curtain/oil-boom), one additional day of boat-based monitoring shall be performed. Sampling for biotoxicity and chemical testing at the boundary of the 300-foot mixing zone and background location would be conditional on the observance of turbidity values in excess of the project specific criterion.

Initial Intensive Demolition (weeks 4-6) - Boat-based monitoring shall be conducted more frequently during the initial phase of demolition operations during which time it is expected that four vessels will be demolished and removed from the site. These four vessels are the *Neisha Ann*, *Aloha*, *Sippican*, and *Geraldine*. Boat-based turbidity monitoring is anticipated to be performed three days per week during this initial three-

week period. Turbidity measurements shall be performed hourly during active project activities during the workday.

During the first week of the intensive demolition, sampling shall be performed when project activities appear to be causing the maximum disturbance to the water area enclosed by the turbidity curtain and when tidal conditions result in maximum drainage of water from the enclosed area to the surrounding waters. Water samples shall be collected 1) in the initial mixing zone immediately adjacent to a seam or equilibration flap where water is draining through the turbidity curtain, 2) along the down-current boundary of the mixing zone at 300 feet from the turbidity curtain, 3) along a transect approximately 600 feet down-current of the turbidity curtain, and 4) at an appropriate up-current background location. The water sample from the initial mixing zone shall be submitted for biotoxicity testing. All other samples shall be archived, with additional biotoxicity and/or chemical testing contingent on the results of biotoxicity testing of the initial mixing zone sample. Poor survivorship in either toxicity test will require the chemical analysis of samples collected at the respective station and the performance of toxicity testing on samples collected at the station immediately down-current.

Additional sampling during this three-week period for biotoxicity and chemical testing shall be conditional on the results of the initial sampling/testing described above or on the observance of turbidity values in excess of the project specific criterion.

General Project Work (weeks 7-11) – Assuming that no major water quality issues are identified during the initial monitoring described above, the frequency of boat-based turbidity monitoring shall be scaled back during the remainder of the in-water work. One additional day of sampling is scheduled tentatively for week 8. The sampling/testing approach shall repeat that described above for the intensive period and shall be performed at a time when project activities are causing a high level of disturbance to the water area enclosed by the turbidity curtain. All other sampling during this period shall be conditional on the observance of turbidity values in excess of the project specific criterion.

Demobilization (weeks 12-13) – Upon completion of the in-water demolition activities, a composite water sample shall be collected from within the enclosed turbidity curtain. The sample shall be submitted for biotoxicity testing (samples for potential chemical testing shall be archived). Removal of the turbidity curtain is contingent on the favorable results from the biotoxicity testing. Boat-based turbidity monitoring shall be performed during removal of the turbidity curtain, with sampling conditional on the observance of turbidity values in excess of the project specific criterion.

Data Recording – A written summary record of field turbidity measurements and a list of samples collected will be provided to the USACE Resident Engineer on a daily basis after each monitoring event.

Lab Schedule - A laboratory turn-around time of 24-hours is required. It is anticipated that the requirement to analyze water column chemistry samples will be reduced or curtailed as operations continue.

III. Project Specific Criterion

The upper level turbidity criterion, defined as a "reportable event", will be 50 Nephelometric Turbidity Units (NTUs) above background as measured at the edge of the 300-foot mixing zone. Additional monitoring and the sampling required by a criterion-exceedence event are defined herein.

IV. Criterion Exceedence

When the monitoring reveals that the upper-level criterion has been exceeded at the edge of the mixing zone, additional background and near field measurements shall be performed as needed to determine if the elevated turbidity is attributed to project activities. Also, an additional transect shall be run 600 feet downstream of the project activity to assess far-field impact. If the turbidity appears to be project-based, the Environmental Oversight Contractor will immediately notify the USACE Resident Engineer or his representative so that corrective actions can be employed to alleviate the condition. If exceedences are noted at both downstream transects (300- and 600-foot), project activities will cease until conditions have abated to acceptable levels at the 300 ft transect. If the criterion has been exceeded at only the downstream edge of the 300-foot mixing zone, corrective actions will be employed as deemed appropriate by the USCAE Resident Engineer. Actions may include either altering or slowing the rate of construction or ceasing project activities until turbidity levels have fallen within an acceptable range.

In addition, when a criterion is exceeded, the Environmental Oversight Contractor shall collect "conditional" water samples along the edge of either one or both of the downstream monitoring transect(s). Biological and chemical testing shall be performed on a composite water sample collected along the downstream edge of the mixing zone(s) within the boundaries of an observable plume. Toxicity testing shall be initiated immediately upon sample collection and delivery to the testing facility. Monitoring of turbidity shall proceed continuously to track the return to background conditions. Upon the resumption of project activities, monitoring will continue at an increased frequency (30-minute cycle) to track turbidity changes and monitor for further exceedences.

The Environmental Oversight Contractor shall also note the presence and extent of any visible oil sheen that may emanate from the activity area, even though other criteria limits have not been exceeded, and contact the USACE Resident Engineer or his representative. A surface grab sample shall be collected for potential analysis. The approximate area of sheen coverage will be sketched onto the data sheet as provided in the Reporting task below.

V. Reporting

The Environmental Oversight Contractor shall develop an oversight report sheet for this project. This daily submittal for each day of boat-based monitoring shall provide the following information:

(1) Date, time, location, and type of construction activity as well as the names of sampling team members and team leader.

(2) A plan-view of the harbor and construction site which allows for the recording of visual events such as plumes or oil sheens. This map will be included with the daily

oversight report sheet and will graphically present turbidity values recorded during each monitoring event.

(4) A summary of weather conditions, and the timing of the tides.

(5) A comments section to allow field personnel to record visual observations or relevant field activities which may assist in data interpretation.

Data sheets shall be delivered either electronically or in hard copy to the USACE or their representative at the end of each day of monitoring. A hard copy shall be hand delivered to the on-site office of the USACE Resident Engineer. If the established turbidity criterion is exceeded, the USACE shall be immediately notified and "conditional" monitoring/sampling activities initiated. A secure project-based web site will be established to post monitoring data sheets along with toxicity and analytical data. The site will be accessible only to individuals identified by the USACE.

VI. Project Meetings

Based on the USACE requirement that the project shall be completed within 120 days of awarding a contract to complete the site work, the Environmental Oversight Contractor should assume the following meetings would be required:

- One Pre-Construction Meeting at the onset of the project to define roles and responsibilities, discuss project logistics and health and safety issues
- Biweekly Construction Coordination Meetings for the duration of the project.
- Monthly Project Status Meetings for the duration of the project.

VII. Deliverables

The Environmental Oversight Contractor shall provide the USACE a field summary report of the boatyard demolition project, including field observations and analytical data upon completion of the monitoring program The deliverable shall include three hard copies and three CD's with all data.

- **Cost Proposal**

The Contractor shall submit their cost estimate breaking out "Base Costs" for the work outlined in this scope of work and also for the following Options to be exercised at the discretion of the Government:

- Option A – Individual Toxicity Testing
- Option B – Chemical Analysis (TPH, Oil/Grease, PCB dissolved, Total Metals (including Cu and Pb), TSS, Turbidity
- Option C – Daily rate for boat based monitoring which includes turbidity monitoring and conditional collection of water samples
- Option D – Daily rate for land based oversight

APPENDIX B

Field Data Logs

ENSR® U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

Date: 20 MARCH 2002

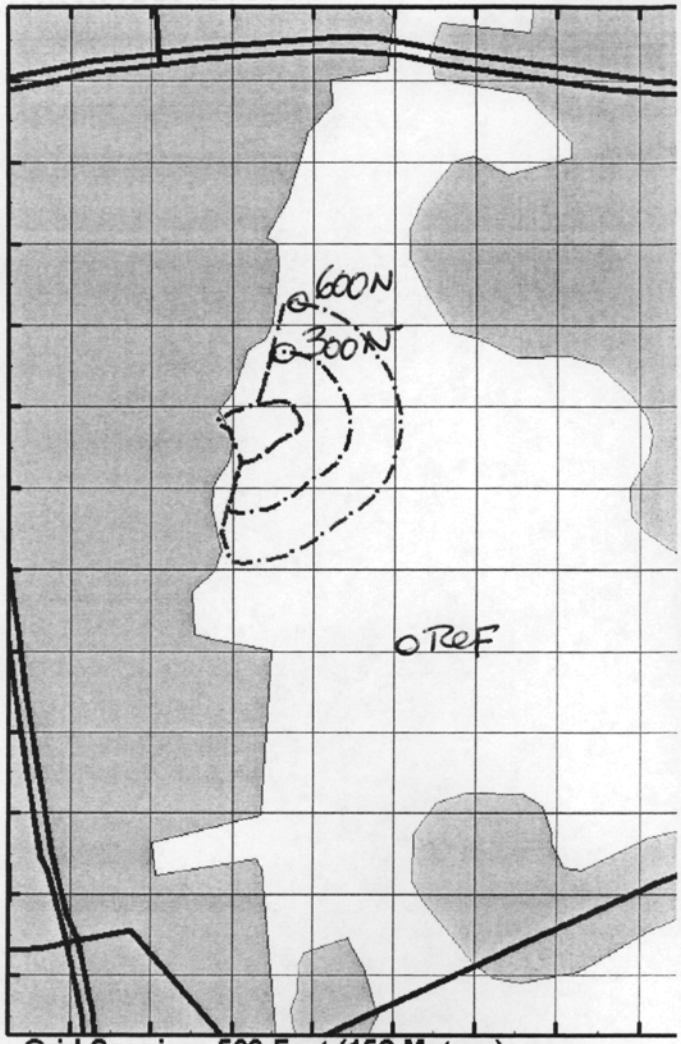
Monitoring Period: Arrival: 0930
Departure: 1200

Demolition Activities Observed:
NONE

COLLECTION OF BACKGROUND DISSOLVED Cu SAMPLES

Tidal Direction: (Flood) Ebb
Tidal Period: 0504 to 1205

Weather Observations: RAIN/SNOW MIX TEMP 35 WINDS 15-25, GUSTING TO 30K NE



Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:
Up-Current Background Station
Water Depth: _____ ft
Turbidity: _____ NTU
Depth of Sensor: _____ ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
300 FT:	____ ft	____ ft	____ NTU
600 FT:	____ ft	____ ft	____ NTU
1000 FT:	____ ft	____ ft	____ NTU

Samples Collected:
☐ None ☐ TSS ☐ Turbidity ☒ Cu/~~Pb~~ (dissolved) ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
SCHEDULED PILE DRIVING FOR TURBIDITY CURTAIN INSTALLATION CANCELLED DUE TO WEATHER - CONSTRUCTION BARGE DELAYED.

BACKGROUND DISSOLVED Cu SAMPLES COLLECTED FROM MID-DEPTH AT THE UP-CURRENT REFERENCE (SAMPLE PLUS DUPLICATE) AND AT THE STATIONS 300 AND 600 FEET DOWNCURRENT.

Scientific Crew: D. Boyle (ENSR) C. DUNBAR C. RYTHER (CRE)
Completed By: D. Boyle

ENSR® U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

Date: 26 MARCH 2002

Monitoring Period: Arrival: 0940
Departure: 1330

Demolition Activities Observed:

INSTALLATION OF THE TURBIDITY CURTAIN

Tidal Direction: Flood (Ebb)
Tidal Period: 0538 to 1132

Weather Observations: RAIN/SNOW MIX
Temp 35-40 winds 15-25+ SE

Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:
Up-Current Background Station
Water Depth: 21 ft
Turbidity: 2-3 NTU
Depth of Sensor: 10 ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
300 FT:	8 ft	5 ft	2-3 NTU
600 FT:	ft	ft	NTU
1000 FT:	ft	ft	NTU

Samples Collected:
☒ None ☐ TSS ☐ Turbidity ☐ Cu/Pb ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
TURBIDITY CURTAIN INSTALLATION (OBSERVED) WAS BEING COMPLETED BY TWO MAT MARINE PERSONNEL IN A SMALL WORK SKIFF. BUNDLED SECTIONS WERE LOADED INTO THE BOAT AND TRANSITED OUT TO THE WORK AREA WHERE THE SECTION WAS ATTACHED TO THE PREVIOUS ASSEMBLY. THIS ITERATIVE PROCESS WAS CONTINUED UNTIL A SUFFICIENT LENGTH WAS ASSEMBLED FOR DEPLOYMENT, AFTER WHICH THE BUNDLES WERE HAULED INTO POSITION, ATTACHED TO PILINGS AND OPENED TO DROP CURTAIN TO THE BOTTOM OF THE HARBOR. NO EFFECTS ON TURBIDITY WERE OBSERVED.

Scientific Crew: D. Boyé (ENSR), C. DUNBAR (CRE)
Completed By: D. Boyé

ENSR®

U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

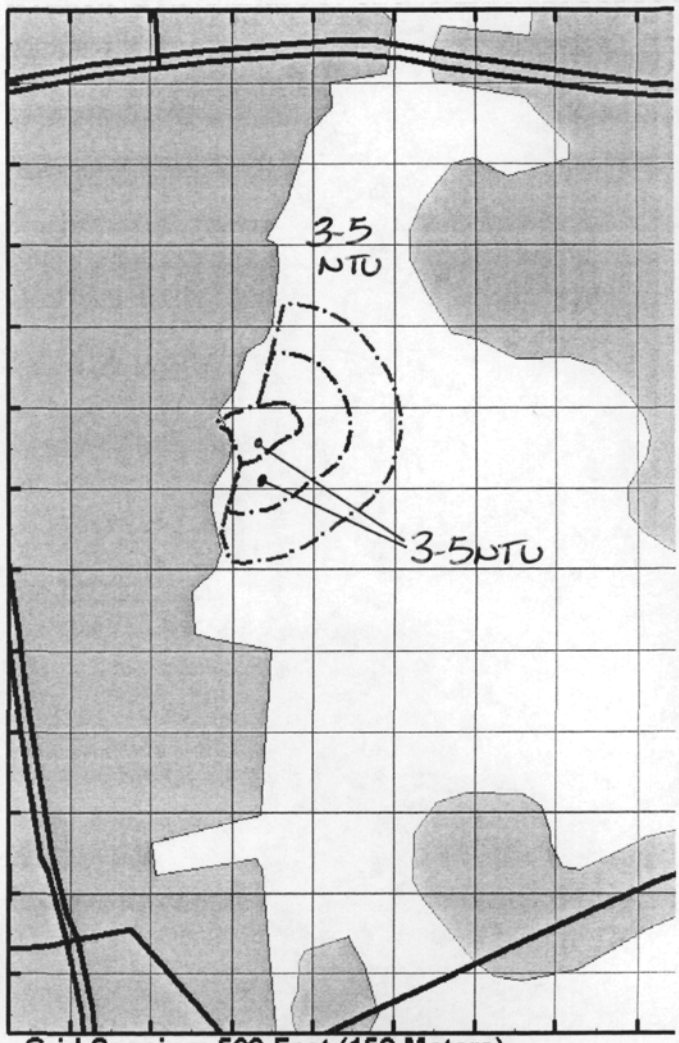
Date: 10 April 2002

Monitoring Period: Arrival: 1030
Departure: 1145

Demolition Activities Observed:
Removal of Topside structural lumber from the area of the "Commonwealth World Wide" and adjoining wreck.

Tidal Direction: Flood (Ebb)
Tidal Period: 0716 to 1317

Weather Observations: P. sunny Temp 60 winds NE going over to west 10-15K.



Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:
Up-Current Background Station
Water Depth: 26 ft
Turbidity: 3-5 NTU
Depth of Sensor: 3-25 ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
300 FT:	8 ft	5 ft	3-5 NTU
600 FT:	ft	ft	NTU
1000 FT:	ft	ft	NTU

Samples Collected:
☒ None ☐ TSS ☐ Turbidity ☐ Cu/Pb ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
No turbidity exceedences were observed.

Demolition efforts were short in duration driven by a shortage of available deck space on the barge to stage debris. Turbidity within the area enclosed by the curtain was equivalent to background at the conclusion of demolition activities.

Scientific Crew: D. Boyé (ENSR) C. Dunbar (CRE)
Completed By: D. Boyé

ENSR® U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

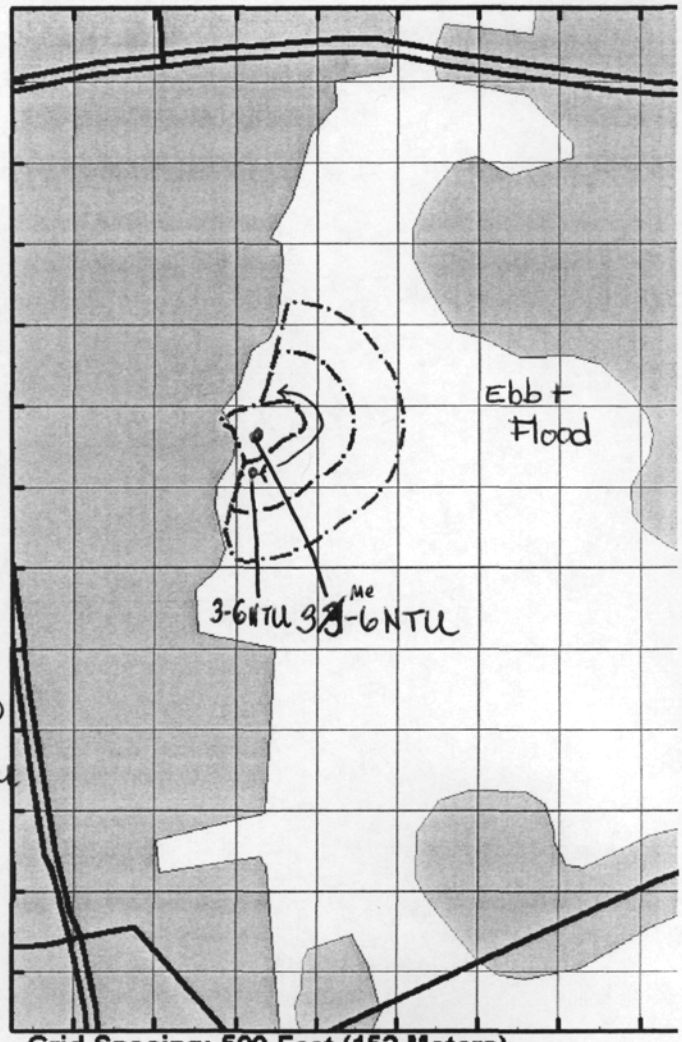
Date: 18 April 2002

Monitoring Period: Arrival: 0830
Departure: 1345

Demolition Activities Observed:
Movement of material from barge to shore until 1100. After 1100 began removal of unnamed #9

Tidal Direction: Flood Ebb
Tidal Period: _____ to _____
0600-1230 1230-1744

Weather Observations: Clear + warm
Wind North 0-5kn shifting to South 5-10 kn in afternoon



Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:

Up-Current Background Station (Ebb) (Flood)

Water Depth:	10	ft	6ft
Turbidity:	3-4	NTU	3-4NTU
Depth of Sensor:	5	ft	4 ft

Range of Turbidity Down Current: (Ebb)

	Water Depth	Depth of Sensor	Turbidity	
25 ~~300~~ FT:	9 ft	5 ft	3-4	NTU
600 FT:	ft	ft		NTU
1000 FT:	ft	ft		NTU
Turbidity curtain South	10 ft	5 ft	6	NTU

Samples Collected:
☐ None ☑ TSS ☑ Turbidity ☑ Cu/Pb ☑ Oil & Grease ☑ PCB ☑ TPH ☑ TOX

Observations:
During the morning flood tide: inside the silt curtain downcurrent, outside silt curtain downcurrent and reference had turbidity values 3-4 NTU.

Collected samples during ebb tide at turbidity curtain on downcurrent side and at 25ft downcurrent. Reference sample taken 600ft North of site. All samples taken at 5ft depth, water column depth ~10ft. Turbidity was 3-6 NTU downcurrent and 4 NTU at reference. No turbidity exceedances were observed.

Scientific Crew: M. Evans + D. Lewis (ENSR) C. Dunbar (CR Env)
Completed By: M. Evans

ENSR® U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

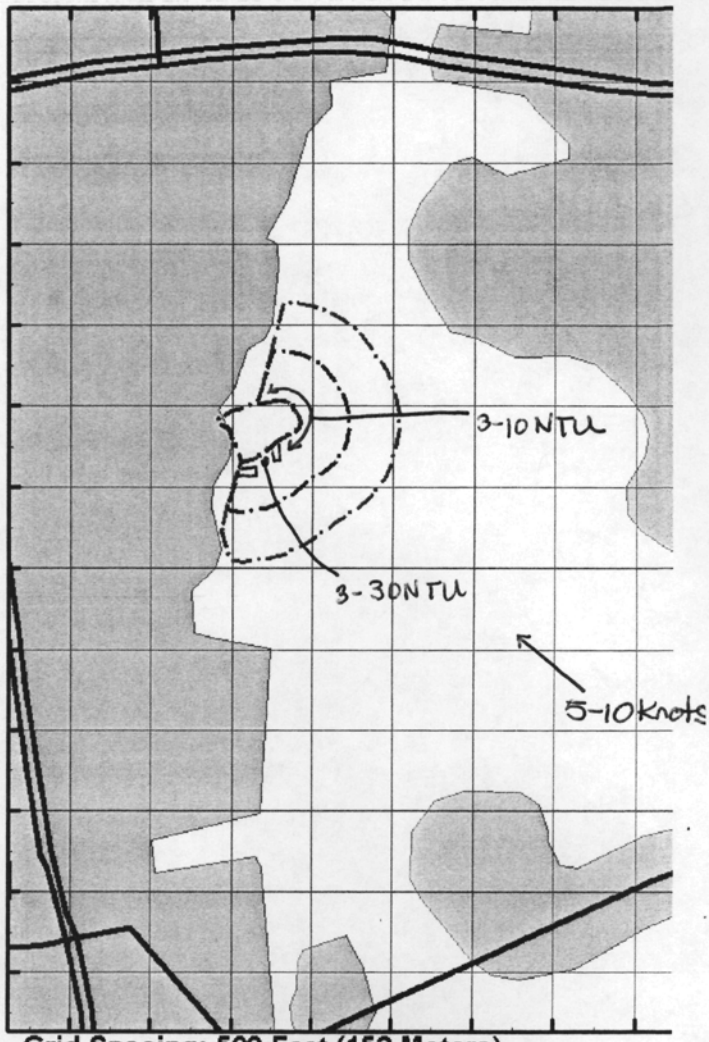
Date: 22 April 2002

Monitoring Period: Arrival: 1100
Departure: 1400

Demolition Activities Observed:
In-water removal of a ship near shore in the Southern half of demolition area

Tidal Direction: (Flood) Ebb
Tidal Period: 1039 to 1645

Weather Observations: cloudy, rainy + cold Wind South-East 5-10 kn, decreasing in afternoon slightly, waves ~1 ft



Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:
Up-Current Background Station - 50ft South
Water Depth: 8 ft
Turbidity: 4-7 NTU
Depth of Sensor: 4 ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
300 FT:	ft	ft	NTU
600 FT:	ft	ft	NTU
1000 FT:	ft	ft	NTU

Samples Collected:
☑ None ☐ TSS ☐ Turbidity ☐ Cu/Pb ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
No turbidity exceedances were observed.

Turbidity ranged from 3-~~8~~ 10 NTU along the silt curtain during demolition activities. From the silt curtain nearest to activities (to the South between construction barge outside curtain and sunken barge/pier) turbidity was 3-30 NTU. There was a damaged section of curtain at this location which was fixed during the day, although turbidity was still slightly elevated (3-20 NTU ~~(3 to NTU)~~) over background. This area is actually downcurrent from the site assuming North-South Tidal flow.

Scientific Crew: M. evans (ENSR) C. Dunbar (CR Env)
Completed By: M. evans

ENSR® U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

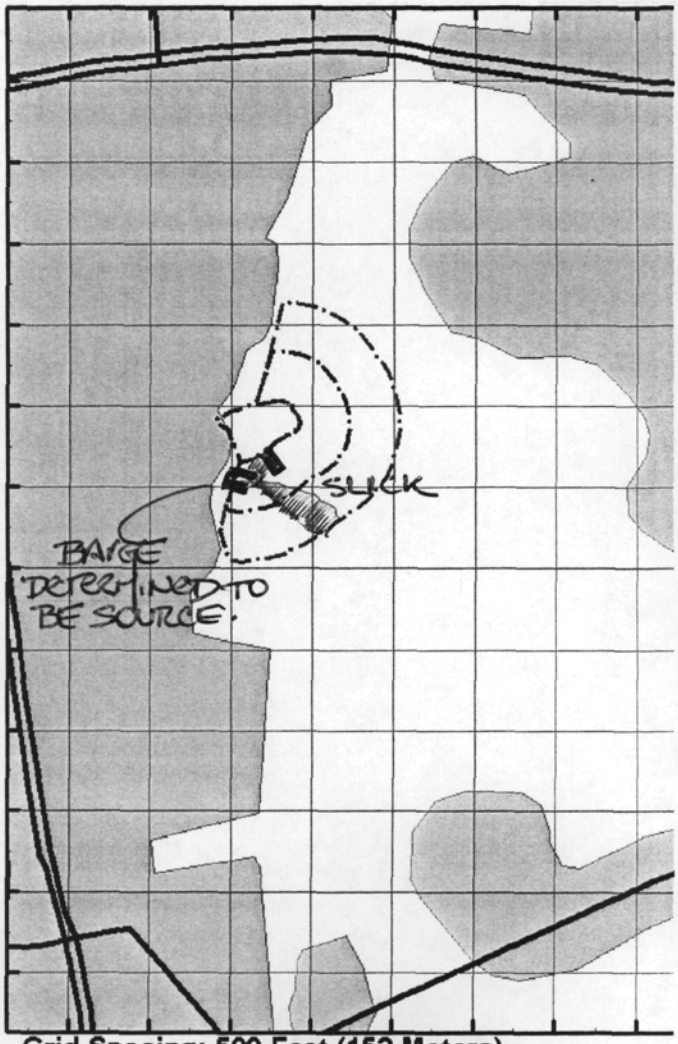
Date: 23 April 2002

Monitoring Period: Arrival: 1245
Departure: 1500

Demolition Activities Observed:
Completing the removal of the vessel Aloha

Tidal Direction: (Flood) Ebb
Tidal Period: 1103 to 1746

Weather Observations: P. cloudy winds 10-15K NW temp 35-40F.



Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:
Up-Current Background Station
Water Depth: 8 ft
Turbidity: <5 NTU
Depth of Sensor: 5 ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
300 FT:	6 ft	3 ft	<5 NTU
600 FT:	ft	ft	NTU
1000 FT:	ft	ft	NTU

Samples Collected:
☒ None ☐ TSS ☐ Turbidity ☐ Cu/Pb ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
No effects on water column turbidity was observed, background and stations down-current and within turbidity curtain less than 5 NTU.

Visible oil slick observed (diesel odor) south of site from turbidity curtain to approximately 500 ft to SE. USACE notified, MAT Marine/Kevric responded. Source tracked to a barge south and outside of work area for H. Melville site. City was reportedly pumping off fuel earlier.

Scientific Crew: D. Bole (ENSR) C. Dunbar (CRE)
Completed By: D. Bole

ENSR® U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

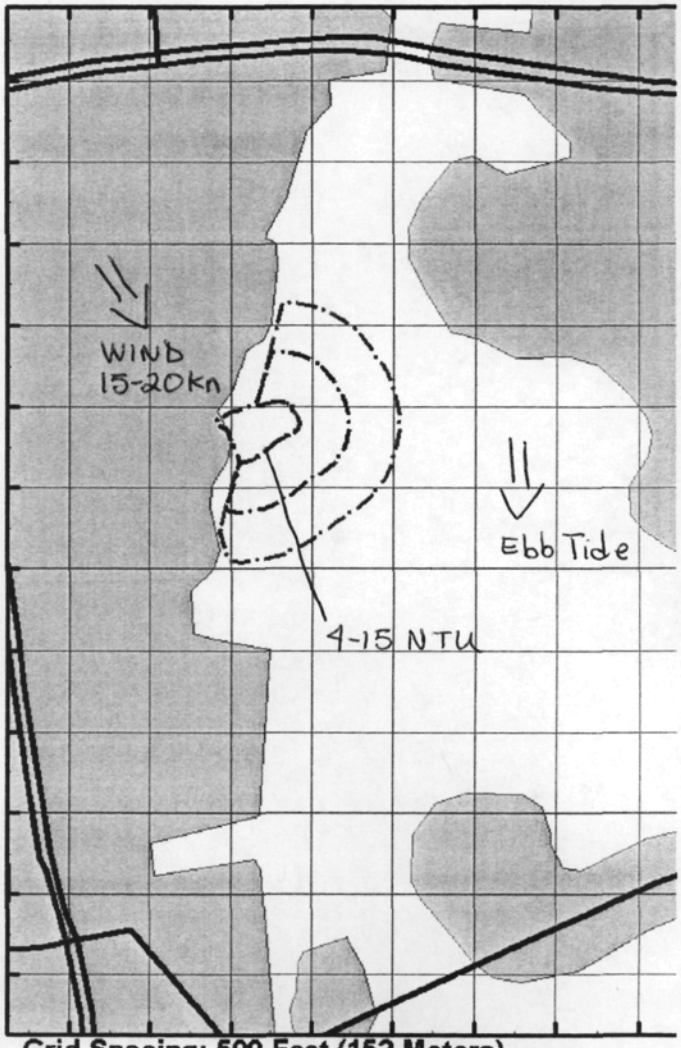
Date: 15 May 2002

Monitoring Period: Arrival: 0954
Departure: 1522

Demolition Activities Observed:
Demolition of concrete barge

Tidal Direction: Flood (Ebb)
Tidal Period: 1048 to 1558

Weather Observations: Partly cloudy, cool. Wind 15-20 knots, North-North West Gusting up to 25-30 knots



Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:
Up-Current Background Station
Water Depth: 8 ft
Turbidity: 4-6 NTU
Depth of Sensor: 4 ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
10 ~~300~~ FT:	6-8 ft	2-4 ft	4-15 NTU
600 FT:	ft	ft	NTU
1000 FT:	ft	ft	NTU

Samples Collected:
☒ None ☐ TSS ☐ Turbidity ☐ Cu/Pb ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
At 1130 received information from Army Corp New Bedford office noting that about 1030 the contractor had hit a pipe underwater during demolition activities. The pipe was cracked and liquid was flowing into the harbor at a substantial rate. When ENSR arrived on-site to sample the material it had stopped flowing. The contractor noted the liquid was colorless and odorless.

No turbidity exceedances were noted.

Scientific Crew: M. Evans (ENSR), C. Dunbar (CR Env)
Completed By: M. Evans

ENSR®

U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

Date: 12 June 2002

Monitoring Period: Arrival: 0915
Departure: 1510

Demolition Activities Observed:
Use of guillotine system to break up barge and use of excavator to remove broken sections

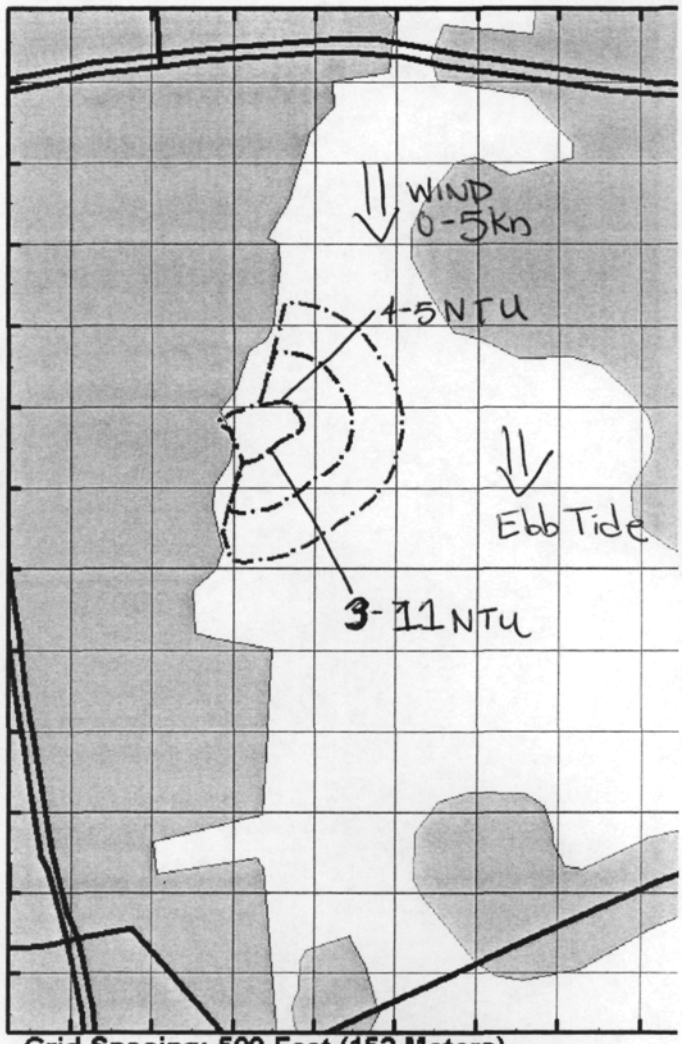
Tidal Direction: Flood (Ebb)
Tidal Period: 0944 to 1448

Weather Observations: Calm and overcast. Wind increasing to 0-5knots from North in afternoon.

Monitoring Performed:
Up-Current Background Station
Water Depth: 5 ft
Turbidity: 4-5 NTU
Depth of Sensor: 3 ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
300 FT:	>10 ft	3-5 ft	3-11 NTU
600 FT:	ft	ft	NTU
1000 FT:	ft	ft	NTU



Grid Spacing: 500 Feet (152 Meters)

Samples Collected:
☒ None ☐ TSS ☐ Turbidity ☐ Cu/Pb ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
No turbidity exceedances were noted.

Substantial activity near site with Cashman tug boats bringing barges up to site and anchoring them. No active dredging occured during this period at the state pier.

