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FOSTER WHEELER ENVIRONMENTAL CORPORATION

USACE CONTRACT NO. DACW33-94-D-0002
TASK ORDER NO. 017
TOTAL ENVIRONMENTAL RESTORATION CONTRACT

FINAL
PRE-DESIGN FIELD TEST
DREDGE TECHNOLOGY
EVALUATION REPORT
NEW BEDFORD HARBOR SUPERFUND SITE
New Bedford, Massachusetts

August 2001

Prepared for

U.S. Army Corps of Engineers
New England District
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ABBREVIATIONS AND ACRONYMS

alum	aluminum sulfate
BARR.PR	Barometric Pressure, inches of Hg
BATTERY	Meteorological Station Battery Voltage
Bean TEC	Bean Technical Excavation Corporation
BELLC	Bean Environmental LLC
CDF	confined disposal facility
cf	cubic feet
CGI	Combustible/Toxic Gas Indicator
CMS	Crane Monitoring System
CO_2	Carbon Dioxide
CRZ	Contaminant Reduction Zone
cy	cubic yards
cy/hr	cubic yards per hour
DDA	debris disposal area
DELTA-T	Temperature Differences
DEP	Massachusetts Department of Environmental Protection
DGPS	Differential Global Positioning System
DTM	Digital Terrain Model
ECD	electron capture detector
EE/O	electrical energy per order
EHS	Environmental, Health & Safety
ENSR	ENSR International
EPA	U.S. Environmental Protection Agency
EZ	Exclusion Zone
ft.	feet
ft^2	square feet
FWENC	Foster Wheeler Environmental Corporation
g/L	grams per liter
GAC	granulated activated carbon
GC	gas chromatography
gpm	gallons per minute
H_2S	Hydrogen Sulfide
HDPE	high density polyethylene
HPG	Horizontal Profiling Grab bucket
in.	inches
Kg/m^3	kilograms per $meter^3$
kW	kilowatt
lbs	pounds
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MHW	Mean High Water
MLLW	Mean Lower Low Water
mm	millimeter
MRL	method reporting limit
MS	mass spectrometry
NBH	New Bedford Harbor
ng/m^2-min	nanogram per $meter^2$ minute
NOAA	National Oceanographic and Atmospheric Administration
NTU	Nephelometric Turbidity Units

OBS	optical backscatter sensor
PCB	polychlorinated biphenyl
pcf	pounds per cubic foot
PDFT	Pre-Design Field Test
PID	Photo-Ionization Detector
PPE	personal protective equipment
ppm	parts per million
PRECIP	Precipitation, inches
psig	pounds per square inch gauge
RH	Relative Humidity, %
RL	Reporting Limit
ROD	Record of Decision
RPD	Relative Percent Difference
RTK	Real Time Kinematic
SAP	Sampling and Analysis Plan
SG	specific gravity
SGU	specific gravity unit
SIGMA	Standard Deviation, degrees
SIM	selected ion monitoring
SPU	Slurry Processing Unit
SR	Solar Radiation, watts · m^2
SSHP	Site Safety and Health Program
TEMP10M	Temperature (°F) at 10 meters aboveground surface
TEMP2M	Temperature (°F) at 2 meters aboveground surface
TSS	total suspended solids
µg/L	micrograms per liter
USACE	U.S. Army Corps of Engineers, New England District
WD	Wind Direction, degrees
WES	Waterways Experiment Station
WHO	World Health Organization
WS	Wind Speed, miles per hour
WTP	Wastewater Treatment Plant

ABSTRACT

The New Bedford Harbor Superfund Site is contaminated with polychlorinated biphenyls (PCBs), heavy metals and other chemicals. Remediation of the site will include dredging contaminated sediments from the harbor to final placement in shoreline confined disposal facilities (CDFs).

This report focuses on the dredging component of the remedial design and presents results of the August 2000, Pre-Design Field Test (PDFT). The main objective of this PDFT was to determine site specific dredge performance values for use in developing a full-scale remediation plan. The PDFT demonstrated and recorded performance data including dredge production, accuracy, slurry solids concentration, and air and water quality impacts.

Foster Wheeler Environmental Corporation subcontracted with Bean Environmental LLC for the delivery and demonstration of a hybrid environmental mechanical/hydraulic excavator dredge. The hybrid dredge was designed to enable accurate dredging of the contaminated sediment, minimize the amount of water added during the slurry pumping process by recycling water decanted from the slurry effluent, and minimize the potential for adverse environmental impacts. The dredging system delivered to the site for the PDFT included a portable, shallow draft barge platform, a Horizontal Profiling Grab bucket (HPG), a Crane Monitoring System (CMS), the Bean patented Slurry Processing Unit (SPU), and a water recirculation system.

Dredge Production

Dredging was performed to obtain representative production rates over a range of conditions, including varying depths, bank height, and chemical and physical conditions. Production monitoring data were collected using a number of electronic data collectors and were summarized daily.

Over the course of the PDFT, the representative average production rate for the dredge was 80 cubic yards per hour (cy/hr). It is believed that excavator production could be increased by 20% on a full-scale project in the Upper Harbor to approximately 95 cy/hr with system optimization.

Dredging Accuracy

The test dredge equipment demonstrated that a mechanical bucket, operated from an excavator with rigid connections and a state-of-the-art monitoring and positioning system could achieve a +/- 4-inch vertical dredging accuracy based on comparison of the PDFT post-dredge survey with the target depths. An accuracy evaluation showed that 95% of the test area was dredged to within 6 inches (in.) of the target depth, and 90% of the test area was dredged to within 4 in.

Another component of the dredging accuracy evaluation was development and testing of a "visual" method to determine dredging depth. The visual method provides a fine-tuning of the dredge plan based on the continuous observations of the "clean" underlying clay layer. The goal of the visual method is to minimize removal of the underlying clay layer to eliminate unnecessary dredging, and further costly processing and storage.

Solids Concentration of Dredge Slurry

Average solids concentration values recorded by the SPU system over sustained dredging periods ranged from 13.3% to 16.3% solids by weight. These concentrations were achieved in dredge areas having *in situ* sediments with average solids concentrations of 32% to 43% solids by weight.

The use of the SPU system on the cleanup of the Upper and Lower Harbors, could reduce the volume of water transported and treated by an estimated 50% to 70% below that required for a hydraulic cutterhead system.

Recirculation System

A water recirculation system was integrated with the test dredge to evaluate the feasibility of recycling water generated by the hydraulic transport process. The recirculation system was highly effective in essentially creating a closed loop system, whereby the only water added to the dredge process was that entrained in the dredge bucket. Without the recirculation system, the volume of water added would be approximately 320% of the *in situ* volume. The recirculation system operated without any significant problems, and confirmed the feasibility of using such a system on the full-scale remediation.

PCB Removal Efficiency

A secondary objective of the PDFT was to evaluate this new dredging technology with regard to site specific cleanup levels. The dredge performed quite well in this regard. The average sediment PCB concentration (upper one foot) was reduced from 857 ppm to 29 ppm over the dredged area. This met the clean up criteria of 50 ppm for the Lower Harbor and approached the criteria of 10 ppm for the Upper Harbor. Based on experiences during the PDFT, it was determined that remedial dredging to 10 ppm is possible through the use of modified operational procedures and project design.

Water Quality Monitoring

Water quality monitoring revealed only a very limited impact on the water column from the actual dredging in terms of both PCBs and suspended solids. The detected elevations of these parameters were within the range of fluctuations normally found in the Harbor with changing environmental conditions. This limited impact was attributed to the bucket design and the method of operation. Larger increases in water column suspended solids and PCB concentrations were attributed to dredging support activities.

Air Quality Monitoring

Flux chamber samples and ambient air samples were collected to achieve various objectives during the PDFT. Overall, this air sampling indicated that CDFs will be a more significant PCB emissions source than the dredging platform.

Wastewater Treatment

Results of the wastewater treatment pilot study showed that granular activated carbon when used with clarification and filtration can remove PCB concentrations to below the site-specific discharge limit of 0.065 milligrams per liter (mg/L) per Aroclor. The study also showed that sludge generated from wastewater treatment plant operations could be dewatered using a plate and frame filter press.

Comparison with Baseline Dredge Technology

A comparison was made between the key performance areas evaluated during the 1989 Pilot Dredging, 1995 Hot Spot Dredging and 2000 PDFT events. The Ellicott 370 HP 10-inch hydraulic cutterhead dredge was the established baseline dredge in terms of dredging performance in the former two events. The PDFT demonstrated that current state-of-the-art dredge technology, in particular a hybrid mechanical/hydraulic dredge with sophisticated environmental controls systems, can attain dredge performance values exceeding that of the baseline dredge, particularly in the areas of dredging accuracy, dredging production, and solids concentration of the dredge slurry.

EXECUTIVE SUMMARY

INTRODUCTION

The New Bedford Harbor Superfund Site is contaminated with polychlorinated biphenyls (PCBs), heavy metals and other chemicals. Remediation of the site will be conducted in accordance with the Record of Decision (ROD) dated September 25, 1998 which includes dredging contaminated sediments from the harbor to final placement in shoreline confined disposal facilities (CDFs).

This report focuses on the dredging component of the remedial design and presents results of the August 2000, Pre-Design Field Test (PDFT) conducted to determine site specific dredge performance values for use in developing a full-scale remediation plan. Dredge performance values were previously estimated based on results of conventional and alternative hydraulic dredging systems used at the site in 1989 for a Pilot Dredging Study, and in 1995 for Hot Spot dredging. However, changes in dredge technology over the past several years makes it likely that newer technology could improve dredge production and other performance values over previous estimates. The PDFT demonstrated and recorded performance data including dredge production, accuracy, slurry solids concentration, and air and water quality impacts. To reflect full-scale remediation activities to the greatest extent possible, the PDFT was conducted over a 100-feet (ft.) by 550-ft. area in the New Bedford Upper Harbor. The PDFT team included: the U.S. Environmental Protection Agency - Region I, the U.S. Environmental Protection Agency (EPA), Narragansett, RI, Atlantic Ecology Division of the National Health and Environmental Effects Laboratory, the U.S. Army Corps of Engineers, New England District (USACE), the Massachusetts Department of Environmental Protection (DEP), Foster Wheeler Environmental Corporation (Foster Wheeler), Bean Environmental LLC (BELLC), ENSR International (ENSR), URS, Kevric, and CR Environmental.

OBJECTIVES

To evaluate the performance improvements of a state-of-the-art environmental dredge technology over conventional dredge technology previously used at the site several performance areas were evaluated:

- Horizontal and vertical dredging;
- Potential impacts to water quality;
- Potential impacts to air quality;
- Dredge production rates in shallow water and sediment with debris;
- Percent (%) solids concentrations in the dredge slurry and slurry pumping capabilities; and
- Removal of the contaminated sediment to a given depth.

A secondary objective of the PDFT was to evaluate this new technology with regard to site specific cleanup levels. Additional objectives of the PDFT were to evaluate the effectiveness of applying contaminant dispersants and flocculents within the CDF to reduce PCB losses to air, to evaluate mechanical dewatering methods and to evaluate the use of granulated activated carbon (GAC) to treat wastewater.

DREDGING TEST PLAN

The dredging test plan consisted of dredge technology selection, dredge performance tests, water quality monitoring, air quality monitoring, and wastewater treatment. A testing schedule was established to ensure that dredge performance testing and monitoring would be captured over five to ten days of dredging. In total, four days (from August 10, 2000 through August 13, 2000) were spent performing trial dredging during which the dredge system underwent modifications to prepare for test dredging. Test dredging was performed over the course of five days (from August 14, 2000 through August 18, 2000).

DREDGE TECHNOLOGY SELECTION

Over sixty dredge technologies available in the United States and internationally were screened prior to selecting three technologies demonstrating the highest probability for success in meeting the New Bedford Harbor project constraints. The technologies selected were:

- The Bean Technical Excavation Corporation (Bean TEC) Bonacavor
- The Normrock Industries *Amphibex*
- The Ellicott International Series 370 hydraulic cutterhead dredge

Because the Normrock Industries *Amphibex* was at the time built on a foreign hull and prohibited from operating in navigable waters of the U.S. under the Jones Act, and because adequate performance data was already available for the Ellicott 370 hydraulic cutterhead dredge, the PDFT only evaluated the Bean type environmental hydraulic excavator.

Foster Wheeler subcontracted with BELLC for the delivery and demonstration of a hybrid environmental mechanical/hydraulic excavator to work along with the Slurry Processing Unit (SPU) previously patented by C.F. Bean Corporation, now C.F. Bean LLC, an affiliate of BELLC. The hybrid dredge was designed to enable accurate dredging of the contaminated sediment, minimize the amount of water added during the slurry pumping process, and recycle the dredge slurry effluent. The dredging system delivered to the site for the PDFT included a portable, shallow draft barge platform, a Horizontal Profiling Grab bucket (HPG), a Crane Monitoring System (CMS), the Bean patented SPU, and a water recirculation system. The main components of the system are described in more detail below.

Horizontal Profiling Grab Bucket (HPG)

A HPG was used by BELLC to achieve the PDFT goal of applying mechanical dredging equipment to the site. The HPG is a mechanical clamshell bucket developed in the Netherlands, designed to excavate thin layers of material with a high degree of accuracy causing minimal spill and turbidity. A hydraulic excavator (backhoe) operates the HPG bucket, with rigid connections rather than wire cable, which are used with a conventional crane derrick. Since the HPG bucket is actively closed by hydraulic cylinders, instead of closing wires, its vulnerability to debris is also significantly reduced. The HPG was designed to provide a level cut as opposed to a conventional clamshell bucket's semi-circular or arched cut which decreases the need for overlap between adjacent grabs to achieve grade. The HPG is also designed to minimize resuspension of sediments by containing the dredged material during excavation and placement.

Crane Monitoring System (CMS)

The CMS is an on-board electronic sensor system that provides the dredge operator precise control of the bucket while dredging, both in the horizontal and vertical planes, and interprets signals from various components of the dredging system onto a computer display. The design dredge prism is based on the

interpretation of the core logs by the design team. In using the CMS, the operator dredges in pre-programmed dredge sets based on a planned horizontal and vertical grid.

Slurry Processing Unit (SPU)

To minimize the amount of water delivered to the CDFs, the Bean patented SPU, which has been used successfully on other remediation projects to achieve high solids concentrations in the dredge slurry, was tested during the PDFT. The SPU system is a proprietary hydraulic slurry transport system that delivers high percent solids concentrations by introducing controlled amounts of water to mechanically dredged material.

Recirculation System

The SPU system is intended to minimize the amount of water added to the dredged material such that the dredge slurry density is optimized. Due to the full-scale project parameters and anticipated water requirements, additional efforts were made to develop a system that would serve to further minimize the volume of water generated during the full-scale project; therefore, a water recirculation system was also tested in the PDFT. The recirculation system involved the pumping of decant water from the CDF back to the dredge for use as make-up water, thereby creating a closed loop system.

DREDGE PERFORMANCE TESTS

The dredge performance tests evaluated three areas:

1) Dredge performance at removing PCBs:
   - Dredge production over a range of conditions
   - Dredging accuracy
   - Solids concentration of the dredge slurry
   - Recirculation system effectiveness
   - PCB removal efficiency (before and after sediment sampling).

2) Water Quality impacts within the Upper Harbor caused by dredging operations.

3) Air Quality impacts at the point of dredging and at the Sawyer Street CDF.

Dredge Production

Dredge production monitoring was performed during dredging operations in the PDFT test area. Dredging was performed to obtain representative production rates over a range of conditions, including varying depths, bank height, and chemical and physical conditions. Production monitoring data were collected using a number of electronic data collectors and were summarized daily. Excavator production and SPU production affected the overall dredge production. Excavator production was found to be dependent upon basic dredge production parameters including bucket capacity, cycle time, depth of cut, bank height, and dredge shifting (advances). Over the course of the PDFT, the representative average production rate for the excavator was 80 cubic yards per hour (cy/hr) in areas with bank height ranging between 1.7 ft. and 2.0 ft. It is believed that excavator production could be increased by 20% on a full-scale project in the Upper Harbor to approximately 95 cy/hr if the system is optimized. This production range would only be attainable in deeper areas of the harbor where access to the dredge areas would be unencumbered by a dredge of similar scale, and draft characteristics to that tested during the PDFT. In shallower areas, where working of the tides would increase the number of barge movements and reduce

the overall dredging efficiency, the dredge production would be anticipated to be significantly less. Alternatively, a smaller dredge with less production capacity than that of a dredge of the scale tested during the PDFT could be used. In either case, with either a larger dredge working the tides, or with use of a smaller dredge, the production range would be on the order of 35 to 50 cy/hr. This is an estimate only, based on knowledge of the anticipated reduction in production efficiency (50%-60%) due to depth restriction on a larger dredge, and an understanding of production capacity of shallow hydraulic dredges. Both the breakpoint at which a larger production environmental dredge would be replaced by a smaller dredge, and the production range of that smaller dredge will be better assessed in the 90% Basis of Design/Design Analysis for the Dredging Design, to be completed in 2001.

SPU production was found to be the dredge production limit in testing during the PDFT, due primarily to problems with debris clogging. Attempts were made during the PDFT to remedy clogging problems by adding water jets in the suction line, welding baffle walls in the hopper, and other operational measures. It is believed that by optimizing the debris management system, SPU production will match, or exceed that of the excavator production for full-scale remediation.

Dredging Accuracy

Dredging accuracy will be key to minimizing the amount of overdredging while still attaining the target cleanup goals of the project. The test dredge equipment demonstrated that a mechanical bucket, operated from an excavator with rigid connections and a state-of-the-art monitoring and positioning system could achieve a +/- 4 inch vertical dredging accuracy based on comparison of the PDFT post-dredge survey with the target depths. An accuracy evaluation showed that 95% of the test area was dredged to within 6 inches (in.) of the target depth, and 90% of the test area was dredged to within 4 in. Most of the points that deviate more than 6 in. are in the slope area, to the north and south of the test area.

Another component of the dredging accuracy evaluation was development and testing of a "visual" method to determine dredging depth. The visual method provided a fine-tuning of the dredge plan based on the continuous observations of the "clean" underlying clay layer. Laboratory analysis has shown the clay layer to contain little to no PCB contamination, and is therefore assumed clean. The goal of the visual method is to minimize removal of the underlying clay layer to eliminate unnecessary dredging, and further costly processing and storage. In locations where this method was used, the depth of cut was reduced from a planned 2-ft. cut, to a 1.7-ft. and 1.8-ft. cut. The visual method was demonstrated as having potential for application across the New Bedford Harbor dredge areas where a distinct interface between the black organic silt surface layer and underlying, native clean gray clay layer is present.

Solids Concentration of Dredge Slurry

Average sustained solids concentration values recorded by the SPU system over sustained dredging periods ranged from 13.3% to 16.3% solids by weight. These concentrations were achieved in dredge areas having *in situ* sediments with average solids concentrations of 32% to 43% solids by weight. This corresponds to volume concentrations on the order of 40% to 50%. The solids concentration values attained by the BELLC dredge were affected by debris clogging. Higher solids concentrations would be attainable with inclusion of a more sophisticated debris separation system on the full-scale project.

The use of the SPU system on the cleanup of the Upper and Lower Harbors could reduce the volume of water transported and treated by an estimated 50% to 70% below that required for a hydraulic cutterhead system. A specific range of slurry density could be prescribed and provided by the SPU that would best accommodate the decanting time, recirculation water pressure, and movement of dredge material disposal operations within the CDF's.

Recirculation System

A water recirculation system was integrated with the test dredge to evaluate the feasibility of recycling water generated by the hydraulic transport process. The recirculation system was highly effective in essentially creating a closed loop system, whereby the only water added to the dredge process was that entrained in the dredge bucket. This water addition amounts to approximately 40% of the *in situ* volume. The water was recycled back to the dredge for use as make up water for the SPU system and as jet water for debris dislodgment in the suction line. As controlled by the SPU, excess recirculation water was directed back to the hopper, from the discharge line, to decrease water content and increase the solids concentration of the dredge slurry. The recirculation system operated without any significant problems, and confirmed the feasibility of using such a system on the full-scale remediation.

PCB Removal Efficiency

The evaluation of the dredge efficiency at PCB removal included two components. The first (primary) goal was to evaluate the dredge's ability to remove contaminated sediment to a given depth horizon relative to the dredging plan. The dredge performance was highly accurate in this regard. Comparison of the target dredge volume with the actual volume dredged yielded an overdredging value of only 16%, with vertical accuracy of +/- 4 in. relative to achieving the intended horizon. Comparison on pre- and post-dredging sediment PCB concentrations revealed that 97% of the PCB mass was removed over the dredged area.

A secondary objective of the PDFT was to evaluate this new dredging technology with regard to site specific cleanup levels. The design included: 1) delineating the 10 ppm PCB concentration horizon within the test area; 2) establishing a dredging plan based on that depth; and 3) assessing the dredge's ability to remove sediment to that depth. It should be understood that the project goal was **not** to leave a final sediment concentration of 10 ppm (as an average concentration over the upper one foot); this was a field test, **not** a remedial operation. The dredge performed quite well in this regard. The average sediment PCB concentration (upper one foot) was reduced from 857 ppm to 29 ppm over the dredged area. This met the clean up criteria of 50 ppm for the Lower Harbor and approached the criteria of 10 ppm for the Upper Harbor. A similar reduction in sediment concentration was observed for the area dredged to planned depth and the area dredged to depth based on the visual method.

The PCB mass remaining after dredging appeared to reside entirely in a thin surface veneer and was attributed to recontamination of the dredged area rather than incomplete removal. Potential recontamination mechanisms include material sloughing down slope along the sides of a dredged cut, material mobilized during bucket impact and retrieval, material mobilized during anchor wire/spud repositioning, material mobilized during support vessel operations, and general transport related to tides and meteorological events. Adjustments to dredging and operational controls will reduce the influence of many of these mechanisms, and, therefore, a corresponding reduction in surficial sediment recontamination is expected during full-scale dredging.

Based on experiences during the PDFT, it was determined that remedial dredging to 10 ppm is possible through the use of modified operational procedures and project design. During full scale operations, development of a dredge plan and sequencing that proceeds from upslope to downslope and with an understanding of the site current (tidal) regime would be made to address some of the recontamination effects due to sloughing. Additionally, dredging operational approaches could be employed during the full scale project including return sweeps, tighter overlap of bucket grabs, and slower retrieval of final bucket grab that would provide for a cleaner bottom surface and reduce sloughing of adjacent areas. As confirmation sampling results became available they would be shared with the dredge contractor and the operator in particular to modify dredging techniques to obtain a bottom that met the cleanup criteria.

Water Quality Monitoring

The test dredge's ability to minimize environmental impact to water quality by measuring the extent of contaminated sediment resuspension and transport was evaluated by ENSR, and represented a joint effort by EPA, USACE, and ENSR.

To evaluate water quality impacts associated with the PDFT, the following investigations were made:

- Predictive modeling to aid in designing the water quality monitoring field program and to assess the utility of modeling for the full-scale remediation effort. In addition, the expected suspended sediment concentration resulting from dredging activities under a variety of transport assumptions was predicted; and

- Field monitoring to assess sediment resuspension during the dredging operation, to collect water samples for laboratory analysis and to ground-truth the predictive modeling. The objectives of field monitoring included real-time location and mapping of any turbidity plume associated with the dredging as well as collection of water samples at designated stations downstream of the dredge for laboratory analysis. The monitoring program was structured to document water column conditions in the Upper Harbor over the course of ebb and flood tidal events during dredging operations. Water samples were analyzed for total suspended solids (TSS) and dissolved and particulate PCBs. An assessment of the correlation of the field turbidity and laboratory TSS data as well as the laboratory TSS and PCB data was also performed.

Correlation assessment between the field and laboratory data was made. Water quality monitoring provided data over a range of operational and environmental conditions. Upon examination of the data, it can be concluded that:

- The actual dredging process (removal of sediments with the hydraulic excavator) appeared to have a limited impact on the water column;

- Activities performed in support of dredging (operation of support vessels) appeared to have a much greater impact on water quality than the dredging; and

- Normal fluctuations in water quality occur in the Upper Harbor related to changing environmental conditions that appear similar or greater in scale than the overall impacts related to the dredging operation.

Air Sampling and Analysis

Flux chamber samples and ambient air samples were collected to achieve various objectives during the PDFT. Flux chamber sampling provided a measure of emissions as an indication of the relative contributions from the various operations to the ambient air concentrations. These will also be used to support the emissions and dispersion modeling calculations performed as part of developing ambient air action levels for upcoming construction work. In addition to flux chamber samples collected in the field, sediment from the bench scale dewatering studies was tested at the USACE Waterways Experiment Station (WES) for emissions measurements.

PDFT flux chamber sampling provided useful data for evaluating relative emissions from various sources. Some key findings are summarized as follows:

- Emission flux measurements do not correlate well with source material concentrations. However, they do generally appear to be the highest in association with well-mixed sediment and water slurries in the CDF.
- *In situ* sediments in the mudflat area do not provide the same magnitude of emission flux per square area as well mixed sediment in the CDF. However, given the large surface area of the exposed mudflats at low tide, these areas and exposed surface water will continue to be a significant source of ambient air concentrations of PCBs, as measured during the Baseline study.
- Total emissions, calculated as (flux) x (surface area) x (time), are directly proportional to the amount of exposed surface area. Accordingly, exposed CDF surface area is a significantly greater source of emissions than dredging operations. The contaminated sediments in the mudflat areas and the river/harbor surface water remain the largest surface area sources of emissions.
- Dredging activities, including the grizzly, hopper, and disturbed sediments in the moon pool are relatively small sources of PCB emissions in comparison with the CDF because of their lower flux measurements and limited surface area.
- The use of surfactants Dawn and Biosolve to control the sheen at the CDF does not appear to be effective at controlling PCB emissions. These limited data suggest that Simple Green may be more effective than other surfactants although additional testing is recommended before drawing definitive conclusions.
- The silt curtain at the moon pool appears to be somewhat effective at containing disturbed sediment thereby reducing the surface area of higher concentration water and the associated emissions in the dredge area.

Ambient air samples were collected to document conditions during dredging and CDF filling operations. The results from this study will be used in conjunction with the flux chamber results to support development of ambient air action levels, being conducted by Foster Wheeler under a separate task.

Wastewater Treatment

Dredging operations conducted as part of the PDFT resulted in generating wastewater requiring treatment before final discharge to the harbor. The volume of wastewater generated during the PDFT was minimized by the use of the water recirculation system. In an effort to test the performance of the equipment and processes proposed for a full-scale wastewater treatment system, a pilot-scale wastewater treatment system was used to treat the wastewater generated during the PDFT. Construction of the pilot-scale system was conducted from August 3, 2000 through September 3, 2000. The system was operated from September 4, 2000 through October 13, 2000 to treat over 1-million gallons of wastewater. The objectives of the pilot-scale study treatment were to evaluate the treatment efficiency, flexibility and reliability of the individual unit operations/processes and confirm the findings of the wastewater treatability studies. The individual unit operations that were evaluated in the pilot-scale treatment included:

- Chemical addition and settling;
- Ultrafine (0.45 μm nominal) sand filtration;
- Granular activated carbon adsorption;

- UV/Oxidation; and
- Sludge dewatering with a plate and frame filter press.

Water samples were collected before and after each of the unit processes. These grab samples were analyzed for TSS, PCBs, and total and dissolved metals (cadmium, chromium, copper and lead). TSS data did not indicate substantial removal of suspended solids from any of the treatment processes. Further investigation indicated some difficulty with laboratory analysis for TSS due to elevated levels of salts present in the samples. For this reason, field turbidity measurements (as NTUs) were taken to be a more accurate indicator of suspended solids removal throughout pilot-scale treatment.

Analysis results also indicate that the contaminants present within the wastewater are strongly associated with the suspended particles and by removing these suspended solids the majority of the contaminants can be removed from the wastewater stream. However, due to the source of the wastewater (seawater) there are colloidal particles present which flocculation, clarification and filtration alone cannot remove. The concentration of PCBs and copper associated with these colloidal particles is sufficient enough that the wastewater could exceed the discharge limits unless tertiary treatment in the form of activated carbon is performed.

The dewatering component of the wastewater treatment pilot-scale study showed that dewatering can reduce the water content and volume of sludge generated during the wastewater treatment process. Sludge is generated during the clarification stage and the amount of sludge generated will depend upon chemical condition, wastewater flowrates, and system operating hours.

Comparison with Baseline Dredge Technology

The Ellicott 370 HP Dragon Series 10-inch (discharge) hydraulic cutterhead dredge, used on both the Pilot Dredging Study in 1989 and the Hot Spot Dredging event in 1995 had been established as the baseline for the Upper Harbor site in terms of dredge efficiency and performance. Prior studies had excluded mechanical dredging techniques for use on these two events due primarily to the inefficiency of barge transport to the disposal facility because of shallow operating depths, the perception that a hydraulic system left a more uniform bottom surface and concern over resuspension of contaminated sediments. Comparison was made of the key performance areas evaluated during the Pilot Dredging, Hot Spot Dredging and PDFT events. The three dredging performance evaluations were conducted across different test areas with different chemical and physical conditions and with different performance testing/cleanup objectives. The PDFT, however, has demonstrated that current state-of-the-art dredge technology, in particular a hybrid mechanical/hydraulic dredge with sophisticated environmental controls systems, can attain dredge performance values exceeding that of the baseline dredge, particularly in the areas of dredging accuracy, dredging production, and solids concentration of the dredge slurry. In terms of impacts to the environment, for both the baseline dredge technology (hydraulic cutterhead) and the PDFT state-of-the art test dredge, water quality was found to be impacted by support vessels and anchor movements more so than the dredging operation itself, and air quality was found to be impacted more at the CDF than at the point of dredging.

CONCLUSIONS

A state-of-the-art hybrid mechanical/hydraulic dredging system demonstrated dredge performance values exceeding that which have previously been achieved at the New Bedford Harbor site in the areas of dredge production, accuracy, and slurry solids concentrations. Both the sediment removal data and PCB data acquired indicate that the dredging technology used for the PDFT is very efficient and has a high probability of achieving sediment PCB clean-up goals established for Upper New Bedford Harbor. Furthermore, given the data set collected during this study, the question of residual contamination due to

sloughing or migration should be able to be addressed logistically by modifying certain dredging procedures during a full-scale remediation. For full-scale remediation activities, the following dredge performance design values are recommended:

Dredge Performance Parameter	Recommended Design Value
Dredging Production, Water Depths greater than 4 ft. [1]	95 cy/hr
Dredging Production, Water Depths between 2 ft. and 4 ft. [1]	35 cy/hr
Dredging Accuracy, Vertical Plane, to Design Depth	+/- .4 ft
Dredging Accuracy, Vertical Plane, using Visual Approach	+/- .5 ft
Dredging Accuracy, Horizontal	+/- 1.5 ft
Average Solids Concentration of Dredge Slurry [2]	10% - 20% solids by weight
Use of Recirculation System for reuse of Dredge Effluent Water from CDF	Recommended

[1] Based on minimum of 10 hr. operating day

[2] Will vary depending on *in situ* density of dredged sediment

Water quality monitoring revealed only a very limited impact on the water column from the actual dredging in terms of both PCBs and suspended solids. The detected elevations of these parameters were within the range of fluctuations normally found in the Harbor with changing environmental conditions. This limited impact was attributed to the bucket design and the method of operation. Larger increases in water column suspended solids and PCB concentrations were attributed to dredging support activities.

Flux chamber samples and ambient air samples were collected to achieve various objectives during the PDFT. Overall, this air sampling indicated that CDFs will be a more significant PCB emissions source than the dredging platform.

Results of the wastewater treatment pilot study showed that granular activated carbon when used with clarification and filtration can remove PCB concentrations to below the site-specific discharge limit of 0.065 milligrams per liter (mg/L) per Aroclor. The study also showed that sludge generated from wastewater treatment plant operations could be dewatered using a plate and frame filter press.

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) entered into an Interagency Agreement with the U.S. Army Corps of Engineers, New England District (USACE) for the New Bedford Harbor (NBH) Superfund Site. Under this Interagency Agreement the USACE is providing EPA with technical assistance to implement the remediation plan selected in EPA's September 25, 1998 Record of Decision.

The remediation plan involves dredging of polychlorinated biphenyl (PCB) contaminated sediments throughout the Acushnet River estuary and New Bedford Harbor and placement of dredged material in shoreline confined disposal facilities (CDFs). Figures 1-1 and 1-2 provide site location maps of the New Bedford Harbor Superfund Site.

Prior dredging activities have been performed in the New Bedford Upper Harbor during the Pilot Dredging study in 1988 and 1989, and for the Hot Spot dredging in 1995. While these dredging events did demonstrate the use of a number of conventional and alternative hydraulic dredging systems, it was felt that changes in dredge technology over the years could improve upon past dredge production and other performance values.

In 2000, Foster Wheeler Environmental Corporation (Foster Wheeler) working with the USACE performed preliminary and detailed evaluations of available dredge technologies to meet the specific requirements of the full scale remediation project. The primary requirements of the dredge equipment for the New Bedford Harbor cleanup were to demonstrate accessibility for dredging of the Upper Harbor given the low bridge clearance and shallow water depths, minimize resuspension of contaminated sediments, provide acceptable dredging production, minimize water added during the dredging process and demonstrate necessary dredging accuracy. From review and discussion of these evaluations with USACE and EPA, it was decided to field test the most promising dredging systems, in a Pre-Design Field Test (PDFT) before final selection of the dredge system(s) for the full scale cleanup is finalized.

1.1 Objectives

To evaluate the performance improvements of a state-of-the-art environmental dredge technology over conventional dredge technology previously used at the site several performance areas were evaluated:

- Percent (%) solids concentrations in the dredge slurry and slurry pumping capabilities;
- Horizontal and vertical dredging;
- Dredge production rates in shallow water and sediment with debris;
- Potential impacts to water quality;
- Potential impacts to air quality; and
- Removal of the contaminated sediments to a given depth.

A secondary goal of the PDFT was to evaluate this new technology with regard to site specific cleanup levels. Additional objectives of the PDFT were to evaluate the effectiveness of applying contaminant dispersants and flocculents within the CDF to reduce PCB losses to air from the CDF, to evaluate mechanical dewatering methods for water treatment sludges and to evaluate the use of granulated activated carbon (GAC) to treat decanted seawater.

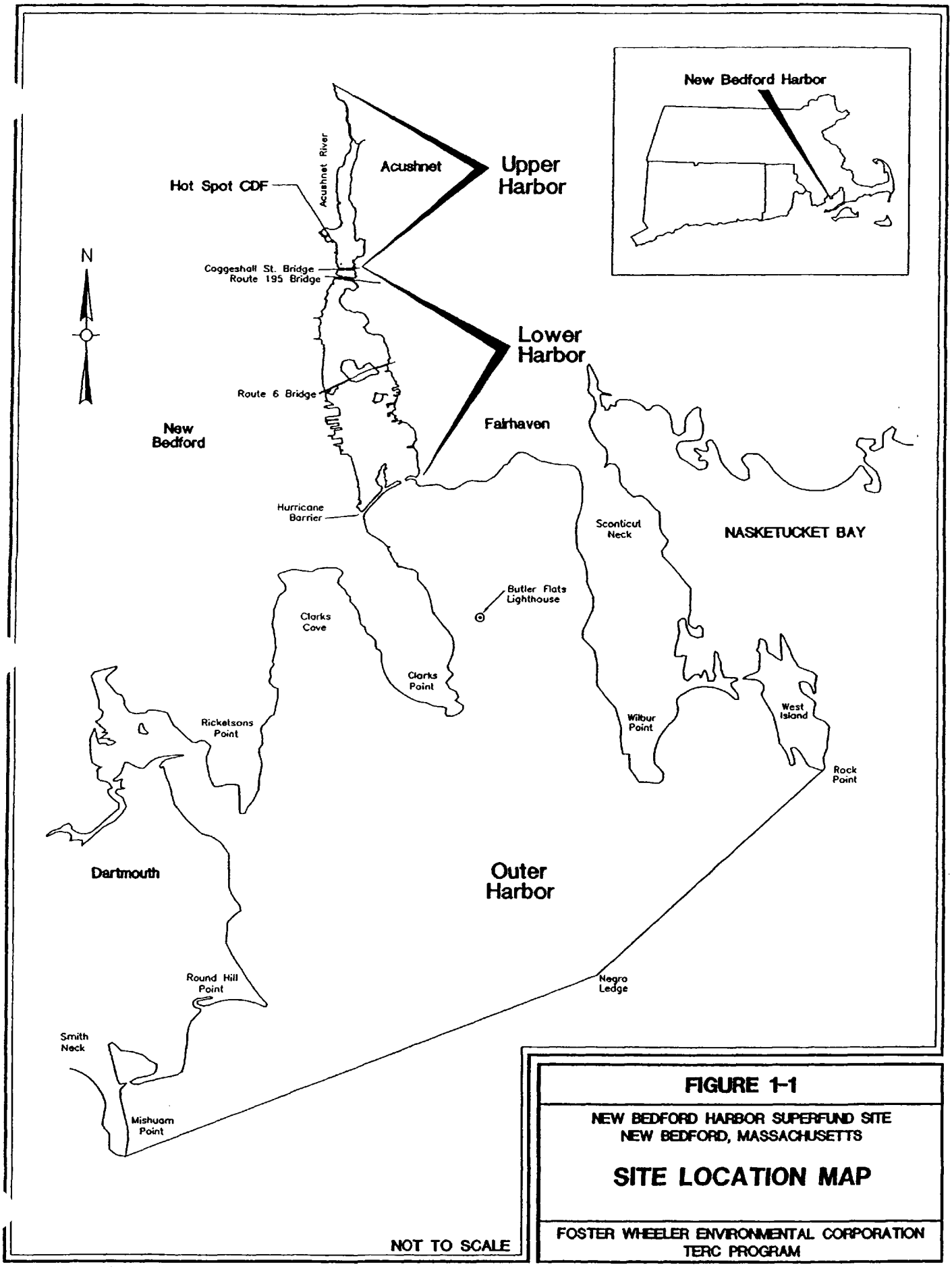

FIGURE 1-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SITE LOCATION MAP

FOSTER WHEELER ENVIRONMENTAL CORPORATION
TERC PROGRAM

CADDFILE: SUPERFUNDSITE.DWG

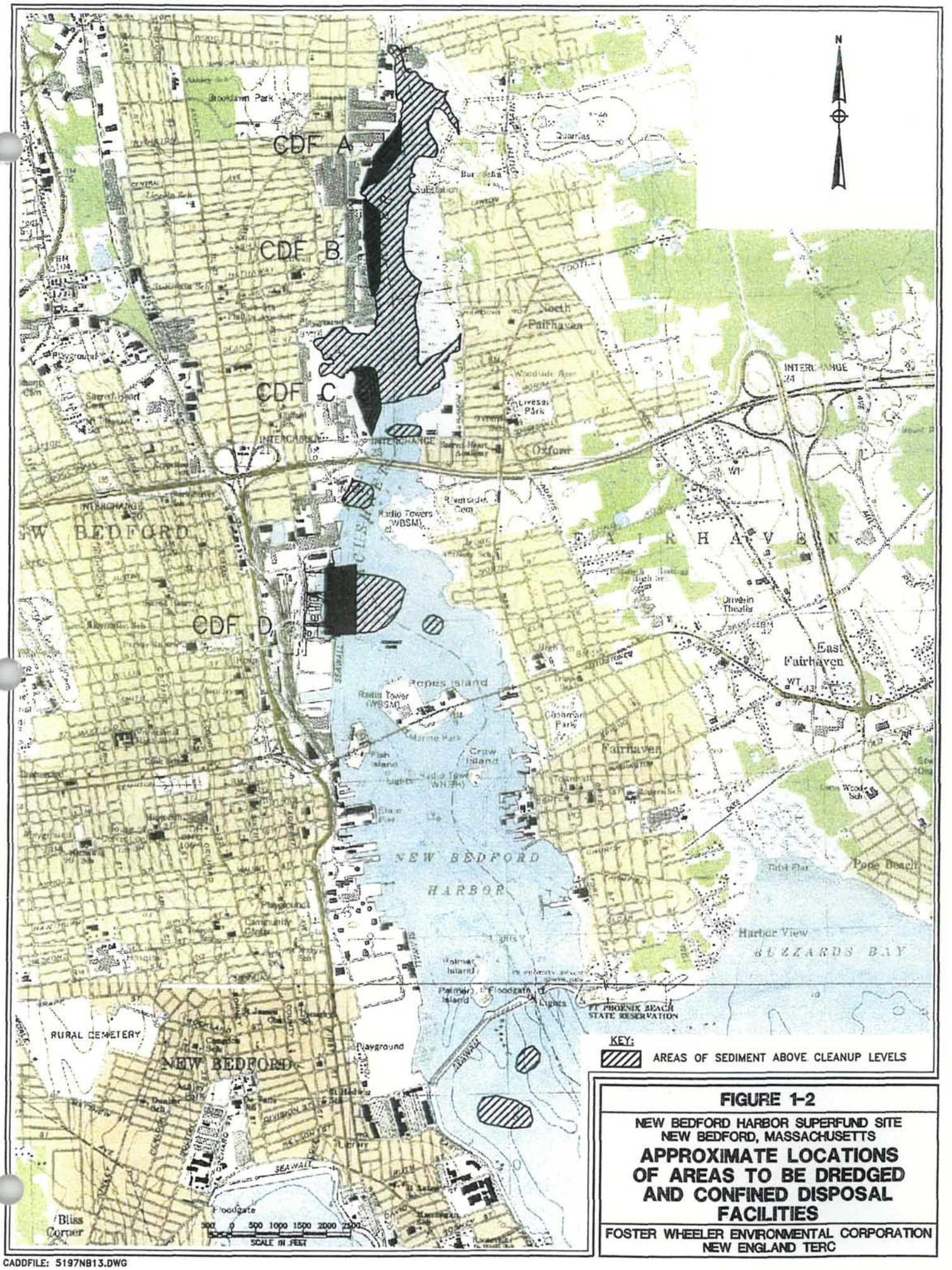

FIGURE 1-2

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

APPROXIMATE LOCATIONS OF AREAS TO BE DREDGED AND CONFINED DISPOSAL FACILITIES

FOSTER WHEELER ENVIRONMENTAL CORPORATION
NEW ENGLAND TERC

CADDFILE: 5197NB13.DWG

1.2 Pre-Design Field Test Plan

1.2.1 Dredge Technology Selection

The reports *New Bedford Harbor Cleanup Dredge Technology Review* (FWENC, 1999) and *Evaluation of Dredge Technologies, Phase Two - Detailed Evaluation* (FWENC, 2000a) were prepared to assist in the dredge technology selection for the full scale remediation project.

The report *New Bedford Harbor Cleanup Dredge Technology Review* (FWENC, 1999) provides a current assessment of the available dredge plant and support equipment that can be considered in determining how the environmental remediation dredging will be performed in New Bedford Harbor. The report evaluates potential dredging technologies that can address a set of specific challenges and criteria that have been identified in previous studies. These include the following:

- Maximize solids content and thereby reduce water volume and water treatment;
- Minimize re-suspension of contaminated marine sediments while dredging;
- Dredge in water depths of 1 to 4 feet (ft.) and intertidal areas;
- Perform precision dredging to minimize overdredging, which would add to the volumes of material requiring disposal in CDFs;
- Dredge in sediment having significant debris;
- Attain relatively high production rates; and
- Minimize or eliminate odors and PCB volatilization (control floatables and oils with specific emphasis on controlling contaminated oil releases during dredging).

As part of the *New Bedford Harbor Cleanup Dredge Technology Review* (FWENC, 1999) a dredge systems matrix was developed to organize and summarize the technologies that could meet the criteria established for the project. The following categories of information were investigated and summarized in the matrix for each dredge technology originally screened (Table 1-1).

Table 1-1
Dredge Technology Evaluation Matrix

Category	Specification
Dredge Type	Mechanical, Hydraulic, or Mechanical / Hydraulic (Hybrid)
Dredge Size (Plant)	Length x Beam x Height
Draft (ft.)	Loaded Draft (ft.)
Dredge Size (Pump / Bucket)	Pump Discharge Diameter (in.) or bucket size (cy)
Production Capacity	Working Production Capacity (cy/hr)
Debris Handling	Very Good, Fair or Poor
Vertical Cutting Accuracy (ft.)	Attainable Vertical Cutting Accuracy
Slurry Density	Advertised Slurry Density (% solids by weight)
Positioning / Monitoring System	Type, Accuracy
Surface oil collector	(Yes / No)
Sediment Re-suspension Minimization	(Good / Poor)
Projects Completed	Project Name Location Project Start / Completion Dates Volume of Sediment Dredged (cy) Pipeline / Haul Distance (ft.) Unit Cost ($/cy)
Dredge Cost	Cost to Purchase / Maintain Dredge

Over sixty (60+) dredge technologies available in the United States and internationally were initially screened for application on the New Bedford Harbor project in the report. Several preferred dredging systems and components were proposed for further evaluation by Foster Wheeler. Based on the project constraints, described above, the following dredge systems and components were proposed for further investigation.

Table 1-2
Dredge Technologies Selected in *Dredge Technology Review*

Manufacturer / Operator	Dredge Technology
Bean Technical Excavation Corporation	*Bonacavor* Hydraulic Excavator
Normrock Industries	*Amphibex* Amphibious Excavator
Aquarius Industries	Amphibious Excavator
DRE-Technologies	Dry-Dredge
Ellicott International	Series 370HP Hydraulic Cutterhead IHC Holland
WILCO Marsh Buggies Inc.	LGP Track Mounted Excavator
Quality Industries	LGP Track Mounted Excavator
Cable Arm Inc.	Cable Arm Environmental Clamshell
Miscellaneous	Land-based Earthmoving Equipment

These dredge systems and components represent existing available technology that have completed full scale environmental remediation projects and are believed to meet many of the New Bedford Harbor Cleanup Project parameters. These technologies were further screened and evaluated against the project criteria in the report *Evaluation of Dredge Technologies, Phase Two - Detailed Evaluation* (FWENC, 2000a). In this study contact was made with dredge technology representatives and project managers who

are most familiar with the technologies. In some cases a site visit was made. Based on this intermediate evaluation, the dredge technologies having the highest probability for success in meeting the New Bedford Harbor project constraints were identified and proposed for further investigation by site demonstration or meetings with technology representatives.

These technologies were selected by Foster Wheeler and USACE project staff knowledgeable of the New Bedford Harbor project and performance parameters. They included the following:

- Bean Technical Excavation Corporation (Bean TEC) *Bonacavor*
- Normrock Industries *Amphibex*
- Ellicott International Series 370 hydraulic cutterhead dredge

Photographs of and technical data for these dredge systems are provided in Appendix P.

The studies concluded that dredging technology used for environmental remediation dredging has changed substantially since completion of both the New Bedford Harbor Pilot Dredging Study in 1988-1989 and the Hot Spot Dredging event in 1995. Prior studies had excluded mechanical dredging techniques for use on these two events due primarily to the inefficiency of barge transport to the disposal facility, because of shallow operating depths, the perception that a hydraulic system left a more uniform bottom surface, and concern over resuspension of contaminated sediments.

In the 1990's, in response to a growing number of environmental remediation projects, hybrid dredging systems (the mating of a mechanical excavation system and a hydraulic transport system) have been developed and used to successfully complete a number of full scale sediment remediation projects. The Bean TEC environmental hydraulic excavator *Bonacavor* and the Normrock Industries *Amphibex*, are two such systems that have completed full-scale projects, and would likely be well suited to complete portions of the full scale cleanup at New Bedford Harbor. Conventional hydraulic cutterhead dredge systems have also been successfully used to complete contaminated sediment removal projects, including the New Bedford Harbor Hot Spot Dredging, and could complete portions of the full scale cleanup successfully.

The Ellicott 370 hydraulic cutterhead dredge had been used during both the Pilot and Hot Spot dredging events, and to date, had provided the best all around performance results at the site. Significant testing and data collection regarding the dredge performance had been achieved for this dredge and documented. The Ellicott 370 hydraulic cutterhead dredge was therefore established as the baseline for comparison of the newer dredge technologies to be tested.

The Normrock Industries *Amphibex* was concluded to represent the most applicable type of "amphibious" dredge technology for the full scale cleanup in shallow and intertidal areas, and the manufacturer was approached to coordinate a field demonstration during the PDFT. At the time however, Normrock Industries, a Canadian firm, had manufacturing operations located only in Canada. Therefore, it's dredge, having been built on a foreign hull, was prohibited from operating in navigable waters of the U.S. under the Jones Act, and thereby precluded from participation in the PDFT. The company has since opened a manufacturing facility for the *Amphibex* in the United States, and as the hull is now not foreign built, it may be further considered for use on the New Bedford Harbor Cleanup, and other dredging operations in the U.S.

The PDFT therefore focused on the Bean type environmental hydraulic excavator for testing on the New Bedford Upper Harbor. Coordination between the Bean Dredging Corporation, the parent company of Bean Environmental LLC (BELLC), and Foster Wheeler was initiated in early 2000, for participation in development and demonstration of a Bean type environmental hydraulic excavator.

Foster Wheeler contracted with BELLC to develop a dredging system that enables selective dredging of the contaminated sediment, minimizes the amount of water added during the slurry pumping process, and recycles the dredge slurry effluent. This dredge system was a modification of the original Bean type environmental hydraulic excavator *Bonacavor*, used successfully on the Bayou Bonfouca Superfund project.

1.2.2 Dredge Performance Tests

The BELLC dredge and support systems were mobilized to the project site in late July 2000. With final assembly of the dredge system and movement into the dredge test area, the BELLC dredge underwent a series of performance tests. Dredge performance parameters monitored by Foster Wheeler and USACE during the field test are described below. Performance monitoring performed by BELLC is also described.

Production Monitoring

Dredge production monitoring was performed over the course of dredge operations in the PDFT test area. Dredging was performed both with and without operational controls (reductions in advance speed and dredge cycle time) to obtain representative production rates over a range of conditions, including varying water depths, depth of cut (bank height), and chemical and geotechnical conditions. BELLC collected production data using a number of electronic data collectors for the dredge systems, including flow meters, production meters, crane monitoring system, and slurry processing data. Foster Wheeler and BELLC production engineers also recorded excavator cycle time, and production delay data throughout the duration of the tests. Production monitoring data was summarized daily, and used as baseline for the following days tests. All production monitoring data collected over the course of the PDFT was assimilated, checked for quality, and screened for use in developing production ranges for the dredge that would be reflective of a full scale operation. The dredge production monitoring program results are presented in Section 3.0, Dredge Performance.

Dredging Accuracy

The BELLC dredge tested was specified to achieve average horizontal positioning and dredging accuracy of +/- 2 ft. or better and average vertical dredging accuracy of +/- 0.5 ft. or better. Initially it was planned that the USACE would measure the horizontal and vertical dredging accuracy, and to ascertain smoothness of the dredge cut including development of windrows, and "potholing" with daily post dredge bathymetric surveys. BELLC's bathymetric survey system however was setup to acquire the pre-dredge survey data for use as part of their dredge positioning and guidance system. The BELLC surveys were used for the PDFT. BELLC recorded the horizontal and vertical dredge excavation position on a continuous basis, as daily progress surveys. A final post-dredge bathymetric survey was conducted by BELLC over the test area, and verified by the USACE survey team. The dredging accuracy results and project surveys are presented in Section 3.0, Dredge Performance.

1.2.3 Environmental Monitoring

Water Quality Monitoring

Water quality monitoring was performed by the USACE subcontractor ENSR International (ENSR) during field testing of the BELLC dredge, to assess sediment resuspension at the point of dredging and downstream of the dredging operation. The dredge system to be tested, including support equipment, was capable of modifying dredge performance with operational controls to minimize resuspension of bottom

sediments. The water quality monitoring program results are presented in Section 4.0, Environmental Monitoring.

Air Sampling

Foster Wheeler's subcontractor, The Kevric Company, performed ambient air sampling and analysis during the PDFT to document concentrations during operations. Locations were selected based on the proximity to dredging and CDF filling operations and included those around the CDF and near dredging operations on the eastern shore of the harbor. In addition, Foster Wheeler's subcontractor URS Corporation collected flux chamber samples to provide a measure of emissions as an indication of the relative contributions from the various operations to the ambient air concentrations. Flux chamber data will also be used to support the emissions and dispersion modeling calculations performed as part of developing ambient air action levels for upcoming construction work. Flux chamber and ambient air sample results are presented in Section 4.4.

2.0 PRE-DESIGN FIELD TEST DESCRIPTION

The PDFT was conducted to provide optimum, site specific dredge performance values for use in developing the New Bedford Harbor full scale remediation project. The PDFT demonstrated and recorded performance data including dredge production, accuracy, slurry solids concentration, air and water quality impacts. To provide the most realistic data for use in development of the full scale remediation project, the PDFT was conducted in areas and with equipment that would be reflective of the full scale project, to the extent possible.

2.1 Pre-Design Field Test Dredge Area

Location and Size

The PDFT test dredge area was selected by Foster Wheeler, EPA and USACE project personnel. A 100-ft. x 550-ft. dredge area, oriented east-west, located in the New Bedford Upper Harbor approximately 3,700 ft. north of the Coggeshall Street Bridge, was originally designated for the PDFT. The area, centered on relatively high levels, over 2,700 ppm of PCB contamination, would contain roughly 4,000 cubic yards (cy) based on a 2 ft. dredge cut. Also, the area ranged in depth from Mean Lower Low Water (MLLW) to -5 ft. MLLW, which is representative of depths in the Upper Harbor.

Analysis of a contaminant characterization program conducted in the PDFT test area and knowledge of the operational parameters of the BELLC dredge was used by Foster Wheeler, USACE and BELLC to develop a dredge plan that would provide a desired range of performance data during the PDFT. The PDFT dredge plan is shown as Figure 2-1. The dredge plan was based on depth and extent of PCB contamination as identified in sediment characterization data.

Dredge cut lanes were established, running north-south, each 30 ft. wide and 100 ft. long, with 2-5 ft. of overlap. As the dredge area transitioned across varying depth, debris, sediment type, and contaminant zones, each cut area provided discrete "sub-test" areas within which dredge performance monitoring would be performed. With concurrence from the PDFT monitoring team, the dredge area was also expanded to a 100-ft. x 150-ft. provisional test area to permit more dredge volume should it be needed, and to capture more deeply contaminated sediments located to the west of the original dredge area. The coordinates for the dredge test area (US State Plane 1983 Zone - Massachusetts Mainland 2001) are as follows:

N 2,704,050	E 815,100
N 2,704,050	E 815,650
N 2,703,950	E 815,650
N 2,703,950	E 815,100

The bed elevations within the dredge area ranged from roughly 0.0 ft. MLLW to -5.0 ft. MLLW. The minimum depth of cut in the dredge plan was 1 foot, while the maximum depth of cut was 4 ft. Materials dredged were hydraulically transported by the dredge via the discharge pipeline to the Sawyer Street CDF (CDF C). Figure A-1 shows PDFT project site including the Sawyer Street CDF. The maximum distance to the discharge within the CDF from the dredge site was 2,800 ft.

CORE LOG SAMPLING RESULTS

Core No.	Core Location Northing	Core Location Easting	Pre-Dredge PCB Concentration (ppm) 0–1 ft	1–2 ft	2–3 ft	3–4 ft
1	2703967	815267	270	560	260	1.1
2	2703967	815333	200	6.0	0.17	
3	2703967	815400	810	6.2	0.36	
4	2703967	815467	2,700	23	0.13	
5	2703967	815533	210	0.63	0.12	
6	2703967	815600	11	0.0038		
7	2703984	815300	96	0.013		
8	2703984	815367	250	490	65	0.27
9	2703984	815433	2,500	2.2		
10	2703984	815500	2,300	27	0.11	
11	2703984	815567	29	0.084	0.0026	
12	2703984	815633	8.8	0.067	0	
13	2704000	815267	370	830	160	0.26
14	2704000	815333	320	0.79		
15	2704000	815400	830	3.0	0.16	
16	2704000	815467	2,500	94	0.41	
17	2704000	815533	460	24	0.0056	
18	2704000	815600	1.6	0.19		
19	2704016	815300	950	2.9		
20	2704016	815367	170	0.092		
21	2704016	815433	1,300	61	0.080	0.32
22	2704016	815500	1,100	64	7.4	7.2
23	2704016	815567	6.2	0.10	0.0030	
24	2704016	815633	4.5	0.032		
25	2704033	815267	460	420	1.2	
26	2704033	815333	330	4.4	0.33	
27	2704033	815400	480	0.82	0.059	
28	2704033	815467	1,000	300	0.062	
29	2704033	815533	67	0.66	0.15	
30	2704033	815600	5.5	0.042		

TEST AREA COORDINATES

POINT	NORTHING	EASTING
A	2704050	815250
B	2704050	815650
C	2703950	815650
D	2703950	815250
E	2703950	815100
F	2704050	815100

NOTE:
HORIZONTAL DATUM IS NAD83, MASSACHSETTS STATE PLANE, VERTICAL DATUM IS NGVD29

LEGEND

- •2 PRE-DREDGE CORE SAMPLE LOCATION
- 36" DREDGE CUT DEPTH
- TEST AREA
- AREA WITH CORE LOGS
- ----0----- MEAN LOWER LOW WATER (MLLW) IN FEET

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FIGURE 2-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

PRE-DESIGN FIELD TEST DREDGE TEST AREA

SCALE: AS SHOWN

CAD FILE: DREDGE_TEST01.DWG

Sediment Composition

Surface sediment ranged from fine-medium sands in the eastern, shallow portion of the test area, to high-water content silts in the western portion of the test area. The material composition within the subtidal portion of the dredge area was anticipated to be a combination of silt, sand, and clay. A recent sediment core from a location within 100 ft. of the dredge area contained 19% sand, 53% silt and 28% clay. In some subtidal areas near the test area, some organic (rooty matter) was encountered. The potential for encountering some cobbles, ballast stone or other debris, also existed, and is anticipated in many areas of the full scale cleanup. In the intertidal and emergent areas along the eastern end of the dredge area and on the shoreline within the dredge area, the sediment consists primarily of silty sand, with the sand component increasing from approximately 60% (40% silt) in the upper 12 in. to 80% (20% silt) 3 ft. below the surface. Geotechnical data for the Upper Harbor, including that in the vicinity of the test area, are provided in Appendix B.

Sediment Chemical Composition

The sediment in the test area was reported to have PCB contamination concentrations of between 0 and 2,700 ppm. Results of the sediment characterization program conducted prior to performance of the PDFT revealed PCB contamination in the dredge test area ranging from 1.6 to 2,700 ppm in the upper 12 in., 0 to 830 ppm at sediment depths from 12-24 in., and 0 to 260 ppm at sediment depths of 24-36 in. The PCB Core logs are provided in Appendix J.

Oceanographic Conditions

The PDFT was conducted near the center of the eastern subtidal and intertidal area of the New Bedford Upper Harbor. In general, wind wave heights in the Upper Harbor do not exceed 1-2 ft. The hurricane barrier and other restrictions across the Lower Harbor prevent ocean swell from propagating into the Upper Harbor. The mean tide range for the Upper Harbor is 3.7 ft., with a spring range of near 4.6 ft. Currents can vary sharply over the harbor area due to various constrictions. At the Coggeshall Street Bridge, the maximum ebb and flood currents are estimated to be 6.0 ft./sec and 3.0 ft./sec., respectively. The average ebb and flood currents are estimated to be 1.7 ft./sec and 1.1 ft./sec., respectively. Current speeds in the Upper Harbor average roughly 0.3 ft./sec., with a maximum of 0.85 ft./sec. The predicted tide record for the New Bedford Harmonic station for the period of performance of the PDFT is provided in Appendix C.

2.2 Pre-Design Field Test Team

The PDFT was performed by individuals from the following organizations:

EPA, New England – Overall responsibility for the PDFT.

USACE, New England District – Managed the joint efforts of Foster Wheeler and other USACE subcontractors in performing the PDFT. Responsible for third-party sampling efforts with Foster Wheeler's assistance, as well as general oversight of the test on behalf of the USACE and the EPA.

EPA, Narragansett, RI, Atlantic Ecology Division of the National Health and Environmental Effects Laboratory – Provided technical oversight of water quality monitoring and PCB removal efficiency study programs conducted during the PDFT.

Foster Wheeler – Prime construction and engineering contractor responsible for implementing the PDFT and management of subcontractors on site. Responsible for developing the dredge test plan, dredge

performance monitoring, air quality monitoring and laboratory analyses, coordination of sediment dewatering and volatilization testing, and water treatment treatability and influent testing of supernatant in the CDF. Conducted ambient air sampling and analyses.

BELLC – Dredge contractor responsible for the design, development, mobilization and performance of state of the art hybrid test dredge demonstrated for PDFT.

ENSR International – Subcontractor to USACE. Responsible for water quality monitoring analyses and collection and analyses of PCB removal efficiency data during PDFT test.

URS – Subcontractor to Foster Wheeler Environmental for flux chamber sampling.

Kevric – Subcontractor to Foster Wheeler Environmental for ambient air monitoring.

CR Environmental – Provided oceanographic data recording equipment and vessel for water quality monitoring.

2.3 Dredge System

Under USACE Contract No. DACW33-94-D-0002, Task Order No. 17, Foster Wheeler subcontracted with BELLC for the delivery and demonstration of a modification of the *Bonacavor* environmental hydraulic excavator to work along with the Slurry Processing Unit (SPU) previously patented by C.F. Bean Corporation, now C.F. Bean L.L.C, an affiliate of BELLC. In response to the contract specifications and numerous meetings between Foster Wheeler, BELLC, and the USACE, BELLC mobilized and demonstrated a hybrid dredge (mechanical excavation/hydraulic transport), based on the Bean type hydraulic excavator platform with SPU. Final design and construction of the dredge's components and systems were carried out at BELLC's Belle Chasse, Louisiana marine yard, outside New Orleans. Dredge systems were assembled at the yard, tested and debugged, disassembled and transported to New Bedford, Massachusetts, for final assembly and mobilization into the PDFT area.

The dredge system mobilized and demonstrated by BELLC at the New Bedford site was comprised of:

- A portable, shallow draft barge platform, with fully loaded draft not to exceed 2.0 ft. The equipment barge and ancillary support vessels were also to be provided with loaded draft not to exceed 2.0 ft.
- A hydraulic excavator with a sealed environmental clamshell bucket. The Profiling Grab bucket designed by Boskalis Dolman and presented at prior meetings between BELLC, Foster Wheeler and the USACE was used for the field test. The BELLC dredge system was to be capable of maintaining at least a 100 cy/hour production rate. The dredge system was also to be capable of providing horizontal positioning accuracy of +/- 2 ft. or better and vertical dredging accuracy of +/- 0.5 ft., or better.
- The SPU was to be incorporated into the design of the environmental hydraulic excavator, as a means of providing relatively high and controllable solids concentrations of the dredge slurry. The SPU was to be capable of maintaining at least 30% solids by weight in the dredged material slurry over the course of a dredging day.
- A water recirculation system that would demonstrate the practicality of recycling decant water from the Sawyer Street CDF as makeup water for hydraulic dredged material transport.
- A discharge pipeline for transport of the dredge slurry to the Sawyer Street CDF.

- Capabilities for providing continuous dredge production data, including discharge flow rate, solids concentration, material production, cycle times, and advance rate. The dredge system also provided dredge and excavator position data on a continuous basis.

Additional materials mobilized to the test site and maintained by BELLC over the duration of the PDFT included the following:

- Oil containment boom, deployed around the point of dredging to contain the oil/PCB sheen.
- Appropriate dredge positioning and navigational aids.
- Appropriate health and safety equipment, including provisions for operations under Level C HAZMAT conditions, if required.
- Support equipment, including personnel transport, setup and dredge plant positioning equipment.

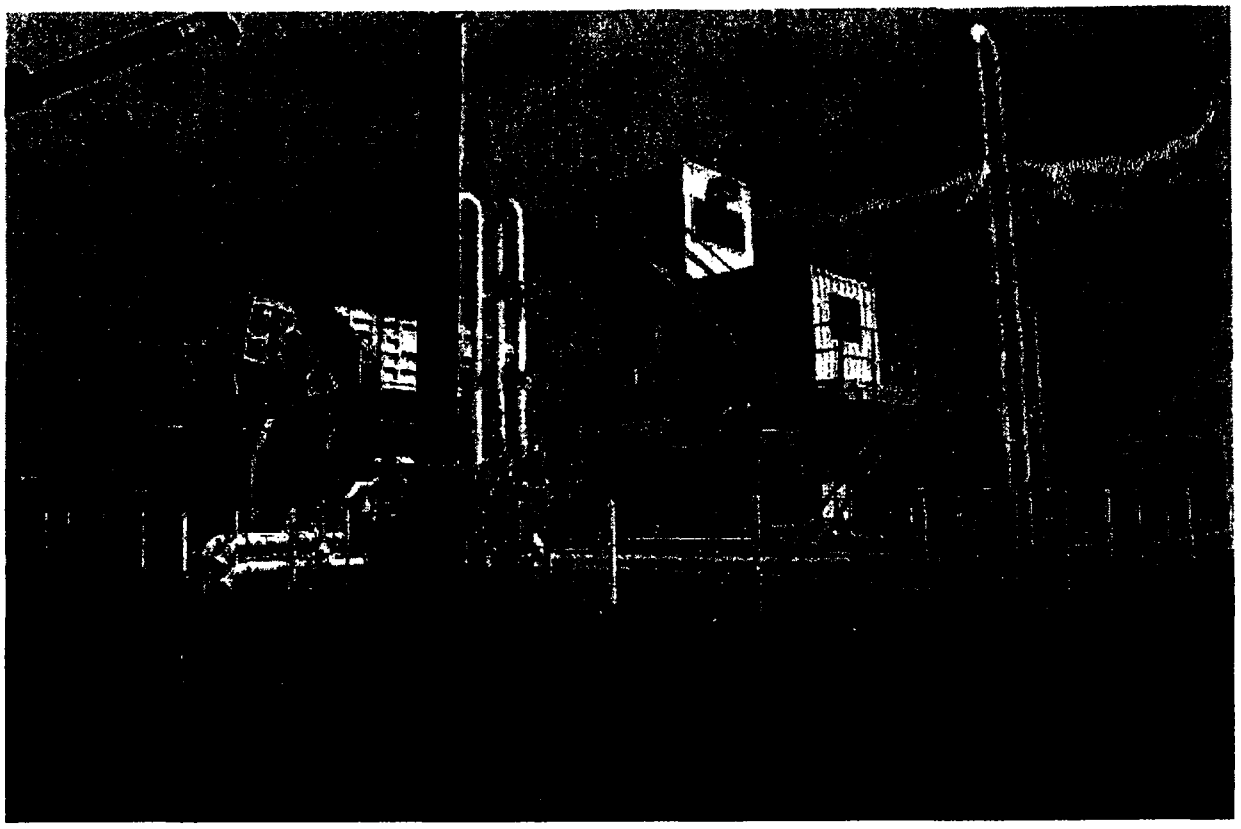
The BELLC portable dredge system developed and tested during the PDFT consisted of the primary components presented in this section. A schematic plan of the dredge as assembled and dredge system cut sheets showing additional details are provided in Appendix D. Various PDFT project photos of the BELLC dredge are provided in Appendix O.

The primary components of the BELLC dredge that distinguish it as a system particularly well suited to perform environmental dredging in the New Bedford Upper Harbor, are the Horizontal Profiling Grab bucket (HPG), the Crane Monitoring System (CMS), the SPU, and the Recirculation system. These components are described in greater detail to convey a thorough understanding of the overall system. Other major components of the dredge are also described in this section.

2.3.1 Dredge Platform

Due to access restrictions by water to the Upper Harbor, cost limitations, and to allow for a dredge system with minimal draft, the installation of heavy equipment, and the use of relatively simple barge shifting devices, the BELLC dredge platform for the PDFT was fabricated using a modular system of interlocked Flexi-Float pontoons. As the Coggeshall and Highway 6 bridges present a height restriction of 8 ft. at Mean High Water (MHW), and the design height of the BELLC dredge was 25 ft., only the barge platform was fabricated in the Lower Harbor. The Flexi-Float units were transported by truck to the MAT Marine yard on Fish Island, just south of the Hwy 6 bridge. Fifteen (15), 40 ft. x 10 ft., Series S-50 Flexi-Float modular pontoons, each 5 ft. in height were used in the fabrication of the BELLC dredge platform (Figure 2-2). The dredge configuration was unconventional in that it was as wide (80 ft.), as it was long (80 ft.). This low aspect ratio provided a large and stable footprint upon which to mount the significant on-board dredge systems, while still maintaining a relatively shallow draft, due to a greater distribution of weight. The draft of the dredge barge with all systems installed was designed to be 2 ft.

Figure 2-2
BELLC Test Dredge Under Construction



A key feature of the dredge was incorporation of a "moonpool", a 30 ft. long x 40 ft. wide cutout, at the digging end of the barge where the excavation actually took place. The moonpool concept permitted the dredging to be conducted within an isolated and relatively quiescent area, enclosed on three sides by the barge sidewalls, with the bow opening closed by a floating oil boom with 3 ft. deep curtain. The moonpool served to "encapsulate" the dredge area, providing for decreased wave action at the point of dredging and entrained any surface sheen within the 30 ft. x 40 ft. area. Once the dredging of an area corresponding to a "moonpool" or "spud" position was finished, the barge was shifted to a position north or south, to dredge an adjacent area.

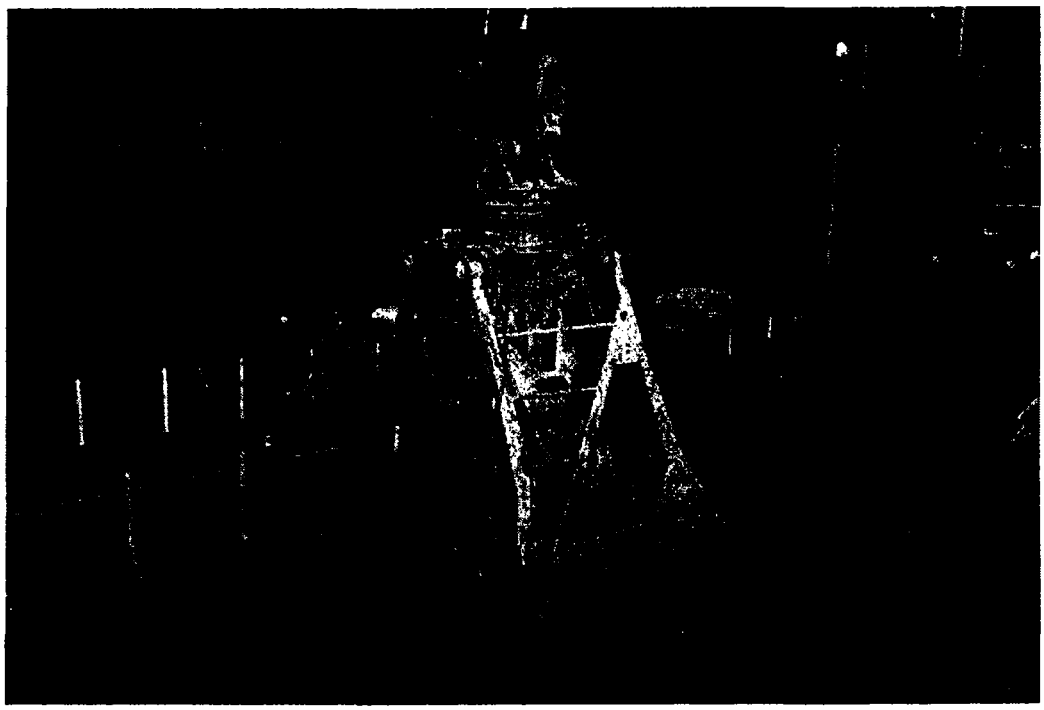
Two (2) 20-inch diameter spuds, each 40 ft. long, of integrated Flexi-Float design were installed on port and starboard sides of the dredge, approximately 56 ft. aft of the bow. A four-point anchoring system, with two (2), manually operated, dual-drum diesel winches, was selected for dredge mobility and positioning. Electric and hydraulic power units were installed for anchor and spud winch systems.

2.3.2 Horizontal Profiling Grab (HPG) Bucket

One of the primary recommendations of the *Dredge Technology Review* and a goal of the PDFT was to apply mechanical dredging equipment to the New Bedford Harbor cleanup site. It was believed that excavation using a mechanical clamshell bucket could provide optimum dredging production, debris management, and dredging accuracy for the New Bedford Harbor site specific conditions. The mechanical bucket selected for use with the BELLC dredge tested during the PDFT was the HPG. The HPG was developed by Royal Boskalis Westminster n.v., BELLC's European partner firm, and has been

used successfully on environmental remediation projects in the Netherlands and Europe involving dredging of contaminated sediments. Both 4.5 cy and 3.25 cy HPG buckets were imported to the United States for demonstration on the PDFT. PDFT production goals and excavator capacity necessitated only the testing of the 4.5 cy bucket (Figure 2-3).

Figure 2-3
Horizontal Profiling Grab Bucket



In practice, the advantages of the HPG bucket design over conventional mechanical buckets include:

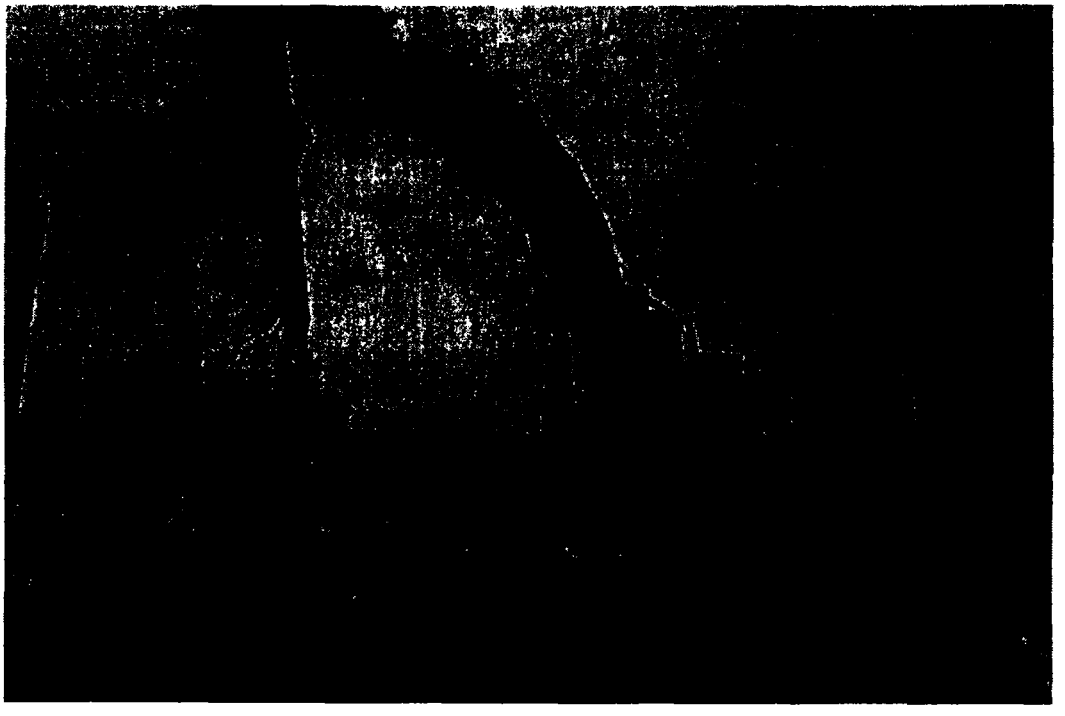
- During closing, the bucket's leading cutting edges follow a horizontal line, by means of specifically designed pistons, allowing a horizontal cut over a relatively large surface. This permits selective dredging of thin horizontal layers.
- The maximum opening of 14.75 ft. is approximately 80% longer than a conventional clamshell bucket. This makes it possible to reach optimal fill of the bucket even when operating in relatively thin layers. The result is high production even when dredging thin layers.
- The incorporation of a 360° horizontal rotor between the excavator-stick and the HPG bucket allows the bucket to be positioned in such a way that the cutting pattern consists of adjoining, parallel rectangles. The result is a more controllable dredge cut pattern with minimal overlap and maximum dredging efficiency. Less overlap between cuts also serves to reduce turbidity and spill.
- Because the HPG bucket is actively closed by hydraulic cylinders with good breakout forces, as opposed to closing wires, its vulnerability to debris has proven to be minimal. The speed of closing and opening is also relatively low to minimize resuspension of sediments.

- The HPG bucket is fitted with vents, three (3) on the top section of each bucket half, each approximately 12-in. x 16-in., which open when the bucket opens and close when the bucket closes. In this manner the bucket encloses the contaminated sediments and minimal turbidity and spill is generated during the lifting of the bucket through the water column and above water. During lowering the bucket in the water, the air enclosed in the bucket escapes immediately when the bucket is submerged, thus avoiding turbidity created by the release of entrapped air at the moment when the bucket is closing.
- The horizontal and vertical position, and rotation angle of the bucket is determined by the Real Time Kinematic (RTK) Differential Global Positioning System (DGPS) in combination with the measurement of angles of all movable parts on the excavator.
- The HPG bucket is integrated with the CMS where real-time bottom level, bucket position, rotation, and dredged depth are monitored. Design and actual bottom levels are incorporated in a Digital Terrain Model (DTM).

2.3.3 Hydraulic Excavator

A Caterpillar 375LC hydraulic excavator (backhoe) with a 27 ft. 6 in. boom and an 18 ft. 1 in. stick was selected as the optimal machine with which to operate the HPG bucket (Figure 2-4). The total weight of the 375LC is approximately 180,000 pounds (lbs). Modifications were made on the excavator's hydraulic system to incorporate all rotation and closure functions of the HPG at relatively low speed to avoid turbidity during dredging. The 375LC was equipped with centimeter level accuracy RTK DGPS and the CMS, described in further detail below. The operators cabin was provided with overpressure fresh air using the BM-Air MAO-5 Pressure Filter System, a unit equipped with heavy-duty dust and carbon filters. The excavator was placed on wooden mats aft of the moonpool and fixed to the barge by means of steamboat ratchets.

Figure 2-4
Caterpillar 375 LC Hydraulic Excavator with Horizontal Profiling Grab Bucket



2.3.4 Crane Monitoring System (CMS)

The CMS is an on-board electronic sensor system that provides the crane operator maximum control of the bucket while dredging, both in the horizontal and vertical planes. The CMS combines signals from the excavator boom, stick, and bucket hinges, signals from the swing of the excavator, the horizontal and vertical position (including tide) of the RTK antenna, and the list, trim and orientation of the barge. These signals are assimilated in a computer that displays the entire dredge system in a graphical format with the pre-dredge hydrographic survey and the design dredge prism. In using the CMS, the operator dredges in pre-programmed dredge sets based on a planned horizontal and vertical grid. A heads up display installed in the operators cab gives a record of the historical bucket position and grade achieved for every set of the dredge. The CMS display monitors were also provided in the control room and the visitor's room during the PDFT. Figure 2-5 shows the typical CMS screen in the operator's cab. Via telemetric link, the CMS display can also be provided to a landside office, in real time, in proximity to the dredge area.

The CMS as installed on the BELLC Test Dredge consisted of the following elements:

- A Sercel Aquarius 5002 RTK DGPS receiver, providing +/- 2 in. accuracy in the X-Y and Z planes.
- A Sperry SR220 Gyrocompass and digital repeater for barge heading providing accuracy of +/- 1 degree.
- List and trim measurement for the barge with accuracy +/- 0.1 degree.
- Measurement of the following movable parts of the excavator and the HPG to calculate the precise dredging position of the HPG bucket in X, Y and Z. All angles were measured with an accuracy of +/- 0.1 degree.
  - Swing angle, excavator to barge
  - Boom-angle
  - Stick-angle
  - Rotation angle of the grab
- A computer system that generates graphical displays with real time plan and profile views of the equipment, the dredge area, dredge grade, dredged areas and elevations, and the mudline, based on a DTM of the PDFT area. Computer monitors were located in the excavator operator's cabin, the control room, and the visitor's room. Dredged depths and positions were logged and stored continuously.

2.3.5 Slurry Processing Unit (SPU)

<u>General</u>

Minimizing the amount of water added to the dredged material was a focus area of the PDFT, as a significant portion of the overall full scale remediation cost will be attributed to the management and treatment of the effluent water from the dredge slurry. To minimize the amount of water to be delivered to the CDFs, the design team intended to test the Bean patented SPU (Figure 2-6), which has been used successfully on other environmental remediation projects to achieve solids concentrations in the dredge slurry averaging over 20% solids by weight.

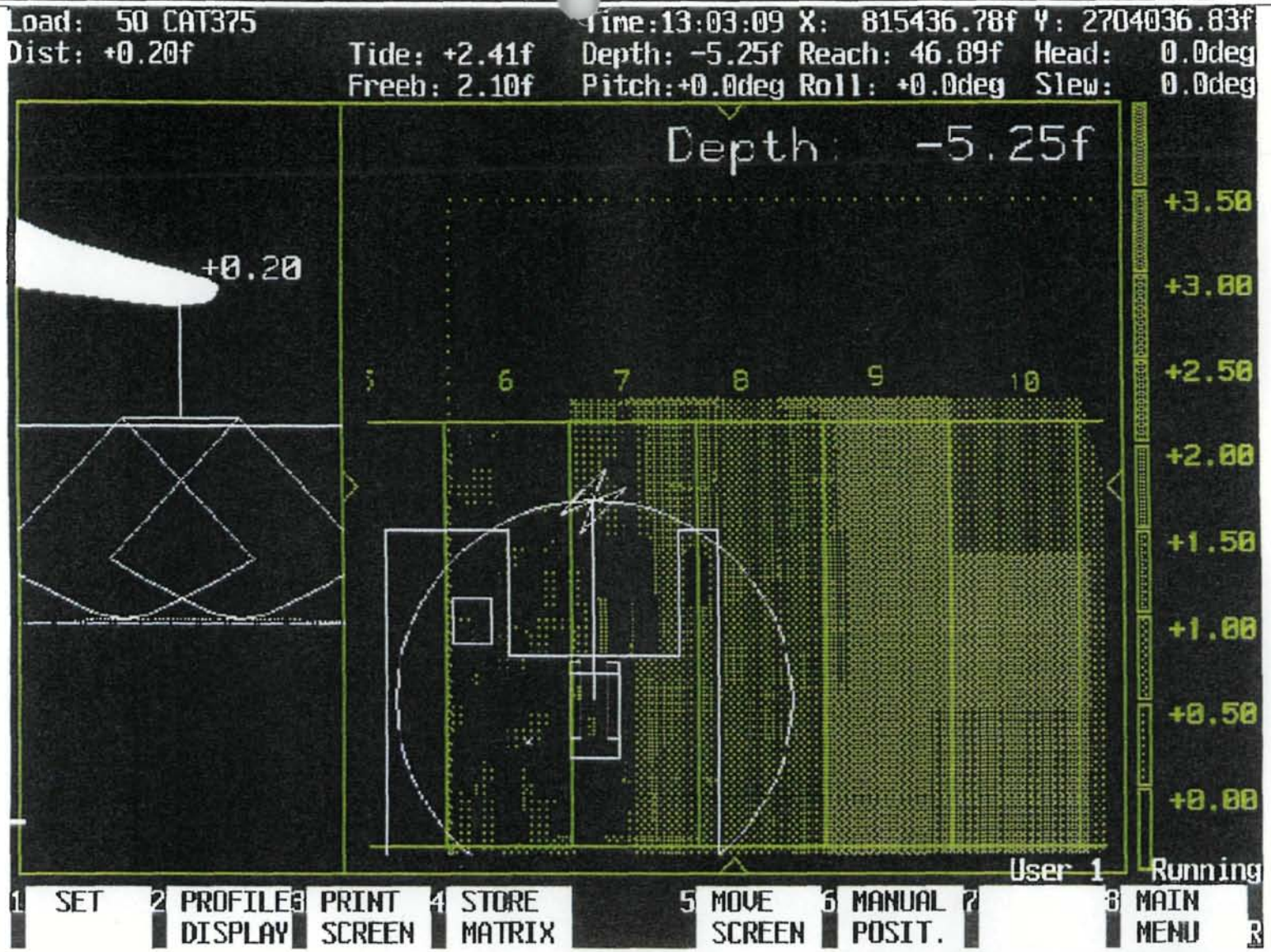


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FIGURE 2-5

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CRANE MONITORING SYSTEM HEADS UP DISPLAY

NOT TO SCALE

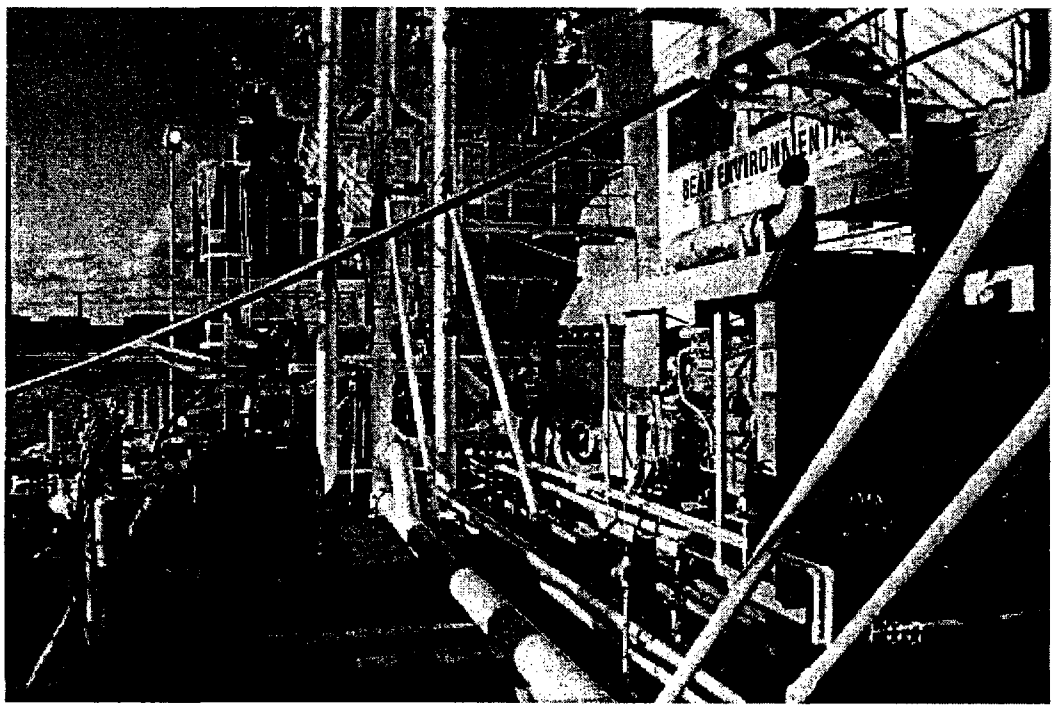
CAD FILE: NBH_IMAGE-1.DWG

The SPU system is a proprietary hydraulic slurry transport system that delivers high percent solids concentrations, by introducing controlled amounts of water to mechanically dredged material. The *in situ* material conditions dictate the theoretical maximum achievable slurry density (i.e., it is not possible to achieve solids concentrations that are higher than that of the *in situ* material).