Scientific Crew: M. Evans (ENSR) C. Dunbar (CR Env)
Completed By: M. Evans

ENSR® U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

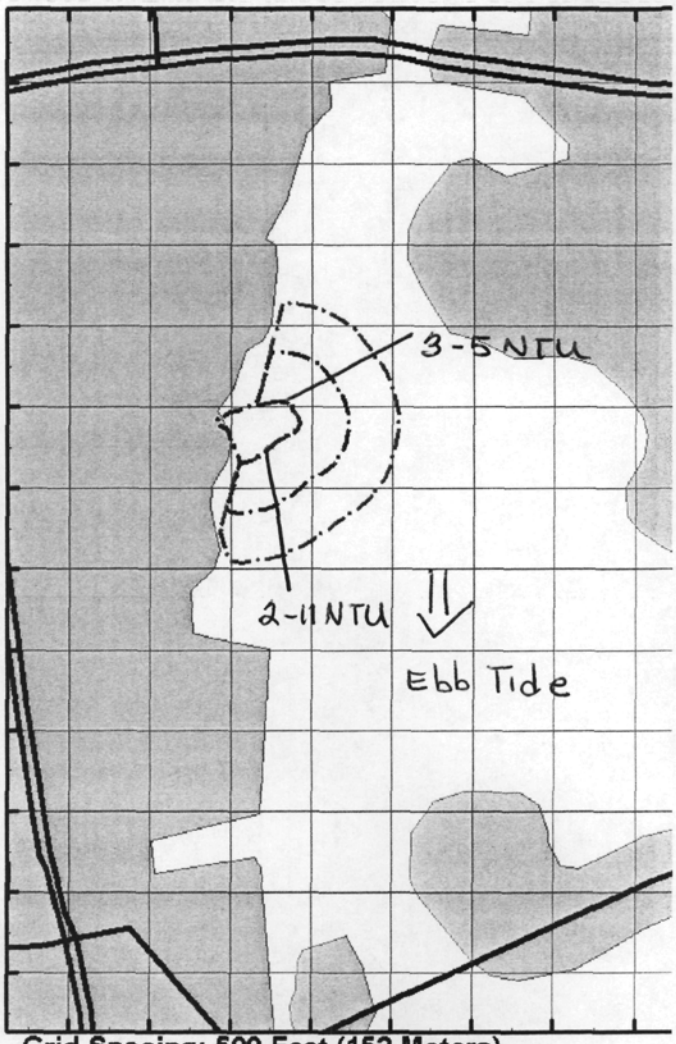
Date: 13 June 2002

Monitoring Period: Arrival: 0928
Departure: 1544

Demolition Activities Observed:
Use of guillotine system to break up barge and use of excavator to remove broken sections from the water

Tidal Direction: Flood (Ebb)
Tidal Period: 1032 to 1539

Weather Observations: Overcast Wind 0-5kn N shifting to 0-5kn S in afternoon



Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:
Up-Current Background Station
Water Depth: 6 ft
Turbidity: 3-5 NTU
Depth of Sensor: 3 ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
300 FT:	6->10 ft	3-5 ft	2-11 NTU
600 FT:	ft	ft	NTU
1000 FT:	ft	ft	NTU

Samples Collected:
☒ None ☐ TSS ☐ Turbidity ☐ Cu/Pb ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
No turbidity exceedances were noted.

Cashman off-loaded material from the state pier dredging activities into piping system to pump sediment to shore. Turbidity ~~readi~~ values down current of this activity were 3-5 NTU. Observed state pier dredging operations

Scientific Crew: M. Evans (ENSR) C. Dunbar (CR Env)
Completed By: M. Evans

ENSR®

U.S. Army Corps of Engineers
New Bedford Harbor Water Quality Monitoring
Herman Melville Marine Boatyard Demolition

EPA

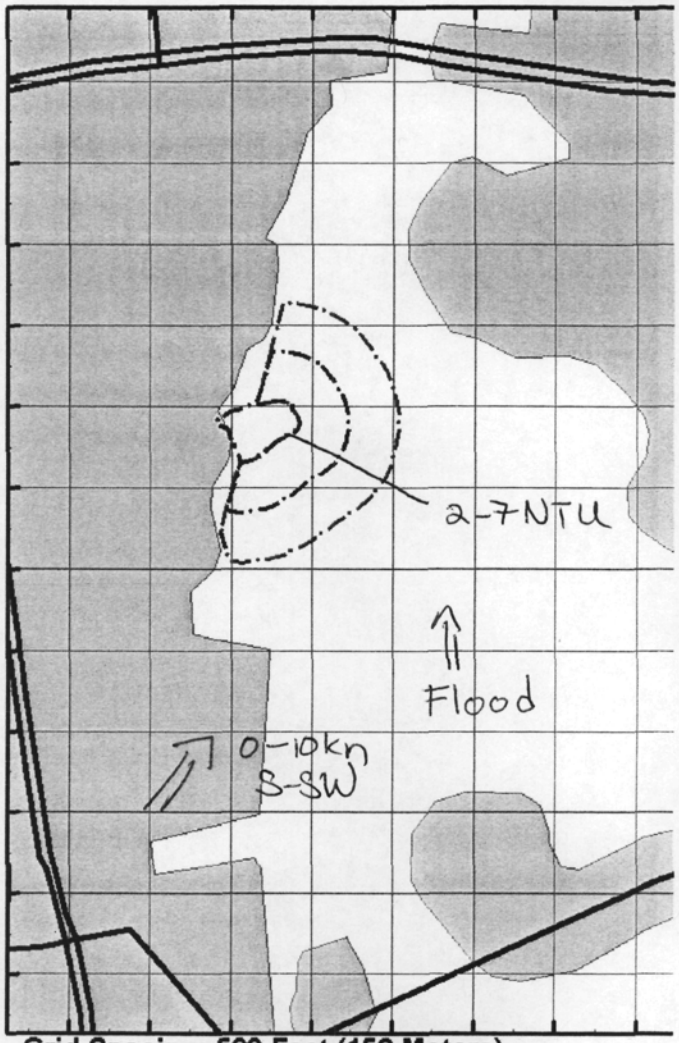
Date: 20 June 2002

Monitoring Period: Arrival: 0940
Departure: 1545

Demolition Activities Observed:
Excavators removed pieces of the steel barge from the water and placed them on a construction barge
No guillotine work was observed

Tidal Direction: (Flood) Ebb
Tidal Period: 1000 to 1700

Weather Observations: Clear + warm
Wind 0-5kn S-SW in morning
increasing to 5-10 kn S-SW
in afternoon



Grid Spacing: 500 Feet (152 Meters)

Monitoring Performed:
Up-Current Background Station
Water Depth: 6-8 ft
Turbidity: 2-7 NTU
Depth of Sensor: 3-4 ft

Range of Turbidity Down Current:

	Water Depth	Depth of Sensor	Turbidity
300 FT:	6-8 ft	3-4 ft	2-7 NTU
600 FT:	ft	ft	NTU
1000 FT:	ft	ft	NTU

Samples Collected:
☒ None ☐ TSS ☐ Turbidity ☐ Cu/Pb ☐ Oil & Grease ☐ PCB ☐ TPH ☐ TOX

Observations:
Observed work was completed near shore.
No turbidity exceedances were noted

Cashman off-loaded material from the state pier dredging activities into piping system to pump sediment to shore.
Observed state pier dredging operations.

Scientific Crew: M. Evans (ENSR) E. Steel (CR Env)
Completed By: M. Evans

Update 10 – Water Quality Monitoring – 11 July 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 01 June to 28 June 2002

Demolition Status Related to Water Quality –

Arrival of the "guillotine" demolition system and continuation of asbestos removal occurred in the early part of the week of 01 June. Demolition of the steel barges began on Tuesday, 11 June. In-water guillotine operations were completed on Friday, 28 June.

Water Quality Monitoring Performed –

Monitoring was performed on three occasions Wednesday and Thursday, 12 and 13 June and on Thursday, 20 June during activities that were considered representative of in-water "guillotine" operations. Turbidity measurements were made with an OBS sensor. Background turbidity values up-current of the work area were between 2 and 7 NTU. Turbidity values along the down-current edge of the turbidity curtain during active demolition ranged from 2 to 11 NTU.

Samples Collected / Analytical Results –

No samples were collected during this period.

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period. During the guillotining of the steel tug an undocumented fuel tank was ruptured on Tuesday, 25 June causing a sudden release at the waters edge, estimated to be approximately 400-gallons. Operations were discontinued and spill countermeasures were implemented to contain and clean up the spill. The USACE Resident Engineer was immediately called to the site to inspect the situation and determined that no additional action or environmental sampling was required. The USCG responded to the site the following morning and was satisfied with the actions taken.

State Pier dredging was observed on each of the monitoring days mentioned above along with sediment transfer operations that occur adjacent to the Herman Melville site. The turbidity monitoring performed did not detect any observable impacts to water quality in the vicinity of the vessel removal work due to the sediment transfer operations.

Project Schedule –

In-water demolition work has been completed; the derelict destroyer hull that is embedded in the bank of the Herman Melville site is the only vessel removal that remains for the Project. The elevation of the vessel is approximately at the high tide mark and therefore may pose a reduced threat, in regards to impacting surface water quality, during its removal. ENSR is not scheduled to monitor turbidity in the harbor during the removal of the destroyer but will maintain a regular site presence until this operation has been completed.

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Update 9 – Water Quality Monitoring – 31 May 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 25 May to 31 May 2002

Demolition Status Related to Water Quality –

No in-water demolition work was conducted during the week. The week was dedicated to the separation and disposal of debris that resulted from the demolition of the concrete-hulled barge.

Water Quality Monitoring Performed –

No water quality monitoring was performed during this period.

Samples Collected / Analytical Results –

No samples were collected during this period.

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period.

The dredging associated with the deepening of the State Pier began on Tuesday, 28 May. No transfer operations adjacent to the Herman Melville site are expected until the week of 03 June.

Project Schedule –

The "guillotine" demolition barge has arrived in New Bedford and will be ready to begin the demolition on the line of steel barges by middle of the week of 03 June. ENSR will be performing more frequent water quality monitoring during the early phases of guillotine operations to assess potential impacts.

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Update 8 – Water Quality Monitoring – 24 May 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 18 May to 24 May 2002

Demolition Status Related to Water Quality –

No in-water demolition work was conducted during the week.

The week was dedicated to the separation and disposal of debris that resulted from the demolition of the concrete-hulled barge. A digital image of active demolition performed on the concrete barge is attached.

Water Quality Monitoring Performed –

No water quality monitoring was performed during this period.

Samples Collected / Analytical Results –

No samples were collected during this period.

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period.

The dredging associated with the deepening of the State Pier has been delayed due to equipment problems with the environmental bucket; efforts are scheduled to resume the week of 27 May. ENSR has contacted APEX Marine and will coordinate future monitoring activities with State Pier dredging operations (i.e. offloading activity) in order to identify potential water quality impacts unrelated to vessel removal operations.

Project Schedule –

The "guillotine" demolition barge is scheduled to arrive in New Bedford on Tuesday, 28 May with actual demolition activities to be initiated on the line of steel barges late in the week of 27 May at the earliest. ENSR will be performing more frequent water quality monitoring during the early phases of guillotine operations to assess potential impacts.

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Update 7 – Water Quality Monitoring – 17 May 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 11 May to 17 May 2002

Demolition Status Related to Water Quality –

The demolition work on the concrete-hulled barge was completed during the week. All of the debris generated by this activity were removed from harbor and transferred to the sorting pad.

Water Quality Monitoring Performed –

Monitoring was performed on Wednesday, 15 May during activities that were considered representative of in-water demolition of the concrete-hulled barge. Turbidity measurements were made with an OBS sensor. Background turbidity values 1000-feet up-current of the work area ranged from 3 to 10 NTU; somewhat elevated due to the windy conditions (north-northwest winds 15 to 25 knots). Turbidity values along the down-current edge of the turbidity curtain during active demolition ranged from 10 to 15 NTU.

Samples Collected / Analytical Results –

No samples were collected during this period.

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period.

During the demolition of the concrete-hulled barge a sub-bottom pipeline residing under the barge was ruptured. A clear odorless liquid discharge (assumed water) was observed. ENSR was notified by USACE personnel on-site, and directed to collect a sample for possible analysis. The discharge of unknown origin was short-lived and ceased prior to the collection of samples.

The dredging associated with the deepening of the State Pier has begun. ENSR will coordinate future monitoring activity with State Pier dredging operations (i.e. offloading activity) in order to identify any water quality impacts unrelated to vessel removal operations.

Project Schedule –

The sorting and disposal of debris generated by the demolition of the concrete hulled barge will occur during the week of 20 May 2002; no in-water demolition activities are planned.

Demolition activities using the guillotine will begin on the line of steel barges and are currently planned for the week of 27 May; no work is scheduled for Memorial Day. ENSR will be performing more frequent water quality monitoring during the early phases of guillotine operations to assess potential impacts.

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Update 6 – Water Quality Monitoring – 10 May 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 04 May to 10 May 2002

Demolition Status Related to Water Quality –

No in-water demolition work was conducted during the week.

The week was dedicated to the separation of wood and steel debris that was transferred off the demolition barge to the sorting pad. This phase of operations is expected to continue into the week of 13 May. Efforts were also completed on removing asbestos materials from the concrete hulled barge in advance of the demolition of this vessel.

Water Quality Monitoring Performed –

No water quality monitoring was performed during this period.

Samples Collected / Analytical Results –

No samples were collected during this period.

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period.

Efforts are underway to retrofit the steel barges immediately south of the Herman Melville site to facilitate the handling of dredged materials associated with the deepening of the State Pier. ENSR will coordinate future monitoring activity with State Pier dredging operations (i.e. offloading activity) in order to identify any water quality impacts unrelated to vessel removal operations.

Project Schedule –

Demolition of the concrete hulled barge is planned for early in the week of 13 May 2002

Demolition activities using the guillotine will begin on the line of steel barges and will start the week of 20 May. ENSR will be performing more frequent water quality monitoring during the early phases of guillotine operations to assess potential impacts.

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Update 5 – Water Quality Monitoring – 03 May 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 27 April to 03 May 2002

Demolition Status Related to Water Quality –

No in-water demolition work was conducted during the week.

At this point all the wooden vessels south of the steel barges have been removed from the harbor and the week was dedicated to the offloading of debris from the demolition barge and transferring these materials to the sorting pad for handling and disposal. This phase of operations is expected to continue through most of the week of 06 May with the goal of completely clearing the sorting pad of all debris that has been generated to date by the removal of the wooden vessels.

Water Quality Monitoring Performed –

No water quality monitoring was performed during this period.

Samples Collected / Analytical Results –

No samples were collected during this period.

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period.

Project Schedule –

The site is being mobilized for the start of demolition work on the steel-hulled vessels using the guillotine. Demolition activities using the guillotine will begin on the line of steel barges and may start late in the week of 06 May. ENSR will be performing more frequent water quality monitoring during the early phases of guillotine operations to assess potential impacts.

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Update 4 – Water Quality Monitoring – 26 April 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 20 April to 26 April 2002

Demolition Status Related to Water Quality –

In-water demolition work was performed. All of the wooden vessels from the southern half of the site (south of the steel barges) have now been removed. Offloading debris from the demolition barge and transferring these materials to the sorting pad was conducted during the latter part of the week.

Water Quality Monitoring Performed –

Monitoring was performed on Monday and Tuesday, 22 and 23 April, during in-water demolition activities considered representative of removing structural lumber. Turbidity measurements were made with an OBS sensor. Background turbidity values 1000-feet up-current of the work area were less than 5 NTU on both days; little variation in water column turbidity was detected down-current of the operation on either day.

A localized plume of higher turbidity, with values as high as 25 NTU above background, was observed immediately outside the **up-current** edge of the turbidity curtain on Monday. This elevated turbidity was related to a breach in the turbidity curtains' flotation collar and was limited to a localized area in the vicinity of active demolition activities. The USACE was notified; MAT Marine rectified the situation within 30-minutes.

An oil sheen was observed on Tuesday which projected from the south side of the turbidity curtain to a point approximately 500-feet downwind to the southeast. The USACE was notified and situation was investigated. The source was determined to be associated with off-site, non-project-related activities (fuel stripping) being conducted on two barges immediately south of the Herman Melville site.

Samples Collected / Analytical Results –

Results of toxicity testing for samples that were collected on 18 April during the monitoring of in-water demolition activities were received on 20 and 21 April. These samples were collected within the confines of the turbidity curtain to assess a worst case condition for this phase of demolition. There was good survivorship of test organisms for the Mysid test and good fertilization rates for the *Arbacia* test. There were no significant differences in test results from the samples collected from an up-current reference station, from within the boundaries of the turbidity curtain, or from a point located 25-feet outside of the turbidity curtain directly down-current of demolition activities. Based on the favorable results of toxicity testing the chemistry samples were archived.

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period.

It is noteworthy to mention that MAT Marine acted quickly, on two separate instances, with appropriate response measures when notified of the observed breach in the turbidity curtain and the oil sheen.

Project Schedule –

Demolition activities using the guillotine are expected to begin on the steel barges early to middle of the week of 29 April. ENSR will be performing more frequent water quality monitoring during the early phases of guillotine operations to assess potential impacts.

Update 3 – Water Quality Monitoring – 19 April 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 13 April to 19 April 2002

Demolition Status Related to Water Quality –

Offloading debris from the demolition barge and transferring these materials to the sorting pad was conducted during most of the week. In-water demolition work resumed on Thursday, 18 April with the removal of structural lumber from at or below the mud line. Demolition continued with the removal of topside structural lumber for vessels lying aground along the bank of the Harbor.

Water Quality Monitoring Performed –

Monitoring was performed on Thursday, 18 April during in-water demolition activities considered representative of removing structural lumber. Turbidity measurements were made with an OBS sensor. Background turbidity values 1000 feet up-current of the work area were less than 5 NTU; little variation in water column turbidity was detected either down-current or within the boundaries of the turbidity curtain. Water column turbidity down-current of the work area was evaluated from the near surface to within 1-foot of the bottom and turbidity values were consistent through the full depth of the profile.

Samples Collected / Analytical Results –

Samples were collected on 18 April to evaluate the water column response during typical in-water demolition activities. Chemistry and toxicity samples were collected from an up-current reference station, from within the boundaries of the turbidity curtain, and from a point located 25-feet outside of the turbidity curtain directly down-current of demolition activities. These samples were collected to determine whether there exists a relationship between turbidity, dissolved copper, and acute toxicity.

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period.

Project Schedule –

Demolition activities are scheduled to continue into early next week after which there will be a few days required to off-load the demolition barge and sort out debris.

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Update 2 – Water Quality Monitoring – 12 April 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 06 April to 12 April 2002

Demolition Status Related to Water Quality –

In-water demolition work continued through the week with temporary staging of the removed debris on the demolition barge adjacent to the shoreline.

Water Quality Monitoring Performed –

Monitoring was performed on 09 and 10 April. Activities observed on 09 April included light demolition activities that targeted the removal of materials that were exposed above the waterline. Activities observed on 10 April were primarily the removal of topside structural lumber; little in the way of underwater removals was conducted. Turbidity measurements were made with an OBS sensor. Background turbidity values 1000 feet up-current of the work area were less than 5 NTU; no variation in water column turbidity was detected down-current on either monitoring day. Water column turbidity down-current of the work area was evaluated from the near surface to within 1-foot of the bottom and turbidity values were consistent through the full depth of the profile. Water column turbidity was also checked within the boundaries of the turbidity curtain at the end of demolition activities on 10 April and no change from background was recorded.

Samples Collected / Analytical Results –

No samples were collected during this reporting period.

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period.

Project Schedule –

In-water demolition activities are scheduled to resume early next week after the debris removed to date has been off-loaded from the demolition barge and sorted out.

Water quality sampling is scheduled for 16 April (contingent on active demolition activities) to assess the relationship between turbidity, dissolved copper, and acute toxicity. Samples will be collected from an up-current reference station and from three stations located down-current of the work area. The three down-current stations will be located at the edge of the turbidity curtain boundary and at distance of 300- and 600-feet.

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Update 1 – Water Quality Monitoring – 05 April 2002
Herman Melville Marine Boatyard Demolition Project.
New Bedford Harbor Superfund Site – New Bedford, Massachusetts

Period Covered – 20 March to 05 April 2002

Demolition Activities Completed –

Driving support pilings for the turbidity curtain / oil boom begins and is completed on 25 March, the installation of the full-depth turbidity curtain begins on the following day and is in-place completely surrounding the in-water work area by weeks end. The turbidity curtain was assembled and installed in panel segments by MAT Marine personnel operating from a small boat. The support pilings and the turbidity curtain were installed in a manner that incorporates two removable sections to facilitate positioning the demolition barge inside the work area. A second turbidity curtain and oil boom was positioned in the immediate area of demolition activities to control surface debris and oil sheen.

Demolition activities begin on Thursday, 04 April with a focus on removing the vessels "*Commonwealth*", "*Wide World*" and the adjacent unnamed wrecks (#09 and #10). Removal of these vessels will allow for the repositioning of demolition barge to a point closer to the shore, permitting better access to other vessels in the work area and off-loading of debris for shore-side handling. During this initial phase, while the shore-side staging area is being completed, the demolition barge will be staging all debris on-board until the vessel is capable of offloading. The barge has a capacity for four days of demolition debris.

Water Quality Monitoring Performed –

Background dissolved copper (Cu) samples were collected from the Lower Harbor on 20 March in advance of in-water demolition related activities.

Monitoring was performed on 26 March during the installation of the turbidity curtain. Turbidity measurements were made with an OBS sensor. Background turbidity values 1000 feet up-current of the work area were less than 5 NTU; no variation in water column turbidity was detected down-current.

Samples Collected / Analytical Results –

Dissolved Cu samples were collected from a reference station 1000 feet up-current of the work area (one sample plus a duplicate) and from two stations located 300- and 600-feet down-current. Duplicate samples collected at the reference station resulted in concentrations of 2.3 and 2.4ug/L. The concentrations determined for the down-current stations were 2.9ug/L and 2.5ug/L at the 300-foot and 600-foot stations respectively. The National Water Quality Criteria for copper is listed as 3.1ug/L (chronic concentration) and 4.8ug/L (maximum concentration).

Noteworthy Items / Exceedences –

No project-specific water quality criteria were exceeded during this reporting period.

Project Schedule –

Water quality sampling is scheduled for 09 April (contingent on active demolition activities) to assess the relationship between turbidity, dissolved copper, and acute toxicity. Samples will be collected from an up-current reference station and from three stations located down-current of the work area. The three down-current stations will be located at the edge of the turbidity curtain boundary and at distance of 300- and 600-feet.

APPENDIX D

Project Updates

SAMP_ID	MATRIX	LAB_ID	PARM	RESULT	QUAL	UNIT	CAS_NO	DF	DATE_ANALYZED	METHOD
REF 1K.S	Water	0203086-01	Copper	2.4		µg/L	7440-50-8	5	03/21/2002	6020A
REF 1K.S	Water	0203086-02	Copper	2.3		µg/L	7440-50-8	5	03/21/2002	6020A
300.N	Water	0203086-03	Copper	2.9		µg/L	7440-50-8	5	03/21/2002	6020A
600.N	Water	0203086-04	Copper	2.5		µg/L	7440-50-8	5	03/21/2002	6020A

Arbacia punctulata Chronic Fertilization Assay

Event:	**Bedford Harbor Monitoring**						
Date:	**04/18/02**			**Replicate Vial**			
ESI Sample ID	**ENSR ID**	**Eggs**	**1**	**2**	**3**	**4**	**Mean**
		Unfertilized	7	19	11	17	13.5
		Fertilized	115	115	115	117	115.5
Lab Control	--	Total	122	134	126	134	129.0
		% Fert.	94.3%	85.8%	91.3%	87.3%	89.7%
		Unfertilized	7	39	42	14	25.5
		Fertilized	114	92	91	116	103.3
	STA TC	Total	121	131	133	130	128.8
		% Fert.	94.2%	70.2%	68.4%	89.2%	80.5%
		Unfertilized	12	16	10	7	11.3
		Fertilized	126	114	116	110	116.5
	25 S	Total	138	130	126	117	127.8
		% Fert.	91.3%	87.7%	92.1%	94.0%	91.3%
		Unfertilized	11	17	18	8	13.5
		Fertilized	114	117	110	111	113.0
	REF	Total	125	134	128	119	126.5
		% Fert.	91.2%	87.3%	85.9%	93.3%	89.4%

***Americamysis bahia* 48-Hour Survival Assay**

Event:	**Bedford Harbor Monitoring**				
Date:	**04/18/02**		**Survival (Day)**		
ESI Sample ID	**ENSR ID**	**Rep**	**0**	**1**	**2**
		A	10	10	10
Lab Control	--	B	10	10	10
		C	10	10	10
		D	10	10	10
		Mean	100.0%	100.0%	100.0%
		A	10	10	9
	STA TC	B	10	10	10
		C	10	10	9
		D	10	10	9
		Mean	100.0%	100.0%	92.5%
		A	10	10	9
	25 S	B	10	10	10
		C	10	10	9
		D	10	10	10
		Mean	100.0%	100.0%	95.0%
		A	10	9	8
	REF	B	10	10	10
		C	10	10	9
		D	10	10	10
		Mean	100.0%	97.5%	92.5%

APPENDIX C

Water Quality Monitoring Data

II. AREA D

U.S. Army Corps of Engineers
New England District

U.S. Environmental Protection Agency

Water Quality Monitoring Summary Report

II. Area D Construction
(September 2002 - June 2003)

New Bedford Harbor Superfund Site - New Bedford, Massachusetts

Prepared by:

Woods Hole Group
Environmental Laboratories

ENSR Corporation

CR Environmental

Contract:
DACW33-02-D-0006
Task Order 0001
ENSR Document No.
10310-003-0800

CV04003a

Draft Final
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EXECUTIVE SUMMARY

As part of the preparation for the remediation of the New Bedford Harbor Superfund Site, a bulkhead was constructed at Area D in the Lower Harbor to support the planned Sediment Dewatering, Material Transfer and Receiving Facility. The area of construction contained sediments with elevated concentrations of PCBs and some metals, and the construction activities had the potential to release suspended solids and associated contaminants into the water column. As a result, the construction contractor performed all in-water work within the confines of a full-depth silt curtain and the majority of dredging was performed within sheet-pile enclosed cells.

In addition to the turbidity controls, a water quality monitoring program was developed by the USACE and USEPA to ensure that the construction was carried out in a manner that did not result in acute impacts to organisms within the waters adjacent to the work zone or result in significant transport suspended material and associated contaminants away from the work zone. The program included boat-based monitoring by the construction contractor during intensive, in-water components of construction as well as periodic oversight and independent monitoring by the USACE's environmental contractor. All monitoring included real-time measurement of turbidity down current of the work area for comparison against an upper level project specific turbidity criterion (set at 50 NTU above background at 300 ft down current of the work zone). The monitoring specified contingent sampling, analyses, and construction work modification in the event of a turbidity criterion exceedence.

Construction activities began in September 2002, and bulkhead construction was completed in June 2003. The water quality monitoring revealed that the site controls were successful in limiting suspended sediment transport and protective of water quality. There were no exceedences of the project-specific turbidity criterion. In addition, water sampling and toxicity testing performed directly within the work zone revealed that there were no significant dissolved phase impacts during the construction.

1.0 INTRODUCTION

New Bedford Harbor is located approximately 50 miles south of Boston on the waters of Buzzards Bay in Bristol County, Massachusetts. The sediments in many areas of the Harbor are contaminated with polychlorinated biphenyl's (PCB's) and metals, primarily from the manufacture of electrical components which occurred in the area between 1940 and the mid-1970's. Based on human health concerns and ecological risk assessments, the U.S. Environmental Protection Agency (USEPA) added New Bedford Harbor to the National Priorities List in 1982 as a designated Superfund Site, and stipulated that remedial measures were required to remove PCB-contaminated sediments from the Harbor. Through an Interagency Agreement between the USEPA and the U.S. Army Corps of Engineers, New England District (USACE), the USACE is responsible for carrying out the design and implementation of the remedial measures.

The New Bedford Harbor Superfund Site extends from the shallow northern reaches of the Acushnet River estuary, south through the commercial harbor of New Bedford and out beyond the City's hurricane barrier into 17,000 adjacent acres of Buzzards Bay. The Superfund Site is divided into three areas: the Upper, Lower and Outer Harbors (Figure 1) defined by geographical features of the Harbor and gradients of sediment contamination. The industrial discharge of PCB contaminated waste, either directly into the Harbor or indirectly through the City's sewer system, was most significant in the Upper Harbor. The location of the associated discharge and the hydrodynamics of the Harbor contributed to the deposition of significant levels of PCB contamination in the Upper Harbor. The highest PCB concentrations or "hot-spots", which contained PCB concentrations in excess of 100,000 ppm, resided in the sediments located in the immediate area of the discharge. These "hot-spot" sediments were removed between 1994 and 1995 as part of the USEPA's first cleanup phase (USEPA, 1997). The remaining sediments in the Upper Harbor, an area of approximately 190 acres, are still heavily contaminated, with PCB concentrations as high as 4,000 ppm.

Future remedial dredging efforts are planned for the Upper Harbor and portions of the Lower and Outer Harbors. Until the remedial action has been completed, any in-water construction activities that disturb the contaminated sediments require that a water quality monitoring program be developed to ensure that the construction operation is carried out in a manner such that:

- The disturbance of the contaminated sediments does not result in any acute impact to organisms within the water column outside of the construction area.

- There is not significant transport and deposition of sediments and their associated contaminants outside the construction zone to uncontaminated areas or areas that have already been remediated.

As part of the progression of the overall New Bedford Harbor Superfund Remediation effort, a Sediment Dewatering, Material Transfer, and Receiving Facility is being constructed at the southern lobe of the former CDF D area, along the western shoreline of New Bedford Harbor south of the I-195 bridge (Figure 2). This location is referred to as Area D. In preparation for the facility at Area D, a cellular sheetpile cofferdam was constructed along the shoreline and backfilled to form a bulkhead. Because the sediments within this area contained elevated levels of PCBs and metals, the USEPA and USACE required that the in-water work be performed with specialized techniques and within a full depth silt curtain. The USEPA and USACE also developed a two-tiered water quality monitoring program; the construction contractor performed regular turbidity monitoring during in-water construction, and the USACE performed periodic oversight and sampling/analysis to ensure that project water quality goals were being met.

Construction activities began in September 2002 and were completed in June 2003. This work was performed by R. Zoppo Corp. under contract to Tetra Tech Environmental (formerly Foster Wheeler Environmental). CLE Engineering performed the construction contractor-based monitoring under subcontract to R. Zoppo Corp. The USACE water quality monitoring was performed by Woods Hole Group Environmental Laboratories (WHG) with team members ENSR Consulting, CR Environmental, and Aquatec Biological Sciences. The monitoring revealed that the site controls were successful in meeting the goals defined above and limiting overall impacts to water quality. This report provides a summary of the water quality monitoring program and results.

2.0 CONSTRUCTION SUMMARY

Bulkhead construction activities at Area D consisted of the placement and backfilling of seven circular sheetpile cells connected by six sheetpile arc structures (Figure 3). The construction extended the existing shoreline of the area approximately 400 ft to the east and 200 feet to the north, covering approximately 1.5 acres of subtidal zone and 0.5 acres of intertidal zone. Prior to construction a full-depth silt curtain with boom was installed around the construction site to contain any material disturbed by construction activities. At the start of the construction, a limited amount of sediment was dredged prior to the placement of sheetpile (Figure 4). However, the majority of dredging was performed within each sheetpiled cell or arc. The construction sequence for each cell or arc consisted of the following:

- Piles were driven, and a template was installed to guide sheetpile placement (Figure 5).
- Sheetpile was placed around the template and driven to depth (Figure 6).
- Sediments were mechanically dredged from within the completed sheetpiled cell or arc (Figure 7).
- The cell or arc was backfilled with gravel/crushed stone (Figure 8).

Contaminated sediments that were removed during the construction were pumped into geotubes for dewatering (Figure 9). Water removed from the dredged sediment was treated through an on-site system prior to discharge back into the harbor. The dewatered sediment was stabilized and used as fill over an upland portion of the site. After the completion of the sheetpiled enclosures, the area behind the cells and arcs was backfilled with gravel/crushed stone/sand to bring the entire area up to grade (Figure 10). Construction of the bulkhead at Area D began in September 2002 and was completed in June 2003.

3.0 WATER QUALITY MONITORING DURING CONSTRUCTION ACTIVITIES

3.1 Overview

As described in Section 2, specific construction techniques and controls were employed to ensure that construction activities and handling of the contaminated sediments were performed in a manner that limited the potential release of suspended material and their associated contaminants to the water column. The USEPA and USACE developed a water quality monitoring program to ensure that these techniques were implemented and the environmental goals outlined in Section 1 were met. The program included a project-specific turbidity criterion and two monitoring components, one performed by the construction contractor and one performed by the USACE.

The project-specific turbidity criterion was defined as 50 NTU above background at the edge of a 300 ft mixing zone around the construction area. This criterion was developed based on a review of previous dredging and monitoring activities at the New Bedford Harbor Superfund Site and an understanding of sediment contamination and current patterns in the vicinity of the construction. The monitoring performed by the construction contractor focused on boat-based, real-time measurement of turbidity for comparison against the project-specific criterion. This monitoring was performed at the outset of a given construction activity to assess potential impacts, and was later reduced in intensity if the specific construction activity was found to meet the environmental goals. The monitoring performed by the USACE included review of daily water quality data as provided by the construction contractor, periodic oversight of the construction contractor field based monitoring activities, and periodic independent monitoring. The independent monitoring included water column sampling for biological testing to ensure that the project-specific turbidity criterion was protective of the environment. A brief summary of the construction contractor and USACE monitoring is presented below. Further information may be found in the Scope of Work (SOW) for the Water Quality Monitoring during Construction Activities at Area D, New Bedford Harbor Superfund Site (Appendix A).

3.2 Construction Contractor Water Quality Monitoring

The construction contractor (R. Zoppo Corp.) was responsible for performing daily water quality monitoring at the outset of the project and during specific construction activities. The daily monitoring consisted of boat-based turbidity measurements and sampling for total suspended solids (TSS). The construction contractor subcontracted this monitoring to CLE Engineering.

Turbidity monitoring was completed using a backscatter nephelometer with an underwater sensor and direct surface readout (Yellow Springs Instrument (YSI) probe). The unit was calibrated daily. Turbidity was measured along the down-current edge of the 300 ft mixing zone and compared to a reference site located 1,000 ft up-current from construction activity (Figure 2). A limited number of confirmatory TSS samples were also collected during construction activities. If turbidity at the 300 ft

mixing zone exceeded the 50 NTU above background criterion, a set of notification, monitoring, and corrective action contingencies was put into place as detailed in Figure 11.

3.3 USACE Water Quality Monitoring

The USACE water quality monitoring was performed by environmental contractor Woods Hole Group Environmental Laboratories (WHG) with team members ENSR Consulting, CR Environmental, and Aquatec Biological Sciences. The USACE environmental contractor maintained a regular site presence to observe environmental conditions during construction activities and to ensure that operations were conducted in accordance with the water quality environmental requirements as outlined in the SOW. This effort involved coordinating boat-based monitoring activities, results notification to appropriate personnel, and assessing any conditions associated with construction activities that could potentially affect water quality within New Bedford Harbor.

Periodic water quality monitoring surveys were conducted by the USACE monitoring contractor to obtain water quality data for comparison to data reported by the construction monitoring contractor. The USACE monitoring contractor measured turbidity at the 300 ft down-current mixing zone and compared this value to the 1,000 ft up-current reference. In the event of a turbidity exceedence at the 300 ft down-current mixing zone, an additional transect to collect turbidity data 600 ft down-current was to be completed, and "conditional" water samples were to be collected at the up-current reference, and the 300 ft mixing zone and 600 ft down-current station for chemical and biological testing in accordance with the procedure outlined in Figure 11.

An analytical protocol was developed to determine when collected water samples would be submitted for biological (toxicity) testing and chemical analysis (Figure 12). Initial biological testing included the 24-hour sea urchin sperm fertilization test (*Arbacia sp.*) and the 48-hour Mysid shrimp (*Mysidopsis bahia*) survival test. Analysis of additional samples was contingent upon the results of the biological testing of the initially analyzed sample. Depending upon these results, further toxicity and chemistry testing of the water sample may have been specified (Figure 12). Chemical analysis included total suspended solids, total PCBs (based on the 18 NOAA Status and Trends congeners), and total heavy metals including copper and lead. Samples were analyzed in accordance with the Sampling and Analysis Plan and Quality Assurance Project Plan – New Bedford Harbor Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies (SAP/QAPP) (WHG, 2002).

Data from chemical analysis were available within 24 hours. Toxicity testing was initiated at the lab immediately upon receipt of samples, and data were available verbally at the earliest possible time, with written reports completed within one week following test completion.

4.0 RESULTS OF WATER QUALITY MONITORING

In-water construction operations were initiated in October 2002. The construction contractor performed daily water quality monitoring during the first three weeks of the in-water work with frequent oversight by the USACE environmental contractor to gauge the potential level of impact of dredging, sheetpile driving, and associated in-water work. Only limited elevations of turbidity were noted immediately outside of the silt curtain around the construction, and turbidity levels returned to background levels within a short distance and never approached the criterion of 50 NTU above background at 300 ft from the construction. Based on these results and in conjunction with the fact that dredging of contaminated material would only occur from within the completed sheetpiled enclosures, the intensity of the monitoring was reduced to periodic construction contractor monitoring with oversight as deemed warranted by a change in construction activity.

Construction operations continued through the fall 2002 and winter-spring 2003 and were completed in June 2003. No boat-based monitoring was performed from mid-January through mid-March as the Harbor was completely iced-in, but regular USACE environmental oversight continued through the period. A summary of the construction contractor water quality monitoring and USACE environmental contractor oversight throughout the project is provided in Table 1. The construction techniques and turbidity controls were found to work well with only limited turbidity elevations outside of the silt curtain (Figure 13) and no exceedence of the 50 NTU criterion at 300 ft from the construction. Five monitoring summary updates were prepared over the course of the project and are included in Appendix B.

Water samples were collected by the USACE environmental contractor for laboratory analysis with assistance from the construction contractor on 11 January 2003 during placement of stone backfill in the area behind the constructed cells. Although turbidity controls were in place, backfilling with the stone over the contaminated sediments remaining in the area was expected to displace sediment pore water with the potential for water quality impacts from dissolved constituents. Samples were collected at the silt curtain boundary (from within the silt-curtained area), at 100 ft down current of silt curtain, and at an up-current reference location. Samples collected from within the silt curtain were submitted for the 24-hour sea urchin sperm fertilization test (*Arbacia sp.*) and the 48-hour Mysid shrimp (*Mysidopsis bahia*) survival test. The results (included in Table 2 and Appendix C) revealed good fertilization rates and survivorship for the test organisms relative to the controls. As a result of the favorable test results, the remaining samples for toxicity and chemistry were not analyzed.

5.0 CONCLUSIONS

Bulkhead construction for a planned sediment receiving and dewatering facility to be used in the remediation of the New Bedford Harbor Superfund Site involved the installation and backfilling of a series of sheetpiled cells and connecting arcs at Area D in Lower New Bedford Harbor. Because of contamination of existing sediments in the vicinity of Area D, site controls were implemented during construction including a full-depth silt curtain and performance of the majority of contaminated sediment dredging from within sheet-piled enclosures.

The USEPA and the USACE developed a water quality monitoring program for the project to ensure that the site controls were effective at preventing acute water column impacts and transport of contaminated sediments away from the construction zone. The program included a construction contractor component that focused on real-time turbidity measurements for comparison against a project-specific criterion of 50 NTU above background at 300 ft down current of construction. The program also included monitoring performed by the USACE to provide oversight of the construction contractor monitoring and evaluation of the protectiveness of the project-specific criterion.

The monitoring revealed that construction techniques and site controls were effective at limiting the release of suspended sediment to the water column during construction operations, and turbidity levels did not exceed (or even approach) the project turbidity criterion at the compliance point. Sampling and toxicity testing were performed during backfilling operations when the potential release of dissolved constituents in the sediment porewater would not be indicated by turbidity monitoring. This testing also revealed no impacts to water quality.

6.0 REFERENCES

USEPA. October 1997. Report on the Effects of the Hot Spot Dredging Operations – New Bedford Harbor Superfund Site, New Bedford, Massachusetts.

WHG. October 2002. Sampling and Analysis Plan and Quality Assurance Project Plan – New Bedford Harbor Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies.

TABLES

Table 1. Monitoring Activities during Area D Dredging and Bulkhead Construction

Date (2002)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
03 October	Dry Dredge dredging	No	0.6-3.4	1.0-5.9	
04 October	Dry Dredge dredging	No	1.7-5.2	3.3-4.0	Limited operation of Dry Dredge due to debris and hopper/pipeline constraints.
07 October	Dry Dredge dredging	No	0.5-7.8	0.3-5	Silt curtain over full water column. Turbidity inside silt curtain 80-90 NTU
08 October	Dry Dredge dredging 2 hours in morning	No	0.7-3.8	0.8-2.7	Confirmed sampling procedures with CLE. Limited operation of Dry Dredge because of debris and hopper/pipeline constraints
09 October	Dry Dredge dredging 1 hour in morning	No	0-4.3	0-1.9	Limited operation of Dry Dredge because of debris and hopper/pipeline constraints.
10 October	Dry Dredge dredging in morning	No	0-1.9	0-1	Limited operation of Dry Dredge because of debris and hopper/pipeline constraints.
11 October	Dry Dredge dredging in morning. Cell #6 template installed.	No	0-6.3	0-0.6	Limited operation of Dry Dredge because of debris and hopper/pipeline constraints. Installed shaker screen.
15 October	Sheet pile driving begins on cell #6. Dry Dredge dredges for 1/2 day	No	0-2.3	0-0.4	No Exceedances

Table 1. (Continued) Monitoring Activities during Area D Dredging and Bulkhead Construction

Date (2002)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
16 October	Dry Dredge dredging 2 hrs in afternoon. Inclement weather – no work after 1430.	No	0-1.1	2.0-3.8	Limited operation of Dry Dredge because of debris and hopper/pipeline constraints. Turbidity in harbor slightly elevated due to 35+ knot winds and rain
17 October	Dry Dredge dredging in am. Sheetpile driving was conducted on cell #6 for entire day.	No	0.1-4.4	0-2.4	Limited operation of Dry Dredge because of debris and hopper/pipeline constraints.
18 October	Dry Dredge dredged 2 hrs in afternoon.	No	0-1.9	0-1.3	
21 October	Dry Dredge dredged from 10:00 to 15:30. Stopped to allow for depth checks	No	0-1.6	0-1.3	
22 October	Dry Dredge dredges from 1030 to 1630.	No	0-4.2	0-0.8	
23 October	Driving Sheetpiles. Extension of bulkhead out about 100 X 100ft using solider piles with horizontal sheet to create a cell which will be backfilled with stone.	No	0-0.5	0	No dredging. Dry Dredge has demobilized off site.

Table 1. (Continued) Monitoring Activities during Area D Dredging and Bulkhead Construction

Date (2002)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
29 October	Diving on cells to inspect for integrity. Two cells completed (#7 and #6)	No	NA	NA	
08 November	Staging sheets, excavating cell #6, weather caused minor delay	No	0-8.3	0-1.4	
21 November	Drove spud piles for cell #3 and processed material	No	0-3.3	0	No Dredging
22 November	No active dredging. Placing template #3	No	NA	NA	No Dredging, CLE on-site but no monitoring
25 November	Excavating cell #7 and processing material. Preparing cell #3	No	0-3.2	0-0.1	
04 December	Backfilling cell #7	No	NA	NA	Turbidity noted alongside Marine Hydraulics adjacent to the site.
10 December	Driving sheet cell #3, no excavation due to mechanical problems with crane	No	NA	NA	
11 December	Dredging of cell #5, pushed stone to extend berm between cells #5 and #6.	No	0-2.4	0-0.2	

Table 1. (Continued) Monitoring Activities during Area D Dredging and Bulkhead Construction

Date (2002)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
12 December	Dredging cell #5, pushed stone to extend berm on east side	No	0-2.2	0-1.4	
16 December	Excavation of cell #5 complete, placing falsework for cell #2, driving sheet on cell #3, post dredge survey of cell #5 complete	No	NA	NA	
17 December	Backfilling cell #5 with crushed stone. Driving sheet on cell #3. Adding stone to east slope.	No	0-5.5	0-0.6	
23 December	Cell #3 sheet installation complete. Driving sheet for cell #2 and arc 6-7.	No	NA	NA	
27 December	Excavating cell #3, continue to drive sheet on arc 6-7 and cell #2.	No	0.6-3.7	1.1-1.8	
30 December	Excavating cell #3, driving sheet for cell #2. Driving arc 6-7 down to level	No	NA	NA	

Table 1. (Continued) Monitoring Activities during Area D Dredging and Bulkhead Construction

Date (2003)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
10 January	Excavation of cell #3. Driving sheets to level on cell #2.	No	NA	NA	
11 January	Pushed stone to extend bulkhead, and placed sheet to keep stone in-place	Yes	1-5	2-5	Toxicity and chemistry samples collected inside silt-curtain, 100ft down current and at reference during stone placement. Turbidity inside silt curtain approx. 3 ft from the bottom ranged up to 200NTU, while 100ft down current turbidity was 1-5 NTU.
15 January	Roller compacting cell #5 and crane placement on cell #5. Continued constructing falsework for cell #4	No	NA	NA	CLE on-site but no on the water work by Zoppo to monitor.
16 January	Set template for cell #4, began to backfill cell #3 with gravel and excavate cell #2.	No	0.3-4.1	0.9-1.9	
22 January	Driving sheets cell #4 stopped excavation of cell #2, use crane & bucket to backfill cell #3. Extended berm to access cell #3	No	NA	NA	

Table 1. (Continued) Monitoring Activities during Area D Dredging and Bulkhead Construction

Date (2003)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
30 January	Driving sheets to level on cell #4	No	NA	NA	
06 February	Surveying cell #4 and arc 5-6 by CLE. Placement of arc 2-3	No	NA	NA	Harbor iced over
13 February	Preparing to excavate cell #4, driving sheet arc 2-3, backfilling arc 5-6,	No	NA	NA	Harbor iced over
20 February	Excavation of cell #4 and stockpiling material as pug-mill is non-operational.	No	NA	NA	Harbor iced over
27 February	Driving sheet on arc 4-5 and backfilling arc 2-3				Harbor iced over
06 March	Placing arc 3.5. Removing spuds arc 2.5.	No	NA	NA	Ice in harbor beginning to break-up
13 March	Cell #1 and arc 3.5 template in place.	No	NA	NA	Harbor free of ice
18 March	Approx. 1/4 of cell #1 is sheeted. Initial sheeting of arc 3.5 complete, sheet now needs to be driven to level	No	NA	NA	

Table 1. (Continued) Monitoring Activities during Area D Dredging and Bulkhead Construction

Date (2003)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
25 March	Lowering template on cell #1 to prep for driving sheets. Backfilling cell 3.5 with gravel.	No	NA	NA	
28 March	Began excavation of cell #1. Removing piles from 3.5 template.		<5	<5	
03 April	Backfilling cell #1, and processing material.	No	NA	NA	
11 April	Cell #1 backfilling complete. Arc 1.5 templates both in place	No	NA	NA	
18 April	Sheeting inside half of arc 1.5	No	NA	NA	
23 April	CLE completing pre-dredge survey of arc 1.5. Sheets being cut down to level on arc 1.5	No	NA	NA	
02 May	Removal of cell #1 template. Backfilling cell #1 and arc 1-2 to grade	No	NA	NA	Area between cell #1, #2, arc 2-3 and shore backfilled, completing in water work. Completion of land work estimated in 4 weeks.

Notes: NA - No turbidity monitoring occurred.

Table 2. Toxicity Testing Results from Area D Dredge Monitoring

Date	Location	*Americamysis bahia* 48hr Survival Assay[1] (Survival after 2 days)	*Arbacia punctulata* Chronic Fertilization Assay[1] (% Fertilized)	Turbidity During Sample Collection (NTU)
11 January 2003	Laboratory Control	100.0%	97.3	NA
	Inside Turb Curtain-2	100.0%	98.8	up to 90

[1]Complete sample results located in appendix C
NA - Not applicable

FIGURES

US Army Corps of Engineers®
New England District

New Bedford Harbor Superfund Site

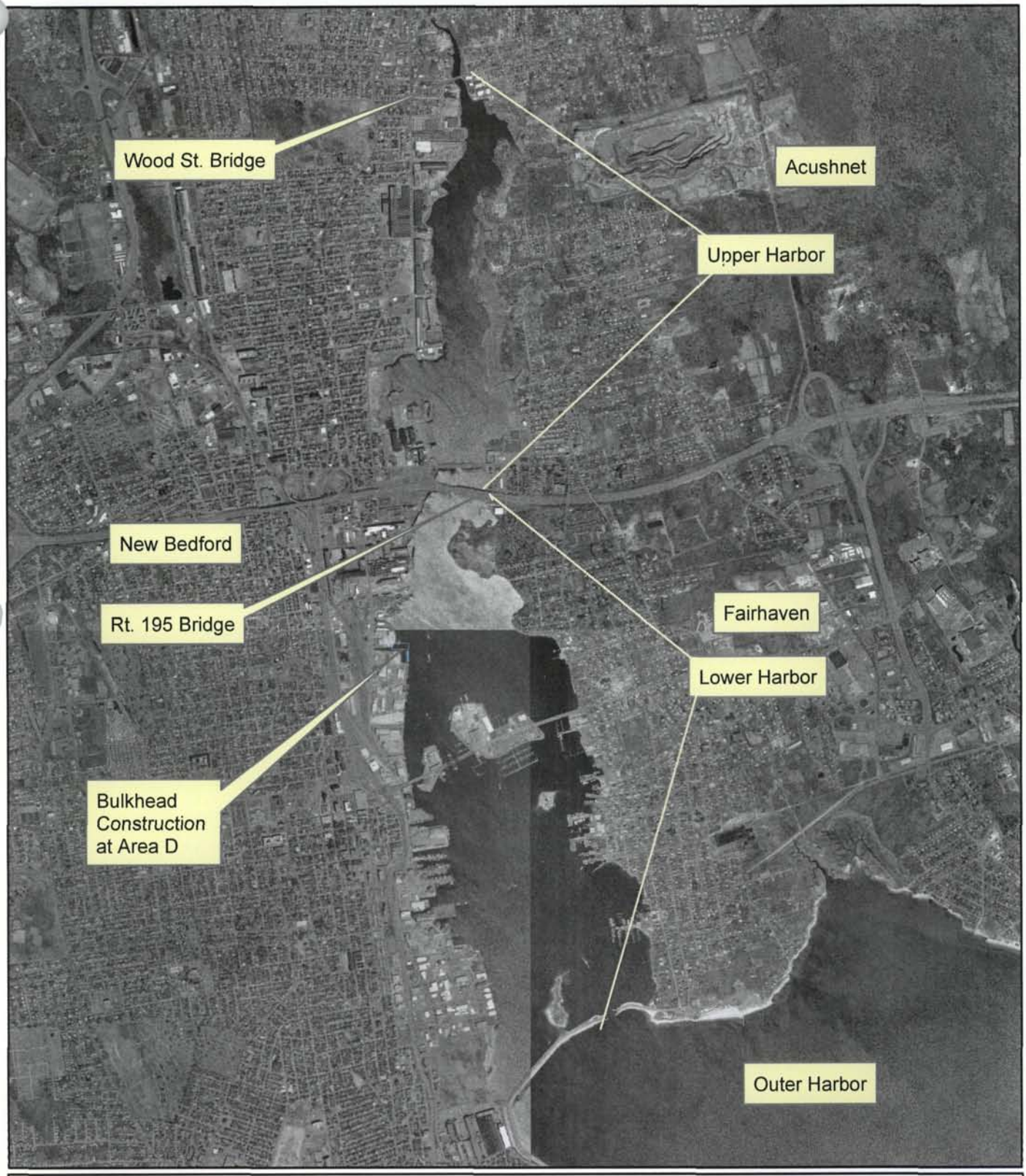

Figure 1. New Bedford Harbor Overview Showing the Location of Bulkhead Construction at Area D

Sources:MassGIS 2-m orthophotos
NAD 83 Mass State Plane m
Date 12 August 2003
ME scale 1:35000

ENSR

Miles
0 0.25 0.5 1

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US Army Corps of Engineers
New England District

New Bedford Harbor Superfund Site

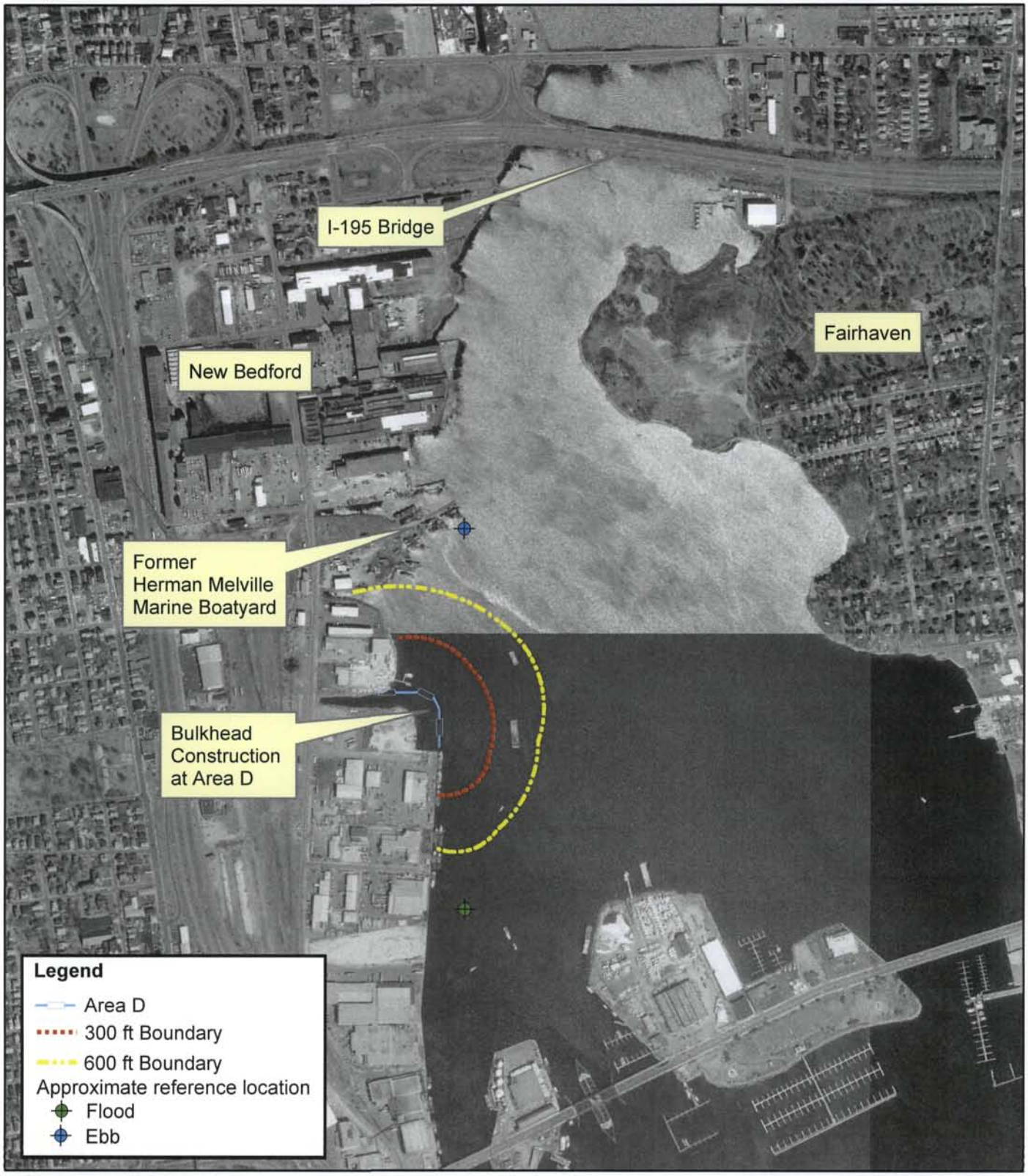

Figure 2. Location of Area D with Environmental Compliance Boundaries

Sources:MassGIS 2-m orthophotos
NAD 83 Mass State Plane m
Date: 12 August 2003
ME scale 1:10000
ENSR

0 250 500 1,000 Feet

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Figure 3. Bulkhead Construction at Area D

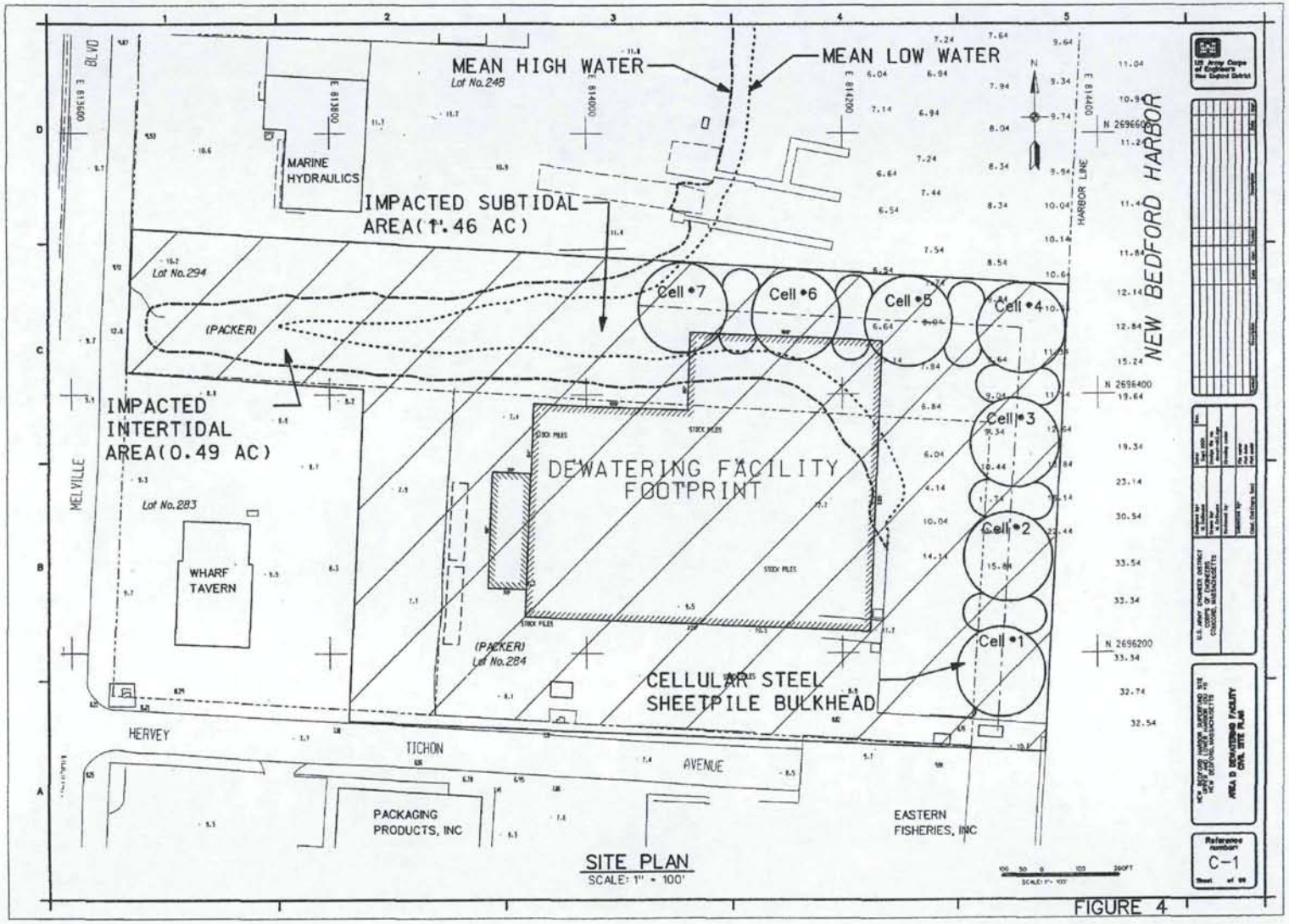


Figure 4. Dredge Operation Outside of Sheetpile (2 Oct 02)

Figure 5. Template Used to Guide Sheetpile Placement (13 Mar 03 at Cell 1)

Figure 6. Sheetpile Being Placed around Template (2 Oct 02 at Cell &)

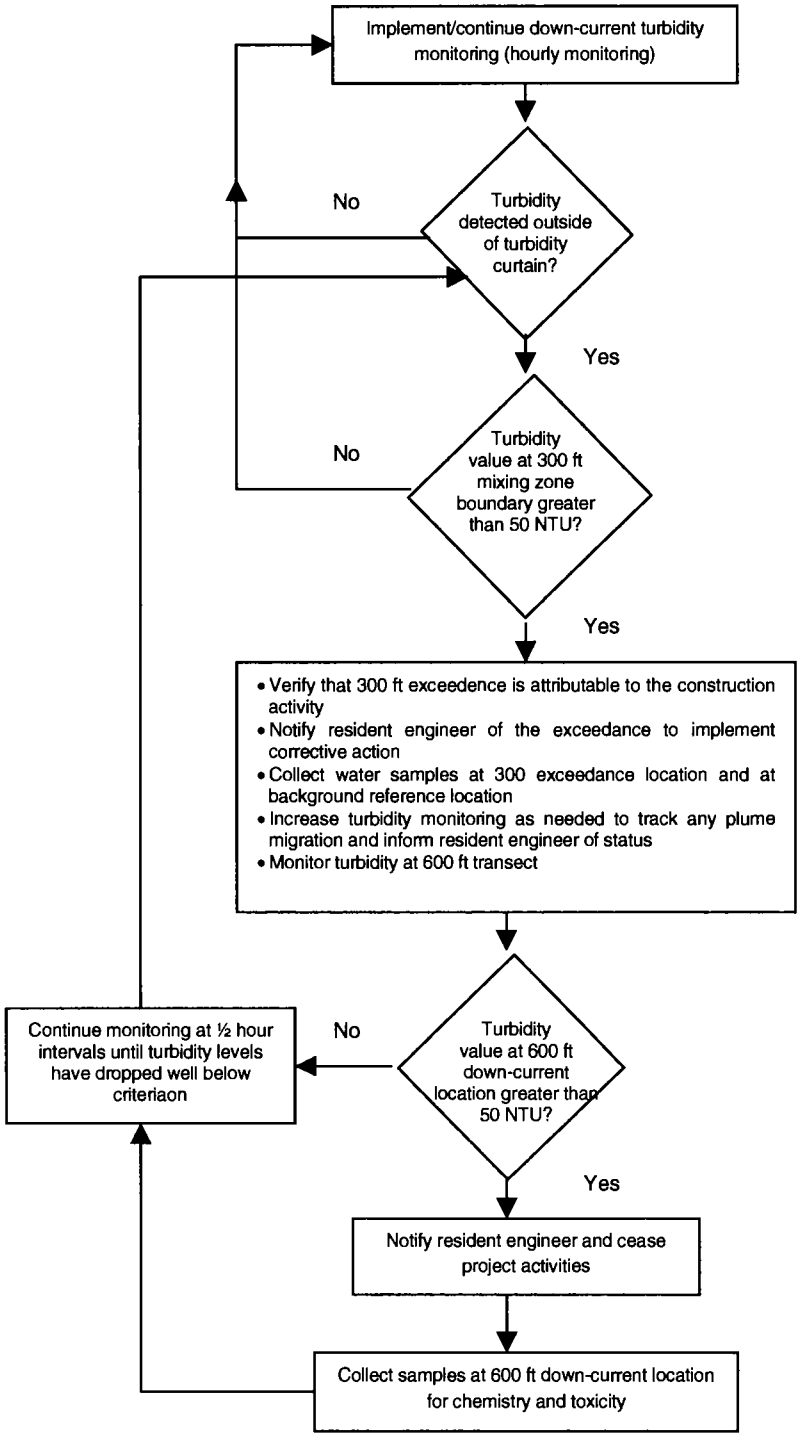
Figure 7. Excavation of Sediment within Cell (25 Nov 02 at Cell 7)

Figure 8. Backfill of Cell and Arc with Gravel (5 Mar 03 at Cell 2, Arc 2.5)

Figure 9. Geotube Used in Sediment Dewatering (2 Oct 02)

Figure 10. Backfill and Grading behind the Constructed Bulkhead

Figure 11. Water Quality Monitoring Decision Sequence



Notes
1: 50 NTU value is defined as 50 NTU above the background turbidity level
2: The presence and extent of any visible oil sheen emanating from project area, even though project turbidity limits have not been exceeded should be brought to the attention of resident engineer, and a surface grab sample shall be collected for potential analysis.

Figure 12. Analytical Protocol Decision Matrix

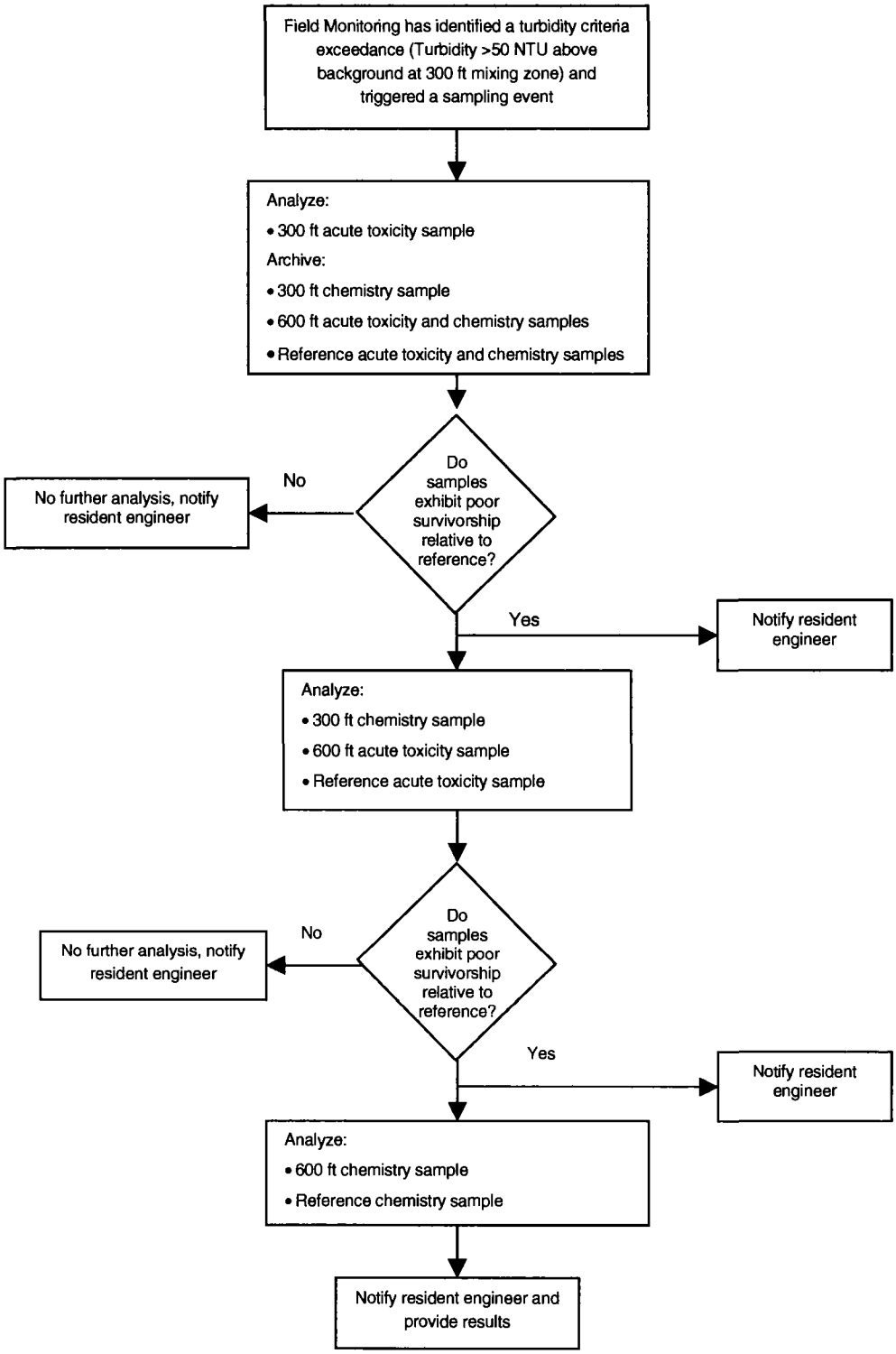


Figure 13. Limited Turbidity outside of Silt Curtain Associated with Backfilling of Cell (4 Dec 02)

APPENDIX

APPENDIX A

Water Quality Monitoring Scope of Work

Scope of Work
Water Quality Monitoring during Construction Activities at Area D
New Bedford Harbor Superfund Site
30 July 2002

I. Background

As part of the progression of the overall New Bedford Harbor Superfund Remediation effort, a Sediment Dewatering, Material Transfer and Receiving Facility will be constructed at the southern lobe of the former CDF D area along the western shoreline of New Bedford Harbor just south of the I-195 bridge (see Figure 1). The steps required to complete this effort include: (a) construction of a cellular sheetpile cofferdam and backfilling to form a shoreline bulkhead; (b) relocation of an existing floating finger pier at a marine facility located just north of the Herman Melville Marine Boatyard; and (c) limited dredging to remove contaminated sediments from the approach channel of a relocated marine facility at the Herman Melville Marine Boatyard.