Sensors located on three specific gravity loops (inverted u-tube manometers) placed along the discharge line on board the dredge measure parameters by which the solids maximization process is managed. The SPU system can be operated in manual or automatic mode. In automatic mode the SPU operator selects the upper and lower limit values for the slurry density and for the discharge velocity. Based on the measured values of slurry density, and comparison with the *in situ* density ranges for the dredge area, the computer will adjust the slurry pump speed and/or add water to the system. In manual mode the SPU operator, not the computer, adjusts the slurry pump speed and/or adds water to the system. He also instructs the excavator operator to add more or less sediment to the system.

A key feature of the SPU is the ability to input decant water from the disposal site back into the system, thereby substantially reducing the overall quantity of water added to the CDF, and reducing the amount of water that must be treated.

Figure 2-6
Slurry Processing Unit



SPU System Operation

Operation of the SPU system begins with debris separation after placement of the dredged material by the HPG bucket on the 6-inch x 6-inch grizzly screen of the process hopper. To manage the debris and stiffer material that would not pass or become lodged on the grizzly screen, an elevated mini-excavator was installed adjacent to the grizzly in order to mash cohesive soils through the grizzly and to remove debris from the grizzly and deposit them in the trash bin. On the bottom of the hopper, two horizontal augers

were installed to homogenize the dredged material and to reduce the (shear-) strength of the sediment to prepare the optimal mixture for the hydraulic transport. This step would further serve to increase slurry density while minimizing pipeline resistance. The augers can turn both ways in order to release debris in case of obstruction. Additionally, a "rockbox" with a 4-inch x 4-inch screen was installed in the suction line between the hopper bottom and the main slurry pump.

The SPU controls system measures hopper level, suction pressure and mixture velocity along the suction line. Suction pressure and/or velocity readings below pre-set operating ranges indicate to the SPU operator the presence of higher than desired densities or suction line blockage.

After discharge from the 12-inch centrifugal pump, the slurry enters the first specific gravity (SG) loop with electronic pressure transducers. The transducers provide the information to the process computer to calculate slurry density and estimate transport pipeline losses. The density measurement is compared to a density set point, based on the *in situ* characterization of the dredge area, and appropriate adjustments (addition of water) are made by the computer system. The same measurements are carried out in a second SG loop, and again the necessary adjustments are made. The third and final SG loop together with the electromagnetic velocity meter measures and records the final solids concentration of the slurry as it is pumped from the dredge to the Sawyer Street CDF.

The 2,800 ft. discharge pipeline was an 8-inch diameter (inner diameter 7.13 in.) fused high density polyethylene (HDPE) line. The same specification and length of pipeline was used as the return water line. Both discharge and return water pipelines were lashed to and floated by a 16-inch HDPE pipeline, plugged at both ends. When the discharge line was loaded with dredge slurry, it had a tendency to sink. When the return water line was full, it was more or less neutrally buoyant. The dredge slurry was discharged roughly halfway along the eastern wall in Cell 1 of the Sawyer Street CDF.

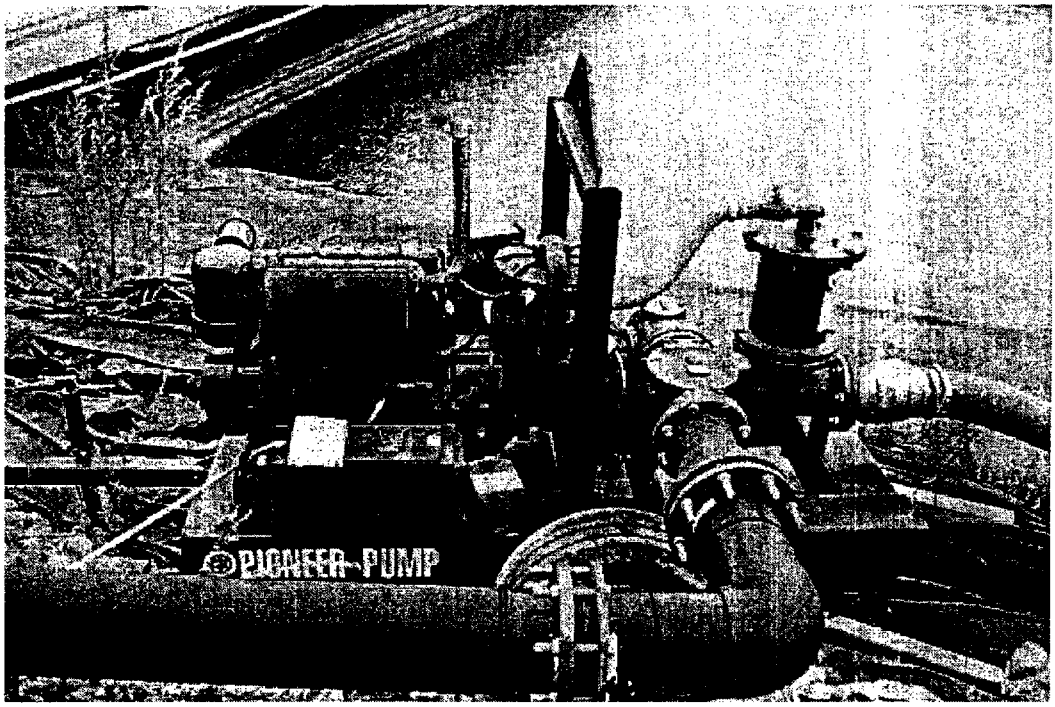
2.3.6 Recirculation System

The SPU system is intended to minimize the amount of water to be added to the dredged material such that the dredge slurry density would be optimized. However, the water that is added to the hydraulic transport system still requires storage capacity and ultimately, treatment. Due to the full scale project parameters of large dredging volume, requirement for hydraulic transport due to shallow water, and limited CDF capacity, efforts were made to develop a system which would serve to further minimize the volume of discharge water to be managed on the full scale project. A water recirculation system was therefore included for testing in the PDFT.

The recirculation system involved the pumping of decant water from the CDF with a self priming 8-inch diesel driven pump (Figure 2-7), via an 8-inch diameter fused HDPE pipeline, back to the dredge for use as make-up water, thereby creating a closed loop system.

The make up water system for the SPU can be obtained from either return water from the CDF or harbor water via a sea chest. During the PDFT dredging, however, only return water from the CDF was used to supply the make-up water pump installed on board the dredge. The make-up pump increased the pressure of the make-up water to a maximum of 150 psi. The make-up water supply, available at a charged manifold, was used by BELLC for a number of operations, including SPU water injectors, suction line debris jets, and the mini excavator (grizzly) debris jet.

Figure 2-7
Recirculation System Return Water Pump, Cell 2



2.3.7 Support Vessels and Equipment

As with any dredging operation, support vessels and equipment are needed to facilitate the process. For the PDFT, BELLC mobilized the following:

Hydrographic Survey Equipment

- Twenty-six foot (26 ft.), shallow draft, twin screw aluminum survey boat.
- Trimble 4000 SSE Sub-meter level RTK DGPS reference station for horizontal positioning.
- Odom Mark II DF3200 dual frequency echosounder.
- Survey computer with SSD dredge navigation and data acquisition and processing software.

Support Vessels

- Twenty-seven foot (27 ft.), shallow draft tender tug, "Miami II".
- 30 ft. x 65 ft. Equipment barge for staging and transportation of equipment and trash boxes with a 15-ton telescopic hydraulic crane.
- Twenty-one foot (21 ft.), shallow draft, Carolina Skiff.

2.4 Chronology of Events

The PDFT was scheduled to be performed in the late July 2000, early August 2000 timeframe. The contract was structured to permit five to ten (5-10) days of dredge performance testing and monitoring. The chronology of events for the PDFT on site activities is as shown in Table 2-1.

Table 2-1
PDFT Chronology of Events

Activity	Date
Mobilization	July 19 - August 7, 2000
Dredge Systems Setup and Calibration	August 7 - August 10, 2000
Trial Dredging, Day 1 (Cut 6)	August 10, 2000
Trial Dredging, Day 2 (Cut 6)	August 11, 2000
Trial Dredging, Day 3 (Cut 6)	August 12, 2000
Trial Dredging, Day 4 (Cuts 6)	August 13, 2000
Test Dredging, Day 5 (Cuts 7,8)	August 14, 2000
Test Dredging, Day 6 (Cuts 8,5)	August 15, 2000
Test Dredging, Day 7 (Cuts 5,4,3)	August 16, 2000
Test Dredging, Day 8 (Cuts 3,2,1)	August 17, 2000
Test Dredging, Day 9 (Cuts 1,A)	August 18, 2000
Demobilization	August 19 - August 30, 2000

2.5 Meteorological Conditions

Meteorological data was collected over the course of the PDFT at the Sawyer Street meteorological station, located near the northeast corner of the site. The daily raw meteorological data sheets for the period of performance are provided in Appendix C. A daily summary of the meteorological conditions encountered on site during the PDFT is provided in Table 2-2. Over the period of performance of the PDFT, the weather conditions ranged from clear and sunny with little wind, to periods of moderate rain (approaching 0.5 in. over course of production day), and wind speeds reaching 15-18 miles per hour.

2.6 Health & Safety Plan

The PDFT was conducted in accordance with the Environmental, Health & Safety (EHS) Program, and the Site Safety and Health Program (SSHP), as facilitated by Foster Wheeler's EHS personnel. EHS personnel also performed real-time and integrated air monitoring on site and on the test dredge to ensure compliance with established occupational exposure limits, as well as sampling of personal protective equipment (PPE) for disposal characterization. No major health and safety related incidents occurred during the PDFT.

Table 2-2
PDFT Meteorological Data Summary

Date	Average Windspeed [1] (mph)	Maximum Windspeed [1] (mph)	Average Wind Direction [1]		Average Temperature [1] (degrees F)	Average Barometric Pressure [1] (inches Hg)	Average Rainfall [1] (inches/hr)	Total Rainfall [2] (inches)
			(0 N)	Compass				
8/10/00	7.45	10.32	309	WNW	81.80	29.79	0.008	0.450
8/11/00	11.10	15.38	89	ENE	77.41	29.88	0.006	0.070
8/12/00	15.16	17.39	53	ENE	70.64	29.89	0.000	0.000
8/13/00	11.63	14.99	53	ENE	68.32	29.91	0.016	0.460
8/14/00	13.52	16.66	43	NNE	68.83	29.88	0.002	0.250
8/15/00	10.59	12.60	29	NNE	69.21	29.96	0.029	0.320
8/16/00	8.37	10.92	222	SSW	74.58	29.78	0.004	0.040
8/17/00	9.01	11.20	294	WNW	71.74	29.89	0.000	0.000
8/18/00	6.71	10.04	126	ESE	69.10	29.95	0.000	0.060

[1] Average over duration of testing 0700 hrs - 1700 hrs

[2] Daily Total

3.0 DREDGE PERFORMANCE

The PDFT was undertaken to evaluate the performance of hybrid mechanical/hydraulic environmental dredge technology with the Bean type SPU. This technology was selected as one of the most applicable dredging system to be used for the full scale remediation based on the results of *the Dredge Technology Review* and *Evaluation of Dredge Technologies, Phase 2 - Detailed Evaluation* studies completed in 2000.

Three main dredge performance areas were evaluated during the PDFT: 1) dredge performance in removal of PCB contaminated sediments; 2) ability to minimize water quality impacts; and 3) ability to minimize air quality impacts. To measure and record performance that could be extrapolated and used in the development of the full scale remediation project, a minimum of five (5) days and a maximum of ten (10) days of test dredging with the BELLC dredge system was planned.

The specific areas of testing for evaluation in the main performance areas included the following:

1) PCB Removal
   - Dredge production over a range of conditions
   - Dredging accuracy
   - Solids concentration of the dredge slurry
   - Recirculation system effectiveness
   - PCB removal efficiency
2) Water Quality
   - Water quality impacts within the Upper Harbor caused by dredging operations
3) Air Quality
   - Ambient air sampling at the point of dredging and at the CDF

The remainder of Section 3.0 describes dredge system performance in PCB removal. The following section, Section 4.0, describes results of water and air quality monitoring, and flux chamber sampling.

3.1 PCB Removal - Dredge Performance Testing

Overview

The PDFT testing schedule was established to ensure that dredge performance testing and monitoring required of the PDFT would be captured over 5-10 days of dredging. The actual schedule changed from an original planned schedule to incorporate modifications to dredging parameters as determined by the prior days dredging, by the PDFT team. The PDFT was scheduled to be performed in the late July 2000, early August 2000 timeframe.

The PDFT test schedule followed the chronology of events as summarized in Table 2-1.

BELLC began dredging operations in Cut 6, and after performing systems calibrations and modifications or "trial" dredging exercises over the course of August 10-13, proceeded to the east into shallower water. The easternmost cut dredged was Cut 8. Thereafter BELLC moved to Cut 5 and proceeded to the west, terminating test dredging in Cut A, in the provisional dredge area. In total, 4 days were spent performing

trial dredging during which the dredge system underwent modifications to prepare for test dredging, while test dredging was performed over the course of 5 days. The dredging progress over the duration of the PDFT in-water work is shown on Figure 3-1.

Dredge performance testing results as it relates to the actual removal and transportation of PCB contaminated sediments as observed during the PDFT are presented in this section. Conclusions and recommendations pertaining to performance values for use in designing the full scale remediation are presented in Section 6.4.

3.1.1 Dredge Production

Dredge production monitoring was performed over the course of dredging operations in the PDFT test area. Dredging was performed to obtain representative production rates over a range of conditions, including varying depths, depth of cut (bank height), and chemical and physical conditions.

BELLC collected production data using a number of electronic data collectors for the dredge systems, including flow meters, production meters, CMS, and slurry processing data. Foster Wheeler and BELLC production engineers additionally recorded excavator cycle time, and production delay data throughout the duration of the tests. Production monitoring data was summarized daily, and reviewed by the PDFT team during the daily planning meeting the following day. An example of a daily production report, for August 17, is shown on Figure 3-2. The complete production records for the PDFT are provided in Appendix E.

The production performance of the PDFT test dredge, a hybrid system involving mechanical excavation and hydraulic material transport, is based on two main processes; material excavation, and materials transportation. These processes, while integrated, should be evaluated separately, in order to more precisely determine the production limits of the dredge system as a whole. This production evaluation method can be adapted for other dredging processes involving either hydraulic dredging, mechanical dredging with barge transportation and rehandling of dredged material, or other hybrid systems. Delays due to dredge advance, debris separation, mechanical repairs, weather, navigation and other factors, can influence either or both the excavator or hydraulic transport production efficiency, as can the operational controls instituted to perform environmental dredging. The key parameters affecting dredge production on site are discussed below.

<u>Excavator Production</u>

The BELLC dredge excavation system consisted of a Caterpillar 375 LC hydraulic excavator with 4.5 cy HPG environmental clamshell bucket. The dredge was designed to provide vertical dredging accuracy exceeding +/- 0.5 ft., and horizontal dredging accuracy exceeding +/- 2 ft., through integration of the excavator and clamshell bucket with a RTK DGPS and the CMS.

The base excavator production of the dredge, which represents the fastest production rate the dredge can attain, is based on the cycle time of the grab, including time required to position the bucket over the dredge cut, lower the bucket to the desired grade, close the bucket, raise the bucket, swing the bucket to the material hopper, open the bucket over the hopper while material drains out, and return the bucket to the next dredge cut. The average digging depth of the bucket was 5 ft. below the water surface, with an average swing angle of 62 degrees. The excavator lifted the bucket 25 ft. above the surface of water.

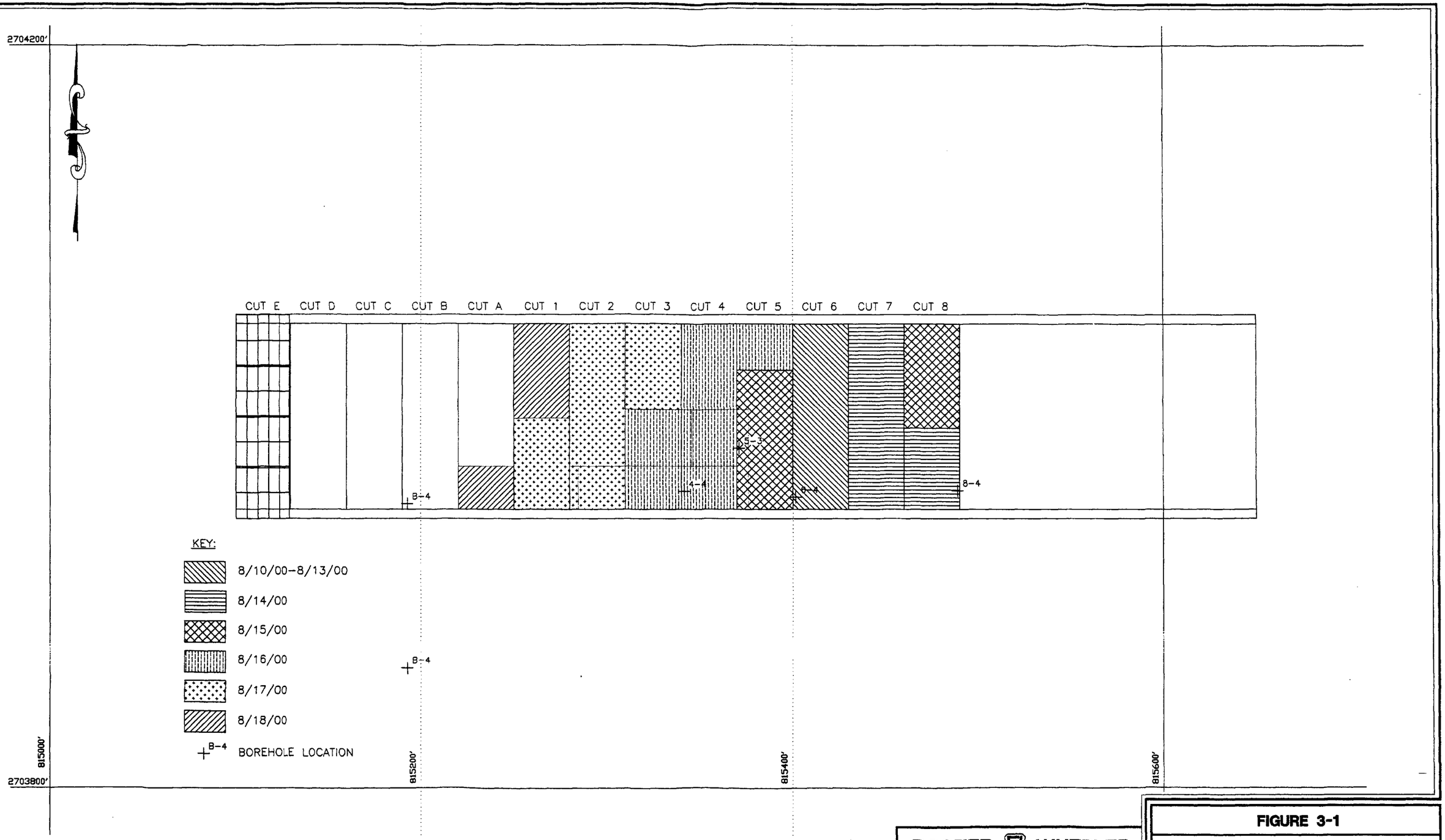


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FIGURE 3-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

DAILY DREDGING PROGRESS

SCALE: AS SHOWN

CAD FILE: 29088db004A-1.DWG

Figure 3-2
Daily Production Report, August 17, 2000

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily Production Report **Date:** **August 17-2000**

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	[1,2,3,4]	[1,2,3,4]	layer(ft)	from	till	time	description
						9:30	10:22	0:52	Start up, move dredge into position,etc
						10:22	10:27	0:05	Backwash
10:27	10:45	0:18	3	3	1.5/2.0*	10:45	10:47	0:02	Trash on grizzley hopper
10:47	10:50	0:03	3	3	1.5/2.0*	10:50	11:00	0:10	Shift to Cut 3, pos 2
11:00	11:40	0:40	3	2	1.7	11:40	11:45	0:05	Shift to Cut 3, pos 1
11:45	12:07	0:22	3	1	1.7	12:07	12:09	0:02	Backwash
12:09	12:23	0:14	3	1	1.7	12:23	12:41	0:18	Shift to Cut 2, pos 1
12:41	13:08	0:27	2	1	1.7	13:08	13:50	0:42	Clean Rockbox
13:50	13:56	0:06	2	1	1.7	13:56	13:59	0:03	Backwash
13:59	14:10	0:11	2	1	1.7	14:10	14:19	0:09	Shift to Cut 2, pos 2
14:19	14:31	0:12	2	1	1.7	14:31	14:34	0:03	Trash on grizzley hopper
14:34	14:38	0:04	2	1	1.7	14:38	14:49	0:11	Trash on grizzley hopper,karts,cable,chain
14:49	14:55	0:06	2	1	1.7	14:55	15:00	0:05	Trash on grizzley hopper
15:00	15:06	0:06	2	1	1.7	15:06	15:08	0:02	Trash on grizzley hopper
15:08	15:32	0:24	2	1	1.7	15:32	15:40	0:08	shift to Cut 2, pos 3
		0:00				15:40	15:44	0:04	Fuel Cat 375
15:44	16:22	0:38	2	3	1.7	16:22	16:28	0:06	Shift to Cut 2, pos 4
16:28	16:49	0:21	2	4	1.7	16:49	16:51	0:02	Trash on grizzley hopper
16:51	16:55	0:04	2	4	1.7	16:55	16:57	0:02	Trash on grizzley hopper
16:57	17:01	0:04	2	4	1.7	17:01	17:40	0:39	Shift to Cut 1, pos 1
17:40	18:04	0:24	1	1	3.0	18:04	18:08	0:04	Backwash
18:08	18:29	0:21	1	1	3.0	18:29	18:46	0:17	Backwash
18:46	18:54	0:08	1	1	3.0	18:54	18:59	0:05	Shift to Cut 1, pos 2
18:59	19:04	0:05	1	2	3.0	19:04	19:07	0:03	Shift correction due to failing boat
19:07	19:22	0:15	1	2	3.0	19:22	19:24	0:02	Backwash
19:24	19:45	0:21	1	2	3.0	19:45	19:53	0:08	Backwash
19:53	20:06	0:13	1	2	3.0				
	total:	6:07					total:	4:29	

REMARKS:

Dredge pos. 3 redredged from 1.5' to 2'; after grab sample had shown the bottom not to be clean.
15:45 Support vessel Miami grounded creating turbidity
All day delivery of fuel and water supply with Miami and barge creating local turbidity
Spud position 1 left vertical cut on West side and graded cut on North side

The average cycle time of the 375 LC for this cycle is around 40 seconds for normal digging without environmental operational controls (Caterpillar, 1998). During actual dredging operations, as seen over the course of the PDFT, the excavator cycle time will be affected primarily by the depth of cut, operational controls due to environmental safeguarding, and operator skill. The overall excavator production rate is affected by cycle time, dredge movements and positioning, layer height of the grab, and material hopper capacity. In practice, other delays, including weather, mechanical problems, and logistics can impact excavator production. The average cycle time per grab of the BELLC dredge as recorded on the day with the greatest production (August 17), was 120 seconds. Excavator production calculations are based on the volume of material dredged as defined by the variance between pre- and post-dredge surveys and the net operational (effective) hours of the excavator between those surveys. Excavator production for the PDFT has been calculated for each day and expressed in cubic yards per net operational (effective) hour. During the initial days of trial dredging, August 11-13, no significant, representative running time was achieved due to system debugging and operator learning, and post-dredge surveys were not completed. Post-dredge progress surveys, performed for the purposes of assessing dredging accuracy and dredge production began on Monday, August 14, 2000.

The total volume of material dredged between August 14 and August 18, as determined by comparison of pre-dredge and post-dredge hydrographic surveys was 2,308 cy. The average hourly production rate for the excavator *alone* over this period was 80.3 cubic yards per hour (cy/hr.). On the final day of dredging, August 18, the excavator production averaged 106.1 cy/hr. The processes affecting the overall dredge production are discussed below.

Dredge Movements and Positioning

Dredge cuts within the PDFT area were set at 30 ft. wide x 100 ft. long. The width of the dredge cut corresponded to the width of the moonpool. As the total width of the moonpool was 40 ft., extra space was available for completing to required depth (grade) an adjacent cut while set over the subject cut, or to allow the dredge some freedom of movement relative to the dredge cut. One dredge cut consisted of four barge- or "spud" positions, as dictated by the 30 ft. length of the moonpool. "Shifting" of the barge was guided with the aid of a gyrocompass repeater and the computer display of the CMS. The CMS provided the operator and the SPU operator a heads-up display, in real time of the dredge in relation to the dredge area. During dredge shifting, a smaller scale on the monitor of the CMS computer system was selected to obtain a plan view image of the dredge in relation to the target dredge cut. Shifting between spud positions within a dredge cut was accomplished by lifting the spuds alternatively and pivoting the barge with one of the winches. A shifting pattern was developed by BELLC for the test dredge that permitted the dredge to remain on line with the dredge cut. The shifting pattern of the BELLC Test Dredge was somewhat unconventional due to the wide barge width relative to the barge length. The shifting patterns used to keep the dredge in line while shifting are presented in Appendix D. The actual shifting patterns employed to move the dredge between spud positions during the PDFT were observed to vary depending on the desired dredge orientation position relative to adjacent cuts (i.e., pickup material in adjacent cuts).

The position of the BELLC dredge while in the PDFT area was maintained by two spuds located on either side of the dredge. The spuds were lifted by means of hydraulic driven winches. To provide barge propulsion during shifting, four 500-lb. anchors were set. Where bottom material was too soft to permit good anchoring, as is the case along the western side of the Upper Harbor, the techniques of using either dual anchors, or land anchors were employed. Two (2) two-drum diesel anchor winches were installed on each side of the barge and used to pay in and pay out wire rope to advance the dredge into the dredge cut. Shifting from one dredge cut to another or outside the dredge area (to allow for surveys) was accomplished by lifting both spuds with anchor winches. Where the anchors could not support a full shifting load, or when the dredge would move over distances outside the anchor setup, the dredge tender

"Miami II" was used to provide propulsion. When the dredge was positioned in a new area, the anchors would be reset and the dredge would have a range within which to move.

The time required to make a shift (spud position change) was measured to take between 6 and 10 minutes. Dredge advance time and alignment became better with crew and dredge operator practice. The time required to move the dredge out of the cut depended on a number of factors, most significant of which was the available stopping force of the anchor. If the anchor slipped at all, the dredge had significantly less control of it's advance movement, and would require a reset of the anchor and/or vessel assist for propulsion into the next cut. It should also be pointed out that for the PDFT, short (100 ft.) cutting lanes were established, relative to the lanes that would be established on the full scale project. Longer lanes would translate into less anchor setting, higher productions and cleaner bottom surfaces. The full scale dredge plan would attempt to achieve cut lanes of up to 500 ft. in length or more.

Depth of Cut

An important element directly influencing the production of the excavator is the depth of cut to be removed. The depth of cut is alternately called the layer thickness or bank height. In the PDFT test area the depth of cut ranged from 1.7 ft. to 4.0 ft. Excavating a thicker layer means that more volume can be dredged before the dredge has to be shifted to a new position, and subsequently, less time is lost for shifting per volume of dredged material. Full bucket grabs also translates into higher production, whereby delivery of as much material as possible is accomplished with minimal entrapment of water.

Operation of the BELLC dredge in environmental (accurate) dredging mode, involved importing DTM data showing the bathymetry of the test area bottom surface, with the dredge plan showing area and vertical extent of cuts, in the dredge's CMS. The dredge plan was based on the results of the PCB characterization and input from USACE, Foster Wheeler, and BELLC as to the aerial extent and depth of cut. The bottom elevation of the cut was defined as depth of cut beneath the bottom surface, calculated by subtracting the depth of cut from the bathymetry. This target elevation was also shown in the CMS, for dredge operator guidance.

The bank height (depth of cut) that provided a full bucket for the 4.5 cy HPG bucket was 14 in. For the PDFT however, and likely for the full scale project, removal of layers of a height less than that which would provide a full bucket was instituted to reduce spillage of material. A layer height of 12 in. was targeted by BELLC to achieve good production with minimal spill, and avoid development of windrows, and to minimize impacts to water quality. A layer height of 12 in. provides a bucket that is approximately 75% full. A 100% bucket fill may cause the squeezing out of material and leave windrows on the bottom surface. An initial minimal overdepth (3-4 in.), was taken into account, as the goal was to deliver a "clean" bottom, to provide for inaccuracies in the different steps of the removal process, namely core sampling, surveying and dredging.

During dredging along the boundaries of a cut, step cuts, which provide a means of creating a slope by dredging a "stairstep", were made to avoid vertical walls of greater than 1 foot height, which might collapse or erode easily. Dredging was initially made in Cuts 6, 7, 8, and 5, respectively as close as possible to the target dredge level, using the dredge plan. Once it was realized that a native, uncontaminated clay layer was not as thick as that indicated in the sediment characterization plots, possibly due to smearing in the core tube, the dredge level in dredge Cuts 2, 3 and 4 changed from one based on the theoretical plan to one based on observation. When the operator encountered clay, as evidenced by deposition on the material hopper grizzly, dredging proceeded no deeper in that grab position. Where the clay layer occurred at more than a few inches from the planned theoretical dredge level, the target level was adjusted within tenths of a foot of the visual observation on the next, adjacent spud or "moonpool" position (1/4 of a dredge cut), in an attempt to minimize the removal of the

underlying clay, which had been tested in the laboratory to be "clean". This visual observation method of determining dredge depth was applied in Cuts 2, 3 and 4. In these cuts, the depth of cut was reduced from a planned 2 ft. cut, to a 1.7 ft. and 1.8 ft. cut. This visual technique of dredging did not appear to impact production, so long as the crane operator was given clear and quick instruction on the "new" dredge elevation, by means of rapid update of the CMS, a process that was observed on the BELLC dredge. The dredging accuracy and PCB removal efficiency results of the PDFT, including in Cuts 2, 3, and 4, appeared good, and are presented in Sections 3.1.2 and 4.2, respectively.

To assess the dredge production as a function of depth of cut (bank height), productions were evaluated for the period August 15-17, a period over which the excavator production varied between 60 cy/hr and 85 cy/hr. During this period the depth of cut, that is the layer height to be removed within a cut, ranged between 1.7 ft. and 2.0 ft. On August 18, dredging in Cuts 1 and A, where the depth of cut was between 3 ft. and 4 ft., the excavator production increased to 106 cy/hr.

Sediment Type

The type of sediment dredged over the course of the PDFT did not appear to impact excavator production one way or the other. In either soft black silt, sand, shell, or clay, the HPG bucket had no problems removing the material. Delays due to material type were encountered on the SPU end of the process as discussed below.

Water Depth

Excavator production will decrease with increasing water depth by the amount of time required to lower and raise the bucket from the bottom. The lowering and retrieving rate of the bucket is a function of the machine selected to operate the bucket, and even more importantly, any operational controls that may be instituted to slow the rate of descent and retrieval in order to maintain air and/or water quality standards.

The production of the BELLC dredge developed and mobilized to the site was limited by draft to work in areas generally deeper than 4 ft. The average draft of the dredge, with fully loaded hopper and fuel tanks was calculated to be approximately 2.5 ft. and was measured to vary between 2 ft. and 4 ft. depending on where along the barge the draft measurements were taken and the level of dredged material in the hopper. As most of the dredge system weight was located at the port forward corner of the dredge, centered on the material hopper, the draft was greatest at this corner of the dredge.

In general the dredge was observed to list forward and to port during all dredging operations. It is believed that with more involved design of the dredge system for a project of greater magnitude than the field test, a barge platform could be constructed with lighter equipment and greater footprint that would float level and draw significantly less water, perhaps 2 ft. or less.

3.1.2 Positioning and Dredging Accuracy

Key to the success of the New Bedford Harbor full-scale remediation will be the ability of the selected dredge(s) to minimize the amount of overdepth dredging while still attaining the target cleanup goals of the project. The BELLC hydraulic excavator dredge was selected for pilot testing, in part, to demonstrate that a mechanical bucket operated from an excavator with rigid connections and state-of-the-art positioning could achieve dredging accuracy exceeding 6 in. in the vertical plane and 24 in. in the horizontal plane.

Real Time Kinematic Positioning (RTK)

An RTK positioning system (Sercel Aquarius RTK) was used to provide the horizontal and vertical positioning for the CMS. At the Sawyer Street Site an RTK differential station was installed to provide the RTK Mobile receiver with the necessary corrections to obtain the required precision.

Horizontal and vertical control was established, for both dredging and surveys, by use of Bench Mark "J " provided by the USACE. The Massachusetts State Plane coordinates for Benchmark "J" are 2,701,124.58 Northing and 814,466.42 Easting, which is located near the Coggeshall Street Bridge in the Upper Harbor. Before starting the PDFT, four (4) hours of position data logging was carried out on the benchmark with this RTK system to confirm vertical control accuracy. The results are shown in Appendix G, Figure G-1.

Crane Monitoring System (CMS)

The CMS requires several input parameters that are measured by a number of sensors. A schematic drawing showing the CMS input parameters is provided in Figure 3-3. The CMS combines signals from the excavator boom, stick, and bucket hinges, signals from the swing of the excavator, the horizontal and vertical position of the RTK antenna, and the list, trim and orientation of the barge. The precise installation and calibration of these sensors determine the accuracy of the CMS. Each sensor was calibrated before installation on the BELLC test dredge. After installation of all the equipment a field calibration was executed. Horizontal and vertical control of the CMS systems was confirmed daily while the test dredging was underway.

Dredge Positioning

Dredge positioning was established using the CMS with input from the RTK system. The CMS, through use of a heads up computer display terminal, provides the crane operator excellent control of the bucket while dredging, showing where the bucket is in both horizontal and vertical planes, in real time. The CMS display monitors were also provided in the control room and the visitor's room during the PDFT. Figure 2-5 shows the typical CMS screen in the operator's cab.

Use of the CMS system allowed the crane operator or "leverman" the ability to "see" where the bucket was in relation to the dredge cut, vertically and horizontally. In general what was seen on the screen, that is the depth of cut attained by the operator, was generally within 2-4 in. of the actual depth of cut as determined by the daily progress hydrographic surveys. The CMS also provided the operator the ability to see where he had dredged in the horizontal plane, and was able to minimize searching for the next dredge cut.

The CMS was also used effectively for shifting the dredge into the next spud position. Generally, the SPU operator would direct the barge movements from the SPU control room, the highest point on the dredge. Before shifting the top-view picture of the barge and dredge area was set to a smaller scale, to provide an overview figure of the barge and the dredge area. The bearing of the barge was indicated by a digital repeater of the gyro compass.

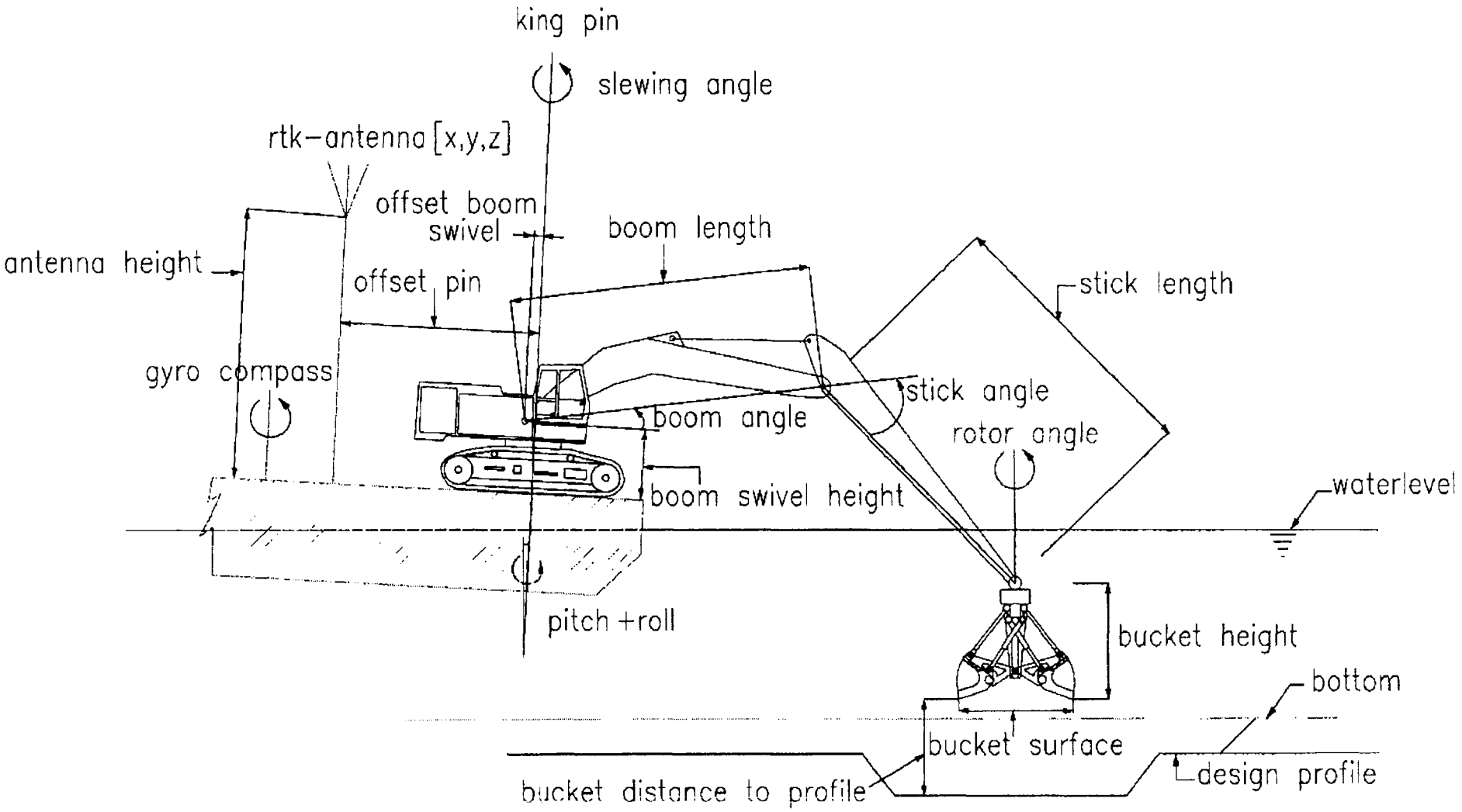

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FIGURE 3-3

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CRANE MONITORING SYSTEM MEASUREMENTS

NOT TO SCALE

CAD FILE: NBH IMAGE 1.DWG

Hydrographic Surveys

The dredging process was monitored by hydrographic surveys. USACE Class 1 Hydrographic survey methods were employed to ensure optimal survey system accuracy. The USACE Class 1 Hydrographic Method requires survey accuracy of better than +/- 2 ft. horizontally and +/- 0.5 ft. vertically. The error (accuracy) of the positioning system used by BELLC in the dredge accuracy evaluation, as demonstrated in system calibration routines (Appendix G, Figure G-1) was +.1/-.08 ft. vertically and +.26/-.1 ft. horizontally. The horizontal positioning of the echosounder transducer was defined by means of a Trimble DGPS system. The DGPS antenna on board the survey boat was mounted vertically above the echosounder transducer. For vertical positioning a benchmark near the office site was created and a tide board close to the dredge area was installed. Before every survey a bar-check to calibrate the echosounder and a position check were carried out. During surveys tide readings were registered and used for post processing of the survey data.

Survey Results

All survey data was post processed and incorporated into a DTM to compare various survey surfaces and design surfaces, and generate cross sections of the dredge cut area.

During analyses of the survey results by BELLC it appeared that the horizontal position data recorded over the course of the survey program had a systematic time delay of approximately 0.4 seconds in comparison with the recorded depth data. The final post-dredge survey results reflect the correction to this time delay. A final confirmatory post-dredge survey of the PDFT test area was also conducted by the USACE and showed good agreement with the BELLC survey.

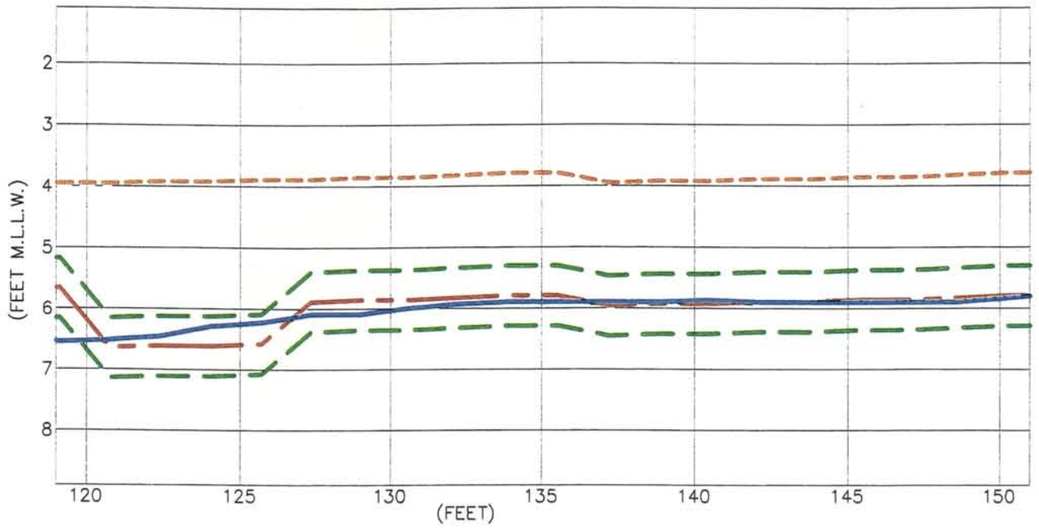
The entire set of hydrographic survey results across the PDFT test area are presented in Appendix H. Only surveys of Cuts 5, 6, 7 and 8, where the focus of the PDFT was dredging accuracy to the target depth, were used for the purposes of assessing the dredging accuracy performance of the BELLC dredge.

Dredging Accuracy

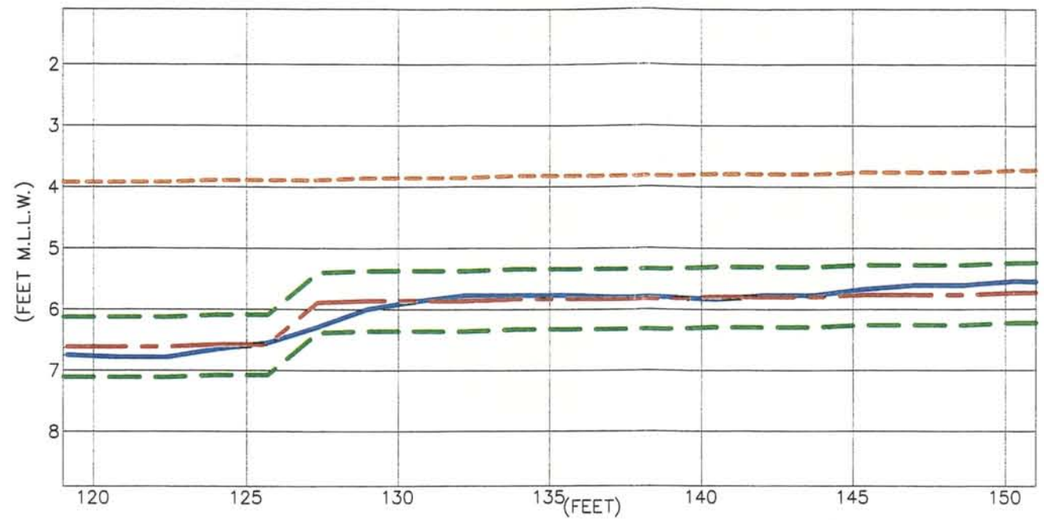
Figures 3-4 through 3-7 show the pre- and post- dredge survey and target elevation cross sections for Cuts 5, 6, 7 and 8 used to evaluate the accuracy of the BELLC test dredge. Additional survey data generated for the PDFT is provided in Appendix H.

As can be seen from the cross sections in particular, the dredge performed very well in terms of vertical dredging accuracy. Overall a +/- 3-inch vertical dredging accuracy was demonstrated across Cuts 5, 6, 7, and 8. A +/- 4-inch vertical dredging accuracy was demonstrated across the entire PDFT test area by the BELLC dredge.

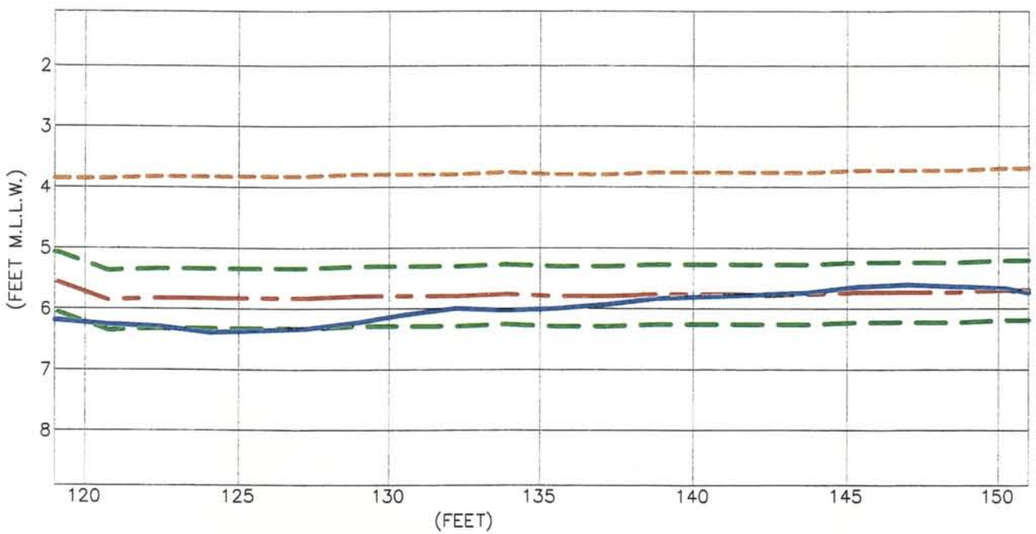
Additional accuracy evaluation was carried out by BELLC which was based on comparison of the post-dredge survey with the target depths for Cuts 6, 7 and 8. The DTM compared 700 points across the 30 ft. x 110 ft. cut area. The % occurrence histograms showing that 95 % of the data points are within 6 in. of the target depth, and 90% are within 4 in. Most of the points that deviate more than 6 in. are in the slope area, on the north and south ends of the cut. The results of BELLCs accuracy evaluation are provided in Appendix G.



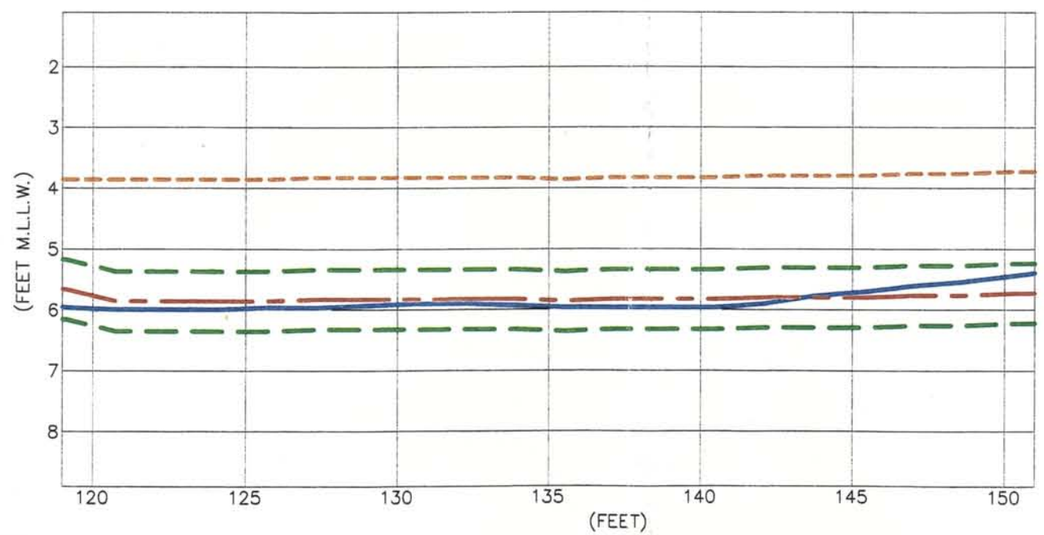
CUT 5 STATION 20



CUT 5 STATION 40



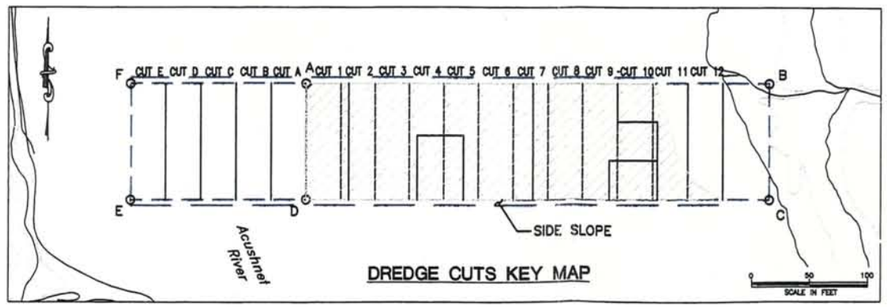
CUT 5 STATION 60



CUT 5 STATION 80

LEGEND

- Pre dredge survey 08/05/00
- Post dredge survey 08/19/00
- Target depth
- Target depth +/- 6 inches



DREDGE CUTS KEY MAP

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NEW ORLEANS, LA 70130

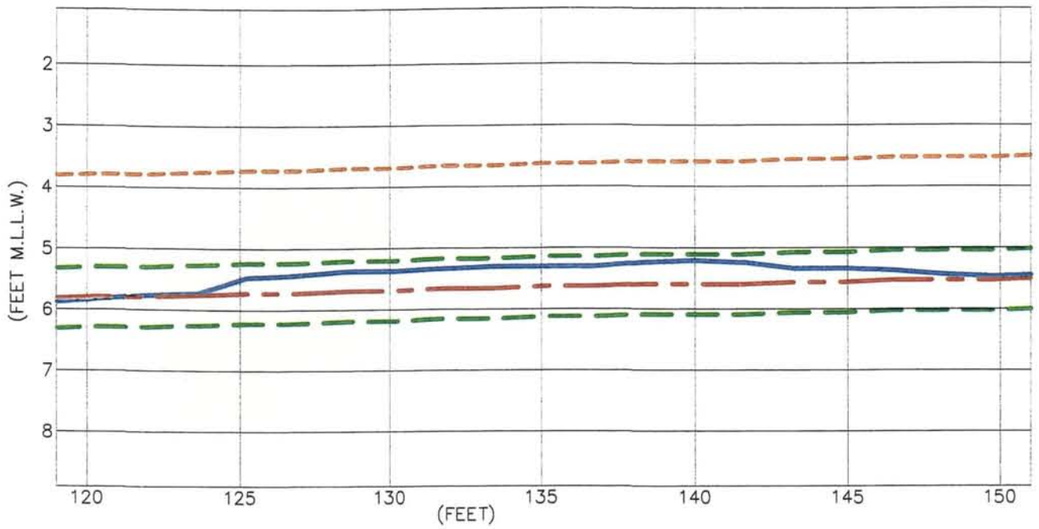
FIGURE 3-4

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

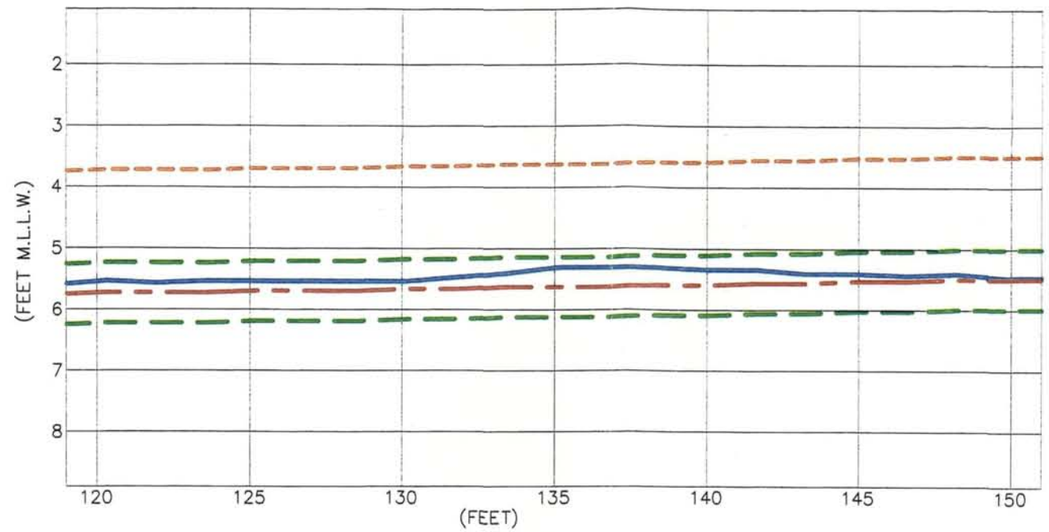
CUT 5
CROSS SECTIONS

SCALE: AS SHOWN

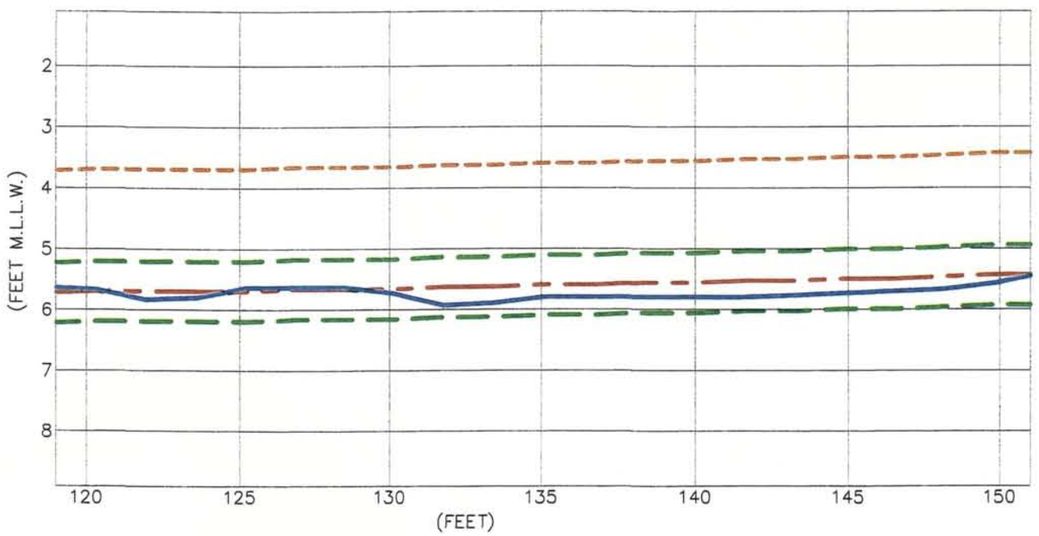
CAD FILE: MNBETS03-1A.DWG



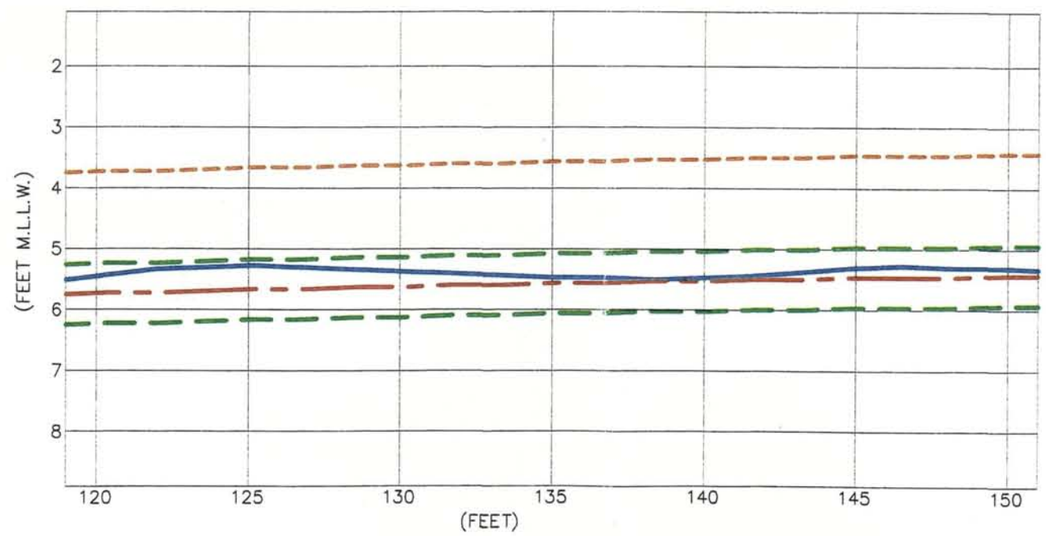
CUT 6 STATION 20



CUT 6 STATION 40



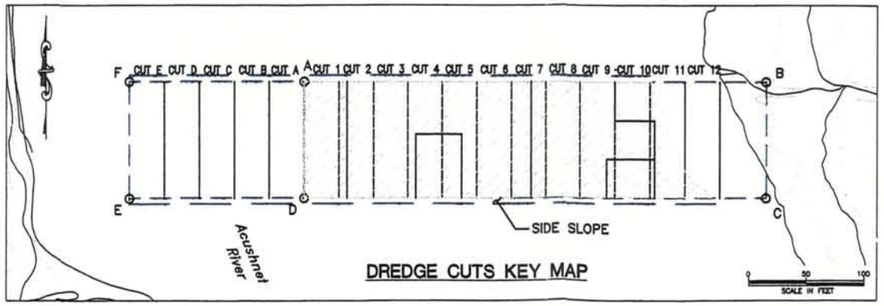
CUT 6 STATION 60



CUT 6 STATION 80

LEGEND

- Pre dredge survey 08/05/00
- Post dredge survey 08/19/00
- Target depth
- Target depth +/- 6 inches



DREDGE CUTS KEY MAP

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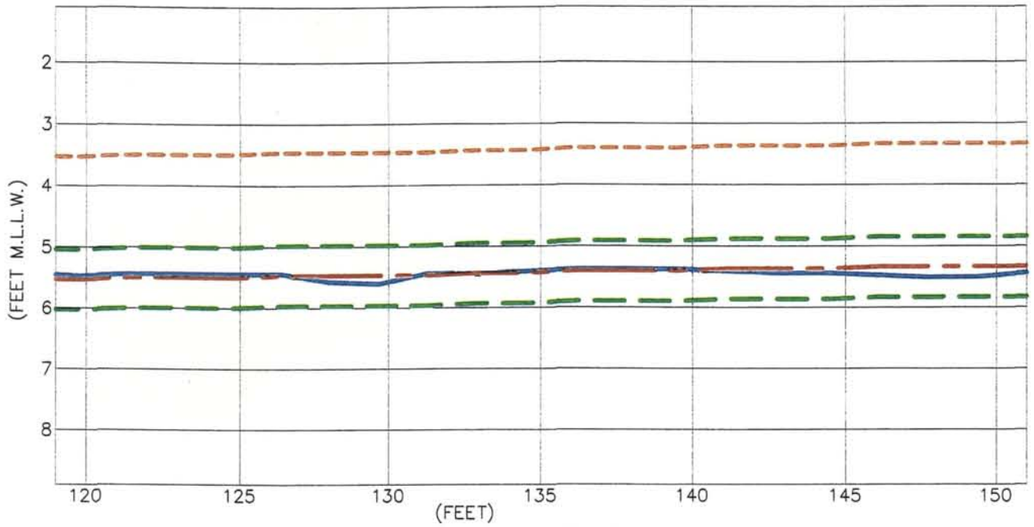
FIGURE 3-5

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

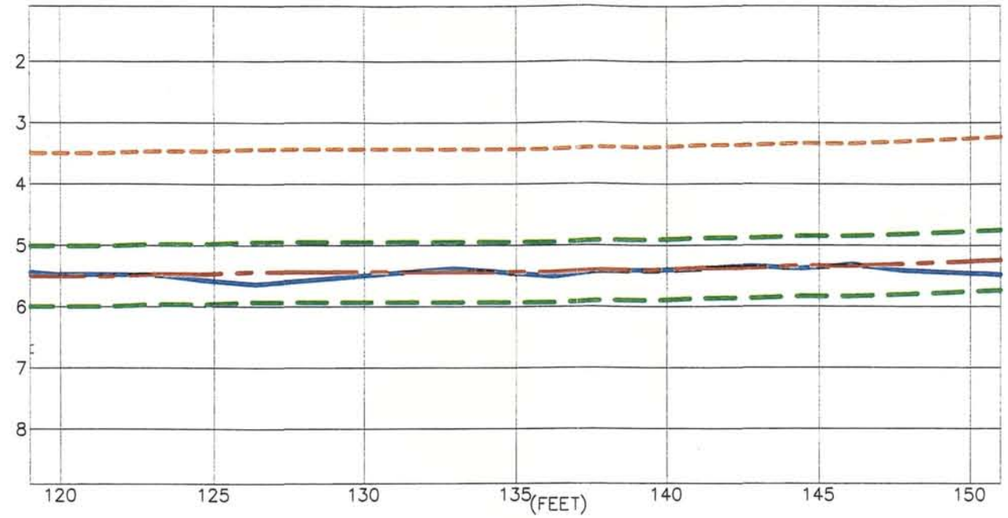
CUT 6
CROSS SECTIONS

SCALE: AS SHOWN

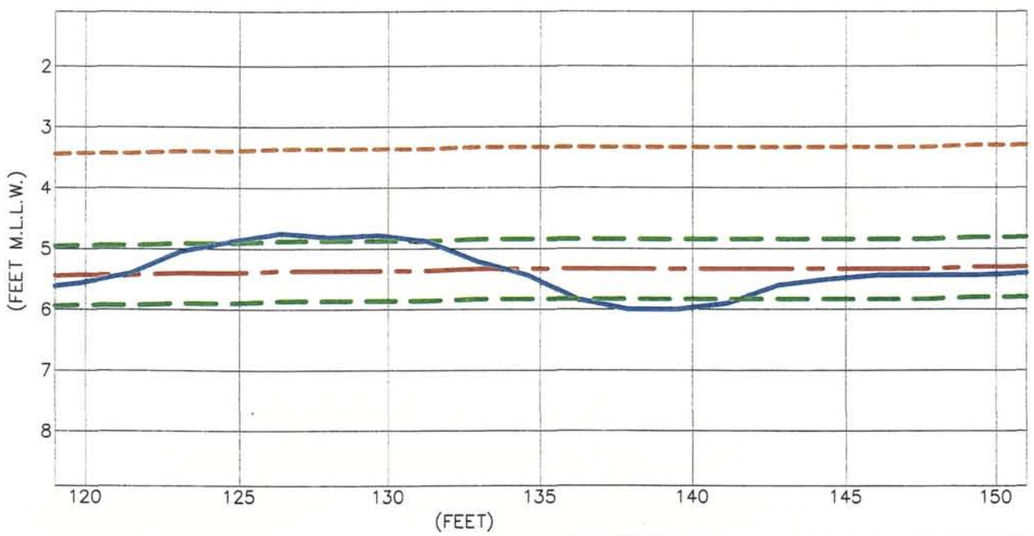
CAD FILE: MNBETS06-1A.DWG



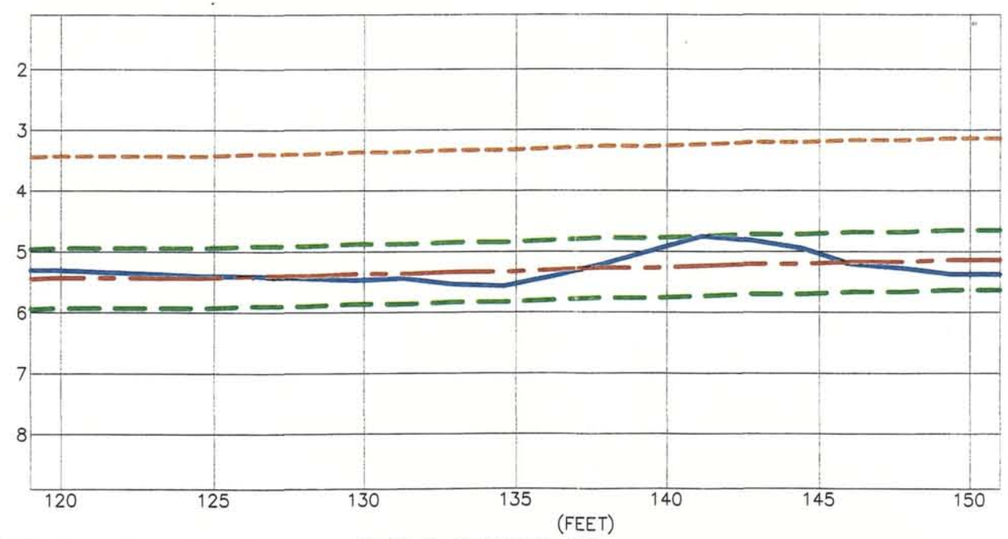
CUT 7 STATION 20



CUT 7 STATION 40



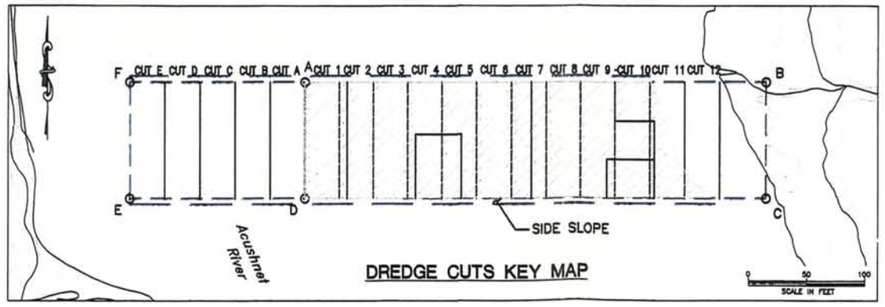
CUT 7 STATION 60



CUT 7 STATION 80

LEGEND

- Pre dredge survey 08/05/00
- Post dredge survey 08/19/00
- Target depth
- Target depth +/- 6 inches



DREDGE CUTS KEY MAP

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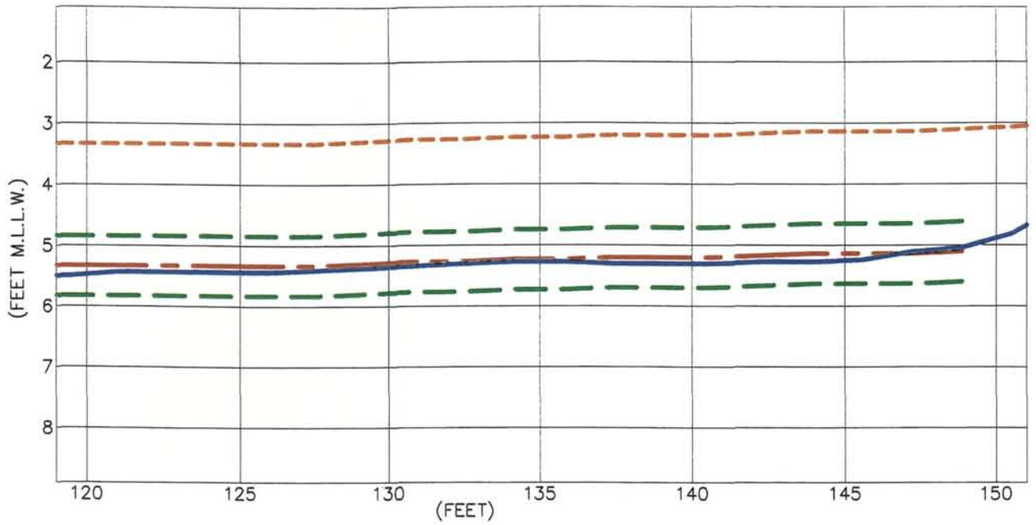
FIGURE 3-6

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

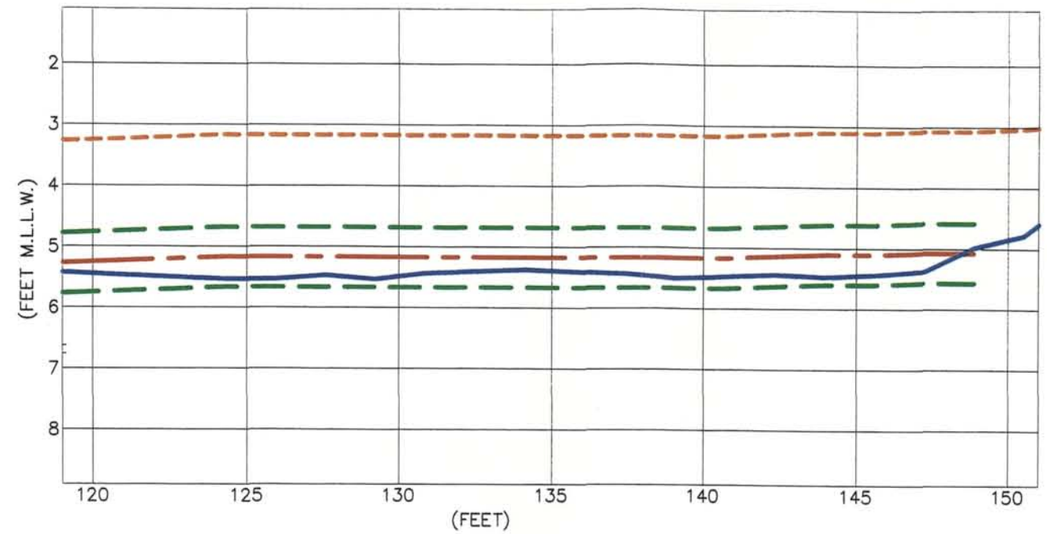
CUT 7
CROSS SECTIONS

SCALE: AS SHOWN

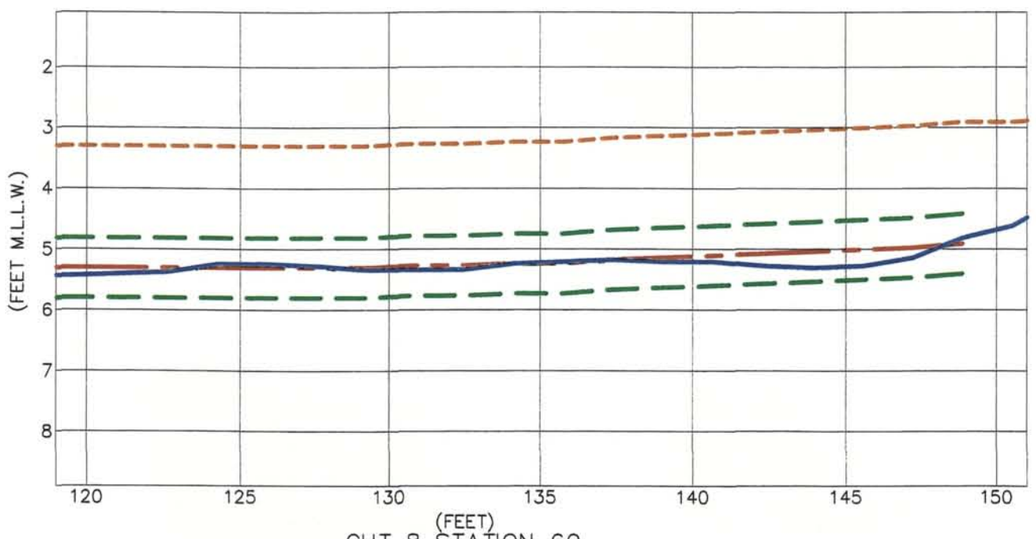
CAD FILE: MNBETS09-1A.DWG



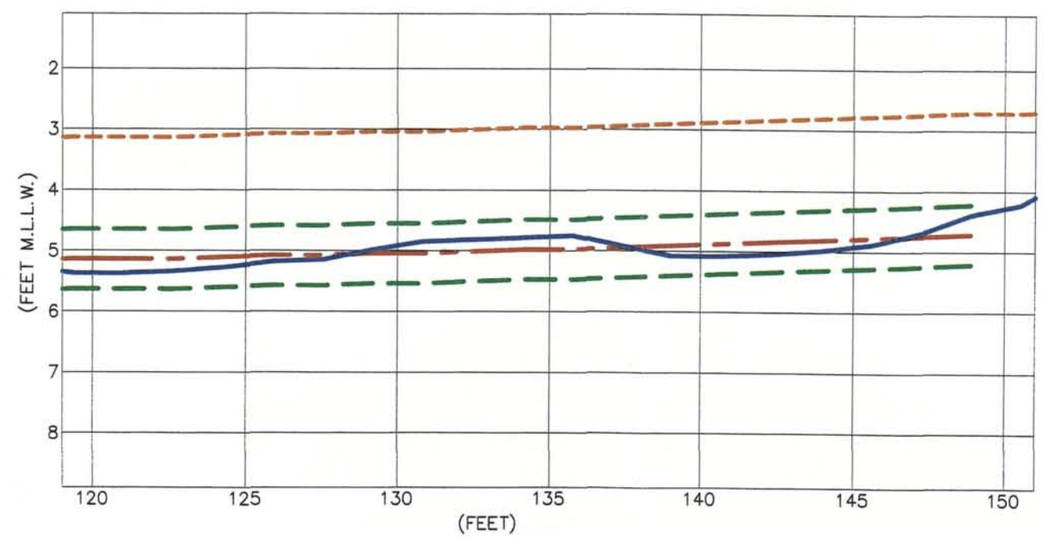
CUT 8 STATION 20



CUT 8 STATION 40



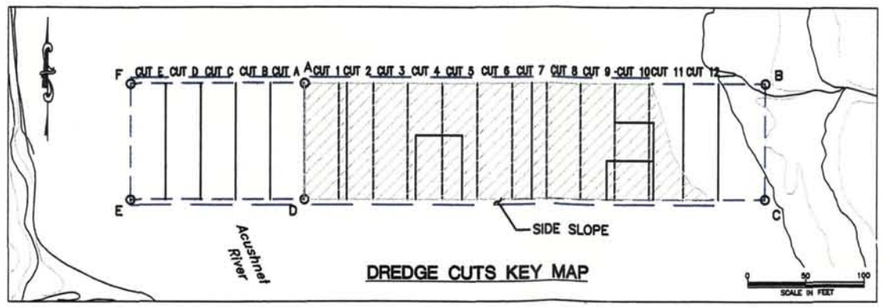
CUT 8 STATION 60



CUT 8 STATION 80

LEGEND

- Pre dredge survey 08/05/00
- Post dredge survey 08/19/00
- Target depth
- Target depth +/- 6 inches



DREDGE CUTS KEY MAP

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FIGURE 3-7

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CUT 8
CROSS SECTIONS

SCALE: AS SHOWN

CAD FILE: MNBETS12-1A.DWG

Correlation with PCB Removal Efficiency

Section 4.2 of this report evaluates the PCB removal efficiency of the BELLC dredge. Comparison of the pre- and post-dredge PCB concentration in the sediment within the test area indicated that approximately 97% of the PCB mass was removed from the test area during the PDFT.

After dredging Cuts 6, 7, 8, and 5, in that order, it was realized in the field that a "clean" clay layer was oftentimes higher in elevation than that shown in contamination characterization plots. Thereafter, with concurrence from the PDFT team, the field target dredge level in Cuts 2, 3 and 4 changed from one based on the theoretical plan to one based on observation. When the operator encountered clay, as evidenced by deposition on the material hopper grizzly, dredging proceeded no deeper in that grab position. Where the clay layer occurred at more than a few inches from the planned theoretical dredge level, the target level was adjusted within tenths of a foot of the visual observation on the next, adjacent spud or "moonpool" position (1/4 of a dredge cut), in an attempt to minimize the removal of the underlying clay.

This visual observation method of determining dredge depth was applied in Cuts 2, 3 and 4. In these cuts, the depth of cut was reduced from a planned 2-ft. cut, to a 1.7-ft. (Cuts 2, 3 and 4) and 1.8 ft. cut (Cut 4). In these areas, the vertical dredging accuracy decreased to an average of approximately +/- 6 in. from the target. This reduction in accuracy was observed to be a result of interruptions in the CMS system display to the operator, and personnel communication errors. It is therefore reasonable to assume, that with rapid updating of the dredge guidance system to reflect field changes in the target elevation based on visual observations of the clean clay layer, the dredging accuracy will approach that achieved in the areas where the target depth is pre-programmed into the crane operators display.

Volume Calculations

Volume calculations were conducted using the daily progress surveys and the pre-dredge survey. The dredged volumes per dredge cut were calculated using the average end area method. Based on these volume calculations, presented in Appendix I, the total volume of *in situ* material removed from the PDFT test area is 2,308 cy. The target volume of material to be removed, based on the final, actual depth of cut targeted across the PDFT area dredged, was calculated to be 1,985 cy. Comparison of this target volume with the actual volume dredged yields an overdredging value of 16%.

3.1.3 Slurry Processing Unit (SPU) Production

Minimization of the amount of water added to the dredged material is a focus area of the PDFT and the design of the full-scale remediation project.

While mechanical excavation delivers dredged material in as close to *in situ* water concentrations as possible, with minimal entrapment of water, the transportation of mechanically dredged material is typically by barge. Due to the shallowness of the Upper Harbor, barges with material capacity to maintain adequate production cannot navigate the upper harbor waters without adversely impacting water quality.

The Bean patented SPU system is a proprietary hydraulic slurry transport system that delivers high percent solids concentrations, by introducing controlled amounts of water to mechanically dredged material. The SPU measures and monitors the *in situ* water content of the material dredged and placed in a hopper, and injects only as much water as is necessary to keep the slurry moving to the treatment and disposal site, at a specified % solids concentration. The *in situ* material conditions dictate the theoretical maximum achievable slurry density. It is not possible to achieve solids concentrations that are higher than that of the *in situ* material.

The dredged material removed from the dredge cut was placed on the grizzly of the material hopper, where it began the debris separation and material transport phases of the dredging process. Debris larger than 6 in. x 6 in. were screened off the surface of the material hopper and placed in the adjacent debris container for ultimate transport and disposal at the Sawyer Street CDF debris disposal area (DDA).

Loading

The SPU production was directly related to the excavator production. To achieve optimum production for the material transport phase of the process using the SPU, the material hopper was to be kept loaded with dredged material (slurry) continuously, to create a buffer of material to be transported. The hopper capacity was 20 cy, therefore the excavator would require approximately 12 minutes to load the hopper, assuming buckets are loaded 75%. During the field test, the hopper was loaded at a rate ranging from approximately 60 cy/hr to 105 cy/hr, depending on the factors discussed in excavator production above, as well as by the efficiency of the debris separation phase at the hopper grizzly.

Debris Separation

Debris with dimensions larger than 4 in. was expected to cause clogging and required clearing in the SPU system during the hydraulic transport, and was therefore removed out of the system at the following locations:

Coarse debris (greater than 8 inches)

A pre-fabricated 6-inch x 6-inch grizzly screen was installed on the top of the hopper. To remove debris from the screen, a mini excavator was installed next to the grizzly to pick-up debris and to deposit it into the trash bin staged next to the hopper. Over the course of dredge testing during the PDFT, material clogging of the grizzly screen was occurring when the gray clay layer was encountered and deposited on the screen. The clay was cohesive and stiff enough that the screen opening would become clogged and not permit the passage of looser material. To remedy this problem, two (2) modifications were made to the mini excavator. First a water jet hose was installed from the water injection manifold, charged with recirculation water, to the end of the mini excavator arm, to be used as an instrument in breaking up the clogged clay. A flat steel plate was also welded onto the backside of the mini excavator bucket, to close the gaps between the bucket teeth, and provide a tool surface which the mini-excavator operator could "mash" the clay through the screen with. Any debris that was separated out by the grizzly, including larger cobbles, metal debris such as chain and wire rope, shopping carts, tires, wood and plastic sheets, was washed with the waterjet, and was deposited into the trash bin, next to the grizzly.

Despite the field remedies implemented to streamline the debris separation phase, some delay was caused by the inability of the grizzly screen to pass dredged material into the hopper such that hopper capacity was not sufficient to continue the hydraulic transport process. For a full scale dredging operation it was suggested by BELLC that, based on site conditions encountered, a different type of debris separation system, such as a vibrating screen, or rotating drum screen, may provide more efficient results.

Figure 3-8
Clearing Rockbox of Debris, note cobbles at base of Rockbox

Small debris (less than 4 inches)

As the inside diameter of the discharge line was 7.13 in., another debris collector, termed the "rockbox", with a screen mesh of 4 in. was installed in the suction line between the hopper bottom and the slurry pump. A significant amount of smaller debris caused the frequent clogging of the screen in the rockbox. The debris consisted of smaller cobbles, plastic debris, horseshoe crabs and a significant amount of quahogs. After some significant downtime and impacts to the overall dredge production due to clogging of the rockbox by this smaller debris, the ultimate remedy for maintaining a clear rockbox was the installation of two additional high pressure water jets, again using recirculation water, on either side of the rock box. Additionally, by experience, the clogging could be avoided by declutching the dredge pump and backflushing the screen of the rockbox periodically. While this preventative measure did reduce the SPU production by a small amount, it was a lesser amount than that attributable to the shutdown of the system to open and clear the rock box and/or pump, a process that took between 24 to 51 minutes, depending on a number of factors, namely volume and type of debris clogging the suction line. Despite delays due to debris on the hydraulic transport process, the excavator production generally could continue most of the time due to the buffering capacity of the hopper.

One significant downtime event did occur however due to debris. On Saturday August 12, at approximately 12:20 hrs., the dredge encountered suction pressure problems on the SPU. It was not known whether this was a problem caused by debris clogging, poor pump performance or some other reason. After about 12 hrs. of downtime to not only resolve the suction pressure issue, and perform other optimization measures, it was discovered that a ¼-inch thick piece of angle iron, roughly 10 in. long by 5 in. high, had managed to pass through the grizzly screen, through the horizontal augers and become lodged in the suction line between the hopper bottom and the rockbox. Based on the photo taken below, it would appear that the metal was effectively choking the suction pipe by about 80%. The piece of metal was removed, and along with the activation of another suction jet at the base of the hopper, the suction problems encountered until that time were drastically reduced.

Figure 3-9
Steel Plate Lodged in Suction Line

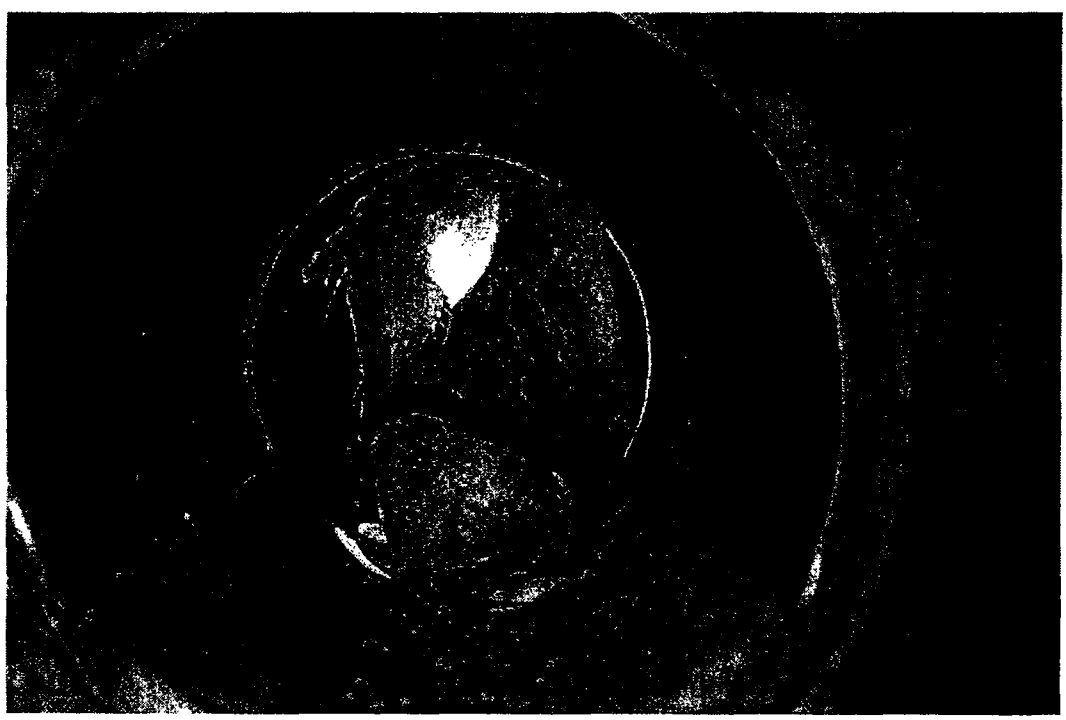
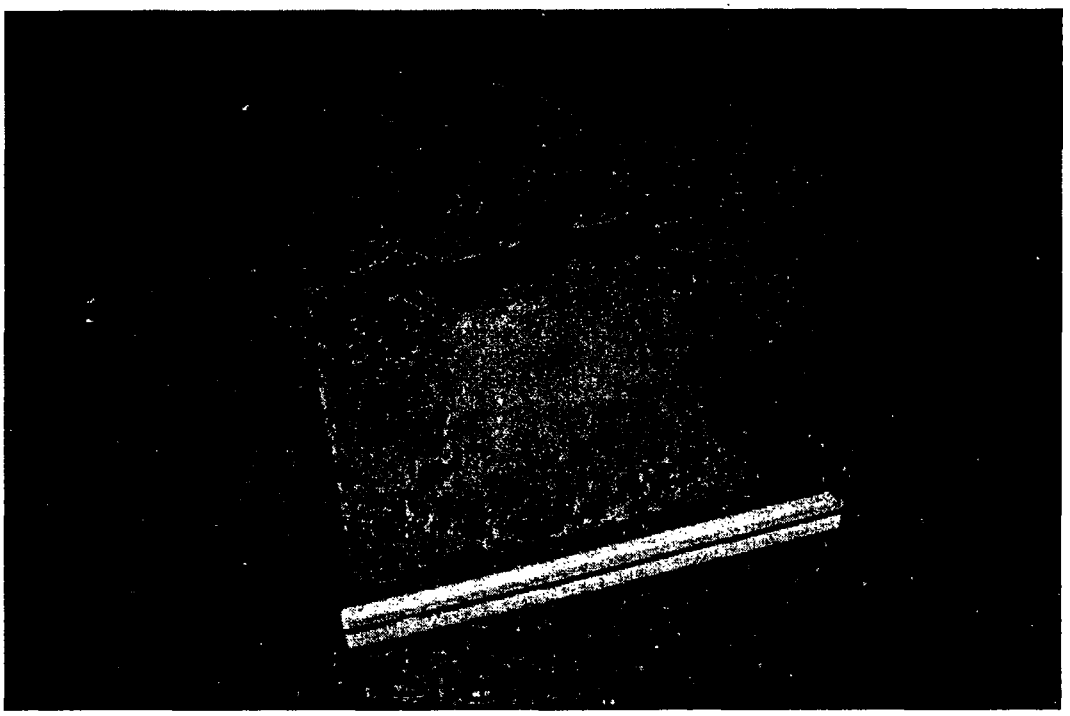


Figure 3-10
Steel Plate Lodged in Suction Line



Approximately 5 tons of debris, both separated out at the grizzly and the rockbox, were removed from the dredged material prior to pumping to shore. This quantity represents less than 1/10 of 1 percent of the total volume dredged during the PDFT.