The sediments within this area contain elevated levels of PCBs and metals, which can potentially have negative environmental impacts if released to the water column in an uncontrolled manner. As occurred for both the Com-Electric power-line relocation project in the upper estuary, the water quality monitoring program for this operation includes both Contractor-based monitoring (Attachment A) at varying levels of intensity during the course of the project as well as more comprehensive water quality monitoring performed by the Government (USEPA/USACE). This scope of work outlines the water quality monitoring to be implemented by Woods Hole Group on behalf of the Government. The overall goal of the monitoring program is to ensure that the construction operation is carried out in a manner such that;

- The disturbance of the contaminated sediments does not result in any acute impact to organisms within the water column adjacent to the construction.

- There is not significant transport and deposition of sediments and their associated contaminants outside the construction zone to uncontaminated areas or areas that have already been remediated.

A. <u>Construction Contractor Monitoring</u>:

The monitoring performed by the construction contractor will focus on boat-based real-time measurements of water column turbidity along specified transects down current of the operation. The intensity of the monitoring will be dependent on the type of construction operation being undertaken and the contaminant levels expected to be encountered. An upper level turbidity criteria has been established for the down-current transects that, if exceeded, will trigger a stepwise contingency plan that includes potential work level reduction or stoppage. The contractor-based monitoring also includes limited water sampling with analysis for total suspended solids to assess the performance of the

real-time measurements. The scope of the contractor-monitoring program is included as Attachment A.

B. Government Monitoring:

This scope summarizes the Government Water Quality Monitoring Program to be implemented by the Government contractor, Woods Hole Group (WHG). This program includes review of daily water quality data as provided by the construction contractor as well as periodic field based efforts over the duration of the construction consisting of parallel real-time turbidity measurements with the potential for additional sampling and analysis including toxicity testing and chemical analysis. This monitoring also consists of periodic oversight of the contractor-based monitoring (Quality Control), data review and confirmation that the project-specified turbidity criteria are protective of the environment.

II. Construction Overview

The following summary provides an overview of the construction activities that will take place within the intertidal and subtidal areas that will require monitoring under this scope of work. The intensity and duration of the monitoring will be determined based on periodic pre- and on-going construction coordination meetings to be held as necessary to ensure adequate planning and scheduling of the monitoring effort.

A. Dewatering Facility - Site preparations for the dewatering facility include the construction of cellular sheetpile cofferdams and filling of shoreline areas to form a shoreline bulkhead. This construction will result in the filling of approximately 2 acres of intertidal (.5 acres) and subtidal area (1.5 acres). In-water construction activities are expected to commence mid-August 2002 with completion in approximately 6 months. This filled area will provide the foundation to build a portion of the dewatering facility as well as provide rail access to and from the site.

Bulkhead construction will include a 670 linear foot cellular sheet pile bulkhead to extend the shoreline. The bulkhead will be constructed offshore along the eastern boundary and along approximately half of the northern boundary of the site (Figure 1). Prior to bulkhead installation, the foundation preparation work will involve the removal of approximately 3,000 cubic yards (CY) of PCB contaminated sediments which range from 5 parts per million (ppm) to 30 ppm. Removal of these sediments will be accomplished by a floating dredge using an environmental bucket. The material will then be transported to an adjacent upland location where it will be dewatered and stabilized for use as backfill behind the bulkhead.

After this material is removed, construction of the individual cells of the bulkhead will proceed. The initial process will involve the construction of access roads from the existing shoreline extending to the north and east into the intertidal and subtidal areas. These access roads will allow for the construction of the bulkhead to occur using a land-based operation.

Following construction of individual bulkhead cells and arcs, approximately 8,400 CY of soft sediment within these sheetpile-enclosed areas will be removed using conventional mechanical excavation equipment. This material, which contains PCB concentrations from 5 ppm to 30 ppm, will also be transported to an adjacent upland location where it will be dewatered and stabilized for use as backfill behind the bulkhead. In addition to the stabilized backfill material, the area between the bulkhead and the existing shoreline will be backfilled with clean structural fill (approximately 30,000 CY) to an elevation of approximately 10 NGVD.

Turbidity curtains will be deployed around the various work areas as needed during construction. As shown during previous work efforts in the harbor, they are an effective means to limit suspended sediment (and associated contaminant) transport away from the project area providing they are properly deployed and maintained.

B. Dredging Associated with the Packer Marine Facility - In order to complete the construction for the Sediment Dewatering, Material Transfer and Receiving Facility, it will be necessary to perform limited environmental dredging as part of the relocation of Packer Marine Inc. from its current location to the Herman Melville Marine Boatyard. This portion of the New Bedford Harbor Superfund Project involves the dredging of approximately 5,000+ CY of contaminated sediment from the swale and dredging footprint for the R.M. Packer Marine Facility to be relocated to the North Lobe area. The contaminated sediments will be mechanically dredged and hydraulically transported to the Sawyer Street Confined Disposal Facility for temporary storage and ultimate offsite disposal. Turbidity curtains will be employed at the dredging and excavation locations as needed. Water quality data collected as part of this scope of work will be used to determine the necessity for continued use of these curtains during the construction process.

C. Finger Pier Relocation - In order to construct the cellular sheetpile bulkhead, a finger pier on the abutting property needs to be relocated. The relocation of this existing 100' long floating dock pier involves the removal and reinstallation of four (4) timber piles and floating dock assembly from the south side of the Marine Hydraulics Boat Ramp to the north side of the existing floating finger piers located at Marine Hydraulics, Inc. No monitoring will be required during this relocation process. A new cast-in place concrete ramp/stairway above MHW will also be constructed at the relocated finger pier assembly. The existing floating dock assembly will be reattached to the relocated timber piles and stairway ramp in the same configuration, as it exists today.

III. Specifics of the Government Water Quality Monitoring Program

A. Monitoring Approach:

A tiered monitoring approach will be used to identify any water quality impacts resulting from construction activities. The purpose of this monitoring is to confirm that acute impacts to the water column do not extend beyond the designated mixing zone

established for the project and to confirm that contaminants are not transported away from the operations area at unacceptable levels to other portions of the harbor. The overall approach will consist of monitoring water column turbidity along a transect at the downstream edge of an established mixing zone within the vicinity of the project site. An exceedance of an upper level turbidity criteria threshold requires notification of appropriate Government personnel and may trigger additional acute toxicity testing and chemical analysis of the water column to quantify impacts.

B. Method:

Boat-based monitoring shall be performed during in-water operations that have the potential to disturb significant quantities of sediment. These in-water operations include those outlined in Section II above as well as any other activities identified (i.e. during the construction coordination meetings discussed under item C below) which have the potential to impact water quality.

During the established monitoring days, efforts will focus on the measurement of water column turbidity along the same mixing zone boundaries, locations, intervals and depths as defined for the construction contractor in Attachment A (page 2) and accompanying Figure 1. Turbidity monitoring shall be performed using an optical backscatter (OBS) nephelometer with an underwater sensor and direct surface readout or other instrumentation having similar capabilities. The OBS sensor unit shall be sensitive over an approximate operating range of 0-1000 NTU and factory calibrated. Accurate operation of the unit shall be checked on a daily basis using known standards. Sampling equipment shall be capable of retrieving water from a specified depth using techniques that have been demonstrated acceptable for low detection limit analysis.

Additional near field and far field monitoring at varying distances away from the construction activity (in addition to the downfield transect) will be performed on each monitoring day to better characterize the aerial extent of any potential near and far-field water column effects. The USACE Technical Manager and Resident Engineer shall be notified immediately if turbidity measurements indicate exceedance of the set criteria along the established transect at the downstream edge of the mixing zone (see item E below), if the construction contractor is determined to not be in compliance with their specified plan, or if other relevant environmental conditions of note are observed.

For the purposes of cost estimation for this scope of work, it should be assumed that there shall be a maximum of 50 boat-based monitoring days over the course of the 26-week project. A schedule of construction activities and associated monitoring will be determined based on periodic pre- and on-going construction coordination meetings to be held as necessary to allow for adequate scheduling and planning of the monitoring effort.

C. Shore-Based Activity

The Government contractor shall maintain an adequate site presence to help ensure that the construction operations related to shoreline and in-water work are

conducted in accordance with environmental requirements specified in the project scope of work. Specific elements of the shore-based work include meeting with the construction contractor's monitoring personnel to review data, construction schedules, observing shoreline construction activities for conditions that could affect water quality and coordinating upcoming boat-based monitoring activities. A regular schedule of update meetings shall be established by WHG with the construction monitoring personnel to coordinate monitoring activities.

For the purposes of this scope of work it should be assumed that a maximum of 20 shore-based observation/coordination days would be required during the course of the 26-week project. A tentative schedule of construction activities and associated monitoring will be determined prior to initiation of the monitoring effort.

D. Additional and Contingency Testing

Additional Testing

Water sampling will be performed to characterize certain baseline conditions, to confirm acceptable water quality within enclosed areas prior to removal of silt curtains or sheet pile, and potentially in response to exceedence of the turbidity criterion or other environmental factors. The upper level turbidity criterion, defined as a "reportable event", will be 50 Nephelometric Turbidity Units (NTUs) above background as measured at the edge of the 300-ft mixing zone. Additional monitoring and the sampling required by a criteria exceedance are outlined below.

E. Criteria Exceedances

When the monitoring reveals that the upper-level criterion has been exceeded at the edge of the mixing zone, additional background and near field measurements shall be performed as needed to determine if the elevated turbidity is attributed to project activities. Also, an additional transect shall be run 600 feet downstream of the project activity to assess far-field impact. If the turbidity appears to be project-based, the Contractor (WHG) shall immediately notify the USACE Resident Engineer and the USACE Technical Manager (or their designated representatives) so that corrective actions can be employed to alleviate the condition. If exceedances are noted at both downstream transects (300- and 600-foot), project activities may cease until conditions have abated to acceptable levels at the 300 ft transect. If the criterion has been exceeded at only the downstream edge of the 300-foot mixing zone, corrective actions will be employed as deemed appropriate by the USCAE Resident Engineer. Actions may include either altering or slowing the rate of construction or ceasing project activities until turbidity levels have fallen within an acceptable range.

In addition, when a criterion is exceeded, the Contractor shall collect "conditional" water samples along the edge of either one or both of the downstream monitoring transect(s). After consultation with Government project managers, biological and chemical testing may be performed on a composite water sample collected along the

downstream edge of the mixing zone(s) within the boundaries of an observable plume. Toxicity testing and/or chemical analysis shall be initiated immediately upon notification to proceed by the USEPA/USACE project representatives. Monitoring of turbidity shall then proceed continuously to track the return to background conditions. Upon the resumption of project activities, monitoring will continue at an increased frequency (30-minute cycle) until conditions abate and to track turbidity changes and monitor for further exceedances.

Chemical and Biological Testing

Upon notice to proceed with either the biological or chemical testing as a result of a criteria exceedance, water samples shall be transported to the testing facility(s). If notice to proceed is only given for the biological testing, the water samples collected for the chemical analysis shall be appropriately archived for potential future analysis. Biological testing includes acute toxicity tests using the 24-hour sea urchin sperm fertilization test (*Arbacia* sp.) and the 48-hour Mysid shrimp (*Mysidopsis bahia*) survival test. Testing protocols must be submitted to the U.S. EPA Laboratory in Narragansett, Rhode Island for review and approval prior to initiation of the monitoring program. Biological testing of the associated background sample and chemical analysis of all samples will generally be contingent upon the results of the toxicity testing. Samples, which do not exhibit toxicity, will generally not require further testing/analysis. However, poor survivorship in either toxicity test will require further analytical testing to identify the cause of toxicity. This analysis will include total suspended solids (TSS), total PCBs (based on the 18 NOAA Status and Trends congeners), and total heavy metals including Copper (Cu) and Lead (Pb).

For this proposal, it should be assumed that there would be 15 samples submitted for biological toxicity testing (Arbacia and Mysid) and 8 samples submitted for chemical analyses (TSS, PCBs, metals). Additional sampling may be performed based on the turbidity monitoring, triggered when turbidity criteria have been approached or exceeded or based on other environmental factors as directed by the USEPA/USACE. Any "conditional samples" collected would potentially undergo the tiered testing/analytical approach outlined above. A schedule of the planned construction sequence and associated monitoring/sampling will be determined prior to the start of the work.

F. Construction Contractor/Monitoring Oversight

The Construction Contractor will also be performing project-related turbidity monitoring during the construction phases in compliance with the Government imposed water quality monitoring program (Attachment A). The Contractor (WHG) shall provide the necessary oversight to the construction-monitoring contractor, which includes an initial coordination meeting (included under Item VI below) and periodic field inspections to ensure that water quality measurements are being carried out according to monitoring specifications. It will also be necessary that the Contractor (WHG) establish and maintain sufficient communication to provide for the efficient transfer/receipt/review

of monitoring data generated by the construction monitoring contractor and any notification of criteria exceedances as required.

IV. Laboratory Schedule

Any samples submitted for laboratory analysis will require a turnaround time of 24-hours. Results from toxicity testing shall be made available verbally at the earliest possible time with written reports submitted within one week.

V. Reporting

A summary sheet of field operations and turbidity measurements and a list of any samples collected will be provided to the USACE Technical Manager on a daily basis following each monitoring event. The Contractor shall develop a daily reporting sheet for this project. This daily submittal for each day of boat-based monitoring shall provide the following information:

(1) Date, time, location, and type of construction activity as well as the names of sampling team members and team leader.

(2) A plan-view of the harbor and construction site, which allows for the recording of visual events such as plumes or oil sheens. This map will be included with the daily oversight report sheet and graphically present the range of turbidity values recorded during each monitoring day along the transect.

(4) A summary of weather conditions, and the timing of the tides.

(5) A comments section to allow field personnel to record visual observations or relevant field activities, which may assist in data interpretation.

A secure, password-accessible website shall be maintained that includes the following:

- Project monitoring plan and quality assurance project plan;
- Record of field operations summary sheets; and
- Record of biological testing and analytical data.

Update reports summarizing the monitoring that has taken place and any associated issues shall be prepared on a weekly basis for the first 10 weeks of the project and every 2 weeks for the remainder of the project. These reports will be distributed by email and be available on the project website.

VI. *Project Meetings*

The Contractor should assume the following meetings as part of the monitoring program:

- One pre-construction meeting at the onset of the project (in New Bedford) to define roles and to review the monitoring approach of the construction contractor.
- Fifteen construction coordination meetings (in New Bedford) held every two weeks. Attendance at these meetings can be assumed as part of the oversight role described above and will include the WHG field coordinator.
- Three project status meetings (in New Bedford) to review data and any issues.

VII. Deliverables

The environmental contractor shall provide the USACE with a summary report of the monitoring results within two months of completion of the monitoring program. The report shall include field observations during construction/dredging and toxicity and analytical data and conclusions based on the monitoring data regarding the overall impacts of project related operations on water quality of the harbor. The deliverable shall include three hard copies and three CDs.

VIII. Cost Proposal

The Contractor shall submit their cost estimate breaking out "base costs" for the work outlined above. Categories for the base cost should follow the outline of this scope of work and include, (a) Field monitoring, (b) Shore based activity, (c) Chemical and biological testing (d) Reporting and report generation (e) Meetings. Also, the following options should be broken out in the event that additional testing will be required. These options will be exercised at the discretion of the Government:

- Option A– Individual biological testing for acute toxicity using the sea urchin sperm fertilization test (*Arbacia* sp.) and the Mysid shrimp (*Mysidopsis* sp.).
- Option B– Individual chemical analysis of water samples for PCB (dissolved), metals (total and dissolved), TSS, and turbidity.
- Boat Based Monitoring Day

IX. Period of Service

The period of service for this Statement of Work shall run through 1 April 2003.

X. Attendance at Meetings

The Contract Manager shall advise the Contractor at least two days prior to each meeting at which the Contractors presence is requested.

XI. Government Points of Contact

Mr. Jay Mackay (978) 318-8142 is the USACE Environmental Contract Manager/Technical Manager and can be contacted to arrange any meetings, teleconferences or answer questions relative to this task order. Mr. Paul L'Heureux is the USACE Construction Engineer. Dr. William Nelson is the USEPA Technical Contact located at the Office of Research and Development, National Health and Ecological Effects Research Laboratory in Narragansett, Rhode Island.

XII. Invoices

The Contractor shall submit monthly invoices that include progress for the billing period, project activity for the next period, outstanding issues, financial status and schedule. Invoices shall reference the Contract Number and Task Order number. The Contractor shall be responsible for the accuracy of the invoices. Incorrect invoices may be returned for correction.

XIII. Proposals

The cost proposal submitted by the Contractor in response to this scope of work shall indicate separately the supplies/services cost estimate for each separate task described in the scope of work including project management.

XIV. Quality Control

The Contractor is responsible for quality control. Quality control must be applied throughout the entire report preparation process. Although the Government technically reviews submissions required by this contract, it is emphasized that the Contractor's work must be prosecuted using proper internal controls and review procedures. The letter of transmittal for each submission shall include a certification that the submission has been subjected to the Contractor's own review and coordination procedures to insure: (a) completeness for each discipline commensurate with the level of effort required for that submission, (b) elimination of conflicts, errors, and omissions, and (c) the overall professional and technical accuracy of the submission. Documents, which are significantly deficient in any of these areas, will be returned for correction and/or upgrading at the Contractors expense prior to Government acceptance. Task Order submission dates will not be extended if a *responsions* of draft material is required for this reason. The Contractor and his associates, if any, shall have the professional competency and technical expertise necessary to accomplish this project in a satisfactory manner.

XV. Conferences

During the progress of the work, the Contractor shall confer with the Contract Manager as necessary to assure timely and accurate reporting and approval of all completed work.

XVI. Release of Data

All data, reports, and materials obtained as a result of this contract shall become the property of the U.S. Government and shall be turned over to the Contracting Officer upon completion of this contract.

XVII. Report Revisions and Corrections

Results of all reviews by NED will be furnished to the Contractor in the form of written comments and marked-up material. The Contractor shall incorporate any written comments into reports or other items within 1 week. Any comments due to errors or inconsistencies in the report on the part of the Contractor shall be made by the Contractor at his own expense. If changes in criteria and/or additions are, in the view of NED, required beyond the original scope of work and services, the Contractor shall be notified in writing by the Contracting Officer and adjustment in the fee will be made to cover the additional work required. Any such additional work executed by the Contractor without the appropriate written notice is undertaken at his own risk.

U.S. Army Corps of Engineers
New Bedford Harbor Superfund Project

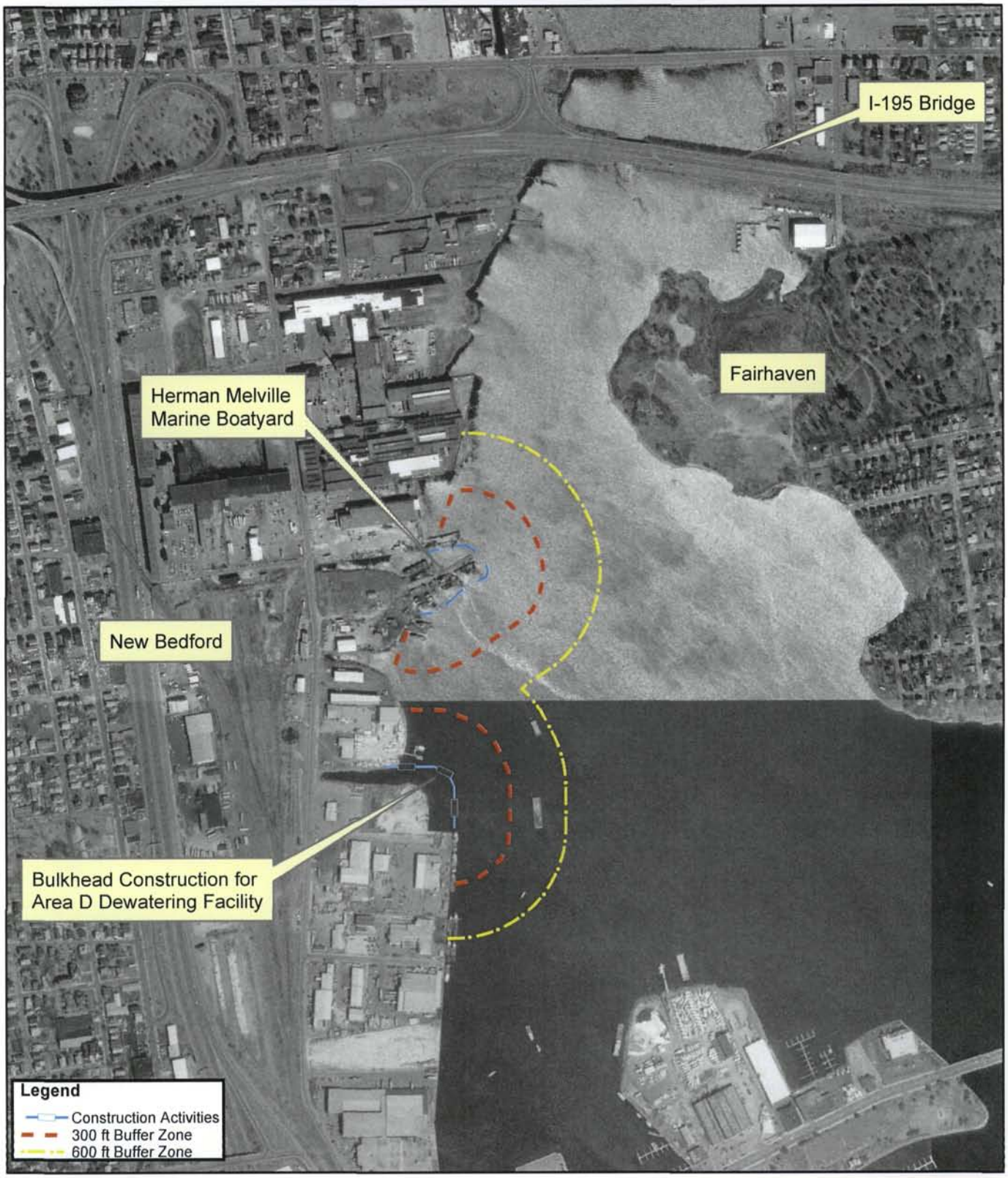


Figure 1: Approximate Location of Area D In-Water Construction and Herman Melville Marine Boatyard Environmental Dredging with Associated 300-Foot and 600-Foot Buffer Zones

ENSR

Sources: MassGIS
Date: 3/20/03

0 500 1,000 2,000 Feet

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Contractor Water Quality Monitoring During Dredging and Excavation Operations Associated with Construction of the Sediment Dewatering Facility New Bedford Harbor Superfund Site 25 January 2002

General

The sediments within portions of the Upper and Lower New Bedford Harbor contain elevated levels of PCBs, metals, and other organic compounds. Release of these sediments to the water column in an uncontrolled manner can have significant environmental impacts. For this reason, the Contractor performing the construction of the sediment dewatering facility at the southern lobe of the former CDF D area will be required to perform water quality monitoring during certain in-water operations that have the potential to disturb significant quantities of sediment.

Water quality monitoring programs have been and will continue to be used during all intrusive activities associated with remediation actions at New Bedford Harbor which have the potential to result in unacceptable environmental impact to the water column. They are also used to limit the transport of contaminants away from the areas of operation to other portions of the harbor. In addition to the Contractor's monitoring program outlined below, the Government will conduct a more comprehensive program to ensure that the operation is carried out in an environmentally acceptable manner.

The overall construction activity will impact water quality to some degree in the vicinity of the operation. The level of impact will be dependent on the particular phase of the operation and the contamination levels of the material being removed. In addition, prior experience has shown that equipment repositioning and support vessel activity have the potential to significantly resuspend material and impact water quality. For these reasons, the Contractor will be required to perform water quality monitoring at varying levels of intensity during the course of the project depending on the specific operational activity.

The overall goal of the Contractor based monitoring is to ensure that the construction operation is carried out in a manner such that significant transport of sediments and their associated contaminants outside the construction zone does not occur. The construction zone includes any location where activity related to the project is taking place that has the potential to impact water quality. In-water components of the construction of the dewatering facility are expected to include:

- Dredging of approximately 30,000 CY of sediment as part of foundation preparation. The upper 3-4 feet of this sediment (approximately 8,400 CY) is expected to have elevated contaminant levels and will be removed using a closed, "environmental" clamshell type dredge. The remaining material is relatively clean and will be removed using a traditional open clamshell dredge.
- Installation of approximately 670 linear feet of cellular steel bulkhead.
- Backfilling of material around the bulkhead.
- General vessel support of the construction operation.

The monitoring performed by the Contractor will consist of boat-based measurement of turbidity within the water column. The real-time nature of these measurements allow for direct correlation between project activities and potential water quality impacts and provide an immediate feedback mechanism to modify project activities potentially causing an impact.

It should be noted that monitoring detailed in this plan assumes the construction approach described above. Changes in the approach or equipment, such as dredging only performed within a sheet-piled cell, could result in significant alterations to the required monitoring.

Monitoring Specifics

Equipment - The Contractor shall perform turbidity monitoring using a backscatter nephelometer with an underwater sensor and direct surface readout. The unit shall be sensitive over an approximate range of 0-1000 NTU, and shall be calibrated on a daily basis using two standards bracketing the performance criteria of 50 NTU described below.

Location – Monitoring of turbidity shall be performed along the down-current edge of a pre-determined "Mixing Zone." The term "Mixing Zone" will be defined based on location of a given construction activity and will likely be set at 300 feet from that activity. The term down-current is defined based on an ebb/flood tide as determined from standard tide tables for New Bedford with confirmation of tidal direction using a local staff gauge and observation of general conditions. An example of mixing zone boundary (along which monitoring would be performed) surrounding a generalized construction area is presented in Figure 1.

Turbidity shall be measured at approximately 20-foot intervals at mid-depth along the down current transect when water column depths are ten feet or less. When water depths are greater than 10 feet, additional vertical profiles shall be made 3 feet below the surface and 3 feet above the bottom to detect sub-surface plume migration, and data should be reported separately for each water depth.

In addition to the down current monitoring, measurements should be performed at a location approximately 1000 feet up current of the construction operation. The location should be set out of the influence of localized turbidity sources such as active vessel docks so that it is representative of actual background conditions affecting the construction area.

Frequency - The Contractor should plan on monitoring on a daily basis during the initial phases of the operation for at least the first three weeks of construction. After this time, monitoring frequency may be reduced dependent on specific construction activities as well as the results of the ongoing monitoring.

Transect measurements shall be made on 30 minute cycles during initial dredging and intensive activities such as equipment positioning. During non-intensive phases of in-water work, transects shall be run at 2-hour intervals. The Contractor shall meet with representative of the USEPA and the USACE prior to and during the course of the project to review planned operations to identify those activities that may warrant intensive monitoring.

Turbidity measurements should be performed at the background station at the start of each monitoring day and at 3-hour intervals during the day.

It should be noted that both the down-current transect and background monitoring locations may change over the course of the day dependent on tidal conditions.

Data Recording – Although the instrumentation used to perform the turbidity measurements may record data electronically, a written record of the measurements is required. This record can be limited to the range of values measured along a transect, noting any higher values. The goal is to be able to easily review the data following completion of a transect.

Sampling - In addition to the turbidity measurements, 3 water samples shall initially be collected and analyzed each day for total suspended solids analysis at locations where turbidity measurements were recorded. Areas of elevated turbidity should be targeted. A laboratory turn-around time of 1 week is required. It is anticipated that this requirement will be reduced or curtailed as operations continue.

Project Specific Criteria

The upper level criteria defined, as a "reportable event", will be 50 Nephelometric Turbidity Units (NTUs) above background as measured at the edge of the mixing zone defined above.

Criteria Exceedences

When the upper level criteria has been exceeded, construction activities shall be temporarily halted until turbidity levels decrease to an acceptable level. During this time, the Contractor shall notify the USACE resident engineer or his representative and attempt to identify and rectify the cause of the exceedence. The monitoring should then resume at the start of construction at an increased level intensity (every 15 minutes over a 60 minute period) to verify that conditions have abated. Explanatory details shall be made on the accompanying data sheet documenting the exceedence and any corrective measures taken. The Contractor shall note the presence and extent of any visible sheens which may emanate from the area of activity even though criteria limits have not been exceeded. The approximate area of sheen coverage should be sketched onto the data sheet as provided in the Reporting task below.

Reporting

The Contractor shall develop a data reporting sheet to be approved for submittal to the Government or their representative for each day of monitoring which records and presents the following information for each transect run:

(1) Date, time, location, and type of construction activity as well as the names of sampling team members and team leader.

(2) A sketch of the location of construction activities on a base map which allows for the recording of visual events such as plumes, sheens etc. relative to the transect run which could assist in data interpretation.

(3) Table or graphic of turbidity values across the transect with beginning and ending times and depth of sensor.

(4) Notes on weather, tide and other relevant activities.

(5) A flagging system (i.e. box at the top of the page) which indicates if any criteria were exceeded on that particular day.

(6) A comment section where field personnel may record any visual observations which may assist in data interpretation.

Data sheets shall be delivered either electronically or in hard copy to the USACE or their representative at the end of each day of monitoring. A hard copy shall be hand delivered to the Corps resident engineer on-site office. If established criteria are exceeded, the USACE shall be immediately notified and corrective action taken. Faxed copies of the data sheets for that day of monitoring shall then be sent to individuals identified at EPA Region I, EPA (AED) and the Corps Engineering/Planning office in Concord, Massachusetts.

It should be noted that the Government will also be performing additional monitoring during dredging, excavation and other construction activities as warranted. If it is determined that unacceptable environmental impacts are occurring irrespective of the Contractor's monitoring results, the Government reserves the right to make adjustments to the construction operation to alleviate those impacts. The Government will also provide oversight to the Contractor and periodically perform unannounced quality assurance checks during monitoring efforts to ensure data integrity.

APPENDIX B

Project Updates

New Bedford Harbor

Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies

Update Report #1
October 2002

Submitted To:
Army Corps of Engineers
696 Virginia Road

US Army Corps of Engineers
New England District

Concord, MA 01742

Submitted By:

Woods Hole Group Environmental Laboratories
375 Paramount Drive, Suite 2
Raynham, MA 02767-5154

New Bedford Harbor
Water Quality Monitoring
for Area D Construction Activities and
Sediment Characterization Studies
Update Report #1

Period of Performance: 30 September - 11 October 2002

Construction Activities: CDF-D Bulkhead Installation

Construction Summary – Zoppo Corporation begins in-water construction on Thursday, 3 October, 2002 with the installation of the template for Cell #7. Sheet pile driving to fully enclose Cell #7 is completed. Dredging operations ahead of the planned alignment of the CDF-D bulkhead has been conducted on an intermittent basis; the dredging equipment encountered difficulties in handling/transferring dredged sediments and required periodic shut-downs and disassembly of the transfer line to clear obstructions. The attached photos show the dredging platform and the transfer line discharging to the de-watering area.

Construction Contractor Monitoring – Regular water quality monitoring was performed daily by CLE during periods of active dredging (4 and 7 through 11 October, 2002) . Turbidity measured down current of the construction site during a day of uninterrupted dredging (observed on 7 October, 2002) indicated only a slight difference between down current turbidity values and the up-current background. Turbidity at the background station was generally < 1NTU, while turbidity 300-feet down current was typically 8 NTU or less. Physical samples for the determination of TSS were collected during periods of active dredging (up to 3 samples/day); TSS values from samples collected during the period of 4 through 9 October 2002 were 12-20 mg/L.

Government Monitoring – Independent boat-based monitoring was performed by the Government Contractor, Woods Hole Group Environmental Laboratories, on 7 October 2002. The turbidity curtain was inspected at a number of locations using an underwater video camera to confirm that the curtain was full-depth; a small gap was detected along a 4' section of curtain in an area where the curtain passed over a deep pocket in the bottom. Turbidity was recorded inside the curtain at the point of active dredging (<15 feet); turbidity values were as high as 80 to 90 NTU, but quickly declined to <10 NTU approximately 45 feet from the dredge. Turbidity values outside the curtain remained at background with the exception of the area in which the curtain was observed not to be full depth. Turbidity values near the bottom, inside and outside of the curtain, at the location of the bottom gap (approximately 45 feet from the dredge) were similar (8 NTU).

Please contact Jay Mackay, Jim Bajek or Maura Surprenant with any questions or comments.