The SPU worked properly during the dredge test and appeared to be stable in the automated mode. The SPU controls permitted easy adjustment of the hydraulic transport parameters such as discharge velocity and maximum allowable slurry density. The automated injection of recirculation water at the three supply points appeared to work correctly. All process parameters were observed clearly at the operators desk panel gauges and on the SPU computer monitor. A screen dump of the SPU controls display is presented in Figure 3-11.

The hydraulic transport capacity of the SPU was designed to be higher than the maximum excavator production, to optimize the production potential of the dredge. The design production limit is therefore on the excavator process. As a significant volume of debris between approximately 3 and 6 in. was encountered, the rockbox clogged frequently despite the adaptation of a number of jets intended to break up such clogging. As such, the dredge (SPU) operator was required to add more recirculated water than is typically necessary to move slurry without risking the plugging of the discharge pipe. In adding more water the density of the slurry, and thereby the dredge production, decreases.

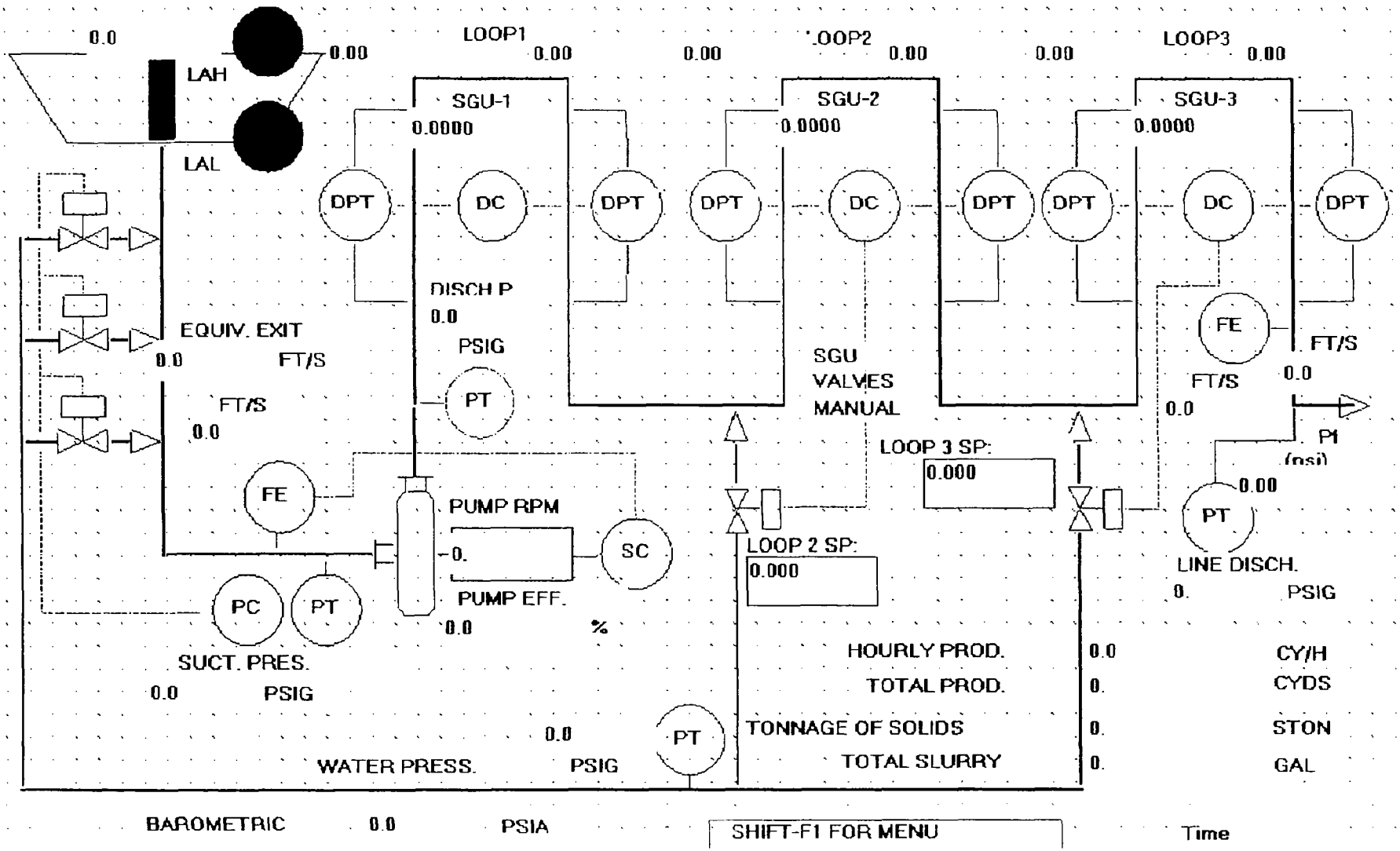


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FIGURE 3-11

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SPU CONTROLS DISPLAY

NOT TO SCALE

CAD FILE: NBH_IMAGE-1.DWG

SPU Production

SPU production is based on net operational hours of the SPU and the mass (tons) of dry solids recorded by the SPU system. The net operational hours for the SPU are based on the following selection criteria:

- SG loop 3 >1.040 specific gravity unit (SGU);
- RPM of the slurry pump >700 rpm; and
- Flow velocity in flow tube >1 ft/s.

When any or all of these criteria were not met, the SPU was not considered to be operational. In total, the net operational hours for the SPU correspond with the net operational hours of the excavator.

From the recorded flow velocity and the slurry density measured in the third specific gravity loop together with the specific gravity of the dredged material, the tons of dry solids are calculated. The SPU volumes are calculated on the basis of estimated densities of the *in situ* material based on sediment investigation results, as described in this section. SPU productions will not be the same as the excavator production therefore, which are based on the comparison of a post-dredge survey with a pre-dredge survey. An example of a daily SPU production report, for August 17, is presented in Figure 3-12. Data are presented in metric (upper portion) and English units (lower portion) in Figure 3-12.

The SPU production report provides data summarizing the period of performance of the SPU system while the dredge system is operating effectively. The production report separates out data recorded by the SPU for periods when the slurry has a specific gravity less than 1.040, when the slurry pump is turning at under 700 rpm, or when the flow velocity in the discharge pipe (flow tube) is under 1 ft./sec. Either of these conditions represent the dredge system as not working effectively.

Of interest in the SPU production report, for August 17's testing, the dredge was considered effective for 435 minutes of 559 minutes overall. By the SPU system then, the dredge's efficiency was 77.8%. During this day 2,509 cy of slurry was discharged, of which 537 cy of the slurry was *in situ* sediment moved. The average volume of slurry moved was 346 cy/hr, the average volume of *in situ* material moved was 74 cy/hr. This testing day, August 17, represented the best production day for the test dredge, and provides performance values that could be extrapolated for the full-scale remediation.

SPU Solids Concentration Results

This section summarizes and evaluates the sediment solids concentration data obtained during the PDFT. Sediment concentration data was obtained from the following sources:

- Sediment samples taken from the dredged sediments prior to dredging. This data was used to determine the *in situ* (i.e. in-place prior to dredging) physical properties.

- Measurements of slurry flow rate and slurry wet density in the discharge pipeline from the dredge (measured in "specific gravity loop 3" or "SG Loop 3" of the SPU).

- Volumes in Disposal Cells.

The actual volume of sediment dredged was determined by calculating the difference in volume between the pre-dredge and post-dredge mudline surface as measured by bathymetric surveys.

Figure 3-12
SPU Production Summary, August 17, 2000

Date: August 17 2000

Date: August 17 2000	conditions: rho_mix>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	tons dry solid/insitu volume [TDS/situ m3]					
	1015	2400	1410	49%	0.684					
total effective slurry pumping time [min]	**time period analysed [hr:min:ss]**	**Flow velocity [m/s]**	**slurry volume discharged**	**insitu Production**	**tons dry solid Production [metric tons]**	**% solids by weight loop 1 [%]**	**% solids by weight loop 2 [%]**	**% solids by weight loop 3 [%]**	**% volume concentration loop 3 [%]**	**density loop 3 [kg/m3]**
		average	average [m3/hr]	average[insitu m3/hr]	average [tons/hr]	average	average	average	average	average
total dredge period:	10:26:-19:44	1.5	265	57	39	13.67%	9.47%	13.08%	21.38%	1,099
snapshots:	11:07-11:43	1.2	213	72	49	20.19%	17.54%	19.94%	33.78%	1,148
	11:53-12:22	1.1	203	69	47	19.67%	17.60%	20.03%	33.94%	1,149
	13:55-14:35	1.4	240	61	42	16.56%	11.37%	15.44%	25.46%	1,116
	15:02-15:17	1.4	247	82	56	19.12%	16.14%	19.75%	33.28%	1,146
	16:09-16:23	1.9	332	81	56	17.26%	9.82%	15.04%	24.55%	1,112
	17:45-18:29	1.8	325	78	53	14.63%	9.75%	14.60%	23.91%	1,109
total effective [min]	total gross [min]	max	daily total [m3]	daily total [insitu m3]	daily total [tons]	max	max	max	max	max
435	559	2.1	1919	410	281	33%	31%	33%	60%	1,252

missing: datalog values between 19:44 and 20:06: estimated = 20 m3

Date: August 17 2000	conditions: rho_mix>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	short tons dry solid per insitu volume [TDS/cu-ft]					
	1015	2400	1410	49%	0.021					
total effective slurry pumping time [min]	**time period analysed [hr:min:ss]**	**Flow velocity [ft/s]**	**slurry volume discharged**	**insitu Production**	**tons dry solid Production**	**% solids by weight loop 1 [%]**	**% solids by weight loop 2 [%]**	**% solids by weight loop 3 [%]**	**% volume concentration loop 3 [%]**	**density loop 3 SGU**
		average	average [cy/hr]	average [insitu cy/hr]	average [short tons/hr]	average	average	average	average	average
total dredge period:	10:26-19:44	4.9	346	74	43	13.67%	9.47%	13.08%	21.38%	1.099
snapshots:	11:07-11:43	4.0	279	94	54	20.19%	17.54%	19.94%	33.78%	1.148
	11:53-12:22	3.8	265	90	52	19.67%	17.60%	20.03%	33.94%	1.149
	13:55-14:35	4.5	314	80	46	16.56%	11.37%	15.44%	25.46%	1.116
	15:02-15:17	4.6	323	108	62	19.12%	16.14%	19.75%	33.28%	1.146
	16:09-16:23	6.2	434	107	61	17.26%	9.82%	15.04%	24.55%	1.112
	17:45-18:29	6.0	425	102	59	14.63%	9.75%	14.60%	23.91%	1.109
total effective [min]	total gross [min]	max	daily total [cy]	daily total [insitu cy]	daily total [short tons]	max	max	max	max	max
435	559	7.0	2509	537	309	33%	31%	33%	60%	1.252

missing: datalog values between 19:44 and 20:06: estimated = 27 cy

The concentrations in the disposal cell were estimated using the data from column settling, self-weight consolidation and column consolidation tests performed on New Bedford sediment.

There are several common ways of reporting sediment "concentrations" or density. Each method has certain advantages for engineering design or construction monitoring. In the testing done during the dredge PDFT, different methods were used for (a) pre-dredge core samples analyzed in the geotechnical laboratory, (b) monitoring slurry flow through the dredge SPU during dredging, and (c) post-dredge survey and calculations. For calculating quantities of dredged material moved and for evaluating dredge production, it is necessary to convert between difference measurements and reporting methods.

In general, soil contains solid particles, water in void space between soil particles, and air in void spaces. For saturated sediment, the volume of air is zero. The top portion of Figure 3-13 shows a schematic representation of the solid and fluid that make up sediment. Table 3-1 provides a list of definitions used to discuss the results of the PDFT solids concentration study.

Results of the pre-dredge testing are reported in Appendix B and F as "wet weight" in kilograms per meter^3 (Kg/m^3), which can be converted to slurry specific gravity by dividing by 1.000. The average wet unit weight of sediment dredged each day was determined by calculating a weighted-average of the pre-dredge samples in each days dredge area. As shown in Figure 3-13, the wet weight of the sediment dredged on August 16, 2000 was 1,400 Kg/m^3. The drawing in Block 1 of the figure shows other ratios such as "concentration", "percent solids by weight", "percent solids by volume", and "moisture content". In addition to the ratios, the drawing in Block 1 shows corresponding weights and volumes of solids and pore fluid in one cubic foot of *in situ* sediment.

During dredging, slurry concentration was measured by density gauges in pipe loop 3. The flow rate and density measurements were taken continuously during SPU operation. The tables in Appendix F (Figure 3-12 is SPU Production Tables for August 17, 2000) show the percent solids at different times and also gives the calculated daily average percent solids by weight for each days dredge. The average percent solids by weight for August 16, 2000 was 13.15%. The other corresponding ratios are shown on the drawing in Block 2 of Figure 3-13. The *in situ* sediment dredged on August 16 had a concentration of 668 grams per liter (g/L) and a wet unit weight of 87.4 pounds per cubic foot (pcf) (1,400 Kg/m^3). This corresponds to 27.8 percent solids by weight and a moisture content of 110 percent.

In moving from the *in situ* concentration to the slurry concentration, the dry weight of solids is the same (41.7 pounds). Since both the *in situ* sediment and pipeline slurry are both saturated with pore fluids, the only difference in volume is due to the addition of fluid. Note that the concentration went from 41.7 pcf *in situ* to 9 pcf in the slurry and that the volume increased from 1.0 to 4.63 cubic feet (cf). In the pipeline slurry, the concentration was 144 g/L and had a wet weight of 317 pounds with a volume of 4.63 cf (68.5 pcf or 1,100 Kg/m^3). The dry weight of solids and the corresponding volume of dry solids is constant; therefore, the difference between *in situ* volume and pipeline volume is the amount of water added to make the slurry, which is 3.63 cf per cf of *in situ* sediment.

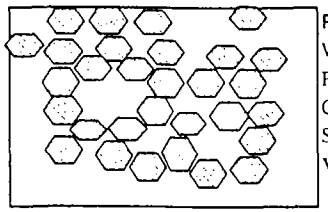
The most accurate method to determine the *in situ* volume of sediment dredged is to perform pre- and post-dredge surveys (which was done for this PDFT). However, dredging contractors need preliminary estimates of *in situ* production during dredging to better manage their work. Therefore, they use data on the flow rate and slurry density combined with data on *in situ* density and concentrations to estimate *in situ* dredge production. The results of typical calculations are shown in Figure 3-12 and the calculations for each day of dredging are shown in Appendix F. The measure values are slurry flow rate, time of discharge and slurry density (also called specific gravity of mixture). This data is used to calculate percent solids in the slurry and dry solids pumped. Finally, data on situ sediment is combined to estimate *in situ* cubic yards of sediment dredged and *in situ* production.

Figure 3-13
Sediment Volume Changes: *In Situ* to Pipeline to Disposal Cell

Phase diagram representation

Volumes		Weights
V_a	AIR (zero for saturated sediments)	W_a = zero
V_w	FLUID	W_w
V_s	SOLIDS	W_s (oven-dried weight)
V_t	TOTALS	W_t

Example particle- water structure

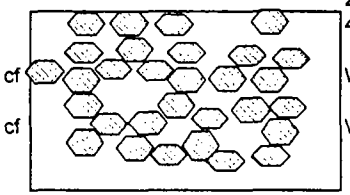


Percent solids by weight:	W_s / W_t
Water content:	W_w / W_s
Percent solids by volume:	V_s / V_t
Concentration:	W_s / V_t
Slurry density:	W_t / V_t
Volume solids (Vs)	$W_s / G_s \cdot \gamma_w$

Solids specific gravity 2.40
Fluid unit weight 63.3 pcf (1.015 Kg/m^3)

1. EXAMPLE IN-SITU SEDIMENTS
16 AUGUST 00

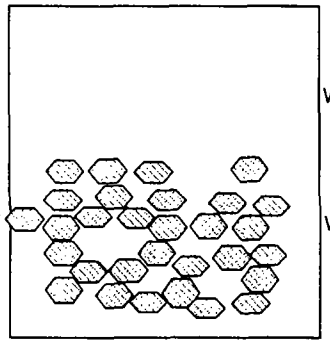
Wet weight 1400 Kg/m^3 (87.4 pcf)
C = 668 g/L or 41.7 pcf
27.8 % solids by volume
47.7 % solids by weight
w = 110 %



Vw = 0.722 cf
Vs = 0.278 cf
Ww = 45.7 lb
Ws =41.7 lb
V = 1.0 cf
W = 87.4 lb.

2. PIPELINE SLURRY
16 AUGUST AVERAGE

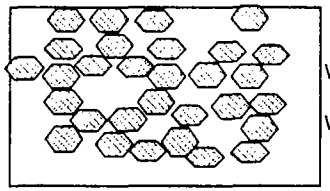
13.15 % solids by weight w = 660%
C = 144 g/L or 9 pcf 6 % solids by volume



Vw = 4.35 cf
Vs = 0.278 cf
Ww = 275 lb
Ws = 41.7 lb
V = 4.63 cf
W = 317 lb

3. IN DISPOSAL SITE
(Based on Settling Column and Self-weight Consolidation)

C = 500 g/L or 31.2 pcf
38.4 % solids by weight
20.8 % solids by volume
w = 161 %



Vw = 1.06 cf
Vs = 0.278 cf
Ww = 67.1 lb
Ws = 41.7 lb
V = 1.34 cf
W = 108.7 lb.

Table 3-1
Geotechnical Symbols and Definitions Used in the Evaluation of Solids Concentration

Symbol	Definition
W_s	Weight of oven-dried solid particles
W_f	Weight of pore fluid surrounding solid particles
W_w	Weight of pure water
V_s	Volume of compressed, oven-dried solid particles
V_f	Volume of pore fluid surrounding solid particles
W_t	Weight of solids and pore fluid
V_t	Volume of solids and pore fluids, which is total volume of sediment or slurry
V_w	Volume of pure water
P_{sw}	Percent solids by weight, which is defined as W_s / W_t times 100
w	Moisture content, which is defined as W_f / W_s. This is used in geotechnical engineering and can be greater than 100 percent.
C	Concentration or dry density, which is defined as W_s / V_t. This can be expressed as Kilograms per cubic meter (Kg / m3), gram per liter (g/L), or pounds per cubic foot (pcf).
d_t or γ_t	Wet unit weight, also called total unit weight or wet density, is defined as W_t / V_t. The symbol γ is often used for this ratio.
d_f or γ_f	Pore fluid density or fluid unit weight is defined as W_f / V_f
d_w or γ_w	Water density or water unit weight is defined as the density of pure water (62.4 pcf or 1,000 Kg / m3).
G_s	Specific gravity of oven-dried solids. This is the unit weight of dry, compressed solids divided by the unit weight of pure water. This is analogous to the unit weight of solid rock.
G_m	Specific gravity of sediment or slurry mixture. This is the unit weight of a solid/water mixture divided by the unit weight of pure water.
G_f	Specific gravity of fluid, which is the unit weight of the fluid divided by the unit weight of pure water. The value of 1.026 is typically used for seawater (64.0 pcf / 62.4 pcf). For this project, the fluid is assumed to be a mixture of fresh and salt water and a fluid specific gravity of 1.015 was used in calculations.
P_{sv}	Percent solids by volume, which is defined as V_s / V_t times 100. This is the ratio of the volume of solids divided by the volume of slurry. The volume of solids can not be measured directly, but is calculated as W_s / (G_s d_w).

Dredging contractors often use the term "percent volume" to describe the ratio of *in situ* sediment volume to the volume of the slurry mixture in the pipeline. This is a useful ratio for dredging because it summarizes the ratio of how much volume must be pumped by hydraulic dredges for each *in situ* cubic yard of sediment removed. For example, if 5 cf of slurry is pumped to remove 1 cf of sediment, then the percent volume would be 20 percent (1/5 times 100).

The dredging contractor "percent volume" does not account for solids concentrations in either the *in situ* sediment or pipeline slurry. This is not the same as the percent solids by volume defined above, which is directly related to solids concentrations. Due to potential confusion with volume percentages, these terms are not used in this report in describing concentration relationships.

In situ Sediment Concentrations

Table 3-2 summarizes the concentration data for the sediment dredged from August 13 to August 18, 2000 during the PDFT. In this table the "Given Data" are values measured during the pre-dredge sampling. The "sediment specific gravity", G_m, is the measured slurry specific gravity on the dredge in Loop 3. In the BELLC data reports, this is shown as the wet unit weight of slurry in Kg/m^3, which in metric unit is simply 1,000 times the slurry specific gravity. The "specific gravity of solids" is based on the values measured in the pre-dredge core samples, as reported in Appendix B and F. The "fluid density" is the same as BELLC used in their calculations in Appendix F. All the ratios under "Calculated Ratios" are calculated from the given values.

The sediment had *in situ* specific gravity of mixtures of 1.26 to 1.41, which corresponds to concentrations of 425 to 668 g/L, wet unit weights of 78.6 to 88.0 pcf (1,260 to 1,410 Kg/m^3), solids by weight of 33.8 to 48.6 percent, and moisture contents of 196 to 110 percent. The organic content of the sediment varied between 4 and 12%. These values are typical for very soft, silt or clay marine sediments with natural organic material.

Pipeline Concentrations

Table 3-3 summarized the concentration data for the dredged material slurry pumped from the barge (as measured in loop 3 for each day from August 13 to August 18, 2000. In this table the "Given Data" are the slurry percent solids by weight, which is measured on the barge during dredging. The sediment solids specific gravity and pore fluid density are the same values measured in the pre-dredge sampling each day.

The average solids by weight ranged from 11.0 to 13.2 percent from August 16-18, which were the days that are closest to expected production. This corresponds to concentrations of 120 to 144 g/L and wet unit weights of 67.6 to 68.5 pcf (1,080 to 1,100 Kg/m^3).

The table also shows calculated ratios for pipeline solids contents ranging from 12 to 28 percent by weight. During full scale dredging, once all system configurations have been optimized and the operators comfortable with the debris management characteristics and range of *in situ* sediment densities to be encountered during dredging, the average concentration is expected to be higher than that experienced during the PDFT test. With production solids contents of 16 to 20 percent by weight, a reasonable assumption for the full scale dredging system, the concentrations would be 180 to 230 g/L and wet unit weights would be 70 to 72 pcf (1,120 to 1,150 Kg/m^3).

Table 3-2
Calculated *In Situ* Sediment Characteristics

	GIVEN DATA			CALCULATED RATIOS						
	Sediment Specific Gravity	Specific Gravity of solids	Fluid Density (pcf)	Wet density (pcf)	Fluid Density (Kg/L)	Solids by volume (percent)	Water Content (percent)	Solids by weight (percent)	Concentration or dry density (pcf)	Concentration or dry density (g/L)
	G_m	G_s	d_f	d_t	d_f	P_{sv}	w	P_{sw}	C	C
Insitu sediment										
13-Aug	1.270	2.40	63.3	79.2	1.014	18.4	187	34.9	27.6	442.7
14-Aug	1.280	2.40	63.3	79.9	1.014	19.2	178	35.9	28.7	460
15-Aug	1.380	2.40	63.3	86.1	1.014	26.4	118	45.9	39.5	633
16-Aug	1.400	2.40	63.3	87.4	1.014	27.8	110	47.7	41.7	668
17-Aug	1.410	2.40	63.3	88.0	1.014	28.5	106	48.6	42.8	685
18-Aug	1.260	2.40	63.3	78.6	1.014	17.7	196	33.8	26.5	425
C	1.10	2.40	63.3	68.6	1.014	6.2	642	13.5	9.2	148
A	1.15	2.40	63.3	71.8	1.014	9.8	390	20.4	14.7	235
L	1.20	2.40	63.3	74.9	1.014	13.4	273	26.8	20.1	321
C	1.25	2.40	63.3	78	1.014	17.0	206	32.6	25.5	408
U	1.30	2.40	63.3	81	1.014	20.6	163	38.1	30.9	495
L	1.35	2.40	63.3	84	1.014	24.2	132	43.1	36.3	581
A	1.40	2.40	63.3	87	1.014	27.8	110	47.7	41.7	668
T	1.45	2.40	63.3	90	1.014	31.4	92	52.0	47.1	754
E	1.50	2.40	63.3	94	1.014	35.0	78	56.1	52.5	841
D	1.55	2.40	63.3	97	1.014	38.7	67	59.9	57.9	928
	1.60	2.40	63.3	100	1.014	42.3	58	63.4	63.3	1014
	1.303	2.40	63.3	81	1.014	20.8	161	38.4	31.2	500

Table 3-3
Calculated Slurry Characteristics
(BELLC 3rd Loop)

	GIVEN DATA			CALCULATED RATIOS						
	Solids by weight (percent)	Specific Gravity of solids	Fluid Density (pcf)	Water Content (percent)	Solids by volume (percent)	Concentration or dry density (pcf)	Fluid Density (Kg/L)	Concentration (g/L)	Slurry Density or wet density (pcf)	Slurry Specific Gravity
	P_{sw}	G	g_f	w	P_{sv}	C	d_f	C	d_t	
BEAN 3rd loop (daily averages)										
13-Aug	8.83	2.40	63.3	1033	3.9	5.89	1.014	94	66.7	1.07
14-Aug	9.44	2.40	63.3	959	4.2	6.32	1.014	101	66.9	1.07
15-Aug	10.33	2.40	63.3	868	4.6	7.0	1.014	111	67.3	1.08
16-Aug	13.15	2.40	63.3	660	6.0	9.0	1.014	144	68.5	1.10
17-Aug	13.08	2.40	63.3	665	6.0	9.0	1.014	144	68.5	1.10
18-Aug	11.02	2.40	63.3	807	5.0	7.4	1.014	119	67.6	1.08
C	12.0	2.40	63.3	733	5.4	8.2	1.014	131	68.0	1.09
A	14.0	2.40	63.3	614	6.4	9.6	1.014	155	68.9	1.10
L	16.0	2.40	63.3	525	7.5	11.2	1.014	179	69.7	1.12
C	17.0	2.40	63.3	488	8.0	11.9	1.014	191	70.2	1.12
U	18.0	2.40	63.3	456	8.5	12.7	1.014	204	70.6	1.13
L	19.0	2.40	63.3	426	9.0	13.5	1.014	216	71.1	1.14
A	20.0	2.40	63.3	400	9.6	14.3	1.014	229	71.6	1.15
T	22.0	2.40	63.3	355	10.7	16.0	1.014	256	72.5	1.16
E	24.0	2.40	63.3	317	11.8	17.6	1.014	283	73.5	1.18
D	26.0	2.40	63.3	285	12.9	19.4	1.014	310	74.5	1.19
	28.0	2.40	63.3	257	14.1	21.1	1.014	339	75.5	1.21

Concentrations of *in situ* sediment and pipeline slurries are useful because the total volume of sediment or slurry is inversely proportional to concentration. In mathematical terms: $V_1C_1 = V_2C_2$ or $V_2/V_1 = C_1 / C_2$. For example, if the concentrations are 600 g/L *in situ* and 100 g/L in the pipeline, the pipeline volume will be 6 times the *in situ* volume (600/100). If the pipeline concentration is raised to 150, then the pipeline volume would only be 4 times the *in situ* volume (600/150).

The lower portion of Figure 3-13 shows schematic representations of the *in situ* sediments in the PDFT dredge area and average pipeline slurry using data from August 16 for illustration. The figure also shows a disposal site representation, which is discussed below. In this figure, one cf of *in situ* sediment is represented in each step. By conservation of mass, the dry weight of solids is constant throughout dredging and disposal (which is 41.7 pounds in the example shown). Since there is no air in saturated sediment, the difference in volumes and unit weights is due only to the addition or subtraction of water.

The *in situ* sediment dredged on August 16 had a concentration of 668 g/L and a wet unit weight of 87.4 pcf (1,400 Kg/m^3). This corresponds to 47.7 percent solids by weight and a moisture content of 110 percent.

In the pipeline slurry, the concentration was 144 g/L and had a wet weight of 317 pounds with a volume of 4.63 cf (68.5 pcf or 1,100 Kg/m^3). The dry weight of solids and the corresponding volume of dry solids is constant; therefore, the difference between *in situ* volume and pipeline volume is the amount of water added to make the slurry, which is 3.63 cf per cf of *in situ* sediment.

If the slurry concentration was increased from 13 percent to 20 percent by weight, the concentration would be increased from 144 g/L to 230 g/L. In this case, the volume in the pipeline would be 2.90(668 g/L / 230 g/L) times the *in situ* volume. The volume of water added would then be 1.90 cf per cf of *in situ* sediment.

Sediment Concentrations in Disposal Cell

Sediment concentrations in the disposal cell can be estimated using data from this dredge test and data from laboratory column settling, self-weight consolidation and column consolidation tests. All these tests were performed on a composite sample of fine-grained sediment from New Bedford. The sand portion of the sediment was removed prior to performing these laboratory tests.

Column consolidation tests were performed on sediment mixtures with concentrations of 42, 94, 178 and 515 g/L. At the completion of column settling, the sediment concentrations were 454, 391, 390 and 549 g/L for the four tests, respectively. The column settling test is designed to model the concentration in sediment at the top of the sediment to water interface in a settling basin.

Sediment in a disposal cell continues to consolidate after discharge due to self-weight consolidation and due to consolidation of fill placed over the sediment. The initial consolidation that occurs under the weight of sediment under water in the settling basin is modeled in the laboratory by the self-weight consolidation test. The test performed on sediment with an initial concentration of 178 g/L showed concentrations that ranged from 265 g/L at a depth of 3 in. to 514 g/L at a depth of 27 in.

The column consolidation test models consolidation at very low loads. The tests performed on sediment with initial concentrations of 42 and 94 g/L showed that under stresses of about 50 pounds per square foot (psf), the concentrations would be about 500 g/L. A stress of 50 psf corresponds to a depth of 3 ft. below the sediment water interface in a disposal cell.

Bulking Factor

The ratio of sediment volume in the disposal cell (below the sediment/water interface) to the *in situ* volume is the "bulking factor". The bulking factor depends on many variables including initial sediment concentration, method of dredging and disposal, rate of dredging, type of dewatering in the disposal cell, depth of disposal cell, and weight of fill over the sediment in the disposal cell. The data can be used to make estimates of bulking for the sediment dredged during the PDFT.

The sediment dredged on August 16 had an *in situ* concentration of 668 g/L. In those areas where the dredged sediment contains little sand, the bulking can be estimated using a concentration of 500 g/L in the disposal cell. Figure 3-13 shows the estimated conditions in sediment in the disposal cell with a concentration of 500 g/L. The volume would be 1.34 cf, which gives a bulking factor of 1.34.

The *in situ* sediment concentration in the dredge test area ranged from 425 to 668 g/L.

The bulking factor decreases when the percentage of sand in the sediment increases. The bulking factor for loose sand and gravel is close to 1.0 because the sand settles quickly and the settling that occurs in a disposal cell is similar to natural settlement that occurs in the Harbor. Extra space in the disposal cells has to be reserved to allow for settlement of the sediment from the slurry discharged in the cells.

Disposal

The dredged material slurry was discharged adjacent to the eastern sheetpile wall, halfway into Cell No.1. To allow visual inspection of the slurry discharge, the end of the discharge pipeline was held 2-3 ft. above the water surface with the aid of a backhoe. After 2-3 days, the coarse materials (mainly shells) present in the slurry had stacked and broke the water surface. To mitigate odors in the vicinity of the CDF by preventing further stacking of the dredged material above the water surface, the pipeline was shortened, by cutting off approximately 20 ft., so that the discharge could be re-directed to another open area in the CDF. An oil absorption boom was installed around the discharge point to minimize the extent of the oil sheen in the CDF.

The 8-inch HDPE pipeline used as the discharge pipeline came off the 3rd SG Loop on the dredge and was lashed to the 16-inch HDPE line, along with the 8-inch recirculation water pipeline, for flotation. When the discharge pipeline was being used it had a tendency to sink up to 2-3 ft., due to wear in the connection with the flotation line. Navigation lights that had been attached to the top of the flotation pipeline did not generally stay attached due to poor connections, wind and wave conditions, and perhaps vandalism.

Solids Concentration of Dredge Slurry

The solids concentration during hydraulic transport of the slurry is governed by the following elements:

- Minimum required velocity in the discharge line.
- Maximum density at which pipeline resistance can be overcome by the maximum pressure generated by the slurry pump.
- Quantity of material discharged in the hopper by the excavator.

Maximum instantaneous volume concentrations between 65 and 85% were achieved corresponding with densities up to 1,270 Kg/m^3 related to *in situ* (wet) densities between 1,260 and 1,410 Kg/m^3. Averages over longer periods of time showed volume concentrations between 25% and 55%.

Average sustained solids concentration values recorded by the SPU system over sustained dredging periods ranged from 13.3% to 16.3% solids by weight. These concentrations were achieved in dredge areas having *in situ* sediments with average solids concentrations of 32% to 43% solids by weight. This corresponds to volume concentrations in the order of 40% to 50%, by volume. The solids concentration values attained by the BELLC dredge were affected by debris. Higher solids concentrations would be attainable with inclusion of a more sophisticated debris separation system on the full-scale project.

The use of the SPU on the cleanup of the Upper and Lower Harbors, could reduce the volume of water transported and treated by an estimated 50% to 70% below that required for a hydraulic cutterhead system. A specific range of slurry density could be prescribed and provided by the SPU, that would best accommodate the decanting time, re-circulation water pressure, and movement of dredge material disposal operations within the CDF's.

3.1.4 Recirculation System

A significant aspect of the PDFT was the successful demonstration of the dredge effluent water recirculation system. The recirculation system essentially created a closed loop system, whereby the only water added to the dredge process was that entrained in the dredge bucket. This water addition amounts to approximately 40% of the *in situ* volume. The water was recycled back to the dredge for use as make up water for the SPU system and as jet water for debris dislodgment in the suction line. As controlled by the SPU, excess recirculation water was directed back to the hopper, from the discharge line, and recycled in the hydraulic slurry transport system. No water was used from the sea chest for makeup water for hydraulic slurry transport.

The recirculation system operated without any significant problems. Only one delay was caused by the recirculation system, when the return water pump lost its prime.

The entire dredge test was carried out using recirculation water from the CDF. No outboard water was used for the make-up pump.

3.1.5 Mass Balance

The total volume of water and dredged material was measured to derive the mass balance for the PDFT. Water levels in Cell 1 and Cell 2 of the Sawyer Street CDF were measured at the start and stop of dredging each day of test dredging, and additions or losses from the system were accounted for.

No dredged material or large volume of water had been placed in Cell 1, since its resurfacing and lining, until the PDFT. No survey was performed in Cell 1 to determine the volume of the dredged material in Cell 1 due to the PDFT.

- The total volume of dredged material slurry added to the Sawyer Street CDF was measured to be 4,204 cy.
- A volume of water added to Cell 1 to suppress air emissions/odor was estimated to be 1,338 cy.
- The volume of rainwater added to the system during the period of performance was measured to be 351 cy by the site meteorological station.
- The estimated volume lost due to evaporation was 257 cy.

- The volume of water lost on the dredge due to overflow of the recirculation water in the hopper was estimated to be 267 cy.
- To account for the likely consolidation of the loose liner and the underlying sand surface, a 1-inch consolidation was applied across Cell 1, for an estimated volume of 270 cy.
- The volume of material removed from the dredge area was calculated to be 2,308 cy based on comparison of the pre- and post-dredge hydrographic surveys of the dredge area.

Based on the measurements and calculations listed above (and shown in Table 3-4), the net volume of water added to the CDF is 1,001 cy.

The calculated volume dredged and pumped shown in Table 3-4 is based on pre- and post-dredge surveys at the dredge site and pre- and post- dredge water level measurements in the disposal pond. For comparison, the estimated *in situ* dredge volume based on BELLC calculations is 2,111 cy (193+340+325+424+537+292 cy). In this case, the ratio of survey volume to estimated is 1.09 (2,308/2,111).

Table 3-4
Mass Balance Calculations of Percent Solids by Volume

	Description	Start	Stop	Volume (cy)
A	Total Volume of Slurry and Water Added	8/10/00 14:10	8/20/00 12:20	4204
B	Volume of Water Used to suppress odor	8/19/00 09:00	8/19/00 12:00	1338
C	Volume of Rain Water	8/10/00 14:10	8/20/00 12:20	351
D	Volume of Water Evaporation	8/10/00 14:10	8/20/00 12:20	257
E	Volume of Losses on dredge	8/10/00 14:10	8/18/00 17:45	267
F	Volume Loss due to Consolidation	8/10/00 14:10	8/20/00 12:20	270
G	Dredged Material Volume (from Post-Survey)	8/10/00 14:10	8/18/00 17:45	2308
H	Net Volume of Water Added by Dredging (=A-B-C+D+E+F-G)	8/10/00 14:10	8/20/00 12:20	1001
	Ratio of *in situ* volume dredged (G) to volume slurry pumped (G+H)			**70%**

The total volume of slurry discharged from the dredge is 9,686 cy (891+1522+1818+1924+2509+1022 cy) based on flow measurement by BELLC. Based on the *in situ* volume dredged measured by survey (2,308 cy) divided by the volume slurry pumped (9,686 cy), the ratio of *in situ* volume to slurry pumped is 23.8%.

A significant aspect of the PDFT was the successful demonstration of the dredge effluent water recirculation system. The entire dredge test was carried out using recirculation water from the CDF. No outboard water was used for the make-up pump. The recirculation system essentially created a closed loop system, whereby the only water added to the dredge process was that entrained in the dredge bucket. This water addition amounts to about 1,001 cy (item H in Table 3-4), which is 43% of the *in situ* volume. The water was recycled back to the dredge for use as make up water for the SPU system and as jet water for debris dislodgment in the suction line. As controlled by the SPU, excess recirculation water was directed back to the hopper, from the discharge line, to decrease water content and increase the solids concentration of the dredge slurry. No water was used from the sea chest for makeup water for hydraulic slurry transport. For comparison, without the recirculation system, the volume of water added would be 7,378 cy (9,686-2,308), which is 320% of the *in situ* volume.

4.0 ENVIRONMENTAL MONITORING

4.1 Overview

The PDFT was undertaken to evaluate performance of the hybrid environmental dredge technology being considered for remediating the New Bedford Harbor Superfund Site. The environmental monitoring objectives of the PDFT included: 1) evaluating actual dredge performance relative to removal of contaminated sediments; 2) evaluating the dredge's ability to minimize environmental impact to water quality by measuring the extent of contaminated sediment resuspension and transport; and 3) evaluating impacts to local air quality. These performance aspects are evaluated in the following sections.

4.2 PCB Removal Efficiency

The evaluation of the dredge performance relative to removal of contaminated sediments included two components: 1) The first (primary) goal was to evaluate the dredge's ability to remove contaminated sediments to a given depth horizon relative to the dredging plan (Foster Wheeler Environmental Corporation – FWENC, 2000a). Results of this analysis are reported within Section 3 of the main report; and 2) A secondary objective was to determine how effectively the dredging technology could remove contaminated New Bedford Harbor sediments within the test area by comparing pre and post dredge PCB concentrations. This information was used to determine overall PCB mass removal efficiency and to evaluate the effectiveness of this technology with regard to site-specific cleanup levels under the conditions of the PDFT.

ENSR conducted the PCB contaminant characterization for the PDFT dredge technology evaluation. Details of this investigation are presented in Appendix J. The appendix includes comparison of pre- and post-dredge PCB concentrations as part of the overall efficiency evaluation. The work represents a joint effort by the EPA (New England Region and Atlantic Ecology Division), the USACE, and ENSR (under contract DACW 33-96-D-004 to the USACE).

Pre-dredge sediment core samples were collected at each of 40 stations which include 30 stations located in the original 100-foot x 400-foot dredge footprint of the test area and 10 additional stations in the provisional test area located immediately to the west (Figure J-2). Post-dredge cores were collected at stations where dredging was completed, and sampling methodology was similar to that of the pre-dredge effort. Post-dredge grab samples were collected adjacent to core locations and at other locations in the test area to assess surficial sediment conditions. The sediments collected for the dredge efficiency testing were analyzed for the 18 congeners selected by National Oceanographic and Atmospheric Administration (NOAA) for the National Status and Trends program and by the EPA EMAP program (hereafter referred to as the NOAA 18). Estimates of total PCBs were calculated based on a mathematical relationship among these parameters in New Bedford Harbor sediments determined by Foster Wheeler Environmental Corporation (FWENC, 2001b). This allows data comparisons to be made with historical Aroclor data and the more generally applicable homologue information. The regression formula used to calculate total PCB homologues from the NOAA 18 is:

$$\text{Total PCBs} = (2.5 \times \text{NOAA 18})$$

It should be emphasized that this is a site-specific relationship developed for New Bedford Harbor sediments only, and should not be applied at other sites.

The results of the PCB analyses for pre- and post-dredge sediment core and grab samples are presented in Appendix J, Tables J-3, J-4, and J-5. Figures 4-1 and 4-2, below, provide summary information on sediment type and PCB concentrations in the test area.

A review of the pre-dredge core logs in Figure 4-1 reveals that most of the pre-design area was overlain with a layer of black silty material. The thickness of this layer generally increased from east to west, ranging from several inches in Cut 14 to over 4 ft. in Cut E. This material appeared to have a high water content and often had a distinct hydrogen sulfide (H_2S) and/or petroleum odor. Sand was noted beneath the thin layer of silt material in the extreme eastern portion of the area. Over the remainder of the pre-design area, the black surficial deposit was underlain by a light gray, clay-like material.

For the cores that were analyzed, the PCB concentrations (ppm as total homologues) have been overlaid on the core logs in Figure 4-1. Each reported value represents the concentration in the 1-foot (0.3m) section of core that was composited for analysis. A review of Figure 4-1 reveals that elevated PCB concentrations are generally restricted to the silty surficial deposit. PCB concentrations ranged from several hundred to several thousand ppm for 1-foot (0.3m) composite core sections that consisted entirely of the silty material. The 1-foot (0.3m) composite core sections that were entirely situated in the underlying clay or sand deposit had no or very low (<10 ppm) detectable PCB concentrations.

Post-dredge core logs and PCB concentrations are presented in Figure 4-2. For the area that was dredged, the sample logs reveal a uniform layer of light gray, clay-like material generally overlain by a thin veneer of black, silty material. As described in Section 3.1 of the main report, dredging was performed only in cuts 1-8 and the southern portion of cut A (see Figure 3-1). In the physical description presented in Figure 4-2, the logs for locations 10 and 22 in cut 9, location 23 in cut 11, and location 12 in cut 13 represent areas that were not dredged. Post-dredge cores were collected at these locations to assess if sediment conditions changed adjacent to the dredged area.

For the cores and grabs that were analyzed, the PCB concentrations (ppm as total homologues) have been overlaid on the core logs in Figure 4-2. For the grabs, the PCB concentrations represent a composite of the 0-2 cm (0-0.8 inch) sediment depth. These concentrations are reported in the box above each core. For the cores, the PCB concentrations represent a composite of the 0-1 foot (0-0.3m) sediment depth. These concentrations are reported within each core.

PCB concentrations for the grabs (generally representing the black silty material) ranged from 0.47 ppm (location 2) to 470 ppm (location 31) and were generally above 100 ppm. Concentrations in the upper one foot (0.3m) composite from the cores ranged from 0.67 ppm (location 9) to 130 ppm (location 21) and were generally above 7 ppm. PCB concentrations were significantly higher in the grabs than in the upper 1-foot (0.3m) core composites at 16 of the 18 locations where both grabs and cores were analyzed.

PCB Removal Efficiency of BELLC Test Dredge

The Pre-Design Field Test was designed to, among other goals, determine the ability of the proposed dredge system to remove contaminated sediment without causing adverse ecological or human health effects. Efficiency was determined based on the ability to remove PCB-contaminated sediment down to the 10 ppm depth horizon. Based on pre-dredge sediment cores, a dredging plan was established to accomplish this. Two measurement endpoints were identified to evaluate this technology. The first was to compare the volume of sediment actually removed to the estimated volume to be removed based on the original dredge plan. This was accomplished using bathymetric data before and after the dredging to determine how effectively the dredge performed (Section 3.0). Comparison of the target dredge volume with the actual volume dredged yielded an overdredging value of only 16%, with vertical accuracy of +/- 4 inches relative to achieving the intended horizon.

A second endpoint designed to evaluate removal efficiency included determining the sediment PCB concentrations before and after dredging to calculate overall PCB removal efficiency of the dredge. The

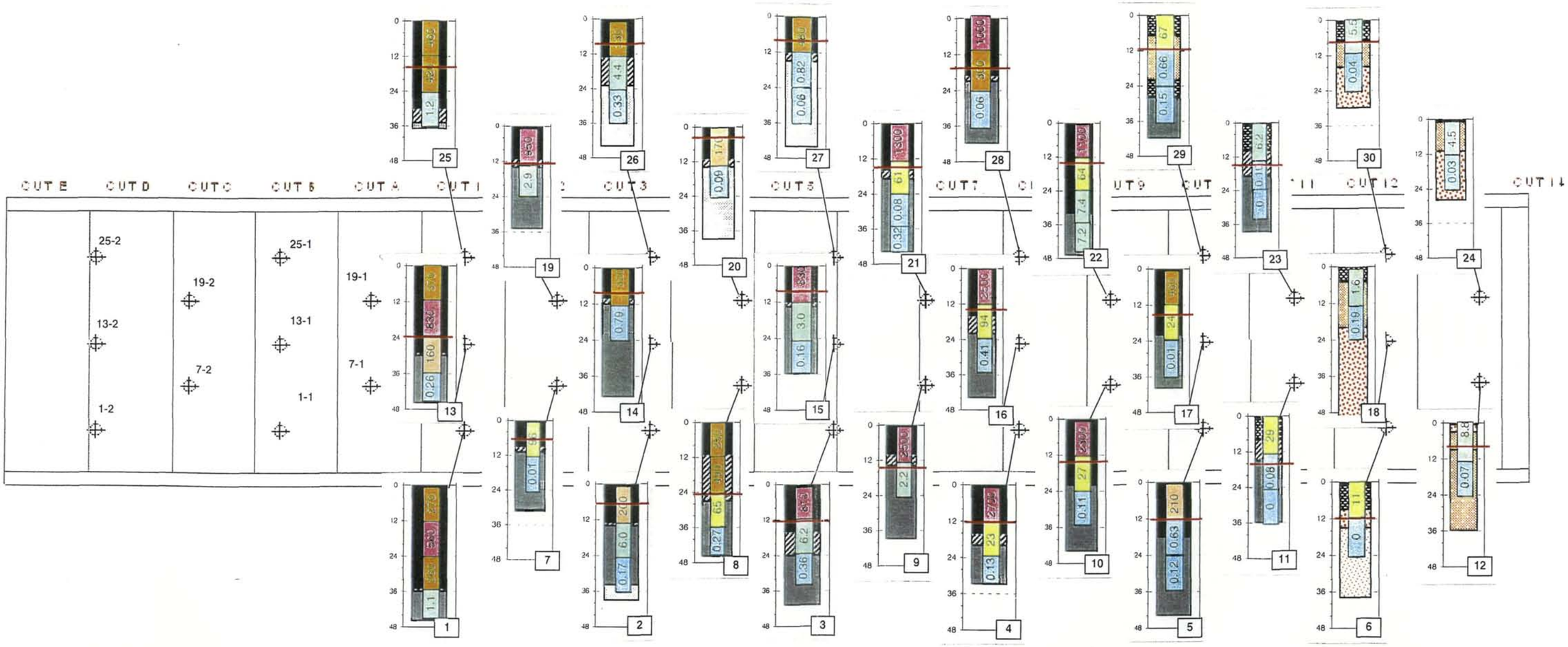
dredge was very efficient in this regard. The results indicate that approximately 97% of the PCB mass was removed within the dredging boundaries. The average PCB concentration in the upper one foot of sediments was reduced from 857 ppm to 29 ppm over the dredged test area. This met the clean up criteria of 50 ppm for the Lower Harbor and approached the criteria of 10 ppm for the Upper Harbor. It should be understood that the PDFT goal was **not** to leave a final sediment concentration of 10 ppm as this was a field test, **not** a remedial operation.

During the design phase of this project, it was determined that most sediments within the dredge test area had a high water and silt/clay content. This fact introduced the possibility that some contaminated sediment within or immediately adjacent to the dredge area could be mobilized during the dredging process and potentially re-contaminate the dredged area. Mechanisms that could mobilize the sediments include bucket impact on the bottom, loss through the water column (appears minimal for the hydraulic excavator), anchor wire/spud repositioning, and material sloughing down slope along the sides of a dredged cut. Furthermore, other factors such as tidal currents and meteorological events (e.g., wind) could produce the same effect due to re-suspended contaminated sediments migrating from other areas of the harbor. The sediment characterization program included the collection of surface grabs in addition to cores in an effort to quantify the effects of sediment mobilization.

Based on the visual observations of the upper surface of post-dredge cores and grab samples and the results of laboratory analyses, some recontamination did occur within the test area. Calculations presented in Appendix J (Section J.5) demonstrate that only a very thin layer of re-deposited, contaminated PCB sediment would be required to increase the concentration within a composited upper one foot (0.3 m) sediment core to greater than 10 ppm. For example, if the sediment adjacent to a clean dredge area has a PCB concentration of 1,000 ppm (as was the case in much of the test area), it would require only a 0.24-inch (0.61cm) layer of newly deposited (post-dredging) contaminated sediment to elevate the average concentration of the upper one foot of clean sediment above 10 ppm.

This thickness of contaminated silty material (only a thin veneer) is consistent with field observations made at the time of grab sample collection. The grab sampler penetrated approximately 6 inches (15 cm) into the sediment. Once retrieved, the top of the sampler was opened, and a portion of the upper 0.8 inches (2 cm) of sediment was removed for analysis. This allowed for visual inspection of the upper sediment profile within the sampler. Based on this information, it appears that the observed average post-dredge PCB concentration (29 ppm upper one foot composite) can be attributed to deposition of mobilized sediments (either from the original dredged area or from adjacent areas by sloughing, tidal action, etc.), rather than inefficient or inaccurate dredging.

In summary, both the sediment removal data and PCB data indicate that this dredging technology is very efficient at contaminated sediment removal. The results indicate that 97% of the PCB mass was removed over the test area, and the remaining sediment concentrations approached the site specific clean up criteria. The PCB mass remaining after dredging appeared to reside entirely in a thin surface veneer and was attributed to recontamination of the dredged area rather than incomplete removal. Adjustments to dredging and operational controls will reduce the influence of many potential recontamination mechanisms. Therefore, during full-scale dredging, a corresponding reduction in surficial sediment recontamination would be expected.



Visual Classification of Sediment Type

- Black-Very Fine (most with obvious H_2S and/or petroleum odor).
- Dark Grey-Fine
- Transition Layer (may be an artifact of coring)
- Grey Fines
- Light Grey Fines
- Silty Sand
- Coarse Sand
- Fine Sand
- Color change noted by lab after removing outer layer.

Notes

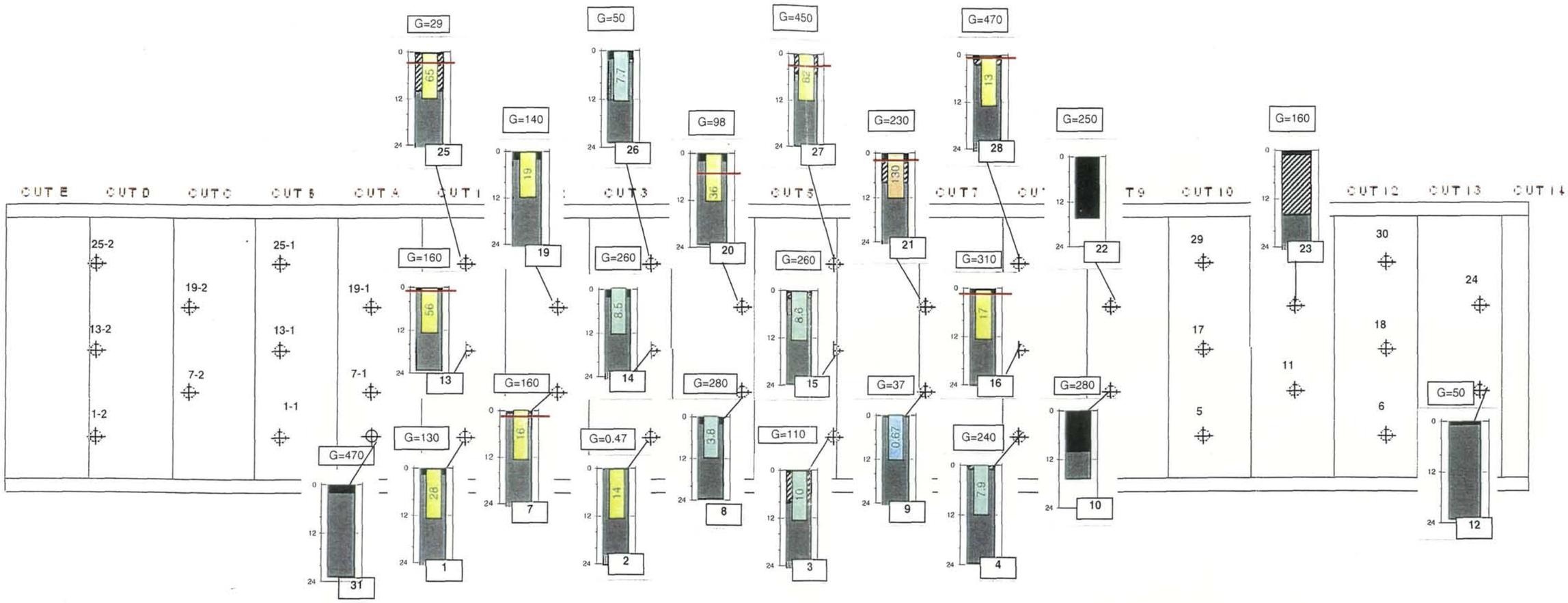
Depths are in inches from the sediment surface.
All PCB data have been surrogate-corrected.
Background stratigraphy is based on field observations.

Total PCB (ppm as total homologues[1])

- < 1 ppm
- 1-10 ppm
- 11-100 ppm
- 101-250 ppm
- 251-500 ppm
- > 500 ppm

[1] Calculated using Foster Wheeler's (February 2001) regression equation.
Total PCBs as homologues = NOAA 18 sum (ppm) * 2.5

Figure 4-1
Pre-Dredge Core Logs+PCB
06-06-01



Visual Classification of Sediment Type

- Black-Very Fine (most with obvious H_2S and/or petroleum odor).
- Dark Grey-Fine
- Transition Layer (may be an artifact of coring)
- Grey Fines
- Light Grey Fines
- Silty Sand
- Coarse Sand
- Fine Sand
- Color Change noted by lab after removing outer layer, for top 12" only.

Notes

Depths are in inches from the sediment surface.
All PCB data have been surrogate-corrected.
"G" = Grab samples were collected from a depth of 0-2cm.
All PCB concentrations are expressed in ppm as total homologues.[1]
Cores 10, 12, 22, 23 were collected from an undredged area.
Background stratigraphy is based on field observations.

Total PCB (ppm as total homologues[1])

- < 1 ppm
- 1-10 ppm
- 11-100 ppm
- 101-250 ppm
- 251-500 ppm
- > 500 ppm

[1] Calculated using Foster Wheeler's (February 2001) regression equation.
Equation used:
Total PCBs as homologues = NOAA 18 sum (ppm) * 2.5

Figure 4-2

Post-Dredge Core Logs+ PCB (Cores and Grabs)

06-06-01

4.3 Water Quality Monitoring

The test dredge's ability to minimize environmental impact to water quality (by limiting the extent of contaminated sediment resuspension and transport) was evaluated by ENSR. A detailed summary of the water quality monitoring program is presented in Appendix K. The water quality monitoring program conducted for the PDFT represents a joint effort by the EPA, the USACE, and ENSR (under contract DACW 33-96-D-004 to the USACE) and included the following components:

- Predictive modeling to aid in design of the water quality monitoring field program and to assess the utility of modeling for the full-scale remediation effort;
- Field monitoring to assess sediment resuspension during the dredging operation, to collect water samples for laboratory analysis, and to ground-truth the predictive modeling;
- Laboratory analysis of water samples (total suspended solids (TSS), PCBs) to assess water quality impacts; and
- Correlation assessment between the field and laboratory data.

The predictive modeling included development of a numerical hydrodynamic and sediment transport model based on previous work at New Bedford Harbor (USACE, 1988 and 2000). The modeling was used to predict the expected suspended sediment concentration resulting from dredging activities under a variety of transport assumptions. These predictions were used to help design the field monitoring program.

Field monitoring was performed in parallel with the dredging activities in August 2000. Objectives of the monitoring included real-time location and mapping of any turbidity plume associated with the dredging as well as collection of water samples at designated stations downstream of the dredge for laboratory analysis. The monitoring program was structured to document water column conditions in the Upper Harbor over the course of ebb and flood tidal events during dredging operations. Water samples were analyzed for TSS and dissolved and particulate PCBs. An assessment of the correlation of the field turbidity and laboratory TSS data as well as the laboratory TSS and PCB data was also performed.

Water column turbidity measurements were performed using an optical backscatter sensor (OBS). Turbidity monitoring was initiated prior to the start of dredging operations for each day of monitoring in order to characterize baseline turbidity conditions within the Upper Harbor. After dredging began, the water quality conditions were closely monitored to assess the development and the aerial extent of any elevations of turbidity from baseline conditions. The results of the model predictions presented in Section K.2 were used to initially set target distances for the transects (locations where an elevation of turbidity was expected). This initial turbidity tracking was conducted for one hour after the start of active production dredging, after which the position of down-current stations was set for collecting TSS and PCB samples. Turbidity data continued to be collected in the Upper Harbor during each monitoring event, and selective east-west or north-south transects were performed to document changing water column conditions.

Sampling for TSS and PCB analyses was performed over four discrete tidal events (ebb/flood on August 16 and ebb/flood on August 17) while dredging operations were ongoing. For the monitoring performed on August 16, stations were set at 50 ft., 100 ft., and 500 ft. down current of the dredging as well as a reference station 1,000 ft. up current. For the monitoring performed on August 17, an additional

down-current station was added, and stations were set at 50 ft., 300 ft., 700 ft., and 1,000 ft. down current of the dredging based on a review of the previous day's data.

Water Quality Impacts Related to Dredging Operation

The water quality monitoring performed during dredging on August 16-18 provided data over a range of operational and environmental conditions. Upon examination of the data, the following conclusions can be made:

- The actual dredging process (removal of sediments with the hydraulic excavator) appeared to have a limited impact on the water column;
- Activities performed in support of the dredging (operation of support vessels) appeared to have a much greater impact on water quality than the dredging; and
- Normal fluctuations in water quality occur in the Upper Harbor related to changing environmental conditions that appear similar or greater in scale than the overall impacts related to the dredging operation.

The monitoring performed during the ebb tide on August 16 provides the best representation of impacts associated specifically with dredging. Dredging was performed with limited shutdown during this monitoring period, and there was limited support vessel activity. Although rainfall occurred on the morning of the 16th, the effect of the runoff was assumed similar for all the composite samples (both up and down current). Field measured turbidity showed some spikes in the vicinity of the dredge but generally returned to background levels within 500 ft. down current of the dredge. Total particulate PCB concentrations were elevated in the vicinity of the dredge, but returned to background levels within 500 ft. down current of the dredge. During the other monitoring events, some of the turbidity transects revealed little or no detectable elevation of turbidity down current of the dredge. Larger increases in turbidity were generally traceable to dredge support activities or environmental conditions as discussed below.

The limited water column impacts associated specifically with the dredging are attributed to both operational and environmental factors. The design of the bucket (tight closing with limited leakage), the configuration of the dredge (with a "moon-pool" work area enclosed behind a 36-in. silt curtain), and the controlled manner in which the operation was executed all contributed to minimizing the release of material to the water column. The shallowness of the area (maximum depth of the dredged area was less than 10 ft. at high tide) and the limited currents (maximum currents generally less than 0.5 ft./s) limited transport away from the dredging area.

Difficulties associated with handling and transferring sediments containing debris and a large component of embedded shells did cause regular suspensions of dredging operations. However, the periods of continuous dredging were sufficient enough to allow setup of "steady state" conditions in the near field area (within 200 ft. of the dredge) included in the monitoring. More continuous dredging over a full or multiple tidal cycles would not be expected to generate a turbidity plume of greater extent in the nearfield area down current of the dredge than that observed during the field test.

Water Quality Impacts Related to Dredging Support Activities

The aerial photographs presented in Figure K-26 provide a good example of the potential water quality impacts of support activities relative to the dredging operation. The photos were taken approximately midway through the ebb tide on August 17. At the time the upper photo was taken, the dredge was not in operation, and the tug *Miami II* was moving a support barge from the dredge to the shore. Because of the

pipeline/dredge configuration, the tug had to transit in shallow water to the east of the dredge (estimated at 4 to 5 ft. in depth at this tidal stage) creating a large turbidity plume in the process.

The water-quality monitoring vessel can be seen taking measurements within the plume in the same photo. A water sample collected within 50 ft. of the tug after its passage had a suspended solids concentration of 300 mg/L and particulate and dissolved PCB concentrations of 26 and 2.7 micrograms per liter (µg/L), respectively (reported as the sum of the 18 NOAA congeners). Background suspended solids and total PCB concentrations at the up current reference station on August 17 were 5 mg/L and 0.75 µg/L, respectively. Although the dredge was not in operation when the upper photo was taken, monitoring performed earlier during nearly continuous dredging operations recorded a plume of much less extent than that associated with the tug.

In the lower photo taken approximately 30 minutes later, the dredge had resumed operations, and the tug was pushing ahead to hold the barge at the shore support area. A large turbidity plume is again visible behind the tug, being carried to the south on the ebb tide.

Water Quality Fluctuations Related to Environmental Factors

The monitoring performed in support of this field test reinforced the importance of understanding the normal fluctuations in water quality that occur independent of the operation being monitored. The PCB concentrations in background samples that were collected in the Upper Harbor on August 7 during the ebb tide prior to the start of the dredging operation were higher by a factor of three for the station 1,000 ft. north of the pre-design area than for a station 1,000 ft. south of the pre-design area (both particulate and dissolved PCB).

The flood-tide monitoring performed on August 16 provides a good example of normal fluctuations of turbidity within the Upper Harbor. Turbidity values at the background station increased from approximately 10 Nephelometric Turbidity Units (NTU) at the start of monitoring to nearly 200 NTU an hour later (higher values than those recorded downstream of the dredge, see Figure K-12). This increase in turbidity was attributed to storm-water discharge to the harbor following the rainfall earlier in the day. By the end of the monitoring period, the entire monitoring area displayed an elevated turbidity of approximately 30-60 NTU (Figure K-13). The elevated turbidity values were not, however, accompanied by increased PCB concentrations at the background station.

4.4 Air Sampling and Analysis

Different types of air samples were collected to achieve various objectives during the PDFT. These included the following:

- Flux chamber sampling provided a measure of emissions as an indication of the relative contributions from the various operations to the ambient air concentrations. These will also be used to support the emissions and dispersion modeling calculations performed as part of developing ambient air action levels for upcoming construction work. In addition to flux chamber samples collected in the field, sediment from the bench scale dewatering studies was tested at the USACE Waterways Experiment Station (WES) for emissions measurements. Test results were reported to USACE.
- Ambient air sampling and analysis was performed from locations around the CDF and harbor to document concentrations during operations.

Sampling was conducted in accordance with the Foster Wheeler TO #17 *Sampling and Analysis Plan* (SAP), Revision #6, dated August 2000 (FWENC, 2000c). The data from these tests are summarized and discussed in the following sections.

4.4.1 Flux Chamber Sampling and Analysis

Flux chamber sampling and analysis was performed by URS Corporation and is detailed in their report included in Appendix L and summarized in Table 4-1. These data are summarized here as a useful indication of relative emission fluxes from the dredge test and to provide engineering design information for future dredging and CDF construction/filling activities. In addition, these data will be used to support the emissions and dispersion modeling efforts being conducted as part of developing the ambient air action levels for future construction activities. Note that this is a limited data set, collected during a single one-week test period. As such, these results do not correlate directly to ambient air concentrations or represent all of the conditions affecting emissions and subsequently ambient air concentrations. These data do provide an indication of relative emissions sources and are useful in evaluating impacts to ambient air quality. The results are discussed in that context below.

Flux chamber samples were collected by isolating a given surface area (0.13 m^2) with the chamber and drawing clean sweep gas (0.005 m^3/min) into the chamber, across the surface and drawing the resulting emission gas through XAD resin for subsequent laboratory analysis for PCBs. URS subcontracted the laboratory analysis of the XAD resin air samples to Alta Analytical Laboratory. Samples were analyzed using high resolution gas chromatography (GC) and high resolution mass spectrometry (MS) operating in selected ion monitoring (SIM) mode for NOAA and World Health Organization (WHO) congeners and total PCB homologue groups.

Samples of source media (sediment, water, and mixtures) were collected by URS and provided to Foster Wheeler for compositing and subsequent analysis. Samples were analyzed by Severn Trent – VT Laboratory for NOAA PCB congeners analysis using GC with an electron capture detector (ECD). NOAA congener results were corrected to the total PCB equivalent using the regression equation with a slope of 2.5 and a zero y-intercept developed by Foster Wheeler and reported in the *Draft Final Comparison of PCB NOAA Congeners with Total Homologue Group Concentrations* Technical Memorandum, dated May 2001 (FWENC, 2001b). Laboratory results are included in Appendix L. Total PCB results are summarized in Table 4-1.

Table 4-1
Summary of Source Material and Flux Chamber Data

Test ID	Description of Flux Chamber Test and Source Material		PCB Concentration of Source Material **	Measured PCB Emission Flux (ng/m^2-min)	Average PCB Flux (ng/m^2-min)
CDF Emission Sources					
A[1]	Fresh sediment discharge from the dredge pipe to the CDF. Sediment was collected from the CDF with a 5-gallon bucket and transferred to wash basin.		14 ppm	901 2,440 4,090	2,477
B[1]	Two inches of harbor water added to the sediment in the wash basin from test A.		18 ppm	666 2,930 3,990	2,529
C[1]	Aqueous / sediment mix collected from inside boom in CDF over water cover with a visible sheen, ~50 ft from discharge pipe.		1,400 ppm no sample	3,320 2,800 1,320	3,060 1,320
D[1]	Aqueous / sediment mix collected from the CDF water cover near the sheen (C) where no sheen was present ~ 15 and 25 ft from C.		38 ppm	1,280 1,430	1,355
E[1]	Aqueous / sediment mix from surface of CDF after application of surfactant:	Dawn Biosolve Simple Green	60 ppm 45 ppm no sample	4,700 3,420 925	4,060 925
Dredge Emission Sources					
F[2]	Aqueous sample from the moon pool at the dredge.		5 ppb 24 ppb	86 303 896 934	195 915
G[2]	Aqueous surface sample of the water near the dredge, outside of the moon pool:	Just outside silt fence 40 ft from silt fence 47 ft from silt fence	4 ppb	127 282 230	213
H	Headspace concentrations at the grizzly – (ng/m^3)		NA - headspace measurement	**ng/m^3** 2,070 4,270 6,100	**ng/m^3** 4,147
Background Emission Sources				**(ng/m^2-min)**	**(ng/m^2-min)**
I[3]	Sediment from mudflats near previous locations (see Sec. 4.4.1.3):	@ loc. S-657 >10K ppm @ loc. S-602 ~9,500 ppm @ loc. S-650~36 ppm @ loc. S-650 (2nd ft) 6,600 ppm	11,000 ppm 100 ppm 210 ppm	600 132 63	600 132 63

** Total PCBs were calculated using the regression equation: total NOAA congeners multiplied by a slope of 2.5 and a y-intercept of zero based on the Foster Wheeler Draft Final Technical Memorandum, *Comparison of PCB NOAA Congeners with Total Homologue Group Concentrations*, May 2001.

1 Source material samples were an aqueous/sediment slurry, easily mixed by shaking. Samples were shaken, transferred with a pipette, weighed, extracted and reported on a wet weight basis (mg/kg).

2 Source material samples were aqueous samples of surface water from the harbor (µg/L).

3 Source material samples were sediment samples from approximately the same locations as sampled during the harbor delineation program, reported on a dry weight basis. Flux chamber source samples were surface grabs. Samples from the previous program (S-657, S-602, and S-650) were composites over the upper one-foot interval, except for S-650, where results from both the upper one-foot composite and second foot composite are provided.

Flux chamber sample total PCB results and those from source media samples (collected by Foster Wheeler) are summarized in Table 4-1. Flux chamber samples were collected from nine different potential sources of PCB emissions denoted as Tests A through I, as listed in the table. For each source area or test, URS collected several, usually three, flux chamber samples. The exceptions being Test D, from the surface of the water in the CDF where no sheen was evident where two samples were collected and from Test F, at the dredge moon pool, where two pairs of samples were collected. Each flux chamber measurement is provided in Table 4-1. Where appropriate, the average flux measurement for the test was calculated and is also provided. Samples of source material from each test were composited by Foster Wheeler with the results shown in the column preceding the individual flux chamber results.

Calculated emissions were somewhat variable and do not appear to directly correlate with source material concentrations. There is likely to be a high degree of variability inherent in the sampling methods and source media concentrations. Conclusions that can be drawn relative to emissions sources based on available data are discussed below.

4.4.1.1 CDF Emission Flux Results

Emissions from exposed sediments in the CDF were identified as a concern during previous dredging operations, especially associated with the Hot Spot dredging and temporary storage. During the Hot Spot removal, the CDF was covered with a liner, making maneuverability of the dredge discharge line and subsequent cover maintenance difficult. Emissions from the CDF during this PDFT study were of interest to evaluate potential options other than a cover for managing emissions, such as water and/or surfactants, to provide input to the dispersion modeling being conducted for developing ambient air action levels for future work, and to compare with other sources of emissions for use in overall management of site activities. The results from the flux chamber sampling are summarized in Table 4-1.

Based on the data provided in Table 4-1, it appears that disturbed sediment and associated sediment/water mixtures at the CDF have the highest emission flux. Emission rates calculated from raw sediment and from sediment with a thin water cover ranged from 666 to 4,090 nanogram per meter^2 minute (ng/m^2-min) with an average of approximately 2,500 ng/m^2-min. Results from inside the boom area in the CDF where a sheen was visible had a slightly smaller range (1,320 to 3,320 ng/m^2-min) also with a calculated average of 2,500 ng/m^2-min. from three tests. URS calculates the area inside of the boom to be approximately 2,000 square feet (ft^2) (190 m^2). Based on the highest emission rate calculated (4,090 ng/m^2-min) for fresh sediment discharged to the CDF, the resulting emission from the surface area inside the boom would be approximately 1.1 gram of total PCB per 24 hour day. Flux chamber data from the area around the boom and the area without a sheen indicate that these surfaces are also a source of significant emissions. URS calculates the surface of Cell #1 as 8,900 m^2 (96,000 ft^2), with an emission rate of 1,430 ng/m^2-min (collected 25 ft. away from sheen), this calculates as a total emission rate of 18 grams per day of total PCBs.

The available data indicate that a shallow (2 in.) water layer and/or the presence or absence of a sheen do not significantly alter the calculated emissions. The average emissions from the CDF surface at a distance from the sheen (Test D) had slightly lower average emissions (1,355 ng/m^2-min) than those calculated near the dredge discharge pipe and from the sheen area. However, note that the individual results were well within the range of emissions calculated for the other CDF sources.

Flux chamber measurements were also taken of the area inside the CDF boom following the application of three surfactants, Dawn dishwashing liquid, commercially available dispersant Biosolve, and Simple Green. Results from the Dawn and Biosolve indicate that the surfactants may not be effective at reducing emissions, and may actually increase the emissions from the surface of the CDF. The result from the Simple Green is somewhat less than most of the other measurements taken at the CDF (925 ng/m^2-min).

However, it is within the range of the lower emissions measurements calculated from raw sediment and the sediment/water mix and may be within the error of the field measurements.

4.4.1.2 Flux Chamber Results from Dredging Operations

Emission measurements from the dredge indicate that slightly elevated emission fluxes are generated from the moon pool at the dredge. The average of the pair of highest emissions was approximately 915 ng/m^2-min, approaching the lower emission fluxes calculated at the CDF. Based on a surface area of approximately 915 ft^2 (85 m^2), the total emissions from the moon pool calculate to approximately 100 mg/day or 0.1 gram per day. Flux chamber results from outside the silt fence averaged 213 ng/m^2-min indicating that the silt fence may be effective at confining the higher emissions within a relatively small surface area.

Another potential source of PCB emissions is the grizzly and hopper on the dredge. Because it was physically impractical to collect flux chamber measurements from the grizzly (a given surface area could not be isolated), headspace measurements were collected by drawing air from the grizzly through the XAD resin. Headspace readings ranged from 2,070 to 6,100 ng/m^3 total PCBs. URS estimates that based on a hopper volume of 72 m^3 and an air exchange rate of one hopper volume every 15 minutes, the emission rate would be approximately 20 µg/min or 0.03 grams of PCB per 24 hour day. Note that if the size of the hopper were significantly increased during full scale operations, the emissions would also increase accordingly.

4.4.1.3 Flux Chamber Results from Mudflats

Flux chamber samples were also collected from the mudflats north of Wood Street on the Acushnet side of the harbor. The locations were chosen as known areas of elevated PCB concentrations based on earlier harbor delineation sampling. Flux chamber samples and corresponding surface grab samples of sediment were collected from locations URS-W1, URS-W2, and URS-W3, corresponding to previous sampling locations identified as S-657, S-602, and S-650, (designated sequentially in order of sampling and composited over a one-foot interval) respectively. Sampling locations are shown on Figure 4-3. It is generally accepted that exposed mudflats at low tide are a primary source of ambient air PCB concentrations, which range from approximately 10 ng/m^3 to over 100 ng/m^3.

Flux sampling chambers were placed near or at previously sampled locations and surface grab samples of the sediment from the mudflats were also collected in association with the flux chamber sampling. Results from the flux chamber and source material samples are included in Table 4-1 (Test I). For reference, the results from the harbor delineation sampling program for these locations (S-657, S-602, and S-650) are also included in Table 4-1. Sediment sample results from the two sampling events are in reasonably consistent agreement given the known field variability in this area. Note that source media samples of sediment from the discharge pipe collected from Tests A and B were reported on a wet weight basis, if corrected for 10 percent solids, results would be approximately 140 and 180 ppm on a dry weight basis. These results are similar to the 99 and 210 ppm dry weight results from two of the source samples from Test I and suggest that the material dredged during the test had PCB concentrations generally consistent with those in portions of the mudflat areas of the harbor. Emission flux measurements from the mudflat area ranged from 63 to 600 ng/m^2-min, less than those measured from sediments and sediment water/mixtures at the CDF. These data suggest that despite elevated PCB concentrations, *in situ* sediments and mudflats do not provide the same magnitude of emission fluxes as recently well mixed sediments exposed in the CDF. It is important to note that despite the lower emission flux from the mudflat areas, the total exposed surface area is approximately 40 acres. Therefore, the total emissions in grams per day would be greater than from the CDF.

The limited amount of flux chamber sampling conducted during this test is insufficient to conclusively determine that sediment/mudflat PCB concentrations significantly affect the magnitude of emission flux, although, the available data suggests that this is the case. No attempt was made to estimate the area of exposed mudflats or the varying emission fluxes associated with differing concentrations and tidal variations. However, it is noted that the area of the exposed mudflats at low tide is larger than the planned CDFs. Ambient air PCB concentrations measured during the baseline study (Foster Wheeler *Final Annual Report Baseline Ambient Air Sampling and Analysis*, March 2001) and referenced below are primarily attributed to emissions from exposed mudflats, and the river/harbor water surface.

4.4.1.4 Flux Chamber Summary

In summary, limited flux chamber sampling during the PDFT provided useful data for evaluating relative emissions from various sources. Some key findings are summarized as follows:

- Emission flux measurements do not correlate well with source material concentrations. However, they do generally appear to be the highest in association with well mixed sediment and water slurries in the CDF.
- *In situ* sediments in the mudflat area do not provide the same magnitude of emission flux per square area as well mixed sediment in the CDF. However, given the large surface area of the exposed mudflats at low tide, these areas and exposed surface water will continue to be a significant source of ambient air concentrations of PCBs, as measured during the Baseline study.
- Total emissions, calculated as flux x surface area x time, are directly proportional to the amount of exposed surface area. Accordingly, exposed CDF surface area is a significantly greater source of emissions than dredging operations. The contaminated sediments in the mudflat areas and the river/harbor surface water remain the largest surface area sources of emissions.
- Dredging activities, including the grizzly, hopper, and disturbed sediments in the moon pool are relatively small sources of PCB emissions in comparison with the CDF because of their lower flux measurements and limited surface area.
- The use of surfactants Dawn and Biosolve to control the sheen at the CDF does not appear to be effective at controlling PCB emissions. These limited data suggest that Simple Green may be more effective than other surfactants although additional testing is recommended before drawing definitive conclusions.
- The silt curtain at the moon pool appears to be somewhat effective at containing disturbed sediment thereby reducing the surface area of higher concentration water and the associated emissions in the dredge area.

4.4.2 Ambient Air Sampling

Ambient air samples were collected on three days during this PDFT to document conditions during dredging and CDF filling operations. Because of the short duration of the test, and the fact that PCB health effects are long-term, data were collected to document conditions and to provide information for full-scale activities at a later date. Data were not used to compare with standards or action levels for this limited one week effort. The results from this study will be used in conjunction with the flux chamber results (discussed above) to support development of ambient air action levels, being conducted by Foster Wheeler under a separate task.

Ambient air samples were collected from four stations around Cell #1 (2, 3, 6, and 17), from station #9, located to the north across the cove from the CDF, and from station #27 on the eastern side of the harbor near the dredge. Figure 4-4 shows the air sampling station locations. Samples were collected for 24 hours on each of three days (sampling was started the mornings of August 15, 16, and 17, 2000) chosen based on those days with maximum dredge production rates and warm weather as representative of "worst case" conditions. Samples were analyzed for NOAA and WHO congeners and total PCB homologue groups. Meteorological data and sample results are included in Appendix L and summarized in Table 4-2.

Table 4-2
Summary of Pre-Design Field Test Ambient Air Data

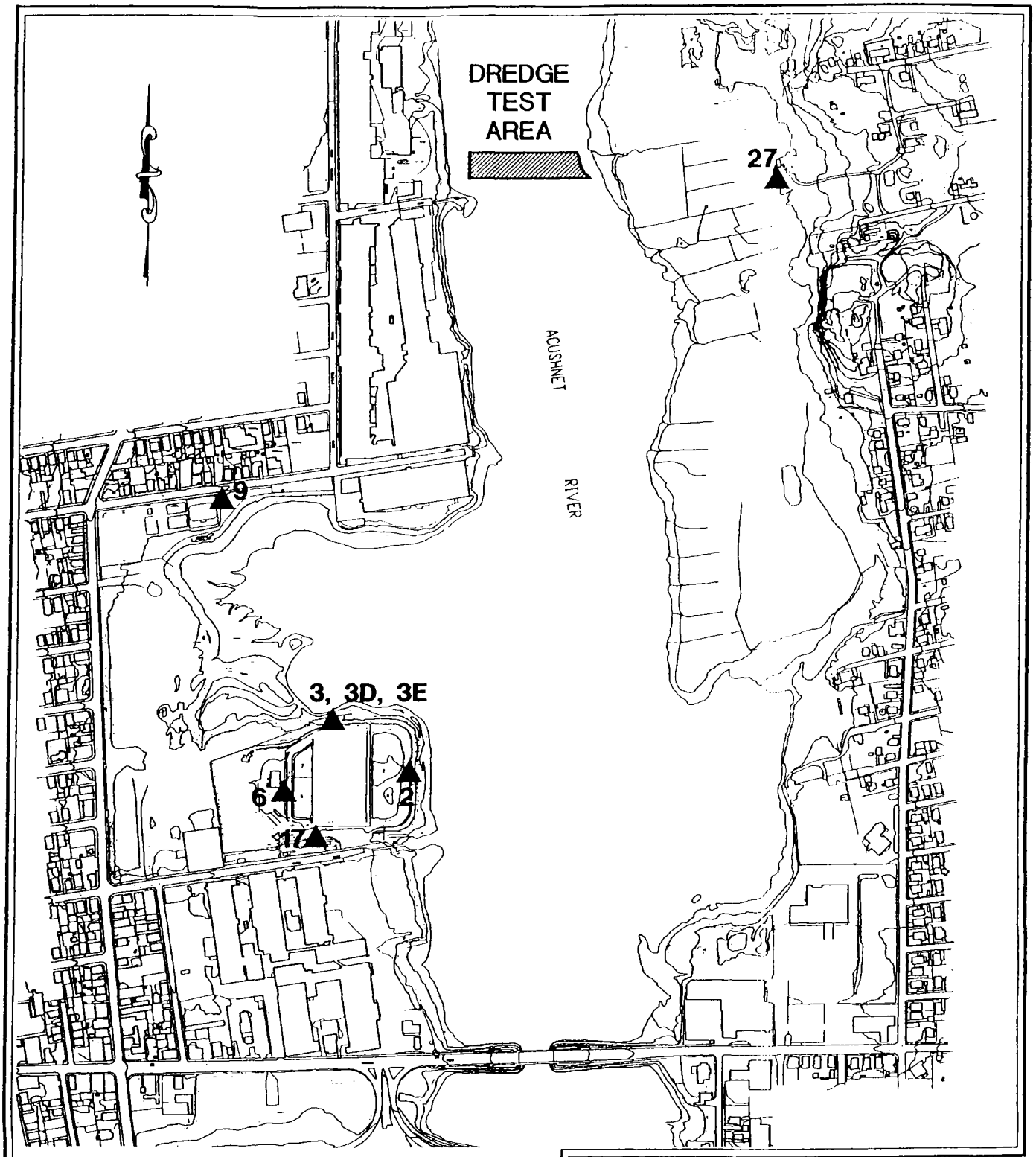
Date	Prevailing Wind Direction	Average Temp. °F	Avg. Solar Radiation w•m2	Concentration of Total PCB Homologue Groups (ng/m3)						
Station ID:				2	3	3D	6	9	17	27
8/15/00	NNE	69	70	43	110	79	110	40	610	12
8/16/00	SW **	70	131	86	100	254*	13	26	17	42
8/17/00	NW	66	269	160	48	82	90	36	110	24
Average:				96	88	138	71	34	245	26

* Sample analyzed by government designated QA lab (80,000 ng / 315.225 m^3)
** See wind rose in Appendix L, wind was from the SW for most of the day (during dredging)

The highest total PCB concentration detected was at station #17 (610 ng/m^3), the station downwind from the CDF on August 15. Stations 3 and 6 also had detected concentrations above 100 ng/m^3 on August 15, 2000. High concentrations on other days ranged from 100 (as measured by the Foster Wheeler primary laboratory, 254 measured by the government QA laboratory) to 160 ng/m^3 at stations 3 and 2, respectively, with somewhat elevated concentrations ranging from 82 to 110 ng/m^3 at stations 2, 3, 6 and 17 on August 16 and 17. Results from stations 9 and 27, away from the CDF, had lower concentrations (less than 50 ng/m^3 on each day) and were also dependent on wind direction. These data support the premise that, other than background attributed to the mudflats and surface water, the primary sources of PCB concentrations in ambient air are due to emissions from CDF operations. Results from station 27 indicate that ambient concentrations were generally consistent with established baseline concentrations for the Acushnet Substation (summer and September 2000 averages ranged from 20 to 40 ng/m^3) (Foster Wheeler *Final Annual Report Baseline Ambient Air Sampling and Analysis*, March 2001) and were not significantly adversely affected by dredging operations.

4.4.3 Odors

During the PDFT, Foster Wheeler conducted both Real-time and Personnel air monitoring. Personnel monitoring consisted of Indirect Analysis of samples taken on the Dredge barge and at the Sawyer Street facility for PCBs using NIOSH Method 5503. Samples taken were from Exclusion Zone (EZ) workers and from the EZ, Contaminant Reduction Zone (CRZ), and the Support Zone to determine if any PCBs were becoming airborne that could be detrimental to workers health. Real-time monitoring is direct monitoring using a Combustible/Toxic Gas Indicator (CGI) and a Photo-Ionization Detector (PID) both operating in the survey mode. The CGI detects the following gases in the atmosphere: Oxygen in the air from 0 to 100% - normal Oxygen is 20.9%. Lower Explosive Limit - a function of Flammable Gases in the Air - 0 to 100%; Carbon Dioxide (CO_2) -0-10,000 ppm; and H_2S, an asphyxiate and toxic gas 0 to 10,000 ppm.



KEY:

▲ AIR SAMPLING STATION LOCATION

0 600 1200

SCALE IN FEET

FIGURE 4-4

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

PRE-DESIGN FIELD TEST AMBIENT AIR SAMPLING LOCATIONS

SCALE: AS SHOWN

CADDFILE: NBH_017a.DWG

On August 18, 2000 both Real Time and Personnel monitoring were being conducted at the Sawyer Street facility. In the Exclusion Zone at the sediment discharge line, an H_2S odor was detected. Readings were taken upwind and downwind of the discharge and no H_2S readings were found upwind (South) of the discharge pipe. Downwind of the discharge pipe readings indicated a maximum H_2S percentage of 7 ppm out to a distance of ten ft. downwind of the discharge pipe. Readings taken 15 ft. downwind of the discharge pipe showed 0 ppm for H_2S. All other parameters of the CGI and PID were 0 or background in the Exclusion Zone. Real-time readings conducted on the Dredge barge using the PID and the CGI all showed 0/background during the sediment dredging.

Real time monitoring was conducted at the Sawyer Street site - in all work areas, EZ perimeter, CRZ and the Support Zone/trailer compound. All CGI and PID readings were 0/background. The area North of the EZ by the cove, north of the site, was checked extensively due to the discernable H_2S odor on that particular day, all readings on the CGI and PID were 0/background downwind outside the EZ in this area.

All Indirect Air Sampling (Personnel Monitoring) results received from ESA laboratories showed PCBs at below detection Limits for the entire Dredge Study, this included several samples from downwind of the discharge area at the Sawyer Street site.

During full scale dredging operations, engineering controls will be used to the extent practicable to control the potential for odors.

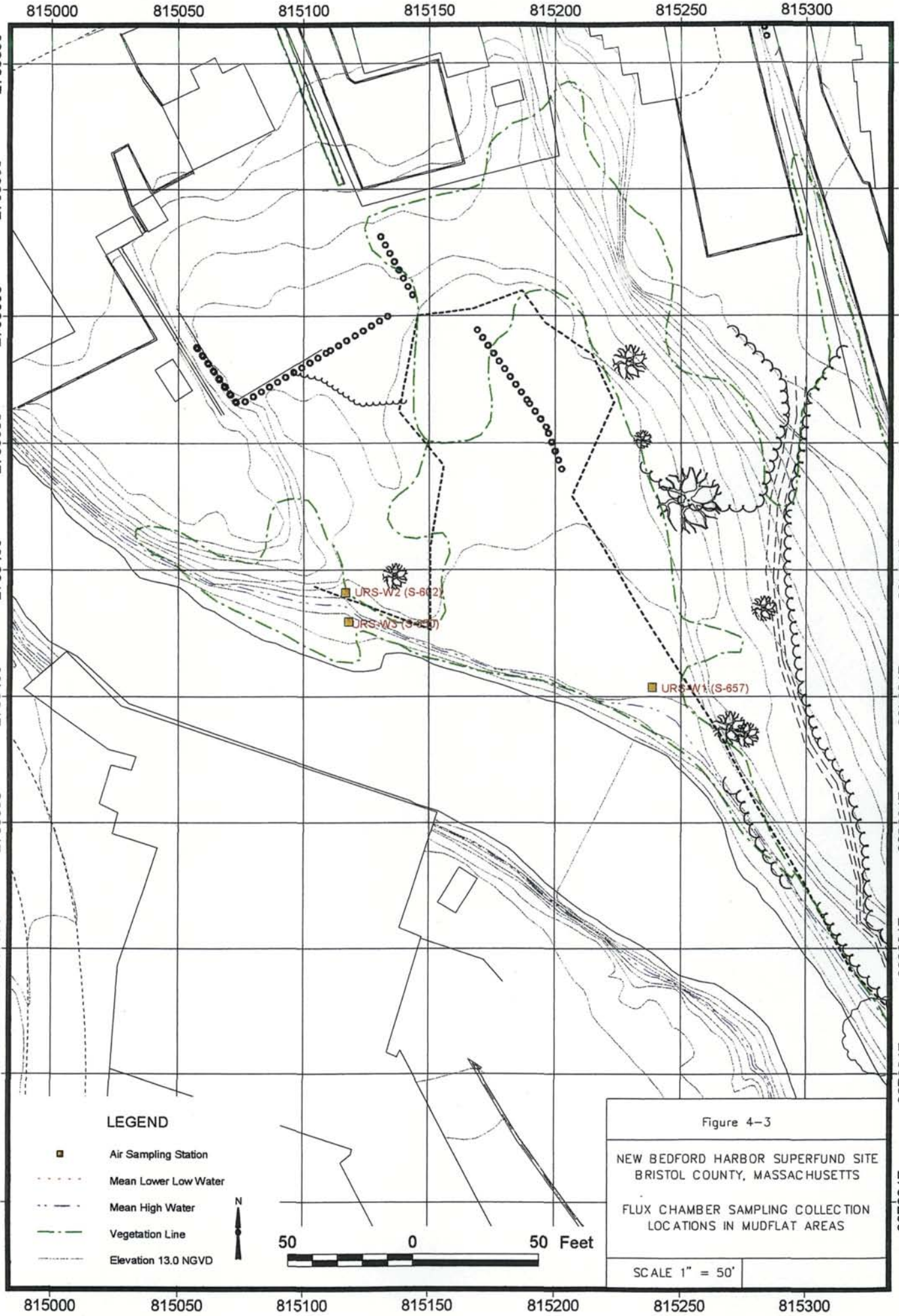


Figure 4-3

NEW BEDFORD HARBOR SUPERFUND SITE
BRISTOL COUNTY, MASSACHUSETTS

FLUX CHAMBER SAMPLING COLLECTION LOCATIONS IN MUDFLAT AREAS

SCALE 1" = 50'

5.0 WASTEWATER TREATMENT

Dredging operations conducted as part of the PDFT resulted in the generation of wastewater requiring treatment before final discharge to the harbor. The volume of wastewater generated during the PDFT was minimized by the use of a water recirculation system from CDF Cell #2 to the dredge SPU. Wastewater generated during the PDFT would be representative of wastewater generated during full-scale dredging using a Bean type hydraulic excavator. In an effort to test the performance of the equipment and processes proposed for a full-scale wastewater treatment system, a pilot-scale wastewater treatment system was used to treat the wastewater generated during the PDFT. The system was operated from September 4, 2000 through October 13, 2000 to treat over 1-million gallons of wastewater.

5.1 Objectives

The objectives of the pilot-scale wastewater treatment were to: 1) evaluate the treatment efficiency, flexibility and reliability of the individual unit operations/processes proposed in the Wastewater Treatment Plant (WTP) design; and 2) confirm the findings of the wastewater treatability studies. The individual unit operations that were evaluated in the pilot-scale treatment included:

- Chemical Addition and Settling;
- Ultrafine (0.45 μm nominal) Sand Filtration;
- Granular activated carbon adsorption;
- UV/Oxidation; and
- Dewatering with a plate and frame filter press.

5.2 Process Description

The pilot-scale wastewater treatment system was operated from September 4, 2000 through October 13, 2000 and treated approximately 1 million gallons of water generated during the dredging field test. The treatment system consisted of chemical addition (aluminum sulfate (alum), polymer) and settling using an inclined plate clarifier, ultra-fine (<0.45 μm nominal) sand filtration, UV/oxidation, and/or GAC adsorption. Portions of the existing WTP were utilized to conduct the pilot scale tests and the existing UV/Oxidation system was also evaluated using the ultrafine filtration system. The layout of the Sawyer Street facility and pilot scale treatment system are shown in Figures 5-1 and 5-2, respectively. A more detailed description of the pilot tests individual unit processes is provided in the following sections.

5.2.1 CDF Cell #1

Sediments dredged during the PDFT were discharged to CDF Cell #1. The resulting supernatant was then pumped from the CDF Cell #1 to CDF Cell #2 using a portable pump located at the site. In order to control the concentration of TSS within the supernatant, flexible hose and adjustable piping were used to pump water from varying depths within the cell. The concentration of PCBs within the dredged sediments ranged from 0 to 2,700 milligrams per kilogram (mg/kg).

5.2.2 CDF Cell #2

CDF Cell #2 was utilized as an equalization basin prior to the wastewater being pumped to the inclined plate clarifier. Utilizing CDF Cell #2 eliminated any mixing effects that could occur as the dredged slurry was discharged into CDF Cell#1 and provided for a more consistent and representative wastewater stream entering the pilot-scale treatment system.

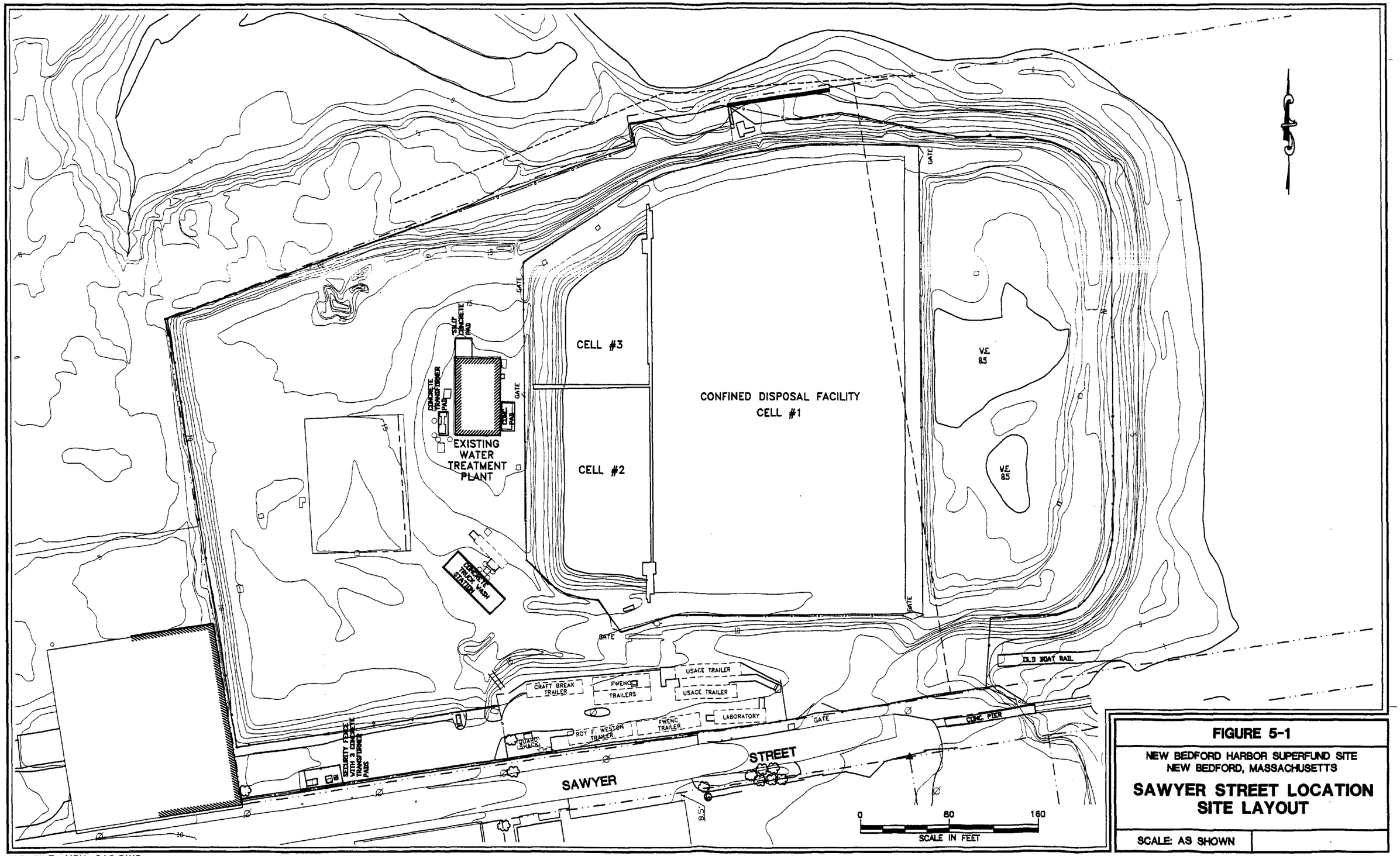


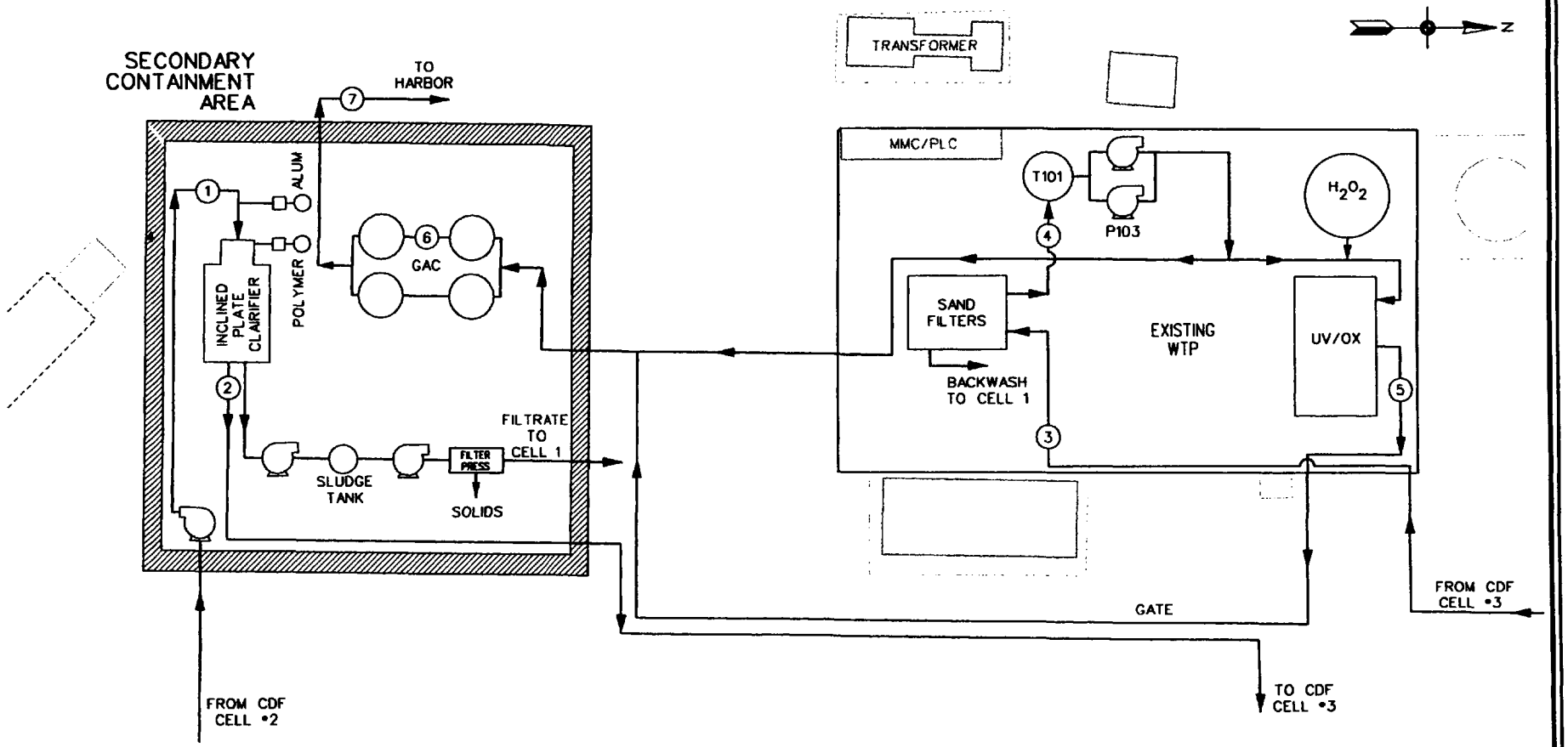
FIGURE 5-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SAWYER STREET LOCATION SITE LAYOUT

SCALE: AS SHOWN

CAD FILE: NBH_016.DWG



STREAM #	DESCRIPTION
1	CLARIFIER INFLUENT
2	CLARIFIER EFFLUENT
3	SAND FILTER INFLUENT
4	GAC/UV/OXIDATION INFLUENT
5	UV/OXIDATION EFFLUENT
6	GAC MIDPOINT
7	GAC EFFLUENT

10 0 20 40 FEET

SCALE 1"=20'

FIGURE 5-2

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

PILOT SCALE SITE LAYOUT

SCALE: NOTED

17ec101f.dgn

5.2.3 Chemical Addition/Settling

An inclined plate clarifier (Parkson Lamella Gravity Settler Model LGS 570/55) was obtained from the Charles George Superfund site (Tyngsboro, MA). The clarifier, which has 456 ft^2 of clarification area and 114 ft^2 of thickening area, was operated at 100 gallons per minute (gpm) (0.22 gpm/ft^2). Both alum and polymer were added inline to the influent wastewater before the clarifier flash mix tank.

Clarified effluent gravity flowed into CDF Cell #3. Flocculent that was formed in the flash and slow mix tanks settled to the bottom of the clarification tank where it accumulated as a sludge. The sludge was pumped to a sludge holding tank for dewatering with a diaphragm plate and frame filter press or back to CDF Cell #1.

5.2.4 CDF Cell #3

CDF Cell #3 was utilized as an equalization basin for the filtration and tertiary treatment systems. Due to the flowrate differential between the clarification and filtration processes, influent water to CDF Cell #3 accumulated at 100 gpm for the first several days of the study. Once approximately 200,000 gallons of wastewater had been collected in CDF Cell #3, the existing sump pumps (P-102 AB) were used to pump the water at 165 gpm (minimum) through an ultrafine (0.45 μm nominal) sand filtration unit and subsequently to the UV/Oxidation system and/or the GAC polishing units. The CDF Cell #3 pumps were operated for approximately 10 hours per day. The increase in the effluent flowrate (100 gpm vs. 165 gpm) was necessary due to the minimum flowrate requirement (165 gpm) of the existing WTP.

5.2.5 Ultrafine Sand Filtration

The ultrafine sand filtration unit was rated for 0.45 μm nominal filtration and was sized to reduce the TSS from 30 mg/L (ppm) to less than 5 ppm. The sand filter was operated at a flowrate of 225 gpm. Approximately 55-60 gpm was continuously recirculated through the filter in order to achieve optimal filtration performance. This is equivalent to the one-quarter recycle rate specified in the proposed full-scale treatment system. Backwashing was conducted with potable water once per 12 hour day at approximately 50 gpm for 8 minutes per vessel. All backwash water necessary for the periodic cleanout of the sand filters was returned to CDF Cell #1.

5.2.6 Granular Activated Carbon

Four vessels (2 sets of 2 carbon vessels in parallel) each filled with 2,500 lbs of 8x30-mesh granular activated carbon were placed in service immediately after the ultrafine sand filtration to ensure compliance with the discharge criteria. These GAC vessels were capable of treating a flowrate of 220 gpm, however they were normally operated at a flowrate of 165 gpm. The effluent from the GAC was then discharged to harbor.

5.2.7 UV/Oxidation

After completion of the first six days of pilot testing using the GAC treatment system, the existing UV/Oxidation unit was used to treat the wastewater for an additional five days at a flowrate of 165 gpm (minimum). To ensure that the effluent from the UV/Oxidation unit met the OU#1 discharge standards, the treated wastewater was passed through the four GAC vessels for final polishing prior to discharge to the harbor.

5.2.8 Plate and Frame Filter Press

A Netzsch 470-millimeter (mm) plate and frame membrane filter press was used to dewater sludge generated in the Lamella clarifier. At regular intervals, the sludge was removed from the clarifier and transferred to a sludge holding tank. Once a sufficient quantity had accumulated, the sludge was chemically conditioned and mixed to enhance flocculation. The conditioned sludge was then pumped from the holding tank to the filter press at 100 pounds per square inch gauge (psig) to 150 (psig). As sludge was fed to the press, water was forced through the filter cloth producing a dewatered cake. At the end of the feed cycle, indicated by a low filtrate output, the blowdown phase began. The blowdown process cleared sludge from the influent ports by forcing compressed air through the lines. After blowdown had finished, the membrane plates were pressurized to 225 psig as a final squeeze to remove additional water from the cake. The last step of the process was to remove the dewatered cake after releasing pressure from the plates. All dewatered cake was placed in storage containers for disposal.

5.3 Results

Water samples were collected before and after each of the unit processes. These grab samples (which were collected daily) were analyzed for TSS, PCBs, total and dissolved metals (cadmium, chromium, copper and lead). Water samples for on-site field measurement of turbidity, pH and temperature were also collected several times each day. In addition, flowrate and pressure data was also recorded. A summary of the contaminant removal rates for turbidity, PCBs, and copper for each of the treatment processes is presented in Table 5-1. Only PCBs and copper are presented in Table 5-1 because they were the only contaminants detected above the discharge limits in the influent stream. The chemical and physical treatment results for each of the unit processes is discussed in more detail in the following sections.

Turbidity values in Table 5-1 are an average of the daily average turbidity while PCBs and copper values are an average of the daily measurement. Throughout pilot-scale treatment, Aroclor-1242 was the only Aroclor detected in the laboratory PCB analyses. The complete analytical results and total flows are provided in Appendix M.

TSS data did not indicate substantial removal of suspended solids from any of the treatment processes including sand filtration. Further investigation indicated some difficulty with laboratory analysis for TSS due to elevated levels of salts present in the samples. For this reason, field turbidity measurements were taken to be a more accurate indicator of suspended solids removal throughout pilot-scale treatment. Turbidity measurements are provided in Appendix M.

5.3.1 Chemical Addition and Settling

Two different coagulants (alum and Aquapure SC) and one anionic polymer (Aquapure FW) were utilized to remove suspended solids during the pilot scale treatment. Chemicals and dosages were selected based on the results of treatability testing. In addition, initial jar testing was conducted at the beginning of pilot-scale treatment to insure optimal dosage rates. In order to form a flocculent, either a 50% solution of Aquapure SC (Hubard-Hall, Inc), an alum coagulant with a slight cationic charge, or a 48% solution of alum was added to the wastewater stream at 100-150 mg/L. To enhance the settlability of the flocculent a 0.5% solution of Aquapure FW, a high molecular weight anionic polymer, was added at a dosage of 2-4 mg/L. The average turbidities entering and exiting the inclined plate clarifier were 16.15 NTU and 6.23 NTU, respectively. The average concentration of PCBs was reduced slightly from 7.03 micrograms per liter (µg/L) to 6.03 µg/L. The total copper concentration was reduced across the clarifier from an average of 18.64 µg/L to 9.4 µg/L while dissolved copper was reduced from 10.48 µg/L to 7.37 µg/L.

Table 5-1
Summary of Pilot-Scale Treatment Results
Average Turbidity, PCBs and Copper Concentrations

Stream #	Unit Operation/Process	Turbidity (NTU)*	Total PCBs (µg/L)	Dissolved Copper (µg/L)	Total Copper (µg/L)
1	Clarifier Influent	16.15	7.03	10.48	18.64
2	Clarifier Effluent/Cell #3 Influent	6.23	6.03	7.37	9.4
3	Cell #3 Effluent/Sand Filtration Influent	1.03	1.26	7.87	8.65
4	Sand Filtration Effluent/ GAC UV/oxidation Influent	0.48	0.94	16.43	14.98
5	UV/oxidation Effluent	0.5	< 0.065	15.0	17.4
6	GAC Midpoint	NM	< 0.065	<3.0	3.79
7	GAC Effluent	0.15	< 0.065	< 3.0	< 3.0

* NTU – Nephelometric Turbidity Units
NM – No measurement

The effluent from the Lamella clarifier was gravity fed to Cell #3 where additional settling and clarification took place. The turbidity was reduced from 6.23 NTU to 1.03 NTU. PCBs were reduced from 6.03 µg/L to 1.26 µg/L. Only a slight reduction in total copper and no reduction in dissolved copper was observed in CDF Cell #3. The existing sump pumps in CDF Cell #3 were then used to pump the wastewater through the remainder of the pilot-scale treatment system. Contaminant reduction rates for the Lamella clarifier and CDF Cell#3 are presented in Table 5-2.

Table 5-2
Chemical Addition/Settling Contaminant Reduction Rates

Sample Location	Average Turbidity (NTU)	Average Total PCBs (µg/L)	Average Copper Concentration Dissolved (µg/L)	Average Copper Concentration Total (µg/L)
Clarifier Influent, SP1	16.15	7.03	10.48	18.64
Clarifier Effluent, SP2	6.23	6.03	7.37	9.40
Cell #3 Effluent, SP3	1.03	1.26	7.87	8.65

Sludge production in the Lamella clarifier was measured by collecting 1-liter samples from the flash mixing tank. The samples were placed in a 1-liter Imhoff Cone and allowed to settle for a period of time until a distinct sludge layer developed. The volume of the sludge layer ranged from 38 ml to 55 ml and varied slightly with chemical and dosage. The volume can be extrapolated to determine sludge removal rates as a percentage of the overall process flow ranging from 3.8% to 5.5%.

After initial start-up of the Lamella clarifier, significant problems with the settling of the sludge were encountered due to the presence of Algae in Cell #2. Although the effluent quality remained clear, most of the sludge produced floated to the top of the Lamella clarifier. Periodic shutdown of the Lamella clarifier was necessary to remove this floating sludge. On September 9, 2000, operation of the Lamella clarifier was stopped so that Tolcide PS-200, an algaecide, could be added to Cell #2. On September 11, 2000 the Lamella clarifier was restarted with no evidence of any floating sludge. Tolcide PS-200 was added on an as-needed basis thereafter.

5.3.2 Ultrafine Sand Filtration

The Vortisand filter was operated from September 14, 2000 through September 29, 2000. For that period, the Vortisand filter influent turbidity averaged 1.03 NTU and the effluent turbidity averaged 0.48 NTU. This represents a 53% reduction in turbidity. The average concentration of PCBs was reduced slightly from 1.26 µg/L to 1.14 µg/L. An unexpected increase in the concentration of total and dissolved copper was noted across the Vortisand. This increase was consistent throughout the test period and is presently unexplainable. Results of the ultrafine sand filtration PCB and copper influent and effluent analyses are shown in Table 5-3.

Table 5-3
Ultra Sand Filtration Contaminant Reduction Rates

Sample Location	Average Turbidity (NTU)	Average Total PCBs (µg/L)	Average Copper Concentration	
			Dissolved (µg/L)	Total (µg/L)
Sand Filtration Influent, SP3	1.03	1.26	7.87	8.65
Sand Filtration Effluent, SP4	0.48	0.94	16.43	14.98

5.3.2.1 Additional Performance Testing of the Vortisand Filter

Due to the relatively low influent levels of turbidity observed at the influent to the Vortisand filtration units, additional performance testing of the Vortisand filtration with higher levels of influent turbidity was conducted on October 4 and 5, 2000. The piping of the pilot-scale system was changed so that water from Cell #2 could be pumped directly to the Vortisand filter, followed by tank T101, activated carbon, and discharged to Cell #3. On October 4, 2000, turbid water from Cell #1 was pumped to Cell #2 in order to increase turbidity levels in Cell #2. Water from Cell #2 was continuously recirculated during the performance testing. Water of varying levels of turbidity was pumped from Cell #2 to the Vortisand filters. Influent turbidity levels ranged from 2.9 NTU to 65.5 NTU. Turbidity removal rates ranged from a low of 16% to a high of 69%.

On October 5, 2000, additional testing was conducted in order to determine the performance of the Vortisand filters operating with more consistent turbidity levels. Less water with lower turbidity levels was pumped from Cell #1 to Cell #2. Continuous recirculation of the water continued within Cell #2 and was maintained at the same rate as the previous day. Influent turbidity levels ranged from 7.4 NTU to 8.0 NTU. Turbidity removal rates ranged from 32.5% to 39.2%. The results from October 4 & 5, 2000 are presented in Table 5-4.

Table 5-4
Vortisand Filtration Performance Testing
October 4 & 5, 2000

Date	Average Influent Turbidity (NTU)	Average Effluent Turbidity (NTU)	Difference (NTU)	% Removal
October 4, 2000	25.8	10.4	15.4	40.9
October 5, 2000	7.8	5.0	2.8	35.6

Samples of the influent and effluent from the Vortisand filter were collected on October 5, 2000 and filtered through 0.45 μm nominal and 1.0 μm nominal capsule filters in an attempt to quantify Vortisand filter performance. The Vortisand filters, rated at 0.45 μm nominal, reduced turbidity levels by 39% from 7.9 NTU to 4.8 NTU without any capsule filtration. However, filtration of the same influent water using a 1 μm nominal capsule filter reduced turbidity levels by nearly 88% from 7.9 NTU to 0.95 NTU and a 0.45 μm nominal capsule filter reduced turbidity levels by 99% from 7.9 NTU to 0.05 NTU. PCB concentrations were reduced 90% and 99% using the 1 μm and 0.45 μm capsule filters, respectively. The complete results are presented in Table 5-5.

Table 5-5
Capsule Filtration Results
October 5, 2000

Sample Location	Capsule Filtration	Turbidity (NTU)	PCBs (μg/L)
Influent	None	7.9	5.01
	1μM nominal	0.95	0.5
	0.45 μM nominal	0.05	<0.05
Effluent	None	4.80	4.24
	1μM nominal	0.93	0.34
	0.45 μM nominal	0.07	0.37

5.3.2.2 Vortisand Differential Pressures

Foster Wheeler contacted the manufacturer of the Vortisand filter for recommendations on how to increase the performance of the filters to achieve the 0.45 μm nominal rating. The manufacturer suggested adding polymer before the inlet to the filter as well as having the filter effluent flow directly to the activated carbon units in order to reduce the differential pressure across the filter. These changes were made to the system and additional Vortisand performance testing was conducted on October 11 and 13, 2000.

On October 11, 2000 the Vortisand filter was operated with the effluent flowing directly to the activated carbon units to reduce the differential pressure across the filter. A high differential pressure can cause the upper layer of fine sand, normally suspended, to become depressed reducing efficiency and causing the filter to operate more like a conventional sand filter. The normal operating differential pressure for the standard Vortisand filter set-up is 10-15 psig with the automatic backwash set at 15 psig. During the initial Vortisand filter set-up for pilot-scale treatment, the operating differential pressure was found to be higher (20 psig to 25 psig) requiring that automatic backwash be set to occur at 29 psig. All changes to the Vortisand filter operating parameters were conducted by the manufacturer, Sonitec Inc., during installation and startup. The high differential pressure was found to drop to 13 psig after the pilot-scale treatment piping was changed to allow the Vortisand filter to be fed directly from Cell #2. This indicates that the cause of the high differential pressures during operation was the size of pumps P-102A and B which were initially used to feed the Vortisand filter. After the piping change, the smaller pump formerly used to feed the Lamella clarifier was used to feed the Vortisand filter causing a drop in filter influent pressure of approximately 10 psig. Further changing the piping to allow the activated carbon to be fed directly from the Vortisand filter did not result in a change of differential pressure. Typical differential pressures encountered during pilot-scale treatment are presented in Table 5-6.

Table 5-6
Vortisand Filter Differential Pressures

Mode of Operation	Influent Pressure (psig)	Effluent Pressure (psig)	Differential Pressure (psig)
Vortisand filter fed from P-102	60-63	36-43	20-26
Vortisand filter fed from Lamella feed pump	51-54	36-42	13-15
Vortisand filter fed from Lamella feed pump with GAC directly in-line	54-55	38-42	13-14

No change in turbidity reduction rate was observed as a result of changes to the operating differential pressure of the Vortisand filter. In one case, a slight increase in turbidity was noted across the Vortisand filter. Influent turbidity levels for October 11, 2000 ranged from 2.75 NTU to 17 NTU and effluent turbidity levels ranged from 2.95 NTU to 6.4 NTU. Turbidity removal rates ranged from -7.3% to 62.4%.

5.3.2.3 Vortisand Filter Operation with Chemical Addition

According to the manufacturer, water from CDF cell #2 may have contained colloidal particles that carried a slight electrical charge. This charge can cause the ultra-fine suspended sand layer and the colloidal particles to repel each other thereby reducing the performance of the filters. This effect has been observed by the manufacturer in other applications where Vortisand filters have been used to filter surface water. Addition of a chemical polymer at the filter influent can reduce or eliminate the electrical charge of the colloidal particles thereby increasing the performance of the filter.

On October 13, 2000, the Vortisand filter was operated while adding chemicals before the filter influent according to the manufacturer's recommendation. Three different chemicals were tested including two coagulants and one anionic polymer. Aquapure SC, an aluminum salt coagulant with a slight cationic charge was mixed to 50% and added at 100 ppm. A 48% solution of alum was also tested at 100 ppm. A 0.5% solution of Aquapure FW, a high molecular weight anionic polymer, was added at 2-4 ppm. The performance of the filter with the addition of each chemical is presented in Table 5-7.

Table 5-7
Vortisand Performance with Chemical Addition
October 13, 2000

Time	Chemical	Influent (NTU)	Effluent (NTU)	% Removal
0900	None	9.1	6.0	34
0940	None	9.5	5.4	43
1015	Aquapure SC, 100 ppm	9.3	5.9	37
1055	Aquapure SC, 100 ppm	9.4	8.1	14
1245	48% Alum, 100 ppm	9.3	7.2	23
1415	Aquapure FW, 2-4 ppm	8.5	3.7	56
1445	Aquapure FW, 2-4 ppm	8.8	3.5	60
1515	Aquapure FW, 2-4 ppm	9.0	3.1	66

5.3.3 Granular Activated Carbon

Activated carbon treatment was conducted from September 15, 2000 through September 19, 2000. Four vessels (2 sets of 2 carbon vessels in parallel) each filled with 2,500 lbs of Envirotrol's EI-30 granular activated carbon. EI-30 is a virgin 8x30-mesh bituminous coal-based activated carbon. Analytical Data from these dates indicted influent total PCB concentrations ranging from 0.73 μg/L to 1.28 μg/L and an effluent PCB concentration less than the method reporting limit (MRL) of 0.05 μg/L per Aroclor for all samples taken. For the same period, the concentration of dissolved copper was reduced from 12-15 μg/L to <3.0 μg/L and the concentration of total copper was reduced from 12-18 μg/L to 4.4 μg/L.

No backwashing of the activated carbon vessels was required during pilot-scale testing and no operational problems with the activated carbon were encountered.

5.3.4 UV/Oxidation

The existing 270 kilowatt (kW) UV/Oxidation unit was operated September 25, 2000 through September 29, 2000. Analytical Data from September 27, 28, 29 indicated influent PCB concentrations of 1.24, 1.19 and 1.42 μg/L and effluent PCB concentrations less than the MRL of 0.05 μg/L per Aroclor for two of the three samples.

The calculated UV dose was 28.125 kWh/1,000 gal. based on a flowrate of 160 gpm. The calculated electrical energy per order (EE/O) was 19.97. This is slightly more efficient than the EE/O of 21.9 determined by Calgon Carbon Corporation in the November 1999 bench-scale testing.

Extrapolation of the EE/O to a full-scale 1,200 gpm system with an influent PCB concentration of 1.0 μg/L would require a total lamp power of 1,708 kW to reduce the PCB concentration below the 0.065 μg/L discharge limit. A 1,708 kW system would require the addition of four 360 kW units in addition to the existing 270 kW unit. This is slightly less than the 1,872 kW determined in the November 1999 bench-scale study which would require five 360 kW units in addition to the existing 270 kW unit.

Each system is sized for an influent PCB concentration of 1.0 μg/L and it is possible that neither UV/oxidation system would be capable of meeting the discharge criteria of 0.065 μg/L if the influent PCB concentration were to increase significantly above 1.0 μg/L. In addition, no reduction of total or dissolved metals can be expected with UV/Oxidation treatment based on this pilot-scale treatment.

5.3.5 Plate and Frame Filter Press

Ten test runs were performed on small volumes of chemically conditioned sludge ranging from 17 gallons to 47 gallons. Of the ten runs carried out, nine were completed. Test #2 was aborted due to sludge "bleed through". Bleed through occurs when sludge passes through the filter cloth into the filtrate flow. Low polymer dosage was likely the cause of the bleed through.

Polymer was added to increase the solids content of the cake produced from each filter press cycle. The polymer used throughout the tests was Aquapure FW or a combination of Aquapure FW with a small amount of Magnifloc added. The strength of the polymer solution ranged from 0.25% to 0.5% and the volume added ranged from 23L to 91L.

The filter press cycle time ranged from 84 minutes to 255 minutes. The operating time was divided into three segments; fill time, squeeze time, and cake release/maintenance time. The average time for each segment was 2 hours and 10 minutes, 25 minutes, and 30 minutes respectively. Fill and squeeze times

were recorded based upon filtrate flow. At the end of each cycle, percent solids and other physical properties of the filter cake were measured.

The percent solids of the filter cake averaged 24%. The maximum and minimum percent solids of the cakes were 38% and 15% respectively. The solids content was determined by weighing the filter cake before and after drying. The density of the filter cake ranged from 68.6 lbs/ft^3 to 91.3 lbs/ft^3 the average density was 74 lbs/ft^3. Density was measured by first weighing a sample of the filter cake. The filter cake sample was then placed in a graduated cylinder of water. By dividing the weight by the volume of water displaced, the density was calculated.

The physical characteristics of the filter cake varied for each test. In certain tests, the filter cake was a well-formed solid, while in others it was thin and soft. Generally, the filter cake was described as having an uneven thickness. The lack of consistency amongst filter cakes can be attributed to the variation in polymer dosage and volume of sludge added. The filtrate however had minimal variance, it was usually a clear color. The volume of polymer added to achieve a 38% solids content cake was 5.3 gallons of a combination of a 0.5% solution of Aquapure FW and a 0.4% solution of Magnifloc, to 50 gallons of sludge.

Samples of the settled sludge, filtrate, and filter cake were sent off-site and analyzed for PCBs, TSS, and metals. Results of analytical tests are presented in Table 5-8.

Table 5-8
Summary of Filter Press Analytical Results

Location	TSS (mg/L)	PCB	Total Cadmium	Total Chromium	Total Copper	Total Lead
September 28, 2000 Sampling Data						
Settled Sludge	4,620	39.8 µg/L	NA	NA	NA	NA
Filtrate	NA	22.8 µg/L	ND:<5.0 µg/L	ND:<22.0 µg/L	27 µg/L	ND: <5.0 µg/L
Filter Cake	NA	35,000 µg /kg dry	0.74 mg/kg dry	200 mg/kg dry	200 mg/kg dry	74 mg/kg dry
September 14, 2000 Sampling Data						
Settled Sludge	7,800	13.0 µg/L	NA	NA	NA	NA

NA - Not analyzed
ND - Not detected

During the pilot-scale tests, minimal maintenance was required to the filter press. Occasionally the filter plates were washed to prevent blinding of the plates.

5.3.6 Effluent Toxicity Testing

In order to evaluate potential impacts of the treated wastewater effluent to aquatic receptors two sets of effluent toxicity tests were conducted by ENSR. Wastewater effluent from the pilot-scale treatment system using activated carbon was used for the first set of toxicity tests while the second test was performed with wastewater effluent generated by the pilot-scale treatment using UV/oxidation. Both sets of toxicity tests used mysid shrimp, sea urchin, and red alga as indicator organisms. In addition, several other parameters were measured including: (1) the concentration of Tolcide PS-200, an algaecide added to CDF Cell #2 for control of algae; (2) the concentration of hydrogen peroxide which is added to the UV/oxidation system; and (3) the concentration of metals including cadmium, chromium, copper and lead.

The results of the toxicity testing of the effluent from pilot-scale wastewater treatment using activated carbon did not indicate any toxic affects on any of the indicator organisms; however, adverse impacts on the reproductive systems of two of the three indicator systems were noted. No hydrogen peroxide was added when activated carbon was being used for wastewater treatment.

The results of the toxicity testing of the effluent from pilot-scale wastewater treatment using UV/oxidation did indicate acute toxicity in one indicator organism and chronic effects in the other two indicator organisms. Hydrogen peroxide in the UV/oxidation effluent was measured at 46 mg/L.

Neither PCBs, metals or Tolcide were detected above the detection limits in either set of toxicity tests. Refer to ENSR Corporation Document No. 9000-236-FOV, *Toxicological Evaluation of GAC and UV/OX Treatment Effluents to New Bedford Harbor CDF WTP Pilot Plant Testing*, December 2000, for detailed results (ENSR, 2000b).

5.4 Conclusions

The data collected indicates that the contaminants present within the wastewater are strongly associated with the suspended particles and by removing these suspended solids the majority of the contaminants can be removed from the wastewater stream. However, due to the source of the wastewater (seawater) there are colloidal particles present which flocculation, clarification and filtration alone cannot remove. The concentration of PCBs and copper associated with these colloidal particles is sufficient enough that the wastewater could exceed the discharge limits for OU#1. Therefore, tertiary treatment in the form of activated carbon will be required in order to achieve the discharge limits for OU #1.

5.4.1 Chemical Addition and Settling

The Lamella clarifier (Model LGS 570/55) was operated at 0.22 gpm/sq ft. during pilot-scale treatment. Based on testing of samples sent to the manufacturer during treatability testing, a loading rate of 0.7 gpm/sq ft. was recommended; however, this recommendation was based on a reduction of influent TSS from 159 ppm to less than 20 ppm TSS using alum, sodium hydroxide and anionic polymer. The performance of the Lamella clarifier was satisfactory in reducing turbidity levels to less than 4 NTU for the majority of pilot-scale treatment. Effluent turbidity was found to increase substantially if the sludge removal rate was not closely monitored due to the channeling and back-up of sludge into the inclined plates. Sludge removal during pilot-scale treatment was conducted by manual operation of an air operated diaphragm pump. For full-scale treatment, better control over sludge removal may be achieved by automating the sludge removal process with a timed sludge removal cycle. In addition sludge quality and sludge removal may be improved with a LGST model Lamella clarifier which incorporates an internal sludge thickening tank. The internal thickening tank will help to prevent channeling and produce a sludge with a higher percentage of solids. Sludge removal rates can be highly variable from day to day depending on influent TSS and chemical dosage rates. During full-scale treatment, the sludge production rate must be checked regularly to determine proper sludge removal rates.

The use of CDF Cell #3 as an additional settling basin after the Lamella clarifier consistently enabled the turbidity levels to be reduced to less than 1 NTU. This indicates that even under optimal performance conditions, a small amount of pin-floc may have been carried through the Lamella clarifier and into CDF Cell #3 where it subsequently settled out. Under full-scale treatment, CDF Cell #3 may be beneficial as a secondary settling basin to improve the quality of the wastewater.

5.4.2 Ultrafine Sand Filtration

The Vortisand sand filters did not achieve their rated filtration efficiency of 0.45-μm nominal in the manner they were operated during the pilot-scale treatment. Changes in the method of operation were attempted in order to increase the performance of the filter. Differential pressures across the filter were adjusted to prevent depression of the suspended sand layer of the filter. In addition, chemicals were injected just prior to the Vortisand filter influent to neutralize charged colloidal particles. Limited data from these tests indicated that the filtration performance increased to as high as 66% reduction in turbidity with the addition of an anionic polymer. Further testing of chemical addition and differential pressure adjustment may prove successful in achieving better filtration performance, however, it is not expected that the 0.45-μm nominal rating will be attainable using these methods. In addition to the 0.45 μm nominal rating of the Vortisand filters, other beneficial features of the system include a reduced footprint as well as a lower backwash flow than most other sand filters.

Due to the fact that the Vortisand filter performed more like a conventional sand filter, other filtration methods may be evaluated for full-scale treatment. Sand filtration alone may not be capable of achieving the desired filtration efficiency. In order to achieve greater filtration efficiency, some type of cartridge or bag filters in place of or in addition to sand filtration will be required.

5.4.3 Activated Carbon

Activated carbon was successful in reducing the concentration of PCBs to below the discharge limit of 0.065 μg/L per Aroclor. In addition, activated carbon reduced the concentration of total and dissolved metals, most notably copper. Although activated carbon is especially known for its ability to remove organic contaminants, its ability to remove low levels of inorganic ions has also been documented.

No operational problems with activated carbon were encountered during the pilot-scale treatment. Over 1-million gallons were treated through the activated carbon without any need to backwash. In addition breakthrough of the primary GAC vessels was not detected. Based on the GAC usage rate of 3,500 gallons wastewater per pound of GAC, breakthrough would not be expected until approximately 17 million gallons have been treated through the primary GAC vessels.

An activated carbon column test to determine GAC usage was not conducted as part of the pilot-scale treatment. For an accurate determination of GAC usage the test column would need to be sized to replicate the characteristics of a full-scale system. This would entail continuous operation of the column for potentially as long as 2 months. Data from the micro-column test conducted during treatability testing will be used for full-scale system sizing calculations.

5.4.4 UV/Oxidation

The 270 kW UV/oxidation unit was successful in reducing the concentration of PCBs to below the discharge criteria of 0.065 μg/L per Aroclor. Based on the influent and effluent concentrations, the UV/oxidation EE/O was calculated to be 19.97, slightly more efficient than EE/O of 21.9 calculated in previous bench testing conducted by Calgon in December 1999.

Extrapolation of the EE/O to a full-scale 1,200 gpm system with an influent PCB concentration of 1.0 μg/L would require a total lamp power of 1,708 kW to reduce the PCB concentration below the 0.065 μg/L discharge limit. A 1,708 kW system would require the addition of four 360 kW units in addition to the existing 270 kW unit. This is slightly less than the 1,872 kW determined in the November 1999 bench-scale study which would require five 360 kW units in addition to the existing 270 kW unit. UV/oxidation system sizing calculations are presented in Appendix M.

Each system is sized for an influent PCB concentration of 1.0 μg/L and it is possible that neither system would be capable of meeting the discharge criteria of 0.065 μg/L per Aroclor if the influent PCB concentration were to significantly increase above 1.0 μg/L. In addition, no reduction of total or dissolved metals can be expected with UV/Oxidation treatment based on this pilot-scale treatment.

5.4.5 Plate and Frame Filter Press

Based upon the results of pilot-scale treatment, dewatering can reduce the water content and volume of sludge generated from the wastewater treatment process. The size of a full-scale dewatering system will depend upon the wastewater flowrates and system's operating hours. Chemical conditioning of the sludge is recommended to increase the solids content of the cake and system efficiency.

Assuming the sludge dewatered during the pilot-scale tests is representative of the sludge to be treated, the table shown below can be used as a guide for sizing a filter press based upon wastewater flowrates. Sizing of the filter press system is based upon operating the filter press for 8-hours per day, and one cycle per day. For each wastewater flowrate, a Netzsch filter press or equivalent is specified based upon the filter cake capacity required. System sizing calculations are presented in Table 5-9.

Table 5-9
Required Filter Press Capacity for Varying Wastewater Flowrates

Wastewater Flowrate (gpm)	Total Solids (lbs/day)	Total Weight of Filter Cake (lbs/day)	Filter Press Volume Required (ft^3)	Netzsch Unit Recommended		
				Model #	# of Units Required	Capacity of System (ft^3)
100	277.42	1,109.69	15.0	630-III	1	20
125	346.78	1,387.11	18.7	630-III	1	20
150	416.13	1,664.53	22.5	800-I	1	30
300	832.27	3,329.06	45.0	800-III	1	50
450	1,248.40	4,993.59	67.5	1200-II	1	88
600	1,664.53	6,658.12	90.0	1200-III	1	110
750	2,080.66	8,322.65	112.5	1200-IV	1	134
900	2,496.80	9,987.18	135.0	1200-V	1	155
1,050	2,912.93	11,651.71	157.5	1500-III	1	172
1,200	3,329.06	13,316.24	179.9	1500-IV	1	200
1,350	3,745.19	14,980.78	202.4	1500-V	1	229
1,400	3,883.90	15,535.62	209.9	1500-V	1	229

5.4.6 Effluent Toxicity Testing

Two sets of toxicity tests were conducted to evaluate potential impacts of the treated wastewater effluent to aquatic receptors. The first set of tests were performed using effluent from activated carbon treatment and did not indicate any toxic affects on any of the indicator organisms, however, adverse impacts on the reproductive systems of two of the three indicator species were noted. The second set of tests were performed using effluent from UV/oxidation treatment and did indicate toxicity in one indicator organism and chronic effects in the other two indicator organisms.

In both sets of toxicity tests, PCBs and metals were not measured above the detection limits. Since the detection limits for the metals are comparable to the levels of the ambient water quality criteria for

protection of aquatic life, it can be assumed that any observed toxicity was not likely due to these constituents.

Tolcide was not measured above the detection limit of 5 mg/L in either toxicity test, however, the concentration that the literature indicates may have some effect on the test organisms is 2.5 mg/L. Although the dosage and biodegradability of Tolcide suggests that it would rapidly dissipate in the environment following application, effects from this constituent cannot be ruled out. If Tolcide did have any effects they would be consistent in both sets of toxicity tests.

Wastewater treatment using UV/oxidation requires the addition of hydrogen peroxide. Hydrogen peroxide in the UV/oxidation effluent was measured at 46 mg/L. No hydrogen peroxide was added to the system during treatment using activated carbon. The increased toxicity and adverse impacts of the effluent from the UV/oxidation toxicity testing may be due to hydrogen peroxide or copper since these are the only water quality parameters that varied between the two tests.

In toxicity testing it is not uncommon to observe low level adverse impacts such as those observed during testing using effluent from activated carbon treatment. These adverse impacts however may be due to Tolcide in the effluent at levels below the 5 mg/L detection limit. In addition, the toxicity testing procedure uses water from Hampton Harbor, NH rather than New Bedford for an experimental control. It is possible that water from the New Bedford Harbor is naturally more conducive to adverse impacts on the indicator organisms than water from Hampton, NH. It is not believed that the activated carbon process directly imparts any characteristics to the effluent that could be attributed to the increased adverse impacts observed during toxicity testing.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The success of the PDFT was determined by a number of factor's including:

1. The dredge contractor's ability to assemble and operate a current state-of-the-art portable dredge system that improved performance as compared to the prior Pilot Dredging and Hot Spot Dredging events with hydraulic dredge systems.

2. The ability of the PDFT team to conduct extensive data collection and field measurements to evaluate test performance.

Foster Wheeler contracted with dredge contractor BELLC to develop a dredging system that enabled accurate dredging of the contaminated sediment, minimized the amount of water added during the slurry pumping process, and recycled the dredge slurry effluent.

BELLC was successful in designing, fabricating and demonstrating the following key state-of-the-art dredge systems for the PDFT:

- A portable, shallow draft barge platform;
- A mechanical dredging system incorporating a hydraulic excavator with a sealed environmental clamshell bucket of Boskalis Dolman design, capable of a relatively high production rate, and horizontal and vertical dredging accuracy;
- The SPU with discharge pipeline, as a means of providing relatively high and controllable solids concentrations of the dredge slurry;
- A water recirculation system, to demonstrate the practicality of recycling decant water from the Sawyer Street CDF as makeup water for hydraulic dredged material transport; and
- Capabilities for providing continuous dredge production and positioning data, including discharge flow rate, solids concentration, material production, cycle times, and advance rate.

The performance of the dredge system was successful, as summarized in this report.

The PDFT study team, including USACE, EPA, Foster Wheeler, ENSR and other subcontractors were also successful in planning and carrying out field data collection programs for the PDFT.

To evaluate the performance improvements of a state-of-the-art environmental dredge technology over conventional dredge technology previously used at the site several performance areas were evaluated:

- Percent (%) solids concentrations in the dredge slurry and slurry pumping capabilities;
- Horizontal and vertical dredging;
- Dredge production rates in shallow water and sediment with debris;
- Potential impacts to water quality;
- Potential impacts to air quality; and
- Removal of the contaminated sediment to a given depth.

A secondary goal of the PDFT was to evaluate this new technology with regard to site specific cleanup levels. Additional objectives of the PDFT were to evaluate the effectiveness of applying contaminant

dispersants and flocculents within the CDF to reduce PCB losses to air from the CDF, to evaluate mechanical dewatering methods for water treatment sludges and to evaluate the use of GAC to treat wastewater.

The PDFT team performed these evaluations. The results are summarized in the report.

6.1 Dredge Performance

Dredge performance testing results as related to the removal and transportation of PCB contaminated sediments during the PDFT are presented in Section 3.0 of this report. The main areas of interest and investigation were in dredge production, dredging accuracy, and dredge slurry solids concentrations and water management. The findings of these investigations are summarized below.

6.1.1 Dredge System Production

Dredge production monitoring was performed over the course of dredging operations in the PDFT test area. Dredging was performed to obtain representative production rates over a range of conditions, including varying depths, bank height, and chemical and physical conditions.

The production performance of the PDFT test dredge, a hybrid system involving mechanical excavation and hydraulic material transport, was based on two main processes: material excavation and materials transportation. These processes, while integrated, were evaluated separately, in order to determine the production limits of the dredge system as a whole. This production evaluation method can be adapted for other dredging processes involving either hydraulic dredging, mechanical dredging with barge transportation and rehandling of dredged material, or other hybrid systems.

<u>Excavator Production</u>

For excavator production, basic dredge production parameters, involving bucket capacity, cycle time, depth of cut, bank height, and dredge shifting (advances) within an anchor set will define the maximum production for a given mechanical dredge. The actual realized dredge production will account for both foreseen and unforeseen delays including re-setting of anchors, mechanical repairs, weather, fueling, operator skill, and other delays. The delays found to be of most consequence with the test dredge excavator production included re-setting of the anchors, downtime due to dredge positioning system repairs, and waiting for the SPU system to be online.

The type of sediment dredged over the course of the PDFT did not appear to impact excavator production one way or the other. In either soft black silt, sand, shell, or clay, the HPG bucket had no problems removing the material. Delays due to material type were encountered on the SPU end of the process as discussed below.

Over the course of the PDFT, the representative average production rate for the excavator was 80 cy/hr. In general, this production was achieved in areas with depth of cut (bank height) ranging between 1.7 ft. and 2.0 ft. On the final day of dredging, August 18, the depth of cut (bank height) was between 3 ft. and 4 ft., and the excavator production averaged 106 cy/hr. Considering that the BELLC dredge system and crew had still not been optimized after only one week of test dredging, SPU suction pressure reduction due to debris blockage had not been fully remedied, and the bucket was only being approximately 75%-80% loaded, it is believed that the excavator production observed over the duration of the PDFT could be increased by 20% on a full scale project in the Upper Harbor to approximately 95 cy/hr. This production range would only be attainable in deeper areas of the harbor where access to the dredge areas was unencumbered by a dredge of similar scale, and draft characteristics to that tested during the PDFT.

In shallower areas, where working of the tides would increase the number of barge movements and reduce the overall dredging efficiency, the dredge production would be anticipated to be significantly less. Alternatively, a smaller dredge with less production capacity than that of a dredge of the scale tested during the PDFT could be used. In either case, with either a larger dredge working the tides, or with use of a smaller dredge, the production range would be on the order of 35 to 50 cy/hr. This is an estimate only, based on knowledge of the anticipated reduction in production efficiency (50%-60%) due to depth restriction on a larger dredge, and an understanding of production capacity of shallow hydraulic dredges. Both the breakpoint at which a larger production environmental dredge would be replaced by a smaller dredge, and the production range of that smaller dredge will be better assessed in the 90% Basis of Design/Design Analysis for the Dredging Design, to be completed in 2001.

SPU Production

The production limit for the BELLC test dredge was found to be on the hydraulic transportation system (SPU) during the PDFT. The production performance of the test dredge was impacted most significantly at the onset and throughout the PDFT by the clogging and blockage of the suction line between the bottom of the material hopper and the primary mover (slurry pump). Here objects consisting primarily of cobbles, metal debris and live quahogs accumulated against the rockbox screen, reducing the suction pressure, and attainable production threshold of the SPU system. Throughout the PDFT the primary focus of optimization was on the hydraulic transport system (SPU). Modifications, which included the addition of water jets in the suction line, baffle walls welded in the hopper, and other operational measures, were made to remedy the production problems encountered due to debris. Only during the last three days of test dredging, August 16, 17, and 18, did the dredge realize running time representative of a full-scale remediation.

Of interest in the SPU production report, for August 17, the most representative testing day for SPU performance, the dredge's efficiency was 77.8% (i.e., *in situ* sediment was dredged during 77.8% of the time dredge operations were ongoing). Dredging efficiency refers to the total actual dredging (effective) time divided by the total operating time (including delays). During this day 2,509 cy of slurry was discharged, of which 537 cy of the slurry was *in situ* sediment moved. The average volume of slurry moved was 346 cy/hr, and an average volume of *in situ* material of 74 cy/hr. It is believed that for the full scale, with optimization of the debris management system, the SPU production will match, or exceed that of the excavator production.

6.1.2 Dredging Accuracy

Key to the success of the New Bedford Harbor full-scale remediation will be the ability of the selected dredge(s) to minimize the amount of overdepth dredging while still attaining the target cleanup goals of the project. The BELLC hydraulic excavator type dredge was selected for pilot testing, in part, to demonstrate that a mechanical bucket operated from an excavator with rigid connections and state-of-the-art positioning could achieve dredging accuracy 6 in. or less in the vertical plane and 24 in. or less in the horizontal plane.

Evaluation of dredging accuracy was carried out based on comparison of the post-dredge survey with the target depths. For dredge Cuts 5, 6, 7 and 8, where accuracy was a focus, 95% of the dredge area was within 6 in. of the target depth. In 90% of the dredge area the average vertical dredging accuracy was most nearly 4 in. Most of the points that deviate more than 6 in. are in the slope area, on the north and south ends of the cut. An approximate 1V:1H slope was excavated by the dredge on either side of the test area, while dredging in an effort to minimize sloughing of adjacent areas into the dredged portions of the PDFT dredge area.

After dredging Cuts 6, 7, 8, and 5, respectively, it was realized in the field that a "clean" clay layer was oftentimes higher in elevation than that shown in contamination characterization plots. Thereafter the field target dredge level in Cuts 2, 3 and 4 changed from one based on the theoretical plan to one based on observation. When the operator encountered clay, as evidenced by deposition on the material hopper grizzly, dredging proceeded no deeper in that grab position. Where the clay layer occurred at more than a few inches from the planned theoretical dredge level, the target level was adjusted within tenths of a foot of the visual observation on the next, adjacent spud or "moonpool" position (1/4 of a dredge cut), in an attempt to minimize the removal of the underlying clay.

This visual observation method of determining dredge depth was applied in Cuts 2, 3 and 4. In these cuts, the depth of cut was reduced from a planned 2 ft. cut, to a 1.7 ft. (Cuts 2,3,4) and 1.8 ft. cut (Cut 4). In these areas, the vertical dredging accuracy decreased to an average of approximately +/- 6 in. from the target. This reduction in accuracy was observed to be a result of interruptions in the CMS display to the operator and personnel communication errors. It is therefore reasonable to assume, for a full scale operation, that with rapid and accurate updating of the dredge guidance system to reflect field changes in the target elevation based on visual observations of the clean clay layer, the dredging accuracy will approach that achieved in the areas where the target depth is pre-programmed into the crane operators display.

6.1.3 PCB Removal Efficiency

The evaluation of the dredge efficiency at PCB removal included two components. The first (primary) goal was to evaluate the dredge's ability to remove contaminated sediment to a given depth horizon relative to the dredging plan. The dredge performance was highly accurate in this regard. Comparison of the target dredge volume with the actual volume dredged yielded an overdredging value of only 16%, with vertical accuracy of +/- 4 in. relative to achieving the intended horizon. Comparison on pre- and post-dredging sediment PCB concentrations revealed that 97% of the PCB mass was removed over the dredged area.

A secondary objective of the PDFT was to evaluate this new dredging technology with regard to site specific cleanup levels. The design included: 1) delineating the 10 ppm PCB concentration horizon within the test area; 2) establishing a dredging plan based on that depth; and 3) assessing the dredge's ability to remove sediment to that depth. It should be understood that the project goal was **not** to leave a final sediment concentration of 10 ppm; this was a field test, **not** a remedial operation. The dredge performed quite well in this regard. The average sediment PCB concentration (upper one foot) was reduced from 857 ppm to 29 ppm over the dredged area. This met the clean up criteria of 50 ppm for the Lower Harbor and approached the criteria of 10 ppm for the Upper Harbor.

During the design phase of this project, it was determined that most sediments within the dredge test area had a high water and silt/clay content. This fact introduced the possibility that some contaminated sediment within or immediately adjacent to the dredge area could be mobilized during the dredging process and potentially re-contaminate the dredged area. Mechanisms that could mobilize the sediments include bucket impact on the bottom, loss through the water column (appears minimal for the hydraulic excavator), anchor wire/spud repositioning, and material sloughing down slope along the sides of a dredged cut. Furthermore, other factors such as tidal currents and meteorological events (e.g., wind) could produce the same effect due to re-suspended contaminated sediments migrating from other areas of the harbor. The sediment characterization program included the collection of surface grabs in addition to cores in an effort to quantify the effects of sediment mobilization.

Based on the visual observations of the upper surface of the post-dredge cores and grab samples and the results of laboratory analyses, some recontamination did occur within the test area. Calculations

presented in Appendix J (Section J.5) demonstrate that only a very thin layer of re-deposited, contaminated PCB sediment would be required to increase the concentration within a composited upper one foot (0.3 m) sediment core to greater than 10 ppm. For example, if the sediment adjacent to a clean dredge area has a PCB concentration of 1,000 ppm (as was the case in much of the test area), it would require only a 0.24-inch (0.61cm) layer of newly deposited (post-dredging) contaminated sediment to elevate the average concentration of the upper one foot of clean sediment above 10 ppm.

This thickness of contaminated silty material (only a thin veneer) is consistent with field observations and analytical results from the post-dredge sampling. Based on this information, it appears that the observed post-dredge PCB concentration of 29 ppm (upper one foot composite) can be attributed to deposition of mobilized sediments (either from the dredged area or adjacent areas by sloughing, tidal currents, etc.) rather than inefficient or inaccurate dredging.

In summary, both the sediment removal data (presented in Section 3.0) and PCB data presented in this appendix indicate that this dredging technology is very efficient at contaminated sediment removal. The results indicate that 97% of the PCB mass was removed over the test area, and the remaining sediment concentrations approached the site specific clean up criteria. A similar reduction in sediment concentration was observed for the area dredged to planned depth and the area dredged to depth based on the visual method. The PCB mass remaining after dredging appeared to reside entirely in a thin surface veneer and was attributed to recontamination of the dredged area rather than incomplete removal.

Based on experiences during the PDFT, it was determined that remedial dredging to 10 ppm is possible through the use of modified operational procedures and project design. During full scale operations, development of a dredge plan and sequencing that proceeds from upslope to downslope and with an understanding of the site current (tidal) regime would be made to address some of the recontamination effects due to sloughing. Additionally, dredging operational approaches could be employed during the full scale project including return sweeps, tighter overlap of bucket grabs, and slower retrieval of final bucket grab that would provide for a cleaner bottom surface and reduce sloughing of adjacent areas. As confirmation sampling results became available they would be shared with the dredge contractor and the operator in particular to modify dredging techniques to obtain a bottom that met the cleanup criteria.

6.1.4 Dredge Slurry Solids Concentration

The solids concentration values attained by the Bean dredge were impacted by production delays due to debris. Average sustained solids concentration values recorded by the SPU system over periods of dredging are provided in Table 6-1 below.

Table 6-1
SPU Slurry Solids Concentrations

	16-Aug-00	17-Aug-00	18-Aug-00
Average % Solids by Weight of *In situ* Material	45.00%	52.00%	34.00%
Average % Solids by Weight of Dredge Slurry (3rd Loop)*	15.55%	16.84%	15.39%
Greatest % Solids by Weight of Dredge Slurry (3rd Loop)*	18.94%	20.03%	20.22%

* Represents average sustained % solids concentration over dredging period

The sediment within the PDFT test area had *in situ* specific gravity of 1.26 to 1.41, which corresponds to concentrations of 425 to 668 g/L, wet unit weights of 78.6 to 88.0 pcf (1,260 to 1,410 Kg/m^3), solids by weight of 33.8 to 48.6 percent, and moisture contents of 196 to 110 percent. These values are typical for very soft, silt or clay marine sediments with natural organic material.

Average sustained solids concentration values recorded by the SPU system over sustained dredging periods ranged from 13.3% to 16.3% solids by weight. These concentrations were achieved in dredge areas having *in situ* sediments with average solids concentrations of 32% to 43% solids by weight. This corresponds to volume concentrations in the order of 40% to 50%, by volume. The solids concentration values attained by the BELLC dredge were affected by debris. As debris would become lodged in the hopper, suction line and/or rock box, more water was required to be introduced to the hydraulic slurry transport system by the SPU in order to maintain suction pressure, and in an attempt, through the introduction of water jets to dislodge the debris in the suction. Higher solids concentrations would be attainable with inclusion of a more sophisticated debris separation system on the full-scale project.

Based on the results of the PDFT, an average 15% solids by weight for a solids concentration of dredge slurry could be applied to the full-scale remediation of the Upper Harbor, using the SPU system. The actual solids concentration values will be determined by better definition of *in situ* density, and the type of hydraulic transport (pumping) system used.

6.1.5 Recirculation System

A significant aspect of the PDFT was the successful demonstration of the dredge effluent water recirculation system. The recirculation system essentially created a closed loop system, whereby the only water added to the dredge process was that entrained in the dredge bucket. This water addition amounts to 30% to 40% of the *in situ* volume, and includes both the water contained in the sediment and the water in the bucket voids due to incomplete filling. Water was recycled back to the dredge for use as make up water for the SPU system and as jet water for debris management in the suction line. No water was used from the seachest for makeup water for hydraulic slurry transport.

The recirculation system operated without any significant problems. Only one delay was caused by the recirculation system, when the return water pump lost its prime.

Use of a recirculation system should be included in the design and planning of the full-scale project. In this case, the only additional water that will require treatment is that water entrained in the dredge bucket, which conservatively approximates 40% of the bucket volume. Some additional investigation remains to determine if additional water treatment measures would be necessary for the recirculation water, which could develop concentrated levels of PCBs and/or metals, after extensive recirculation.

6.1.6 Bulking Factor

The *in situ* sediment concentration in the dredge test area ranged from 425 to 668 g/L. In areas where the initial sediment concentration is lower than 500 g/L, the bulking factor would be less than 1.3 and could approach 1.0. This is because the pipeline concentration was approximately the same for all the sediment dredged in the dredge test. The concentration in the disposal cell would be about the same. Therefore, the ratio of *in situ* volume to disposal cell volume would be about 1.0. The bulking factor also decreases when the percentage of sand in the sediment increases. The bulking factor for loose sand and gravel is close to 1.0 because the sand settles quickly and the settling that occurs in a disposal cell is similar to natural settlement that occurs in the Harbor.

6.2 Environmental Monitoring

6.2.1 Water Quality Monitoring

The test dredge's ability to minimize environmental impact to water quality was evaluated by measuring the extent of sediment resuspension and transport, and is summarized in Appendix K.

For test days representing full scale remediation, such as August 16, field measured turbidity showed some spikes in the vicinity of the dredge but generally returned to background levels within 500 ft. down current of the dredge. Total particulate PCB concentrations (with "total" reported as the sum of the 18 NOAA congeners) were elevated in the vicinity of the dredge, but returned to background levels within 500 ft. down current of the dredge. During the other monitoring events, some of the turbidity transects revealed little or no detectable elevation of turbidity down current of the dredge. Greater increases in urbidity were generally traceable to dredge support activities or environmental conditions unrelated to field test operations. Barge movements by the support tug *Miami II* in shallow water for instance were recorded as causing suspended solids concentration of 300 mg/L and particulate and dissolved PCB concentrations of 26 and 2.7 µg/L, respectively, within 50 ft. of the tug (background concentrations of suspended solids were 5 mg/L and total dissolved + particulate PCBs were 0.75 ug/L on this date). Aerial photos, presented in Appendix K and Appendix O, illustrate the visual difference in the turbidity plumes associated with the tug and the dredge.

The limited water column impacts associated specifically with the dredging are attributed to both operational and environmental factors. The design of the bucket (tight closing with limited leakage), the configuration of the dredge (with a "moon-pool" work area enclosed behind a 36-inch silt curtain), and the controlled manner in which the operation was executed all contributed to minimizing the release of material to the water column. The shallowness of the area (maximum depth of the dredged area was less than 10 ft. at high tide) and the limited currents (maximum currents generally less than 0.5 ft./sec) limited transport away from the dredging area.

Difficulties associated with handling and transferring sediments containing debris and large components of embedded shells did cause regular suspensions of dredging operations. However, the periods of continuous dredging were sufficient enough to establish "steady state" conditions in the near field area (within 200 ft. (61 m) of the dredge) and are considered representative of continuous dredging operations. More continuous dredging over a full or multiple tidal cycles would not be expected to generate a turbidity plume of greater extent in the nearfield area down current of the dredge than that observed during the field test. Based on the modeling predictions presented in Section K.2, any additional farfield increases are expected to be limited to the Upper Harbor.

6.2.2 Air Quality Monitoring

Different types of air samples were collected to achieve various objectives during the PDFT. These included the following:

- Flux chamber sampling provided a measure of emissions as an indication of the relative contributions from the various operations to the ambient air concentrations. These will also be used to support the emissions and dispersion modeling calculations performed as part of developing ambient air action levels for upcoming construction work. In addition to flux chamber samples collected in the field, sediment from the bench scale dewatering studies was tested at the USACE WES for emissions measurements. Test results were reported to USACE.
- Ambient air sampling and analysis was performed from locations around the CDF and harbor to document concentrations during operations.
- Sampling was conducted in accordance with the Foster Wheeler TO #17 *Sampling and Analysis Plan* (SAP), Revision #6, dated August 2000 (FWENC, 2000c). The data from these tests are summarized and discussed in the following sections.

Flux Chamber Sampling

In summary, limited flux chamber sampling during the PDFT provided useful data for evaluating relative emissions from various sources. Some key findings are summarized as follows:

- Emission flux measurements do not correlate well with source material concentrations. However, they do generally appear to be the highest in association with well mixed sediment and water slurries in the CDF.
- *In situ* sediments in the mudflat area do not provide the same magnitude of emission flux per square area as well mixed sediment in the CDF. However, given the large surface area of the exposed mudflats at low tide, these areas and exposed surface water will continue to be a significant source of ambient air concentrations of PCBs, as measured during the Baseline study.
- Total emissions, calculated as (flux) x (surface area) x (time), are directly proportional to the amount of exposed surface area. Accordingly, exposed CDF surface area is a significantly greater source of emissions than dredging operations. The contaminated sediments in the mudflat areas and the river/harbor surface water remain the largest surface area sources of emissions.
- Dredging activities, including the grizzly, hopper, and disturbed sediments in the moon pool are relatively small sources of PCB emissions in comparison with the CDF because of their lower flux measurements and limited surface area.
- The use of surfactants Dawn and Biosolve to control the sheen at the CDF does not appear to be effective at controlling PCB emissions. These limited data suggest that Simple Green may be more effective than other surfactants although additional testing is recommended before drawing definitive conclusions.
- The silt curtain at the moon pool appears to be somewhat effective at containing disturbed sediment thereby reducing the surface area of higher concentration water and the associated emissions in the dredge area.

Ambient Air Sampling

Ambient air samples were collected on three days during this PDFT to document conditions during dredging and CDF filling operations. Because of the short duration of the test, and the fact that PCB health effects are long-term, data were collected to document conditions and to provide information for full-scale activities at a later date. Data were not used to compare with standards or action levels for this limited one-week effort. The results from this study will be used in conjunction with the flux chamber results (discussed above) to support development of ambient air action levels, being conducted by Foster Wheeler under a separate task.

Ambient air samples were collected from four stations around Cell #1 (2, 3, 6, and 17), from station #9, located to the north across the cove from the CDF, and from station #27 on the eastern side of the harbor near the dredge. Figure 4-4 shows the air sampling station locations. Samples were collected for 24 hours on each of three days (sampling was started the mornings of August 15, 16, and 17, 2000) chosen based on those days with maximum dredge production rates and warm weather as representative of "worst case" conditions. Samples were analyzed for NOAA and WHO congeners and total PCB homologue groups. Meteorological data and sample results are included in Appendix L and summarized in Table 4-2.

The highest total PCB concentration detected was at station #17 (610 ng/m^3), the station downwind from the CDF on August 15. Stations 3 and 6 also had detected concentrations above 100 ng/m^3 on August 15, 2000. High concentrations on other days ranged from 100 (as measured by the Foster Wheeler primary laboratory, 254 measured by the government QA laboratory) to 160 ng/m^3 at stations 3 and 2, respectively, with somewhat elevated concentrations ranging from 82 to 110 ng/m^3 at stations 2, 3, 6 and 17 on August 16 and 17. Results from stations 9 and 27, away from the CDF, had lower concentrations (less than 50 ng/m^3 on each day) and were also dependent on wind direction. These data support the premise that, other than background attributed to the mudflats and surface water, the primary sources of PCB concentrations in ambient air are due to emissions from CDF operations. Results from station 27 indicate that ambient concentrations were generally consistent with established baseline concentrations for the Acushnet Substation (summer and September 2000 averages ranged from 20 to 40 ng/m^3) (Foster Wheeler *Final Annual Report Baseline Ambient Air Sampling and Analysis*, March 2001) and were not significantly adversely affected by dredging operations.

6.3 Comparison with Pilot Dredging and Hot Spot Dredging Events

The Foster Wheeler report *New Bedford Harbor Cleanup, Dredge Technology Review* (FWENC, 1999), developed to assess applicable dredge technology for implementation of the New Bedford Harbor full scale remediation concluded that dredging technology used for environmental remediation dredging had changed substantially since completion of both the New Bedford Harbor Pilot Dredging Study in 1989 and the Hot Spot Dredging event in 1995. The dredge technology showing the best performance on these events was the Ellicott 370 HP Dragon Series 10-inch (discharge) hydraulic cutterhead dredge. This dredge therefore established the baseline for the Upper harbor site in terms of dredge efficiency and performance. Prior studies had excluded mechanical dredging techniques for use on these two events due primarily to the inefficiency of barge transport to the disposal facility because of shallow operating depths, the perception that a hydraulic system left a more uniform bottom surface and concern over resuspension of contaminated sediments.

Table 6-2 compares the key performance areas evaluated during the Pilot Dredging, Hot Spot Dredging and PDFT events.

Each of the three dredging performance evaluations summarized in Table 6-2 were conducted across different test areas with different chemical and physical conditions and with different performance testing/cleanup objectives. The PDFT, however, has demonstrated that current state-of-the-art dredge technology, in particular a hybrid mechanical/hydraulic dredge with sophisticated environmental controls systems, can attain dredge performance values exceeding that of the baseline dredge, the Ellicott 370 HP, particularly in the areas of dredging accuracy, dredging production, and solids concentration of the dredge slurry.

6.4 Recommendations for Full Scale Remediation

The PDFT was conducted to provide optimum, site specific dredge performance values for use in developing the New Bedford Harbor full scale remediation project. To provide the most realistic data for use in development of the full scale remediation project, the PDFT was conducted in areas and with equipment that would be reflective of the full scale project, to the extent possible.

The PDFT successfully demonstrated and recorded performance data including dredge production, accuracy, slurry solids concentration, air and water quality impacts, reflective of dredge technology currently available in the U.S. dredge industry.

Table 6-2
Dredging Performance Comparison

Performance Data	Pilot Dredging Study [1] Ellicott 370 Dragon Series	Hot Spot Dredging [2] Ellicott 370 Dragon Series	Pre-Design Field Test BELLC Hybrid Test Dredge
Total Available Work Days	N/A	345	10
Total Dredge Days	8	261	5
Total Shutdown Days [3]	N/A	32	0
Other Non-dredge Days	N/A	52	5
Total Quantity Removed (cy)	951	14,000	2,308
Required Quantity (cy)	1,574	8,428	1,985
Overdredge Quantity (cy)	0	5,568	323
Overdredge Percentage	0%	66.10%	16.30%
Number of passes	1	2	1
Area Dredged (sq. ft.)	21,250	189,742	24,900
Area Re-Dredged (sq. ft.) [4]	0	22,760	0
Avg. Dredge Time (hrs/day, pay)	4.1	7.7	11
Avg. Dredge Time (hrs/day, prod.)	3.2	4	5.2
Average Production Rate (cy/hr) [5]	37	13.4	72.5
Effective Time	78%	52%	47%
Target depth of cut	2 ft.		1.7 to 4.0 ft.
Accuracy	average underdredge by 9.5 in.	N/A	+/- 4 in.
Solids Concentration of Dredged Slurry (by weight)	2-3%	2-3%	13-16% using patented SPU. Recirculation system was also adapted to test dredge permitting the reduction of water to be treated by an estimated 300% over conventional hydraulic slurry pump capabilities.
Water Quality Impacts	Sediment Resuspension Rate at the point of dredging was estimated to be 40 grams per second.	60 Kg PCBs migrated from Upper Harbor to Lower Harbor over 18 month duration of project. Well within the 240 Kg mass cumulative transport non-exceedance level.	PCB concentrations elevated near dredge, but returned to background levels within 500 ft. down current of dredge. Larger increases in turbidity were generally traceable to dredge support activities or environmental conditions. Barge movements by tug in shallow water were recorded as causing suspended solids concentration of 300 mg/L and particulate and dissolved PCB concentrations of 26 and 2.7 µg/L within 50 ft. of the tug.

Table 6-2
Dredging Performance Comparison – *Continued*

Performance Data	Pilot Dredging Study [1] Ellicott 370 Dragon Series	Hot Spot Dredging [2] Ellicott 370 Dragon Series	Pre-Design Field Test BELLC Hybrid Test Dredge
Air Sampling	N/A	Demonstrated that disposal of contaminated sediment into the shoreline CDF raised ambient PCB levels above background, but not to the point where worker safety or public heath threatened.	Over 24 hrs of ambient air sampling the highest total PCB concentration detected (610 ng/m^3) was downwind from the CDF. High concentrations on other days ranged from 50 to 160 ng/m^3 and were dependent on wind direction. These data support the premise that, other than background attributed to the mudflats and surface water, the primary sources of PCB concentrations in ambient air are due to emissions from CDF operations.

[1] During the Pilot Scale Study, the Ellicott 370 was tested in 5 separate dredge areas, each with different operational parameters and sediment types. Dredge performance values for the area most representative of the Upper Harbor condition, Area 1, are presented for comparison here. The Ellicott 370 was operated at 40% swing speed, 50% maximum cutterhead rotation, and 100% pump speed. Only one pass was performed in Area 1. (USACE, 1990)

[2] During the Hot Spot Dredging, the Ellicott 370 was used to remove sediment with the highest PCB concentrations in the Harbor. Multiple passes and confirmation sampling were necessary to ensure the 4,000 ppm cleanup level was attained. The dredge capacity (advance rate and cutterhead rotation) was kept at close to 50% to minimize environmental impacts due to the dredging operations. (USACE, 1996)

[3] Shutdown Days represent dredge days shutdown by Owner (USACE)

[4] Area Re-Dredged represents dredge area where more than one pass was made

[5] Based on average over all dredge days

Table 6-3 presents the recommended dredge performance values for use in designing the New Bedford Harbor Full Scale Remediation Project, based on the data obtained over the course of the PDFT.

Table 6-3
Recommended Dredge Performance Values for Use in Designing the New Bedford Harbor Full Scale Remediation

Dredge Performance Parameter	Recommended Design Value
Dredging Production, Water Depths greater than 4 ft. [1]	95 cy/hr
Dredging Production, Water Depths between 2 ft. and 4 ft. [1,2]	35 cy/hr
Dredging Accuracy, Vertical Plane, to Design Depth	+/- .4 ft.
Dredging Accuracy, Vertical Plane, using Visual Approach	+/- .5 ft.
Dredging Accuracy, Horizontal	+/- 1.5 ft.
Average Solids Concentration of Dredge Slurry [2]	10% - 20% solids by weight
Use of Recirculation System for reuse of Dredge Effluent Water from CDF	Recommended

[1] Based on minimum of 10 hr. operating day
[2] To be better assessed in the 90% Basis of Design/Design Analysis
[3] Will vary depending on *in situ* density of dredged sediment

7.0 REFERENCES

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APPENDICES

A

Appendix A
Pre-Design Field Test Site Map and Plan

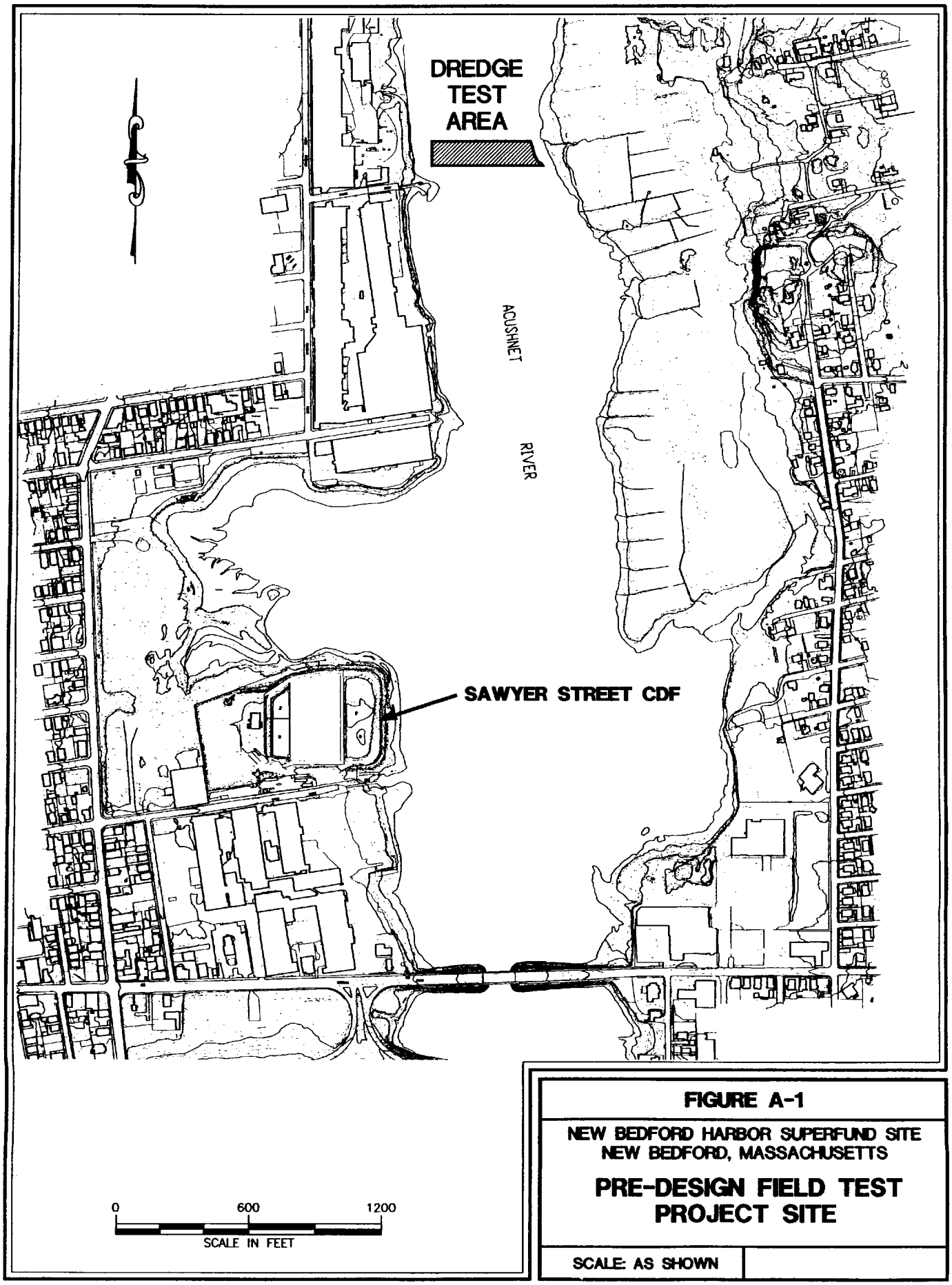


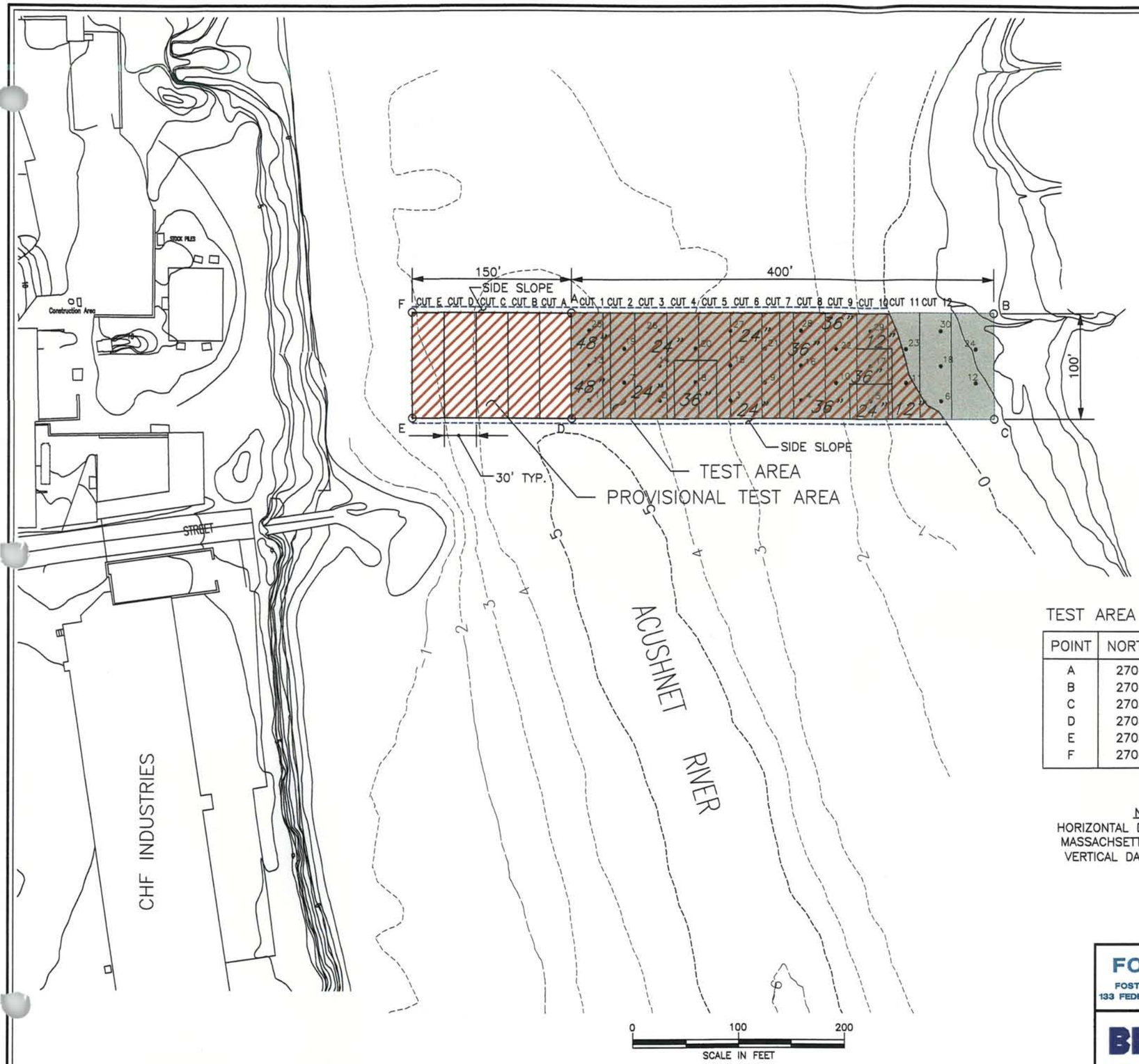
FIGURE A-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

PRE-DESIGN FIELD TEST PROJECT SITE

SCALE: AS SHOWN

CADDFILE: NBH_017b.DWG



CORE LOG SAMPLING RESULTS

Core No.	Core Location Northing	Core Location Easting	Pre-Dredge PCB Concentration (ppm) 0-1 ft	1-2 ft	2-3 ft	3-4 ft
1	2703967	815267	270	560	260	1.1
2	2703967	815333	200	6.0	0.17	
3	2703967	815400	810	6.2	0.36	
4	2703967	815467	2,700	23	0.13	
5	2703967	815533	210	0.63	0.12	
6	2703967	815600	11	0.0038		
7	2703984	815300	96	0.013		
8	2703984	815367	250	490	65	0.27
9	2703984	815433	2,500	2.2		
10	2703984	815500	2,300	27	0.11	
11	2703984	815567	29	0.084	0.0026	
12	2703984	815633	8.8	0.067	0	
13	2704000	815267	370	830	160	0.26
14	2704000	815333	320	0.79		
15	2704000	815400	830	3.0	0.16	
16	2704000	815467	2,500	94	0.41	
17	2704000	815533	460	24	0.0056	
18	2704000	815600	1.6	0.19		
19	2704016	815300	950	2.9		
20	2704016	815367	170	0.092		
21	2704016	815433	1,300	61	0.080	0.32
22	2704016	815500	1,100	64	7.4	7.2
23	2704016	815567	6.2	0.10	0.0030	
24	2704016	815633	4.5	0.032		
25	2704033	815267	460	420	1.2	
26	2704033	815333	330	4.4	0.33	
27	2704033	815400	480	0.82	0.059	
28	2704033	815467	1,000	300	0.062	
29	2704033	815533	67	0.66	0.15	
30	2704033	815600	5.5	0.042		

TEST AREA COORDINATES

POINT	NORTHING	EASTING
A	2704050	815250
B	2704050	815650
C	2703950	815650
D	2703950	815250
E	2703950	815100
F	2704050	815100

NOTE:
HORIZONTAL DATUM IS NAD83, MASSACHSETTS STATE PLANE, VERTICAL DATUM IS NGVD29

LEGEND

- •2 PRE-DREDGE CORE SAMPLE LOCATION
- 36" DREDGE CUT DEPTH
- TEST AREA
- AREA WITH CORE LOGS
- ----0----- MEAN LOWER LOW WATER (MLLW) IN FEET

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION
133 FEDERAL STREET, BOSTON, MASSACHUSETTS 02110

BEAN ENVIRONMENTAL, L.L.C.
ST. CHARLES AVE., SUITE 500
NEW ORLEANS, LA 70130

FIGURE A-2

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

PRE-DESIGN FIELD TEST DREDGE TEST AREA

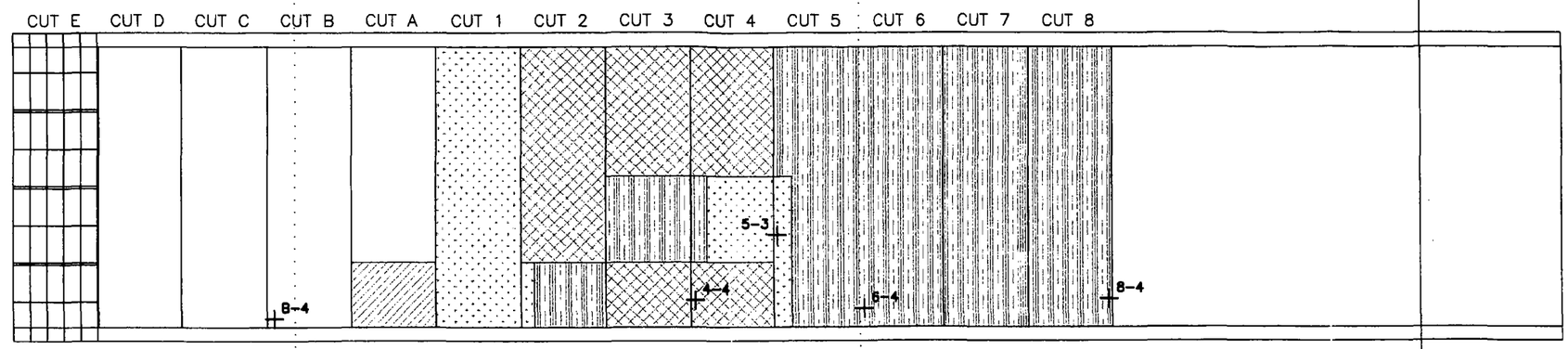
SCALE: AS SHOWN

CAD FILE: DREDGE_TEST01.DWG

B

Appendix B
Dredge Test Area Geotechnical Data

2704200



LEGEND

+	CORE LOCATION
4-4	CORE NUMBER
	DREDGING DEPTH 1.7'
	DREDGING DEPTH 2'
	DREDGING DEPTH 3'
	DREDGING DEPTH 4'

SEDIMENT CORE SAMPLES
LOCATION COORDINATES

CORE NO.	NORTHING	EASTING
B-4	2703952.99	815192.52
4-4	2703959.61	815341.56
5-3	2703982.90	815371.23
6-4	2703956.55	815401.48
8-4	2703960.05	815488.85

NOTE:
HORIZONTAL DATUM IS NAD83,
MASSACHSETTS STATE PLANE,
VERTICAL DATUM IS NGVD29

815000
2703800
815200
815400
815600

0 50 100
SCALE IN FEET

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION
133 FEDERAL STREET, BOSTON, MASSACHUSETTS 02110

BEAN ENVIRONMENTAL, L.L.C.
ST. CHARLES AVE., SUITE 500
NEW ORLEANS, LA 70130

FIGURE B-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

SEDIMENT CORES TAKEN DURING TEST DREDGING

SCALE: AS SHOWN

CAD FILE: 29088db003A-1.DWG

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Summary of Test Results on Mid June samples by GZA GeoEnvironmental Inc.