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US Army Corps of Engineers
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e-mail: joseph.b.mackay@nae02.usace.army.mil

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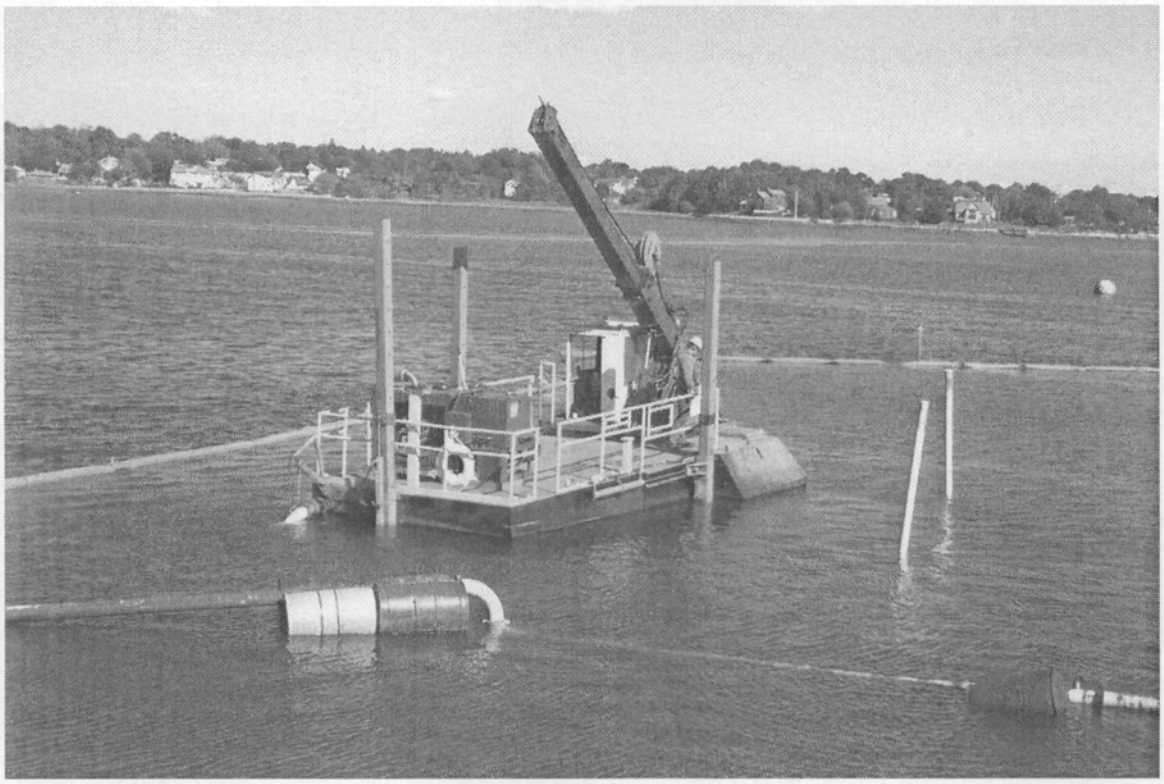
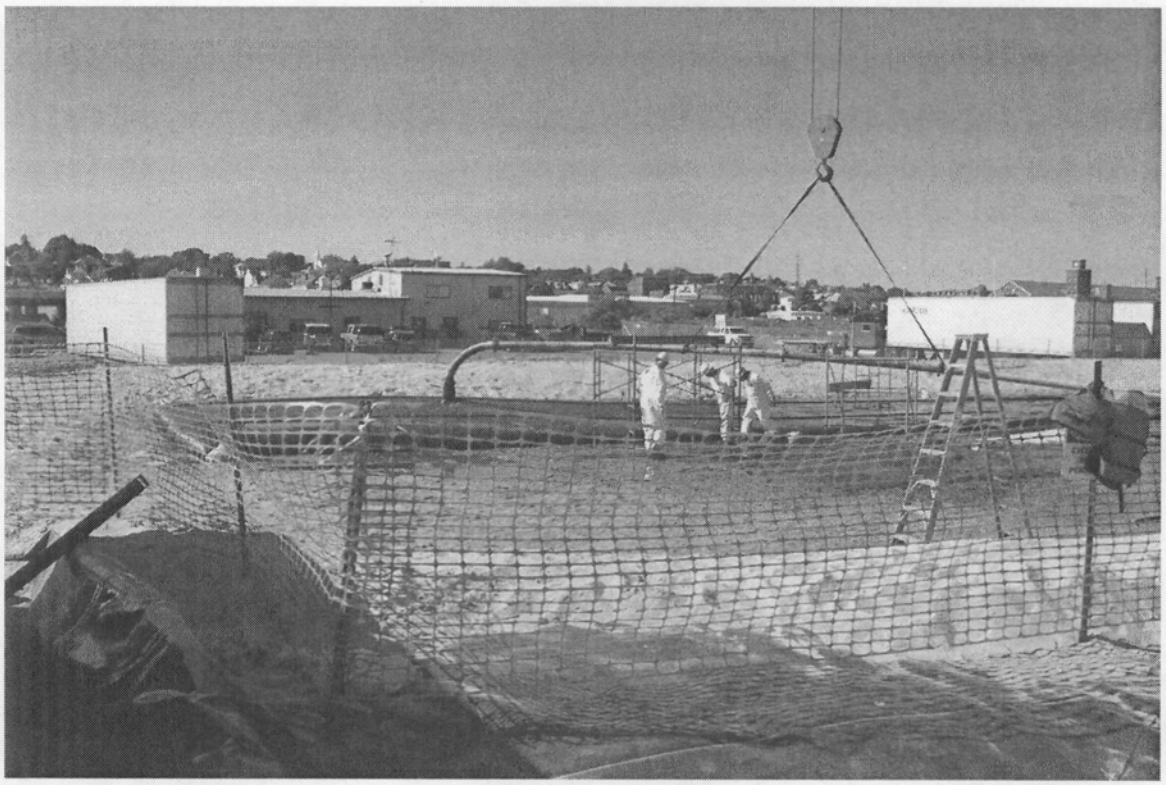
Maura Surprenant
Woods Hole Group Environmental Laboratories
Phone: (508) 822-9300
e-mail: msurprenant@whgrp.com



Dredging Platform at the New Bedford Harbor Area D Construction Site – October 2002



Transfer line discharging to the de-watering area at the New Bedford Harbor Area D Construction Site – October 2002

New Bedford Harbor

Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies

Update Report #2
November 2002

Submitted To:
Army Corps of Engineers
696 Virginia Road
Concord, MA 01742

US Army Corps of Engineers®
New England District

Submitted By:

Woods Hole Group Environmental Laboratories
375 Paramount Drive, Suite 2
Raynham, MA 02767-5154

Woods Hole Group

New Bedford Harbor
Water Quality Monitoring
for Area D Construction Activities and
Sediment Characterization Studies
Update Report #2

Period of Performance: 12 October through 29 November 2002

Construction Activities: CDF-D Bulkhead Installation

Construction Summary:

Week of 14 October 2002. Began driving sheetpile on cell #6. Dredging operations ahead of the planned alignment of the CDF-D bulkhead continue on an intermittent basis. The dredging equipment continues to encounter difficulties in handling/transferring dredged sediments and required periodic shut-downs and disassembly of the transfer line to clear obstructions.

Week of 21 October 2002. Driving of sheetpile on cell #6 continues. Soldier piles are driven to extend the bulkhead sea-ward to allow placement of cell #3. The dredging contractor responsible for pre-dredging the bulkhead area has demobilized. Further dredging will be completed using a crane and bucket.

Week of 28 October 2002. Work associated with extending the bulkhead continues. Driving of sheet for cell #6 is completed. The template for cell #5 is installed.

Week of 04 November 2002. Started driving sheet for cell #5. Continued working on bulkhead extension and staging material. Weather prevented some work from being completed. Excavation of cell #6 began.

Week of 11 November 2002. No work was completed on 11 November due to the Veterans Day holiday. Driving of sheet for cell #5 and excavation of cell #6 continues. Cell #6 is surveyed and backfilled with stone.

Week of 18 November 2002. Removed template from cell #6 and installed template for cell #3. Material processing continues.

Week of 25 November 2002. Excavation of cell #7 begins and is completed by Friday. Preparation of cell #3 and materials processing continue. A video survey of cell #5 to check cell integrity is completed.

Construction Contractor Monitoring:

Regular water quality monitoring was performed daily during periods of active dredging by Dry Dredge. Dry Dredge continued to experience problems with the dredge system, therefore there were very few periods of more than 2 hours of uninterrupted dredging. During these periods turbidity at the background station was < 4 NTU, while turbidity 300ft down current was <5 NTU. Physical samples for the determination of TSS were collected during periods of active dredging (up to 3 samples/day). TSS values from samples collected during the period of 10-16 October were 6.3-20 mg/L. No turbidity monitoring was completed from 24 October to 7 November due to absence of any dredging activities or other activities requiring monitoring.

Dredging began again on 08 November utilizing a clam-shell dredge. Monitoring during active dredging on 08 and 25 November showed turbidity values < 10 NTU at 300ft down current stations. Background turbidity during these periods was < 2 NTU. Physical samples for the determination of TSS were collected

on 25 November. CLE was also present on-site on 21 and 22 November to monitor, but no dredging took place.

Government Monitoring:

No independent monitoring was scheduled for this period. ENSR conducted oversight of the CLE monitoring performed on 17 October, 22 and 25 November 2002. No issues were observed. Site visits were conducted on 23 and 29 October 2002. During the site visits CLE was not required to complete monitoring and was therefore not on site. ENSR observed site activities to determine if any activities requiring environmental oversight were occurring. During both visits no issues were encountered.

Schedule (Week 2 December 2002):

One day of oversight is planned for this week. CLE is planning a day of monitoring once excavation of cell #5 begins. Cell #7 will be backfilled. Sheet pile driving will continue on cell #3 and cell #5 excavation will begin. ENSR will continue to schedule one day of oversight per week.

Please contact the individuals listed below with any questions or comments.

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New Bedford Harbor

Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies

Update Report #3
December 2002

Submitted To:
Army Corps of Engineers
696 Virginia Road
Concord, MA 01742

US Army Corps of Engineers
New England District

Submitted By:

Woods Hole Group Environmental Laboratories
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Raynham, MA 02767-5154

Woods Hole Group

Bedford Harbor
Water Quality Monitoring
for Area D Construction Activities and
Sediment Characterization Studies
Update Report #3

Period of Performance: 3 December through 23 December 2002

Construction Activities: CDF-D Bulkhead Installation

Construction Summary:

Week of 02 December. The post-dredge survey of cell #7 was completed. The backfilling of cell #7 was completed and the template removed. Pile driving on cell #3 continued throughout the week and preparations were made to begin excavating cell #5.

Week of 09 December. Pile driving on cell #3 continued throughout the week. Excavation of cell #5 began and continued throughout the week. Extension of the stone berm into the harbor along the north and east side of the bulkhead occurred.

Week of 16 December. The post-dredge survey and backfilling of cell #5 were completed. Additional stone was added to the east slope of the bulkhead to extend it further into the Harbor. Construction of falsework and placement of the template for cell #2 and the arc between cells #6 & #7 (arc 6-7) were completed. Driving of sheet began on cell #2 and arc 6-7. Driving of sheet on cell #3 was completed.

Construction Contractor Monitoring:

Regular water quality monitoring was performed on 11, 12 and 17 December 2002. Three physical samples for the determination of TSS were collected during each monitoring day. TSS data are not available at this time. Background turbidity ranged from 0-1.4 NTU and turbidity 300 feet downcurrent ranged from 0-5.5 NTU during monitoring periods. CLE was also on-site to perform the post dredge surveys of cells #5 and #7. Monitoring of excavation activities was attempted on Tuesday 10 December 2002, but due to mechanical problems no excavation occurred.

Government Monitoring:

No independent monitoring was scheduled for this period. ENSR conducted oversight of the CLE monitoring on 10, 11 and 17 December 2002. No issues were observed. Additional site visits were conducted on 04, 06 and 16 December (days when CLE was not scheduled to be on site) to view the progress of construction and to better gauge upcoming construction activities to help schedule monitoring. During site visits on 06 and 16 December 2002 no issues were encountered. During the site visit of 04 December 2002 elevated turbidity was noted adjacent to cell #7 near the shoreline within the confines of the turbidity curtain. A small area of elevated turbidity was noted outside of the curtain along the shore, escaping through an approximately 4 ft gap where the curtain met the shore. The source of the elevated turbidity was the stone placement within cell #7 (rock flour on the stone was suspended in the water within the cell and was then released through a gap in the sheeting of the cell). The situation was discussed with USACE, and the gap in the turbidity curtain was corrected. Pictures of the small area of elevated turbidity and general site pictures are attached with a photo-log.

Schedule (Week 23 December 2002):

Construction will not occur in the afternoon of the 24 December 2002 or during the 25 December 2002 due to the Christmas Holiday. Excavation of cell #3 and driving sheets on cell #2 and arc 6-7 is scheduled for the rest of the week. ENSR will continue to schedule one day of oversight or a site-visit per week.

The long-term schedule for the project includes finishing the construction, excavation and backfilling of the cells and arcs then using a water jet or vibro-compactor to compact the cell material. The necessity of dredging along the outside of the cells and arcs is under evaluation. This excavation may occur on the outside of cells #3 and #4 as well as along the arcs from cells #4-5 and #3-4. This activity will not occur the week of 23 December 2002. Cells #1, 2 and 3 will be backfilled with gravel instead of the crushed stone used in the other cells. A trunk system will be used to load the gravel into the cells from the bottom to the top, instead of the conveyor system to avoid the separation and layering of the gravel from the associated fines. After all the cells are complete the stone used to extend the berm into the Harbor will be removed to the low tide level. ENSR will continue to schedule one day of oversight per week.

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New Bedford Harbor

Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies

Update Report #4
January 2003

Submitted To:
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Concord, MA 01742

US Army Corps of Engineers
New England District

Submitted By:

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Woods Hole Group

New Bedford Harbor
Water Quality Monitoring
for Area D Construction Activities and
Sediment Characterization Studies
Update Report #4

Period of Performance: 24 December through 27 January 2003

Construction Activities: CDF-D Bulkhead Installation

Construction Summary:

Week of 23 December 2002. Excavation of cell #3 began and continued throughout the week. Driving of sheet on cell #2 and arc 6-7 continued throughout the week. A half-day of work was completed on 24 December and no work was completed on 25 December due to the Christmas holiday.

Week of 30 December 2002. Excavation of cell #3 continued throughout the week. The material in the lower half of cell #3 has been very difficult to excavate. Driving of sheet on cell #2 continued and the sheet for arc 6-7 was driven to level. The template for arc 5-6 was placed.

Week of 06 January 2003. Excavation of cell #3 was completed. Driving of sheet to level on cell #2 continued. Saturday, stone was placed to extend the bulkhead allowing the crane access to cell #5.

Week of 13 January 2003. Construction of false-work for cell #4 began and the template was set. Additional stone was added to cell #5 to bring the stone level to the top of the sheetpile wall allowing movement of a crane onto the cell. Driving of sheet on cell #2 was completed and excavation began. Backfilling of cell #3 with gravel began. Excavation of arc 6-7 was completed.

Week of 20 January 2003. Excavation of cell #2 continued until mid-week. Backfilling of cell #3 at the beginning of the week was accomplished using a conveyor system. Later in the week the crane and bucket used in excavation of cell #2 were transferred to backfilling of cell #3, in an attempt to speed up production. Driving sheet on cell #4 continued throughout the week. Backfilling of arc 6-7 began at the end of the week.

Construction Contractor Monitoring:

Regular water quality monitoring was performed on 27 December, 11 and 16 January. Three physical samples for the determination of TSS were collected during each monitoring day. TSS data are not available at this time. Background turbidity ranged from 0.9-5 NTU and turbidity 300ft down-current ranged from 0.3-5 NTU during monitoring periods. CLE was also on-site to perform the post dredge survey of cell #3. Monitoring of excavation and backfilling activities was attempted on 15 January, but was abandoned when it was determined these activities would not occur that day.

Government Monitoring:

No independent monitoring was scheduled for this period. ENSR conducted oversight of the CLE monitoring on 11 and 16 January. No issues were observed. Additional site visits were conducted on 23 and 30 December and 10, 15 and 22 January (days when CLE was not scheduled to be on site) to view the progress of construction and to better gauge upcoming construction activities to help schedule monitoring. On 16 January it was noted that the silt curtain did not encompass cell #4 completely, this was again noted

on 22 January. The situation was rectified on 24 January. During site visits no other issues were encountered.

On 11 January ENSR completed collection of toxicity (Acute *Arbacia* fertilization and *Mysid* survival bioassays) and chemistry (TSS/Turbidity, total metals, and total PCBs) samples associated with the pushing of stone to extend the berm. Toxicity and chemistry samples were collected inside the turbidity curtain down-current of stone placement activities in the morning, after placement of approximately 6 buckets of stone. After collection of this initial sample, stone was placed inside a cofferdam type structure to create a bridge to cell #5. This activity was determined to have little potential effect on water quality due to the contained nature of the system.

Later samples were collected from the same location after stone placement continued for approximately an hour in the afternoon, outside the cofferdam/bridge structure. During this hour, approximately 75% of the stone needed at this location was placed. TSS/Turbidity and acute toxicity samples were collected and analyzed from this location. Total metals and total PCB samples collected at the silt curtain and additional biology and chemistry samples collected 100ft down-current of the silt curtain sample and at a reference 1000 ft up-current were archived. The afternoon samples were collected during the ebb tide. The acute toxicity bioassay results indicated no increased mortality in the site sample as compared to the control sample for either the *Arbacia* fertilization or *Mysid* survival bioassays. The turbidity was reported as 15 NTU and the TSS as 52 mg/L. Initial turbidity readings taken during sample collection indicated turbidity at the silt curtain to be as high as 200 NTU, although corresponding visual water quality did not support this value. Since the meter was located very close to the turbidity curtain, it is highly likely that these values were compromised due to its close proximity. Once the meter was moved up a foot, the turbidity decreased rapidly. Turbidity returned to background (2-5 NTU) 100ft down-current of the turbidity curtain sample site.

Schedule:

Week of 27 January – Sheeting of cell #4 will be completed and driving the sheets to level will begin. Sheeting of arc 5-6 will begin and preparations for the installation of cell #1 will begin the week of 3 February. Backfilling of cell #4 and arc 6-7 will continue this week.

Attachments:

Photographs from the Area D construction as well as the dredging North of Wood St are attached to this update with a photo-log.

Please contact the individuals listed below with any questions or comments.

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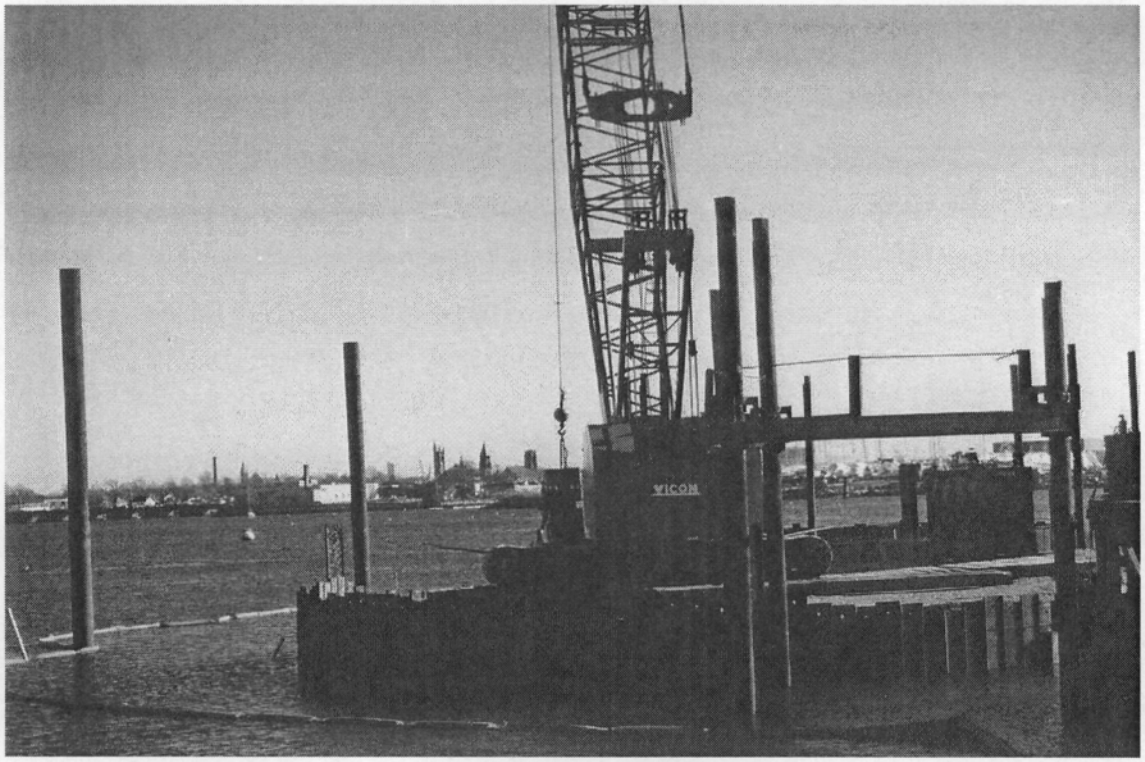
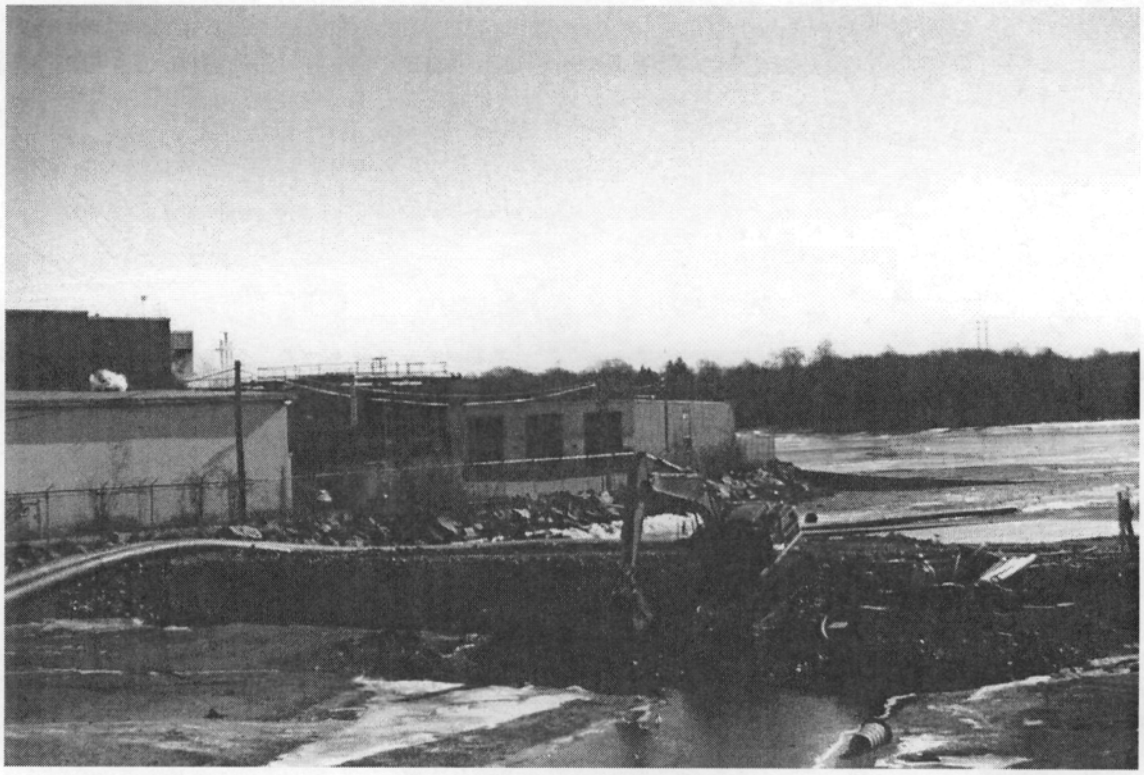
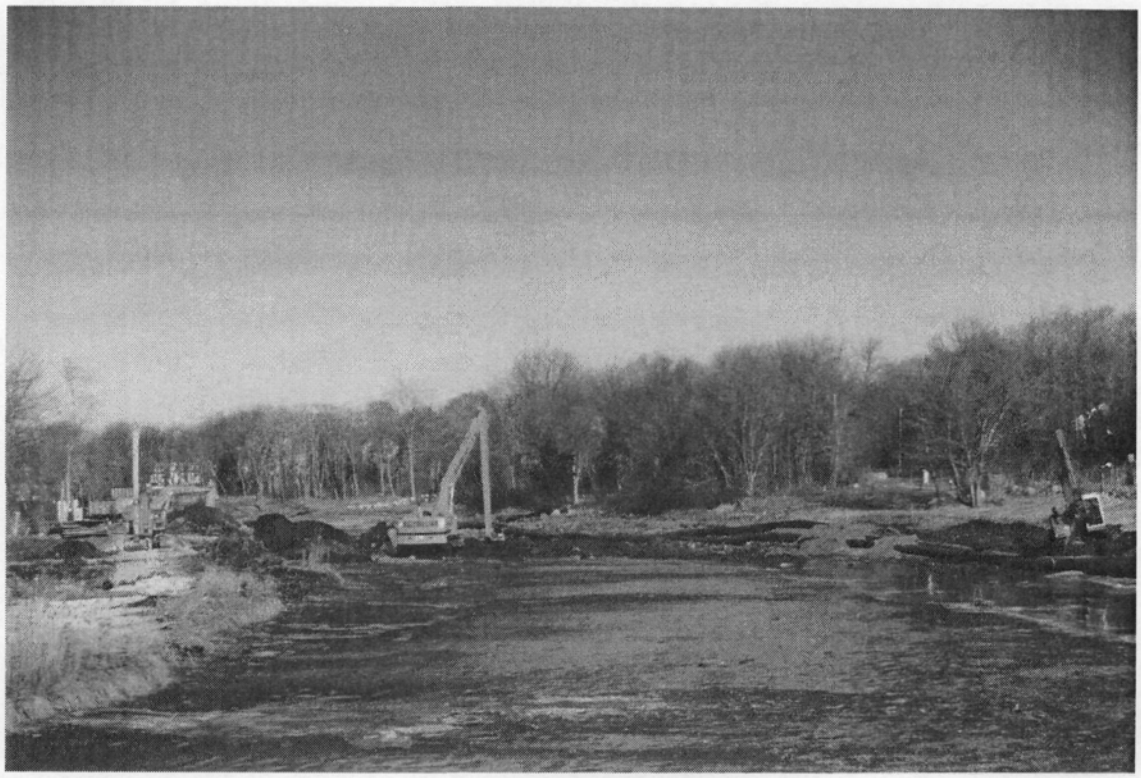
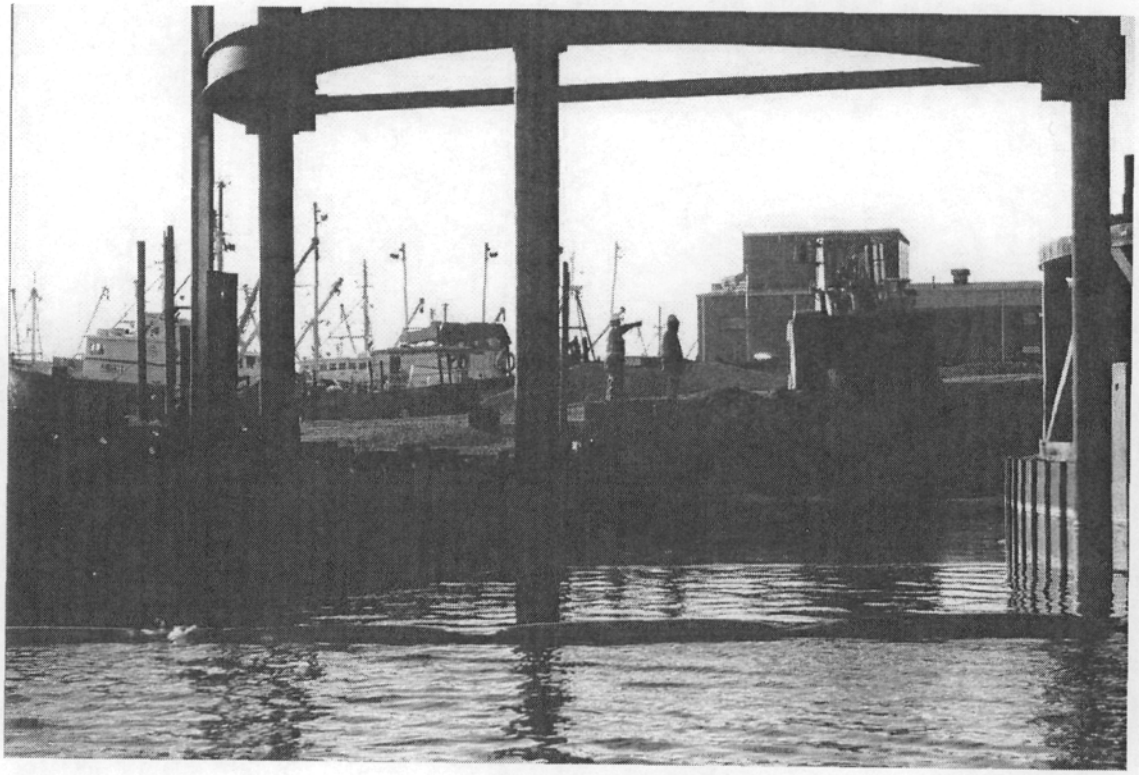
Table 1. New Bedford Harbor, Area D, Photo Log

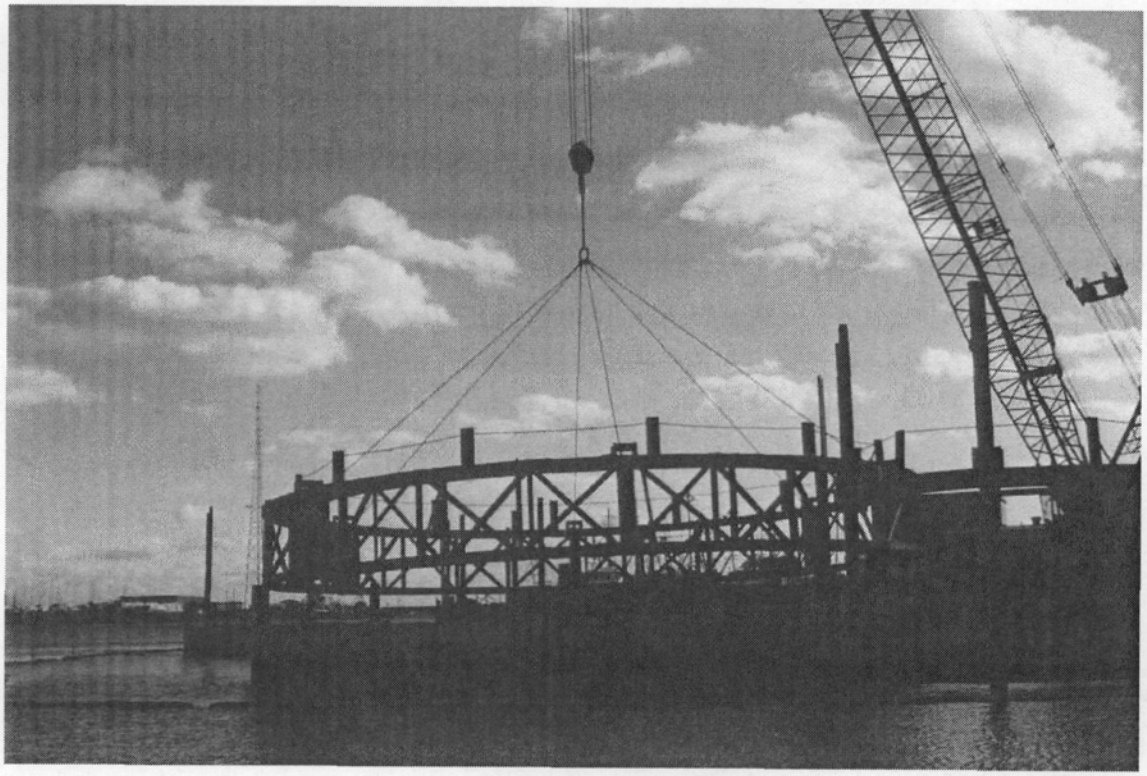
Photo Number	*Date Taken*	*Description*
13	15 Jan 03	Crane on cell #5 in preparation for construction of cell #4.
14	15 Jan 03	South berm of North of Wood St Construction (Not related to Area D). Note river outfall pipe and silt curtain down-stream of berm.
15	15 Jan 03	View looking North from Wood St. Bridge (North of Wood St Construction, not related to Area D)
16	15 Jan 03	Area between cells #5 and #6 and arc 5-6. Shows sheet wall and gravel bridge to cell #5.
17	11 Jan 03	Moving template from storage on cell #5 to store on cell #6.
18	11 Jan 03	Initial dumping of stone to extend berm. Only 6 scoops were added to berm. This occurred in the early A.M. and ENSR collected samples at the silt curtain during this activity that were not analyzed. This is area where cell #4 will be located. (Later placement of stone at this location allowed sampling and toxicity samples were analyzed)
19	23 Dec 02	South berm, North of Wood St. Construction, before pumping began. Note hose sections for pumping of river on left side of picture. (Not associated with Area D construction)
20	23 Dec 02	North berm, North of Wood St. Construction, before pumping began (Not associated with Area D construction)
21	23 Dec 02	South berm, North of Wood St. Construction, before pumping began (Not associated with Area D construction)
22	23 Dec 02	Arc template
23	23 Dec 02	Overview of site, driving sheet on cell #2
24	23 Dec 02	Driving sheet on arc 6-7.
25	23 Dec 02	Cells #5,6 & 7 filled with stone.