BEAN ENVIRONMENTAL L.L.C.
Date: 28 September, 2000

Boring /Test no	Sample No.	depth [inch]	lab no.	specific gravity [ton]	water content [%]	dry unit weight lbs/cubic ft [pcf]	wet unit weight lbs/cubic ft [pcf]	dry unit weight [kg/m3]	wet unit weight [kg/m3]	calc check of dry weight [kg/m3]	stirred Torvane RSS [tsf]	stirred Torvane RSS [kPa]	LL %	PL %	PI %	Sieve no. 200 %	Hyd 2 mu %	Org %	D50 mu	amf mu	>2000 mu %
A1	A1_1	0_12																			
	A1_2	12_19			185	24	68.4	384	1096	384	0.03	0.0015									
	A1_3	19_23			181	26.4	74.2	423	1189	423	0.06	0.0029									
	A1_4	23_34			71.8	56.2	96.6	900	1547	901	0.04	0.0020									
	A1_5	34_60			68.5	61.4	103.5	984	1658	984	0.05	0.0024									
C1	C1_1	0_13			99.6	40.3	80.5	646	1290	646	0.02	0.0010									
	C1_2	13_23			155	35.1	89.6	562	1435	563	0.04	0.0020									
	C1_3	23_34			75.9	52.3	92	838	1474	838	0.03	0.0015									
B2	B2_1	0_7			99.3	44.1	87.9	706	1408	706	0.02	0.0010									
	B2_2	7_23			117	43.8	95	702	1522	701	0.04	0.0020									
	B2_3	23_32			90.8	46.7	89.1	748	1427	748	0.04	0.0020									
	B2_4	32_46			55.7	57.2	89	916	1426	916	0.05	0.0024									
A3	A3_1	0_8			148	32.4	80.4	519	1288	519	0.03	0.0015									
	A3_2	8_34			120	39.6	87.2	634	1397	635	0.04	0.0020									
	A3_3	34_54									0.06	0.0029									
C3	C3_1	0_13			129	37.7	86.3	604	1382	604	0.02	0.0010									
	C3_2	13_24	no test																		
	C3_3	24_41			103	43.7	88.8	700	1422	701	0.04	0.0020									
	C3_4	41_52			112	42.6	90.4	682	1448	683	0.04	0.0020									
	C3_5		no test																		
B4	B4_1	0_13			56.8	63.9	100.2	1024	1605	1024	0.03	0.0015									
	B4_2	13_30			97.2	46.1	91	738	1458	739	0.03	0.0015									
	B4_3	30_41			91.7	47.9	91.9	767	1472	768	0.04	0.0020									
	B4_4		no test																		
A5	A5_1	0_6		2.62	21.7	98.6	120	1579	1922	1579						8		2.1	260		14
	A5_2	6_23			20.5	103	124.1	1650	1988	1650											
C5	C5_1	0_11		2.62	36.2	83.3	113.4	1334	1817	1334						11		1.4	300		14
	C5_2		no test																		
	A1_2, C1_1, B2_1, A3_1			2.32	-			0	0				102	54	48	77	14	12.7	15		7
	A1_4, C1_2			2.54	-			0	0				54	25	29	49	12	3.7	87		6
	A1_5, C1_3			2.63	-			0	0				56	26	30	60	15	4.8	28		2
	B2_2, A3_2, C3_3, B4_2			2.48	-			0	0				82	38	44	80	20	5.1	10		3
	B2_3, C3_4, B4_3			2.54	-			0	0				75	36	39	73	17	4.6	18		1
	C3_1, B4_1			2.49	-			0	0				68	35	33	56	8	7.5	60		8
	A1_3, B2_4, A3_3, C3_4			2.4	-			0	0				79	44	35	49	8	5.5	80		1
	A5_2, C5_2				-			0	0							12	2		280		9

1 pound =	0.4536	kg	= 1 lbs
1 cubic ft =	0.028316847	m3	
1 short ton =	907.2	kg	= 2000 lbs
1 long ton =	1016.048	kg	= 2240 lbs
1 square ft =	0.09290304	m2	

FIGURE B-2

GZA Laboratory Results

APPENDIX B
GZA –1

2001-017-0178
7/16/01

LABORATORY TESTING DATA SHEET

Project Name: SOIL TESTING, NEW BEDFORD HARBOR SUPERFUND SITE

Project No.: L16389 — Assigned By: REMCO — Reviewed By:

Project Engineer: D. SCHULZE — Date: Jul-00 — Date Reviewed:

Boring/ Test Pit No.	Sample No.	Depth (in)	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Wet unit wt. Pcf	Permeability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %		Consol. $\frac{G_s}{1+e_0}$	Laboratory Log and Soil Description
A1	A1-2	12-19	1.1	185							24.0	68.4		Tvr =0.03 tsf							From 12-19", Grey Brown Organic SILT
	A-1-3	19-23	1.2	181							26.4	74.2		Tvr=0.06 tsf							From 19-23" Dk.Grey-Brown Organic SILT, little fibers
	A-1-4	22-34	1.3	71.8							56.2	96.6		Tvr=0.04 tsf							From 22-25" Grey Organic Silt , little shell, From 25-28", Grey Organic
	A-1-5	34-60.0	1.4	68.5							61.4	103.5		Tvr=0.05 tsf							Silt, From 28-34", Grey Organic SILT some fine Sand
																					From 34-60", Dk.Grey Organic SILT
C1	C-1-1	0-13	2.1	99.6							40.3	80.5		Tvr=0.02 tsf							From 0-13", Dk.Grey/Black Organic SILT
	C-1-2	13-23	2.2	155							35.1	89.6		Tvr=0.04 tsf							From 13-23", Dk.Grey Organic SILT, trace Shell
	C-1-3	23-34	2.3	75.9							52.3	92.0		Tvr=0.03 tsf							From 23-34", Dk.Grey-Brown Organic SILT, little Shell
B2	B-2-1	0-7	3.1	99.3							44.1	87.9		Tvr=0.02 tsf							From 0-7", Dk.Grey/Black Organic SILT, some Shell (Note: 2" Shell from 1-3"),
	B-2-2	7-23	3.2	117							43.8	95.0		Tvr=0.04 tsf							From 7-23", Dk.Grey-Brown Organic SILT
	B-2-3	23-32	3.3	90.8							46.7	89.1		Tvr=0.04 tsf							From 23-32", Dk.Grey-Brown Organic SILT, trace fibers, (Note: 1" pocket of fibers from 31-32")
	B-2-4	32-46	3.4	55.7							57.2	89.0		Tvr= 0.05 tsf							
																					From 32-36", Brown Organic SILT, some fibers,
																					From 36-46", Brown f-m SAND and Organic SILT,

GZA GeoEnvironmental, Inc.

LABORATORY TESTING DATA SHEET

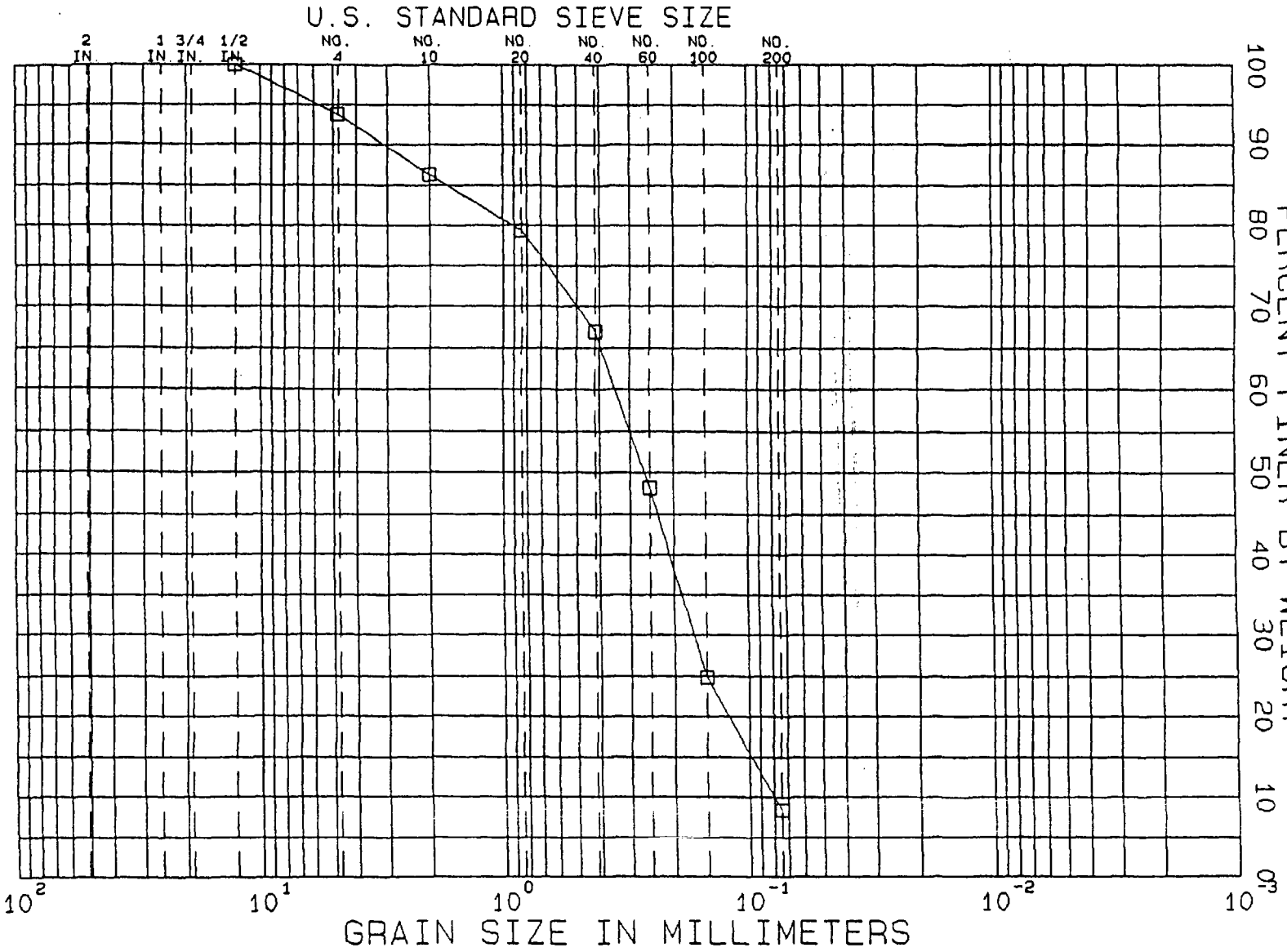
Project Name: SOIL TESTING, NEW BEDFORD HARBOR SUPERFUND SITE
Project No.: L16389 — Assigned By: REMCO — Reviewed By:
Project Engineer: D. SCHULZE — Date: Jul-00 — Date Reviewed:

Boring/ Test Pit No.	Sample No.	Depth (in)	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Wet unit wt. Pcf	Permeability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %		Consol. $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
A-3	A-3-1	0-8	4.1	148							32.4	80.4		Tvr=0.03 tsf							From 0-8", Dk.Grey-Black Organic SILT
	A-3-2	8-34	4.2	120							39.6	87.2		Tvr=0.04 tsf							From 8-39", Grey-Brown Organic SILT
	A-3-3	34-54	4.3	600							8.4	* 59.1		Tvr=0.06 tsf	(* γt < γw, suggests voids)						From 34-54", Brown fibrous PEAT
C-3	C-3-1	0-13	5.1	129							37.7	86.3		Tvr=0.02 tsf							From 2-4", Dk.Grey-Black Organic SILT, some Shell, From 4-11"
	C-3-3	24-41	5.2	103							43.7	88.8		Tvr= 0.04 tsf							Dk.Grey-Black Organic SILT From 24-48", Grey-Brown Organic
	C-3-4	41-52	5.3	112							42.6	90.4		Tvr= 0.04 tsf							SILT, From 48-52" Dk.Brown fibrous PEAT, little Sand
B-4	B-4-1	0-13	6.1	56.8							63.9	100.2		Tvr=0.03 tsf							From 0-13", Dk.Grey Organic SILT, some Sand, trace Shell
	B-4-2	13-30	6.2	97.2							46.1	91.0		Tvr= 0.03 tsf							From 13-15" Dk.Grey-Black Organic SILT, some Sand, From 15-30"
	B-4-3	30-41	6.3	91.7							47.9	91.9		Tvr= 0.04 tsf							Grey-Brown Organic SILT From 30-41" Grey-Brown Organic SILT
A-5	A-5-1	0-6	7.1	21.7			8		2.1	2.62	98.6	120.0									From 0-6", Grey-Brown f-m SAND, little Gravel, trace Org. Silt trace Shells
	A-5-2	6-23	7.2	20.5							103.0	124.1									From 6-10" Grey-Brown f-m SAND, some Silt, trace Gravel
																					From 10-16", Grey-Brown f-m SAND, little Silt,
																					From 16-33", Grey f-m Sand, trace Silt,
C-5	C-5-1	0-11	8.1	36.2			11		1.4	2.62	83.3	113.4									Dk.Grey f-m SAND, little Organic Silt, trace Gravel, trace Shells

LABORATORY TESTING DATA SHEET

Project Name: SOIL TESTING, NEW BEDFORD HARBOR SUPERFUND SITE
Project No.: L16389 — Assigned By: REMCO — Reviewed By:
Project Engineer: D. SCHULZE — Date: Jul-00 — Date Reviewed:

Boring/ Test Pit No.		Sample No.	Lab No.	Identification Tests: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	ORG %	G_s	Dry unit wt. pcf	Wet unit wt. Pcf	Permeability cm/sec	Strength Tests: Torvane or Type Test	$\bar{\sigma}_c$ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %		Consol. $\frac{C_c}{1+e_0}$	Laboratory Log and Soil Description
		A-1-2,C-1-1 B-2-1,A-3-1	9.1		102	54	77	14	12.7	2.32											Dk.Brown/Black Organic SILT, little fine Sand, trace Gravel, trace Shells
		A-1-4 C-1-2	10.1		54	25	49	12	3.7	2.54											Grey-Brown Organic SILT and f-m SAND, trace Shells
		A-1-5 C-1-3	11.1		56	26	60	15	4.8	2.63											Grey-Brown Organic SILT and f-m SAND, trace Shells
		B-2-2,A-3-2 C-3-3,B-4-2	12.1		82	38	80	20	5.1	2.48											Grey-Brown Organic SILT, little (+) fine Sand, trace Shells
		B-2-3,C-3-4 B-4-3	13.1		75	36	73	17	4.6	2.54											Grey-Brown Organic SILT, some fine Sand, trace Shells
		C-3-1 B-4-1	14.1		68	35	56	8	7.5	2.49											Dk.Brown/Black Organic SILT and f-m SAND, trace Shells
		A-1-3,B-2-4 A-3-3,C-3-4	15.12		79	44	49	8	5.5	2.40											Brown f-m SAND and Organic SILT, trace Shells
		A-5-2 C-5-2	16.1				12	2													Brown f-m SAND, little (-) Silt, trace Gravel, trace Shells
																					* In Progress



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	REMARKS
S7.1	A-5-1	Grey-Brown f-m SAND, trace (+) Silt, trace Gravel, trace Shells

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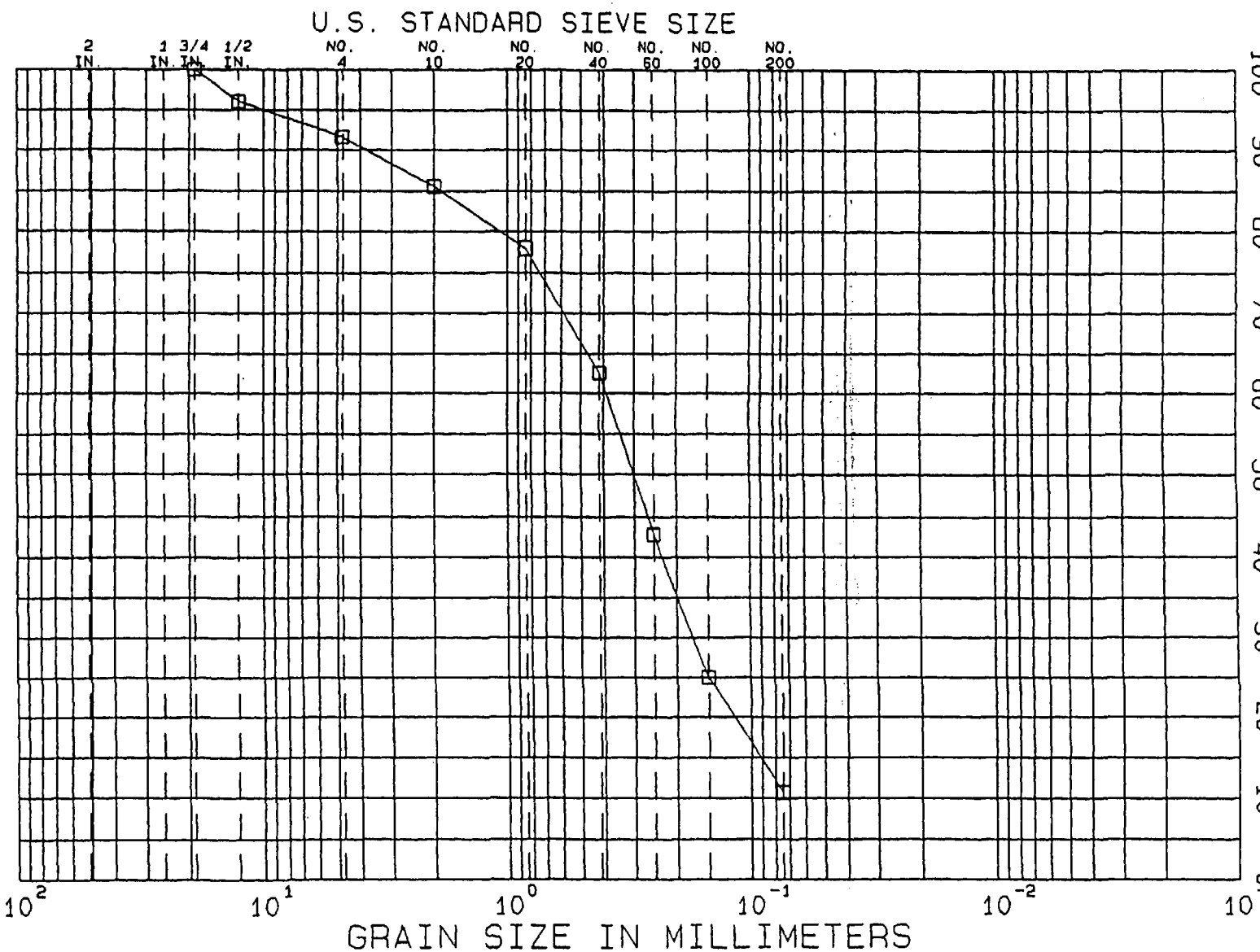
ENGINEERS AND SCIENTISTS

SOIL TESTING NEW BEDFORD
HARBOR SUPERFUND SITE
GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH. PEC
REVIEWER DAS

TEST SERIES NO. 7
DATE July 00
FILE L16388

APPENDIX F-8



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	REMARKS
S8.1	C-5-1	Dk.Grey f-m SAND, little Organic Silt, trace Gravel, tr. Shell

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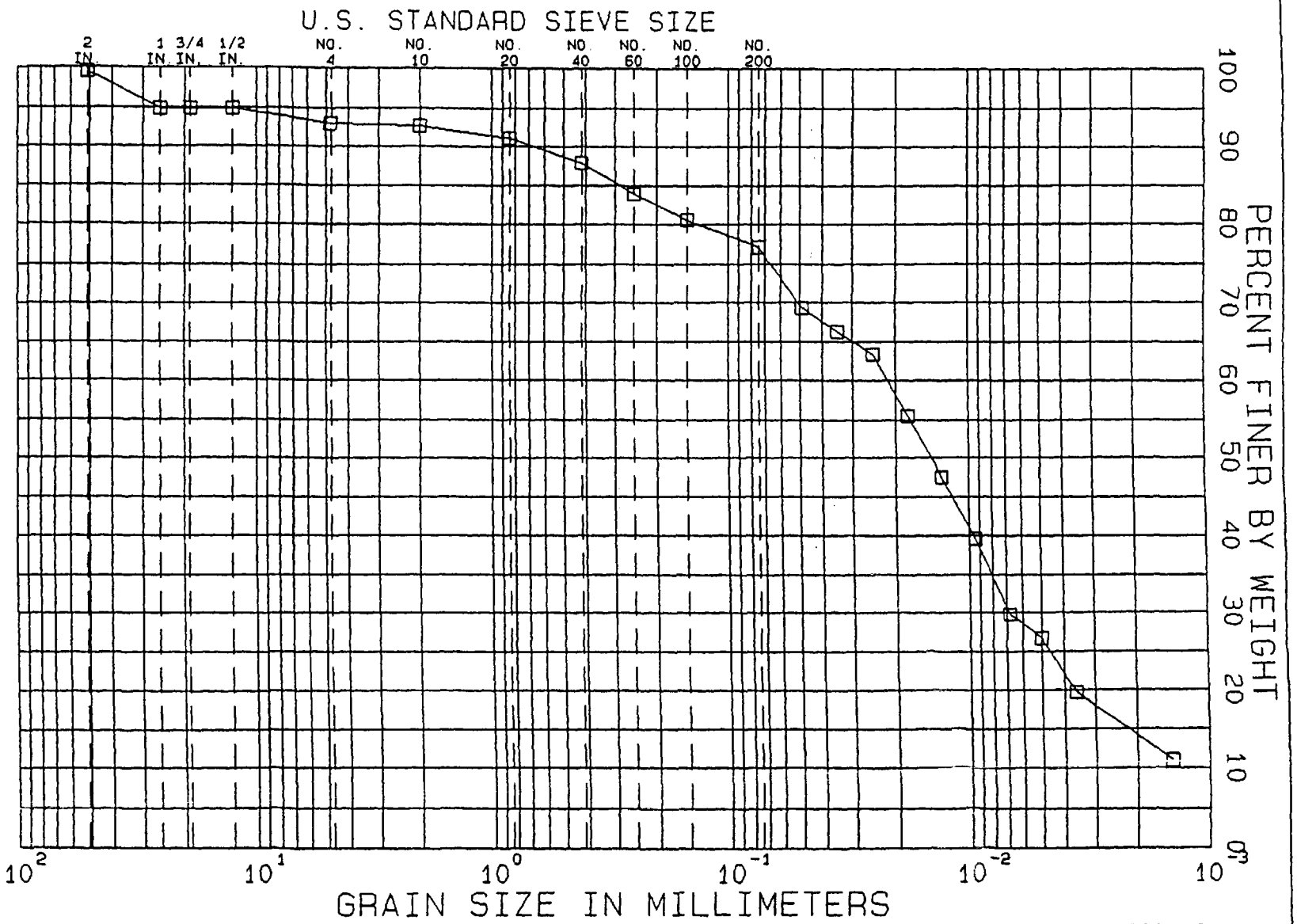
ENGINEERS AND SCIENTISTS

SOIL TESTING NEW BEDFORD
HARBOR SUPERFUND SITE
GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH. PEC
REVIEWER DAS

TEST SERIES
NO. B
DATE July 00
FILE L16389

APPENDIX E-9



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	REMARKS
S9.1	A-1-2, C-1-1 B-2-1, A-3-1	Dk.Brown/Black Organic SILT, little fine Sand, trace Gravel, tr.Shells

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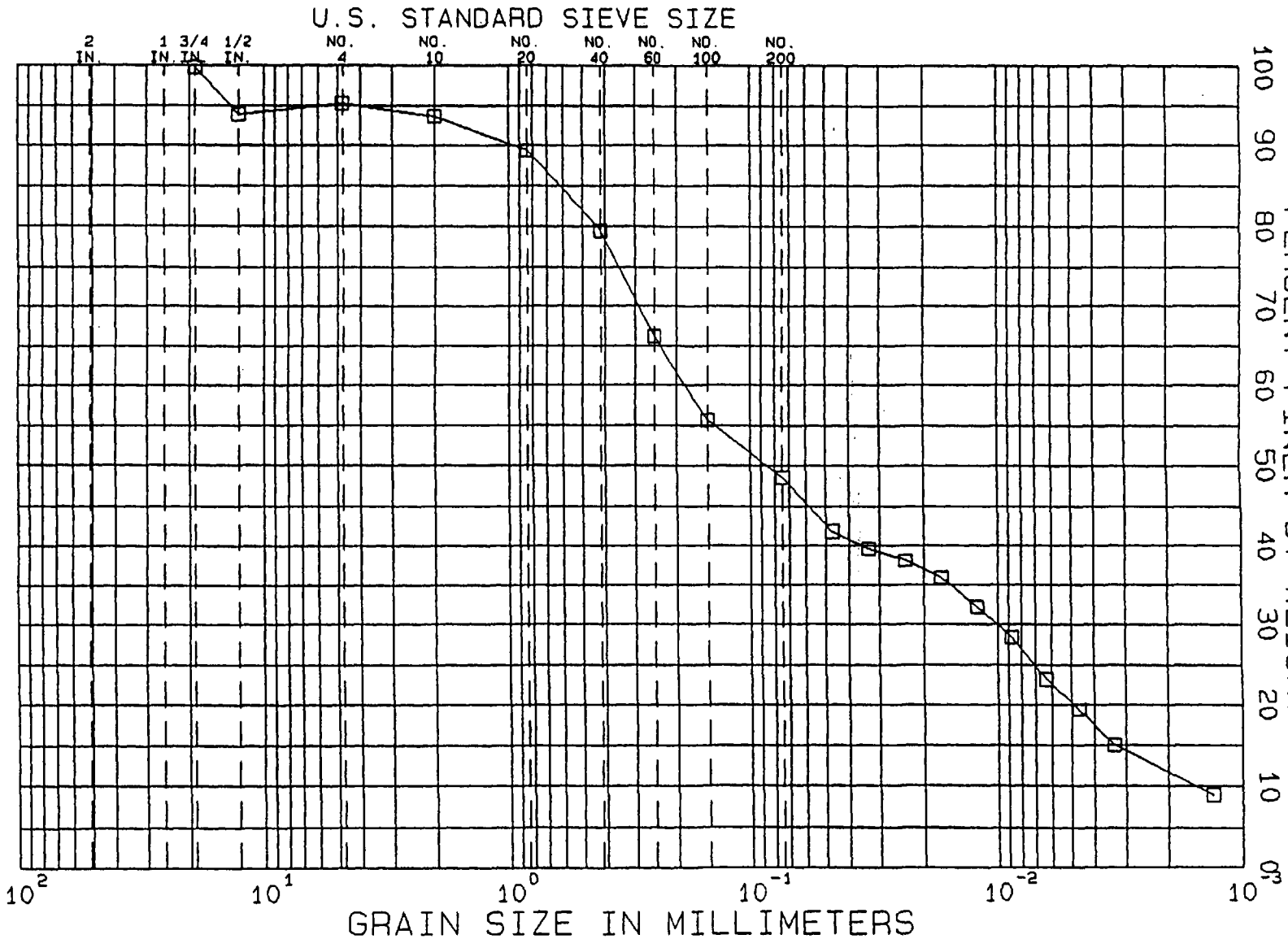
SOIL TESTING NEW BEDFORD
HARBOR SUPERFUND SITE
GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH PEC
REVIEWER DAS

TEST SERIES NO. 9
DATE July 00
FILE L16389

APPENDIX E-9



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	REMARKS
S10.1	A-1-4 C-1-2	Grey-Brown Organic SILT and f-m SAND, trace Shell

SOIL TESTING NEW BEDFORD
HARBOR SUPERFUND SITE
GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH. PEC
REVIEWER DAS

TEST SERIES NO. 10
DATE July 00

FILE L16389

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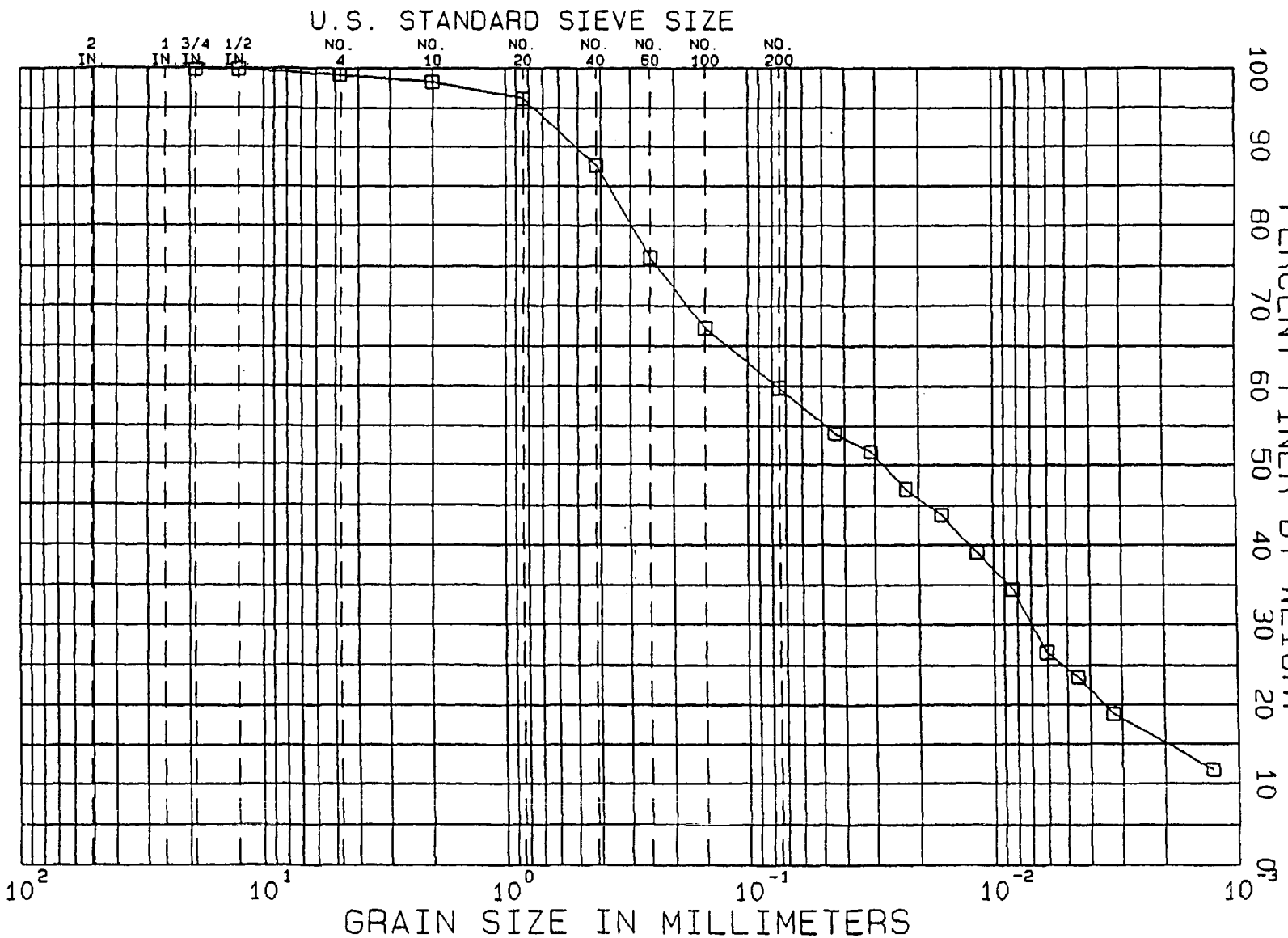
APPENDIX E-9



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	REMARKS
911.1	A-1-5 C-1-3	Grey-Brown Organic SILT and f-m SAND, trace Shells

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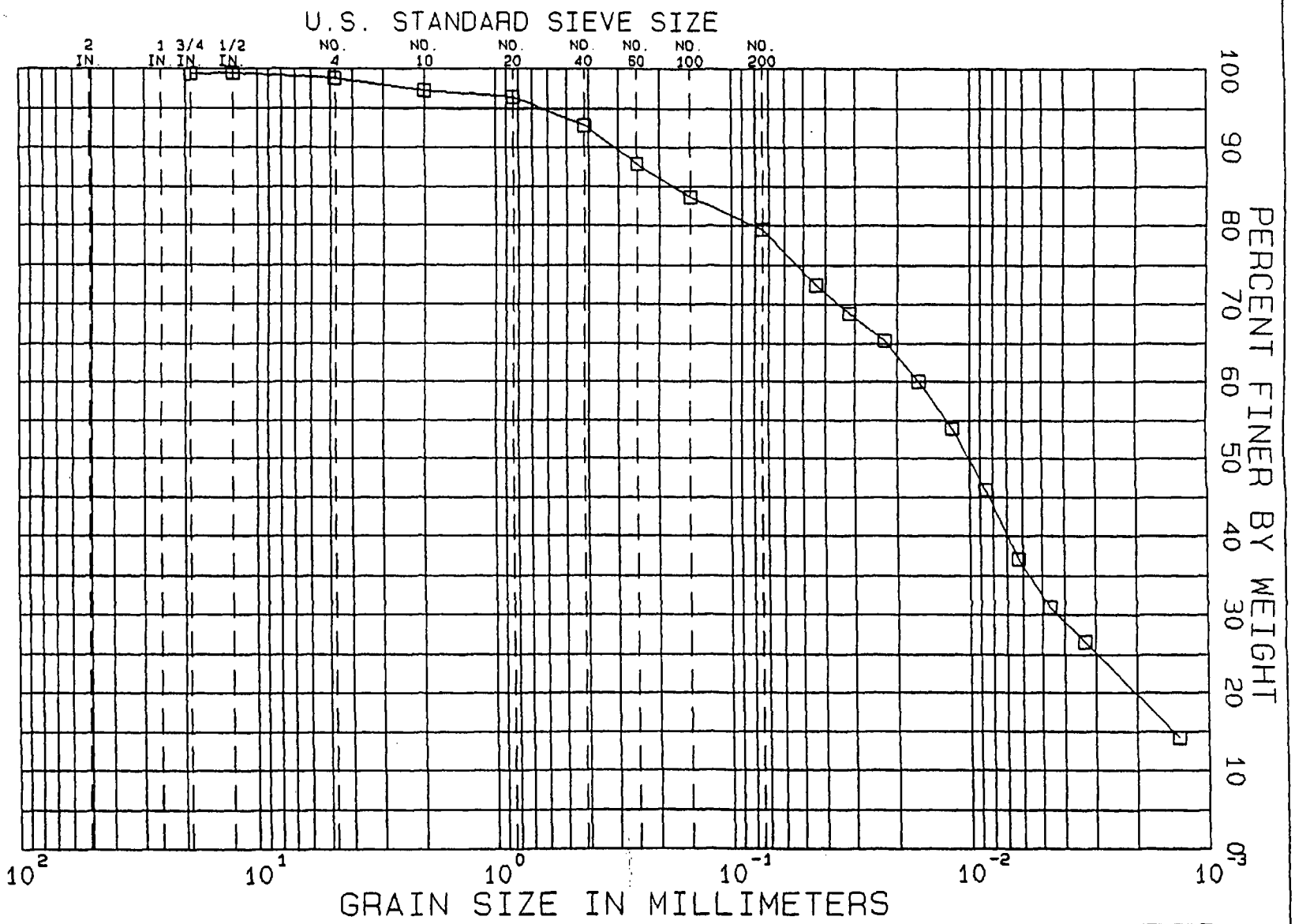
SOIL TESTING NEW BEDFORD
HARBOR SUPERFUND SITE
GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH. PEC
REVIEWER DAS

TEST SERIES NO. 11
DATE July 00
FILE L16389

APPENDIX E-9

APPENDIX B
GZA –9



TEST NO.	MATERIAL SOURCE	REMARKS
S12.1	B-2-2, A-3-2 C-3-3, B-4-2	Grey-Brown Organic SILT little (+) fine Sand, trace Shells

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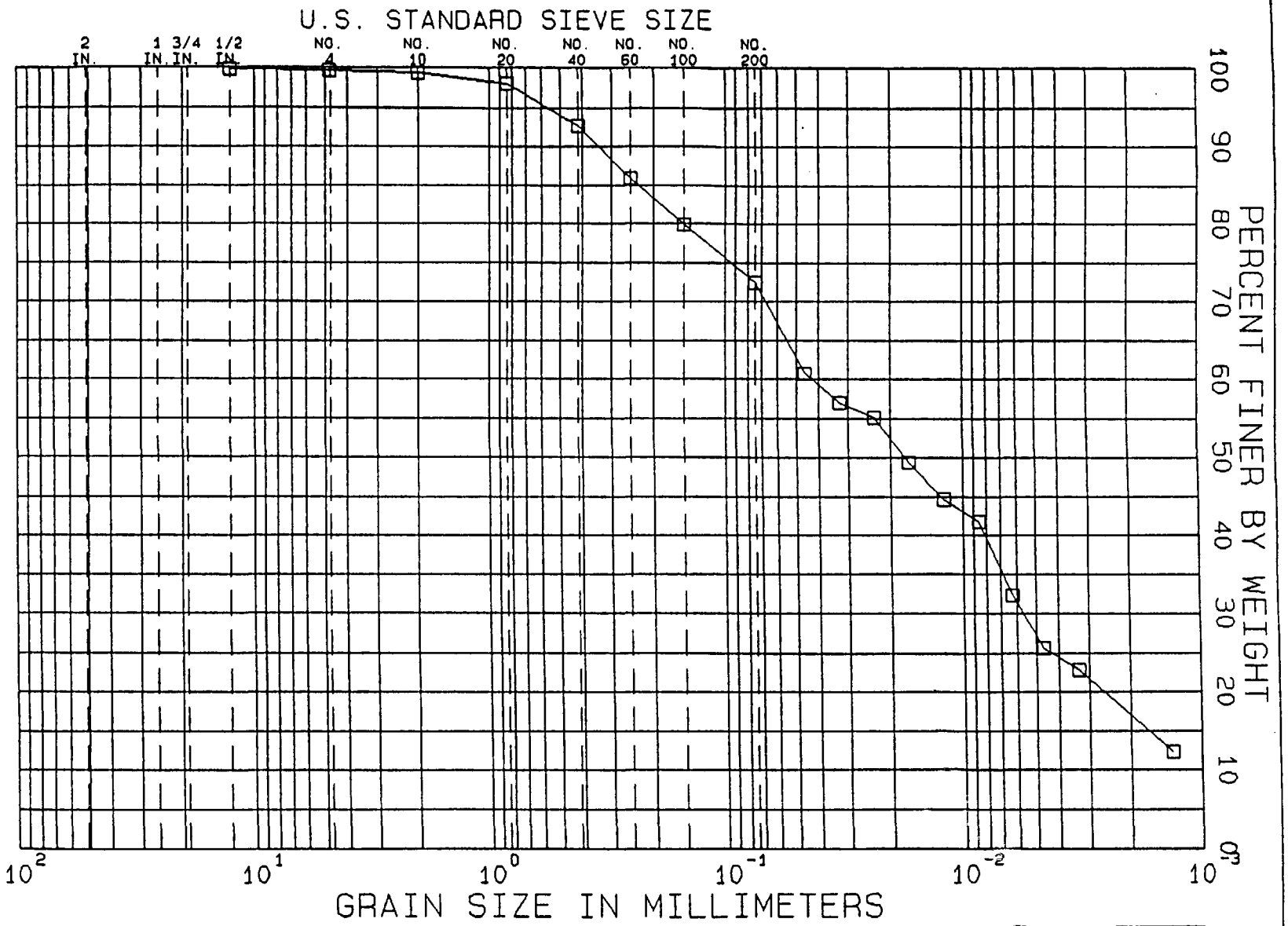
SOIL TESTING NEW BEDFORD
HARBOR SUPERFUND SITE
GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH. PEC
REVIEWER DAS

TEST SERIES NO. 12
DATE July 00
FILE L16389

APPENDIX E-9

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

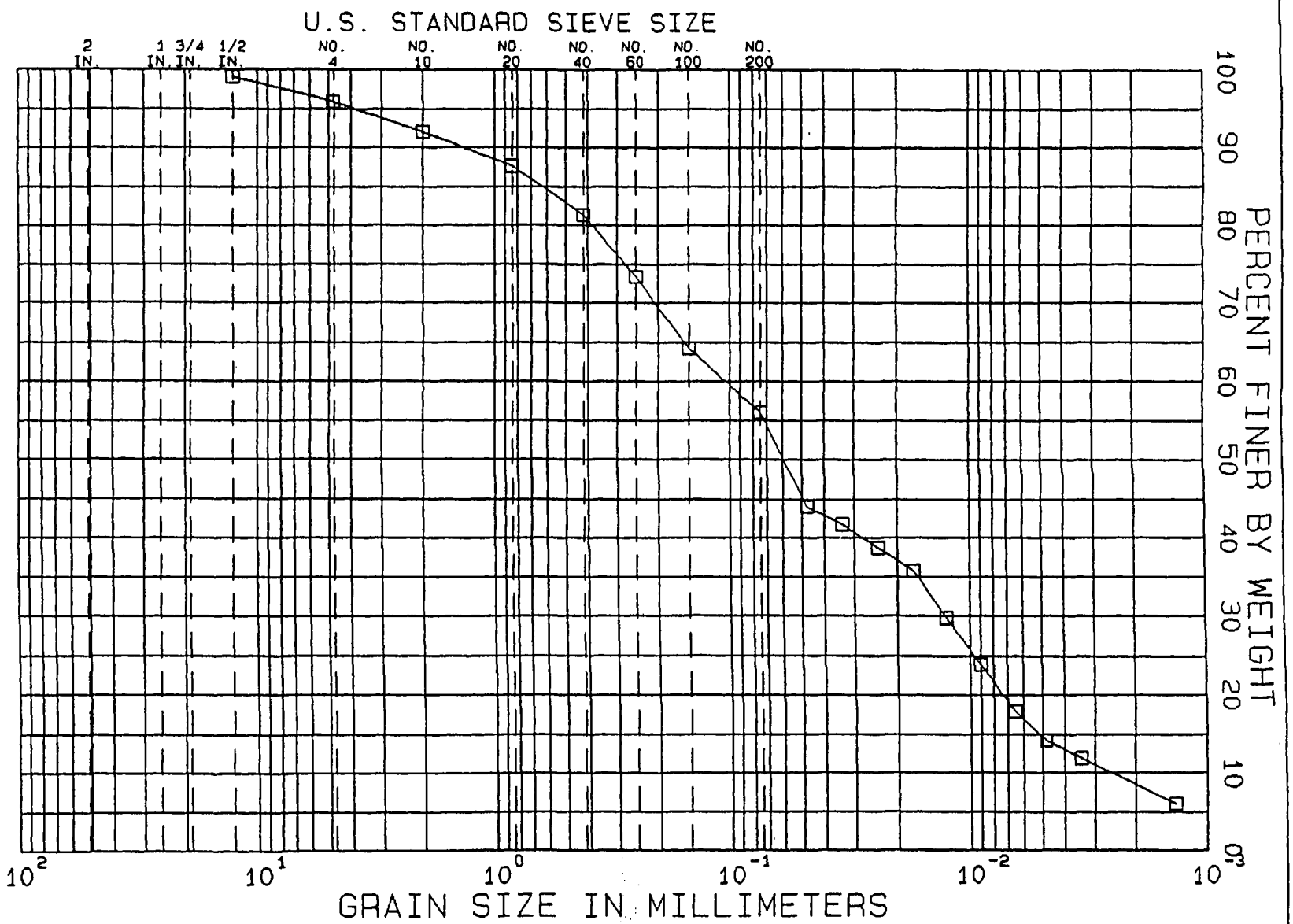
TEST NO.	MATERIAL SOURCE	REMARKS
S13.1	B-2-3, C-3-4 B-4-3	Grey-Brown Organic SILT some fine Sand, trace Shells

SOIL TESTING NEW BEDFORD
HARBOR SUPERFUND SITE
GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH PEC
REVIEWER DAS

TEST SERIES NO. 13
DATE July 00
FILE L16389

APPENDIX E-9



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	REMARKS
S14.1	C-3-1 B-4-1	Dk.Brown/Black Organic SILT and f-m SAND, trace Shells

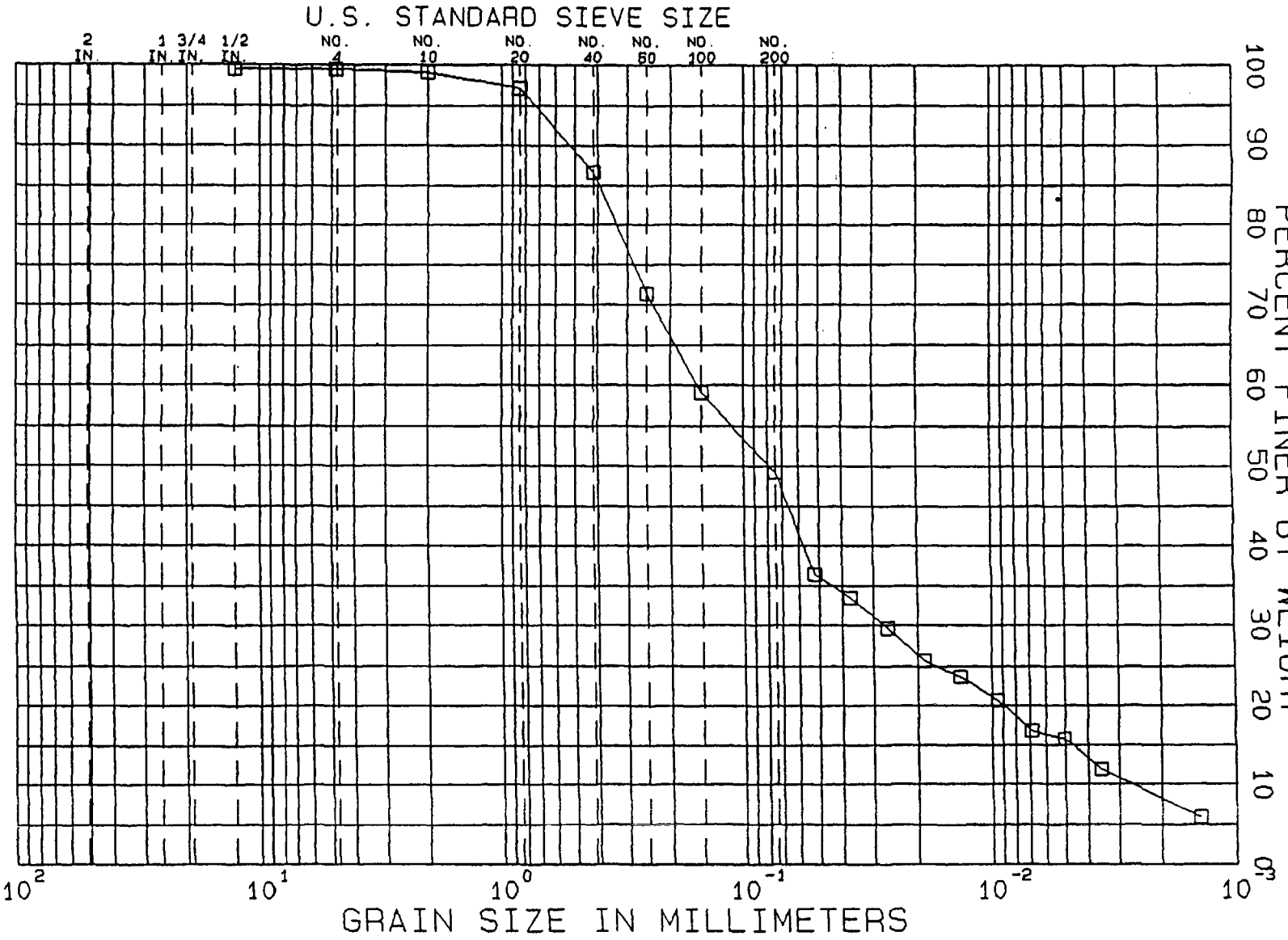
SOIL TESTING NEW BEDFORD
HARBOR SUPERFUND SITE
GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH. PEC
REVIEWER DAS

TEST SERIES NO. 14
DATE July 00
FILE L16389

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS

APPENDIX E-9



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	REMARKS
S15.1	A-1-3, B-2-4 A-3-3, C-3-4	Brown f-m SAND and Organic SILT, trace Shells

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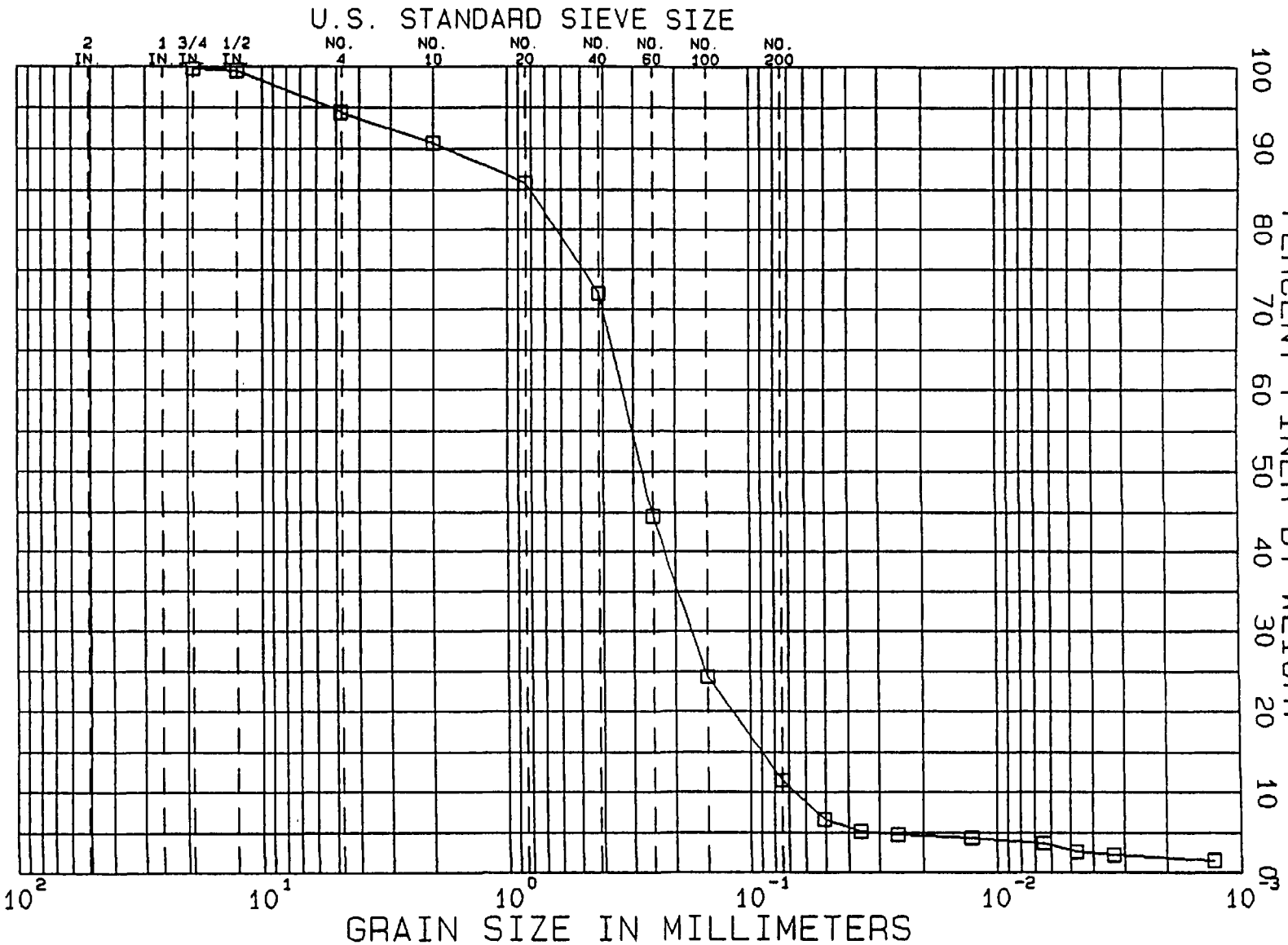
SOIL TESTING NEW BEDFORD
HARBOR SUPERFUND SITE
GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH. PEC
REVIEWER DAS

TEST SERIES NO. 15
DATE July 00

FILE L16389

APPENDIX E-9



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

TEST NO.	MATERIAL SOURCE	REMARKS
S16.1	A-5-2 C-5-2	Brown f-m SAND, little (-) Silt, trace Gravel, trace Shells

SOIL TESTING NEW BEDFORD HARBOR SUPERFUND SITE

GRADATION TESTS

BORING NO.
SAMPLE
DEPTH
TECH. PEC
REVIEWER DAS

TEST SERIES NO. 16
DATE July 00
FILE L16389

GZA GEOENVIRONMENTAL, INC.
ENGINEERS AND SCIENTISTS

APPENDIX E-9

S.3

Appendix C
Meteorological and Tide Data

Meteorological Data Terms

WS	Wind Speed, miles per hour
WD	Wind Direction, degrees
SIGMA	Standard Deviation, degrees
TEMP10M	Temperature (°F) at 10 meters aboveground surface
TEMP2M	Temperature (°F) at 2 meters aboveground surface
DELTA-T	Temperature Differences
SR	Solar Radiation, watts $\cdot$ m^2
BATTERY	Meteorological Station Battery Voltage
BARR.PR	Barometric Pressure, inches of Hg
RH	Relative Humidity, %
PRECIP	Precipitation, inches

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 6	100	6.5199	279.86	10.925	68.526	67.685	.83924	.14312	13.482	0	29.941	78.199	0
8 6	200	6.4126	281.67	9.314	68.063	67.243	.82102	.12794	13.481	0	29.946	78.611	0
8 6	300	5.2633	275.72	10.354	67.952	67.065	.88821	.13761	13.49	0	29.943	79.985	0
8 6	400	3.307	323.12	30.994	67.832	66.709	1.1231	.13417	13.497	0	29.944	81.381	0
8 6	500	2.586	50.333	6.1462	65.185	63.962	1.2245	.1566	13.525	0	29.944	85.821	0
8 6	600	2.0432	45.64	9.4386	63.616	62.696	.92002	5.6722	13.549	0	29.949	88.43	0
8 6	700	1.5857	59.852	13.537	67.73	65.72	2.0097	87.209	13.546	0	29.968	84.78	0
8 6	800	1.8054	126.95	27.301	73.316	71.067	2.2487	237.05	13.472	0	29.996	80.277	0
8 6	900	4.1804	162.26	9.8148	76.085	75.039	1.0453	425.53	13.375	0	30.013	73.887	0
8 6	1000	4.824	189.41	20.522	80.161	78.991	1.1704	616.62	13.295	0	30.016	66.279	0
8 6	1100	6.5566	184.94	22.272	82.346	81.321	1.0255	750.29	13.23	0	30.018	61.924	0
8 6	1200	8.8258	221.16	20.629	82.793	82.438	.35488	735.8	13.206	0	30.019	55.694	0
8 6	1300	9.4636	199.06	18.817	81.527	81.84	-.31385	705.3	13.222	0	30.01	58.919	0
8 6	1400	10.524	215.4	20.092	79.362	79.765	-.40381	533.19	13.239	0	30.003	62.893	0
8 6	1500	11.064	217.21	21.295	78.092	78.282	-.19001	468.26	13.264	0	29.989	65.974	0
8 6	1600	10.768	224.75	16.593	76.813	76.64	.17152	239.47	13.283	0	29.986	68.656	0
8 6	1700	7.4232	225.61	21.483	76.408	76.026	.38133	144.92	13.31	0	29.979	70.754	0
8 6	1800	8.5263	222.58	20.671	74.855	74.566	.28914	103.09	13.329	0	29.981	75.52	0
8 6	1900	8.8186	200.6	16.399	74.065	73.628	.43502	59.129	13.348	0	29.98	79.011	0
8 6	2000	9.4718	198.32	14.021	73.483	72.924	.55931	14.453	13.364	0	29.978	78.277	0
8 6	2100	11.421	194.34	12.644	72.985	72.521	.46465	.22652	13.378	0	29.974	79.194	0
8 6	2200	11.641	194.24	10.755	72.78	72.317	.46479	.19703	13.381	0	29.976	78.99	0
8 6	2300	10.377	188.07	13.597	72.728	72.136	.59262	.2022	13.389	0	29.96	80.962	0
8 6	2400	12.832	195.95	13.209	72.705	72.28	.42598	.18216	13.389	0	29.948	78.275	0
AVG		7.3434	194.88	16.284	73.725	73.036	.68947	115.97	13.377	0	29.978	74.696	0
MAX		12.832	323.12	30.994	82.793	82.438	2.2487	533.19	13.549	0	30.019	88.43	0
MIN		1.5857	45.64	6.1462	63.616	62.696	-.40381	.12794	13.206	0	29.941	55.694	0

AVG
MAX
MIN

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 7	100	11.166	192.05	12.466	72.808	72.377	.43241	.17422	13.388	0	29.935	77.208	0
8 7	200	13.094	192.52	11.754	71.312	70.962	.35074	.17665	13.392	0	29.914	82.048	0
8 7	300	11.758	192.95	11.456	71.21	70.475	.73626	.12319	13.412	0	29.886	89.524	.01
8 7	400	10.808	198.72	15.013	73.594	72.933	.6611	.15261	13.403	0	29.876	86.423	0
8 7	500	9.1991	204.59	19.734	71.382	70.88	.50249	.13221	13.4	.00003	29.863	91.622	.11
8 7	600	10.476	216.48	23.013	72.217	71.501	.71655	2.3426	13.399	0	29.86	94.384	.03
8 7	700	11.286	206.75	17.244	71.156	70.557	.59882	7.6859	13.398	.00008	29.863	95.229	.29
8 7	800	11.515	193.65	11.484	71.955	71.332	.6214	18.009	13.396	0	29.873	96.256	0
8 7	900	9.1411	194.94	14.349	73.16	72.496	.66383	95.595	13.39	0	29.863	93.311	0
8 7	1000	8.793	211.84	21.906	74.417	73.908	.50922	90.42	13.383	0	29.85	89.618	0
8 7	1100	10.671	219.06	20.172	73.736	73.11	.62622	94.714	13.379	0	29.843	92.123	.01
8 7	1200	11.644	226.67	17.5	76.033	75.6	.43286	271.43	13.364	0	29.831	89.59	0
8 7	1300	12.727	238.23	17.464	79.289	79.177	.11237	558.05	13.309	0	29.807	83.552	0
8 7	1400	11.834	241.41	19.449	82.816	83.228	-.4122	821.52	13.266	0	29.799	78.682	0
8 7	1500	15.026	235.08	18.608	83.707	84.196	-.48886	766.62	13.238	0	29.798	74.101	0
8 7	1600	13.038	241.85	18.206	84.71	84.944	-.23393	669.65	13.215	0	29.797	72.852	0
8 7	1700	14.247	234.03	16.89	83.98	84.131	-.15209	515.56	13.197	0	29.799	73.468	0
8 7	1800	11.857	238.1	18.482	83.44	83.378	.0617	335.54	13.197	0	29.804	75.047	0
8 7	1900	9.2945	237.06	18.888	81.85	81.463	.38696	138.32	13.212	0	29.81	77.562	0
8 7	2000	7.5121	233.82	17.596	79.611	78.941	.67031	21.689	13.247	0	29.818	81.187	0
8 7	2100	7.6258	235.44	17.08	77.954	77.264	.68884	.39201	13.282	0	29.82	84.077	0
8 7	2200	9.5335	230.37	15.258	76.616	75.971	.64436	.22899	13.307	0	29.834	85.67	0
8 7	2300	7.8113	239.49	17.413	76.207	75.475	.73349	.21707	13.328	0	29.829	86.173	0
8 7	2400	8.0147	239.81	17.477	76.119	75.34	.78072	.19804	13.339	0	29.832	85.505	0
AVG		10.753	220.62	17.038	76.637	76.235	.40182	102.44	13.327	0	29.842	84.801	.01875
MAX		15.026	241.85	23.013	84.71	84.944	.78072	558.05	13.412	.00008	29.935	96.256	.29
MIN		7.5121	192.05	11.456	71.156	70.475	-.48886	.12319	13.197	0	29.797	72.852	0

AVG
MAX
MIN

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 8	100	5.795	243.94	19.059	76.003	75.103	.89921	.19632	13.349	0	29.837	85.183	0
8 8	200	5.0788	228.45	19.269	76.78	75.795	.98477	.19052	13.349	0	29.832	83.375	0
8 8	300	4.6953	225.98	21.798	75.055	74.22	.834	.19117	13.362	0	29.83	85.252	0
8 8	400	6.6147	223.04	20.242	74.232	73.501	.73088	.17993	13.371	0	29.828	86.737	0
8 8	500	5.2934	250.25	19.331	76.384	75.438	.94567	.16597	13.367	0	29.831	83.803	0
8 8	600	3.3637	266.74	23.607	76.929	75.86	1.0688	1.5041	13.358	0	29.833	82.806	0
8 8	700	2.62	215.33	22.181	77.638	76.504	1.1345	56.973	13.357	0	29.837	82.928	0
8 8	800	4.4364	214.76	23.207	79.953	78.778	1.175	204.53	13.315	0	29.856	80.884	0
8 8	900	5.1432	264.36	19.531	82.756	81.786	.96984	305.52	13.261	0	29.864	77.813	0
8 8	1000	7.0597	307.74	16.685	85.353	83.991	1.3629	534.18	13.211	0	29.871	73.05	0
8 8	1100	7.8849	307.39	14.772	87.544	86.15	1.3945	607.4	13.167	0	29.872	66.035	0
8 8	1200	8.6145	308.62	17.226	89.272	87.762	1.5094	833.65	13.141	0	29.858	62.378	0
8 8	1300	8.3371	283.41	18.921	90.166	89.781	.38539	823.5	13.131	0	29.848	59.12	0
8 8	1400	9.2277	274.89	22.018	89.303	89.159	.14531	671.87	13.137	0	29.841	59.68	0
8 8	1500	9.9805	222.38	23.107	88.4	88.669	-.26805	648.84	13.143	0	29.836	64.326	0
8 8	1600	10.307	228.72	19.938	88.088	88.483	-.39432	649.11	13.144	0	29.832	64.21	0
8 8	1700	10.588	232.89	18.596	88.079	88.167	-.08861	506.12	13.122	0	29.83	63.17	0
8 8	1800	10.294	235.59	16.452	86.712	86.618	.0938	347.01	13.131	0	29.837	63.473	0
8 8	1900	8.2468	240.29	17.837	84.942	84.495	.44671	165.66	13.165	0	29.843	65.095	0
8 8	2000	6.1593	237.81	16.951	81.978	81.088	.89023	22.091	13.21	0	29.85	68.064	0
8 8	2100	4.1956	268.63	15.022	79.838	78.78	1.0581	.41885	13.261	0	29.855	71.548	0
8 8	2200	4.7409	277.53	13.715	78.511	77.44	1.0702	.25059	13.3	0	29.865	74.12	0
8 8	2300	5.1023	271.83	13.815	78.085	77.009	1.0775	.22522	13.32	0	29.859	74.057	0
8 8	2400	4.1075	257.21	21.175	77.073	75.96	1.1114	.19918	13.34	0	29.866	74.432	0
AVG		6.5786	253.66	18.936	82.045	81.272	.77238	119.2	13.251	0	29.846	72.981	0
MAX		10.588	308.62	23.607	90.166	89.781	1.5094	534.18	13.371	0	29.872	86.737	0
MIN		2.62	214.76	13.715	74.232	73.501	-.39432	.16597	13.122	0	29.828	59.12	0

AVG
MAX
MIN

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 9	100	3.1226	243.67	25.771	75.895	74.825	1.07	.19324	13.363	0	29.865	77.18	0
8 9	200	3.427	245.71	28.361	74.499	73.506	.99279	.19668	13.378	0	29.853	82.01	0
8 9	300	2.3554	183.29	29.316	74.209	73.148	1.0603	.21321	13.401	0	29.841	84.577	0
8 9	400	3.4297	198.89	28.203	74.029	73.102	.92498	.20901	13.403	0	29.841	85.521	0
8 9	500	3.2928	165.8	10.843	74.733	73.849	.88327	.21338	13.405	0	29.842	84.747	0
8 9	600	3.0076	174.08	19.39	75.087	74.099	.98937	2.2175	13.404	0	29.857	83.178	0
8 9	700	4.2169	180.28	11.494	76.364	75.486	.879	42.411	13.388	0	29.858	80.668	0
8 9	800	5.0516	212.9	23.97	79.169	78.283	.88632	173.28	13.352	0	29.861	77.197	0
8 9	900	8.2499	232.25	16.413	80.618	79.87	.74812	219.62	13.307	0	29.868	72.881	0
8 9	1000	8.3274	238.32	17.366	81.588	80.833	.75484	262.68	13.284	0	29.867	71.058	0
8 9	1100	9.2484	243.13	18.746	82.061	81.411	.65011	250.43	13.257	0	29.866	70.25	0
8 9	1200	7.0087	244.22	19.952	82.775	82.162	.61279	309.48	13.208	0	29.847	70.617	0
8 9	1300	10.71	232.4	17.107	86.131	85.954	.17598	670.2	13.202	0	29.834	66.288	0
8 9	1400	13.017	226.8	19.465	87.792	88.499	-.70715	854.9	13.184	0	29.821	62.851	0
8 9	1500	13.387	224.27	20.139	85.967	86.925	-.95769	774.56	13.177	0	29.818	64.766	0
8 9	1600	13.657	220.97	20.383	84.55	85.15	-.59973	623.1	13.186	0	29.811	67.749	0
8 9	1700	11.712	226.89	19.144	84.364	84.695	-.3308	473.19	13.18	0	29.796	70.094	0
8 9	1800	11.528	229.6	17.828	82.806	82.848	-.04197	282.29	13.193	0	29.782	74.176	0
8 9	1900	9.7395	230.68	19.535	79.838	79.52	.31798	114.21	13.231	0	29.775	79.381	0
8 9	2000	5.9627	208.42	25.394	77.321	76.691	.63054	17.195	13.277	0	29.766	83.442	0
8 9	2100	7.3078	202.95	19.011	75.718	75.105	.61244	.33476	13.319	0	29.763	86.836	0
8 9	2200	7.6836	198.59	17.51	74.803	74.384	.41965	.2754	13.338	0	29.763	88.597	0
8 9	2300	6.466	202.39	21.281	74.91	74.462	.44791	.24914	13.35	0	29.761	89.202	0
8 9	2400	6.0271	199.07	20.011	75.51	75.002	.50809	.25414	13.353	0	29.752	89.255	0
AVG		7.414	215.23	20.276	79.197	78.742	.4553	107.46	13.298	0	29.821	77.605	0
MAX		13.657	245.71	29.316	87.792	88.499	1.07	473.19	13.405	0	29.868	89.255	0
MIN		2.3554	165.8	10.843	74.029	73.102	-.95769	.19324	13.177	0	29.752	62.851	0

AVG
MAX
MIN

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 10	100	6.8161	219.2	23.434	75.324	74.856	.46809	.2309	13.353	0	29.761	89.568	0
8 10	200	7.8206	232.64	16.489	75.333	74.708	.62575	.22731	13.351	0	29.746	89.546	0
8 10	300	7.6204	224.6	19.276	75.426	74.839	.58725	.22051	13.359	0	29.727	89	0
8 10	400	8.3675	226.84	17.478	74.912	74.367	.54442	.21628	13.357	0	29.716	89.142	0
8 10	500	6.9722	278.09	18.051	74.999	74.347	.65233	.19739	13.359	0	29.727	88.795	0
8 10	600	6.2399	265.9	20.03	71.787	71.205	.58169	.13033	13.377	.0001	29.737	91.936	.36
8 10	700	3.6643	268.17	23.458	71.938	71.283	.65521	6.1091	13.389	.00002	29.741	94.594	.09
8 10	800	4.379	317.95	13.79	73.056	72.112	.94442	67.139	13.325	0	29.752	92.6	0
8 10	900	5.6264	339.16	14.802	75.844	74.756	1.0878	250.34	13.295	0	29.77	87.108	0
8 10	1000	7.0903	333.05	15.658	78.763	77.559	1.2045	450.89	13.293	0	29.794	80.885	0
8 10	1100	7.1881	315.54	16.925	82.602	81.291	1.311	732.55	13.236	0	29.799	72.553	0
8 10	1200	7.347	319.04	21.12	84.466	83.121	1.345	801.73	13.207	0	29.8	67.41	0
8 10	1300	8.2556	309.66	21.999	86.144	85.74	.40326	941.62	13.198	0	29.806	62.678	0
8 10	1400	8.3993	294.73	21.044	86.352	86.545	-.1928	833.35	13.198	0	29.817	60.85	0
8 10	1500	10.028	279.4	15.601	86.955	87.382	-.42783	842	13.191	0	29.818	58.658	0
8 10	1600	10.317	300.18	15.72	87.206	86.958	.24776	662.92	13.178	0	29.815	57.409	0
8 10	1700	9.7027	317.2	14.292	86.54	85.716	.82344	450.09	13.172	0	29.822	58.313	0
8 10	1800	7.5467	304.37	13.725	86.597	85.844	.75463	344.89	13.171	0	29.838	57.543	0
8 10	1900	5.7807	288.68	13.916	84.845	83.774	1.0706	123.14	13.19	0	29.852	58.906	0
8 10	2000	4.8522	265.81	14.109	82.221	81.171	1.0506	30.138	13.224	0	29.862	67.35	0
8 10	2100	4.2647	262	12.222	79.123	78.067	1.0563	.3102	13.274	0	29.868	73.294	0
8 10	2200	3.9648	282.85	11.684	78.423	77.264	1.1581	.2312	13.31	0	29.876	74.859	0
8 10	2300	3.3503	296.36	32.368	77.546	76.397	1.149	.21034	13.335	0	29.867	75.719	0
8 10	2400	2.7128	325.53	14.414	76.117	74.947	1.1715	.20605	13.357	0	29.868	79.072	0
AVG		6.5961	286.12	17.567	79.688	78.927	.76133	95.829	13.279	0	29.799	75.741	.01875
MAX		10.317	339.16	32.368	87.206	87.382	1.345	450.89	13.389	.0001	29.876	94.594	.36
MIN		2.7128	219.2	11.684	71.787	71.205	-.42783	.13033	13.171	0	29.716	57.409	0

AVG
MAX
MIN

25

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 11	100	2.9432	1.1713	14.403	75.093	73.907	1.1853	.21536	13.377	0	29.864	80.955	0
8 11	200	3.5114	26.241	6.7576	72.6	71.351	1.2479	.22381	13.401	0	29.862	85.518	0
8 11	300	3.1338	22.315	9.0225	71.473	70.312	1.1605	.2015	13.428	0	29.853	88.167	0
8 11	400	3.2411	7.3689	11.446	71.154	70.071	1.0844	.19349	13.438	0	29.844	88.498	0
8 11	500	3.6361	17.942	9.1117	70.011	68.912	1.0996	.19392	13.456	0	29.852	89.875	0
8 11	600	3.3779	1.4757	13.043	69.625	68.624	1.0015	1.7227	13.467	0	29.863	89.493	0
8 11	700	5.5139	4.2814	11.779	70.642	69.498	1.1437	67.817	13.456	0	29.878	88.833	0
8 11	800	8.1272	19.392	8.1867	73.874	72.645	1.2292	209.84	13.324	0	29.89	82.222	0
8 11	900	8.2087	27.567	7.759	76.77	76.178	.59144	401.76	13.266	0	29.891	76.341	0
8 11	1000	6.9071	39.886	11.475	80.195	79.806	.38933	585.93	13.266	0	29.889	74.076	0
8 11	1100	8.4956	71.249	14.417	82.932	82.774	.15729	683.61	13.209	0	29.891	71.283	0
8 11	1200	11.496	135.63	11.773	82.022	82.255	-.23319	732.75	13.197	0	29.893	71.034	0
8 11	1300	14.595	140.29	10.116	78.479	81.289	-2.8091	938.5	13.205	.00002	29.894	66.299	.07
8 11	1400	15.385	137.43	10.375	76.721	79.752	-3.0316	815.05	13.228	0	29.885	64.453	0
8 11	1500	13.527	136.13	10.664	78.481	81.032	-2.5507	784.44	13.235	0	29.884	63.028	0
8 11	1600	13.96	134.59	9.0984	75.668	78.047	-2.3793	488.68	13.252	0	29.87	67.171	0
8 11	1700	13.508	135.36	10.159	75.607	77.603	-1.9957	559.22	13.261	0	29.859	67.225	0
8 11	1800	8.85	127.47	12.938	78.535	78.777	-.24144	372.69	13.259	0	29.861	67.741	0
8 11	1900	8.1935	134.49	12.146	76.834	76.834	.00025	160.62	13.275	0	29.867	70.665	0
8 11	2000	7.6387	132.34	9.6688	73.679	73.426	.25364	18.417	13.323	0	29.866	75.252	0
8 11	2100	5.0334	106.32	10.685	72.783	72.273	.51017	.28169	13.367	0	29.874	78.133	0
8 11	2200	4.439	71.976	9.2482	72.017	71.459	.55662	.23418	13.397	0	29.887	80.61	0
8 11	2300	5.2825	58.458	8.2717	70.021	69.406	.61383	.2196	13.428	0	29.895	82.988	0
8 11	2400	5.9005	67.365	8.6373	68.594	68.045	.5477	.18841	13.455	0	29.892	85.141	0
AVG		7.7044	73.197	10.466	74.742	74.762	-.01953	150.98	13.332	0	29.875	77.292	.00292
MAX		15.385	140.29	14.417	82.932	82.774	1.2479	585.93	13.467	.00002	29.895	89.875	.07
MIN		2.9432	1.1713	6.7576	68.594	68.045	-3.0316	.18841	13.197	0	29.844	63.028	0

AVG
MAX
MIN

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 12	100	5.3476	66.535	9.0726	68.036	67.442	.59362	.17626	13.473	0	29.884	87.429	0
8 12	200	5.3161	51.887	9.4084	67.732	67.042	.69222	.15422	13.481	0	29.877	87.811	0
8 12	300	6.5528	56.872	8.3404	66.791	66.256	.53307	.14505	13.496	0	29.865	89.044	0
8 12	400	6.242	36.668	7.2989	66.37	65.711	.65991	.12044	13.502	0	29.848	89.515	0
8 12	500	7.1608	31.679	7.6569	65.747	65.128	.61826	.15159	13.511	0	29.842	89.524	0
8 12	600	9.1092	43.429	8.3235	65.459	65.074	.38555	1.1923	13.517	0	29.84	89.015	0
8 12	700	12.044	44.238	8.663	66.433	66.328	.10463	51.352	13.508	0	29.849	86.734	0
8 12	800	11.111	36.666	7.8399	67.969	67.837	.13228	127.56	13.482	0	29.87	83.876	0
8 12	900	16.84	52.116	9.5839	68.865	69.223	-.35962	289.17	13.432	0	29.877	79.569	0
8 12	1000	16.122	54.671	10.625	70.832	71.386	-.554	425.29	13.407	0	29.879	77.188	0
8 12	1100	16.245	48.895	10.271	71.712	72.517	-.8042	457.14	13.379	0	29.884	75.775	0
8 12	1200	17.393	49.498	10.009	72.215	73.176	-.96116	511.96	13.362	0	29.886	72.701	0
8 12	1300	15.712	55.199	9.9678	72.171	73.149	-.97806	533.38	13.351	0	29.9	71.663	0
8 12	1400	16.205	63.806	10.603	73.061	74.295	-1.2337	635.39	13.35	0	29.893	72.192	0
8 12	1500	14.604	60.704	11.685	72.267	72.881	-.61451	254.73	13.348	0	29.902	74.154	0
8 12	1600	15.64	62.958	9.638	70.942	71.621	-.67845	249.19	13.368	0	29.899	76.228	0
8 12	1700	14.893	59.037	10.065	70.541	71.043	-.50113	180.66	13.377	0	29.9	75.442	0
8 12	1800	15.043	45.65	10.184	69.777	70.548	-.7715	228.11	13.393	0	29.907	74.916	0
8 12	1900	13.822	48.62	9.1329	69.036	69.565	-.52787	142.18	13.403	0	29.912	74.418	0
8 12	2000	11.439	39.405	8.6976	66.375	66.351	.02386	20.278	13.444	0	29.918	77.818	0
8 12	2100	8.8872	33.326	8.5559	65.241	64.862	.37861	.20554	13.483	0	29.928	80.777	0
8 12	2200	7.7223	38.617	9.1997	65.194	64.854	.34126	.15902	13.502	0	29.922	81.799	0
8 12	2300	8.3608	54.827	9.6358	65.591	65.405	.18403	.14873	13.508	0	29.918	81.152	0
8 12	2400	6.4635	48.9	9.9264	66.482	66.122	.36029	.13756	13.508	0	29.915	80.114	0
AVG		11.595	49.342	9.3493	68.535	68.659	-.12403	151.03	13.441	0	29.888	80.369	0
MAX		17.393	66.535	11.685	73.061	74.295	.69222	533.38	13.517	0	29.928	89.524	0
MIN		5.3161	31.679	7.2989	65.194	64.854	-1.2337	.12044	13.348	0	29.84	71.663	0

AVG
MAX
MIN

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New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 13	100	6.6467	29.734	8.8749	66.513	65.921	.59145	.1561	13.505	0	29.899	81.036	0
8 13	200	6.6597	23.985	9.344	65.968	65.193	.77518	.14256	13.508	0	29.895	82.82	0
8 13	300	6.2314	26.894	9.3395	65.452	64.805	.6473	.145	13.517	0	29.89	84.67	0
8 13	400	7.4293	17.249	8.5222	65.426	64.72	.70538	.12818	13.515	0	29.881	85.644	0
8 13	500	7.6538	18.27	9.1738	65.358	64.769	.58955	.14379	13.518	0	29.864	86.356	0
8 13	600	9.1527	20.314	8.7166	65.966	65.473	.49183	.46588	13.514	0	29.874	87.048	0
8 13	700	8.9377	26.103	8.4216	66.826	66.431	.39405	9.6931	13.502	0	29.885	86.92	0
8 13	800	8.1412	40.724	10.549	66.63	66.485	.14403	30.437	13.49	0	29.9	86.76	.01
8 13	900	8.1067	44.8	8.2743	65.607	65.639	-.03267	73.27	13.489	.00002	29.912	90.55	.06
8 13	1000	9.1704	59.719	9.7912	65.411	65.502	-.09151	100.72	13.485	.00003	29.913	92.657	.1
8 13	1100	10.736	65.65	10.074	65.68	65.707	-.02604	197.16	13.486	0	29.922	91.37	.01
8 13	1200	11.411	56.76	10.374	68.149	68.33	-.18183	274.79	13.477	0	29.92	86.552	0
8 13	1300	12.936	55.07	10.632	69.83	70.166	-.33703	331.99	13.445	0	29.914	82.673	0
8 13	1400	14.808	58.211	10.155	71.443	71.821	-.37836	372.1	13.408	0	29.909	78.551	0
8 13	1500	14.378	61.967	10.725	71.308	71.703	-.39613	338.08	13.394	0	29.911	77.614	0
8 13	1600	14.987	57.998	10.786	70.769	71.272	-.50172	322.72	13.387	0	29.911	77.993	0
8 13	1700	14.323	56.767	9.6826	69.892	70.204	-.31253	178.72	13.391	0	29.907	79.367	0
8 13	1800	14.9	53.382	10.017	68.874	69.108	-.23333	101.24	13.412	0	29.896	80.081	0
8 13	1900	13.144	53.731	9.4323	67.854	68.025	-.17039	34.588	13.432	0	29.891	81.76	0
8 13	2000	10.098	44.181	9.9096	65.985	66.124	-.139	5.5257	13.457	0	29.897	86.759	0
8 13	2100	11.145	41.944	9.536	65.496	65.574	-.07849	.13137	13.479	0	29.9	89.424	0
8 13	2200	11.443	41.031	8.3759	65.153	65.291	-.13844	.122	13.487	.00002	29.902	90.594	.07
8 13	2300	11.65	37.74	8.6233	64.157	64.285	-.1286	.07689	13.496	.00004	29.894	93.461	.16
8 13	2400	12.732	37.391	7.7873	63.948	64.073	-.12559	.0499	13.504	.00001	29.887	94.361	.05
AVG		10.701	42.901	9.4632	66.987	66.943	.04446	98.858	13.471	0	29.899	85.626	.01917
MAX		14.987	65.65	10.786	71.443	71.821	.77518	372.1	13.518	.00004	29.922	94.361	.16
MIN		6.2314	17.249	7.7873	63.948	64.073	-.50172	.0499	13.387	0	29.864	77.614	0

AVG
MAX
MIN

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 14	100	13.518	36	8.6634	63.997	64.125	-.12749	.01002	13.505	0	29.876	94.413	.03
8 14	200	10.973	36.949	9.5498	64.257	64.224	.03261	.0159	13.501	.00001	29.87	94.808	.05
8 14	300	11.17	31.21	7.8372	64.64	64.49	.14932	.01289	13.504	0	29.857	95.361	.02
8 14	400	11.142	36.842	7.2864	64.965	64.924	.04205	.00193	13.494	.00002	29.85	95.391	.06
8 14	500	12.013	42.002	9.4639	64.827	64.784	.04334	.01511	13.492	.00001	29.853	95.606	.05
8 14	600	13.166	42.774	8.9236	64.833	64.879	-.04578	.33758	13.495	0	29.851	95.458	.02
8 14	700	14.907	40.584	8.576	64.367	64.538	-.17118	19.806	13.445	0	29.86	95.578	.02
8 14	800	16.199	36.433	8.4117	65.306	65.502	-.19556	74.014	13.439	0	29.864	93.239	0
8 14	900	16.657	44.079	9.3631	66.218	66.683	-.46431	126.81	13.482	0	29.875	90.815	0
8 14	1000	16.57	45.274	9.2197	67.245	67.981	-.73481	244.29	13.462	0	29.876	89.398	0
8 14	1100	15.235	42.736	9.5991	68.769	69.244	-.47652	225.92	13.44	0	29.878	87.506	0
8 14	1200	15.34	40.325	9.4578	68.833	69.313	-.47895	212.45	13.43	0	29.875	87.148	0
8 14	1300	12.05	46.959	10.708	69.838	70.045	-.20785	175.8	13.42	0	29.88	86.645	0
8 14	1400	12.705	46.81	9.1144	70.186	70.553	-.3678	237.75	13.411	0	29.877	86.174	0
8 14	1500	12.557	46.549	9.9306	71.459	71.912	-.45368	315.72	13.393	0	29.872	85.083	0
8 14	1600	8.7747	47.379	8.8962	72.454	72.476	-.02089	209.52	13.379	0	29.888	84.245	0
8 14	1700	7.6825	34.85	8.1805	72.466	72.376	.0905	158.95	13.375	0	29.889	85.645	0
8 14	1800	7.7107	40.769	10.108	71.983	71.834	.14879	94.313	13.381	0	29.892	86.309	0
8 14	1900	6.4865	45.987	8.5631	72.076	71.701	.3758	51.569	13.39	0	29.888	86.725	0
8 14	2000	6.7109	21.931	8.526	71.356	70.7	.65534	6.29	13.401	0	29.899	87.555	0
8 14	2100	5.846	28.131	9.6089	70.594	70.007	.58789	.16077	13.416	0	29.917	88.656	0
8 14	2200	7.3238	11.952	10.754	69.986	69.326	.65979	.13937	13.427	0	29.939	89.555	0
8 14	2300	7.8309	22.76	7.9902	69.472	68.92	.55215	.14531	13.436	0	29.939	90.175	0
8 14	2400	7.9348	31.637	7.578	69.156	68.771	.38504	.13737	13.44	0	29.936	90.243	0
AVG		11.271	37.538	9.0129	68.303	68.305	-.00093	89.757	13.44	0	29.883	90.072	.01042
MAX		16.657	47.379	10.754	72.466	72.476	.65979	315.72	13.505	.00002	29.939	95.606	.06
MIN		5.846	11.952	7.2864	63.997	64.125	-.73481	.00193	13.375	0	29.85	84.245	0

AVG
MAX
MIN

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 15	100	7.6739	28.951	8.4364	68.71	68.365	.34656	.13014	13.447	0	29.943	91.277	0
8 15	200	6.4075	20.484	9.8365	68.303	67.872	.43111	.12213	13.448	0	29.952	91.565	0
8 15	300	7.2248	26.572	9.0821	67.108	66.894	.21463	.16924	13.464	0	29.944	92.675	0
8 15	400	6.8549	40.643	10.27	67.363	67.139	.22365	.13452	13.465	0	29.941	92.048	0
8 15	500	6.1784	37.425	9.3508	67.456	67.22	.23552	.14784	13.47	0	29.945	92.03	0
8 15	600	7.3572	14.443	9.7222	67.238	66.867	.3709	.97213	13.474	0	29.952	93.028	0
8 15	700	9.2697	19.52	8.4531	67.443	67.132	.30955	34.945	13.422	0	29.958	93.038	0
8 15	800	9.3684	34.571	7.3202	68.23	68.032	.19762	52.677	13.463	0	29.969	91.638	0
8 15	900	9.0657	26.841	9.496	68.986	68.655	.33106	82.438	13.46	0	29.982	90.948	0
8 15	1000	10.661	18.981	8.8299	69.48	69.2	.2809	137.73	13.444	0	29.981	90.073	0
8 15	1100	10.206	27.207	7.6566	69.588	69.429	.15832	228.19	13.438	0	29.983	91.645	.01
8 15	1200	11.004	27.506	8.2466	72.598	72.376	.22235	341.83	13.413	0	29.97	86.913	0
8 15	1300	12.504	32.173	7.5433	71.783	71.629	.15407	162.61	13.397	0	29.963	84.937	0
8 15	1400	10.999	40.884	8.73	68.199	68.243	-.0448	70.36	13.417	.00005	29.955	90.794	.17
8 15	1500	8.9057	28.901	9.7024	68.838	68.467	.37089	126.29	13.432	.00001	29.94	93.77	.04
8 15	1600	11.939	30.255	8.71	69.661	69.44	.22143	181.42	13.437	0	29.924	90.924	.01
8 15	1700	12.603	31.194	7.8669	68.89	68.752	.13689	122.28	13.433	.00002	29.92	92.037	.09
8 15	1800	12.117	37.958	7.2683	69.687	69.489	.19842	88.757	13.439	0	29.913	90.226	0
8 15	1900	10.834	36.225	6.8668	69.299	69.103	.19394	33.264	13.438	0	29.911	89.934	0
8 15	2000	9.1195	33.34	8.7171	68.26	68.053	.20681	2.7677	13.445	0	29.91	91.146	0
8 15	2100	7.8293	27.441	8.8603	67.697	67.338	.3597	.10802	13.458	0	29.912	93.024	0
8 15	2200	7.1569	24.468	8.7447	68.315	67.821	.49488	.07903	13.462	0	29.913	92.245	0
8 15	2300	5.5974	19.121	11.851	68.515	67.961	.55589	.06314	13.461	0	29.911	92.068	0
8 15	2400	6.3053	353.52	14.475	68.472	67.824	.64792	.05921	13.461	0	29.897	92.379	0
AVG		9.0492	42.443	9.0015	68.755	68.471	.28409	69.481	13.445	0	29.941	91.265	.01333
MAX		12.603	353.52	14.475	72.598	72.376	.64792	341.83	13.474	.00005	29.983	93.77	.17
MIN		5.5974	14.443	6.8668	67.108	66.867	-.0448	.05921	13.397	0	29.897	84.937	0

AVG
MAX
MIN

New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 16	100	5.7638	343.17	13.928	68.407	67.679	.72917	.04926	13.465	0	29.891	91.975	0
8 16	200	5.545	325.76	11.147	67.947	67.27	.67735	.04668	13.465	0	29.874	92.111	0
8 16	300	5.0585	320.02	9.4784	67.674	67.003	.67103	.05298	13.472	0	29.849	92.673	0
8 16	400	4.1161	270.3	13.815	67.753	67.112	.64062	.04389	13.473	0	29.838	91.968	0
8 16	500	3.6914	243.37	19.45	68.358	67.749	.60787	.04102	13.475	0	29.83	90.906	0
8 16	600	5.113	197.66	14.221	68.771	68.25	.51831	.55215	13.47	0	29.822	90.711	0
8 16	700	6.5003	202.31	17.928	69.269	68.729	.53943	19.036	13.433	0	29.821	90.49	0
8 16	800	6.3088	218	21.595	70.947	70.376	.57082	142.29	13.441	0	29.832	89.252	0
8 16	900	9.7027	222.53	20.724	74.174	73.723	.45104	333.87	13.387	0	29.822	83.934	0
8 16	1000	8.853	222.8	20.803	73.037	72.313	.72303	142.66	13.372	0	29.811	84.607	.02
8 16	1100	8.4663	207.39	16.239	70.658	69.83	.829	123.89	13.405	0	29.801	90.303	.01
8 16	1200	8.8247	208.44	22.118	73.273	72.677	.59436	174.24	13.404	0	29.78	87.443	0
8 16	1300	9.7044	222.77	21.518	74.474	74.179	.29442	252.67	13.373	0	29.761	85.835	0
8 16	1400	10.923	229.83	17.136	74.707	74.484	.22307	269	13.353	0	29.742	85.087	0
8 16	1500	8.4898	236.55	18.367	77.834	77.892	-.0587	500.91	13.322	0	29.729	81.472	0
8 16	1600	6.7402	246.66	22.545	81.785	81.991	-.20656	592.03	13.269	0	29.717	75.24	0
8 16	1700	7.5311	229.25	19.88	80.24	80.016	.22451	224.69	13.247	0	29.716	75.231	.01
8 16	1800	8.4806	290.86	14.289	75.968	75.197	.7712	239.28	13.301	0	29.728	81.753	0
8 16	1900	8.1149	300.29	11.784	77.257	76.54	.71724	163	13.302	0	29.744	74.489	0
8 16	2000	5.8784	307.9	10.21	75.033	73.778	1.2546	24.628	13.332	0	29.764	67.193	0
8 16	2100	5.5578	303.91	10.097	71.639	70.36	1.2789	.21442	13.391	0	29.779	70.335	0
8 16	2200	4.7319	301.3	12.612	69.806	68.593	1.213	.15847	13.437	0	29.79	72.796	0
8 16	2300	6.957	303.86	11.553	69.241	68.08	1.162	.12385	13.464	0	29.803	70.231	0
8 16	2400	6.9111	302.9	11.779	68.122	66.986	1.136	.10997	13.478	0	29.811	69.529	0
AVG		6.9985	260.74	15.967	72.349	71.7	.6484	133.48	13.397	0	29.794	82.732	.00167
MAX		10.923	343.17	22.545	81.785	81.991	1.2789	592.03	13.478	0	29.891	92.673	.02
MIN		3.6914	197.66	9.4784	67.674	66.986	-.20656	.04102	13.247	0	29.716	67.193	0

AVG
MAX
MIN

PRELIMINARY DATA
New Bedford Harbor Meteorological Data
Hourly Summary

2000

Date Mo Day	TIME EST	Wind Speed mph	Wind Direction deg	compass	STD deg	Temp (10m) °F	Temp (2m) °F	Delta Temp °F	Solar Radiation w/m²	Barr. Press. "Hg	Relative Humidity %RH	Precp in(H_2O)
8 17	100	8.8	302	WNW	10.0	66.7	65.7	1.00	0	29.81	71	0.00
8 17	200	8.5	308	NW	10.0	65.5	64.5	0.99	0	29.80	73	0.00
8 17	300	6.6	308	NW	8.8	64.7	63.6	1.04	0	29.79	75	0.00
8 17	400	4.0	323	NW	9.9	63.3	62.2	1.06	0	29.79	77	0.00
8 17	500	3.1	314	NW	12.9	62.4	61.4	1.05	0	29.82	80	0.00
8 17	600	5.2	305	NW	9.1	61.8	60.8	1.01	1	29.84	80	0.00
8 17	700	4.9	289	WNW	11.8	62.5	61.6	0.86	37	29.87	80	0.00
8 17	800	3.9	273	W	20.9	66.0	65.0	1.08	170	29.89	77	0.00
8 17	900	8.7	302	WNW	13.7	68.3	67.5	0.79	399	29.90	73	0.00
8 17	1000	10.3	312	NW	12.5	70.4	69.4	0.94	594	29.90	69	0.00
8 17	1100	10.4	298	WNW	15.7	72.4	71.7	0.78	710	29.90	66	0.00
8 17	1200	9.9	297	WNW	15.9	73.9	73.2	0.64	790	29.90	63	0.00
8 17	1300	11.2	285	WNW	16.4	74.3	74.6	-0.27	905	29.88	60	0.00
8 17	1400	10.8	292	WNW	16.6	75.2	75.9	-0.71	924	29.89	59	0.00
8 17	1500	10.3	285	WNW	19.1	75.7	76.2	-0.55	756	29.89	58	0.00
8 17	1600	9.4	287	WNW	17.4	76.5	76.8	-0.29	623	29.88	57	0.00
8 17	1700	9.3	309	NW	14.2	75.9	75.5	0.39	376	29.88	58	0.00
8 17	1800	9.6	309	NW	13.2	75.5	74.9	0.57	298	29.89	58	0.00
8 17	1900	8.4	322	NW	11.0	74.1	73.2	0.89	135	29.90	59	0.00
8 17	2000	8.6	331	NNW	12.3	70.9	69.8	1.11	21	29.91	63	0.00
8 17	2100	6.4	315	NW	10.3	66.8	65.8	0.99	0	29.93	69	0.00
8 17	2200	6.4	316	NW	9.2	65.4	64.3	1.07	0	29.94	72	0.00
8 17	2300	2.2	338	NNW	25.2	64.2	63.0	1.17	0	29.94	74	0.00
8 17	2400	1.9	27	NNE	27.4	62.2	60.7	1.55	0	29.94	81	0.00
AVG		7.5	294		14.3	68.9	68.2	0.71	113	29.88	69	0.00
MAX		11.2	338		27.4	76.5	76.8	1.55	594	29.94	81	0.00
MIN		1.9	27		8.8	61.8	60.7	-0.71	0	29.79	57	0.00
Total												0.00
		CHECK DATA	CHECK DATA			OK		OK	CHECK DATA	OK	OK	OK

Post-it® Fax Note 7671

To M. Guzman

Co./Dept.

Phone #

Fax #

Date 8/22

# of pages ▶

From B. Watson

Co.

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New Bedford Harbor - RAW Data Review Copy

DATE	TIME	WS	WD	SIGMA	TEMP10M	TEMP2M	DELTA-T	SR	BATTERY	NA	BARR.PR	RH	PRECIP
8 18	100	2.489	44.375	12.402	60.107	58.838	1.2686	.07199	13.618	0	29.933	84.488	0
8 18	200	2.0031	36.327	16.952	58.92	57.909	1.0107	.03775	13.639	0	29.932	86.102	0
8 18	300	2.438	41.492	11.036	57.9	57.071	.82947	.01605	13.66	0	29.93	86.845	0
8 18	400	2.2212	51.111	11.067	57.172	56.398	.77418	.03633	13.672	0	29.923	87.015	0
8 18	500	2.2986	42.874	8.1929	56.428	55.68	.74668	.01089	13.688	0	29.919	88.083	0
8 18	600	2.9364	36.036	7.8838	55.485	54.77	.71555	1.0063	13.699	0	29.922	89.037	0
8 18	700	4.3386	3.3409	11.785	57.007	55.951	1.0563	59.937	13.693	0	29.948	87.619	0
8 18	800	3.205	32.93	10.155	62.02	60.784	1.2353	188.66	13.638	0	29.972	83.221	0
8 18	900	2.3346	34.92	14.343	68.092	67.003	1.0894	371.43	13.528	0	29.983	75.83	0
8 18	1000	3.3904	160.22	21.468	73.408	72.312	1.0966	571.13	13.41	0	29.987	68.795	0
8 18	1100	7.1491	179.78	10.992	72.468	72.268	.20042	452.37	13.367	0	29.982	66.176	0
8 18	1200	8.9666	162.5	9.1257	73.324	73.056	.26849	510.31	13.363	0	29.968	63.72	0
8 18	1300	9.0136	175.54	10.908	73.456	73.317	.1387	405.02	13.352	0	29.951	61.638	0
8 18	1400	9.9679	171.83	9.9798	72.084	71.877	.20769	271.65	13.365	0	29.94	62.669	0
8 18	1500	10.038	164.83	8.6694	70.072	69.761	.30997	157.68	13.388	0	29.931	64.402	0
8 18	1600	8.0789	157.77	10.937	69.407	69.016	.39121	108.46	13.422	0	29.918	68.421	0
8 18	1700	7.3046	142.01	8.5124	68.806	68.42	.38669	64.013	13.434	0	29.902	72.418	0
8 18	1800	7.089	145.79	11.522	69.156	68.746	.40912	59.233	13.441	0	29.889	76.811	0
8 18	1900	8.3967	151.65	14.988	69.193	68.837	.35683	11.43	13.448	0	29.883	79.448	0
8 18	2000	10.382	149.23	8.683	66.455	66.551	-.09657	1.8234	13.459	0	29.867	84.324	0
8 18	2100	5.6669	120.1	12.774	66.441	66.209	.23143	.15071	13.477	.00001	29.862	88.451	.04
8 18	2200	6.8126	140.76	8.0361	65.535	65.06	.47503	.06759	13.489	0	29.847	91.98	0
8 18	2300	3.2448	110.64	13.267	66.505	65.987	.5168	.02714	13.501	0	29.836	88.505	.01
8 18	2400	3.4286	73.585	13.232	64.903	64.682	.21923	.08299	13.507	0	29.827	91.08	.01
AVG		5.5498	105.4	11.538	65.598	65.021	.57658	134.78	13.511	0	29.919	79.045	.0025
MAX		10.382	179.78	21.468	73.456	73.317	1.2686	571.13	13.699	.00001	29.987	91.98	.04
MIN		2.0031	3.3409	7.8838	55.485	54.77	-.09657	.01089	13.352	0	29.827	61.638	0

AVG
MAX
MIN

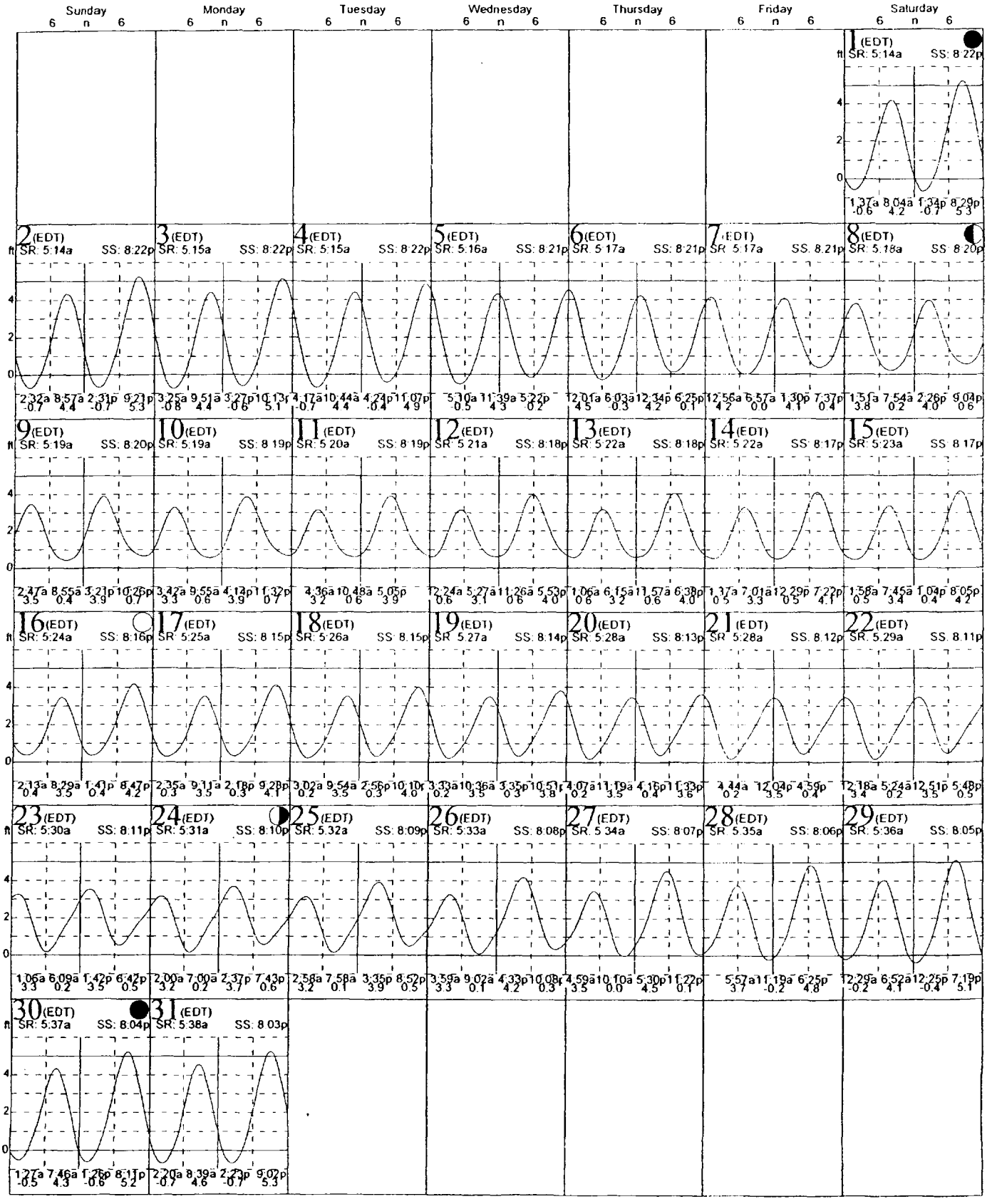
New Bedford Harbor
Tidal Records
July, August, September 2000

Tides-NEW BEDFORD, MASS.

Harmonic station (NOAA)
41° 38 N 70° 55 W

July 2000

Monthly High & Low
High July 1, 8:29p 5.3 ft
Low July 3, 3:25a -0.8 ft



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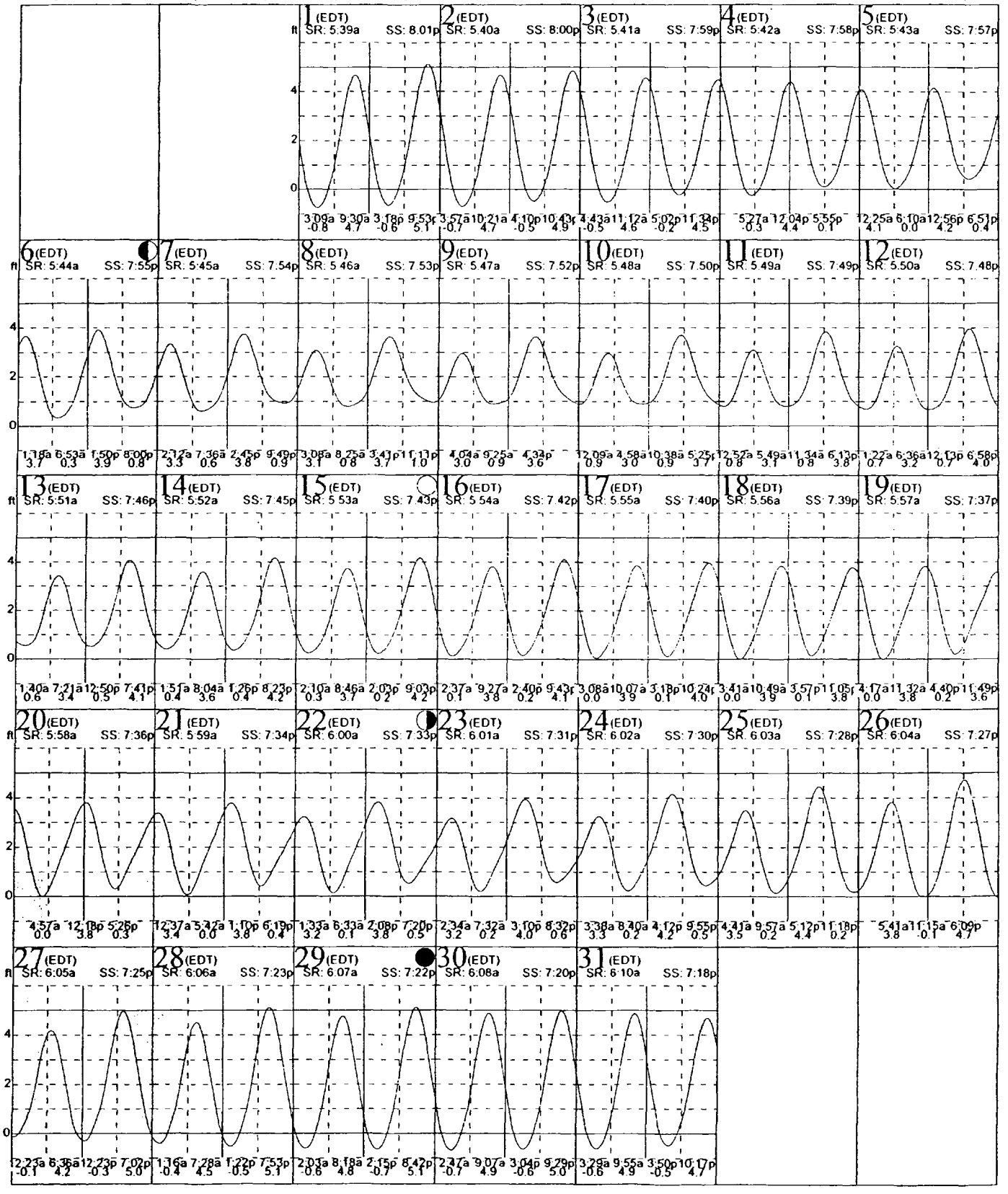
Tides-NEW BEDFORD, MASS.

Harmonic station (NOAA)
41° 38 N 70° 55 W

August 2000

Monthly High & Low
High August 1, 9:53p 5.1 ft
Low August 2, 3:57a -0.7 ft

Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday



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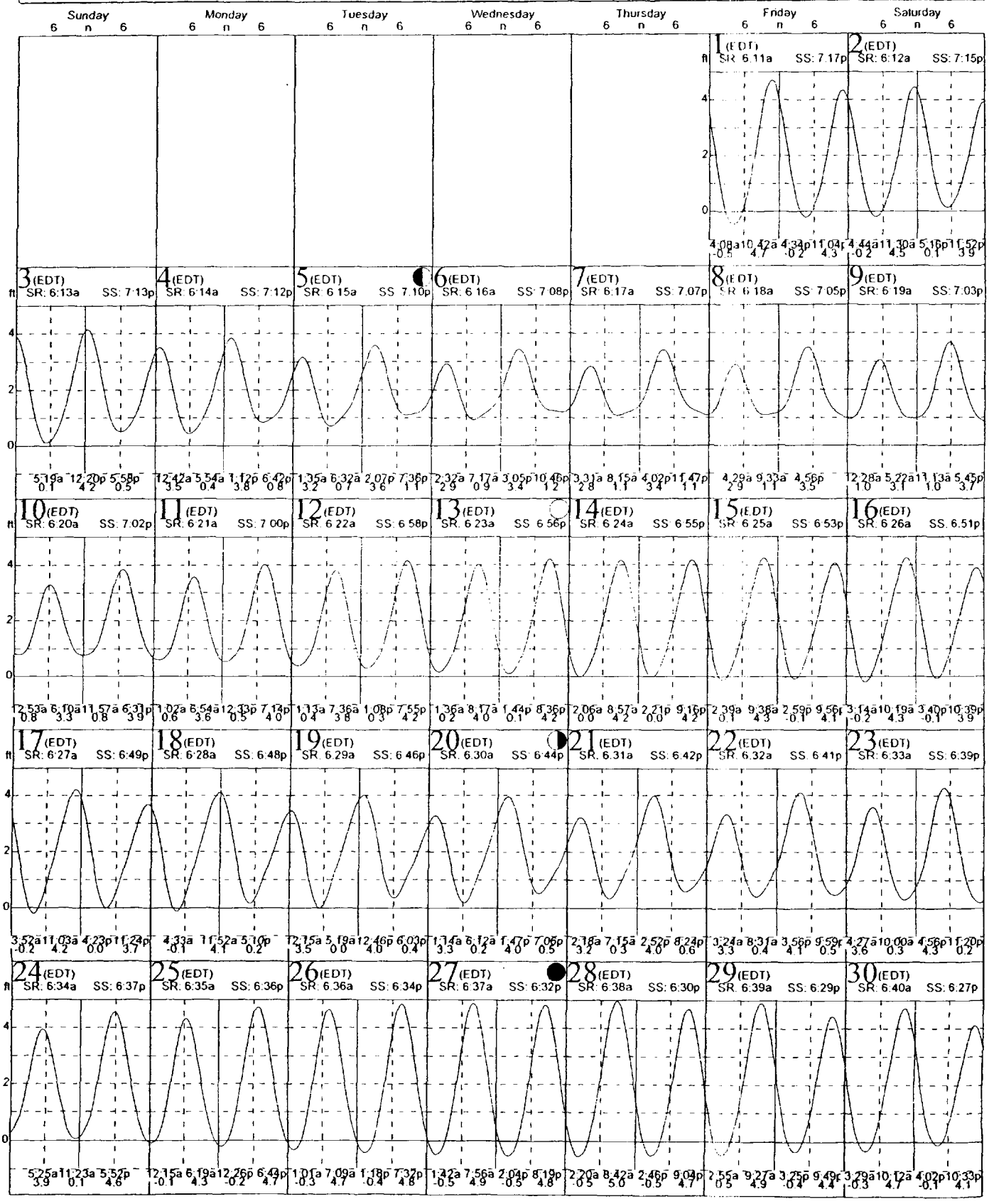
Tides-NEW BEDFORD, MASS.

Harmonic station (NOAA)
41° 38 N 70° 55 W

September 2000

Monthly High & Low
High September 28, 8:42a 5.0 ft
Low September 28, 2:20a -0.5 ft



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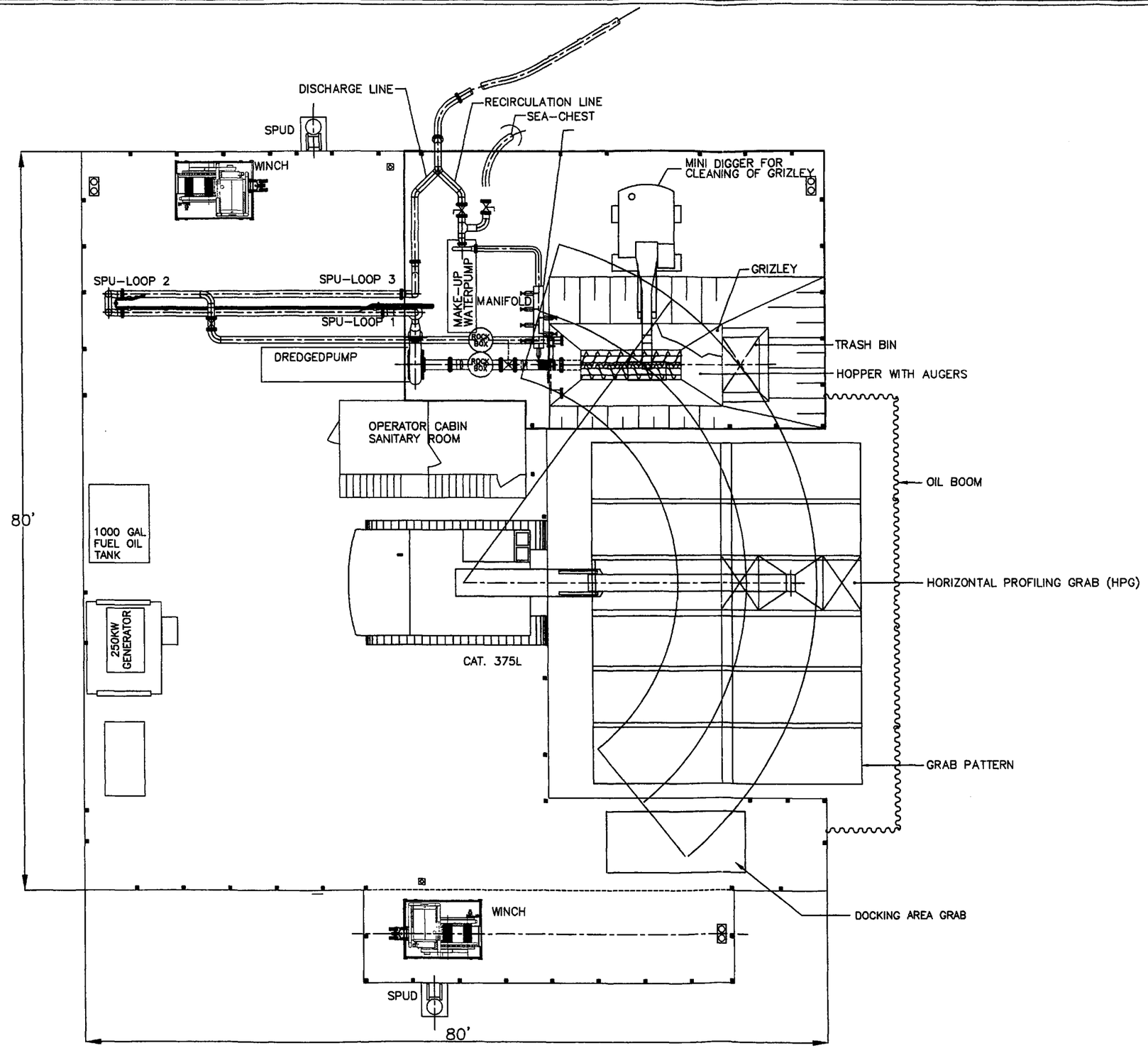
D

Appendix D
BELLC Dredge General Arrangement and System Details



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133 FEDERAL STREET, BOSTON, MASSACHUSETTS 02110

BEAN ENVIRONMENTAL, L.L.C.
ST. CHARLES AVE., SUITE 500
NEW ORLEANS, LA 70130

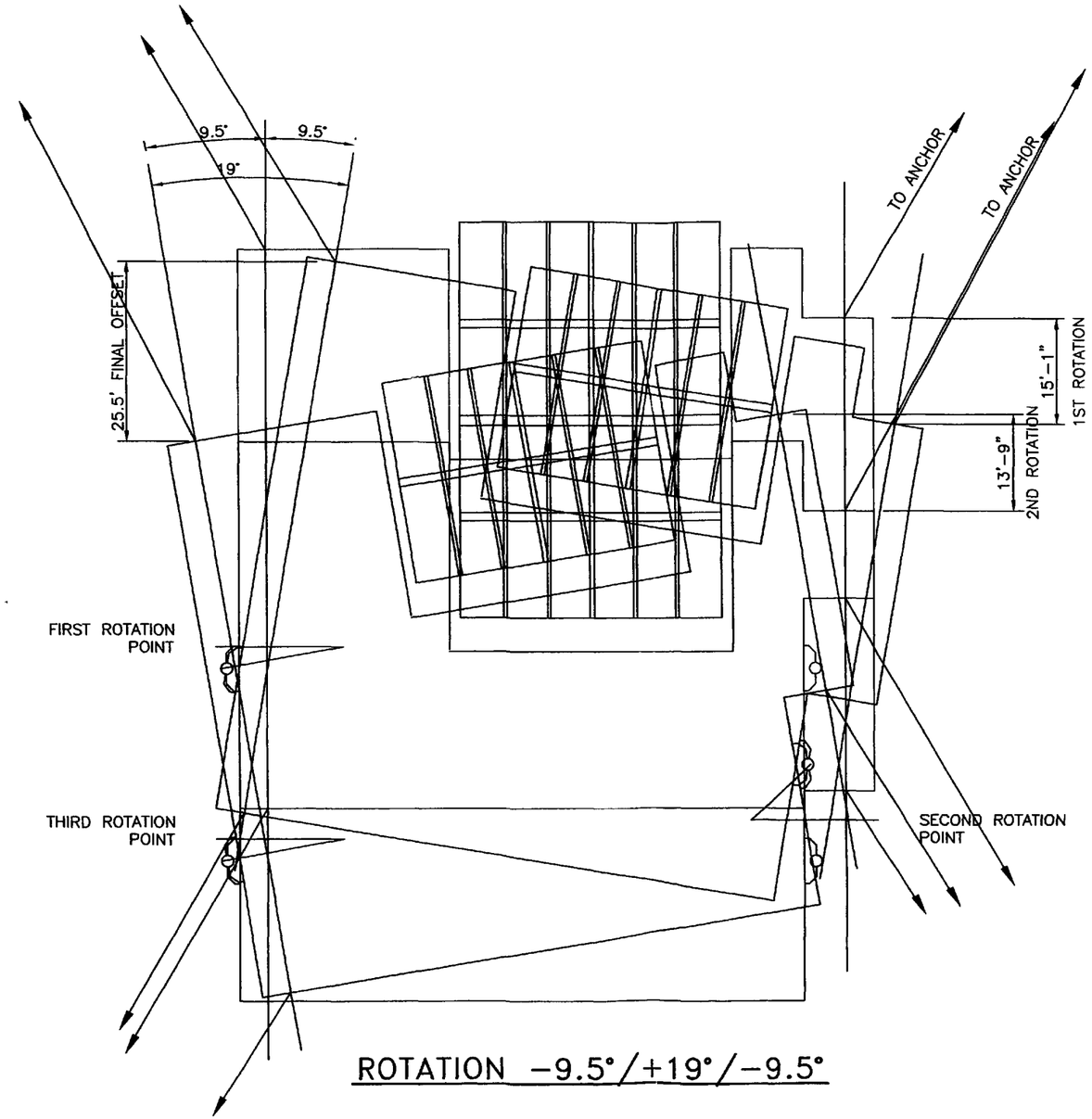
FIGURE D-1

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

BELLC TEST DREDGE GENERAL ARRANGEMENT

NOT TO SCALE

CAD FILE: 29088LY002A-1A.DWG



0 20 40
SCALE IN FEET

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NEW ORLEANS, LA 70130

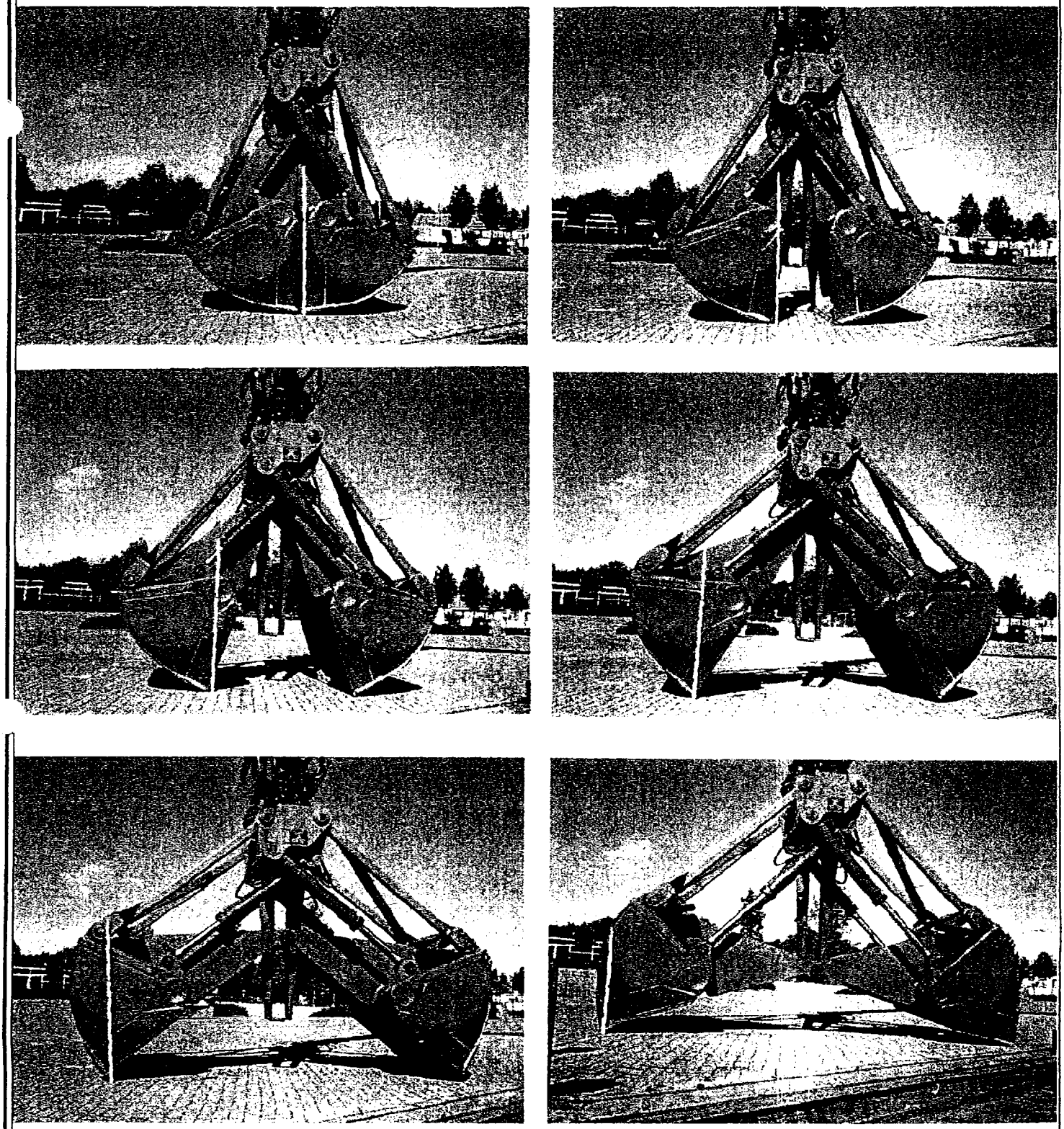
FIGURE D-2

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

BELLC TEST DREDGE WALKING SEQUENCE

SCALE: AS SHOWN

CAD FILE: 29088wm0032A-1A.DWG



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NEW ORLEANS, LA 70130

FIGURE D-3

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

HORIZONTAL PROFILING GRAB BUCKET

NOT TO SCALE

CAD FILE: NBH_IMAGE-1.DWG

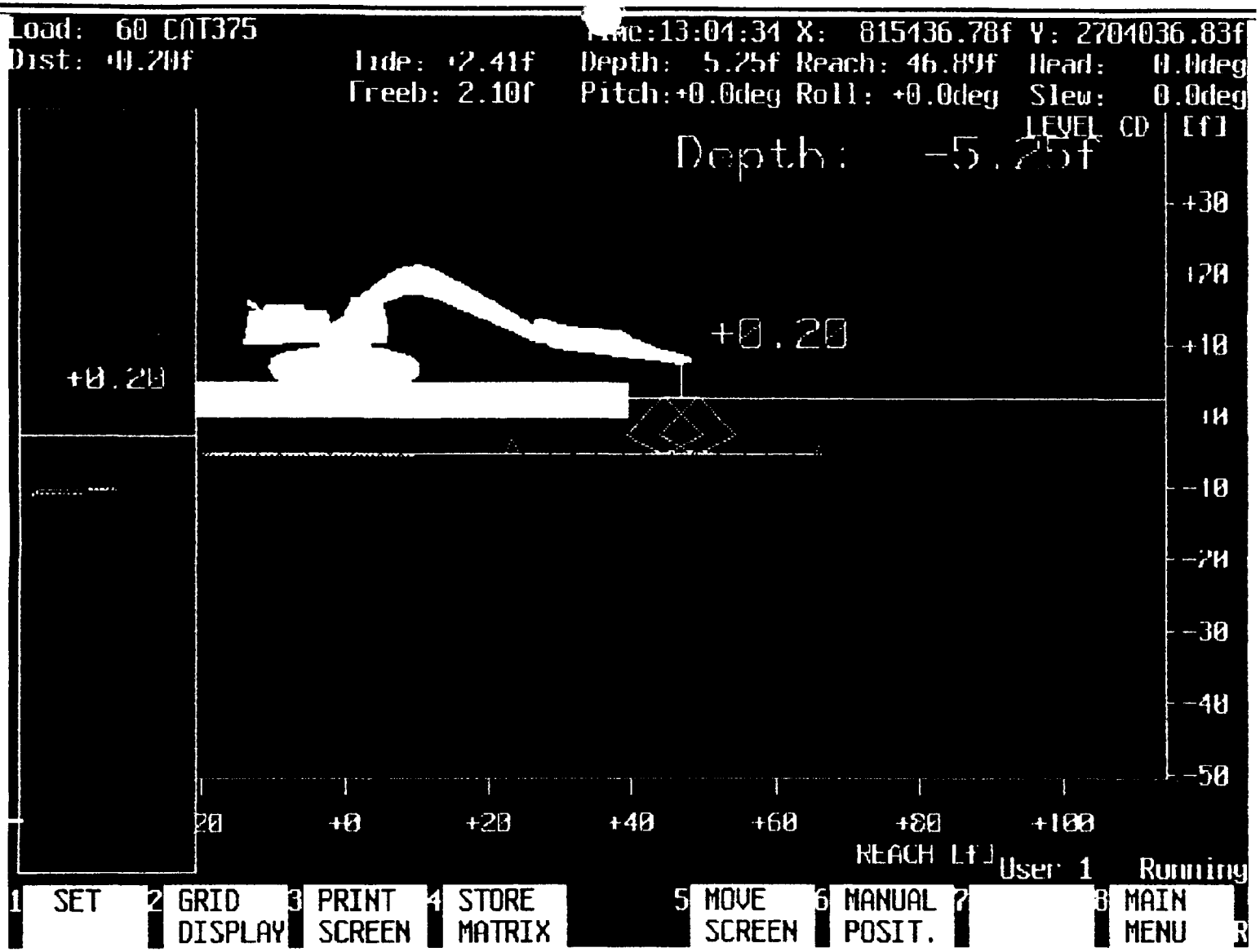

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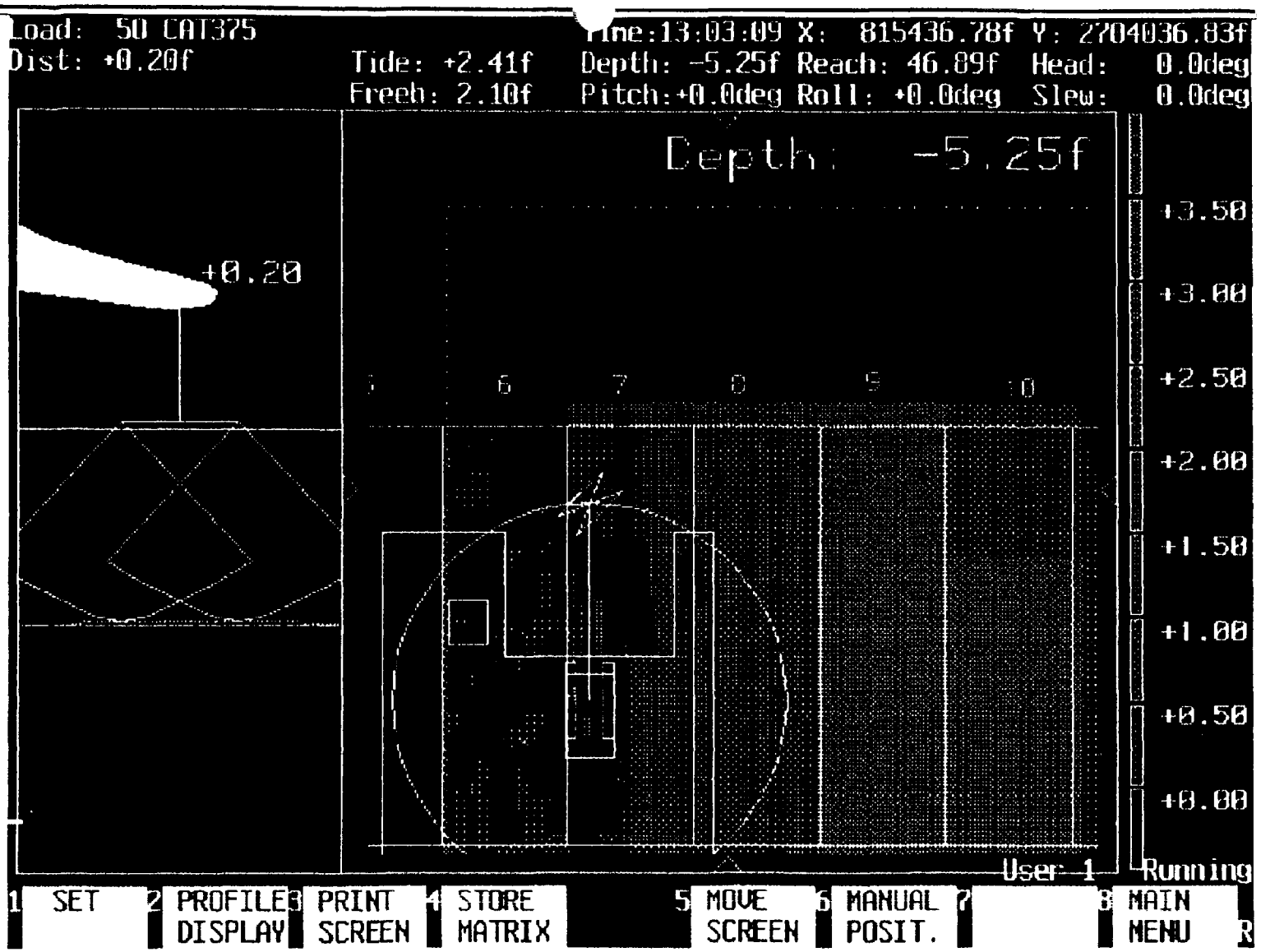
FIGURE D-4

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

BELLC TEST DREDGE CMS DISPLAY SCREEN

NOT TO SCALE

CAD FILE: NBH_IMAGE-1.DWG



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NEW ORLEANS, LA 70130

FIGURE D-5

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

BELLC TEST DREDGE CMS DISPLAY SCREEN

NOT TO SCALE

CAD FILE: NBH_IMAGE-1.DWG

Appendix E
Dredge Production Data

Daily Production Reports

2001-017-0178
7/16/01

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Production Report Summary

Date: August 30, 2000

Date	Day	Time Hours	Hours decimal Day	Hours decimal Cum	yd3	Net Hours	Remarks
10-Aug	Thursday	0:56	0.93	0.93			
11-Aug	Friday	1:26	1.43	2.37			
12-Aug	Saturday	1:22	1.37	3.73			
13-Aug	Sunday	2:17	2.28	6.02			
14-Aug	Monday	5:36	5.60	11.62	645	55.52	Cum. Volume / Cum. Dredging hrs.
15-Aug	Tuesday	5:28	5.47	17.08	335	61.28	Daily Volume / Daily Dredging hrs.
16-Aug	Wednesday	5:24	5.40	22.48	462	85.56	Daily Volume / Daily Dredging hrs.
17-Aug	Thursday	6:07	6.12	28.60	523	85.50	Daily Volume / Daily Dredging hrs.
18-Aug	Friday	3:14	3.23	31.83	343	106.08	Daily Volume / Daily Dredging hrs.
TOTALS		31:50:00	31.83		2,308	72.5	Average yd3 per hour

REMARKS:

The first complete post-dredge survey which can be used to calculate dredged volume was performed on August 14. Therefore volumes and Net Dredging Hours are taken cumulative to that date.
Volumes are calculated as per spreadsheet "Volumes according to surveys"

Table E-1

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily Production Report

Date: August 10-2000

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	[1,2,3,4]	[1,2,3,4]	layer(ft)	from	till	time	description
						13:30	14:20	0:50	Start up
14:20	14:45	0:25	6	1	2.0	14:45	15:16	0:31	Backwash
15:16	15:36	0:20	6	1	2.0	15:36	15:46	0:10	Backwash
15:46	15:53	0:07	6	1	2.0	15:53	15:58	0:05	Backwash
15:58	16:02	0:04	6	1	2.0	16:02	16:59	0:57	Flush pipeline
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
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		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00							
	total:	0:56					total:	2:33	

REMARKS:

Report reconstructed from limited daily report and SPU logging data.

TABLE E-2

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily Production Report

Date: August 11-2000

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	[1,2,3,4]	[1,2,3,4]	layer(ft)	from	till	time	description
			6	1	2.0	13:20	13:43	0:23	Start up, prime pumps, CMS check
13:43	14:00	0:17	6	1	2.0	14:00	14:07	0:07	Shift barge to Cut 6, pos 2
14:07	14:23	0:16	6	2	2.0	14:23	14:40	0:17	Obstruction suction line
14:40	14:55	0:15	6	2	2.0	14:55	15:05	0:10	Estimated Backwash time
15:05	15:14	0:09	6	2	2.0	15:14	16:40	1:26	Packing slurry pump
16:40	16:50	0:10	6	2	2.0	16:50	17:00	0:10	Estimated Backwash time
17:00	17:19	0:19	6	2	2.0	17:19	18:00	0:41	Refueling
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
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		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
	total:	1:26					total:	3:14	

REMARKS:

Report reconstructed from limited daily report and SPU logging data.
No SPU logging data available before 16:05 hrs.

TABLE E-3

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily Production Report

Date: August 12-2000

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	[1,2,3,4]	[1,2,3,4]	layer(ft)	from	till	time	description
						8:15	8:40	0:25	Start up
						8:40	10:18	1:38	CMS; datalink breakdown
10:18	10:25	0:07	6	3	2.0	10:25	11:30	1:05	Recirculation pump CDF; lost prime
11:30	11:45	0:15	6	3	2.0	11:45	11:54	0:09	Backwash
11:30	12:12	0:42	6	3	2.0	12:12	12:20	0:08	Shift to cut 6. Pos 4
12:20	12:26	0:06	6	4	2.0	12:26	12:44	0:18	Obstruction suction line
12:44	12:47	0:03	6	4	2.0	12:47	13:15	0:28	Clean Rockbox
		0:00				13:15	14:05	0:50	Repack Slurrypump
		0:00				14:05	14:16	0:11	Start up
14:16	14:20	0:04	6	4	2.0	14:20	14:50	0:30	Obstruction suction line
14:50	14:55	0:05	6	4	2.0	14:55	18:00	3:05	Open system, steelplate found in suction line
		0:00						0:00	Install modifications
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
	total:	1:22					total:	8:47	

REMARKS:

Because of continous clogging in suction line an inspection was made by removing a spool piece of the suction line.
A folded steelplate was found in the suction line, obstructing 90 % of the pipeline diameter.

TABLE E-4

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily Production Report

Date: August 13-2000

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	[1,2,3,4]	[1,2,3,4]	layer(ft)	from	till	time	description
						7:30	16:05	8:35	Modifications dredge system:
									Hopper level indicator; dam in hopper;
									Installation of jet-nozzles mini-excavator,
									suction inlet hopper.
16:05	16:34	0:29	6	4	2.0	16:34	16:47	0:13	Backwash
16:47	17:17	0:30	6	4	2.0	17:17	17:22	0:05	Backwash
17:22	17:29	0:07	6	4	2.0				
17:29	18:40	1:11	6	4,3,2,1	2.0			0:00	Final clean-up of cut 6
		0:00				18:40	19 00	0:20	Shift barge to Cut 7, pos 1
		0:00						0:00	
		0:00						0:00	
		0:00						0.00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00							
	total:	2:17					total.	9:13	

REMARKS:

TABLE E-5

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily Production Report

Date: August 14-2000

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	[1,2,3,4]	[1,2,3,4]	layer(ft)	from	till	time	description
								0:00	
								0:00	
						7:30	8:39	1:09	Start up, reset stern port anchor
8:39	9:00	0:21	7	1	2.0	9:00	9:05	0:05	Remove trash grizzley hopper
9:05	9:24	0:19	7	1	2.0	9:24	9:30	0:06	Backwash
			7	1	2.0	9:30	9:35	0:05	CMS, calibration
9:35	10:16	0:41	7	1	2.0	10:16	10:25	0:09	Shift to Cut 7, pos 2
10:25	10:41	0:16	7	1	2.0	10:41	10:43	0:02	Backwash
10:43	10:47	0:04	7	2	2.0	10:47	11:40	0:53	CMS, deviation + calibration
11:40	12:19	0:39	7	2	2.0	12:19	12:25	0:06	Backwash
12:25	12:42	0:17	7	2	2.0	12:42	12:52	0:10	Shift to Cut 7, pos 3 (Ronny 12:38-13:12)
						12:52	13:24	0:32	Clean Rockbox
13:24	14:23	0:59	7	3	2.0	14:23	14:36	0:13	Shift to Cut 7, pos 4
14:36	15:25	0:49	7	4	2.0	15:25	15:35	0:10	Shift to Cut 8, pos 4 (Ronny 15:11-15:43)
		0:00				15:35	15:53	0:18	Excavator Operator break
15:53	16:01	0:08	8	4	2.0	16:01	16:04	0:03	Backwash
16:04	16:11	0:07	8	4	2.0	16:11	16:14	0:03	Backwash
16:14	16:44	0:30	8	4	2.0	16:44	17:18	0:34	Clean Rockbox
17:18	17:44	0:26	8	4	2.0	17:44	18:00	0:16	Move dredge for survey
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
	total:	5:36					total:	4:54	

REMARKS:

TABLE E-6

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily Production Report

Date: August 15-2000

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	[1,2,3,4]	[1,2,3,4]	layer(ft)	from	till	time	description
						6:30	7:05	0:35	Start up
7:05	8:20	1:15	8	2	2.0	8:20	8:54	0:34	Clean Rockbox
8:54	9:25	0:31	8	2	2.0	9:25	9:33	0:08	Shift to Cut 8, pos 1
9:33	10:06	0:33	8	1	2.0	10:06	10:08	0:02	Backwash
10:08	10:28	0:20	8	1	2.0	10:28	10:34	0:06	Backwash
						10:34	10:45	0:11	Shift to Cut 5, pos.4
						10:45	11:22	0:37	Suction line clogged
						11:22	11:46	0:24	Clean Rockbox
11:46	11:56	0:10	5	4	2.0	11:56	12:10	0:14	Backwash
		0:00				12:10	12:35	0:25	Suction line clogged
12:35	12:50	0:15	5	4	2.0	12:50	12:53	0:03	Backwash
		0:00				12:53	13:03	0:10	SPU; packing blown out
		0:00				13:03	14:19	1:16	CDF; cutting pipeline
14:19	14:31	0:12	5	4	2.0	14:31	14:50	0:19	Backwash
14:50	15:25	0:35	5	4	2.0	15:25	15:32	0:07	Shift to Cut 5, pos 3
15:32	15:50	0:18	5	3	2.0	15:50	15:55	0:05	Backwash
		0:00				15:55	17:38	1:43	Rockbox modification, install jets,open screen
17:38	18:13	0:35	5	3	2.0	18:13	18:25	0:12	Shift to Cut 5, pos 2
18:25	18:42	0:17	5	2	2.0	18:42	18:48	0:06	Backwash
18:48	19:15	0:27	5	2	2.0			0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00							
	total:	5:28					total	7:17	

REMARKS:

7:05- Start dredging Cut 8, chainage 48.60 South to North
Overflow hopper from 12:15 to 12:25 because of clogging suction line.
17:40- Installed reverse jet in rockbox for cleaning of trash screen

TABLE E-7

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily Production Report

Date: August 16-2000

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	{1,2,3,4}	{1,2,3,4}	layer(ft)	from	till	time	description
						8:30	8:50	0:20	Initial shift to dredge area Cut 5; pos 1
						8:50	9:30	0:40	Clean rockbox
						9:30	10:25	0:55	Weather delay; Thunderstorm;
						10:25	10:50	0:25	Fueling
						10:50	10:58	0:08	Start up
10:58	11:28	0:30	5	1	2.0	11:28	11:31	0:03	Backwash
11:31	11:35	0:04	5	1	2.0	11:35	11:42	0:07	Shift to Cut 4, Pos 1
11:42	11:51	0:09	4	1	1.8	11:51	11:53	0:02	Backwash
11:53	11:55	0:02	4	1	1.8	11:55	11:58	0:03	Backwash
11:58	12:31	0:33	4	1	1.8	12:31	12:32	0:01	Backwash
12:32	12:39	0:07	4	1	1.7	12:39	12:47	0:08	shift to Cut 4, Pos 2
12:47	13:29	0:42	4	2	1.7/ 2.7	13:29	13:38	0:09	shift to Cut 4, Pos 3
						13:38	13:52	0:14	Open Rockbox
13:52	14:10	0:18	4	3	1.7/ 2.7	14:10	14:15	0:05	Backwash
14:15	15:05	0:50	4	3	1.7/ 2.7	15:05	15:14	0:09	Shift to Cut 4, Pos4
15:14	15:18	0:04	4	4	1.7	15:18	15:20	0:02	Crane Monitoring System
15:20	15:33	0:13	4	4	1.7	15:33	15:35	0:02	Backwash
15:35	15:37	0:02	4	4	1.7	15:37	16:20	0:43	Open Rockbox
16:20	16:40	0:20	4	4	1.7	16:40	16:42	0:02	Backwash
16:42	16:46	0:04	4	4	1.7	16:46	16:57	0:11	Shift to Cut 3, Pos 4
16:57	17:08	0:11	3	4	1.7	17:08	17:22	0:14	Backwash
17:22	17:37	0:15	3	4	1.7	17:37	17:42	0:05	Backwash
17:42	17:47	0:05	3	4	1.7	17:47	17:50	0:03	Backwash
17:50	18:04	0:14	3	4	1.7	18:04	18:25	0:21	Shift to Cut 3,Pos 3
18:25	19:06	0:41	3	3	1.5				
	total:	5:24					total:	5:12	total:

REMARKS:

Cut 4 and Cut 3 have been dredged with the original target profile in the CMS, the dredging depth has been adjusted in the field, based on visual observation of natural clay being present on the grizzley on top of the hopper.
The 3rd spud position of Cut 3 a layer of 2,7' has been dredged
An overflow incident occurred between 15:35 and 16:20 due to trash in the dump valve of the hopper, valve couldn't be closed entirely.

TABLE E-8

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily Production Report

Date: August 17-2000

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	[1,2,3,4]	[1,2,3,4]	layer(ft)	from	till	time	description
						9:30	10:22	0:52	Start up, move dredge into position,etc
						10:22	10:27	0:05	Backwash
10:27	10:45	0:18	3	3	1.5/2.0*	10:45	10:47	0:02	Trash on grizzley hopper
10:47	10:50	0:03	3	3	1.5/2.0*	10:50	11:00	0:10	Shift to Cut 3, pos 2
11:00	11:40	0:40	3	2	1.7	11:40	11:45	0:05	Shift to Cut 3, pos 1
11:45	12:07	0:22	3	1	1.7	12:07	12:09	0:02	Backwash
12:09	12:23	0:14	3	1	1.7	12:23	12:41	0:18	Shift to Cut 2, pos 1
12:41	13:08	0:27	2	1	1.7	13:08	13:50	0:42	Clean Rockbox
13:50	13:56	0:06	2	1	1.7	13:56	13:59	0:03	Backwash
13:59	14:10	0:11	2	1	1.7	14:10	14:19	0:09	Shift to Cut 2, pos 2
14:19	14:31	0:12	2	1	1.7	14:31	14:34	0:03	Trash on grizzley hopper
14:34	14:38	0:04	2	1	1.7	14:38	14:49	0:11	Trash on grizzley hopper,karts,cable,chain
14:49	14:55	0:06	2	1	1.7	14:55	15:00	0:05	Trash on grizzley hopper
15:00	15:06	0:06	2	1	1.7	15:06	15:08	0:02	Trash on grizzley hopper
15:08	15:32	0:24	2	1	1.7	15:32	15:40	0:08	shift to Cut 2, pos 3
		0:00				15:40	15:44	0:04	Fuel Cat 375
15:44	16:22	0:38	2	3	1.7	16:22	16:28	0:06	Shift to Cut 2, pos 4
16:28	16:49	0:21	2	4	1.7	16:49	16:51	0:02	Trash on grizzley hopper
16:51	16:55	0:04	2	4	1.7	16:55	16:57	0:02	Trash on grizzley hopper
16:57	17:01	0:04	2	4	1.7	17:01	17:40	0:39	Shift to Cut 1, pos 1
17:40	18:04	0:24	1	1	3.0	18:04	18:08	0:04	Backwash
18:08	18:29	0:21	1	1	3.0	18:29	18:46	0:17	Backwash
18:46	18:54	0:08	1	1	3.0	18:54	18:59	0:05	Shift to Cut 1, pos 2
18:59	19:04	0:05	1	2	3.0	19:04	19:07	0:03	Shift correction due to failing boat
19:07	19:22	0:15	1	2	3.0	19:22	19:24	0:02	Backwash
19:24	19:45	0:21	1	2	3.0	19:45	19:53	0:08	Backwash
19:53	20:06	0:13	1	2	3.0				
	total:	6:07					total:	4:29	

REMARKS:

Dredge pos. 3 redredged from 1.5' to 2'; after grab sample had shown the bottom not to be clean.
15:45 Support vessel Miami grounded creating turbidity
All day delivery of fuel and water supply with Miami and barge creating local turbidity
Spud position 1 left vertical cut on West side and graded cut on North side

TABLE E-9

New Bedf Pre-Design Dredge Test, New Bedford Superfund Site
BEAN EnvFoster Wheeler Environmental Corporation
Daily Production Report

Date: August 18-2000

Dredging			Cut No.	spudpos.	Dredge	Delay			delay
from	till	time	[1,2,3,4]	[1,2,3,4]	layer(ft)	from	till	time	description
						10:00	10:40	0:40	Waiting on coring executed in dredge cut
10:40	10:50	0:10	1	3	3.0	10:50	10:54	0:04	Backwash
10:54	11:10	0:16	1	3	3.0	11:10	11:16	0:06	Backwash
11:16	11:54	0:38	1	3	3.0	11:54	12:09	0:15	Shift to Cut 1, pos 4
12:09	12:29	0:20	1	4	3.0	12:29	12:32	0:03	Backwash
12:32	12:57	0:25	1	4	3.0	12:57	13:02	0:05	Backwash
13:02	13:09	0:07	1	4	3.0	13:09	14:00	0:51	Clean Rockbox
		0:00				14:00	15:10	1:10	Electrical breakdown due to Auger trip
15:10	15:19	0:09	1	4	3.0	15:19	15:29	0:10	Shift to Cut A
		0:00				15:29	16:26	0:57	Diskette CMS corrupted
16:26	17:04	0:38	A	4	4.0	17:04	17:08	0:04	Trash on grizzley hopper
17:08	17:25	0:17	A	4	4.0	17:25	17:27	0:02	Backwash
17:27	17:30	0:03	A	4	4.0	17:30	17:34	0:04	Backwash
17:34	17:45	0:11	A	4	4.0			0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00						0:00	
		0:00							
	total:	3:14					total:	4:31	

REMARKS:

In Cut 1, pos 4 no clean bottom after removal of 3' of material; shifted to Cut A for water quality monitoring program at request of ENSR.
In Cut A vertical sides were dredged to a 4' level. Goal of this test was to achieve max. production and slurry density. No clean bottom is expected in this area.

TABLE E-10

BELLC
Daily Operations Reports

2001-017-0178
7/16/01

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Wednesday 19-Jul-00
Report No.: 1

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fair

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer	8				
R. Van Epps	Operator	8				
J. Owens	Levee	8				
D. Prejean	Mate	8				
M. LaFleur	Mate	8				
C. Dixon	DH	8				

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Received 8" and 16" pipe, unloaded pipe and stored. Crew went through physicals and pre-work medical screening. Fusing technician arrived on site this PM.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe

Safety Issues: None

Maintenance: Check oil in machines.

Remarks/Comments: None

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Thursday 20-Jul-00
Report No.: 2

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fair

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Completed crew physicals; began fusing 8" and 16" pipe; did not have the required flanges, had to order for Friday delivery but began fusing pipe w/o flanges.

Subcontractors, and Work Performed: US Fusions, pipe fusing technician.

Rental Equipment: JCB Extending Forklift, JCB Backhoe

Safety Issues: None

Maintenance: Check oil in machines.

Remarks/Comments: None

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Friday 21-Jul-00
Report No.: 3 ~~2~~

DMW 7/13/01

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fari

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8	3			
R. Van Epps	Operator	8	3			
J. Owens	Levee	8	3			
D. Prejean	Mate	8	3			
M. LaFleur	Mate	8	3			
C. Dixon	DH	8	3			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Fusing 8" and 16" pipe, pulling with backhoe and began running into the water. Banding sections every 100' +/- to keep pipeline together. Received barges at MAT Marine facility, received a truck with winches, spudwells, spuds, misc. deck gear. Could not assemble the barges that were received, so barges were stored on beach.

Subcontractors, and Work Performed: US Fusions, pipe fusing technician.
MAT Marine, supplied lifting equipment and yard space (deepwater)

Rental Equipment: JCB Extending Forklift, JCB Backhoe

Safety Issues: We will put lighting on pipe out in the water.

Maintenance: Check oil in machines.

Remarks/Comments: None

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Saturday 22-Jul-00
Report No.: 4

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fair

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer		10			
R. Van Epps	Operator		10			
J. Owens	Levee		10			
D. Prejean	Mate		10			
M. LaFleur	Mate		10			
C. Dixon	DH		10			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Fusing 8" and 16" pipe; banding together sections and floating into water along pipeline route, setting anchors approx. every 500 feet to account for wind and current. Received barges at MAT Marine facility. Began assembling the center and port side sections, tied off to MAT dock.

Subcontractors, and Work Performed: US Fusions, pipe fusing technician.
MAT Marine, supplied lifting equipment and yard space (deepwater)

Rental Equipment: JCB Extending Forklift, JCB Backhoe, small skiff.

Safety Issues: Two men in skiff while tending pipe, always with radio communications.

Maintenance: Check oil in machines.

Remarks/Comments: None

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Sunday 23-Jul-00
Report No.: 5

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fair

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer			10		
R. Van Epps	Operator			10		
J. Owens	Levee			10		
D. Prejean	Mate			10		
M. LaFleur	Mate			10		
C. Dixon	DH			10		

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Fusing 8" and 16" pipe; banding together sections and floating into water along pipe route. Skiff tending the pipe to avoid kinks and large bellys. Brought over anchor winch for pipe pulls, increasing production. Received barge sections and MAT Marine and continued to assemble some of the sections. Should receive more sections tomorrow AM.
Received 35 T crane, but did not pass inspection. Will return crane tomorrow.

Subcontractors, and Work Performed: US Fusions, pipe fusing technician.
MAT Marine, supplied lifting equipment and yard space (deepwater)

Rental Equipment: JCB Extending Forklift, JCB Backhoe, small skiff.

Safety Issues: None

Maintenance: Check oil in machines.

Remarks/Comments: None

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Monday 24-Jul-00
Report No.: 6

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fair

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	3			
D. Prejean	Mate	8	3			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Fusing 8" and 16" pipe; banding together sections and floating into water along pipe route. Production increased with addition of winch, but rain is in forecast. Built shed to protect fusing equipment against rain.
Received more barge sections at MAT Marine, and have assembled the majority of the barge. Awaiting sections from PA to complete barge assembly.
Received 45T crane and returned 35T crane.
Received gen set, slurry pump, fuel tank and unloaded at JSI facility.

Subcontractors, and Work Performed: US Fusions, pipe fusing technician.
MAT Marine, supplied lifting equipment and yard space (deepwater)

Rental Equipment: JCB Extending Forklift, JCB Backhoe, small skiff, Tadano 45 T crane.

Safety Issues: None

Maintenance: Check oil in machines.

Remarks/Comments: Vandals broke into JSI facility, spray painted on crane and cut anti-two block device on boom. CRS to replace anti-two block device. Vandals caught by Police; security guard saw them in the act. No physical damage to Bean equipment.

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Tuesday 25-Jul-00
Report No.: 7

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Cloudy, some showers

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer	8				
R. Van Epps	Operator	8				
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Fusing 8" and 16" pipe; banding together sections and floating into water along pipeline route, setting anchors approx. every 500 feet (current pulls belly in pipe).
Did not receive barge sections; due to arrive on Thursday. Received 22 T crane today. Received 500 lb. anchors and survey boat, stored in FWENC yard.

Subcontractors, and Work Performed: US Fusions, pipe fusing technician.
MAT Marine, supplied lifting equipment and yard space (deepwater)

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, small skiff.

Safety Issues: None

Maintenance: Check oil in machines.

Remarks/Comments: None

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Wednesday 26-Jul-00
Report No.: 8

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Rain all day

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer	8	3			
R. Van Epps	Operator	8	3			
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Dried out fusing equipment, fused 8" and 16" pipe, continued pulling out into water. 2500 LF completed to date. Received two control houses, hopper wing walls, deck piping, crane mats, walkways today. Surveyors working on site layout for pre dredge survey.

Subcontractors, and Work Performed: US Fusion, supplied fusing machines and technician.

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, small skiff.

Safety Issues: Taking extra care for working in rainy conditions.

Maintenance: Check oil in machines, grease machines.

Remarks/Comments:

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Thursday 27-Jul-00
Report No.: 9

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Rain all day

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Dried out fusing equipment, fused 8" and 16" pipe, continued pulling out into water. Completed 3000 LF of 8" and 16"; will start 2nd run of 8" pipe tomorrow AM, and should be finished with entire pipeline by late Friday, early Saturday.
Received one barge at MAT Marine; four more barges should arrive Friday.
Received final loads of dredge equipment, including the hopper, buildings, pipe, excavator platform. The CAT 375 excavator to arrive by Friday.

Subcontractors, and Work Performed: US Fusion, supplied fusing machines and technician.
MAT Marine, lifting equipment and labor.

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, small skiff.

Safety Issues: Taking extra care for working in rainy conditions. All crew with raingear and rain boots.

Maintenance: Performing daily safety inspections, grease and check oil in machines.

Remarks/Comments: Due to trucking delays and equipment delivery, construction of the dredge should be completed by Friday, August 4. Start date for dredging may get pushed beyond August 7.

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Friday 28-Jul-00
Report No.: 10

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Cloudy, light sprinkles

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Fusing final run of 8" pipe, will finish tomorrow. Remaining barges arrived today, so complete flexifloat barge system has been assembled. Cat 375 excavator arrived today, and was assembled at JSI facility. Welders began putting together top wing walls of hopper. Buckets arrived from Boston, unloaded and inspected (appear OK). Did not receive pin for bucket, will be delivered tomorrow.

Subcontractors, and Work Performed: US Fusion, supplied fusing machines and technician. MAT Marine, lifting equipment and labor.

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff.

Safety Issues: None

Maintenance: Performing daily safety inspections, grease and check oil in machines.

Remarks/Comments: Management personnel undergoing 40 Hour Hazwoper training.

Jeffrey B. Mill

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Saturday 29-Jul-00
Report No.: 11

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Cloudy, light sprinkles

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prelean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Rain delayed final run of pipe, will try to finish tomorrow. Floated barge assembly up river to JSI facility, installed spuds, one anchor. Prepared to load buildings, pumps, and pipeline. Welders working on hopper wingwalls. Surveyors preparing for pre-dredge survey. Bean personnel instructed not to operate equipment on FWENC site due to MA Operator License requirement.

Subcontractors, and Work Performed: US Fusion, supplied fusing machines and technician.

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Performing daily safety inspections, grease and check oil in machines.

Remarks/Comments: Mgmt. Undergoing 40-Hour Hazwoper. Bean applied for MA operator license over one month ago and has not received any response whatsoever from the State. Calls to State Inspectors resulted in no information, help, assistance, etc. Bean has asked for FWENC assistance in any ways to accelerate the licensing process.

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Sunday 30-Jul-00
Report No.: 12

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Rain off and on

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer			12.5		
R. Van Epps	Operator			10		
J. Owens	Levee			10		
D. Prejean	Mate			10		
M. LaFleur	Mate			12.5		
C. Dixon	DH			10		

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Completed final run of pipeline. Only remaining tasks are final tie down. Installed all buildings, loops, anchor winches, pipeline, crane mats, spud power pack. Welders completed the hopper wingwalls, will fit and install on Monday. Electricians arrived today, will begin running wire and making connections Monday AM. Surveyors making preparations for pre-dredge survey with GPS equipment, boat, position checks (horizontal and vertical).

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Performing daily safety inspections, grease and check oil in machines.

Remarks/Comments: Planning for pre-test of equipment (pump water) on August 5-6; pre-test of equipment (pumping mud) on August 6-7; beginning dredging on or about August 7. Still require dredge depths from USACE, and to begin planning for the dredge test.

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Monday 31-Jul-00
Report No.: 13

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Rain

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Began fitting hopper wingwalls to the hopper frame; electricians began running power and control wires to equipment, buildings; continue installing monitoring system on Cat 375 excavator, installing air purifying filter on same: mobilizing dredge equipment.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 8

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Scheduled start date remains August 7.

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Tuesday 1-Aug-00
Report No.: 14

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Rain

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Ollivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Welding wingwalls to hopper base; electricians wiring power and control cables; continue assebling pipe system and fuel system; installing monitoring system on Cat 375; installing air purifying system on same; general assembly of dredge equipment.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Scheduled start date remains August 7.

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Wednesday 2-Aug-00
Report No.: 15

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Rain

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Walked Cat 375 excavator onto barge; picked generator set, fuel tank, and hopper and set onto deck; began tack welding equipment to deck; electricians continued wiring power and signal cable to equipment and controls. Pulled loaded barge back into deeper water for offshore work and assembly.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 8

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Start date on or about August 7.

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Thursday 3-Aug-00
Report No.: 16

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Cloudy, light sprinkles

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Ollvier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Tie down Cat 375; assemble platform for small excavator; installing hand rails; continue wiring power and signal cables on dredge; load fuel tank; put small crane on barge and tied down as a work platform; assembled punch list for completion of dredge systems.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Start date on or about August 7.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Friday 4-Aug-00
Report No.: 17

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Cloudy, light sprinkles

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prejean	Mate	8	2			
M. LaFleur	Mate	8	2			
C. Dixon	DH	8	2			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Continued mobilization of dredge. Work included tying down equipment, welding and installation of pipe, wiring system, electrical work, installation of mini-excavator.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Start date on or about August 7.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Saturday 5-Aug-00
Report No.: 18

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Cloudy, light sprinkles

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer		12			
R. Van Epps	Operator		12			
J. Owens	Levee		12			
D. Prelean	Mate		12			
M. LaFleur	Mate		12			
C. Dixon	DH		12			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Continued mobilization of dredge. Work included tying down equipment, welding and installation of pipe, wiring system, electrical work, installation of mini-excavator.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Start date on or about August 7.

Jeffrey B. McW

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Sunday 6-Aug-00
Report No.: 19

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fair

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer			13		
R. Van Epps	Operator			13		
J. Owens	Levee			13		
D. Prejean	Mate			13		
M. LaFleur	Mate			13		
C. Dixon	DH			13		

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Continued mobilization of dredge. Work included tying down equipment, welding and installation of pipe, wiring system, electrical work, installation of mini-excavator. Electricians wiring in SPU system and controls.
Performing pre-dredge surveys of area at high tide, verifying data with USACE data.
Ancil Taylor arrived on site for dredge test.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Start date sometime during the week of Aug. 7

Jeffrey B. Miller
Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Monday 7-Aug-00
Report No.: 20

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fair

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8				
R. Van Epps	Operator	8				
J. Owens	Levee	8				
D. Prejean	Mate	8				
M. LaFleur	Mate	8				
C. Dixon	DH	8				

Production Data

Cut Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Performing final mobilization of dredge, primarily safety items and minor installations. Dredge is capable of working as of 6 August. As per meeting with USACE and FWENC, we are working only 8 hour shifts for final mobilization due to fatigue of crew and staff. Pre-dredge surveys complete and agreed upon with USACE.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: Working 8 hour shifts for next couple of days due to crew fatigue.

Maintenance: Regular maintenance on equipment

Remarks/Comments: Start date sometime during the week of Aug. 7

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Tuesday 8-Aug-00
Report No: 21

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fair

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	OT	DT	ST Rate	Per Diem
R. Olivier	Engineer	8				
R. Van Epps	Operator	8				
J. Owens	Levee	8				
D. Prejean	Mate	8				
M. LaFleur	Mate	8				
C. Dixon	DH	8				

Production Data

Cut Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Performing final mobilization of dredge, primarily safety items and minor installations. Dredge is capable of working as of 6 August. As per meeting with USACE and FWENC, we are working only 8 hour shifts for final mobilization due to fatigue of crew and staff. Work plan being developed with FWENC, USACE and Bean Environmental. FWENC wishes to work straight through beginning with our first day of dredging, which looks to be Thursday. The monitoring subcontractor now states that they need water quality data through complete tidal cycles; both ebb and flood. This will affect working hours on the dredge.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: Working 8 hour shifts for next couple of days due to crew fatigue.

Maintenance: Regular maintenance on equipment

Remarks/Comments: Start date tentatively Thursday, August 10.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Wednesday 9-Aug-00
Report No.: 22

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Fair

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8	5			
R. Van Epps	Operator	8	5			
J. Owens	Levee	8	5			
D. Prejean	Mate	8	5			
M. LaFleur	Mate	8	5			
C. Dixon	DH	8	5			

Production Data

Cut Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Performing final mobilization of dredge, primarily safety items and minor installations. Dredge is capable of working as of 6 August. As per meeting with USACE and FWENC, we are working only 8 hour shifts for final mobilization due to fatigue of crew and staff. Work plan has been finalized. Dredging will start tomorrow in Cut 6.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues:

Maintenance: Regular maintenance on equipment

Remarks/Comments: Start date tentatively Thursday, August 10.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Thursday 10-Aug-00
Report No.: 23

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny and Hot

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8	4			
R. Van Epps	Operator	8	4			
J. Owens	Levee	8	4			
D. Prejean	Mate	8	4			
M. LaFleur	Mate	8	4			
C. Dixon	DH	8	4			

Production Data

Cut	6	
Area	3000	SF
Grade:	2	Ft
Overdepth:	0.5	Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:	4.5	CY

Work Performed This Date: Reset anchors, set on station, and began dredging today. Encountered problems with debris and clogging of the rock box. Working time just under 3 hours, spent remainder of the day identifying solutions to backwash and debris concerns.
No survey performed this date, but numerous position checks occurred. All checked out OK.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Detailed dredge log being prepared by BSLLC and FWENC, to be submitted as a separate report.

Jeffrey B. McW

Project Manager

BEAN **Bean Environmental L.L.C.**
Daily Report of Operations

Date: Friday 11-Aug-00
Report No.: 24

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny and Hot

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Ollvier	Engineer	8	5			
R. Van Epps	Operator	8	5			
J. Owens	Levee	8	5			
D. Prejean	Mate	8	5			
M. LaFleur	Mate	8	5			
C. Dixon	DH	8	5			

Production Data

Cut	6	
Area	3000	SF
Grade:	2	Ft
Overdepth:	0.5	Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:	4.5	CY

Work Performed This Date: Continued dredging in Cut 6, identified more problems in the rock box with debris and rock. Backwashed several times and cleaned rock box, added jet lines to auger and rock box. Performed survey, CMS check and position check.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Detailed dredge log being prepared by BSLLC and FWENC, to be submitted as a separate report.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Saturday 12-Aug-00
Report No.: 25

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny and Hot

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer		14			
R. Van Epps	Operator		14			
J. Owens	Levee		14			
D. Prejean	Mate		14			
M. LaFleur	Mate		14			
C. Dixon	DH		14			

Production Data

Cut	6	
Area	3000	SF
Grade:	2	Ft
Overdepth:	0.5	Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:	4.5	CY

Work Performed This Date: Continued dredging in cut 6. Problems with datalink between CMS and SPU control room; fixed by mid morning. Again encountered numerous obstructions to suction line and within rock box. Opened up a spool piece and found a steel plate and some horseshoe crabs within the suct. line which obstructed approximately 80% of the flow, explaining most of the concerns. Removed the pieces and spent remainder of the day installing more jet systems by which to backwash the suction line in the vicinity of the rock box.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe. Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Detailed dredge log being prepared by BSLLC and FWENC, to be submitted as a separate report.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Sunday 13-Aug-00
Report No.: 26

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny and Hot

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer			12		
R. Van Epps	Operator			12		
J. Owens	Levee			12		
D. Prejean	Mate			12		
M. LaFleur	Mate			12		
C. Dixon	DH			12		

Production Data

Cut	6	
Area	3000	SF
Grade:	2	Ft
Overdepth:	0.5	Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:	4.5	CY

Work Performed This Date: AM installed modifications to the dredge including jet lines to the mini excavator, jet lines to the rock boxes, a dam in the top of the hopper to prevent overflow into the trash box, re-welded bars on the grizzly. Began dredging again in Cut 6, completed cut 6 at approx. 1830 hours.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Detailed dredge log being prepared by BSLLC and FWENC, to be submitted as a separate report.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Monday 14-Aug-00
Report No.: 27

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Overcast

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Ollvier	Engineer	8	5			
R. Van Epos	Operator	8	5			
J. Owens	Levee	8	5			
D. Prejean	C. Operator	8	5			
M. LaFleur	Boat	8	5			
C. Dixon	Mate	8	5			

Production Data

Cut	7&8	
Area	3000	SF
Grade:	2	Ft
Overdepth:	0.5	Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:	4.5	CY

Work Performed This Date: Dredging in Cuts 7 and 8. Encountered trash and debris, but backwash appears to alleviate the problem. Cleaned out rock box twice today.
Survey performed of cuts dredged to date. CMS calibrated twice during dredging operations, position check OK. Had to re-set port stern anchor due to dragging.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Detailed dredge log being prepared by BSLLC and FWENC, to be submitted as a separate report.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Tuesday 15-Aug-00
Report No.: 28

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Overcast

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8	6			
R. Van Epps	Operator	8	6			
J. Owens	Levee	8	6			
D. Prejean	C. Operator	8	6			
M. LaFleur	Boat	8	6			
C. Dixon	Mate	8	6			

Production Data

Cut	8&5	
Area	3000	SF
Grade:	2	Ft
Overdepth:	0.5	Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:	4.5	CY

Work Performed This Date: Completed Cut 8, moved to Cut 5 and dredged three of four positions. Problems with rock box and debris choking suction; installed a backwash jet to increase running time. Also opened screen in the rock box to allow passage of quahog shell, but still filter out large rocks. Cleaned out rock box twice today. Running time improving with modifications that are specific to the material dredged and the debris encountered.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Detailed dredge log being prepared by BSLLC and FWENC, to be submitted as a separate report.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Wednesday 16-Aug-00
Report No.: 29

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Rain, brief thunderstorm.

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8	5			
R. Van Epps	Operator	8	5			
J. Owens	Levee	8	5			
D. Prejean	C. Operator	8	5			
M. LaFleur	Boat	8	5			
C. Dixon	Mate	8	5			

Production Data

Cut	5,4,3	
Area	3000	SF
Grade:	2.7-1.7	Ft
Overdepth:	0.5	Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:	4.5	CY

Work Performed This Date: Completed cuts 5 and 4, dredged two positions in cut 3. Opened rock box and cleaned three times today. Dredging depth for cuts 4 and 3 were adjusted in the field due to the results of field samples showing less of the silt than originally thought. The hopper overflowed into the trash bin today due to clogging of the dump valve.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Detailed dredge log being prepared by BSLLC and FWENC, to be submitted as a separate report.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Thursday 17-Aug-00
Report No.: 30

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Overcast

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8	6			
R. Van Epps	Operator	8	6			
J. Owens	Levee	8	6			
D. Prejean	C. Operator	8	6			
M. LaFleur	Boat	8	8			
C. Dixon	Mate	8	6			

Production Data

Cut	3,2,1	
Area	3000	SF
Grade:	1.5-3.0	Ft
Overdepth:	0.5	Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:	4.5	CY

Work Performed This Date: Completed cuts 3 and 2, dredged two positions in cut 1. Lost some time due to excessive trash found in cut; had to be removed from grizzly and placed in trash bin. Cleaned out rock box once today, found usual debris, few rocks, horseshoe crabs. Boats grounded today causing turbidity in water; also transport of fuel and water to dredge.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Detailed dredge log being prepared by BSLLC and FWENC, to be submitted as a separate report.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Friday 16-Aug-00
Report No.: 31

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Overcast

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
P. Olivier	Engineer	8	3			
R. Van Eccs	Operator	8	3			
J. Owens	Levee	8	3			
D. Prejean	C. Operator	8	3			
M. LaFlaur	Boat	8	3			
C. Dixon	Mate	8	3			

Production Data

Cut	1,A	
Area	3000	SF
Grade:	3.0-4.0	Ft
Overdepth:	0.5	Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:	4.5	CY

Work Performed This Date: Completed dredging today, finished cut 1 and a portion of Cut A. Focused on moving dense slurry, had to backwash due to debris several times. Opened up rock box once today, lost time due to computer failure in SPU control. Shifted to Cut A so that monitoring subcontractor could obtain more turbidity readings. Leaving a clean bottom was not an issue for Cut A.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments: Detailed dredge log being prepared by BSLLC and FWENC, to be submitted as a separate report.