VICON

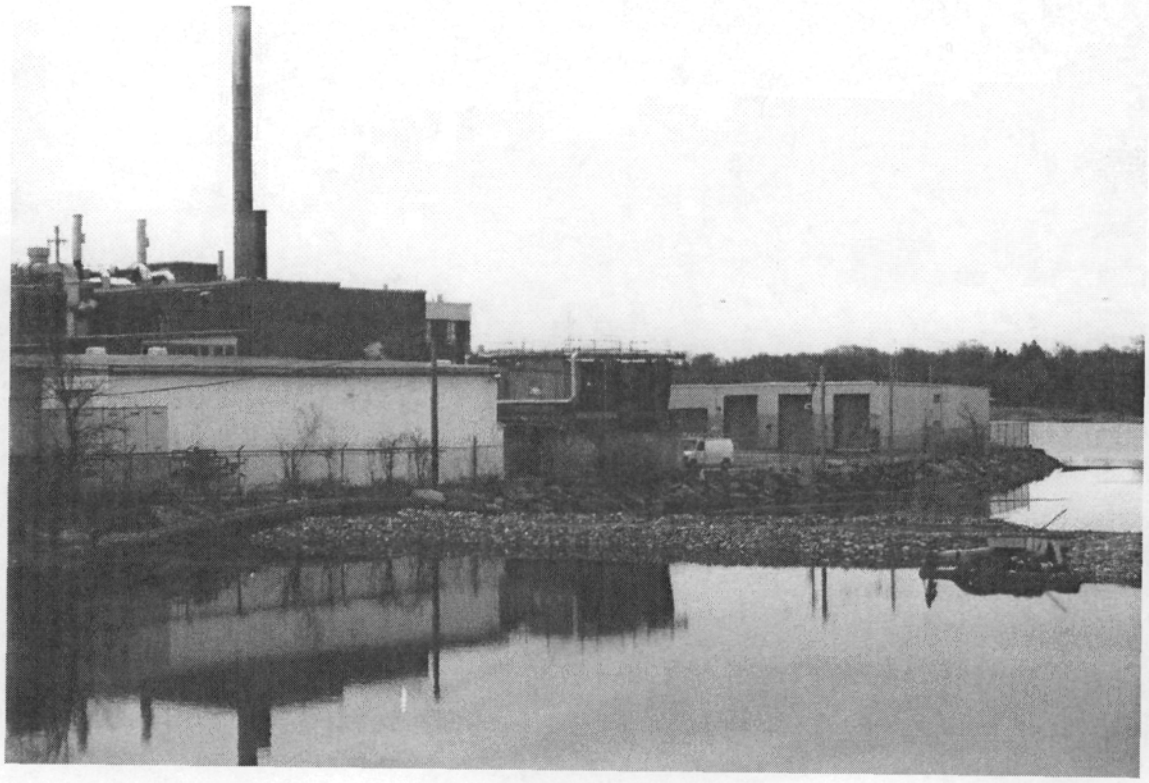




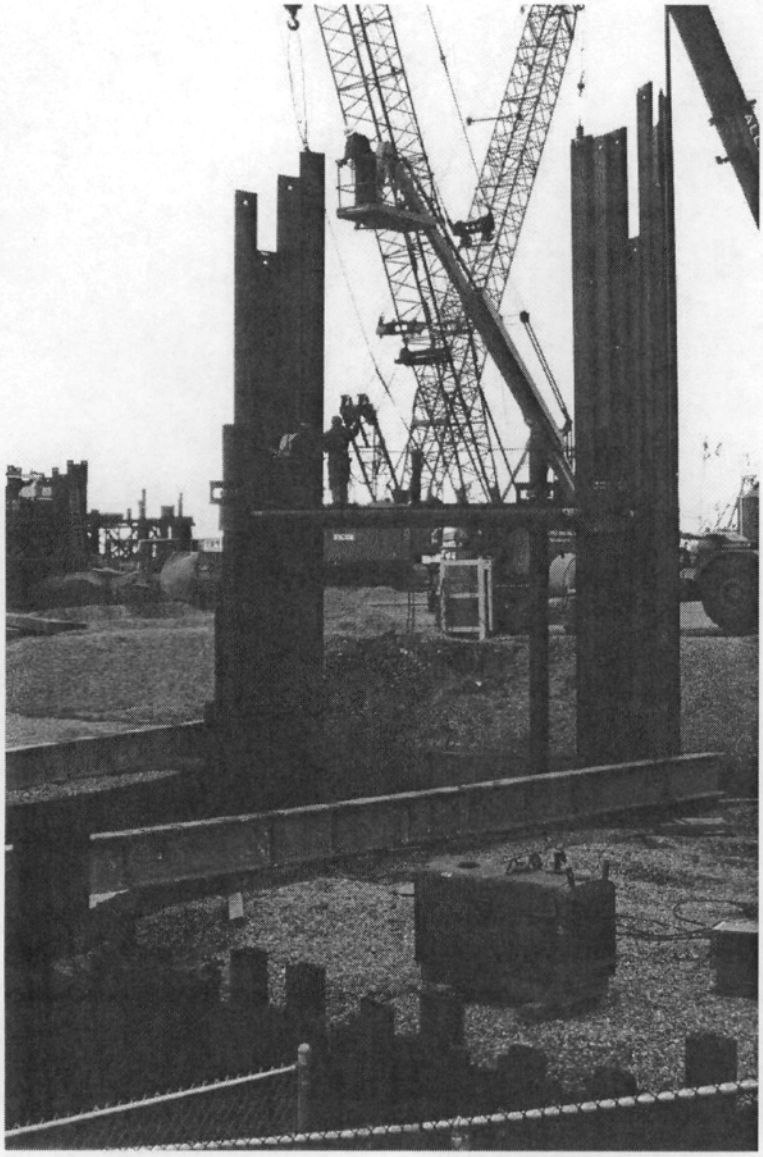


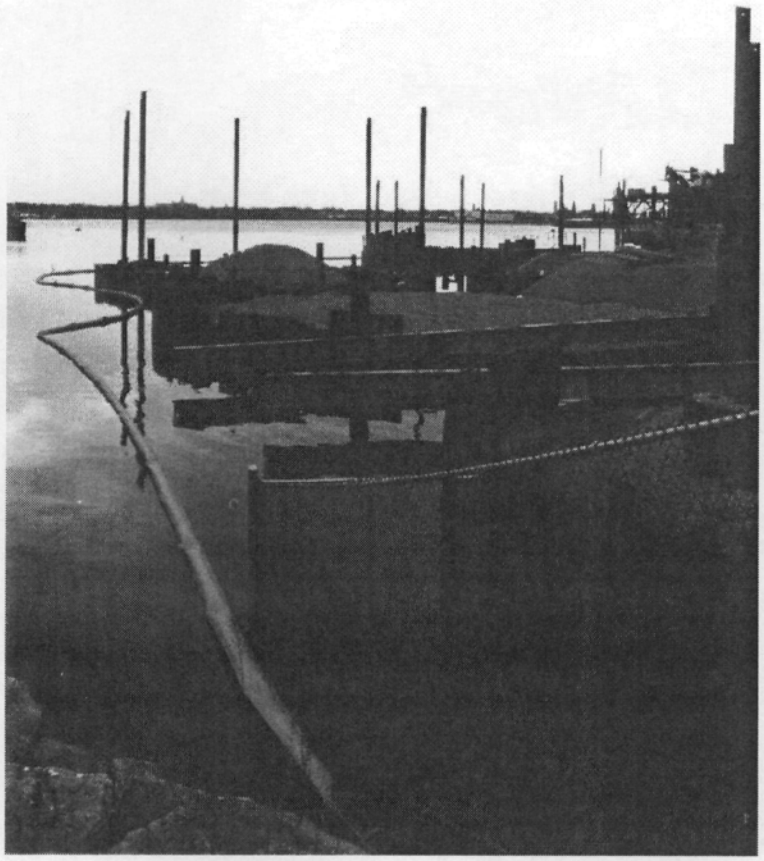


CAT



NEW BEDFORD ICE & COLD STORAGE





New Bedford Harbor

Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies

Update Report #5
March 2003

Submitted To:
Army Corps of Engineers
696 Virginia Road
Concord, MA 01742

US Army Corps of Engineers
New England District

Submitted By:

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New Bedford Harbor
Water Quality Monitoring
for Area D Construction Activities and
Sediment Characterization Studies
Update Report #5

Period of Performance: 27 January through 14 March 2003

Construction Activities: CDF-D Bulkhead Installation

Construction Summary:

Week of 27 January 2003. Driving of sheet on cell #4 and arc 5-6 continued throughout the week. Excavation of cell #2 was completed and backfilling of this cell began. Backfilling of cell #3 was completed and continued on arc 6-7.

Week of 03 February 2003. Completed driving sheets and the video survey on cell #4 and arc 5-6. Continued to backfill arc 6-7 and cell #2. Placed arc 2-3 and began driving sheets on this arc. Excavation of arc 5-6 began.

Week of 10 February 2003. Driving sheets on arc 2-3 continued throughout the week. Excavation of arc 5-6 was completed and backfilling began. Excavation of cell #4 began at the end of the week.

Week of 17 February 2003. No work was completed on Monday, 17 February 2003 due to the Presidents Day holiday. Tuesday, 18 February 2003 was spent in snow removal activities due to a large storm that began on 17 February 2003. Excavation of cell #4 continued and was completed. Backfilling of cell #4 began at the end of the week after the camera survey was complete. Driving sheet on arc 2-3 continued.

Week of 24 February 2003. Sheeting, dredging and backfilling of arc 2-3 was completed. Driving sheet on arc 4.5 was completed.

Week of 03 March 2003. Driving sheet on arc 3-4 began. Dredging of arc 4-5 was completed and placement of piles for cell #1 template began.

Construction Contractor Monitoring:

No regular water quality monitoring was performed during this period due to the state of the Harbor. The Harbor has been completely covered in ice since approximately the week of 20 January 2003. All construction activities undertaken during this period had been performed earlier in the year when the Harbor was open and monitoring was possible. Monitoring at that time did not reveal any water quality issues associated with construction activities, including the type of work conducted while the harbor was iced over. As of the week of 03 March 2003, the ice in the harbor began to clear.

Government Monitoring:

No independent monitoring was scheduled for this period and no oversight of CLE monitoring occurred as CLE was not on-site to monitor during this period. Site visits were conducted on 30 January and 6, 13, 20 and 27 February and 06 March 2003 (days when CLE was not scheduled to be on site) to view the progress of construction and to better gauge upcoming construction activities to help schedule monitoring. During site visits no issues were encountered.

Schedule:

Week of 17 March 2003 – Continue driving sheet on arc 3-4. Backfilling arc 4-5. Setting falsework for cell #1.

Attachments:

Photographs from the Area D construction as well as the dredging North of Wood St are attached to this update with a photo-log. Please note that Photo #28 was taken during the period covered in Update #4.

Please contact the individuals listed below with any questions or comments.

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New Bedford Harbor

Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies

Update Report #6
May 2003

Submitted To:
Army Corps of Engineers
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US Army Corps of Engineers®
New England District

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New Bedford Harbor
Water Quality Monitoring
for Area D Construction Activities and
Sediment Characterization Studies
Update Report #6

Period of Performance: 10 March – 18 April 2003

Construction Activities: CDF-D Bulkhead Installation

Construction Summary:

Week of 10 March 2003. Driving of sheet on arc 3-4 continued throughout the week. Arc 4-5 was surveyed and backfilled with stone, the berm was extended to cell #2. The template for cell #1 was placed.

Week of 17 March 2003. Sheet on arc 3-4 was driven to level and the arc excavated. Sheeting of cell #1 began.

Week of 24 March 2003. Sheeting and excavation of cell #1 were completed. Arc 3-4 was surveyed prior to backfilling by CLE and subsequently backfilled with gravel.

Week of 31 March 2003. CLE completed the post-dredge survey of cell #1. Backfilling of cell #1 began and continued throughout the week. Backfilling of the areas behind the bulkhead also occurred as well as the processing of stockpiled material.

Week of 07 April 2003. The retaining sheet near the swale was removed. Backfilling of cell #1 was completed and templates for arc 1-2 were placed.

Week of 14 April 2003. Sheeting of arc 1-2 began and continued throughout the week. Backfilling between the bulkhead and cells was completed.

Construction Contractor Monitoring: Water quality monitoring was performed on 28 March 2003 during excavation of cell #1 and removal of piles from template 3-4. Turbidity recorded during the monitoring period was <5 NTU. No chemistry or toxicity samples were collected as no turbidity exceedances were noted. Routine TSS samples were collected although data has not been made available yet. All in-water construction activities undertaken during this period were also performed earlier in the project when monitoring was undertaken. Monitoring at that time did not reveal any water quality issues associated with the construction activities.

Government Monitoring: No independent monitoring was scheduled for this period. Oversight of monitoring activities on 28 March 2003 was completed, and no issues were encountered. Site visits were conducted on 13, 18 and 25 March and 03, 11 and 18 April (days when CLE was not scheduled to be on site) to view the progress of construction and to better gauge upcoming construction activities to help schedule monitoring. No issues were encountered during site visits

Schedule: Week of 21 April 2003 – Excavation of arc 1-2 and driving sheet for the extension from cell #1 to the pier will begin. Backfilling of areas between the bulkhead and cells will continue. This phase of the project is scheduled for completion by the end of May/beginning of June.

Attachments:

Attachments: Two photographs from the Area D construction are attached to this update.

Please contact the individuals listed below with any questions or comments.

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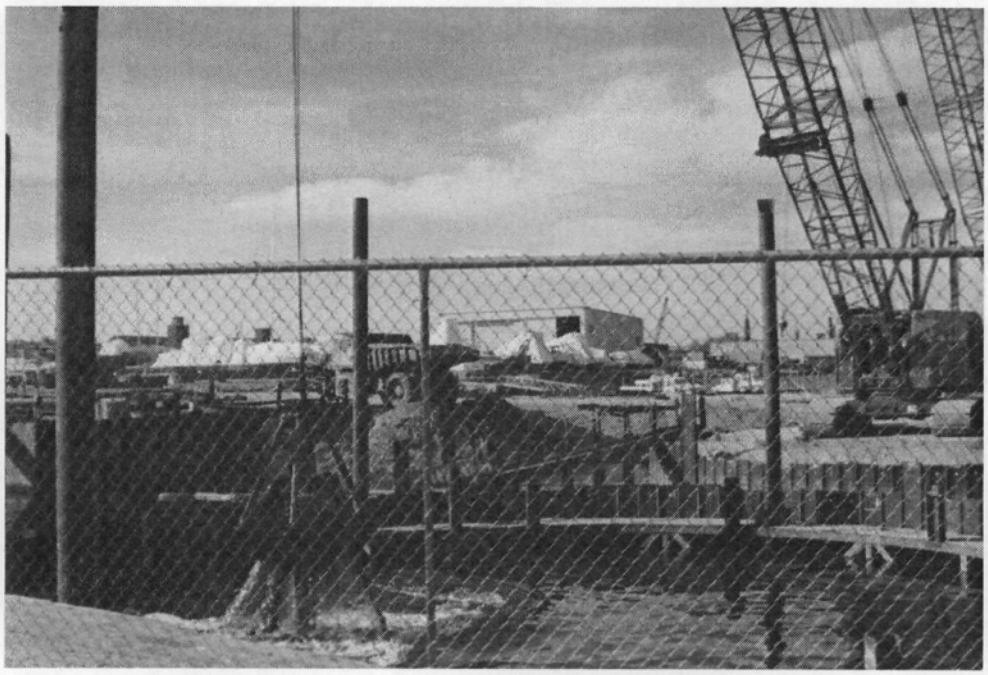

Photo #54 – 28 Mar 03 – Area D excavation of cell #1

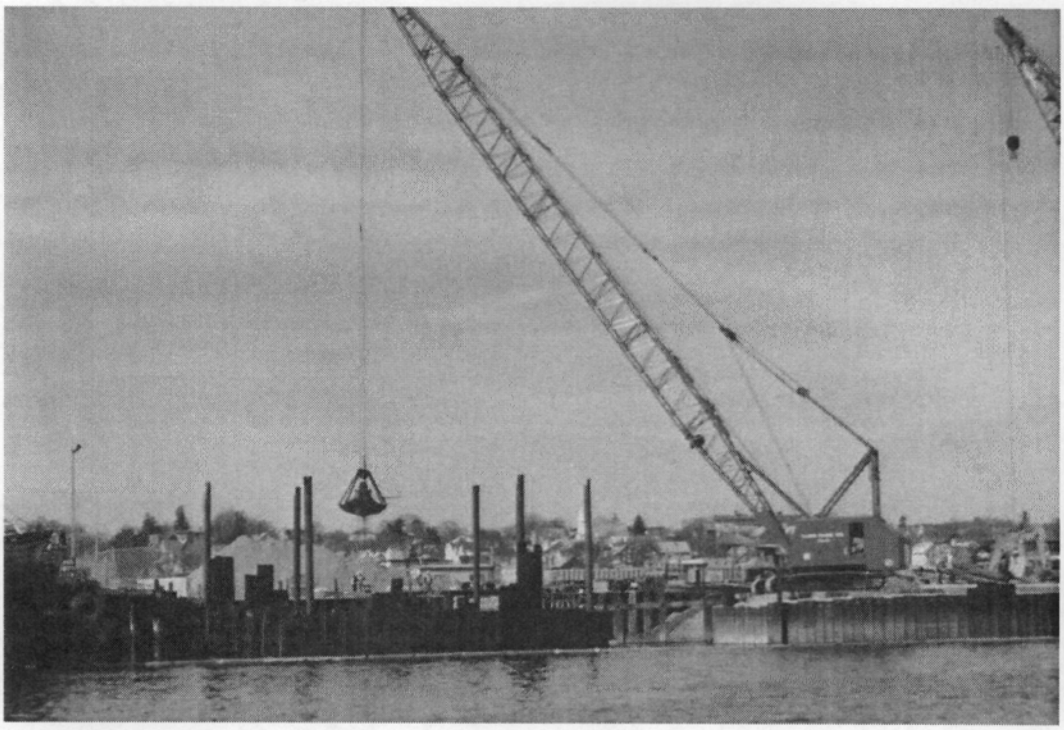

Photo #55 – 28 Mar 03 – Area D excavation of cell #1

APPENDIX C

Project Toxicity Data

Aquatec Biological Sciences

Ecology | Environmental Toxicology | Natural Resource Assessments | Microbiology

Woods Hole Analytical Laboratory
375 Paramount Drive

Raynham, MA 45196

Date: 1/19/03
Project: 03010
SDG 6706
Site: New Bedford Area D

Method: *Sea Urchin, Arbacia punctulata, Fertilization*

Sample Number	Client Identifier	Initial Count	Replicate % Fertilization A	B	C	D	Mean Fertilization (%)
23632	At Turb Curtain-2	100	100	99	98	98	98.8
23641	Control Arbacia	100	100	100	99	90	97.3

* Indicates a statistically significant reduction (P<0.05) in the response relative to the corresponding response in the laboratory control sample.

Method: *Mysid, Americamysis bahia, 48 H Static Acute Test*

Sample Number	Client Identifier	Initial Count	Replicate % Survival A	B	C	D	Mean Survival (%)
23632	At Turb Curtain-2	10	100	100	100	100	100.0
23640	Control Americamysis	10	100	100	100	100	100.0

* Indicates a statistically significant reduction (P<0.05) in the response relative to the corresponding response in the laboratory control sample.

Samples Received

Number	Sample Name	Date Time and Collected		Type
023631	100ft Outside Turb Curtain	1/11/03	3:43:00 PM	Water
023632	At Turb Curtain-2	1/11/03	3:31:00 PM	Water
023633	At Turb Curtain	1/11/03	11:40:00 AM	Water
023634	Reference-Area D	1/11/03	3:57:00 PM	Water
023640	Control Americamysis	1/14/03		Water
023641	Control Arbacia	1/14/03		Water

Submitted By:

273 Commerce Street, Williston, VT 05495 Tel: 802.860.1638 Fax: 802.658.3189

Aquatec Biological Sciences

Ecology | Environmental Toxicology | Natural Resource Assessments | Microbiology

Quality Assurance Report

Woods Hole Analytical Laboratory	Date:	1/19/03
375 Paramount Drive	Project:	03010
	SDG	6706
Raynham, MA 45196	Site:	New Bedford Area D

Qualifiers and Special Conditions

To the best our knowledge, there are no special conditions or qualifiers that relate to the samples in this report.

273 Commerce Street, Williston, VT 05495 Tel: 802.860.1638 Fax: 802.658.3189

III. NORTH LOBE

U.S. Army Corps of Engineers
New England District

U.S. Environmental Protection Agency

Water Quality Monitoring Summary Report

III. North Lobe Dredging (August - October 2003)

New Bedford Harbor Superfund Site - New Bedford, Massachusetts

Prepared by:

Woods Hole Group
Environmental Laboratories

ENSR Corporation

CR Environmental

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EXECUTIVE SUMMARY

As part of the remediation of the New Bedford Harbor Superfund Site, approximately 3945 cubic yards of contaminated sediments were removed from four specific locations in the North Lobe area of the Lower Harbor. The sediments were removed to allow for construction of a bulkhead and shore side facility to accommodate relocation of the Tisbury Towing and Transportation Company. The sediments to be dredged contained elevated concentrations of PCBs and some metals. As a result, the USEPA and USACE required that the dredging be performed using a closed environmental dredge bucket, with a contingency for deployment of a full-depth silt curtain and transport of the dredged material to the USACE's Sawyer Street Facility for storage and later off-site disposal.

In addition to the turbidity controls, a water quality monitoring program was developed by the USEPA and USACE to ensure that the dredging was carried out in a manner that did not result in acute impacts to organisms within the waters adjacent to the work zones or result in significant transport of suspended material and associated contaminants away from these areas. The monitoring program included real-time measurement of turbidity down current of the dredging area for comparison against an upper level project specific turbidity criterion (set at 50 NTU above background 300 ft down current of the work zone). The monitoring specified contingent sampling, analyses, and construction work modification in the event of a turbidity criterion exceedence. The monitoring also included sampling immediately adjacent to the dredge to assess the protectiveness of the 50 NTU criterion and to determine if the use of silt curtain(s) was required.

The dredging of the North Lobe areas was completed between August and October 2003. The water quality monitoring revealed that the dredging caused minimal elevation of suspend solids outside of the immediate dredge area. Turbidity levels at 300 ft down current of the dredging did not exceed (or approach) the 50 NTU above background criterion, and there were no acute toxicity effects for water samples collected in the higher turbidity zone adjacent to the dredge. This allowed the dredging operation to be completed without the deployment of silt curtains. Similar to the monitoring performed during other construction and dredging projects in New Bedford Harbor, vessel operations and repositioning of equipment were found to have the potential to suspend as much sediment as the dredging operation. However, for the transport of the North Lobe material, sediment suspension was only apparent in limited shallow water areas at the lower stages of the tide and, as such, the impacts were considered minimal.

1.0 INTRODUCTION

New Bedford Harbor is located approximately 50 miles south of Boston on the waters of Buzzards Bay in Bristol County, Massachusetts. The sediments in many areas of the Harbor are contaminated with polychlorinated biphenyl's (PCB's) and metals, primarily from the manufacture of electrical components which occurred in the area between 1940 and the mid-1970's. Based on human health concerns and ecological risk assessments, the U.S. Environmental Protection Agency (USEPA) added New Bedford Harbor to the National Priorities List in 1982 as a designated Superfund Site, and stipulated that remedial measures were required to remove PCB-contaminated sediments from the Harbor. Through an Interagency Agreement between the USEPA and the U.S. Army Corps of Engineers, New England District (USACE), the USACE is responsible for carrying out the design and implementation of the remedial measures.

The New Bedford Harbor Superfund Site extends from the shallow northern reaches of the Acushnet River estuary, south through the commercial harbor of New Bedford and out beyond the City's hurricane barrier into 17,000 adjacent acres of Buzzards Bay. The Superfund Site is divided into three areas: the Upper, Lower and Outer Harbors (Figure 1) defined by geographical features of the Harbor and gradients of sediment contamination. The industrial discharge of PCB contaminated waste, either directly into the Harbor or indirectly through the City's sewer system, was most significant in the Upper Harbor. The location of the associated discharge and the hydrodynamics of the Harbor contributed to the deposition of significant levels of PCB contamination in the Upper Harbor. The highest PCB concentrations or "hot-spots", which contained PCB concentrations in excess of 100,000 ppm, resided in the sediments located in the immediate area of the discharge. These "hot-spot" sediments were removed between 1994 and 1995 as part of the USEPA's first cleanup phase (USEPA, 1997). The remaining sediments in the Upper Harbor, an area of approximately 190 acres, are still heavily contaminated, with PCB concentrations as high as 4,000 ppm.

Future remedial dredging efforts are planned for the Upper Harbor and portions of the Lower and Outer Harbors. Until the remedial action has been completed, any in-water construction activities that disturb the contaminated sediments require that a water quality monitoring program be developed to ensure that the construction operation is carried out in a manner such that:

- The disturbance of the contaminated sediments does not result in any acute impact to organisms within the water column outside of the construction area.

- There is not significant transport and deposition of sediments and their associated contaminants outside the construction zone to uncontaminated areas or areas that have already been remediated.

As part of the progression of the overall New Bedford Harbor Superfund Remediation effort, construction of a Sediment Dewatering, Material Transfer & Receiving Facility began in 2002 at the southern lobe of the former CDF D in the Lower Harbor, now referred to as Area D (Figure 1). The dewatering plant will accept dredge material from the Harbor for processing during full scale dredging operations. As part of the construction of this facility, the Tisbury Towing and Transportation Company that was located at Area D is being relocated a short distance to the north at the area referred to as the North Lobe (Figure 1). The relocation of this facility required site and shoreline development of the North Lobe area, including construction of a shoreline bulkhead and dredging of an approach channel.

Previous sampling and analysis of sediments in the North Lobe area had detected elevated levels of PCBs and metals, most notably copper. As a result, the USEPA and USACE had identified specific areas in the vicinity of the planned construction at the North Lobe where special handling of sediments was required because of the contamination levels (Figure 2). A follow up sediment characterization investigation was performed on the sediments in this area, including analysis of sediment and elutriate samples for metals from each area labeled in Figure 2 as well as toxicity bioassays on the suspended particulate phase generated from Areas A and F6 (ENSR 2003). The analyses confirmed the elevated metals concentrations and revealed the potential for acute suspended phase toxicity, particularly for the sediments from Area F6 (ENSR 2003). Based on these results, the USEPA and USACE limited the dredging for preparation of the North Lobe area for construction to Areas A, B, C, and D and required that the dredging be performed with a closed environmental bucket with a contingency for deployment of silt curtains.

In addition to the specialized dredging technique, the USEPA and USACE developed a water quality monitoring program to ensure that the project water quality goals were being met. The monitoring focused on real-time turbidity monitoring adjacent to the dredging and at specified distances from the operation (Figure 3). Dredging operations were completed between August and October 2003. This work was performed by Maximillian Corp. under contract to Tetra Tech Environmental (formerly Foster Wheeler Environmental). The USACE water quality monitoring was performed by Woods Hole Group Environmental Laboratories (WHG) with team members ENSR Consulting, CR Environmental, and Aquatec Biological Sciences. The monitoring revealed that the site controls were successful in meeting the goals defined above and limiting overall impacts to water quality. This report provides a summary of the water quality monitoring program and results.

2.0 DREDGING SUMMARY

The dredging of North Lobe area consisted of the removal of approximately 3945 cubic yards of contaminated sediments from Areas A, B, C, and D (Figure 2). The dredging was performed using an excavator outfitted with a closed environmental bucket (Figure 4). Dredged sediments were initially placed into a partitioned holding bay on the dredge barge. Debris imbedded within the sediment was sorted within the holding bay, and excess water was discharged into the Harbor. Material in the holding bay was then transferred into small scows (Figure 4). The scows were then pushed up the Harbor to the USACE Sawyer St. facility, and material was removed from the scow using a long reach excavator (Figure 5). The material was processed to further remove debris and stones and pumped into the holding cell located at the Sawyer St. facility.

An oil-absorbent boom was maintained around the dredging operation. Due to the limited duration of dredging in each dredge area and the use of the enclosed environmental bucket, silt curtains were not initially placed around the dredge. The deployment of silt curtains was contingent upon the results of water quality monitoring activities, i.e., if the monitoring indicated that the use of the environmental bucket alone was not sufficient to limit water column impacts, then silt curtains would be deployed. Dredge activities began in August 2003 and were completed in October 2003, and the use of the silt curtains was not required.

3.0 WATER QUALITY MONITORING DURING DREDGING

As described in Section 2, specialized dredging equipment was required to ensure that the removal of the sediments was performed in a manner that limited the potential release of suspended material and their associated contaminants to the water column. The USEPA and USACE developed a water quality monitoring program to ensure that the dredging equipment was effective at meeting the environmental goals outlined in Section 1. The program was based on the measurement of turbidity as a surrogate for contaminant release and transport and included a project-specific turbidity criterion and boat-based monitoring. A brief summary of the monitoring is presented below, and further information may be found in the Scope of Work (SOW) for the Water Quality Monitoring during Construction Activities at the North Lobe, New Bedford Harbor Superfund Site (Appendix A).

The project-specific turbidity criterion was defined as 50 NTU above background at the edge of a 300 ft mixing zone around the dredging area (Figure 3). This criterion was developed based on a review of previous dredging and monitoring activities at the New Bedford Harbor Superfund Site and an understanding of sediment contamination and current patterns in the vicinity of the construction. The water quality monitoring program focused on boat-based measurement of turbidity in the near field adjacent to the dredging and along transects at specified distances from the operation. In the event of a turbidity exceedence at the 300 ft down-current mixing zone, samples were collected at this location for toxicity testing, and additional monitoring and sampling was detailed as outlined in Figure 6. An analytical test protocol was developed to determine when collected water samples would be submitted for biological (toxicity) testing and chemical analysis following an exceedence of the turbidity criterion (Figure 7). The Sampling and Analysis Plan and Quality Assurance Project Plan – New Bedford Harbor Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies (SAP/QAPP) (WHG, 2002) provided specific detail on sample handling and laboratory methodology.

The monitoring also included periodic sample collection within the near field area immediately adjacent to the dredging for toxicity testing to determine if the 50 NTU criterion was ecologically protective or if there was a need to deploy silt curtains to meet project environmental goals. Sample collection was targeted at the area with the highest turbidity levels with the 24-hour sea urchin (*Arbacia* sp) fertilization test used to assess ecological impact.

4.0 RESULTS OF WATER QUALITY MONITORING

Boat-based monitoring was performed on 13 days and shore-side oversight on two days during the eight-week dredging project. A summary of the daily monitoring is provided in Table 1,and the two monitoring updates prepared over the course of the project are included in Appendix B. There were no exceedences of the 50 NTU turbidity criterion.

Background turbidity levels generally ranged from 4 to 6 NTU over the course of the project. In the near field area within 100 ft of the dredge, the water was often visibly turbid. Turbidity levels were commonly 20-30 NTU above background in this area and ranged as high as 70 NTU above background. Turbidity decreased with distance from the dredge and was generally within 10 NTU of background at 300 ft down current of the dredge. Debris (in the form of scrap metal, wire, and wood) were removed by the dredge on multiple occasions while monitoring was being performed, but did not appear to significantly affect turbidity.

Turbidity associated with other related operations was also monitored. Water from holding bay on the dredge barge was periodically discharged as was ballast water from the dredge's internal chambers. Visibly turbid water was sometimes observed in the immediate vicinity of the discharge, especially when it occurred directly at the surface. At these times turbidity as high as 60 NTU above background was measured within approximately 50 ft of the discharge. However, the elevated turbidity was generally localized and often difficult to document separately from the actual dredging. Turbidity was also monitored as the scows containing the dredged material were pushed approximately 0.75 miles north for offloading at the USACE Sawyer Street facility in the Upper Harbor. Turbidity elevation along this transit was only noted in the shallow water where the dredging operation was performed and in the approach to the Sawyer Street facility. Turbidity values as high as 200 NTU were recorded within the propeller wash approximately 100 ft from the pushboat during those occasions when the scow was temporarily grounded in the shallow water. These turbidity elevations were short in duration (minutes) and dropped off quickly with distance from the pushboat.

A large oil slick was observed on the water early in the project, but this slick was determined to be associated with a fishing vessel that sank at its mooring near the dredge site. A localized oil sheen was observed on several occasions in the vicinity of the dredging, but dissipated within several hundred feet of the operation.

Water samples were collected within the identified turbidity plume in the near field area of the dredge on four occasions during the project (Table 2). These samples were submitted for the 24-hour sea urchin (*Arbacia* sp) fertilization test. The test results revealed no apparent acute effects for any of the samples (Table 2; Appendix C).

5.0 DISCUSSION

The water quality monitoring revealed that the dredging of North Lobe Areas A, B, C, and D caused minimal elevation of suspend solids outside of the immediate dredge area. Turbidity levels at 300 ft down current of the dredging did not exceed (or approach) the 50 NTU above background criterion, and there were no acute toxicity effects for water samples collected in the higher turbidity area adjacent to the dredge. This allowed the dredging operation to be completed without the deployment of silt curtains. The limited turbidity associated with the dredging is attributed to the dredging technique as well as the location. The dredging was performed using a fully enclosed bucket mounted on an excavator. This allowed precise placement of the dredge bucket and limited loss during retrieval. In addition, because the dredge areas were located in shallow water close to shore, they were outside of the zone of higher tidal currents, and the potential for sediment transport was minimized.

Similar to the monitoring performed during other construction and dredging projects in New Bedford Harbor, vessel operations and repositioning of equipment were found to have the potential to suspend as much sediment as the dredging operation (ENSR 2003, 2001). For the North Lobe dredging project, these vessel effects were only apparent in limited shallow water areas at the lower stages of the tide as loaded scows were transferred from the dredging area to the offloading area at the Sawyer Street Facility and, as such, the impacts were considered minimal.

6.0 REFERENCES

ENSR. 2001. Water Quality Monitoring Summary Report, Construction of the Commonwealth Electric Cable Crossing, New Bedford Harbor Superfund Site - New Bedford, MA. Contract: DACW33-96-D-004, Task Order 49. 9000-275-000. February 2001.

ENSR. 2003. North Lobe Dredging Area Characterization Report, New Bedford Harbor Superfund Site - New Bedford, MA. 10310-004-0637. August 2003.

ENSR, 2001. Water Quality Monitoring Summary, Appendix K, Pre-Design Field Test Dredge Technology Evaluation Report, New Bedford Harbor Superfund Site. August 2001.

USEPA. 1997. Report on the Effects of the Hot Spot Dredging Operations - New Bedford Harbor Superfund Site, New Bedford, MA. October, 1997.

Woods Hole Group. 2002. Sampling and Analysis Plan & Quality Assurance Project Plan for New Bedford Harbor, Water Quality Monitoring for Area D Construction Activities and Sediment Characterization Studies (Revision 4.0).

TABLES

Table 1. Monitoring Activities during North Lobe Dredging

Date (2003)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
25 August	Site Preparation	No		5-6	WQ mob
02 September	Dredging in Area B begins	No	3-43	4-6	Highest turbidity measured along transect 50 ft down current of dredging. Turbidity at 300 ft compliance point turbidity ranged from 3-25 NTU. Extensive oil sheen noted on harbor, later determined to be associated with a recently sunken fishing vessel
03 September	Dredging in Area B continues	3	2-16	3-4	Highest turbidity measured along transect 50 ft down current (3-16 NTU). Turbidity at 300 ft compliance point ranged from 3-11 NTU. Oil sheen associated with sunken vessel still visible. Dewatering of dredged material in dredge hopper did not result in elevated turbidity.
04 September	Dredging of Area B completed, Dredging of Area D begins D. Loaded scow pushed to Sawyer St.	No	4-75	4-6	Highest turbidity noted at 50 ft transect (4-75 NTU). Turbidity at 300 ft compliance point was 4-9 NTU. Some localized oil sheen associated with dredging operations noted. Turbidity at dewatering discharge up to 37 NTU, decreased to background levels within 20 ft. Turbidity associated with positioning of scow at Sawyer St up to 218 NTU close to the push boat. Dropped to 5 NTU 100 ft from scow.
08 September	Dredging Area D continued. Loaded scow moved to Sawyer St.	No	3-15	4	Dewatering of dredged material was observed. No turbidity elevations detected.