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Saturday 19-Aug-00
Report No.: 32

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Overcast

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer		11			
R. Van Epps	Operator		11			
J. Owens	Levee		11			
D. Prejean	C. Operator		11			
M. LaFleur	Boat		11			
C. Dixon	Mate		11			

Production Data

Cut Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Began disassembling and demobilization, including pipe, dredge, and all equipment. Decon performed today on bucket and other items. FWENC laborers assisting in decon of major items as per agreement between the parties.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Sunday 20-Aug-00
Report No.: 33

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer			11		
R. Van Epps	Operator			11		
J. Owens	Levee			11		
D. Prejean	C. Operator			11		
M. LaFleur	Boat			11		
C. Dixon	Mate			11		

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Continued with demobilization and decon today. FWENC helping with decon as per agreement. Performed decon on mini excavator and hopper, flushed hopper and pipeline with water, diesel, simple green. Continued disassembly of equipment on deck.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Monday 21-Aug-00
Report No.: 34

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	OT	DT	ST Rate	Per Diem
R. Olivier	Engineer	8	2			
R. Van Epps	Operator	8	2			
J. Owens	Levee	8	2			
D. Prejean	C. Operator	8	2			
M. LaFleur	Boat	8	2			
C. Dixon	Mate	8	2			

Production Data

Cut Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Personnel began going through exit physicals during the week. Continued demobilizing the dredge and decontamination. Cutting pipe and storing at FWENC facility. All demobilization to occur at Manomet street facility.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Tuesday 22-Aug-00
Report No.: 35

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Oliver	Engineer	8	4			
R. Van Epps	Operator	8	4			
J. Owens	Levee	8	4			
D. Prejean	C. Operator	8				
M. LaFleur	Boat	8	4			
C. Dixon	Mate	8	4			

Production Data

Cut Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Continued with demobilization, exit physicals. Unloading deck equip. from barge for trucking. Preparing for heavy lifts. Trucking of equipment to FWENC yard.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift. JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Wednesday 23-Aug-00
Report No.: 36

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer	8	4			
R. Van Eops	Operator	8	4			
J. Owens	Levee	8	4			
D. Prejean	C. Operator					
M. LaFleur	Boat	8	4			
C. Dixon	Mate	8	4			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Continued with demobilization, exit physicals. Unloading deck equip. from barge for trucking. Preparing for heavy lifts, trucking of equipment to FWENC yard.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Thursday 24-Aug-00
Report No.: 37

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Oliver	Engineer	8	4			
P. Van Epps	Operator	8	4			
J. Owens	Levee	8	4			
D. Prejean	C. Operator					
M. LaFleur	Boat	8	4			
C. Dixon	Mate	8	4			

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Continued with demobilization, exit physicals. Unloading deck equip from barge for trucking. Preparing for heavy lifts, trucking of equipment to FWENC yard.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Jeffrey B. McWilliams

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Friday 25-Aug-00
Report No.: 38

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	OT	DT	ST Rate	Per Diem
R. Olivier	Engineer	8				
R. Van Epps	Operator	8				
J. Owens	Levee	8				
D. Prejean	C. Operator					
M. LaFleur	Boat	8				
C. Dixon	Mate	8				

Production Data

Cut		
Area		SF
Grade:		F:
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Crew left project today; time above indicates travel time. Only Van Epps and Project Manager remain on site. Performed final demobilization picks and loading of trucks. Will take barge downstream for disassembly over the weekend.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Saturday 26-Aug-00
Report No.: 39

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer					
R. Van Epps	Operator		10			
J. Owens	Levee					
D. Prejean	C. Operator					
M. LaFleur	Boat					
C. Dixon	Mate					

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Performing demobilization. Finalized removal of equipment from deck. McWilliams/Van Epps set moorings in Acushnet River as per discussions with USACE and FWENC. Barge will be moored in river overnight for AM departure to MAT Marine yard for barge disassembly. Completed all decon certificates for FWENC.

Subcontractors, and Work Performed: None

Rental Equipment: JCB Extending Forklift, JCB Backhoe, Tadano 45 T crane, Grove 22 T crane, Cat 375 excavator, small skiff, Recon 6

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Jeffrey B. McWilliams

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Sunday 27-Aug-00
Report No.: 40

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer					
R. Van Epps	Operator			8		
J. Owens	Levee					
D. Prejean	C. Operator					
M. LaFleur	Boat					
C. Dixon	Mate					

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol:		CY

Work Performed This Date: Pushed barge down river to MAT Marine yard for disassembly.

Subcontractors, and Work Performed: None

Rental Equipment: Tadano 45 ton crane, work skiff.

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Monday 28-Aug-00
Report No.: 41

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours OT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer					
R. Van Epps	Operator	8	2			
J. Owens	Levee					
D. Prelean	C. Operator					
M. LaFleur	Boat					
C. Dixon	Mate					

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Disassemble barges and load onto trucks.

Subcontractors, and Work Performed: None

Rental Equipment: Tadano 45 ton crane, work skiff.

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Tuesday 29-Aug-00
Report No.: 42

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours ST	Hours CT	Hours DT	ST Rate	Per Diem
R. Olivier	Engineer					
R. Van Epps	Operator	8	2			
J. Owens	Levee					
D. Prejean	C. Operator					
M. LaFleur	Boat					
C. Dixon	Mate					

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Disassemble barges and load onto trucks.

Subcontractors, and Work Performed: None

Rental Equipment: Tadano 45 ton crane, work skiff.

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

BEAN Bean Environmental L.L.C.
Daily Report of Operations

Date: Wednesday 30-Aug-00
Report No.: 43

Project: Pre-Design Field Test, New Bedford, MA
Client: Foster Wheeler Environmental Corp.
Weather: Sunny

Dredge: New Bedford
Proj. Mgr.: Jeff McWilliams

Labor

Name	Class	Hours			ST Rate	Per Diem
		ST	OT	DT		
R. Olivier	Engineer					
R. Van Epps	Operator	8	2			
J. Owens	Levee					
D. Prejean	C. Operator					
M. LaFleur	Boat					
C. Dixon	Mate					

Production Data

Cut		
Area		SF
Grade:		Ft
Overdepth:		Ft
Dig Volume		CY
Pay Volume		CY
Bucket Vol.:		CY

Work Performed This Date: Disassemble barges and load onto trucks.
McWilliams left site today.

Subcontractors, and Work Performed: None

Rental Equipment: Tadano 45 ton crane, work skiff.

Safety Issues: None

Maintenance: Regular maintenance on equipment

Remarks/Comments:

Project Manager

Appendix F
SPU System Log and Slurry Solids Concentration Data Summary

Symbol	Definition
	Definitions applicable for in-situ sediment and/or slurry mixtures
W_s	Weight of oven-dried solid particles
W_f	Weight of fluid surrounding solid particles
V_s	Volume of compressed, oven dried solid particles
V_w	Volume of fluid surrounding solid particles
W_t	Weight of solids and pore fluid
V_t	Total volume of solids and pore fluid
v_{mix}	Flow velocity of the mixture measured in a pipe with diameter d [m/s]
D	Diameter of pipe in which the flow velocity of the mixture is measured [m]
	Definitions and formulas applied in calculations:
w	Moisture content, which is defined as. W_w / W_s. This is used in geotechnical engineering and can be greater than 100 percent. [%]
C	Concentration which is defined as W_s / V_t.
ρ_s	Density of the grains, is defined as W_s / V_s. [kg/m3]
ρ_{situ}	In-situ density of the soil or wet unit weight or wet density, is defined as W_t / V_t of the in-situ soil. [kg/m3]
ρ_m	Mixture density, is defined as W_t / V_t of the mixture [kg/m3]
ρ_w	Pore fluid density or fluid unit weight is defined as W_f / V_f [kg/m3] In the case of New Bedford 1,014 Kg/m3 is used.
G_s	Specific gravity of solid particles (grains) This is the unit weight of solids divided by the unit weight of pure water. Because of the presence of organic material the specific gravity of the dredged material appeared to be 2.400
G_{situ}	Specific gravity of the in-situ sediment. This is the unit weight of the in-situ solids/water mixture divided by the unit weight of pure water
G_m	Specific gravity of slurry mixture. This is the unit weight of a solids/water mixture divided by the unit weight of pure water
SG_w	Specific gravity of (sea)water , which is the unit weight of the (sea)water divided by the unit weight of pure water. The value of 1.026 it typically used for seawater (64.0 pcf / 62.4 pcf). For this project, the fluid is assumed to be a mixture of fresh and salt water and a fluid specific gravity of 1.014 was used in calculations [SGU]

TABLE F-1

C_w	Percent solids by weight, which is defined as W_s / W_t times 100	[%]
	Percent solids by weight of insitu material is defined as: $\frac{\rho_s * (\rho_{situ} - \rho_w)}{\rho_{situ} * (\rho_s - \rho_w)} * 100$	[%]
	Percent solids by weight of a slurry is defined as: $\frac{\rho_s * (\rho_{mix} - \rho_w)}{\rho_{mix} * (\rho_s - \rho_w)} * 100$	[%]
C	Percent volume concentration In the dredging industry the term "volume concentration" is commonly used to describe the ratio between the slurry density in the dredging process and the in situ density, and is calculated by the term. $100 \times (\rho_m - \rho_w)/(\rho_{situ} - \rho_w)$	[%]
	This percent volume concentration can also be described as: $100 \times (SG_m - SG_w)/(SG_{situ} - SG_w)$	[%]
$Prod_{situ}$	In-situ production rate is defined as: $v_{mix} * 0.25 * \pi * d^2 * (\rho_{mix} - \rho_w)/(\rho_{situ} - \rho_w)$	[insitu m3/s]
$Prod_{situ}\ \Delta t$	In-situ production calculated over a certain time interval is defined as: $Prod_{situ} * \Delta t$	[insitu m3]
$Prod_{TDS}$	Tons dry solid production is defined as: $0.001 * \Delta t * 0.25 * \pi * d^2 * v_{mix} * \rho_s * (\rho_{mix} - \rho_w) / (\rho_s - \rho_w)$	[tons]
V_{mix}	Volume of slurry mixture discharged is defined as: $\Delta t * v_{mix} * 0.25 * \pi * d^2$	[m3]

TABLE F-1 (CONT.)

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Summary of Daily SPU Reports

Date	Day	Net Operational hrs		Volume Slurry (soil+recirc.water) yd3		Volume (soil-situ yd3) yd3		Production situ yd3/ Nett Hours	Situ Density kg/m3	Average Volume Concentration %	Volumes not logged (soil-situ yd3) yd3		Remarks
		Day	Cum.	Day	Cum.	Day	Cum.				Day	correct.Cum.	
10-Aug	Thursday												
11-Aug	Friday												
12-Aug	Saturday												
13-Aug	Sunday		2.55		891		193	76	1,270	23	72	265	Cumulative values.
14-Aug	Monday	4.60	7.15	1,522	2,413	340	533	74	1,280	24		605	
15-Aug	Tuesday	6.02	13.17	1,818	4,231	325	858	54	1,380	18		930	
16-Aug	Wednesday	5.93	19.10	1,924	6,155	424	1,282	71	1,400	22		1,354	
17-Aug	Thursday	7.25	26.35	2,509	8,664	537	1,819	74	1,410	22	27	1,918	
18-Aug	Friday	3.33	29.68	1,022	9,686	292	2,111	88	1,260	29	45	2,255	
	TOTALS	29.68		9,686		2,111	AVERAGES	71	1,349	23	144	2,255	

REMARKS:

See also SPU daily performance sheets

TABLE F-2

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Daily average insitu densities based on soil sample test results

Date	Cut no dredged [-]	percentage of cut dredged [%]	average excavation depth [ft]	sample codes applicable [-]	[-]	[-]	wet unit weight [kg/m3]	wet unit weight [kg/m3]	wet unit weight [kg/m3]	cut average wet unit weight [kg/m3]	daily average wet unit weight [kg/m3]
08/10 - 08/13	6	100%	2	6_4 (0-14")	8_4 (14-24")	5_3 (14_24")	1,177	1,345	1,456	1,270	1,270
14-Aug	7	100%	2	B-A3	8_4		1,361	1,238		1,299	
	8	44%	2	8_4			1,238			1,238	1,281
15-Aug	8	56%	2	B-A3			1,361			1,361	
	5	75%	2.1	B-B2	5_3	6_4	1,482	1,454	1,275	1,404	1,386
16-Aug	5	25%	2	B-B2			1,485			1,485	
	4	100%	1.75	B-B2	5_3	4_4	1,484	1,454	1,359	1,414	
	3	45%	1.6	4_4	B-C1		1,358	1,290		1,324	1,404
17-Aug	3	55%	1.8	4_4			1,360			1,360	
	2	100%	1.825	B-B2			1,486			1,486	
	1	50%	3	B-A1			1,341			1,341	1,407
18-Aug	1	50%	3	B-C1			1,290			1,290	
	A	25%	4	B_4			1,231			1,231	1,266

TABLE F-3

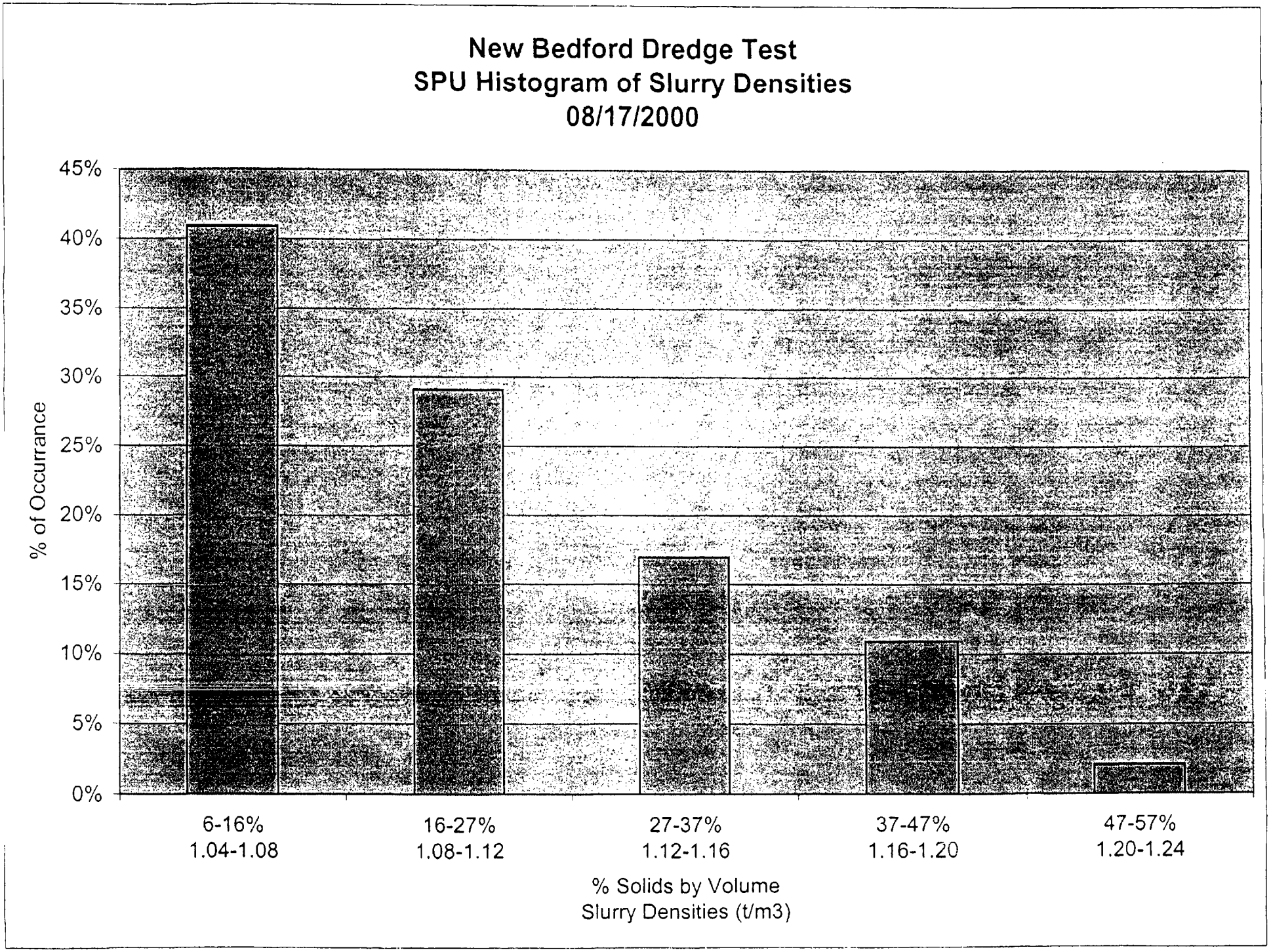

New Bedford Dredge Test
SPU Histogram of Slurry Densities
08/17/2000
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
% of Occurrance
6-16%
1.04-1.08
16-27%
1.08-1.12
27-37%
1.12-1.16
37-47%
1.16-1.20
47-57%
1.20-1.24
% Solids by Volume
Slurry Densities (t/m3)

Figure F-1

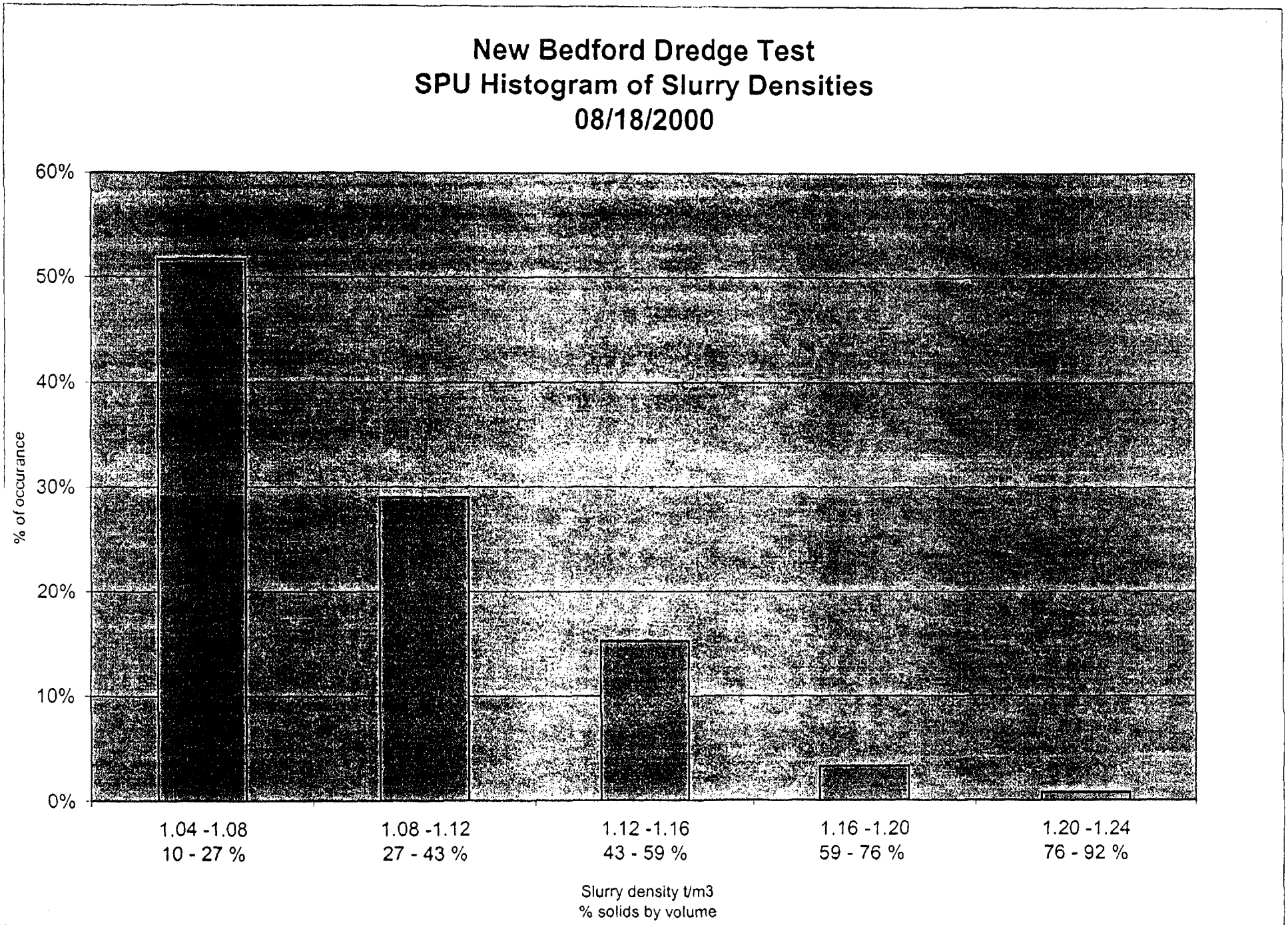

New Bedford Dredge Test
SPU Histogram of Slurry Densities
08/18/2000
60%
50%
40%
30%
20%
10%
0%
% of occurance
1.04 -1.08
10 - 27 %
1.08 -1.12
27 - 43 %
1.12 -1.16
43 - 59 %
1.16 -1.20
59 - 76 %
1.20 -1.24
76 - 92 %
Slurry density t/m3
% solids by volume

Figure F-2

Date: August 10 to 13 2000

Date: August 10 to 13 2000	conditions: rho_mix loop 3>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s				
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	tons dry solid/insitu volume [TDS/situ m3]
	1015	2400	1270	35%	0 442

total effective slurry pumping time [min]	time period analysed [hr:min:ss]	Flow velocity [m/s]	slurry volume discharged	insitu Production	tons dry solid Production [metric tons]	% solids by weight loop 1 [%]	% solids by weight loop 2 [%]	% solids by weight loop 3 [%]	% volume concentration loop 3 [%]	densi loop [kg/m
		average	average [m3/hr]	average[insitu m3/hr]	average [tons/hr]	average	average	average	average	averag
total dredge period:	10 until 13 August	1.5	268	58	26	9.98%	6.78%	8.83%	21.64%	1,(
		max	daily total [m3]	daily total [insitu m3]	daily total [tons]	max	max	max	max	max
total effective [min] 153		2.9	681	147	65	46%	35%	35%	100%	1.2

Missing datalog values between 14:10 and 16:05 due to error during saving: missing estimated quantity = 55 m3

Date: August 10 to 13 2000	conditions:SGU loop3>1.040, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s				
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	short tons dry solid per insitu volume [TDS/cu-ft]
	1015	2400	1270	35%	0 014

total effective slurry pumping time [min]	time period analysed [hr:min:ss]	Flow velocity [ft/s]	slurry volume discharged	insitu Production	tons dry solid Production	% solids by weight loop 1 [%]	% solids by weight loop 2 [%]	% solids by weight loop 3 [%]	% volume concentration loop 3 [%]	densi loop SGU
		average	average [cy/hr]	average [insitu cy/hr]	average [short tons/hr]	average	average	average	average	averag
total dredge period:	10 until 13 August	5.0	351	76	28	9.98%	6.78%	8.83%	21.64%	1.(
		max	daily total [cy]	daily total [insitu cy]	daily total [short tons]	max	max	max	max	max
total effective [min] 153		9.6	891	193	72	46%	35%	35%	100%	1.2

Missing datalog values between 14:10 and 16:05 due to error during saving: missing estimated quantity = 72 cy

TABLE F-4

Date: August 14 2000

Date: August 14 2000	conditions: rho_mix loop 3>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	tons dry solid/insitu volume [TDS/situ m3]					
	1015	2400	1280	36%	0.459					
total effective slurry pumping time [min]	time period analysed [hr:min:ss]	Flow velocity [m/s]	slurry volume discharged	insitu Production	tons dry solid Production [metric tons]	% solids by weight loop 1 [%]	% solids by weight loop 2 [%]	% solids by weight loop 3 [%]	% volume concentration loop 3 [%]	densit loop [kg/m3
total dredge period:	08:18-17:46	average 1.4	average [m3/hr] 253	average[insitu m3/hr] 56	average [tons/hr] 26	average 11.19%	average 6.88%	average 9.44%	average 22.32%	averag 1,0
total effective [min] 276	total gross [min] 540	max 1.8	daily total [m3] 1164	daily total [insitu m3] 260	daily total [tons] 119	max 35%	max 36%	max 35%	max 96%	max 1.2

Date: August 14 2000	conditions:SGU loop3>1.040, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	short tons dry solid per insitu volume [TDS/cu-ft]					
	1015	2400	1280	36%	0.014					
total effective slurry pumping time [min]	time period analysed [hr:min:ss]	Flow velocity [ft/s]	slurry volume discharged	insitu Production	tons dry solid Production	% solids by weight loop 1 [%]	% solids by weight loop 2 [%]	% solids by weight loop 3 [%]	% volume concentration loop 3 [%]	density loop 3 SGU
total dredge period:	08:18-17:46	average 4.7	average [cy/hr] 331	average [insitu cy/hr] 74	average [short tons/hr] 29	average 11.19%	average 6.88%	average 9.44%	average 22.32%	averag 1.0
total effective [min] 276	total gross [min] 540	max 6.1	daily total [cy] 1522	daily total [insitu cy] 340	daily total [short tons] 131	max 35%	max 36%	max 35%	max 96%	max 1.2

TABLE F-5

Date: August 15 2000

Date: August 15 2000	conditions: rho_mix>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	tons dry solid/insitu volume [TDS/situ m3]					
	1015	2400	1380	46%	0.632					
effective slurry pumping time [min]	**time period analysed [hr:min:ss]**	**Flow velocity [m/s]**	**slurry volume discharged**	**insitu Production**	**tons dry solid Production [metric tons]**	**% solids by weight loop 1 [%]**	**% solids by weight loop 2 [%]**	**% solids by weight loop 3 [%]**	**% volume concentration loop 3 [%]**	**density loop 3 [kg/m3]**
		average	average [m3/hr]	average[insitu m3/hr]	average [tons/hr]	average	average	average	average	average
total dredge period:	07:05-19:33	1.3	231	41	26	11.05%	8.11%	10.33%	17.85%	1,080
snapshots:	08:08-08:24	1.3	231	48	30	13.26%	9.58%	11.97%	20.75%	1,091
	09:52-10:14	1.2	219	50	32	13.12%	12.16%	13.06%	22.88%	1,099
	12:36-12:57	1.5	257	50	32	12.37%	8.32%	11.22%	19.56%	1,086
	17:44-18:18	1.5	261	61	39	13.76%	10.87%	13.41%	23.55%	1,101
	18:57-19:20	1.4	240	64	40	16.60%	11.54%	15.01%	26.48%	1,112
total effective time [min]	total gross [min]	max	daily total [m3]	daily total [insitu m3]	daily total [tons]	max	max	max	max	max
361	747	2.4	1390	248	157	36%	33%	36%	72%	1,278

Date: August 15 2000	conditions: rho_mix>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	short tons dry solid per insitu volume [TDS/cu-ft]					
	1015	2400	1380	46%	0.020					
effective slurry pumping time [min]	**time period analysed [hr:min:ss]**	**Flow velocity [ft/s]**	**slurry volume discharged**	**insitu Production**	**tons dry solid Production**	**% solids by weight loop 1 [%]**	**% solids by weight loop 2 [%]**	**% solids by weight loop 3 [%]**	**% volume concentration loop 3 [%]**	**density loop 3 SGU**
		average	average [cy/hr]	average [insitu cy/hr]	average [short tons/hr]	average	average	average	average	average
total dredge period:	07:05-19:33	4.3	302	54	29	11.05%	8.11%	10.33%	17.85%	1.080
snapshots	08:08-08:24	4.3	302	63	33	13.26%	9.58%	11.97%	20.75%	1.091
	09:52-10:14	4.1	287	66	35	13.12%	12.16%	13.06%	22.88%	1.099
	12:36-12:57	4.8	336	66	35	12.37%	8.32%	11.22%	19.56%	1.086
	17:44-18:18	4.8	341	80	43	13.76%	10.87%	13.41%	23.55%	1.101
	18:57-19:20	4.5	314	83	44	16.60%	11.54%	15.01%	26.48%	1.112
total effective time [min]	total gross [min]	max	daily total [cy]	daily total [insitu cy]	daily total [short tons]	max	max	max	max	max
361	747	7.9	1818	325	173	36%	33%	36%	72%	1.278

TABLE F-6

Date: August 16 2000

Date: August 16 2000	conditions: rho_mix>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	tons dry solid/insitu volume [TDS/situ m3]					
	1015	2400	1400	48%	0.667					
effective slurry pumping time [min]	**time period analysed [hr:min:ss]**	**Flow velocity [m/s]**	**slurry volume discharged**	**insitu Production**	**tons dry solid Production [metric tons]**	**% solids by weight loop 1 [%]**	**% solids by weight loop 2 [%]**	**% solids by weight loop 3 [%]**	**% volume concentration loop 3 [%]**	**density loop 3 [kg/m3]**
		average	average [m3/hr]	average(insitu m3/hr)	average [tons/hr]	average	average	average	average	average
total dredge period:	11:02-19:23	1.4	248	55	36	14.24%	9.76%	13.15%	22.02%	1,100
snapshots:	11:02-11:29	1.7	292	65	43	13.29%	10.94%	13.27%	22.32%	1,101
	11:33-11:38	2.0	352	68	45	11.71%	8.57%	11.75%	19.33%	1,089
	12:04-12:19	1.4	254	68	46	18.11%	11.78%	15.85%	26.83%	1,118
	12:51-13:07	1.5	260	67	45	17.59%	11.74%	15.18%	25.74%	1,114
	13:14-13:30	1.4	250	68	45	17.44%	11.94%	16.08%	27.08%	1,119
	14:02-15:05	1.4	256	62	42	15.61%	10.50%	14.54%	24.36%	1,109
	17:00-17:14	1.2	216	70	47	20.04%	14.43%	18.75%	32.32%	1,139
	17:27-18:07	1.2	215	66	44	18.77%	13.96%	17.96%	30.68%	1,133
	18:34-19:02	1.2	216	70	47	19.50%	15.48%	18.94%	32.55%	1,140
total effective time [min]	total gross [min]	max	daily total [m3]	daily total [insitu m3]	daily total [tons]	max	max	max	max	max
356	500	2.2	1471	324	216	33%	30%	32%	59%	1,241

Date: August 16 2000	conditions: rho_mix>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	short tons dry solid per insitu volume [TDS/cu-ft]					
	1015	2400	1400	48%	0.021					
effective slurry pumping time [min]	**time period analysed [hr:min:ss]**	**Flow velocity [ft/s]**	**slurry volume discharged**	**insitu Production**	**tons dry solid Production**	**% solids by weight loop 1 [%]**	**% solids by weight loop 2 [%]**	**% solids by weight loop 3 [%]**	**% volume concentration loop 3 [%]**	**density loop 3 SGU**
		average	average [cy/hr]	average [insitu cy/hr]	average [short tons/hr]	average	average	average	average	average
total dredge period:	11:02-19:23	4.6	325	71	40	14.24%	9.76%	13.15%	22.02%	1,100
snapshots:	11:02-11:29	5.4	381	85	48	13.29%	10.94%	13.27%	22.32%	1,101
	11:33-11:38	6.5	460	89	50	11.71%	8.57%	11.75%	19.33%	1,089
	12:04-12:19	4.7	333	89	50	18.11%	11.78%	15.85%	26.83%	1,118
	12:51-13:07	4.8	340	88	49	17.59%	11.74%	15.18%	25.74%	1,114
	13:14-13:30	4.6	326	88	50	17.44%	11.94%	16.08%	27.08%	1,119
	14:02-15:05	4.8	335	82	46	15.61%	10.50%	14.54%	24.36%	1,109
	17:00-17:14	4.0	283	91	51	20.04%	14.43%	18.75%	32.32%	1,139
	17:27-18:07	4.0	281	86	48	18.77%	13.96%	17.96%	30.68%	1,133
	18:34-19:02	4.0	282	92	52	19.50%	15.48%	18.94%	32.55%	1,140
total effective time [min]	total gross [min]	max	daily total [cy]	daily total [insitu cy]	daily total [short tons]	max	max	max	max	max
356	500	7.1	1924	424	238	33%	30%	32%	59%	1,241

TABLE F-7

Date: August 17 2000

Date: August 17 2000	conditions: rho_mix>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	tons dry solid/insitu volume [TDS/situ m3]					
	1015	2400	1410	49%	0 684					
total effective slurry pumping time [min]	time period analysed [hr:min:ss]	Flow velocity [m/s]	slurry volume discharged	insitu Production	tons dry solid Production [metric tons]	% solids by weight loop 1 [%]	% solids by weight loop 2 [%]	% solids by weight loop 3 [%]	% volume concentration loop 3 [%]	densit loop 3 [kg/m3
		average	average [m3/hr]	average[insitu m3/hr]	average [tons/hr]	average	average	average	average	averag
total dredge period:	10:26:-19:44	1.5	265	57	39	13.67%	9.47%	13.08%	21.38%	1,0
snapshots:	11.07-11:43	1.2	213	72	49	20.19%	17.54%	19.94%	33.78%	1,1
	11:53-12:22	1.1	203	69	47	19.67%	17.60%	20.03%	33.94%	1,1
	13:55-14:35	1.4	240	61	42	16.56%	11.37%	15.44%	25.46%	1,1
	15:02-15:17	1.4	247	82	56	19.12%	16.14%	19.75%	33.28%	1,1
	16:09-16:23	1.9	332	81	56	17.26%	9.82%	15.04%	24.55%	1,1
	17:45-18:29	1.8	325	78	53	14 63%	9 75%	14.60%	23.91%	1,1
total effective [min]	total gross [min]	max	daily total [m3]	daily total [insitu m3]	daily total [tons]	max	max	max	max	max
435	559	2.1	1919	410	281	33%	31%	33%	60%	1,2

missing: datalog values between 19:44 and 20:06: estimated = 20 m3

Date: August 17 2000	conditions: rho_mix>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	short tons dry solid per insitu volume [TDS/cu-ft]					
	1015	2400	1410	49%	0 021					
total effective slurry pumping time [min]	time period analysed [hr:min:ss]	Flow velocity [ft/s]	slurry volume discharged	insitu Production	tons dry solid Production	% solids by weight loop 1 [%]	% solids by weight loop 2 [%]	% solids by weight loop 3 [%]	% volume concentration loop 3 [%]	densit loop 3 SGU
		average	average [cy/hr]	average [insitu cy/hr]	average [short tons/hr]	average	average	average	average	averag
total dredge period:	10.26-19:44	4.9	346	74	43	13 67%	9 47%	13.08%	21.38%	1.0
snapshots:	11:07-11:43	4.0	279	94	54	20.19%	17 54%	19.94%	33.78%	1.1
	11:53-12:22	3.8	265	90	52	19.67%	17.60%	20.03%	33.94%	1.1
	13:55-14:35	4.5	314	80	46	16.56%	11.37%	15.44%	25.46%	1.1
	15:02-15:17	4.6	323	108	62	19.12%	16.14%	19.75%	33.28%	1.1
	16:09-16:23	6.2	434	107	61	17.26%	9.82%	15.04%	24.55%	1.1
	17:45-18:29	6.0	425	102	59	14.63%	9.75%	14.60%	23.91%	1.1
total effective [min]	total gross [min]	max	daily total [cy]	daily total [insitu cy]	daily total [short tons]	max	max	max	max	max
435	559	7.0	2509	537	309	33%	31%	33%	60%	1.2

missing: datalog values between 19:44 and 20:06: estimated = 27 cy

TABLE F-8

Date: August 18 2000

Date: August 18 2000	conditions: rho_mix loop 3>1040kg/m3, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	tons dry solid/insitu volume [TDS/situ m3]					
	1015	2400	1260	34%	0.425					
total effective slurry pumping time [min]	**time period analysed [hr:min:ss]**	**Flow velocity [m/s]**	**slurry volume discharged**	**insitu Production**	**tons dry solid Production [metric tons]**	**% solids by weight loop 1 [%]**	**% solids by weight loop 2 [%]**	**% solids by weight loop 3 [%]**	**% volume concentration loop 3 [%]**	**density loop 3 [kg/m3]**
		average	average [m3/hr]	average[insitu m3/hr]	average [tons/hr]	average	average	average	average	average
total dredge period:	11:16-18:55	1.3	235	67	29	10.94%	8.97%	11.02%	28.60%	1,08
snapshots:	12:31-12:45	1.4	249	88	38	14.25%	10.74%	13.60%	35.54%	1,10
	16:32-16:51	1.0	168	71	30	15.31%	15.49%	15.87%	42.02%	1,11
	16:57-17:27	1.2	203	87	37	15.92%	15.39%	16.22%	43.02%	1,12
	17:38-17:45	1.2	218	121	51	18.65%	18.89%	20.22%	55.45%	1,15
total effective [min]	total gross [min]	max	daily total [m3]	daily total [insitu m3]	daily total [tons]	max	max	max	max	max
200	459	3.7	781	223	95	30%	29%	29%	84%	1,22

Missing datalog values between 10:40 and 11:16 due to breakdown datalog computer: missing estimated quantity = 34 m3

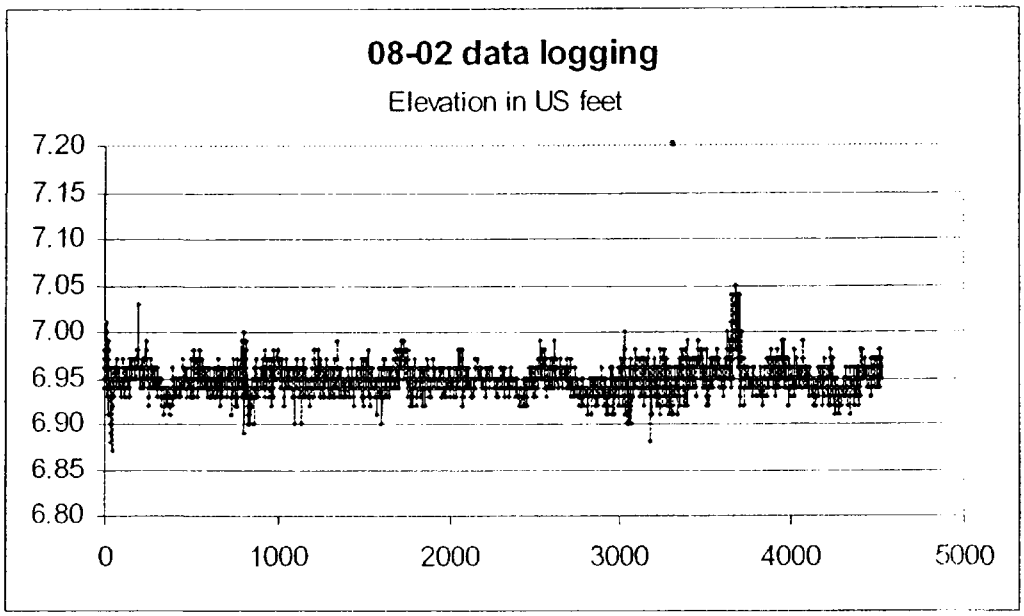
Date: August 18 2000	conditions:SGU loop3>1.040, rpm slurry pump>700 rpm, flow velocity in 250 mm flow tube>1 ft/s									
	water density [kg/m3]	specific gravity [kg/m3]	insitu density [kg/m3]	avg. % solids by weight of insitu material	short tons dry solid per insitu volume [TDS/cu-ft]					
	1015	2400	1260	34%	0.013					
total effective slurry pumping time [min]	**time period analysed [hr:min:ss]**	**Flow velocity [ft/s]**	**slurry volume discharged**	**insitu Production**	**tons dry solid Production**	**% solids by weight loop 1 [%]**	**% solids by weight loop 2 [%]**	**% solids by weight loop 3 [%]**	**% volume concentration loop 3 [%]**	**density loop 3 SGU**
		average	average [cy/hr]	average [insitu cy/hr]	average [short tons/hr]	average	average	average	average	average
total dredge period:	11:16-18:55	4.4	307	88	31	10.94%	8.97%	11.02%	28.60%	1.08
snapshots:	12:31-12:45	4.6	326	116	41	14.25%	10.74%	13.60%	35.54%	1.10
	16:32-16:51	3.1	220	93	33	15.31%	15.49%	15.87%	42.02%	1.11
	16:57-17:27	3.8	266	114	41	15.92%	15.39%	16.22%	43.02%	1.12
	17:38-17:45	4.0	285	158	57	18.65%	18.89%	20.22%	55.45%	1.15
total effective [min]	total gross [min]	max	daily total [cy]	daily total [insitu cy]	daily total [short tons]	max	max	max	max	max
200	459	12.3	1022	292	105	30%	29%	29%	84%	1.22

Missing datalog values between 10:40 and 11:16 due to breakdown of computer: missing estimated quantity = 45 cy

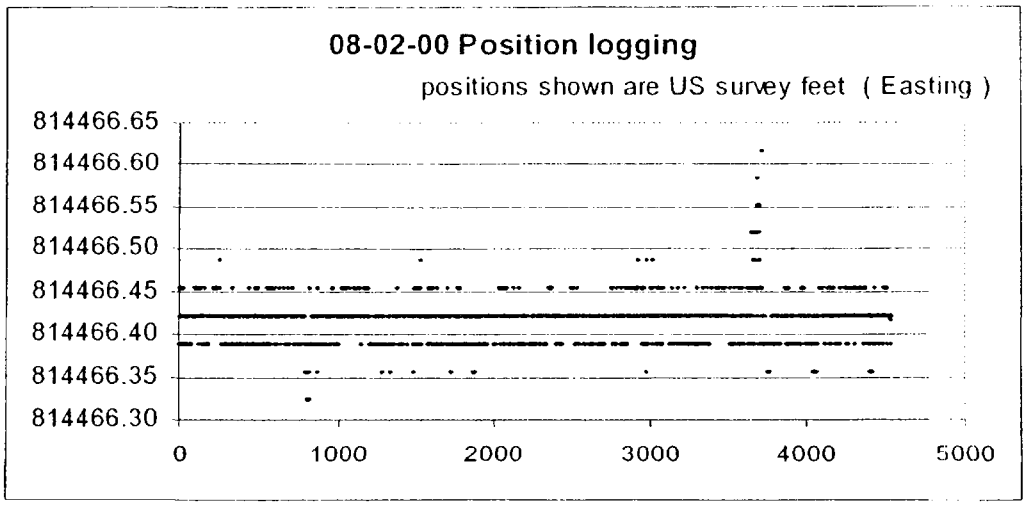
TABLE F-9

G

Appendix G
Dredging Accuracy Data



No. of loggings



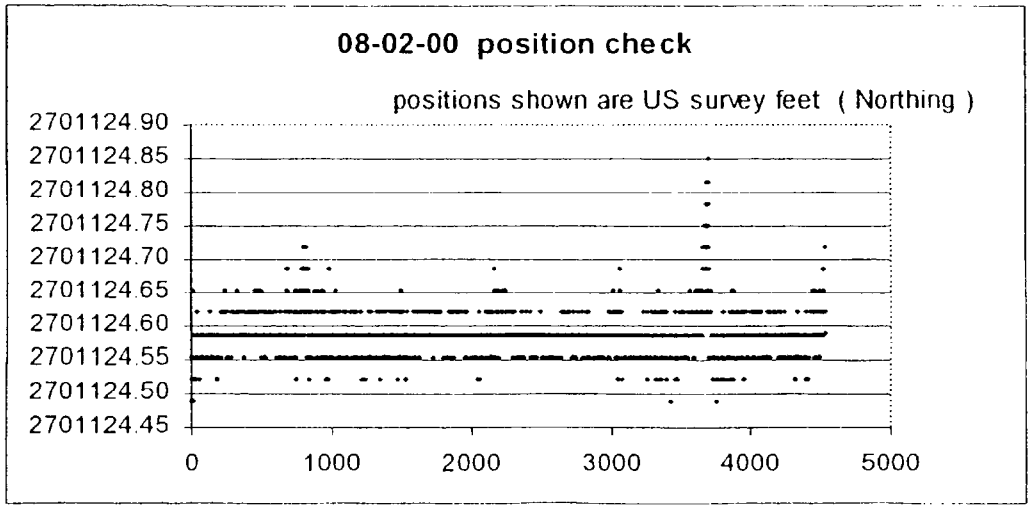


FIGURE G-1

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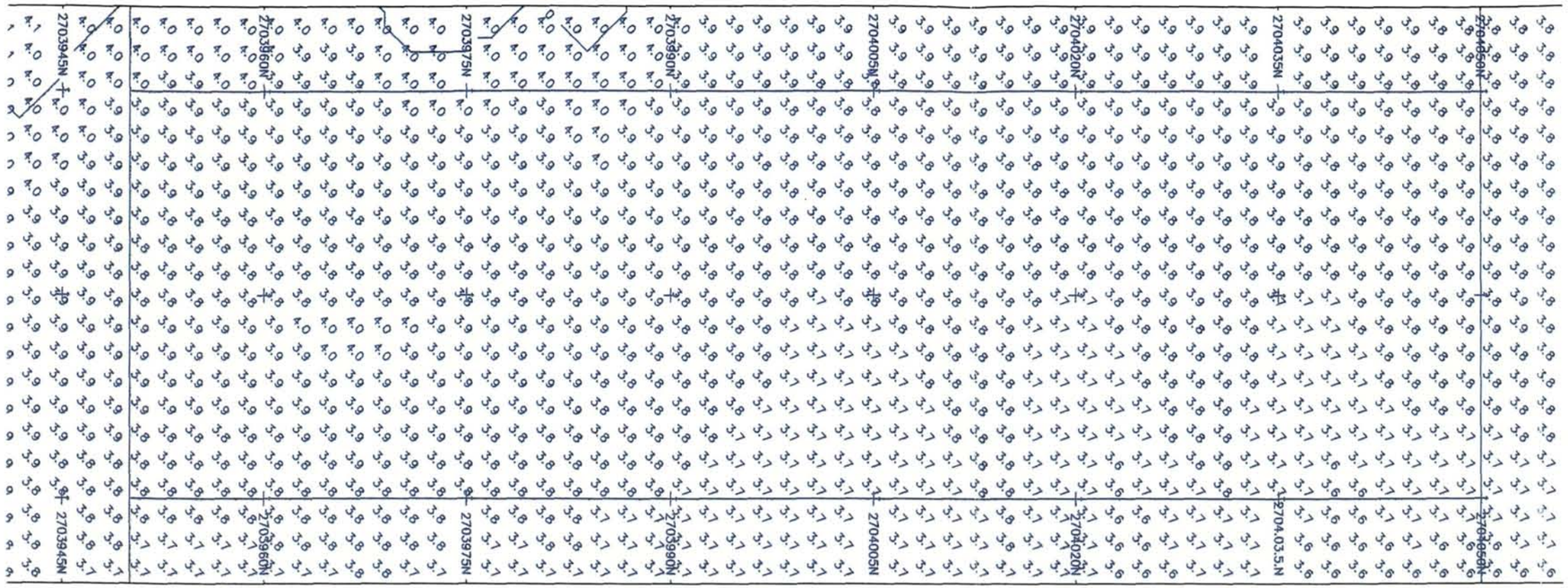
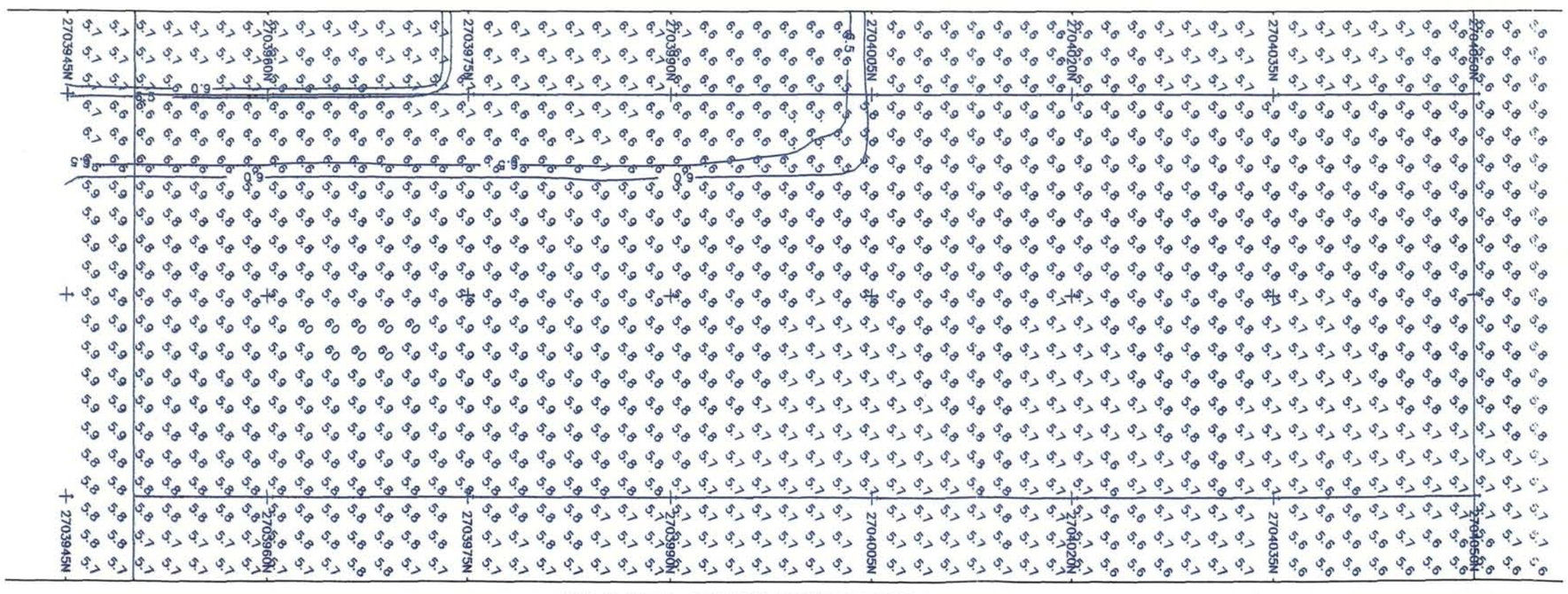
133 FEDERAL STREET, BOSTON, MASSACHUSETTS 02110

BEAN ENVIRONMENTAL, L.L.C.
ST. CHARLES AVE., SUITE 500
NEW ORLEANS, LA 70130



CUT 5 PRE-DREDGE SURVEY: AUGUST 5TH, 2000



CUT 5 FIELD TARGET DREDGE DEPTHS

NOTES:

1. SURVEY DATA PROVIDED BY BEAN ENVIRONMENTAL LLC.
2. ALL DEPTHS ARE RELATIVE TO M.L.L.W. (i.e. 5.8 is 5.8 ft M.L.L.W.).
3. "+" DENOTES ELEVATION ABOVE TARGET ELEVATION (UNDER DREDGING).

0 20 40
SCALE IN FEET

FIGURE G-2

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CUT 5
ACCURACY EVALUATION

SCALE: AS SHOWN

CAD FILE: MNBETS01-A1.DWG

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133 FEDERAL STREET, BOSTON, MASSACHUSETTS 02110

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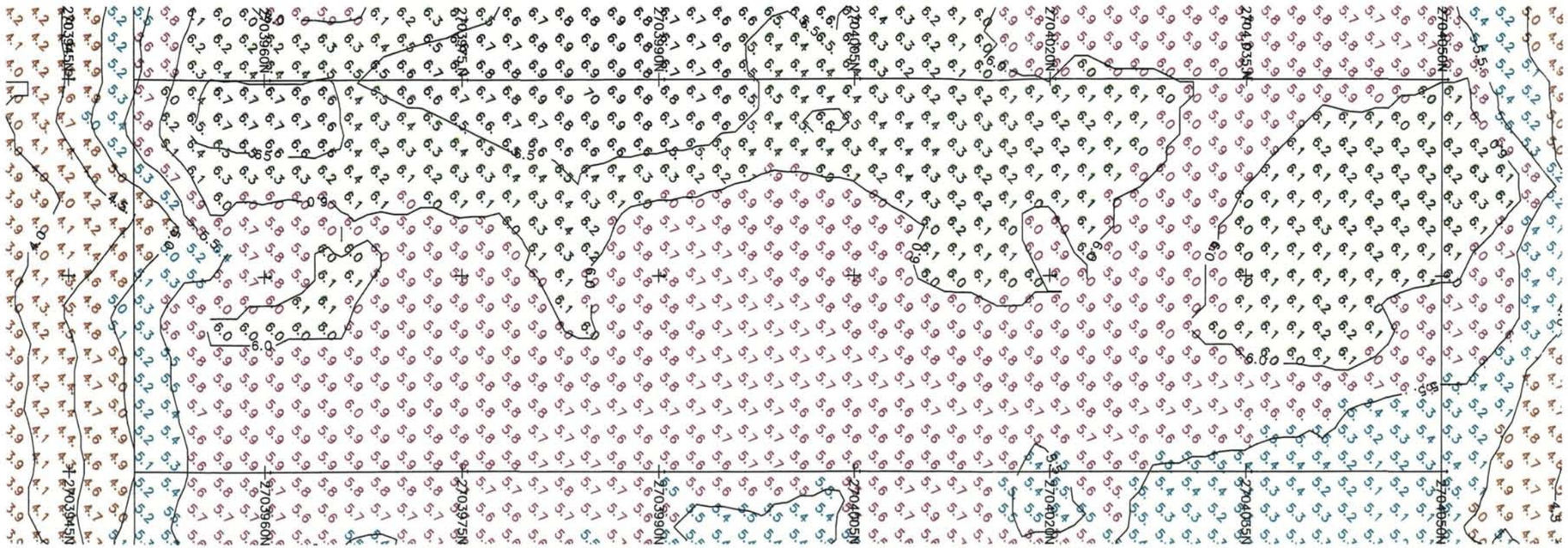
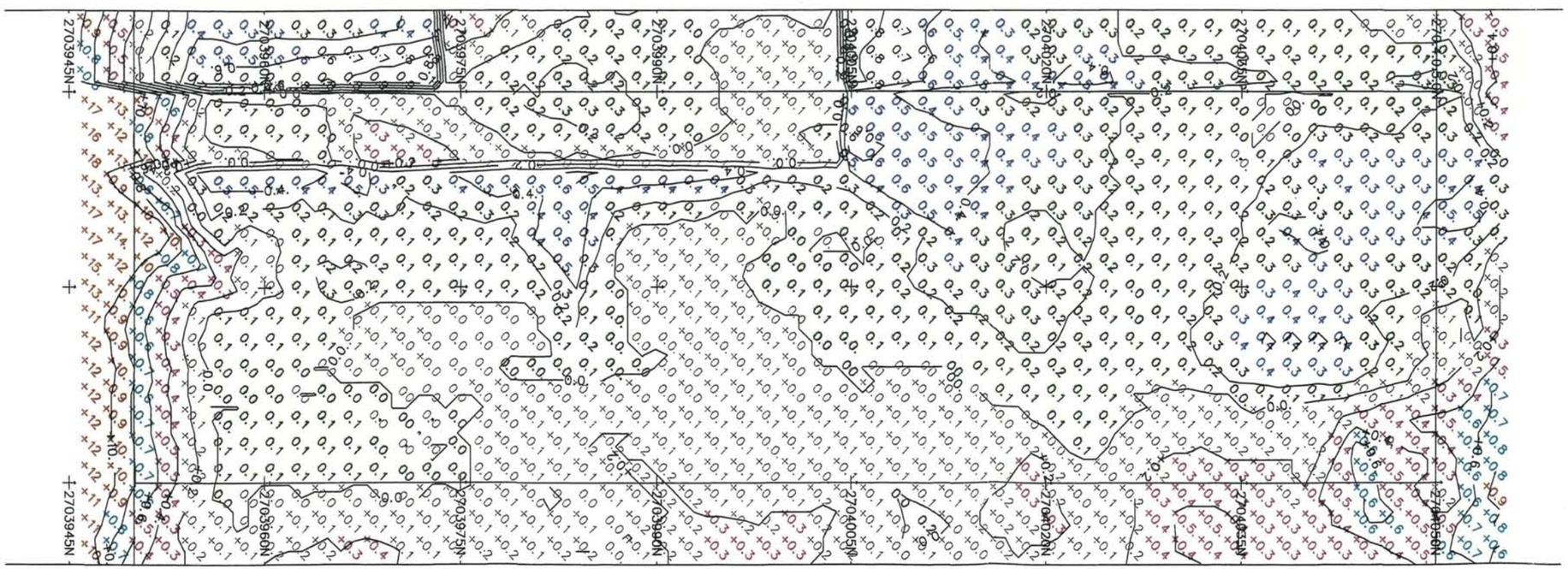
NEW ORLEANS, LA 70130



CUT 5 POST DREDGE SURVEY: AUGUST 19TH, 2000



CUT 5 TARGET DEPTHS - POST DREDGE SURVEY

NOTES:

1. SURVEY DATA PROVIDED BY BEAN ENVIRONMENTAL LLC.
2. ALL DEPTHS ARE RELATIVE TO M.L.L.W. (i.e. 5.8 is 5.8 ft M.L.L.W.).
3. "+" DENOTES ELEVATION ABOVE TARGET ELEVATION (UNDER DREDGING).

0 20 40
SCALE IN FEET

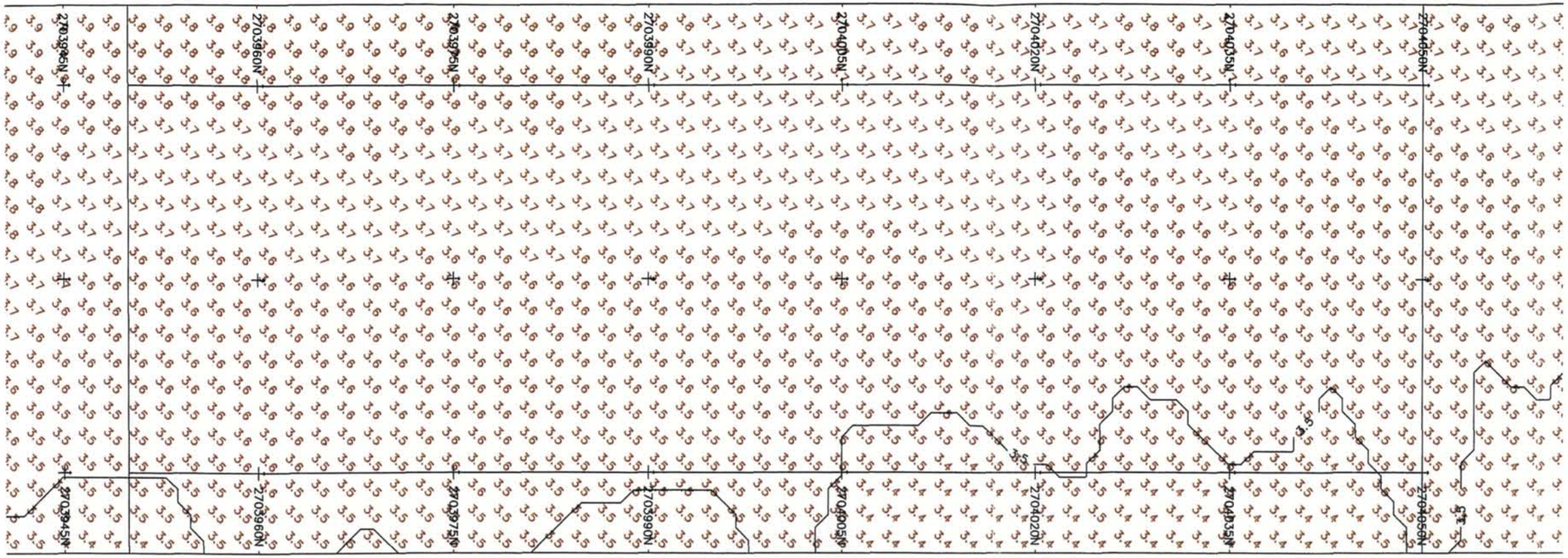
FIGURE G-3

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

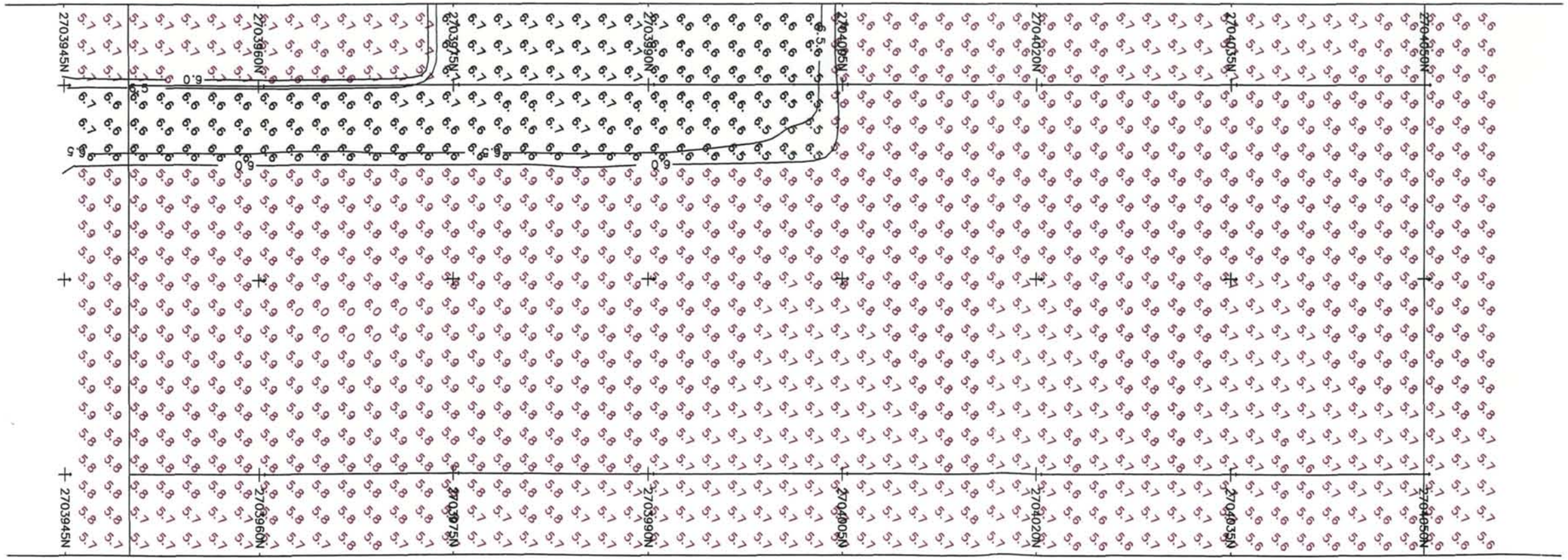
CUT 5
ACCURACY EVALUATION

SCALE: AS SHOWN

CAD FILE: MNBETS02-A1.DWG



CUT 6 PRE-DREDGE SURVEY: AUGUST 5TH, 2000



CUT 6 FIELD TARGET DREDGE DEPTHS

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NEW ORLEANS, LA 70130

NOTES:

1. SURVEY DATA PROVIDED BY BEAN ENVIRONMENTAL LLC.
2. ALL DEPTHS ARE RELATIVE TO M.L.L.W. (i.e. 5.8 is 5.8 ft M.L.L.W.).
3. "+" DENOTES ELEVATION ABOVE TARGET ELEVATION (UNDER DREDGING).

0 20 40
SCALE IN FEET

FIGURE G-4

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CUT 6
ACCURACY EVALUATION

SCALE: AS SHOWN

CAD FILE: MNBETS04-A1.DWG

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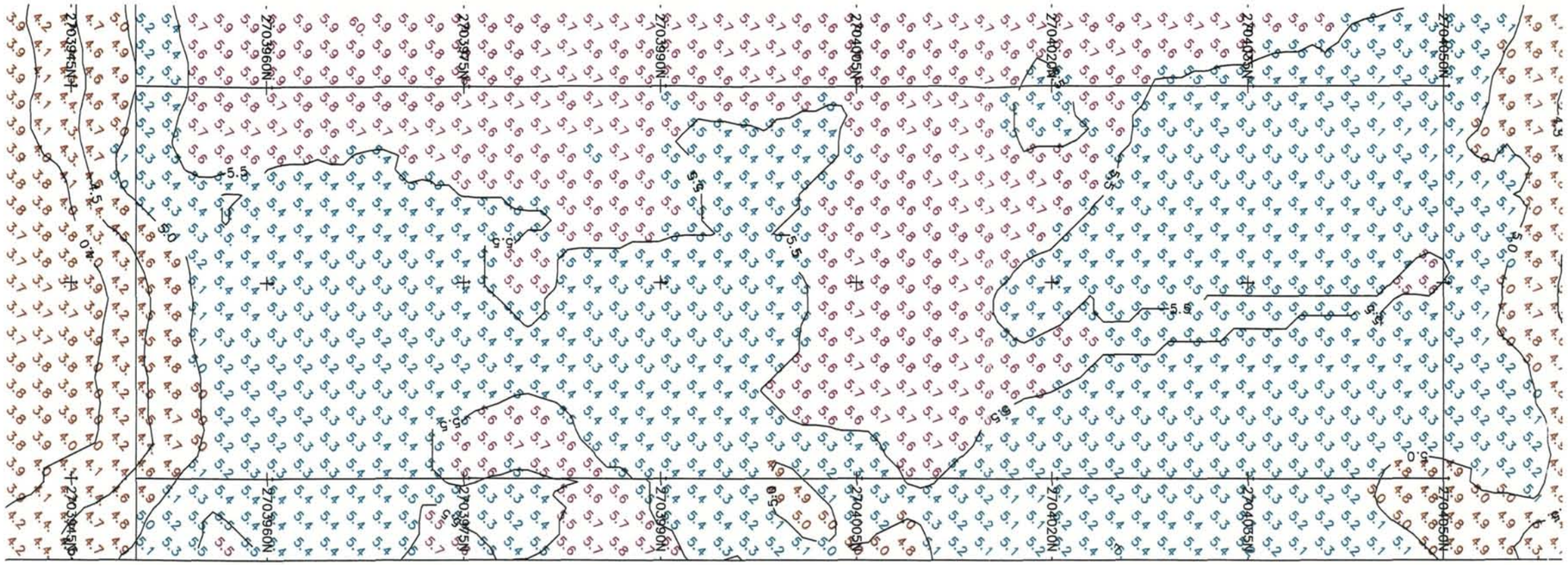
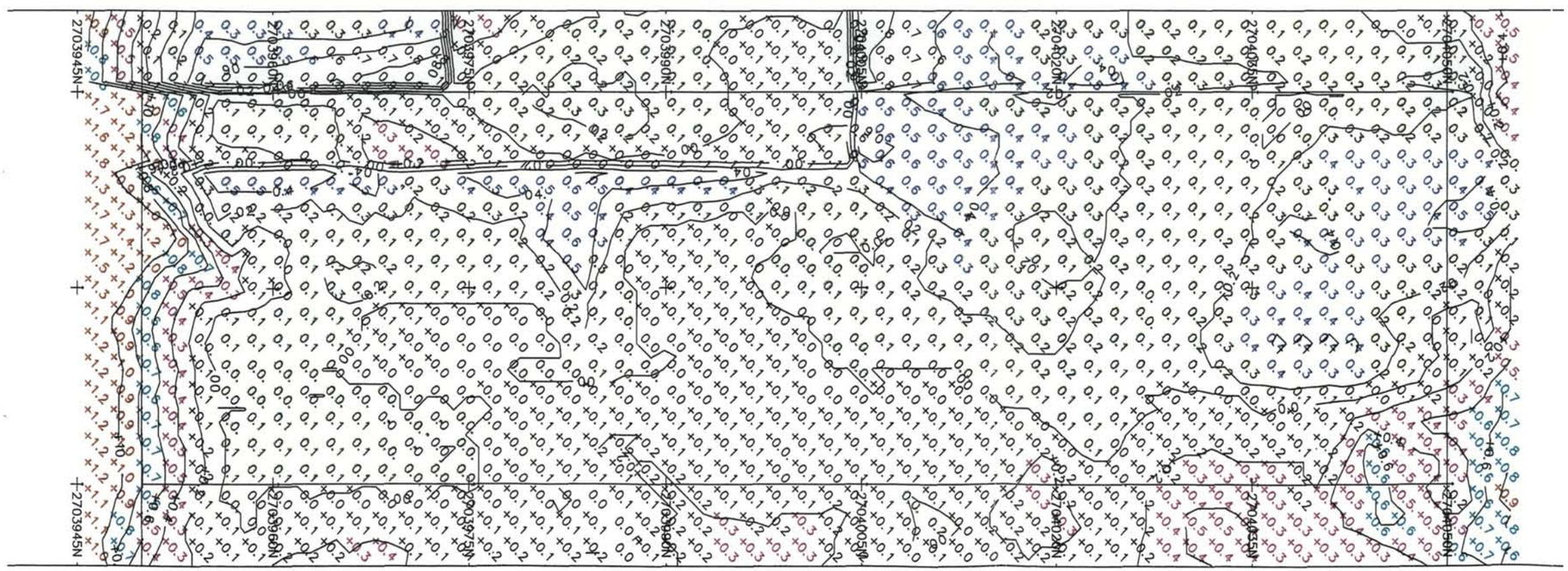
NEW ORLEANS, LA 70130



CUT 6 POST DREDGE SURVEY: AUGUST 19TH, 2000



CUT 6 TARGET DEPTHS - POST DREDGE SURVEY

NOTES:

1. SURVEY DATA PROVIDED BY BEAN ENVIRONMENTAL LLC.
2. ALL DEPTHS ARE RELATIVE TO M.L.L.W. (i.e. 5.8 is 5.8 ft M.L.L.W.).
3. "+" DENOTES ELEVATION ABOVE TARGET ELEVATION (UNDER DREDGING).

0 20 40
SCALE IN FEET

FIGURE G-5

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CUT 6
ACCURACY EVALUATION

SCALE: AS SHOWN

CAD FILE: MNBETS05-A1.DWG

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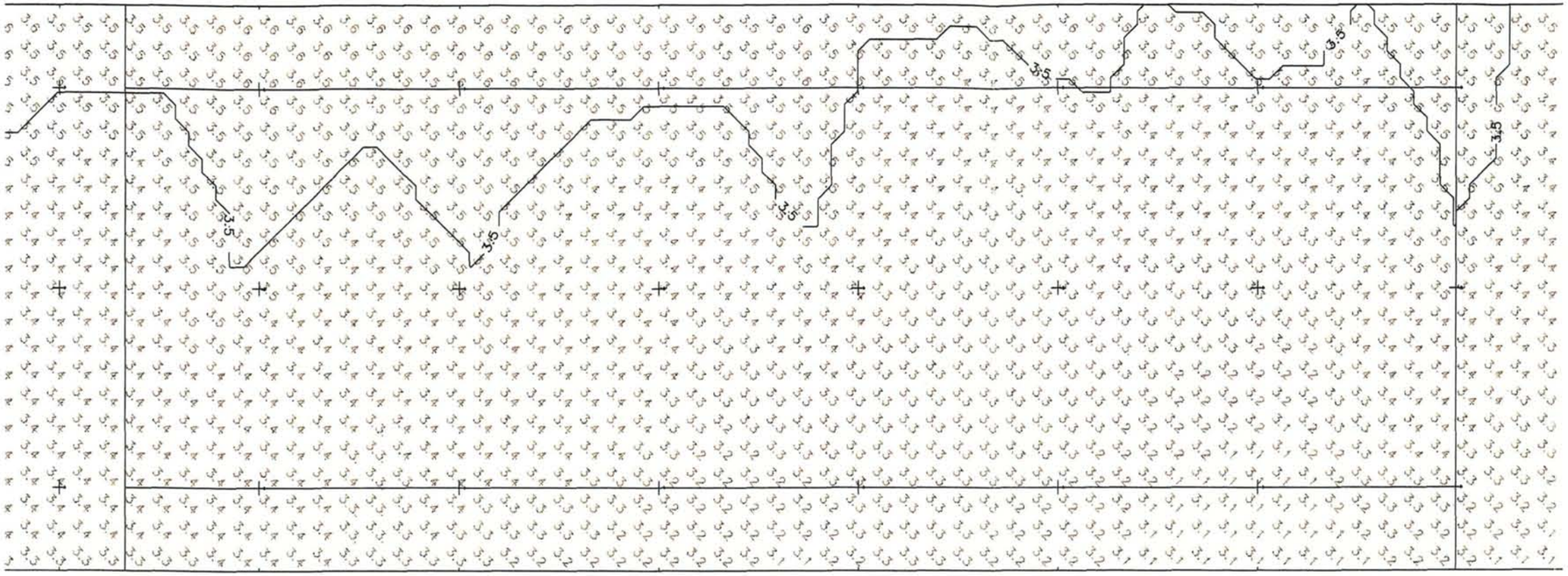
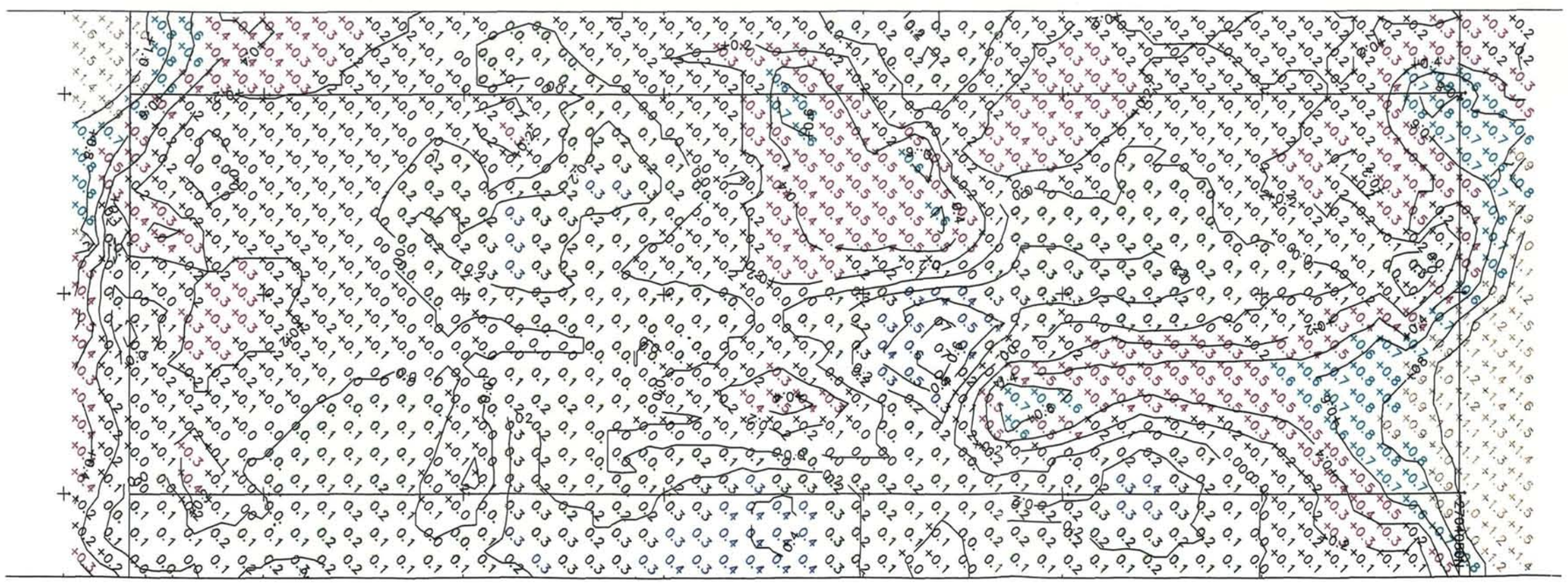
NEW ORLEANS, LA 70130



CUT 7 PRE DREDGE SURVEY: AUGUST 5TH, 2000



CUT 7 FIELD TARGET DREDGE DEPTHS

NOTES:

1. SURVEY DATA PROVIDED BY BEAN ENVIRONMENTAL LLC.
2. ALL DEPTHS ARE RELATIVE TO M.L.L.W. (i.e. 5.8 is 5.8 ft M.L.L.W.).
3. "+" DENOTES ELEVATION ABOVE TARGET ELEVATION (UNDER DREDGING).

0 20 40
SCALE IN FEET

FIGURE G-6

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CUT 7
ACCURACY EVALUATION

SCALE: AS SHOWN

CAD FILE: MNBETS07-A1.DWG

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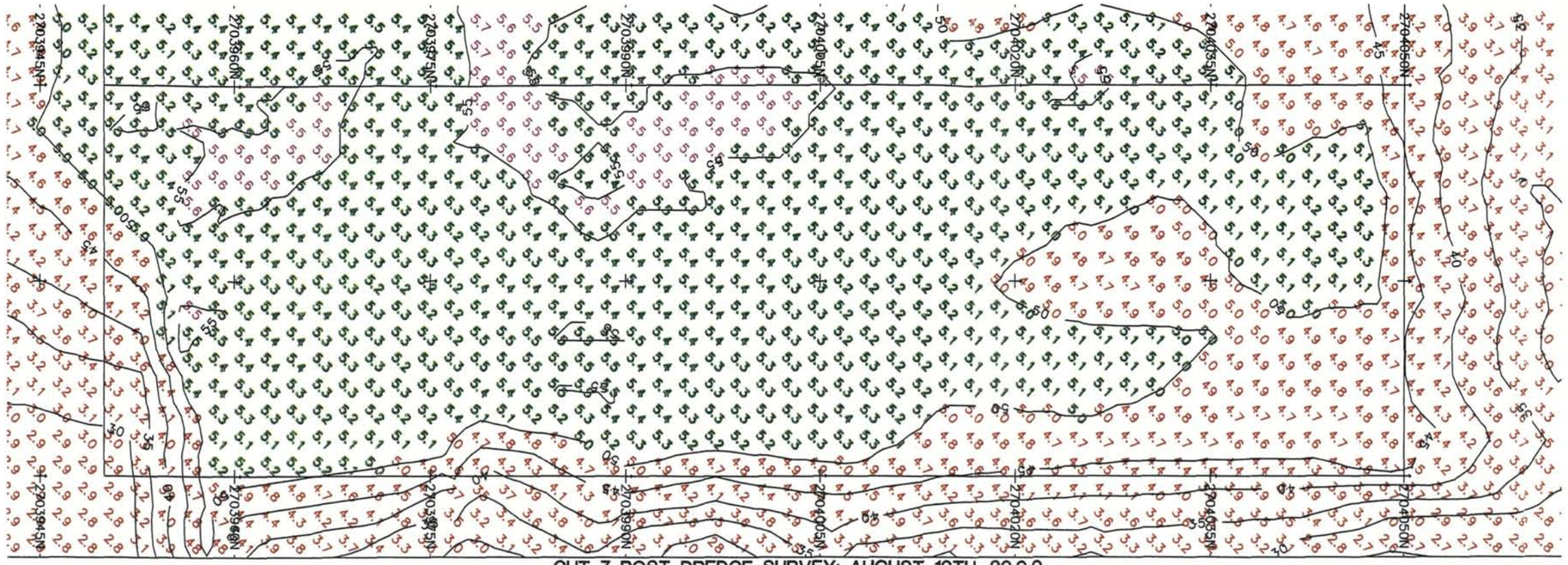
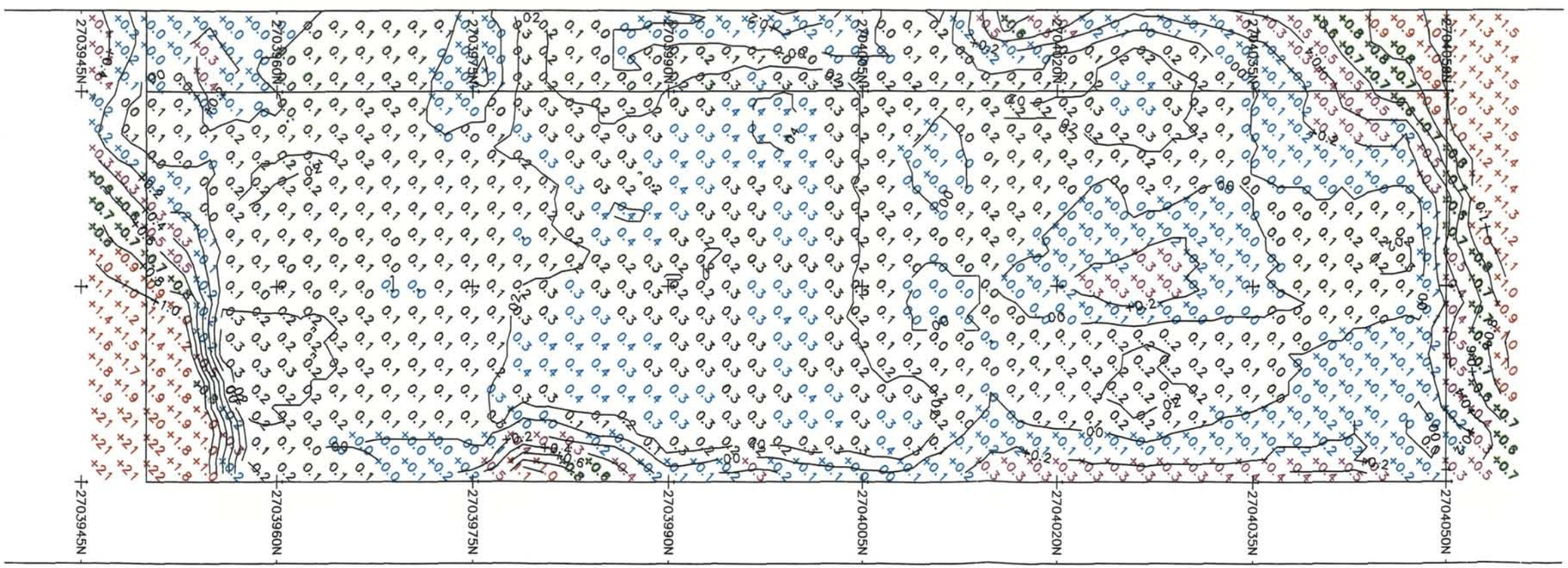
NEW ORLEANS, LA 70130



CUT 7 POST DREDGE SURVEY: AUGUST 19TH, 20.0.0.



CUT 7 TARGET DEPTHS - POST DREDGE SURVEY

NOTES:

1. SURVEY DATA PROVIDED BY BEAN ENVIRONMENTAL LLC.
2. ALL DEPTHS ARE RELATIVE TO M.L.L.W. (i.e. 5.8 is 5.8 ft M.L.L.W.).
3. "+" DENOTES ELEVATION ABOVE TARGET ELEVATION (UNDER DREDGING).