Table 1. (Continued) - Monitoring Activities during North Lobe Dredging

Date (2003)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
09 September	Dredging Area D continues. 2 loaded scows moved to Sawyer St.	No	2-13	3-8	Moved dewatering discharge to approx. 3 ft below surface; highest reading was 8 NTU at approx. 4 ft below surface. Discharge from dredge barge bilge up to 21 NTU (likely due to rust in discharge). Turbidity associated with positioning scow at Sawyer St. at low tide was up to 51 NTU, dropped to 5 NTU 150 ft from scow.
11 September	Continued dredging Area D	No	NA	NA	A scow pushed to Sawyer St grounded in shallow water at low tide - cleared itself as the tide rose.
15 September	Dredging Area D	No	NA	NA	Limited dredging occurred in the afternoon.
16 September	Dredging Area D. Loaded scow pushed to Sawyer St.	No	1-21	4	Turbidity 50-100 ft from loaded scow and push boat in shallows near Sawyer St. ranged from 4-20 NTU.
17 September	Dredging Area D	No	NA	NA	Floating wood debris observed in dredging area.
22 September	Dredging in Area D. Several trips of scow to Sawyer St.	Yes	0-92	4-5	Turbidity at 300 ft compliance point ranged from 2-14 NTU. Highest turbidity recorded 10-25 ft from dredge. Sample collected for 1 hour *Arbacia* toxicity. Substantial wire debris in dredged material.

Table 1. (Continued) - Monitoring Activities during North Lobe Dredging

Date (2003)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
24 September	Dredging in Area D. Several trips of scow to Sawyer St.	No	0-26	4-5	Turbidity during scow transfer activities approx. 1 hr after low tide ranged from 5-134 NTU within 50 ft of scow and push boat. Values decreased to less than 20 NTU within 15 minutes. Turbidity associated with dewatering of sediment ranged from 1-20 NTU. Turbidity associated with barge bilge water discharge ranged from 8-32 NTU and localized oil sheen was observed on near dredge ops.
29 September	Dredging Area D. Several trips of scow to Sawyer St. Shoreline dredge via shore-based excavator occurred for ~1 hr	Yes	2-52	4-7	No turbidity issues associated with shoreline dredging. Localized oil droplets, surface sheen, and floating debris were noted though out the dredge area. Sample collected 50 ft from dredging activities. Elevated turbidity was observed during Sawyer St. transfer activities but was short in duration and in limited area.
01 October	Completed dredging of Area D and began dredging Area C.	No	4-30	3-4	Turbidity increased to 30 NTU near location of dewatering pump discharge. Oil sheen, a brown film and small pieces of absorbent boom material were noted at Area D and Sawyer St sites. Turbidity from 5-36 NTU was observed behind the scow at Sawyer St. Values decreased to 5-14 NTU within one minute.

Table 1. (Continued) - Monitoring Activities during North Lobe Dredging

Date (2003)	Activity	Samples Collected	Turbidity Down-Current (NTU)	Turbidity at Up-Current Reference Site (NTU)	Notes
06 October	Dredging Area C continued and several trips of scow to Sawyer St.	No	4-32	3-5	Oil sheen, small pieces of boom absorbent material, and floating debris were present in the vicinity of the dredging. High levels of turbidity from prop wash of scow pushboat were observed at low tide. Scow became grounded at low tide and was allowed to refloat as tide flooded. Higher levels of turbidity (12-17 NTU) were noted at 300 ft point along the shore, probably due to shoreline sediment resuspension
08 October	Dredging in Area C suspended as dredging began in Area A. Several trips of the scow to Sawyer St.	Yes	4-34	4-5	Sample collected approx. 10 ft from dredge in an area affected by both the dredging and the dewatering discharge pump. Turbidity ranged from 30-63 NTU at this location. Turbidity recorded during scow transfer 2 hrs after low tide ranged from 3-86 NTU, decreasing to 4-29 NTU within 10 minutes. No oil sheen was observed on the Harbor surface.
14 October	Dredging completed in Area A. Dredging in Area C. Initial project dredging completed pending survey.	No	0-40	1-5	Two small surface oil slicks were observed at 150 and 300 ft south of dredging activities. Turbidity related to scow movements near dredging activities up to 29 NTU.

Notes: NA - No turbidity monitoring occurred.

Table 2 - Results of *Arbacia* Fertilization Test

Date	Location of Sample	Dredge Area	Result
3 September 2003	60 ft South of Dredge	Area B	No Effect
22 September 2003	10 ft North of Dredge	Area D	No Effect
29 September 2003	50 ft South of Dredge	Area D	No Effect
8 October 2003	10 ft South of Dredge (sample taken in an area affected by both dredging activities and dewatering of dredge material)	Area C	No Effect

FIGURES

US Army Corps of Engineers
New England District

New Bedford Harbor Superfund Site

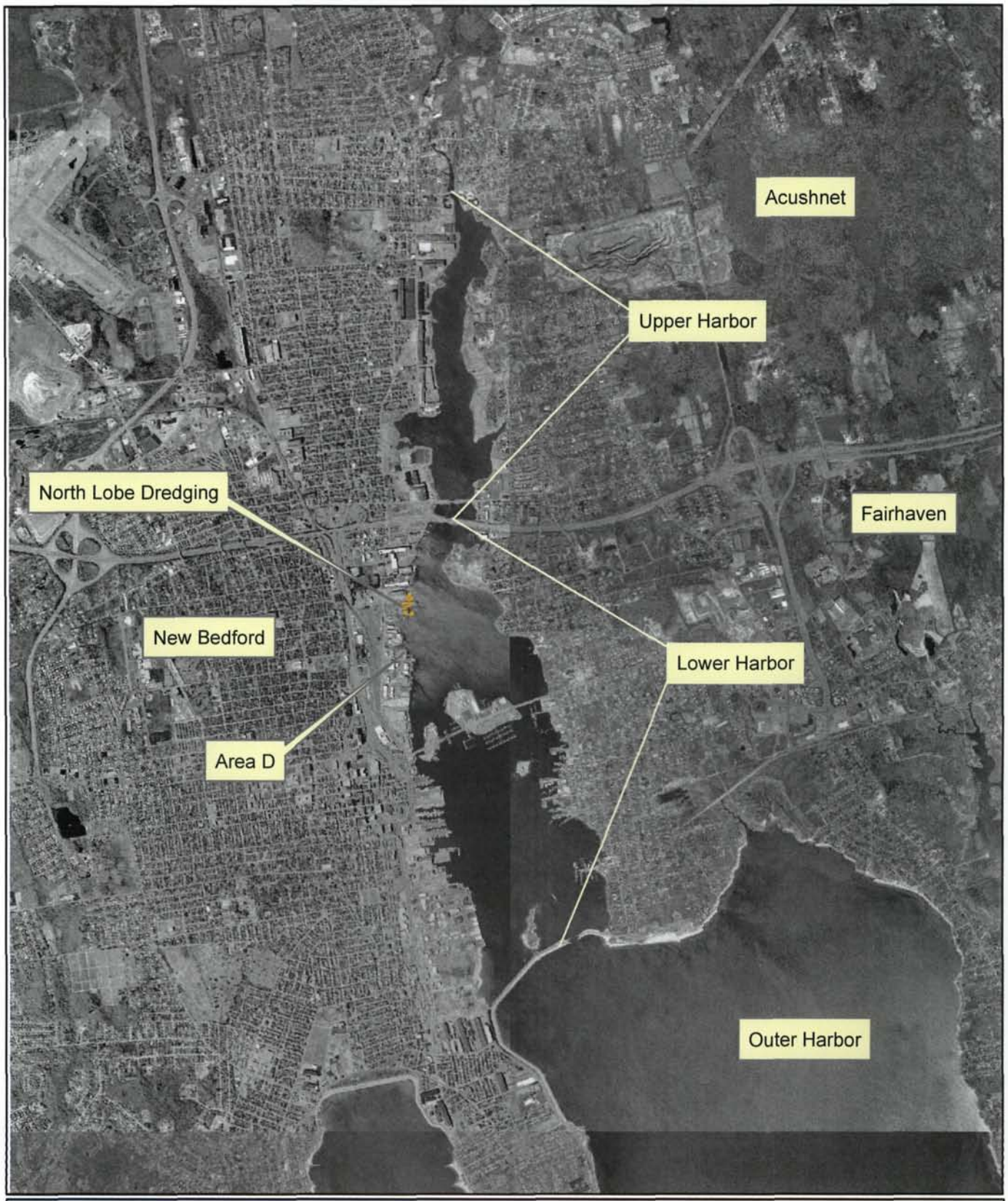

Figure 1. Harbor Overview Showing the Location of the North Lobe Dredging

Sources: MassGIS 1/2-m color orthophotos
NAD 83 Mass State Plane m
Date: 24 November 2003
ME

0 0.25 0.5 1 Miles

ENSR

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US Army Corps of Engineers
New England District

New Bedford Harbor Superfund Site

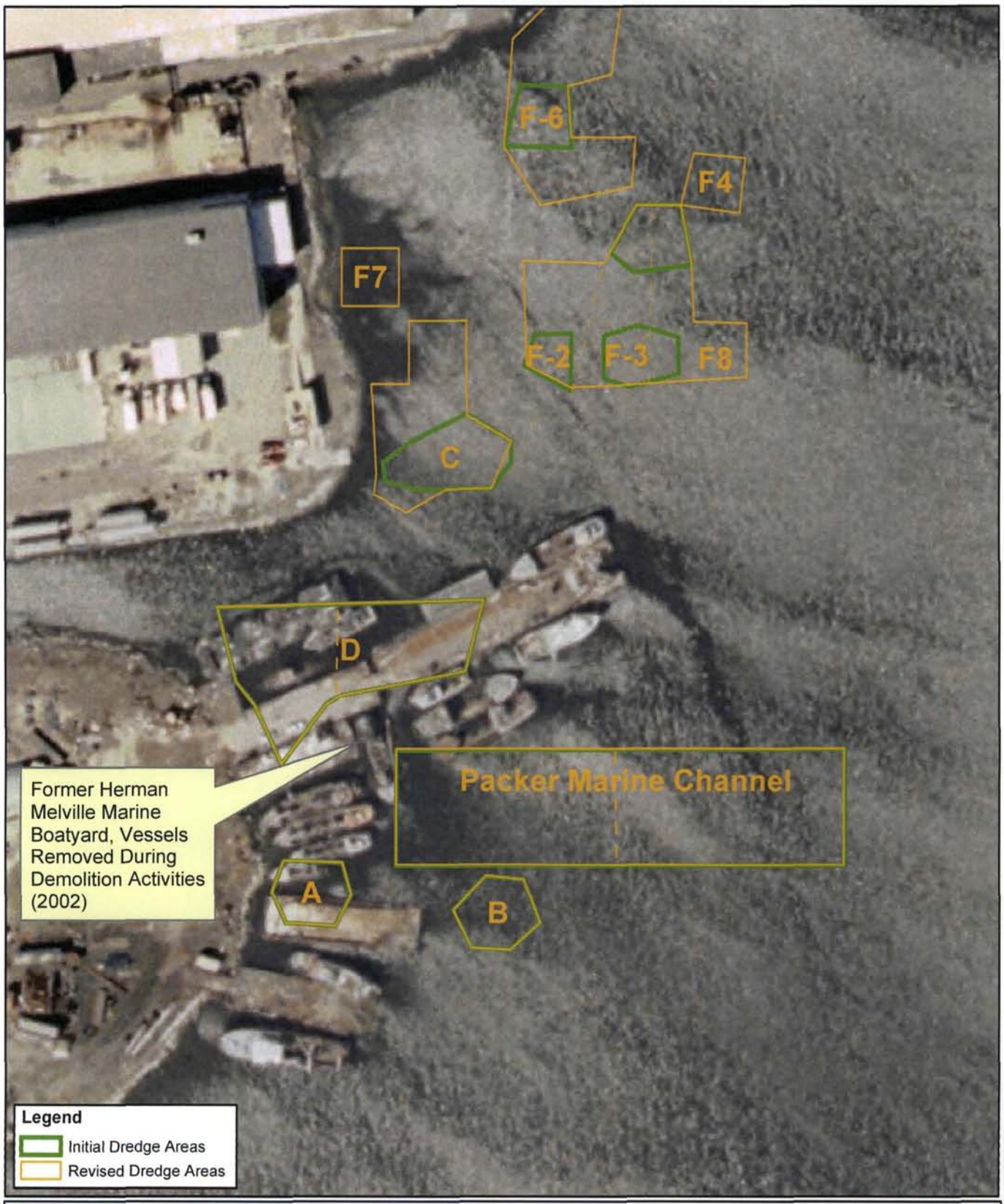

Figure 2. Initial and Revised North Lobe Dredge Areas

Sources: MassGIS 1/2-m color orthophotos
NAD 83 Mass State Plane m
Date: 24 November 2003
ME

ENSR

0 50 100 200 Feet

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US Army Corps of Engineers
New England District

New Bedford Harbor Superfund Site

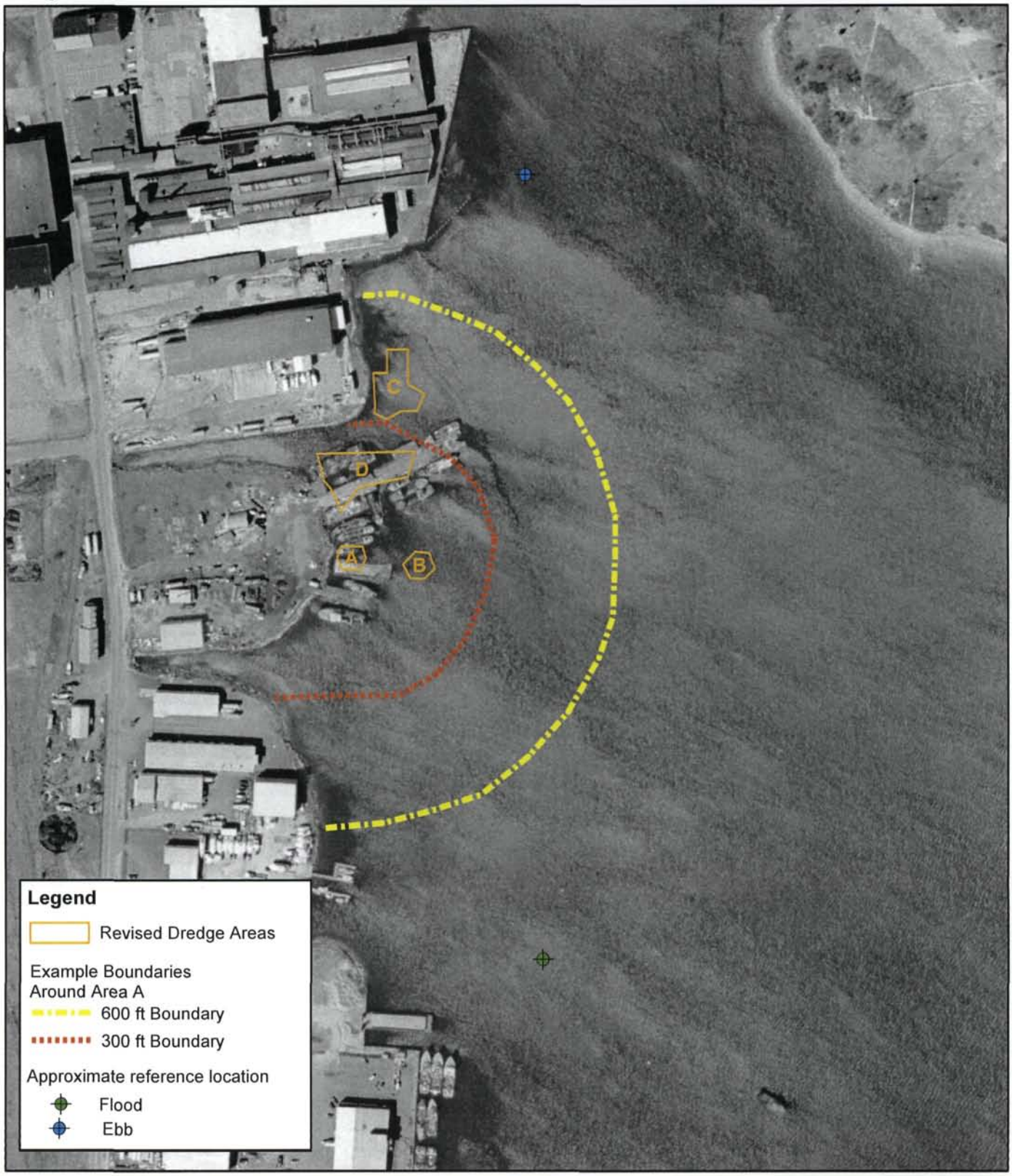

Figure 3. Revised North Lobe Dredge Areas Dredged Fall 2003, with 300 ft and 600 ft Boundaries for Area A

Sources: MassGIS 1/2-m color orthophotos
NAD 83 Mass State Plane m
Date: 24 November 2003
ME

0 250 500 1,000 Feet

ENSR

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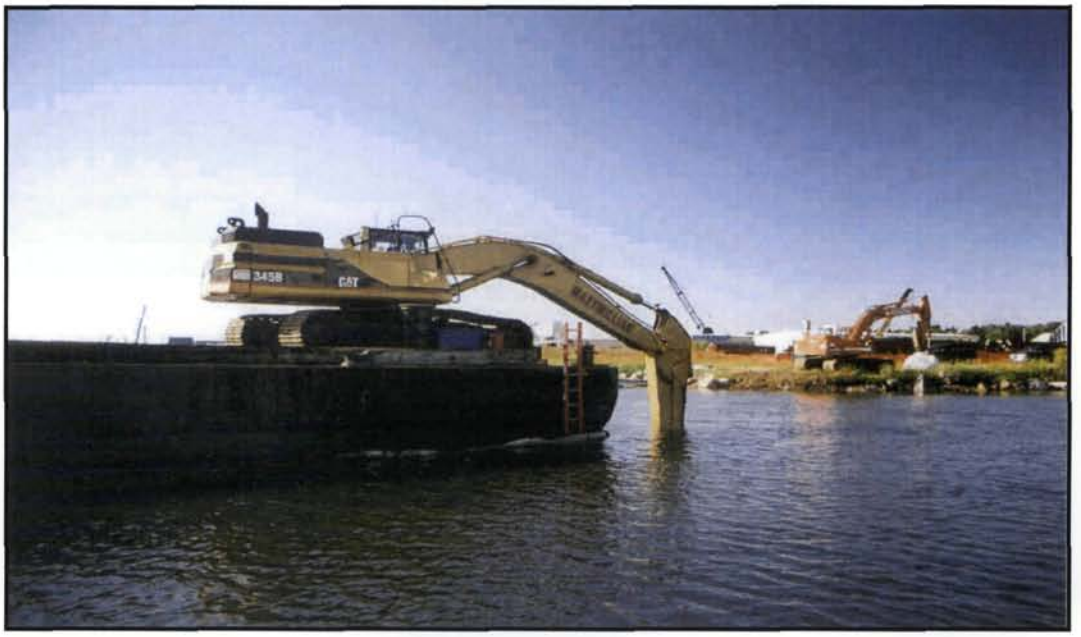
Figure 4. Photographs of North Lobe Dredging



Excavator dredge working at Area D

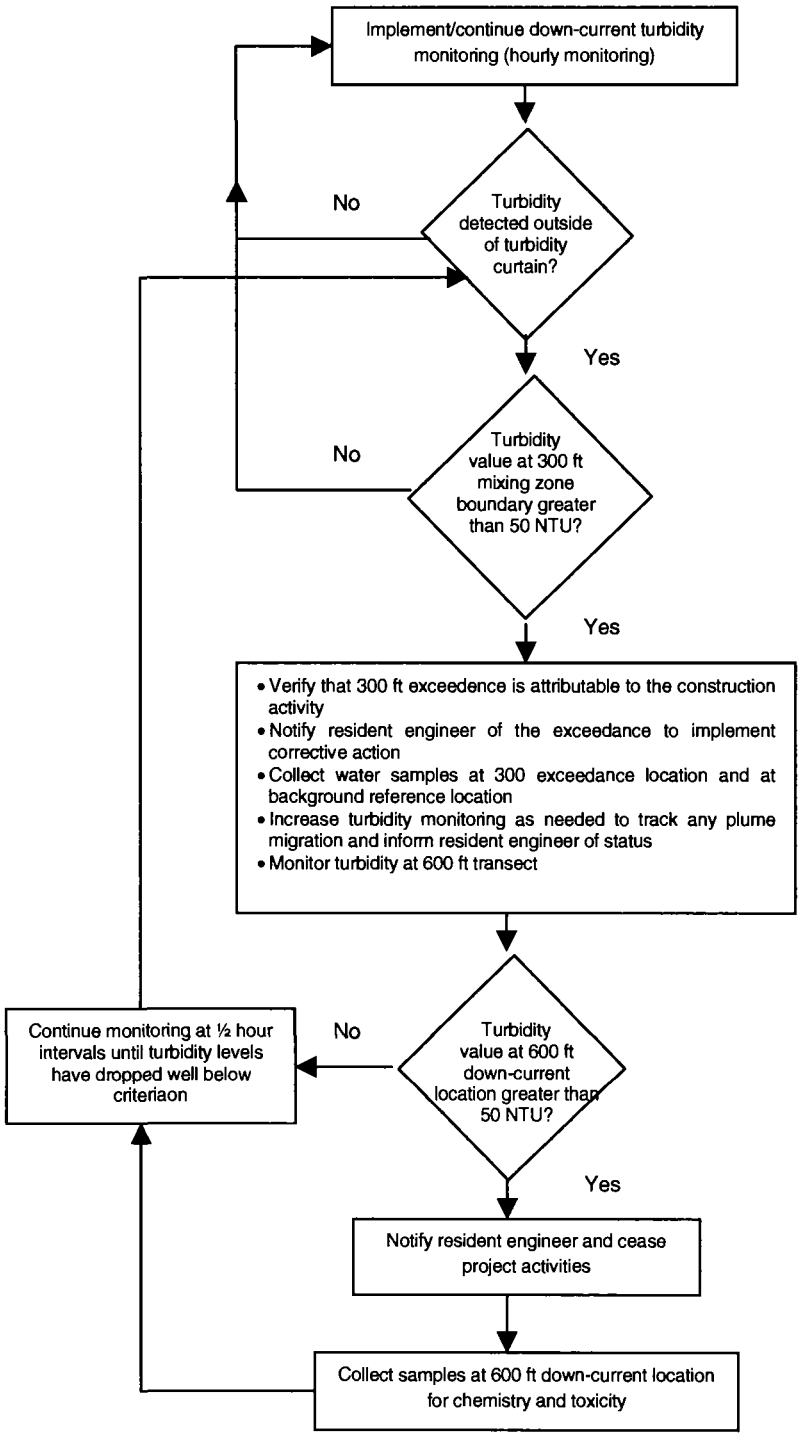
Dredged material transferred to hopper barge

Figure 5. Photographs of Dredging Material Transfer to Sawyer Street Facility

Hopper barge pushed from North Lobe to Upper Harbor

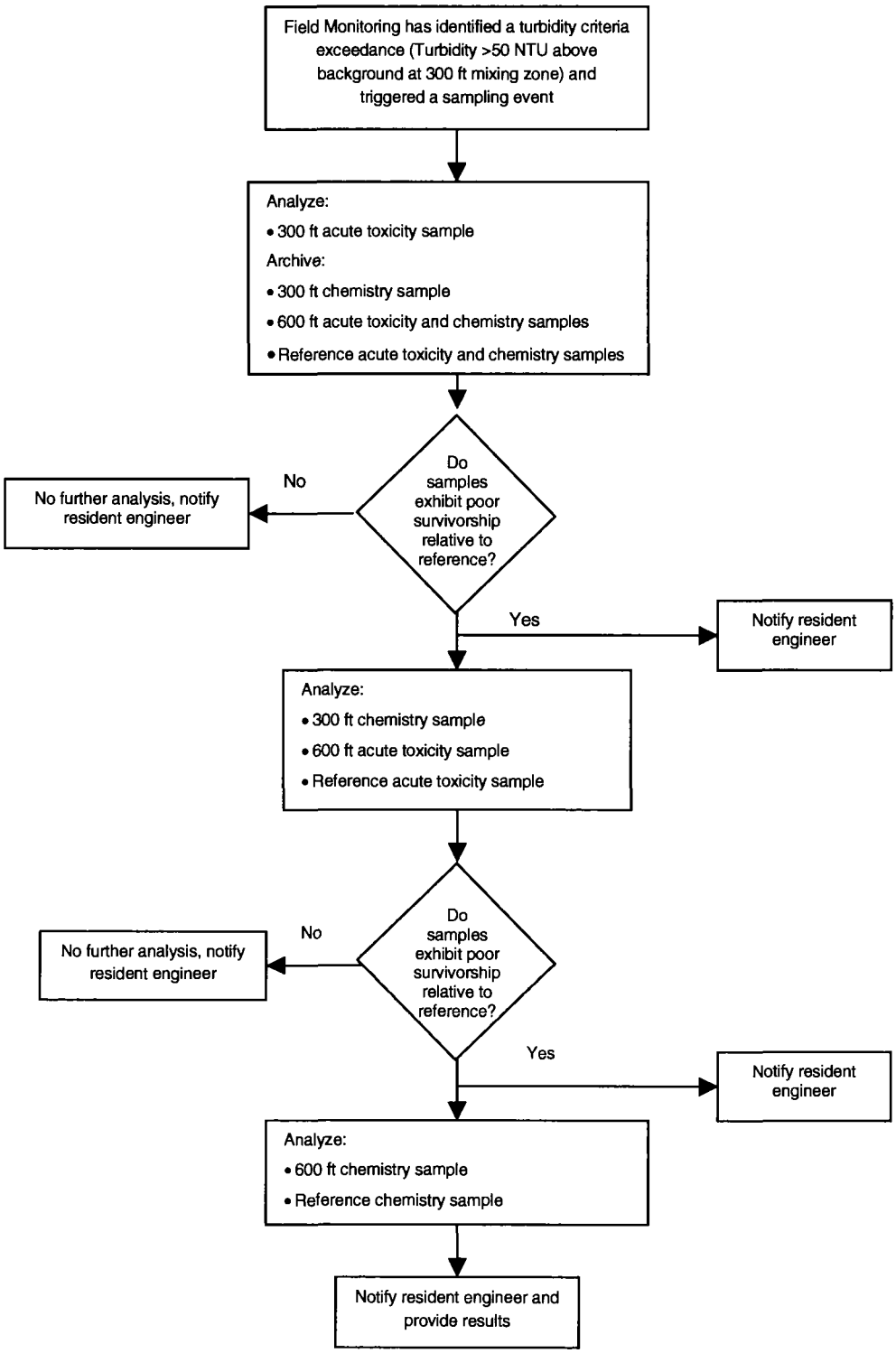
Dredge material offloaded at Sawyer Street Facility

Figure 6. Water Quality Monitoring Decision Sequence



Notes
1: 50 NTU value is defined as 50 NTU above the background turbidity level
2: The presence and extent of any visible oil sheen emanating from project area, even though project turbidity limits have not been exceeded should be brought to the attention of resident engineer, and a surface grab sample shall be collected for potential analysis.

Figure 7. Analytical Protocol Decision Sequence



APPENDIX

APPENDIX A

Water Quality Monitoring Scope of Work

Scope of Work Modification
Water Quality Monitoring during Construction Activities at Area D
New Bedford Harbor Superfund Site
24 July 2003

I. Background

This Scope of Work modifies the existing Woods Hole Group Task Order No. 0001-001 (Mod) under contract DACW33-02-D-0006 entitled Water Quality Monitoring during Construction Activities at Area D, New Bedford Harbor Superfund Site dated 30 July 2002. The purpose of this modification is to focus monitoring efforts and redirect residual funding from the Area D effort and apply it to the environmental dredging at the North Lobe (NLD) adjacent to Area D scheduled to occur mid-August of 2003. Although the NLD effort was included in the original SOW, the experience gained during Area D monitoring allows for a refining of this upcoming monitoring effort. These revisions are incorporated into this SOW modification.

Based on historic and current chemical data, the sediments within the North Lobe Area contain elevated levels of PCBs and metals, which can potentially have negative environmental impacts if released to the water column in an uncontrolled manner. As in previous monitoring efforts the water quality monitoring program for the NLD includes comprehensive Contractor-based monitoring on behalf of the Government at varying levels of intensity during the course of the project. This SOW outlines the water quality monitoring approach to be implemented by Water Quality Monitoring Contractor Woods Hole Group and their Sub-Contractors (WHG) on behalf of the Government. The overall goal of the monitoring program is to ensure that the dredging operation is carried out in a manner such that;

- The disturbance of the contaminated sediments does not result in any acute impact to organisms within the water column adjacent to the construction.
- There is not significant transport and deposition of sediments and their associated contaminants outside the project area to uncontaminated areas.

II. Government Monitoring:

This SOW summarizes the Government Water Quality Monitoring Program to be implemented by WHG. This program includes field based monitoring efforts over the duration of the construction consisting of real-time turbidity measurements in and around the dredging areas with the likely potential for water column sampling and analysis including toxicity testing and water column chemistry.

III. Construction Overview of the North Lobe Environmental Dredging

The following summary provides an overview of the dredging and support activities that will take place as part of the NLD that will require monitoring under this SOW. The intensity and duration of the monitoring will be determined based on periodic construction coordination meetings to be held as necessary to ensure adequate planning and scheduling of the monitoring effort.

As part of the Area D site preparation, the Packer lease facilities (bulkhead and dock loading area) will be relocated to the North Lobe property off of Herman Melville Boulevard. Refer to Figure 1-1 for aerial photo showing existing site conditions. As a result of this move, an extension of the existing navigation channel to the North Lobe location and construction of a bulkhead will be required. Prior to performing this work, a dredging contractor will remove approximately 7,000 CY of contaminated materials (Sediments with PCB levels equal to or greater than 50 ppm) from the footprint of these areas, and areas adjacent to the MacLean property immediately north of the North Lobe. Refer to Attachment 1 for the locations of these Areas. The dredging sequence of these areas will be discussed at the pre-construction meeting to be attended by WHG. The water depths range from shoreline to approximately 10 feet Mean Lower Low Water (MLLW), and dredge cut depths range from approximately 1,5 feet to 5.5 feet below the mudline surface. The dredge material will be loaded onto scows and transported to the Sawyer Street Facility north of the Coggeshall Street Bridge for offloading.

For the environmental dredging component there are ten areas to be dredged (Refer to Attachment 1). Dredging will be performed using an environmental bucket unless deemed impractical due to debris or other operational constraints. Due to the limited dredging duration in each area, silt curtains will not be deployed unless the water quality monitoring indicates unacceptable environmental impacts are occurring within the water column during operations. Dredging operations are expected to commence mid-August 2003 and be completed by 30 September 2003.

III. Specifics of the Government Water Quality Monitoring Program

A. Monitoring Approach:

A tiered monitoring approach will be used to identify any water quality impacts resulting from environmental dredging activities. The purpose of this monitoring is to confirm that acute impacts to the water column do not extend beyond the designated mixing zone established for each of the dredge areas of the project and to confirm that contaminants are not transported away from the operations area at unacceptable levels to other portions of the harbor. The overall approach will consist of monitoring water column turbidity along transects at the downstream edge of established mixing zones for each of the individual dredging areas. An upper level turbidity criteria exceedance threshold will require notification of appropriate Government personnel and may trigger additional acute toxicity testing and chemical analysis of the water column to quantify

impacts. Additional toxicity testing may be required at the start of dredging in some areas to identify near-field impacts.

B. Method:

Boat-based monitoring shall be performed at varying time intervals during dredging and the transport of dredged material to the Sawyer Street facility. During the established monitoring days, sampling efforts will focus on the measurement of water column turbidity along the downstream edge of the established mixing zone designated as 300 ft downcurrent of project operations (the area currently being dredged). Turbidity monitoring shall be performed using an optical backscatter (OBS) nephelometer with an underwater sensor and direct surface readout or other instrumentation having similar capabilities. The OBS sensor unit shall be sensitive over an approximate operating range of 0-1000 NTU and factory calibrated. Accurate operation of the unit shall be checked on a daily basis using known standards. Water column sampling equipment shall be capable of retrieving water from a specified depth using techniques that have been demonstrated acceptable for low detection limit analysis.

Additional near field and far field monitoring at varying distances away from the construction activity (in addition to the downfield transect) will be performed on each monitoring day to better characterize the aerial extent of any potential near and far-field water column effects. The USACE Technical Manager and Resident Engineer shall be notified immediately if turbidity measurements indicate exceedance of the set criteria along the established transect at the downstream edge of the mixing zone (see item E below).

For the purposes of cost estimation for this scope of work, it should be assumed that there will be a maximum of 25 boat-based monitoring days over the course of the 7-week project. A schedule of construction activities and associated monitoring will be determined based on periodic pre- and on-going construction coordination meetings to be held as necessary to allow for adequate scheduling and planning of the monitoring effort.

C. Monitoring Coordination

WHG shall ensure that adequate coordination with the on-site USACE Project Engineer or his representative occurs so that boat-based monitoring activities can be scheduled to coincide with weekly construction schedules. The WHG monitoring contractor representative (on-site field coordinator) shall obtain daily verbal briefings from the USACE Project Engineer (or his representative) and update the USACE Technical/Contract Manager, WHG Project Managers and Technical Lead as necessary to determine monitoring requirements for upcoming activities. A regular schedule of weekly update meetings (1 X per week) shall be established by WHG with the USACE Technical Manager, U.S.EPA and WHG personnel including the Sr. Projects Manager and Technical Lead to review the previous weeks activities, monitoring results and to plan for upcoming monitoring efforts.

D. Additional and Contingency Testing

Additional Testing

Water sampling will be performed to characterize certain baseline conditions, to assess near-field conditions and possibly in response to an exceedence of the turbidity criterion or other environmental factor(s). The upper level turbidity criterion, defined as a "reportable event", will be 50 Nephelometric Turbidity Units (NTUs) above background as measured along the down-field edge of the 300-ft mixing zone at each dredge area. Additional monitoring and the sampling required by a criteria exceedance are outlined below.

E. Criteria Exceedances

When the monitoring reveals that the upper-level criterion has been exceeded at the edge of the 300 ft mixing zone, additional background and near field measurements shall be performed as needed to determine if the elevated turbidity is attributed to project activities. Also, an additional transect shall be run 600 feet downstream of the project activity to assess far-field impact. If the turbidity appears to be project-based, WHG on-site field coordinator shall immediately notify the USACE Resident Engineer and the USACE Technical Manager (or their designated representatives) so that corrective actions can be employed to alleviate the condition. If exceedances are noted at both downstream transects (300- and 600-foot), project activities will cease until conditions have abated to acceptable levels at the 300 ft transect. If the criterion has been exceeded at only the downstream edge of the 300-foot mixing zone, corrective actions will be employed as deemed appropriate by the USCAE Construction Engineer. Actions may include either altering or slowing the rate of dredging or ceasing project activities until turbidity levels have fallen to within an acceptable range. These criteria may be altered based upon the results of the toxicity testing outlined below.

In addition, when a criterion is exceeded, WHG shall collect "conditional" water samples along the edge of either one or both of the downstream monitoring transect(s). After consultation with the Government, biological and chemical testing may be performed on a composite water sample collected along the downstream edge of the mixing zone(s) within the boundaries of an observable plume. Toxicity testing and/or chemical analysis shall be initiated immediately upon notification to proceed by the USEPA/USACE project representatives. Monitoring of turbidity shall then proceed continuously to track the return to background conditions. Upon the resumption of project activities, monitoring will continue at an increased frequency (30-minute cycle) until conditions abate and to track turbidity changes and monitor for further exceedances.

Chemical and Biological Testing

Upon notice to proceed with either the biological or chemical testing as a result of a criteria exceedance, water samples shall be transported to the testing facility(s). If

notice to proceed is only given for the biological testing, the water samples collected for the chemical analysis shall be appropriately archived for potential future analysis. Biological testing includes acute toxicity tests using the 1-hour sea urchin sperm fertilization test (*Arbacia* sp.) and the 48-hour Mysid shrimp (*Mysidopsis bahia*) survival test. Biological testing of the associated background sample and chemical analysis of all samples will generally be contingent upon the results of the toxicity testing. Samples, which do not exhibit toxicity, will generally not require further testing/analysis. However, poor survivorship in either toxicity test may require further analytical testing to identify the cause of toxicity. This analysis will include total suspended solids (TSS), total PCBs (based on the 18 NOAA Status and Trends congeners), dissolved Copper and dissolved Zinc.

For this proposal, it should be assumed that there would be 10 samples submitted for biological toxicity testing and 5 samples submitted for chemical analyses (TSS, dissolved PCBs, dissolved Copper and dissolved Zinc). Additional sampling may be performed based on the turbidity monitoring, triggered when turbidity criteria have been approached or exceeded or based on other environmental factors as directed by the USEPA/USACE. Any "conditional samples" collected would potentially undergo the tiered testing/analytical approach outlined above. A schedule of the planned construction sequence and associated monitoring/sampling will be determined prior to the start of the work.

IV. Laboratory Schedule

Any samples submitted for laboratory chemical analysis will require a turnaround time of 72 -hours. Results from toxicity testing shall be made available verbally at the earliest possible time, hard copies within 1 –week, and written reports submitted within two weeks.

V. Reporting

A summary sheet of field operations and turbidity measurements and a list of any samples collected will be provided to the USACE Technical Manager on a daily basis following each monitoring event. The Contractor shall develop a daily reporting sheet for this project. The daily submittal for each day of boat-based monitoring shall provide the following information:

(1) Date, time and location of any dredging activity and the names of sampling team members and team leader.

(2) A plan-view of the harbor and construction site, which allows for the recording of visual events such as plumes or oil sheens. This map will be included with the daily reporting sheet and graphically present the range of turbidity values recorded during each monitoring day along the transect.

(4) A summary of weather conditions, and the timing of the tides.

(5) A comments section to allow field personnel to record visual observations or relevant field activities that may have impacted water quality (i.e. rain events), which may assist in data interpretation.

Update reports summarizing the monitoring that has taken place and any associated issues shall be prepared on a weekly basis. These reports will be distributed by email to U.S.EPA and USACE representatives. An aerial photograph (arc view) of the dredging areas and associated 300 ft downfield transects shall be provided with the reports.

VI. Project Meetings and Coordination

WHG should assume the following meetings as part of the monitoring program:

- Two pre-construction coordination meetings at the onset of the project (in New Bedford) to review construction approaches and schedules and to discuss initial monitoring approaches. This meeting shall be attended by a Sr. Project Manager, Project Manager, Technical Lead and on-site coordinator.

- Eight Construction coordination meetings (in New Bedford) to be attended by the WHG on-site field coordinator. It should be assumed that 5 of these meetings will occur on those days that monitoring will take place and that attendance at these meetings can be assumed to be part of the field based monitoring role described above.

- Two project status meetings (in New Bedford) to be attended by the same personnel as the pre-construction meetings to review data resolve issues and modify monitoring approaches if needed.

VII. Deliverables

WHG shall provide the USACE with a summary report of the monitoring results within two months of completion of the monitoring program. The report shall include an Executive Summary and other sections discussing monitoring methods, field observations during dredging, project photos and associated analytical and toxicity data. A conclusions section shall also be included which discusses the overall impacts of project related operations on the water quality of the harbor and the overall effectiveness of the monitoring approach in limiting operational impacts. The deliverable shall include three hard copies and three CDs.

VIII. Cost Proposal

The Contractor shall submit their cost estimate breaking out "base costs" for the work outlined above. Categories for the base cost should follow the outline of this scope of work and include, (a) Field monitoring, (c) Chemical and biological testing (d) Reporting

and report generation (e) Meetings and Coordination. Also, the following options should be broken out in the event that additional testing will be required. These options will be exercised at the discretion of the Government:

- Option A– Individual biological testing for acute toxicity using the sea urchin sperm fertilization test (*Arbacia* sp.) and the Mysid shrimp (*Mysidopsis* sp.).
- Option B– Individual chemical analysis of water samples for PCB (dissolved), metals (total and dissolved), TSS, and turbidity.
- Boat Based Monitoring Day

IX. Period of Service

The period of service for this Statement of Work shall run through 1 December 2003.

X. Attendance at Meetings

The Contract Manager shall advise the Contractor at least two days prior to each meeting at which the Contractors presence is requested.

XI. Government Points of Contact

Mr. Jay Mackay (978) 318-8142 is the USACE Environmental Contract Manager/Technical Manager and can be contacted to arrange any meetings, teleconferences or answer questions relative to this task order. Mr. Chris Turek is the USACE Construction Engineer. Dr. William Nelson is the USEPA Technical Contact located at the Office of Research and Development, National Health and Ecological Effects Research Laboratory in Narragansett, Rhode Island. Mr. Gary Morin is the USACE Project Manager.

XII. Invoices

The Contractor shall submit monthly invoices that include progress for the billing period, project activity for the next period, outstanding issues, financial status and schedule. Invoices shall reference the Contract Number and Task Order number. The Contractor shall be responsible for the accuracy of the invoices. Incorrect invoices may be returned for correction.

XIII. Proposals

The cost proposal submitted by the Contractor in response to this scope of work shall indicate separately the supplies/services cost estimate for each separate task described in the scope of work including project management.

XIV. Quality Control

The Contractor is responsible for quality control. Quality control must be applied throughout the entire report preparation process. Although the Government technically reviews submissions required by this contract, it is emphasized that the Contractor's work must be prosecuted using proper internal controls and review procedures. The letter of transmittal for each submission shall include a certification that the submission has been subjected to the Contractor's own review and coordination procedures to insure: (a) completeness for each discipline commensurate with the level of effort required for that submission, (b) elimination of conflicts, errors, and omissions, and (c) the overall professional and technical accuracy of the submission. Documents, which are significantly deficient in any of these areas, will be returned for correction and/or upgrading at the Contractors expense prior to Government acceptance. Task Order submission dates will not be extended if a *responsions* of draft material is required for this reason. The Contractor and his associates, if any, shall have the professional competency and technical expertise necessary to accomplish this project in a satisfactory manner.

XV. Conferences

During the progress of the work, the Contractor shall confer with the Contract Manager as necessary to assure timely and accurate reporting and approval of all completed work.

XVI. Release of Data

All data, reports, and materials obtained as a result of this contract shall become the property of the U.S. Government and shall be turned over to the Contracting Officer upon completion of this contract.

XVII. Report Revisions and Corrections

Results of all reviews by NED will be furnished to the Contractor in the form of written comments and marked-up material. The Contractor shall incorporate any written comments into reports or other items within 1 week. Any comments due to errors or inconsistencies in the report on the part of the Contractor shall be made by the Contractor at his own expense. If changes in criteria and/or additions are, in the view of NED, required beyond the original scope of work and services, the Contractor shall be notified in writing by the Contracting Officer and adjustment in the fee will be made to cover the additional work required. Any such additional work executed by the Contractor without the appropriate written notice is undertaken at his own risk.

APPENDIX B

Project Updates

New Bedford Harbor

Water Quality Monitoring
For North Lobe Dredging Activities

Update Report #1
September 2003

Submitted To:
Army Corps of Engineers
696 Virginia Road
Concord, MA 01742

US Army Corps of Engineers
New England District

Submitted By:

Woods Hole Group Environmental Laboratories
375 Paramount Drive, Suite 2
Raynham, MA 02767-5154

Woods Hole Group

New Bedford Harbor
Water Quality Monitoring
For North Lobe Dredging Activities
Update Report #1

Period of Performance: 25 August – 19 September 2003

Construction Activities: North Lobe Dredging Activities

Construction Summary:

Week of 25 August 2003. Site preparation. No dredging occurred. Please note that the dredge contractor does not work on Fridays.

Week of 1 September 2003. No work was completed on Monday due to the Labor Day holiday. Dredging of area B began on Tuesday, and was completed on Thursday. Dredging of area D began late Thursday.

Week of 8 September 2003. Dredging of Area D continued throughout the week.

Week of 15 September 2003. Dredging of Area D continued throughout the week.

Government Monitoring: Initial pre-dredge mobilization of the water quality monitoring program occurred on 25 August 2003. Water quality monitoring occurred on 2, 3, 4, 8, 9 and 16 September 2003. Shore-side observation/coordination, occurred on 11 and 15 September (Table 1). Water quality samples were collected on 3 September for toxicity testing at 60 ft down current (near-field/south) and 300 ft downcurrent (compliance transect/south), and 100 ft up-current (north/reference) of dredging activities. The near-field (60 ft south) sample was analyzed for the 1-hour Sea Urchin sperm cell fertilization test (acute) and the other two samples were archived pending near-field sample test results. Results indicated no toxicity for the near-field sample relative to the control. Therefore no further analysis of the additional samples were conducted.

Turbidity at the 300 ft compliance transect ranged from 3-11 NTU (not corrected for background), well below the project specific turbidity criteria 50 NTU above background. Turbidity was generally highest within 50 ft. of dredging activities, with values ranging from 3-75 NTU. Values only exceeded 21 NTU on one monitoring day at the 50 ft transect. During the week of 1 September, a large oil sheen was noted on the Harbor. Based on visual observations, it was concluded that this was a result of salvage operations of a fishing vessel which had recently sunk on 2 September adjacent to the project area. It should be noted that some oil was observed to be associated with the North Lobe dredging operation but generally remained in the immediate area adjacent to the dredge barge. Dredging of debris was noted while monitoring on 8 and 9 September but did not appear to significantly affect turbidity readings.

Monitoring during the transit of scows within the Acushnet River to the Sawyer St processing facility resulted in turbidity readings ranging from 4-218 NTU. These readings were taken directly in the push boat prop-wash as it positioned the loaded scows along the off-loading barge. Readings were greater than 51 NTU only once in the five events monitored. The turbidity was confined to the project area with readings dropping to less than 10 NTU approximately 150 ft from the operations.

Turbidity associated with the dewatering of dredge material from the scow was generally higher when the discharge outfall was located at the water surface. Turbidity readings of 37 NTU were noted to a depth of 4 ft within a plume. The signal decreased to background within 20 ft of the discharge. After the discharge pipe was lowered to approximately 4 feet below the surface, little if any turbidity signal was detected. A

turbidity signal was also noted during the barge bilge water pump discharge. Turbidity was elevated to 21 NTU at 20 ft from discharge. This turbidity was likely related to rust in the discharge water.

Schedule: Week of 22 September 2003 – Dredging activities continued in Area D. Dredging at Area D will continue for approximately 2 more weeks. WHG/ENSR will resume monitoring activities on 22 September.

Attachments:

Attachments: Daily log of activities associated with North Lobe Dredging Operations.

Please contact the individuals listed below with any questions or comments.

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Table 1 - Daily Field Sheet North Lobe Dredging, New Bedford Harbor

Date		Construction Activity	Tide (Ebb or Flood)	ENSR Monitoring					Notes:
				Oversight Day	Background Turbidity (NTU)	Turbidity Range (NTU)	Turbidity Exceedance (Yes/No)	Samples collected	
25-Aug-03	Mon	Site Prep.	Ebb		5-6		No	No	Dredging has not begun, WQ mob day
26-Aug-03	Tue	No Dredging, Site Prep.							
27-Aug-03	Wed	No Dredging, Site Prep.							
28-Aug-03	Thu	No Dredging, Site Prep.							Dredge has Issues with navigational software. ENSR on-site but no monitoring conducted
29-Aug-03	Fri	No Work							
1-Sep-03	Mon	Holiday, No Work							
2-Sep-03	Tue	Dredging in cell B begins			4-6	3-43	No	No	Highest turbidity taken during transect 50ft south of dredging. At 300ft compliance point turbidity ranged from 3-25 NTU. Extensive oil sheen noted on harbor, most likely associated with sunken fishing vessel
3-Sep-03	Wed	Dredging in cell B continues			3-4	2-16	No	3	Highest turbidity taken at 50 ft transect (3-16 NTU). Turbidity at 300ft compliance point 3-11 NTU. Oil sheen associated with sunken vessel still visible. Observed dewatering of dredge material but did not detect elevated turbidity during this operation.

Date	Construction Activity	Tide (Ebb or Flood)	ENSR Monitoring					Notes:
			Oversight Day	Background Turbidity (NTU)	Turbidity Range (NTU)	Turbidity Exceedance (Yes/No)	Samples collected	
4-Sep-03 Thu	Completed dredging of area B and moved dredge to area D. Began dredging in area D. Pushed a loaded scow up to Sawyer St.			4-6	4-75	No	No	Highest turbidity noted at 50 ft transect (4-75 NTU). Turbidity at 300 ft compliance point was 4-9 NTU. Some oil sheen associated with dredging operations was noted. Turbidity at dewatering discharge up to 37 NTU, decreased to background levels within 20 ft. Turbidity associated with positioning of scow at Sawyer St up to 218 NTU. Dropped to 5 NTU 100 ft from scow.
5-Sep-03 Fri	No Work							
8-Sep-03 Mon	Dredging of area D continued. A loaded scow was moved to Sawyer St. Dredge bucket cracked during dredging and was repaired in afternoon.			4	3-15	No	No	Dewatering of dredge material was observed. No turbidity elevations detected.
9-Sep-03 Tue	Dredging of area D continued. Two loaded scows were moved to Sawyer St.			3-5	2-13	No	No	Moved dewatering discharge to approx. 3 ft below surface; highest reading was 8 NTU at approx. 4 ft below surface. Discharge from dredge barge bilge up to 21 NTU probably due to rust in discharge. Turbidity associated with positioning scow at Sawyer St. at low tide was up to 51 NTU, dropped to 5 NTU 150 ft from scow.
10-Sep-03 Wed	Continued dredging area D							

Date		Construction Activity	Tide (Ebb or Flood)	ENSR Monitoring					Notes:
				Oversight Day	Background Turbidity (NTU)	Turbidity Range (NTU)	Turbidity Exceedance (Yes/No)	Samples collected	
11-Sep-03	Thu	Continued dredging area D		x					Noted that a scow moved up to Sawyer St at low tide grounded approx. 20 ft from discharge point. Suggested that scow be allowed to clear itself as the tide rose.
12-Sep-03	Fri	No Work							
15-Sep-03	Mon	Continued dredging area D		x					Minimal dredging occurred in the afternoon. Dredge bucket was sent out for repair on Friday and had not arrived on-site until late in the day.
16-Sep-03	Tue	Continued dredging in area D. Loaded scows were pushed to Sawyer St.			4	1-21	No	No	Dredge added a second pump and discharge pipe to dewater dredge material. Turbidity 50-100ft from loaded scow and push boat in shallows near Sawyer St. ranged from 4-20 NTU. Turbidity associated with dredging appears to be highest in areas directly adjacent to waters passed over by excavator arm and bucket. Most likely due to spillage of material from dredge bucket into this area.
17-Sep-03	Wed	Continued dredging area D							Debris appears to be more wood than steel. Prior debris more steel
18-Sep-03	Thu	Continued dredging area D							
19-Sep-03	Fri	No Work							

New Bedford Harbor

Water Quality Monitoring
For North Lobe Dredging Activities

Update Report #2
October 2003

Submitted To:
Army Corps of Engineers
696 Virginia Road
Concord, MA 01742

US Army Corps
of Engineers
New England District

Submitted By:

Woods Hole Group Environmental Laboratories
375 Paramount Drive, Suite 2
Raynham, MA 02767-5154

Woods Hole Group

New Bedford Harbor
Water Quality Monitoring
For North Lobe Dredging Activities
Update Report #2

Period of Performance: 22 September – 17 October 2003

Construction Activities: North Lobe Dredging Activities

Construction Summary:

Week of 22 September 2003. Dredging of Area D continued throughout the week.

Week of 29 September 2003. Dredging of Area D was completed on Wednesday, and dredging of Area C began. A shore-based excavator completed shoreline dredging associated with Area D on Monday in approximately 1 hour.

Week of 6 October 2003. Dredging of Area C was suspended on Wednesday due to shallow water along northern edge. Dredging of Area A was initiated.

Week of 13 October 2001. Dredging of Area A and C were completed.

Government Monitoring: Water quality monitoring occurred on 22, 24, and 29 September, and 1, 6, 8, and 14 October 2003 (Table 1). Water quality samples were collected on 22 and 29 September, and 8 October.

Water quality samples were collected on 22 September for toxicity testing 10 ft from the dredge bucket (near-field), 300 ft downcurrent (compliance transect/north), and 1,000 ft upcurrent (reference/south). Turbidity recorded during collection of the near-field sample (10 ft) ranged from 20 to 92 NTU. The near-field (10 ft) sample was analyzed for the 1.3-hour Sea Urchin sperm cell fertilization test (acute), and the other two samples were archived pending near-field sample test results. Results indicated no toxicity for the near-field sample relative to the control. Therefore, no further analysis of the additional samples were conducted.

Water quality samples were also collected on 29 September for toxicity testing at 50 ft downcurrent (near-field/south), 300 ft downcurrent (compliance transect/south), and 1,000 ft upcurrent (reference/north). As was conducted on 22 September, the nearfield sample (50 ft downcurrent) was tested using the 1.3-hour Sea Urchin sperm cell fertilization test (acute), and the other two samples were archived pending the results of the near-field sample. Turbidity recorded during collection of the near-field sample (50 ft) ranged from approximately 20 to 29 NTU. Results indicated no toxicity for the near-field sample relative to the control. Therefore, no further analyses of the archived samples were conducted.

On 8 October two water quality samples were collected for toxicity testing at 10 ft downcurrent (near-field/south), and 1,000 ft upcurrent (reference/north). Turbidity recorded during collection of the near-field sample (10 ft) ranged from 30 to 40 NTU. The nearfield sample was analyzed for acute toxicity (Sea Urchin fertilization test), and the reference sample was archived. Results indicated no toxicity for the near-field sample relative to the control. No further analysis of the reference sample was conducted.

Turbidity at the 300 ft compliance transect ranged from 2-17 NTU (not corrected for background) during all monitoring periods except 14 October, 2003, when turbidity ranged from 2-26 NTU at the 300 ft compliance transect. Turbidity extending to the 300 ft south compliance transect was observed for approximately 1 hour as dredging was completed in Area A. Turbidity was generally highest within 100 ft

of dredging activities, with values recorded up to 92 NTU. Turbidity values within 100 ft of dredging activities exceeded 40 NTU on only two of the seven monitoring days.

An oil sheen was observed on the Harbor surface in the vicinity of dredging operations on 24 September and 14 October. On 29 September an oil sheen, oil droplets, and debris consisting of small particles and pieces of the absorbent oil boom were observed throughout the day at distances up to, and beyond the 300 ft compliance transect. Similar material was observed on 1 October both at the North Lobe dredging site, and at Sawyer Street. On 1 October, similar material was observed at the North Lobe dredge site. Shoreline dredging associated with Area D was completed on 29 September by a shore-based excavator. This dredging was completed in approximately 1 hour and was not observed to affect turbidity.

Monitoring the transit of scows from the North Lobe dredge site to the Sawyer Street sediment processing facility resulted in turbidity readings ranging from 3-134 NTU. Highest readings at Sawyer Street were obtained directly in the areas affected by the push boat prop wash as it transited the shallow areas within approximately 1,000 ft of the sediment transfer site at low tide. Elevated turbidity was localized (confined to the project area), and of short duration.

Turbidity near the dredge material dewatering pump outfall at the scow was generally elevated over surrounding areas but localized in extent. Ballast water discharge from the dredge barge on 24 September was observed to be more turbid than previously observed. Turbidity in the discharge plume ranged from 8-32 NTU on 24 September.

Schedule: Week of 20 October 2003 – Initial dredging activities were completed on 14 October with the completion of Areas A and C. Further potential dredging activities are pending the completion of a bathymetric survey, and the results of confirmatory sediment samples taken in the dredged areas. WHG/ENSR will schedule additional monitoring activity should conditions warrant.

Attachments:

Attachments: Daily log of activities associated with North Lobe Dredging Operations.

Please contact the individuals listed below with any questions or comments.

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Table 1 - Daily Field Sheet North Lobe Dredging, New Bedford Harbor

Date		Construction Activity	Tide (Ebb or Flood)	ENSR Monitoring					Notes:
				Overnight Day	Background Turbidity (NTU)	Turbidity Range 50-300 ft from Dredging Activities (NTU)	Turbidity Exceedance (Yes/No)	Samples collected	
22-Sep-03	Mon	Continued dredging in Area D. Several trips of scow to Sawyer St. were completed.			4-5	0-92	No	Yes	Turbidity at 300 ft compliance point from 2-14 NTU. Highest turbidity recorded 10-25 ft from dredge. Sample collected for 1 hour Arbacia toxicity. Substantial wire debris in dredge material.
23-Sep-03	Tue	Continued dredging in Area D.							No Monitoring
24-Sep-03	Wed	Continued dredging in Area D. Several trips of scow to Sawyer St. were completed.			4-5	0-26	No	No	Turbidity during scow transfer activities approx. 1 hr after low tide ranged from 5-134 NTU within 50 ft of scow and push boat. Turbidity probably associated with plume from push boat prop. Values decreased to less than 20 NTU within 15 minutes. Turbidity associated with dewatering of sediment ranged from 1-20 NTU. Turbidity associated with barge ballast water discharged ranged from 8-32 NTU and oil was observed on the Harbor surface near dredge ops.
25-Sep-03	Thu	Continued dredging in Area D.							No Monitoring
26-Sep-03	Fri	No Work							No Monitoring

Date		Construction Activity	Tide (Ebb or Flood)	ENSR Monitoring					Notes:
				Oversight Day	Background Turbidity (NTU)	Turbidity Range 50-300 ft from Dredging Activities (NTU)	Turbidity Exceedance (Yes/No)	Samples collected	
29-Sep-03	Mon	Continued dredging in Area D. Several trips of scow to Sawyer St. were completed. Shoreline dredge by a shore-based excavator occurred for 1 hr in the morning			4-7	2-52	No	Yes	Shoreline dredging was just completed as monitoring was initiated. No turbidity issues associated with shoreline dredging were apparent. Oil droplets, surface sheen and debris were noted thoughout area. Sample collected 50 ft from dredging activities. Elevated turbidity was observed during Sawyer St. transfer activities but was short in duration and in limited area.
30-Sep-03	Tue	Continued dredging in Area D.							No Monitoring
1-Oct-03	Wed	Completed dredging of area D and began dredging in area C			3-4	4-30	No	No	Turbidity was noted to increase up to 30 NTU near location of dewatering pump discharge. Oil sheen, a brown film and small pieces of absorbent boom material were noted at Area D and Sawyer St sites. Turbidity from 5-36 NTU was observed behind the scow at Sawyer St. Values decreased to 5-14 NTU within one minute. Dredge bucket cracked in the afternoon and repairs took the remainder of the day.
2-Oct-03	Thu	Continued dredging in Area C							No Monitoring
3-Oct-03	Fri	No Work							No Monitoring

Date		Construction Activity	Tide (Ebb or Flood)	ENSR Monitoring					Notes:
				Oversight Day	Background Turbidity (NTU)	Turbidity Range 50-300 ft from Dredging Activities (NTU)	Turbidity Exceedance (Yes/No)	Samples collected	
6-Oct-03	Mon	Dredging of Area C continued and several trips of scow to Sawyer St were observed			3-5	4-32	No	No	Oil sheen, boom absorbent material and debris were present on surface of Harbor. High levels of turbidity from prop wash of scow push boat were observed at low tide. Scow became grounded at low tide and was allowed to refloat as tide flooded. Higher levels of turbidity (12-17 NTU) were noted at 300 ft point along the shore, probably due to shoreline sediment resuspension.
7-Oct-03	Tue	Continued dredging in Area C							No Monitoring
8-Oct-03	Wed	Dredging in Area C was suspended and dredging began in Area A. Several trips of the scow to Sawyer St. were observed			4-5	4-34	No	Yes	Sample collected approx. 10 ft from dredge in an area affected by both the dredging and the dewatering discharge pump. Turbidity ranged from 30-63 NTU at this location. Turbidity recorded during scow transfer 2 hrs after low tide ranged from 3-86 NTU, decreasing to 4-29 NTU within 10 minutes. No oil sheen was observed on the Harbor surface.
9-Oct-03	Thu	Dredging continued in Area A							No Monitoring
10-Oct-03	Fri	No Work							No Monitoring
13-Oct-03	Mon	No Work-Columbus Day							No Monitoring

Date		Construction Activity	Tide (Ebb or Flood)	ENSR Monitoring					Notes:
				Oversight Day	Background Turbidity (NTU)	Turbidity Range 50-300 ft from Dredging Activities (NTU)	Turbidity Exceedance (Yes/No)	Samples collected	
14-Oct-03	Tue	Dredging was completed in Area A. A small section of Area C that remained was dredged. Initial project dredging completed pending survey.			1-5	0-40	No	No	Two small surface oil slicks were observed at 150 and 300 ft south of dredging activities. Turbidity related to scow movements near dredging activities up to 29 NTU.
15-Oct-03	Wed	No on-water work							No Monitoring
16-Oct-03	Thu	Survey, No on-water work							No Monitoring
17-Oct-03	Fri	No Work							No Monitoring

APPENDIX C

Water Quality Monitoring Data

Aquatec Biological Sciences

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Toxicity Summary Report

Woods Hole Analytical Laboratory		Date:	9/4/2003
375 Paramount Drive		Project:	03040
		SDG	7331
Raynham, MA	02767	Site:	North Lobe

Method: 1008.0 Species: *Arbacia punctulata*

Sample ID	Sample Name	Mean Fertilization (%)
025490	NBH-60	99.6
025493	Seawater	100.0

* Indicates a statistically significant reduction (P<0.05) in the response relative to the corresponding response in the reference sample.

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Toxicity Summary Report

Woods Hole Analytical Laboratory		Date:	9/4/2003
375 Paramount Drive		Project:	03040
		SDG	7331
Raynham, MA	02767	Site:	North Lobe

Samples Received

Number	Sample Name	Date Time and Collecte		Type
025490	NBH-60	9/3/2003	3:16:00 PM	Water
025491	NBH-300	9/3/2003	3:37:00 PM	Water
025492	NBH-Ref	9/3/2003	3:52:00 PM	Water
025493	Seawater	8/27/2003		Seawater

Submitted By: _____

Toxicity Summary Report

Woods Hole Analytical Laboratory
375 Paramount Drive

Raynham, MA 02767

Date: 9/4/2003
Project: 03040
SDG 7331
Site: North Lobe

Method: 1008.0 Species: *Arbacia punctulata*
Sample ID: **NBH-60**
Laboratory ID: **25490**

Conc (%)	Endpoint	Replicate Fertilized (%) A	B	C	D	E	Average Fertilized (%)
100	Fertilization	100	99	100	99	100	99.6

Method: 1008.0 Species: *Arbacia punctulata*
Sample ID: **Seawater**
Laboratory ID: **25493**

Conc (%)	Endpoint	Replicate Fertilized (%) A	B	C	D	E	Average Fertilized (%)
100	Fertilization	100	100	100	100	100	100.0

Submitted By: _____

Quality Assurance Report

Woods Hole Analytical Laboratory		Date:	9/4/2003
375 Paramount Drive		Project:	03040
		SDG	7331
Raynham, MA	02767	Site:	North Lobe

Qualifiers and Special Conditions

The Standard Reference Toxicant Test resulted in a response that was slightly higher than the control chart limits.

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Toxicity Summary Report

Woods Hole Analytical Laboratory		Date:	9/25/2003
375 Paramount Drive		Project:	03040
		SDG:	7398
Raynham, MA	02767	Site:	New Bedford Harbor-N.Lobe Dredging

Method: 1008.0 Species: *Arbacia punctulata*

Sample ID	Sample Name	Mean Fertilization (%)
025980	50 ft. - N	99.6
025984	Seawater	99.8

* Indicates a statistically significant reduction (P<0.05) in the response relative to the corresponding response in the reference sample.

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Toxicity Summary Report

Woods Hole Analytical Laboratory		Date:	9/25/2003
375 Paramount Drive		Project:	03040
		SDG:	7398
Raynham, MA	02767	Site:	New Bedford Harbor-N.Lobe Dredging

Samples Received

Number	Sample Name	Date Time and Collecte		Type
025980	50 ft. - N	9/22/2003	2:10:00 PM	Water
025981	300 ft. - N	9/22/2003	2:24:00 PM	Water
025982	Reference	9/22/2003	2:35:00 PM	Water
025984	Seawater	9/22/2003		Seawater

Submitted By: _____

Toxicity Summary Report

Woods Hole Analytical Laboratory
375 Paramount Drive

Raynham, MA 02767

Date: 9/25/2003
Project: 03040
SDG 7398
Site: or-N.Lobe Dredging

Method: 1008.0 Species: *Arbacia punctulata*
Sample ID: **50 ft. - N**
Laboratory ID: **25980**

Conc (%)	Endpoint	Replicate Fertilized (%) A	B	C	D	E	Average Fertilized (%)
100	Fertilization	100	100	100	99	99	99.6

Method: 1008.0 Species: *Arbacia punctulata*
Sample ID: **Seawater**
Laboratory ID: **25984**

Conc (%)	Endpoint	Replicate Fertilized (%) A	B	C	D	E	Average Fertilized (%)
100	Fertilization	100	100	99	100	100	99.8

Submitted By: _____

Quality Assurance Report

Woods Hole Analytical Laboratory		Date:	9/25/2003
375 Paramount Drive		Project:	03040
		SDG	7398
Raynham, MA	02767	Site:	New Bedford Harbor-N.Lobe

Qualifiers and Special Conditions

Test sample fertilization exceeded 99 percent and was deemed not significantly different from the control by visual observation.

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Toxicity Summary Report

Woods Hole Analytical Laboratory
375 Paramount Drive

Raynham, MA 02767

Date: 10/1/2003
Project: 03040
SDG: 7425
Site: New Bedford Harbor Area D

Method: 1008.0 Species: *Arbacia punctulata*

Sample ID	Sample Name	Mean Fertilization (%)
026030	50 ft.	97.8
026033	Seawater	99.2

* Indicates a statistically significant reduction (P<0.05) in the response relative to the corresponding response in the reference sample.

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Toxicity Detail Report

Woods Hole Analytical Laboratory
375 Paramount Drive

Raynham, MA 02767

Date: 10/1/2003
Project: 03040
SDG: 7425
Site: New Bedford Harbor Area D

Method: 1008.0 Species: *Arbacia punctulata*
Sample ID: **50 ft.**

Laboratory ID: **26030**	Conc (%)	Endpoint	Replicate Fertilized (%) A	B	C	D	E	Average Fertilized (%)
	100	Fertilization	98	98	100	96	97	97.8

Method: 1008.0 Species: *Arbacia punctulata*
Sample ID: **Seawater**

Laboratory ID: **26033**	Conc (%)	Endpoint	Replicate Fertilized (%) A	B	C	D	E	Average Fertilized (%)
	100	Fertilization	100	98	100	100	98	99.2

Submitted By: _____

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Toxicity Detail Report

Woods Hole Analytical Laboratory		Date:	10/9/2003
375 Paramount Drive		Project:	03040
		SDG:	7469
Raynham, MA	02767	Site:	North Lobe Monitoring

Method: 1008.0 Species: *Arbacia punctulata*

Sample ID: **10S**

Laboratory ID: **26115**	Conc (%)	Endpoint	Replicate Fertilized (%) A	B	C	D	E	Average Fertilized (%)
	100	Fertilization	99	100	100	100	99	99.6

Method: 1008.0 Species: *Arbacia punctulata*

Sample ID: **Seawater** (control)

Laboratory ID: **26117**	Conc (%)	Endpoint	Replicate Fertilized (%) A	B	C	D	E	Average Fertilized (%)
	100	Fertilization	99	100	100	100	99	99.6

Submitted By: _____

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Toxicity Summary Report

Woods Hole Analytical Laboratory		Date:	10/9/2003
375 Paramount Drive		Project:	03040
		SDG:	7469
Raynham, MA	02767	Site:	North Lobe Monitoring

Method: 1008.0 Species: *Arbacia punctulata*

Sample ID	Sample Name	Mean Fertilization (%)
026115	10S	99.6
026117	Seawater (Control)	99.6

* Indicates a statistically significant reduction (P<0.05) in the response relative to the corresponding response in the reference sample.

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