0 20 40
SCALE IN FEET

FIGURE G-7

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CUT 7
ACCURACY EVALUATION

SCALE: AS SHOWN

CAD FILE: MNBETS11-1A.DWG

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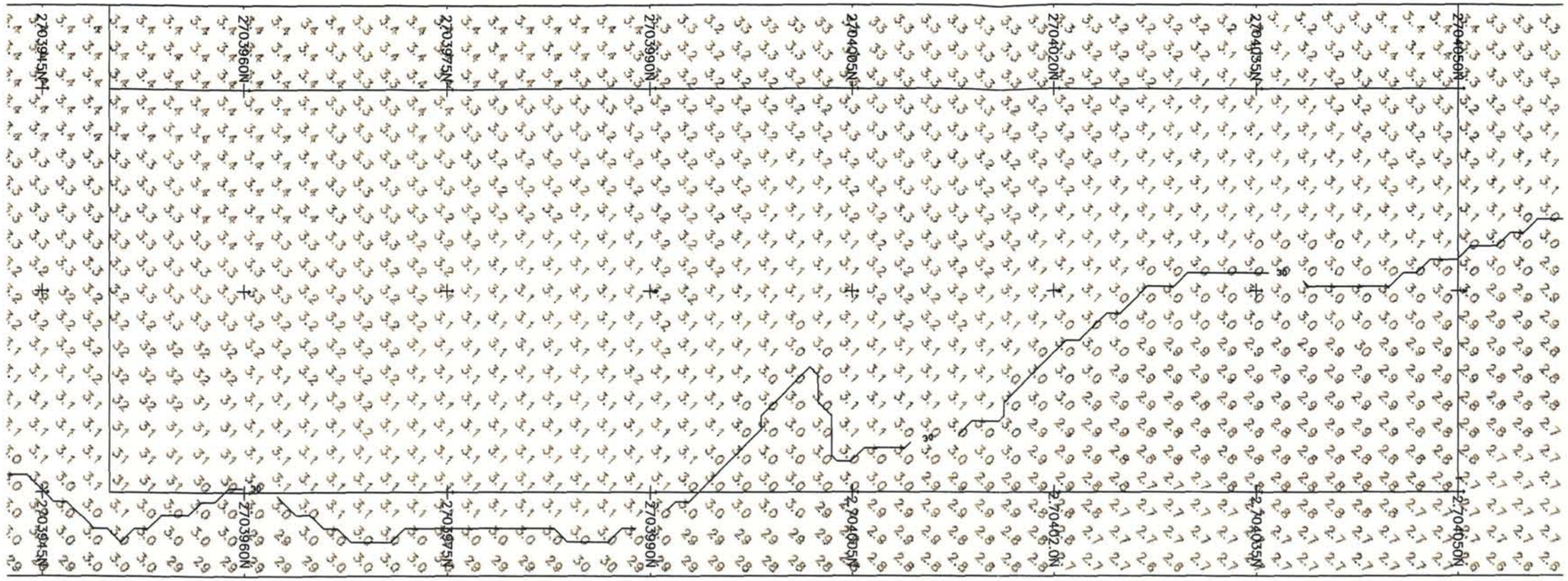
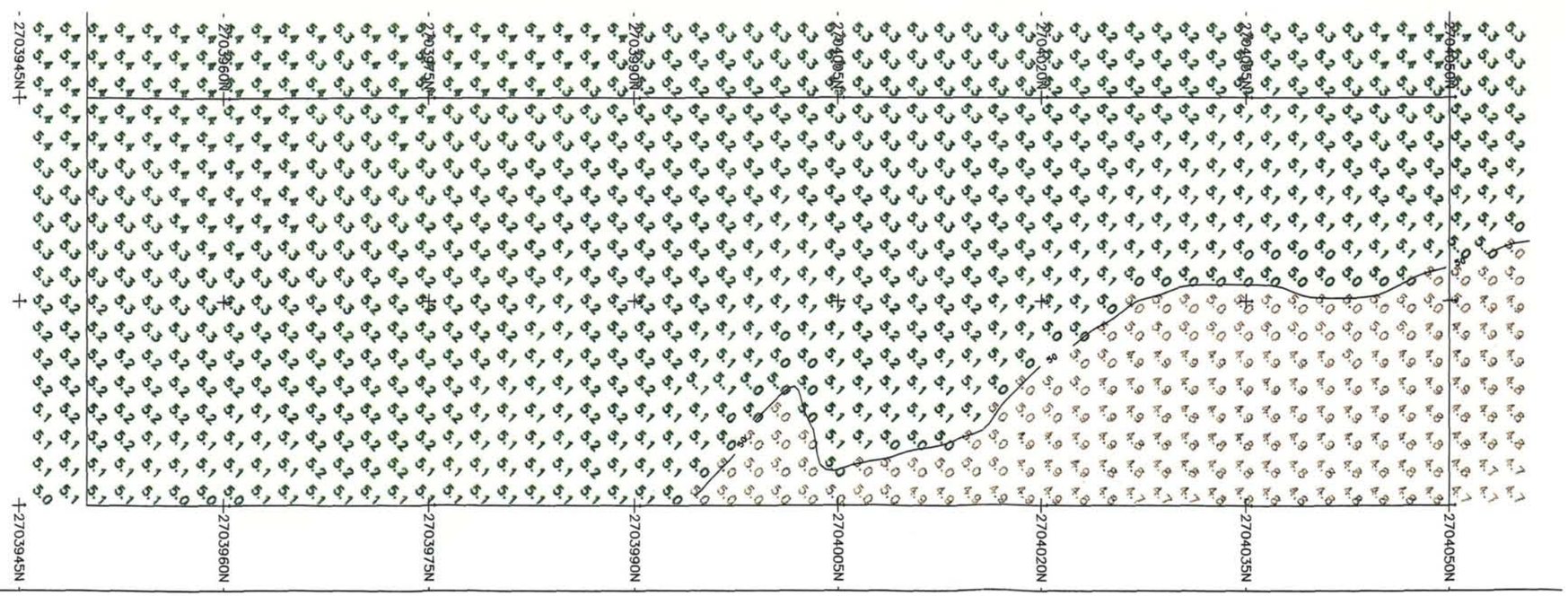
NEW ORLEANS, LA 70130



CUT 8 PRE DREDGE SURVEY: AUGUST 5TH, 2000



CUT 8 FIELD TARGET DREDGE DEPTHS

NOTES:

1. SURVEY DATA PROVIDED BY BEAN ENVIRONMENTAL LLC.
2. ALL DEPTHS ARE RELATIVE TO M.L.L.W. (i.e. 5.8 is 5.8 ft M.L.L.W.).
3. "+" DENOTES ELEVATION ABOVE TARGET ELEVATION (UNDER DREDGING).

0 20 40
SCALE IN FEET

FIGURE G-8

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CUT 8
ACCURACY EVALUATION

SCALE: AS SHOWN

CAD FILE: MNBETS10-A1.DWG

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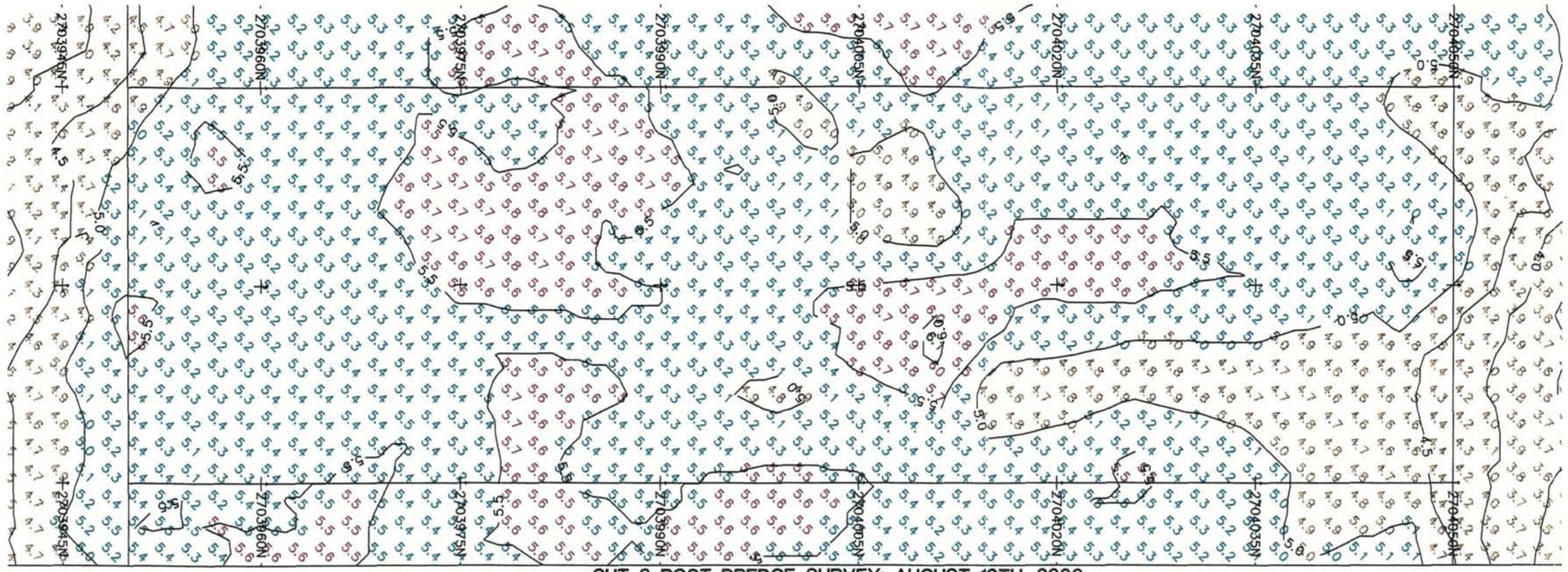
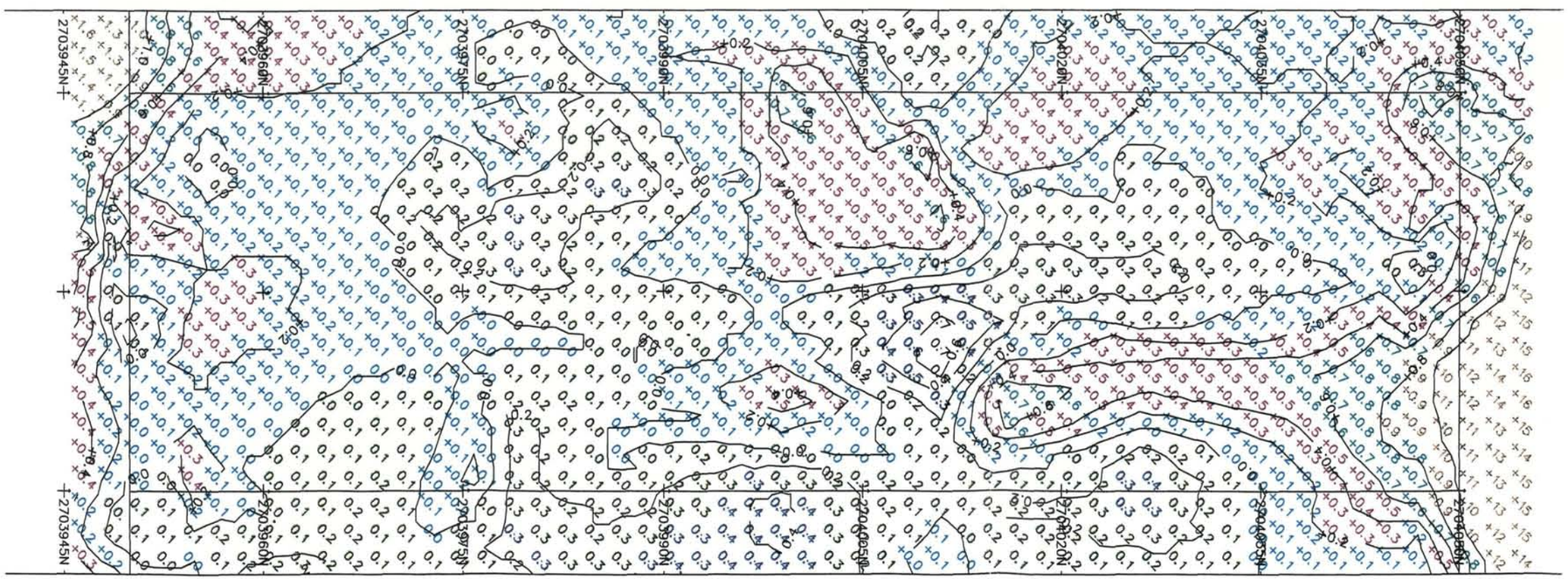
NEW ORLEANS, LA 70130



CUT 8 POST DREDGE SURVEY: AUGUST 19TH, 2000



CUT 8 TARGET DEPTHS - POST DREDGE SURVEY

NOTES:

1. SURVEY DATA PROVIDED BY BEAN ENVIRONMENTAL LLC.
2. ALL DEPTHS ARE RELATIVE TO M.L.L.W. (i.e. 5.8 is 5.8 ft M.L.L.W.).
3. "+" DENOTES ELEVATION ABOVE TARGET ELEVATION (UNDER DREDGING).

0 20 40
SCALE IN FEET

FIGURE G-9

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

CUT 8
ACCURACY EVALUATION

SCALE: AS SHOWN

CAD FILE: MNBETS08-A1.DWG

H

Appendix H
Survey Data

New Bedford Dredge Test
Cut 6
DTM datapoints used for accuracy evaluation

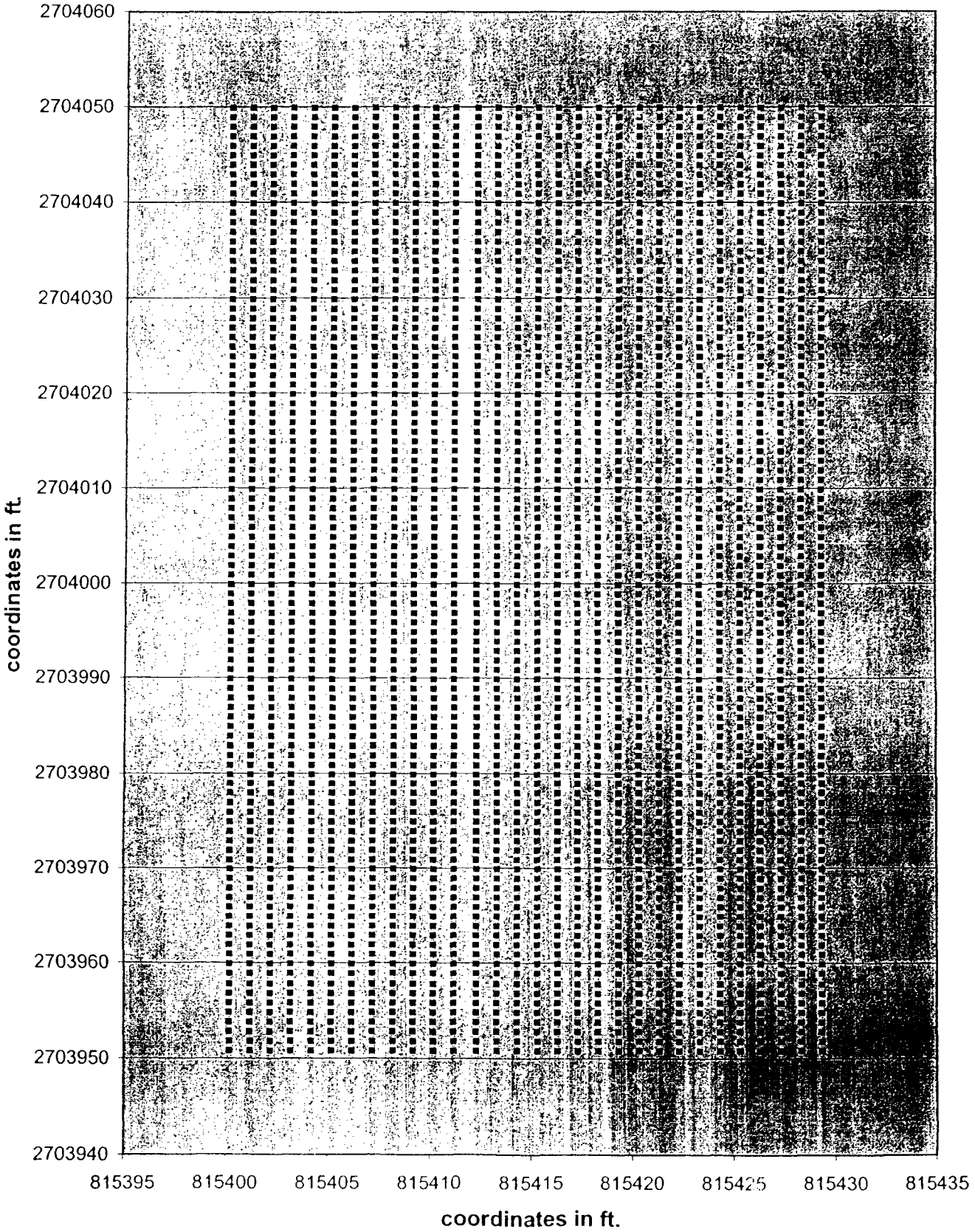
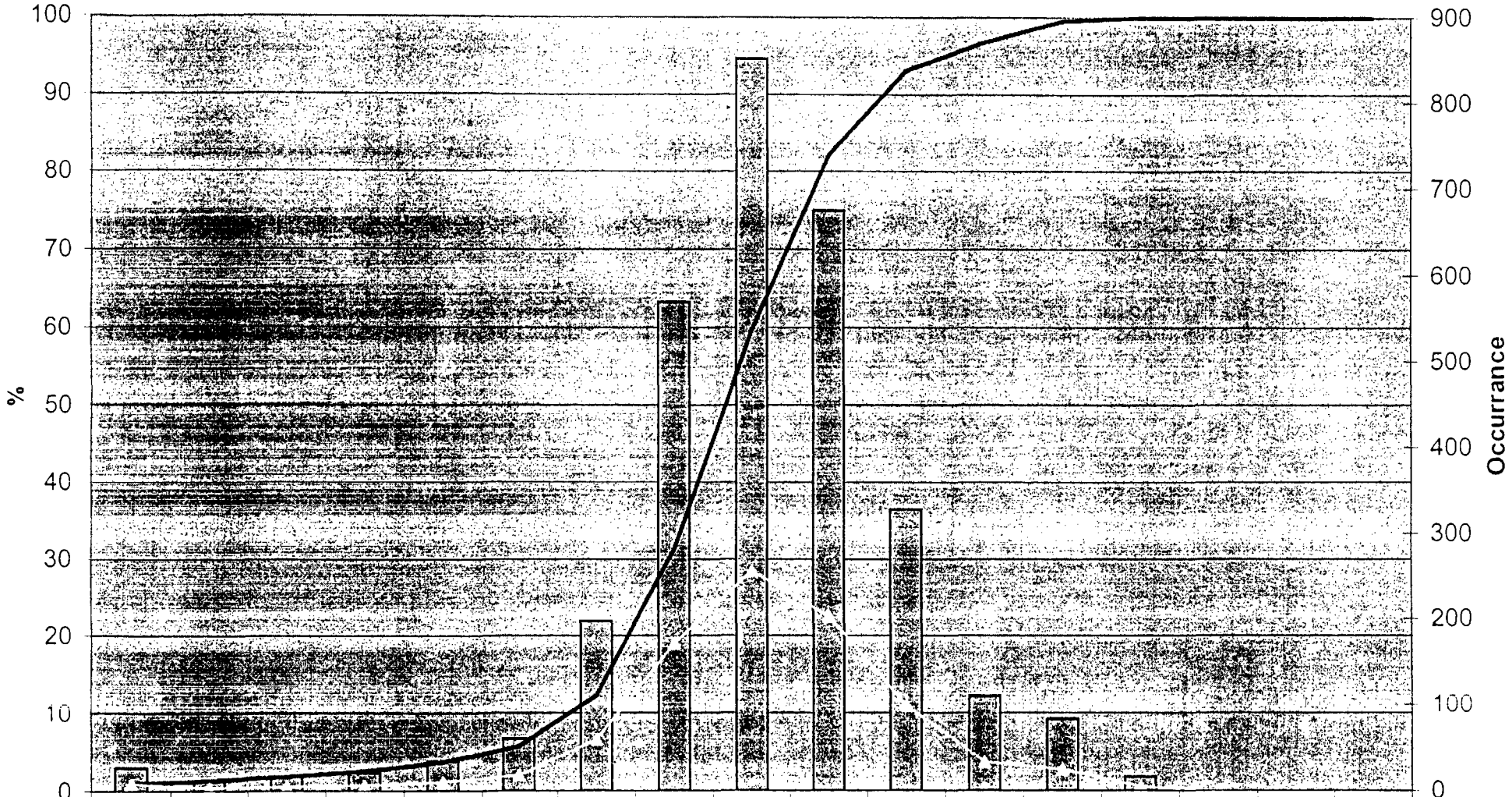


FIGURE H-1

New Bedford Dredge Test
Dredging Accuracy Evalaution - Cut 6 (including slopes)

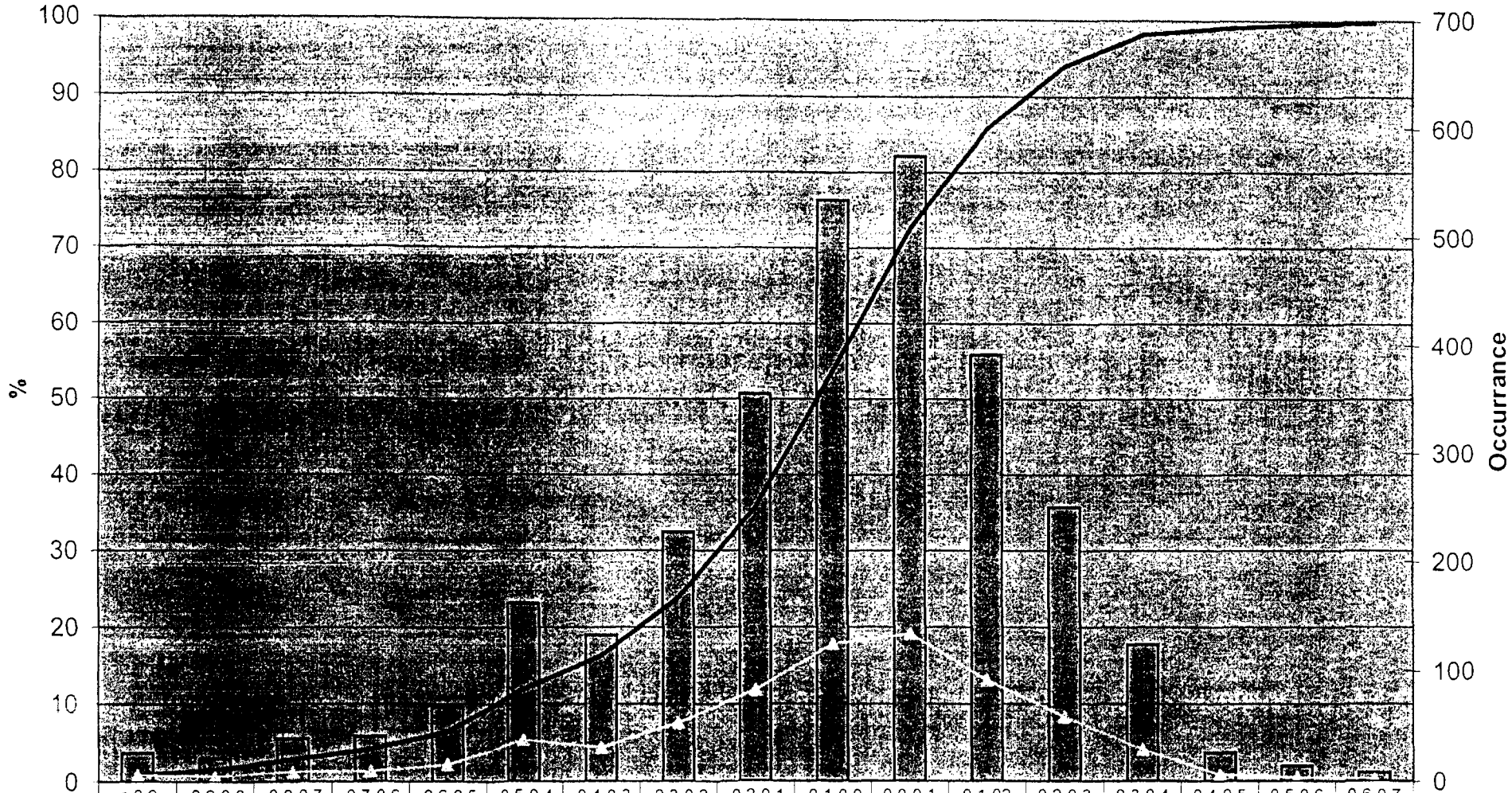


	<-0.9	-0.9-0.8	-0.8-0.7	-0.7-0.6	-0.6-0.5	-0.5-0.4	-0.4-0.3	-0.3-0.2	-0.2-0.1	-0.1-0.0	0.0-0.1	0.1-02	0.2-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7
Occurance	27	12	17	21	34	60	197	569	851	675	328	110	83	16	0	0	0
Cumulative %	1	1	2	3	4	6	12	31	60	82	93	97	99	100	100	100	100
freq %	0.9	0.4	0.6	0.7	1.1	2.0	6.6	19.0	28.4	22.5	10.9	3.7	2.8	0.5	-	-	-

Deviation from target elevation per 0.1 feet
(negative is a higher level, positive is a lower level)

FIGURE H-2

New Bedford Dredge Test
Dredging Accuracy Evaluation Cut 7 (including slopes)

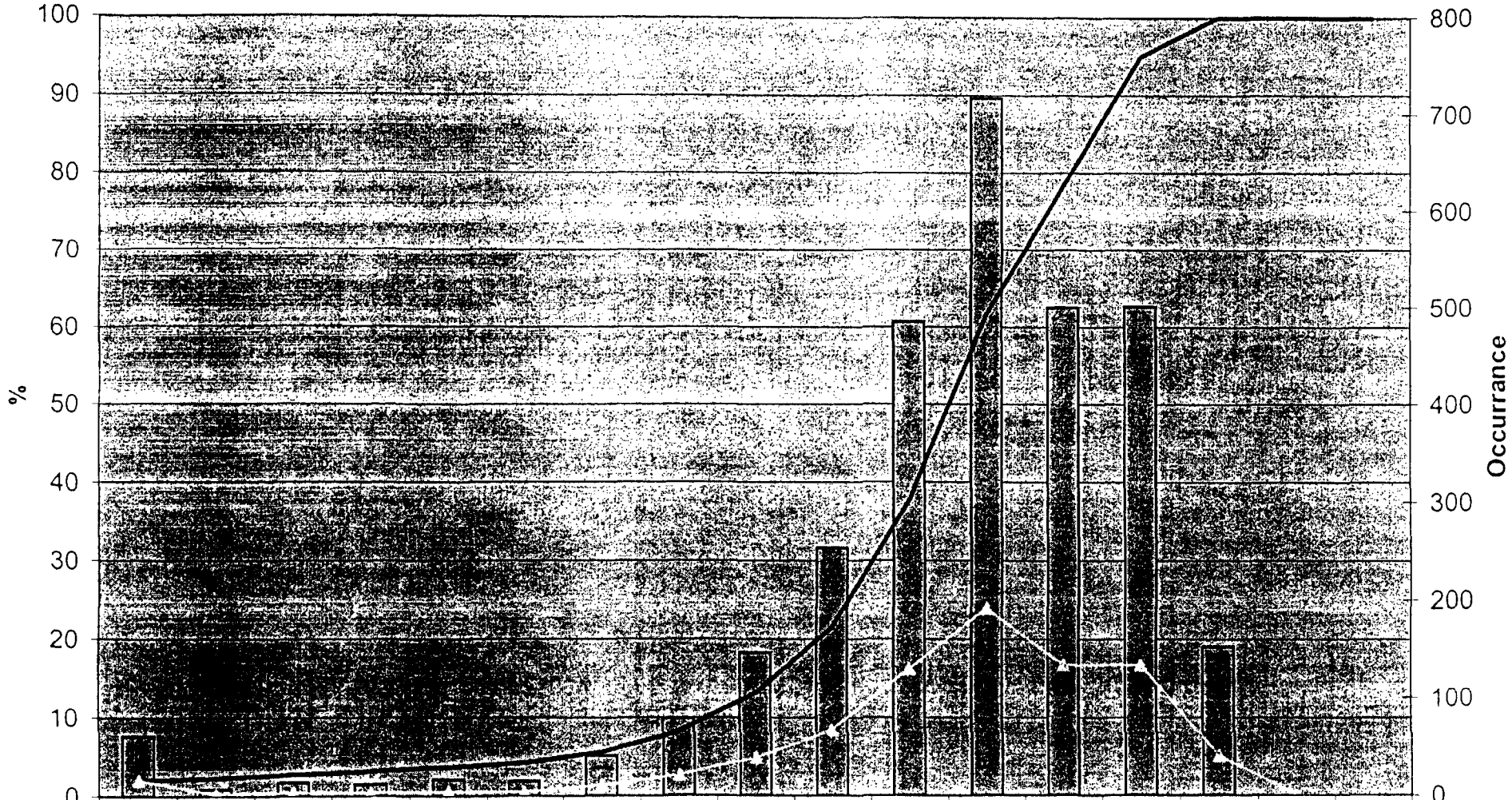


	<-0.9	-0.9-0.8	-0.8-0.7	-0.7-0.6	-0.6-0.5	-0.5-0.4	-0.4-0.3	-0.3-0.2	-0.2-0.1	-0.1-0.0	0.0-0.1	0.1-02	0.2-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7
Occurance	26	21	39	41	67	162	133	227	354	534	575	391	250	124	26	14	8
Cumulative %	1	2	3	4	6	12	16	24	36	53	73	86	94	98	99	99	100
freq %	1	1	1	1	2	5	4	8	12	18	19	13	8	4	1	0	0

Deviation from target elevation per 0.1 feet
(negative is a higher level, positive is alower level)

FIGURE H-3

New Bedford Dredge Test
Dredging Accuracy Evaluation Cut 8 (including slopes)

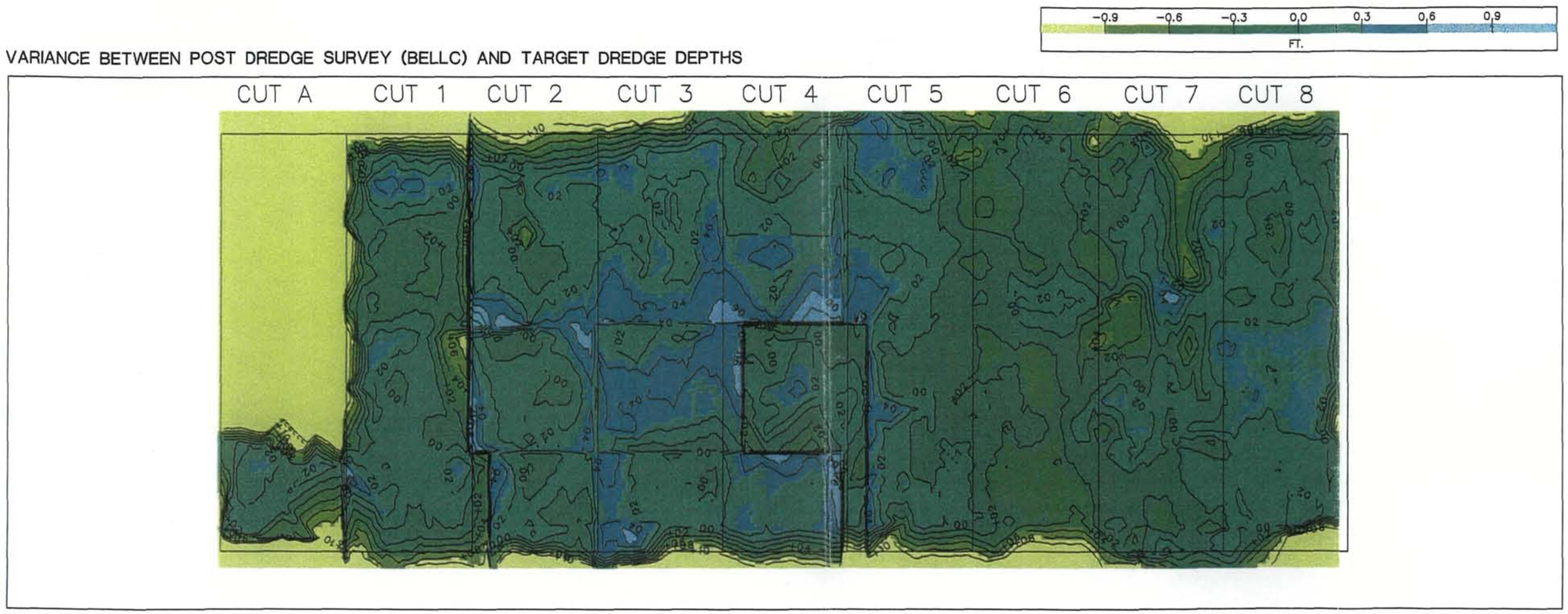


	<-0.9	-0.9-0.8	-0.8-0.7	-0.7-0.6	-0.6-0.5	-0.5-0.4	-0.4-0.3	-0.3-0.2	-0.2-0.1	-0.1-0.0	0.0-0.1	0.1-02	0.2-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7
Occurance	61	7	14	12	17	15	41	79	146	253	485	717	500	501	152	0	0
Cumulative %	2	2	3	3	4	4	6	8	13	22	38	62	78	95	100	100	100
freq %	2	0	0	0	1	1	1	3	5	8	16	24	17	17	5	0	0

Deviation of target elevation per 0.1 feet
(negative is a higher level, positive is a lower level)

FIGURE H-4

VARIANCE BETWEEN POST DREDGE SURVEY (BELLC) AND TARGET DREDGE DEPTHS



0 30 60
SCALE IN FEET

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NEW ORLEANS, LA 70130

FIGURE H-5

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

VARIANCE BETWEEN POST DREDGE SURVEY (BELLC) AND TARGET DREDGE DEPTHS

SCALE: AS SHOWN

CAD FILE: 29088db011A-1.DWG

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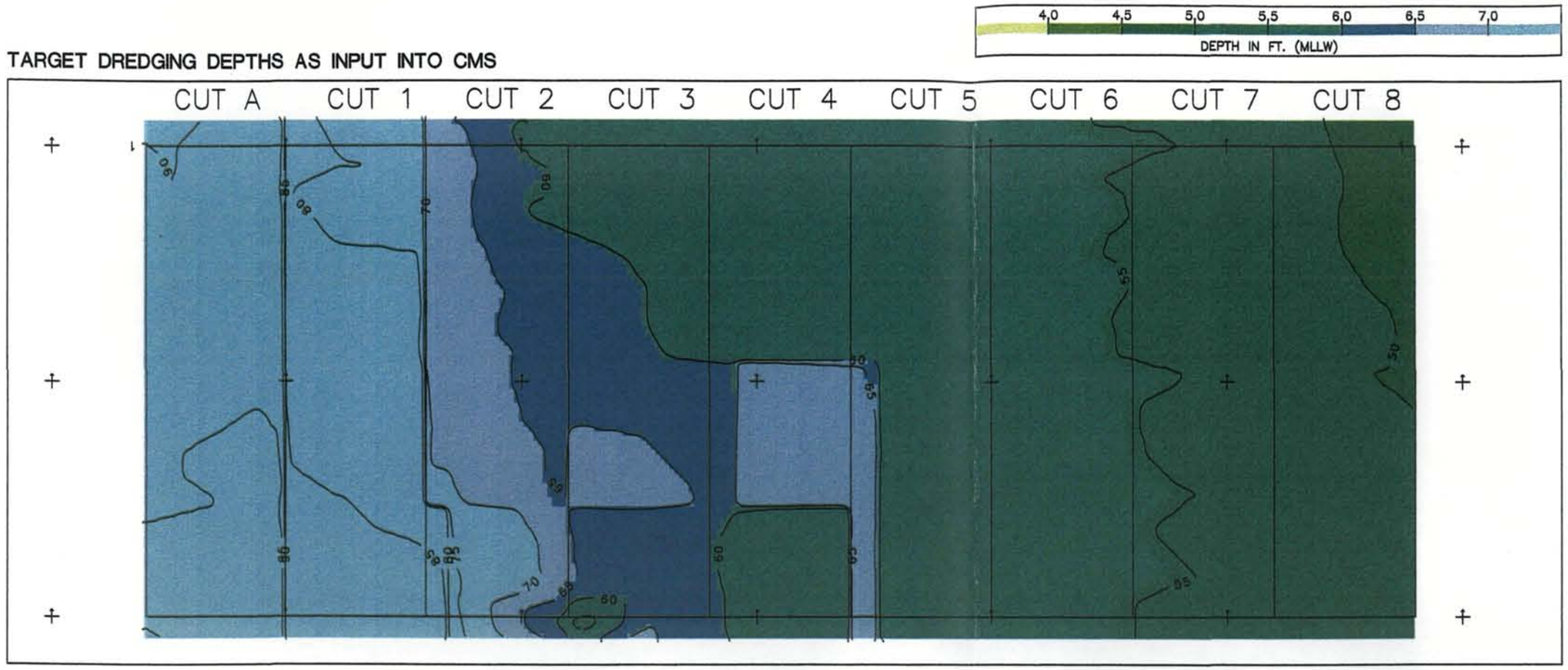
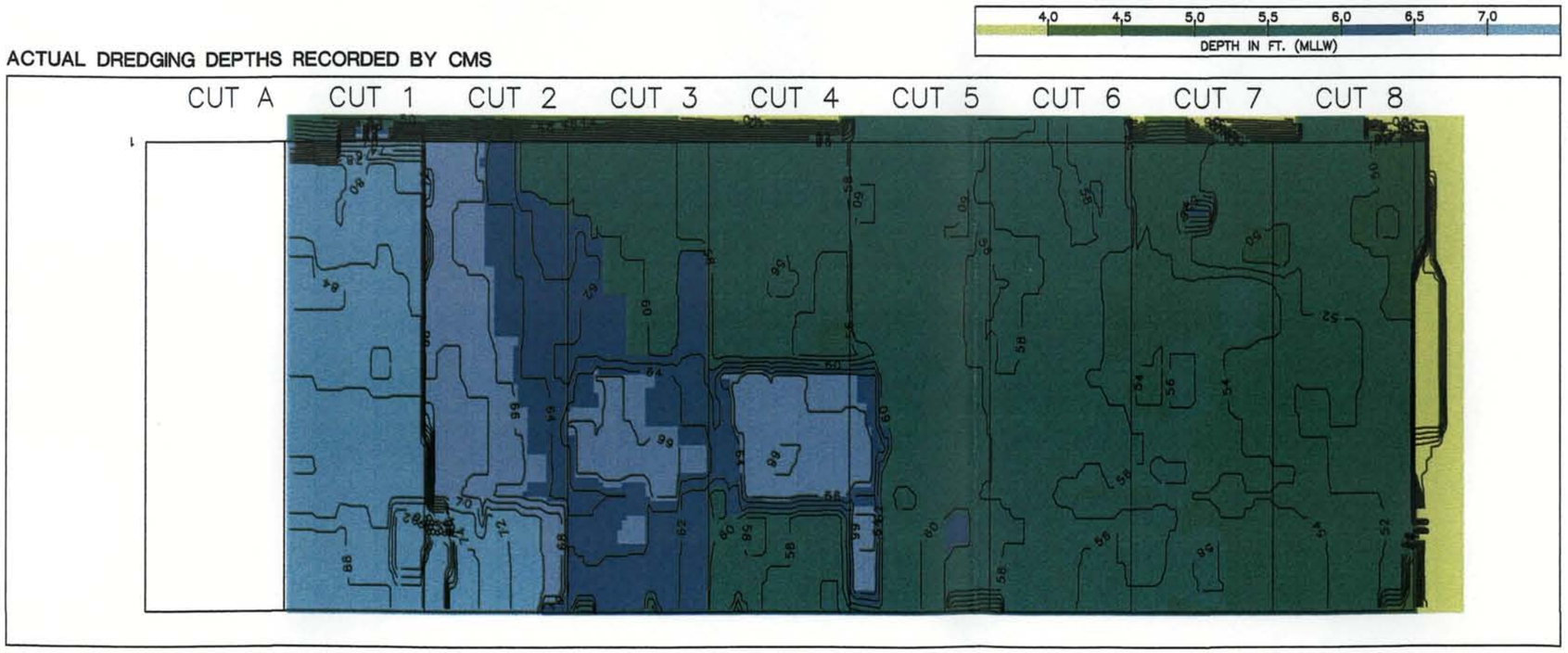
NEW ORLEANS, LA 70130

TARGET DREDGING DEPTHS AS INPUT INTO CMS



ACTUAL DREDGING DEPTHS RECORDED BY CMS



0 30 60
SCALE IN FEET

FIGURE H-6

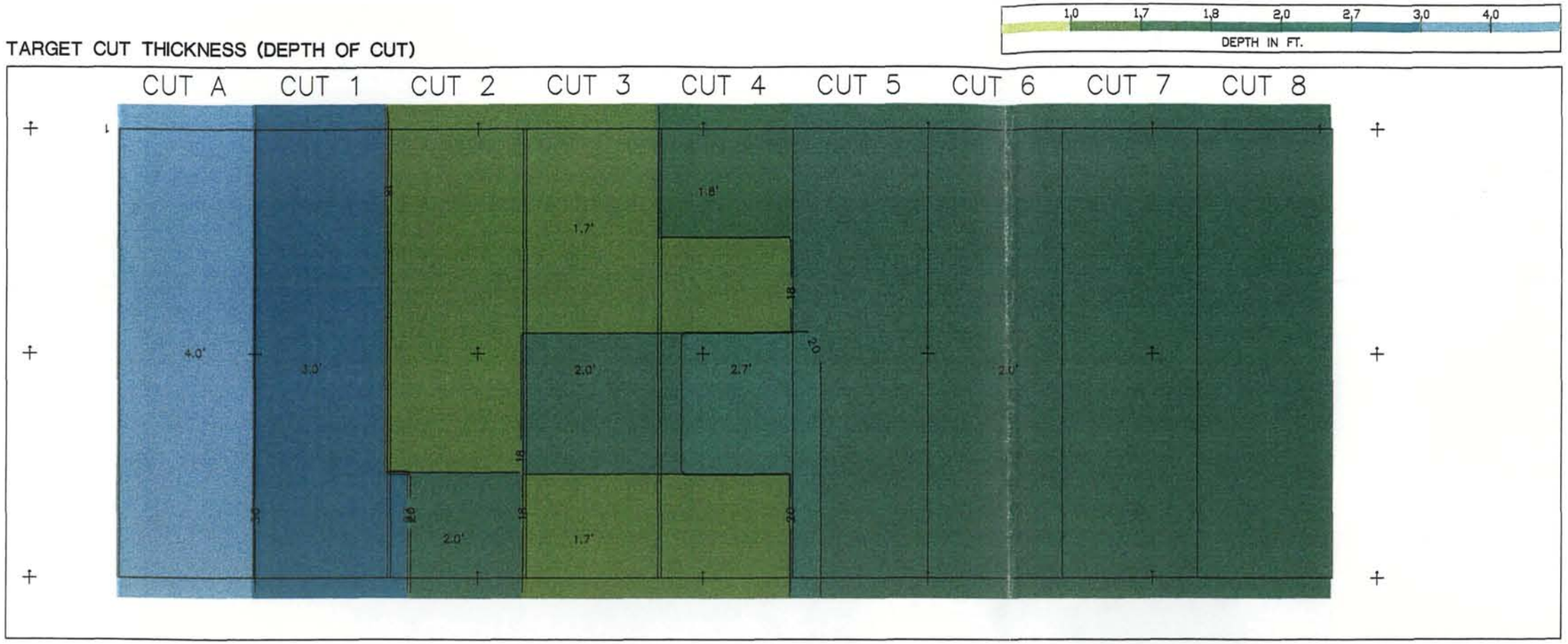
NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

DREDGE RESULTS AS LOGGED BY CMS

SCALE: AS SHOWN

CAD FILE: 29088db009A-1.DWG

TARGET CUT THICKNESS (DEPTH OF CUT)



ACTUAL CUT THICKNESS (DEPTH OF CUT)

FOSTER WHEELER
FOSTER WHEELER ENVIRONMENTAL CORPORATION
133 FEDERAL STREET, BOSTON, MASSACHUSETTS 02110

BEAN ENVIRONMENTAL, L.L.C.
ST. CHARLES AVE., SUITE 500
NEW ORLEANS, LA 70130

0 30 60
SCALE IN FEET

FIGURE H-7

NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

DEPTH OF CUT DREDGED BASED ON POST DREDGE SURVEY (BELLC)

SCALE: AS SHOWN

CAD FILE: 29088db006A-1.DWG

Appendix I
Volume Calculations

New Bedford Harbor Superfund Site, Pre-Design Field Test
BEAN Environmental L.L.C., Test Dredge
Production Report Summary
Volume Calculations

Date: August 30-2000

Removed volumes per 30' x 110' Cut

Survey		No.	Production Date	Cut A (cy)	Cut1 (cy)	Cut 2 (cy)	Cut3 (cy)	Cut 4 (cy)	Cut 5 (cy)	Cut 6 (cy)	Cut 7 (cy)	Cut 8 (cy)	Cut 9 (cy)	TOTAL (cy)
8/14/2000	evening	2	Aug-14							252	267			
8/16/2000	morning	3	Aug-15							233	227	244	43	
8/16/2000	evening	4	Aug-16					236	243	221				
8/18/2000	morning	5	Aug-17				204							
8/19/2000	morning	6	Aug-18	152	382	244	260	270	275	236	247	260	58	2384
Average Volume				**152**	**382**	**244**	**232**	**253**	**259**	**236**	**247**	**252**	**51**	**2308**

Dredged cuts per day

	Production Date	Cut A	Cut1	Cut 2	Cut3	Cut 4	Cut 5	Cut 6	Cut 7	Cut 8	Cut 9	TOTAL
	Aug-14							1	1	0.44	1	
	Aug-15						0 75			0 56		
	Aug-16				0 47	1	0 25					
	Aug-17		0.5	1	0 53							
	Aug-18	1	0.5									

Dredge volume per day (based on average volume per cut and dredged cuts per day)

	Production Date	Cut A	Cut1	Cut 2	Cut3	Cut 4	Cut 5	Cut 6	Cut 7	Cut 8	Cut 9	TOTAL
	Aug-14							236	247	111	51	645
	Aug-15						194			141		335
	Aug-16				109	253	65					427
	Aug-17		191	244	123							558
	Aug-18	152	191									343
Totals		**152**	**382**	**244**	**232**	**253**	**259**	**236**	**247**	**252**	**51**	**2308**

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APPENDIX J

Dredge Test Area Contaminant Characterization Pre-Design Field Test
Dredge Technology Evaluation Report
New Bedford Harbor Superfund Site

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APPENDIX J – DREDGE TEST AREA CONTAMINANT CHARACTERIZATION PRE-DESIGN FIELD TEST - DREDGE TECHNOLOGY EVALUATION REPORT NEW BEDFORD HARBOR SUPERFUND SITE

J.1 INTRODUCTION

The Pre-Design Field Test (PDFT) was undertaken to evaluate the performance of a dredge system being considered for use at the New Bedford Harbor Superfund Site. The objectives of the Pre-Design Field Test included: 1) evaluating actual dredge performance relative to removal of contaminated sediments; 2) evaluating the dredge's ability to minimize environmental impact to water quality by measuring the extent of contaminated sediment resuspension; and 3) evaluating the dredge's ability to operate within acceptable air quality levels. The technology selected for the study was a hydraulic excavator equipped with a slurry-processing unit (provided and operated by Bean Environmental LLC).

The evaluation of the dredge performance relative to removal of contaminated sediments included two components: 1) The first (primary) goal was to evaluate the dredge's ability to remove contaminated sediments to a given depth horizon relative to the dredging plan (Foster Wheeler Environmental Corporation – FWENC, 2000a). Results of this analysis are reported within Section 3 of the main report; and 2) A secondary objective was to determine how effectively the dredging technology could remove contaminated sediments within the test area by comparing pre and post dredge PCB concentrations. This information was used to determine overall PCB mass removal efficiency and to evaluate the effectiveness of this technology with regard to site-specific cleanup levels under the conditions of the PDFT. Results of this evaluation are reported in this Appendix.

The PDFT was performed in August 2000 in a 100-foot by 550-foot (31m x 168m) area within New Bedford's Upper Harbor (Figure J-1) referred to in this Appendix as the "test area". Prior to dredging, a series of sediment cores were collected in this area. Cores were split into 1-foot (0.3m) sections to undergo PCB analysis. Geostatistical methods were used to map the initial PCB concentration in sediments in 1-foot (0.3m) horizons over the test area. Following dredging, sediment cores were collected in the test area at the same locations as the cores taken before dredging and analyzed for PCBs. The results were then mapped over the test area. Comparison of the pre- and post-dredging PCB data allowed for assessment of the PCB removal efficiency of the dredging system during the PDFT.

Characterization of surface sediments within the test area prior to dredging indicated a high silt-clay content and a high water content (32-43% solids by weight). Therefore, it was envisioned suspension of material during dredging and sloughing of the sediment adjacent to the dredged area could re-contaminate the test area (especially along the boundaries) either during or shortly after dredging was completed in a specific area. To evaluate the extent of this potential re-contamination, post-dredging surface grab samples were collected at each core location, as well as at a series of other locations within the test area.

This Appendix reports on the comparison of the pre- and post-dredge PCB concentrations as part of the overall efficiency evaluation. The work represents a joint effort by the U.S. EPA (Region I and ORD), the U.S. Army Corps of Engineers (USACE, New England District), and ENSR International (under contract DACW 33-96-D-004 to the USACE). The results of the water quality monitoring and air quality monitoring can be found in Appendices K and L, respectively.

J.2 METHODS

J.2.1 Selection of Sampling Locations

A systematic grid of 30 sampling points was assigned to the original 100-foot by 400-foot (31m x 122m) dredging test area (cuts 1-14 in Figure J-2). These sampling points are labeled as EPA 1 through EPA 30 in Figure J-2. Spacing of the sampling points was designed to allow for adequate characterization of the pre-dredge PCB concentrations within the test area to assist in development of the dredge plan. The spacing and number of sampling points also allowed for performance of statistically valid comparisons between pre- and post- dredging concentrations to assess the ability of the dredge to achieve target cleanup levels within the test area.

Prior to the start of the dredging, the original test area was expanded 150 feet (46 m) to the west into the adjacent deeper water (cuts A-E in Figure J-2) to permit more dredge volume should it have been needed over the course of the PDFT. Consequently, the existing sampling grid was expanded into this area, with an additional 10 sampling points established and sampled prior to the start of dredging. Post-dredge samples were collected at the same locations as the pre-dredge samples with the addition of sampling point EPA 31. This sample point was added to allow for characterization of post-dredge sediment conditions in the portion of cut A of the provisional area that was ultimately dredged (Figure J-2). Target and actual sampling locations are presented in Table J-1.

Additional post-dredge grab samples were collected at other locations within the test area. These grabs were taken with the goal of assessing surficial sediment contaminant levels within the first 0-2 cm (0-0.8 inches) immediately after dredging. The specific target locations for these grabs were not determined prior to sampling. Rather, the general area and spacing were established, with the actual locations determined as the sampling crew worked around the shifting dredge-anchor system. The grab sampling included locations near the center of each dredge cut as well as closely spaced locations along two transects crossing cut 1. Transects were located in Cut 1 to assess potential worst case conditions for recontamination of the dredge area due to sloughing. Cut 1 was chosen for this assessment because it was bordered on three sides by undredged areas containing thick layers of contaminated silt. Actual sampling locations are presented in Figure J-2 and in Table J-1.

J.2.2 Pre-Dredge Sediment Collection

Sediment core samples were collected at 40 stations including the 30 samples from the original 100-foot x 400-foot (31m x 122m) dredge footprint of the test area and the 10 additional samples from the expanded test area located immediately to the west (Figure J-2). Samples were collected using 2.625-inch (6.668cm) outside diameter push-core barrels (clear polycarbonate liners) that were outfitted with an internal piston for maximizing recovery and for maintaining

the stratigraphy within the core samples. The sampling platform used for the effort was a 26-foot Carolina Skiff. The vessel was equipped with a center moon-pool well and A-frame for deploying and recovering sampling equipment and a 3-point anchoring system for accurate vessel positioning. Coring operations were performed by TG&B, Inc.

Sampling was accomplished by mounting a bearing plate and extension pole atop a length of polycarbonate liner. The piston was positioned inside at the bottom of the liner, and an attached cable was led up inside the liner and out through the top of the bearing plate. At each station the depth was accurately recorded and transferred to the rigging of the sampling equipment along with a second mark with a differential of +4 feet (1.2 m) in order to indicate the target penetration depth required by the project. Once the bottom of the core barrel reached the sediment water interface, as indicated by the markings, the cable leading down to the top of the piston was secured to a fixed point on the A-frame, thus preventing any further vertical movement downward with the core barrel. The core barrel was manually driven into the sediments. The piston, fixed at the sediment/water interface, placed the sample under negative pressure during retrieval, allowing for recovery of a nearly undisturbed core sample.

The core barrel was driven through the soft materials until the target 4-foot (1.2m) penetration was achieved. At some locations, the core barrel could not be manually driven the full 4 feet (1.2m). Smaller penetration depths (less than 4 feet (1.2m)) were permitted if, upon core retrieval, a visible horizon marking the transition between the soft black surficial material and underlying lighter colored clay was obtained. For the cores collected in the expanded test area, longer cores (greater than 4 feet (1.2m)) were collected to ensure that the soft black surficial material was fully penetrated.

A firm sandy bottom was encountered at stations 6 and 18, which significantly limited the depth the cores could be driven to manually. For these stations, the outside of the liner was armored with a steel jacket and a vibratory attachment was used to achieve a greater penetration depth. Once the sampling equipment was recovered, the core barrel was removed from the assembly and immediately capped on the bottom and promptly labeled. Any overlying water was allowed to settle, and the liner was cut just above the sediment/water interface and securely capped.

Additional information on sampling methodology can be found in the Quality Assurance Project Plan (QAPP) and related coring Standard Operating Procedures (ENSR, 2000).

J.2.3 Post-Dredge Sediment Collection

Post-dredge core sampling methodology was similar to that of the pre-dredge effort. However, all cores were collected using a push-core (no vibracore) since the required depth of penetration was only 2 feet (0.6m) below the sediment water interface, as opposed to the 4 feet (1.2m) in the pre-dredge effort. The post-dredge coring targeted only those sampling points that fell within the area actually dredged during the PDFT (see Figure J-2).

In addition to the collection of core samples, grab samples were also obtained at these stations as well as at a number of additional locations to monitor dredge performance (Figure J-2). Grabs were collected along two transects across cut 1 to help characterize a "worst case" of edge effects on recontamination (the cut was bounded by a relatively thick layer of fine-grained surficial sediments). Grab samples were collected using a petite-ponar sampler or a similar device having

a penetration depth of approximately 6 inches (0.15m). As the goal of the grab sampling was to assess surficial contamination only, the top 2 cm (0.8 inches) of material was removed from each grab and transferred into a pre-labeled glass jars for laboratory analysis.

J.2.4 Positioning

Positioning for coring was achieved using a survey grade differential global positioning system (DGPS), a Trimble Real Time Kinematic (RTK) system with the capabilities of continuous centimeter level accuracy. Navigational coordinates for each targeted sampling point were pre-entered into the system as "waypoints" so that the vessel operator could view range and bearing information to each sampling point during vessel positioning. Once the vessel was at a given sampling point, fine level positioning adjustments were made using the 3-point mooring system to achieve the requirements of 2-foot (0.6m) horizontal accuracy. To prevent the possibility of maneuvering operations impacting the bottom sediments, anchors for each line were set well outside of the footprint for the evaluation area and buoyant mooring line was utilized. Positioning during the collection of the additional grab samples (collected shortly after a cut was dredged) was achieved with a Trimble Pro-XRS DGPS unit with sub-meter accuracy.

J.2.5 Laboratory Analysis of Sediment PCB Concentrations

The sediments collected for the dredge efficiency testing were analyzed for the 18 congeners selected by NOAA for the National Status and Trends program and by the EPA EMAP program (hereafter referred to as the NOAA 18). Two laboratories supported ENSR in performing the analysis. Arthur D. Little located in Cambridge, MA was selected as the primary laboratory, and Woods Hole Group located in Raynham, MA participated as the backup/QA laboratory.

Sediments arriving at the analytical laboratory were immediately placed in freezers for storage (-0°C) until further processing. Core samples were later thawed partially to allow removal from core tubes and scraped with a stainless steel spoon to remove the outer centimeter of sediment. This scraping process removed sediment transferred to different depths during the coring process and allowed analysis of the undisturbed central portion of the core. The cores were cut into 1-foot (0.3m) sections and allowed to thaw before mixing to form the composite sample. The preparation methods used to generate these data were selected to match methods used by previous investigators and are detailed in the project Quality Assurance Project Plan (QAPP; ENSR, 2000).

The U.S. EPA's Atlantic Ecology Division's Standard Operating Procedure (SOP), *The Extraction of New Bedford Harbor Sediment Samples for PCBs,* was used for this study with minor modifications as proposed in the QAPP. Freon was omitted from the test protocol and replaced with methylene chloride; heptane was replaced by hexane; and an additional clean-up step, using alumina, was added to the method. Sediments were mixed with methylene chloride and acetone and disrupted using ultrasonication. Extracts were cleaned using alumina, activated copper, and sulfuric acid, and exchanged into hexane for instrumental quantitation.

The compounds dibromo-octafluoro-biphenyl (DBOFB), PCB 103, and PCB 198 were added to all samples as surrogate internal standards (SIS) and carried through the sample preparation and analysis process as a measure of accuracy. The Pre-Design Program sediment data sets were SIS corrected using PCB 103 for consistency with other data from the area (New Bedford Harbor

Long Term Monitoring Program). In a few cases the recovery of this compound was suspect, and the data were corrected using PCB 198.

Analysis of the final extracts was accomplished using GC/ECD instrumentation, which provides excellent (ppb) detection limits for the NOAA 18 congeners. The analysis utilized two chromatographic columns with dissimilar phases to allow confirmation of the target compounds.

Estimates of total PCBs as homologue were calculated based on a mathematical relationship among these parameters in New Bedford Harbor sediments determined by Foster Wheeler Environmental Corporation (FWENC, 2001). The following formula was used to calculate total homologues:

PCB Homologue Calculations

$$y = 2.5x$$

where:

y = total PCB concentration as homologues in ppm

x = sum of the concentrations of the NOAA 18 congeners in ppm

The laboratory data were validated by ENSR's QA department. Validation included assessment of the following elements:

- Analytical completeness (agreement with chain-of-custody and project requirements);
- Sample preservation and holding times;
- Instrument initial and continuing calibration information;
- Laboratory method blank/equipment blank contamination;
- Surrogate spike recoveries;
- Matrix spike/matrix spike duplicate (MS/MSD) results;
- Laboratory control sample (LCS) results;
- Standard reference material (SRM) results;
- Instrument reference standard (IRS) results;
- Internal standard performance; and
- Quantitation limits and sample results.

The validation was used to potentially qualify or reject sample or individual congener data that did not meet the data quality objectives established in the QAPP (ENSR, 2000).

J.2.6 Geostatistics and Mass Removal

The composite values for each depth horizon were used to produce PCB concentration contour maps of the PDFT area for three sediment depth horizons in the pre-dredge conditions (0-1 foot, 1-2 foot, 2-3 foot (0-0.3m, 0.3-0.6m, 0.6-0.9m)) and for one depth horizon in the post-dredge conditions (0-1 foot (0-0.3m)). Contours were produced using both inverse distance weighting (IDW) and kriging methods to interpolate the PCB data between core locations.

The PCB mass removed was estimated by first calculating the mean PCB concentration within each 1-foot (0.3m) horizon. This concentration value (mass PCB/mass sediment) was then

multiplied by the mass of sediment within each horizon to obtain the total mass of PCBs within each horizon. The PCBs within the three 1-foot (0.3m) horizons were summed to obtain the total PCBs within the test area. A similar process was used to calculate the PCB mass in the top 1-foot (0.3m) of sediment after dredging. The post-dredge mass of PCBs was divided by the pre-dredge mass to obtain the overall PCB removal efficiency.

J.3 DESCRIPTION OF THE COLLECTION EFFORT

Collection of the pre-dredge sediment samples over the original pre-design test area (cuts 1-14 in Figure J-2) was performed on 13-16 June 2000. This allowed for sufficient time to complete the laboratory analyses and to incorporate the results into the dredging plan for the test area. Just prior to the start of the dredging in August 2000, an expanded test area was defined to the west of the original test area (cuts A-E in Figure J-2) to accommodate potential additional dredging during the PDFT. Additional cores were collected in this area immediately prior to the start of dredging (7-8 August 2000). Samples from this expanded test area were archived and were to be analyzed only if dredging was actually performed in that area. A summary of the pre-dredge collection efforts is presented in Table J-2.

Grab samples of the top 0-2 cm (0-0.6 inches) of sediment were collected as soon as practicable after dredging was completed in a given cut, generally on the same day as the dredging and often within several hours of the dredging. These grab samples were collected from 12 August through 18 August. Reoccupation of the pre-dredge sampling points and collection of cores and grabs was performed on 17, 18, and 21 August, all within two to four days of the completion of dredging in a given cut. A summary of the post-dredge collection efforts is presented in Table J-2.

J.4 RESULTS

J.4.1 Analytical Results

The results from the analysis of pre-dredge core samples are presented in Table J-3. Post-dredge core and grab data from the pre-established sampling grid are presented in Table J-4. Analytical data from the additional post-dredge grabs collected along the two transects across cut 1 are presented in Table J-5. A summary of the total PCB concentrations (as total homologues) for all of the analyzed sediment samples is presented in Table J-6. Note that pre-dredge cores from the provisional test area that was not dredged and the additional non-transect grab samples (see Figure J-2) were not analyzed.

Samples or individual congener data that did not meet the data quality objectives (DQO's) established in the QAPP were flagged/qualified. None of ENSR's findings warranted rejection of any data. Selected sample or congener results were qualified with a "J" to indicate that the value was below the statistically derived reporting limit or did not meet project DQO's and should be considered an estimate. Detailed qualifier explanations were included in the associated validation memoranda and summarized on the data tables.

Equipment blank data associated with the core collection effort were determined to be clean relative to the sediment concentrations. Congeners PCB 8, PCB 118, PCB 170, and PCB 195

were not detected in the blank. The remaining congeners were detected at concentrations <1% compared to sample results.

J.4.2 Pre-Dredge Characterization

A physical description of the pre-dredge cores is presented graphically in Figure J-3. The logs in this figure are based on visual observation of the sediment material through the clear polycarbonate core tubes. As the tubes scratch easily and the coring process can potentially drag sediments down, smearing them along the wall of the core tube, the core logs should be considered approximate. For cores that were designated for analysis, the tube was cut away in the lab (the cores had been frozen). The outer layer of sediment (that was potentially smeared during the coring process) was scraped away in the lab exposing the inner sediments. The lab recorded the approximate position of significant color and texture changes for the inner section of the core. This position has been noted in the core logs as the red lines in Figure J-3.

A review of the core logs in Figure J-3 reveals that most of the PDFT area was overlain with a layer of black silty material. The thickness of this layer generally increased from east to west, ranging from several inches in cut 14 to over 4 feet (1.2m) in cut E. This material had a high water content and often had a distinct H_2S and/or petroleum odor. Shell fragments were also observed in this material. Sand was noted beneath the thin layer of silt material in the extreme eastern portion of the area. Over the remainder of the pre-design area, the black surficial deposit was underlain by a light gray, clay-like material.

For the cores that were analyzed, the PCB concentrations (ppm as total homologues) have been overlaid on the core logs in Figure J-4. Each reported value represents the concentration in the 1-foot (0.3m) section of core that was composited for analysis. A review of Figure J-4 reveals that elevated PCB concentrations are generally restricted to the silty surficial deposit. PCB concentrations ranged from several hundred to several thousand ppm for 1-foot (0.3m) composite core sections that consisted entirely of the silty material. The 1-foot (0.3m) composite core sections that were entirely situated in the underlying clay or sand deposit had no or very low (<10 ppm) detectable PCB concentrations.

J.4.3 Post-Dredge Characterization

A physical description of the post-dredge cores is presented graphically in Figure J-5. For the area that was dredged, the sample logs reveal a uniform layer of light gray, clay-like material generally overlain by a thin veneer of black, silty material. As described in Section 3.1 of the main report, dredging was performed only in cuts 1-8 and the southern portion of cut A (see Figure J-2 for dredged area location). In the physical description presented in Figure J-5, the logs for locations 10 and 22 in cut 9, location 23 in cut 11, and location 12 in cut 13 represent areas that were not dredged. Post-dredge cores were collected at these locations to assess if sediment conditions changed adjacent to the dredged area.

For the cores and grabs that were analyzed, the PCB concentrations (ppm as total homologues) have been overlaid on the core logs in Figure J-6. For the grabs, the PCB concentrations represent a composite of the 0-2 cm (0-0.8 inch) sediment depth. These concentrations are reported in the box above each core. For the cores, the PCB concentrations represent a composite of the 0-1 foot (0-0.3m) sediment depth. These concentrations are reported within each core.

PCB concentrations for the grabs (generally representing the black silty material) ranged from 0.47 ppm (location 2) to 470 ppm (location 31) and were generally above 100 ppm. Concentrations in the upper 1-foot (0.3m) composite from the cores ranged from 0.67 ppm (location 9) to 130 ppm (location 21) and were generally above 7 ppm. PCB concentrations were significantly higher in the grabs than in the upper 1-foot (0.3m) core composites at 16 of the 18 locations where both grabs and cores were analyzed.

A comparison of core logs and PCB concentrations for pre- and post-dredge conditions is presented in Figure J-7 for an east-west transect and in Figure J-8 for a north-south transect. For both transects, the vertical position of the post-dredge cores and post-dredge bathymetry clearly shows that dredging removed material to below the pre-dredge silt/clay boundary. Comparing the PCB concentration at a given 1-foot (0.3m) depth interval for the pre- and post-dredge cores shows that the post-dredge values are consistently higher.

PCB concentrations in surficial sediments along two transects crossing cut 1 are presented in Figure J-9. These grab samples were collected within several hours of completion of the dredging in the cut. Transect 1 ("T1" series of samples) was aligned near the northern extreme of cut 1, and transect 2 ("T2" series of samples) was aligned approximately 20 feet (6.1m) south of transect 1. See Figure J-2 for the location of the transects and sampling points. Lowest PCB concentrations were noted near the center of both transects. Concentrations increased to the east toward the overlap with the previously dredged cut 1 and to the west toward cut A which had not been dredged.

J.4.4 Geostatistics and Mass Removal

A comparison was made between the inverse-distance weighting (IDW) and kriging methods used to interpolate PCB concentrations and produce contour maps. The difference between the two methods was less than 5%; therefore, only results using the IDW method are presented in this report.

Figures J-10, J-11, and J-12 show the contoured pre-dredge PCB concentrations for the 0-1 foot, 1-2 foot, and 2-3 foot (0-0.3m, 0.3-0.6m, 0.6-0.9m) depth horizons, respectively (average concentrations over the one-foot interval). The results are tabulated for each overall depth horizon as well as just for the dredge area (Table J-7). The pre-dredge PCB concentrations decreased significantly with depth in the study area (e.g., 857 ppm to 26 ppm between the 0-1 foot (0-0.3m) and 2-3 (0.6-0.9m) foot depth horizons), indicating that the PCBs in this area are not being buried, or diluted, by clean sediment over time. These concentrations were used to set the target depth for the dredging (depth with a PCB concentration less than 10 ppm).

The post-dredge PCB concentration contours are presented in Figure J-13 and in Table J-7. As described in Section 3 of the main report, the dredge removed from 1 foot to more than 3 feet of sediment over the test area down to the targeted clean horizon.

These data were used to calculate the mass of PCBs removed from the dredge area (Table J-8). The mass of sediment for each horizon was determined and multiplied by the average PCB concentration within each horizon to calculate the mass of PCBs within that horizon. The mass was summed for each pre-dredge layer to determine the total pre-dredge PCB mass within the dredge area. The post-dredge mass was divided by the pre-dredge mass to calculate the overall

PCB mass removal efficiency. The results indicate that approximately 97% of the PCB mass was removed from the test area during this dredging study.

J.5 DISCUSSION

The Pre-Design Field Test was designed to, among other goals, determine the ability of the proposed dredge system (as described in Section 2.3 of the main report) to remove contaminated sediment without causing adverse ecological or human health effects. Efficiency was determined based on the ability to remove PCB-contaminated sediment down to the 10 ppm depth horizon. Based on pre-dredge sediment cores, a dredging plan was established to accomplish this. Two measurement endpoints were identified to evaluate this technology. The first was to compare the volume of sediment actually removed to the estimated volume to be removed based on the original dredge plan. This was accomplished using bathymetric data before and after the dredging to determine how effectively the dredge performed (Section 3.0). Comparison of the target dredge volume with the actual volume dredged yielded an overdredging value of only 16%, with vertical accuracy of +/- 4 inches relative to achieving the intended horizon.

A second endpoint designed to evaluate removal efficiency included determining the sediment PCB concentrations before and after dredging to calculate overall PCB removal efficiency of the dredge. The dredge was very efficient in this regard. The results indicate that approximately 97% of the PCB mass was removed within the dredging boundaries. The average PCB concentration in the upper one-foot of sediments was reduced from 857 ppm to 29 ppm over the dredged test area. This met the clean up criteria of 50 ppm for the Lower Harbor and approached the criteria of 10 ppm for the Upper Harbor. It should be understood that the PDFT goal was **not** to leave a final sediment concentration of 10 ppm as this was a field test, **not** a remedial operation. Rather, the PDFT did have a goal of identifying potential mechanisms responsible for not reaching the 10 ppm cleanup level under the specific conditions of the PDFT.

During the design phase of this project, it was determined that most sediments within the dredge test area had a high water and silt/clay content. This fact introduced the possibility that some contaminated sediment within or immediately adjacent to the dredge area could be mobilized during the dredging process and potentially re-contaminate the dredged area. Mechanisms that could mobilize the sediments include bucket impact on the bottom, loss through the water column (appears minimal for the hydraulic excavator), anchor wire/spud repositioning, and material sloughing down slope along the sides of a dredged cut. Furthermore, other factors such as tidal currents and meteorological events (e.g., wind) could produce the same effect due to re-suspended contaminated sediments migrating from other areas of the harbor. The sediment characterization program included the collection of surface grabs in addition to cores in an effort to quantify the effects of sediment mobilization.

Based on the visual observations of the upper surface of the cores and grab samples and the results of laboratory analyses, some recontamination did occur within the test area. The relevant question with respect to dredge efficiency is to evaluate whether the post-dredge PCB concentrations were due to mobilized sediments settling out over the dredged area or due to undredged material (i.e., not all the material was removed by the dredge). Table J-9 presents a calculation of the how much surficial re-contamination, via a given mechanism (i.e., tide, wind), would be required to produce PCB concentrations above 10 ppm (upper one foot composite) in a previously clean area.

Assuming that an area were dredged to a clean (i.e., 0 ppm PCB) depth horizon, only a very thin layer of re-deposited, contaminated PCB sediment would be required to increase the concentration within a composited upper 1-foot (0.3 m) sediment core to greater than 10 ppm (Table J-9). For example, if the sediment adjacent to a clean dredge area has a PCB concentration of 4,000 ppm, it would require only a 0.03-inch (0.08cm) layer of newly deposited (post-dredging) contaminated sediment to elevate the average concentration of the upper one foot of clean sediment above 10 ppm. If the adjacent sediment PCB concentrations were between 500 and 1,000 ppm, which was the case in many parts of the test area, it would require only 0.12 inches to 0.24 inches (0.30 to 0.61cm) of newly deposited contaminated sediment to elevate the average concentration of the upper one foot of clean sediment above 10 ppm.

This thickness of contaminated silty material (only a thin veneer) is consistent with field observations made at the time of grab sample collection. The grab sampler penetrated approximately 6 inches (15 cm) into the sediment. Once retrieved, the top of the sampler was opened, and a portion of the upper 0.8 inches (2 cm) of sediment was removed for analysis. This allowed for visual inspection of the upper sediment profile within the sampler. Based on this information, it appears that the observed average post-dredge PCB concentration (29 ppm upper one foot of composite) can be attributed to deposition of mobilized sediments (either from the original dredged area or from adjacent areas by sloughing, tidal action, etc.), rather than inefficient or inaccurate dredging.

In summary, both the sediment removal data (presented in Section 3.0) and PCB data presented in this Appendix indicate that this dredging technology is very efficient at contaminated sediment removal. The results indicate that 97% of the PCB mass was removed over the test area, and the remaining sediment concentrations approached the site specific clean up criteria. The PCB mass remaining after dredging appeared to reside entirely in a thin surface veneer and was attributed to recontamination of the dredged area rather than incomplete removal. Adjustments to dredging and operational controls will reduce the influence of many potential recontamination mechanisms. Therefore, during full-scale dredging, a corresponding reduction in surficial sediment recontamination is expected.

J.6 REFERENCES

ENSR, 2000. *Sampling and Analysis Plan & Quality Assurance Project Plan for New Bedford Harbor - Pre-Design Dredge Efficiency Testing.* New Bedford Harbor Superfund Site, New Bedford Massachusetts. August 2000. Prepared under USACE Contract DACW33-96-D-0004.

FWENC, 2000. *Pre-Design Field Test Work Plan* New Bedford Harbor Superfund Site, New Bedford, Massachusetts. June 2000. Prepared under USACE Contract DACW33-94-D-002.

FWENC, 2001. *Draft Final Comparison of PCB NOAA Congeners with Total Homologue Group Concentrations Technical Memorandum.* New Bedford Harbor Superfund Site, New Bedford, Massachusetts. May 2001. Prepared under USACE Contract DACW33-94-D-002.

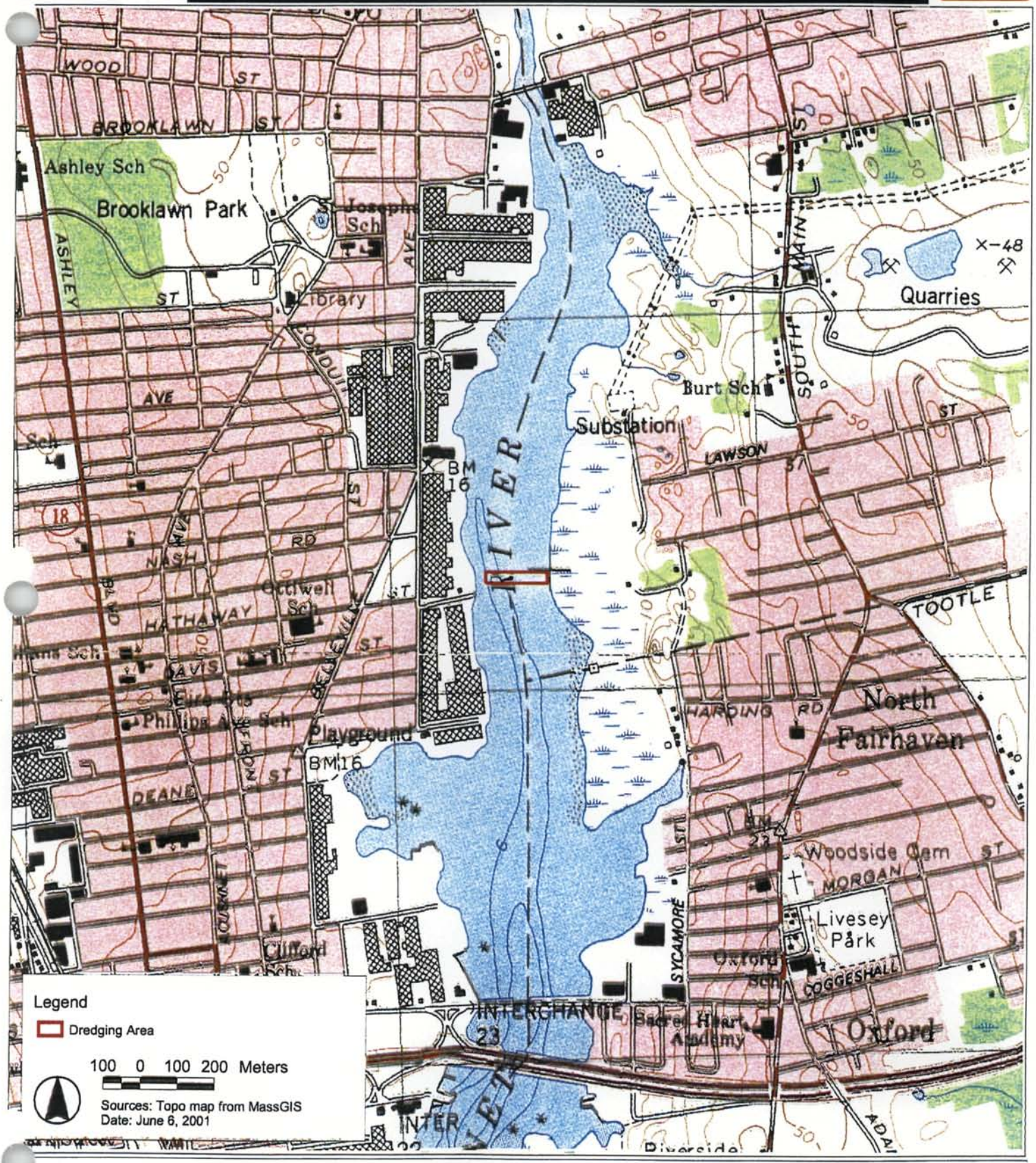
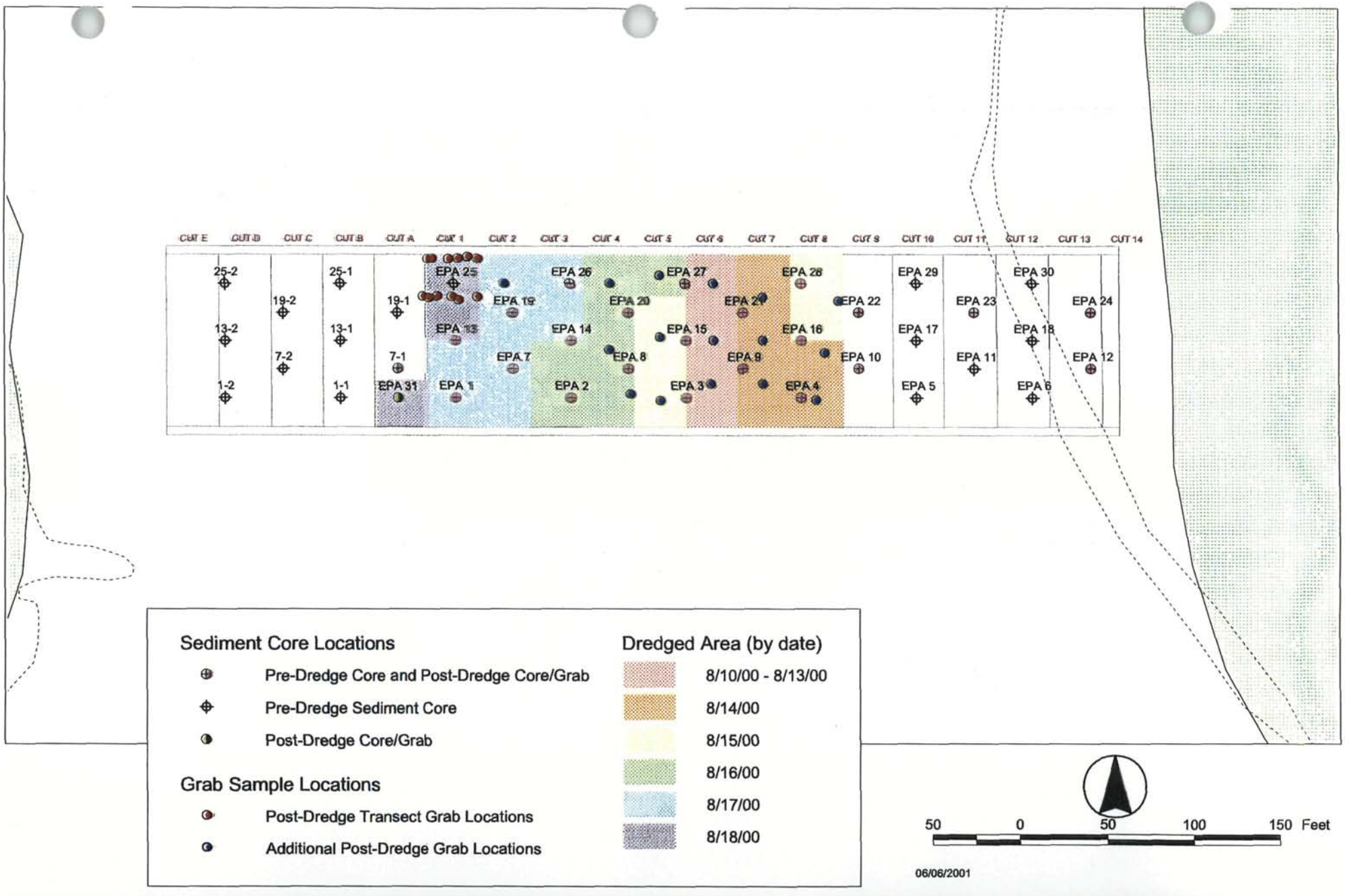
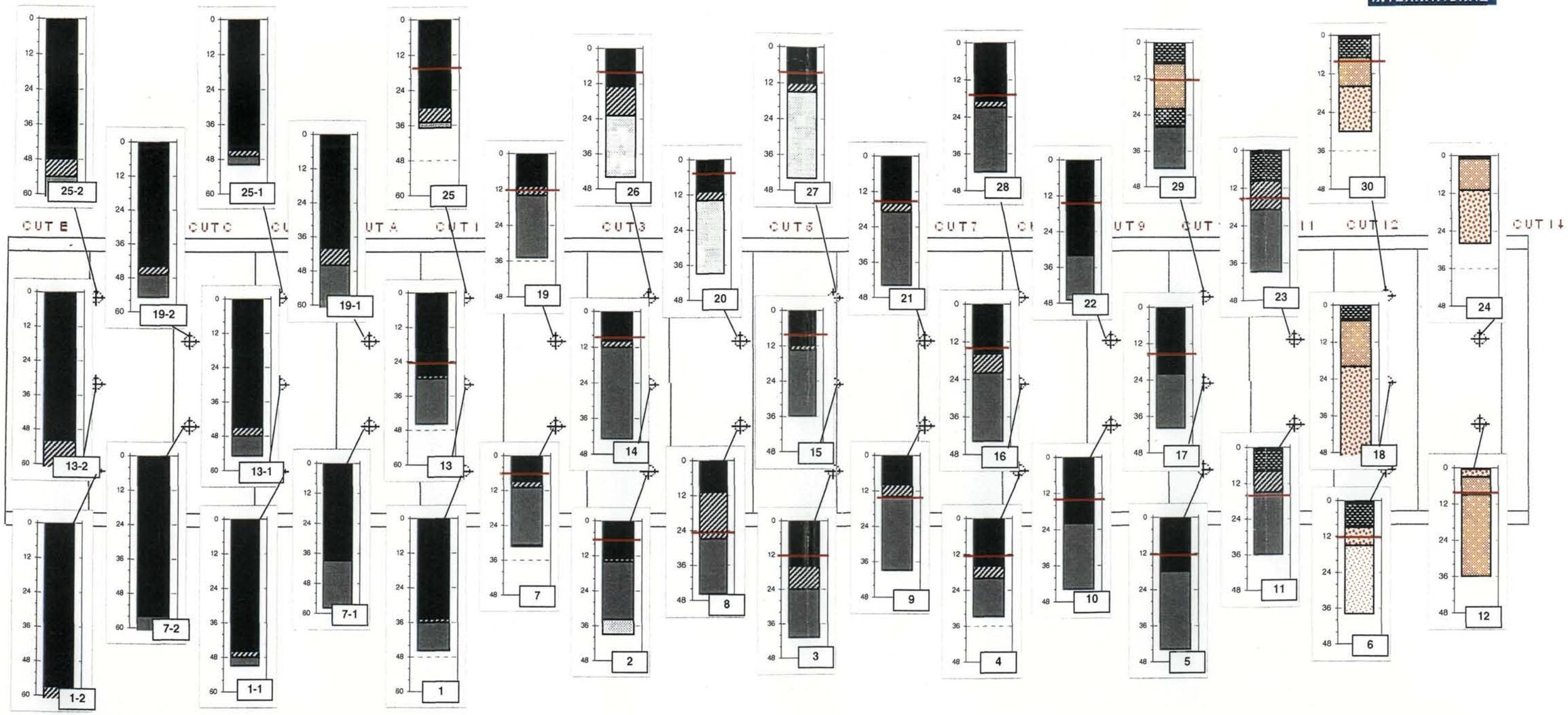


Figure J-1 Upper New Bedford Harbor Showing Pre-Design Field Test Area



U.S. Army Corps of Engineers - New Bedford Harbor Superfund Project
Figure J-2: Sediment Sampling Locations

ENSR INTERNATIONAL



Visual Classification of Sediment Type

- Black-Very Fine (most with obvious H_2S and/or petroleum odor).
- Dark Grey-Fine
- Transition Layer (may an be artifact of coring)
- Grey Fines
- Light Grey Fines
- Silty Sand
- Coarse Sand
- Fine Sand
- Color change noted by lab after removing outer layer

Notes

Depths are in inches from the sediment surface.

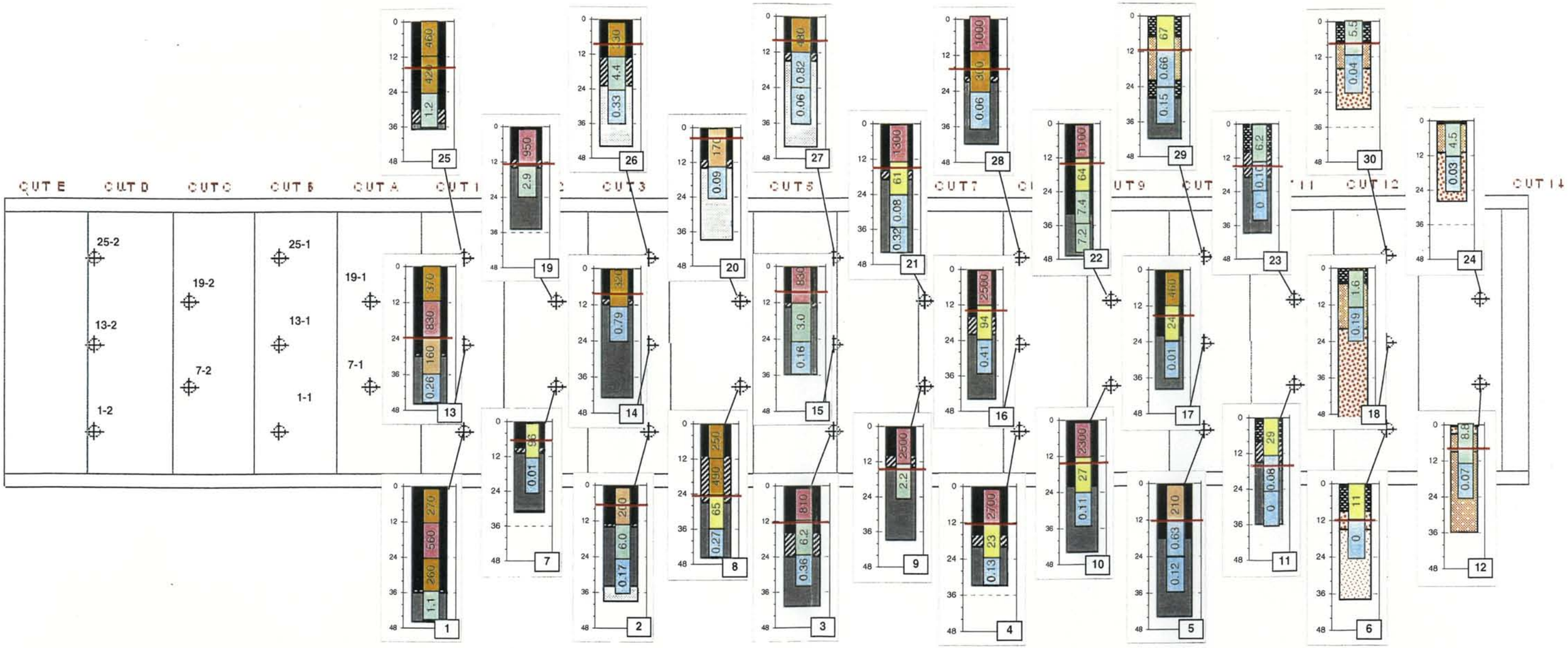
Samples 1-1, 1-2, 7-1, 7-2, 13-1, 13-2, 19-1, 19-2, 25-1, and 25-2 were collected 7-8, August 2000.
All other cores were collected on 13-15, June 2000.

Core 9: Laboratory noted that a piece of wood was through core cross-section.

Core 24: 1-11" is a mix of silt/sand and coarse sand with a slight gradation from dark to light.

Total length of core 7-2: 73"
Total length of core 1-2: 81"
Total length of core 13-2: 76"
Total length of core 19-1: 65"
Total length of core 25-2: 72.5"

Figure J-3
Pre-Dredge Core Logs
06-06-01



Visual Classification of Sediment Type

- Black-Very Fine (most with obvious H_2S and/or petroleum odor).
- Dark Grey-Fine
- Transition Layer (may be an artifact of coring)
- Grey Fines
- Light Grey Fines
- Silty Sand
- Coarse Sand
- Fine Sand
- Color change noted by lab after removing outer layer.

Notes

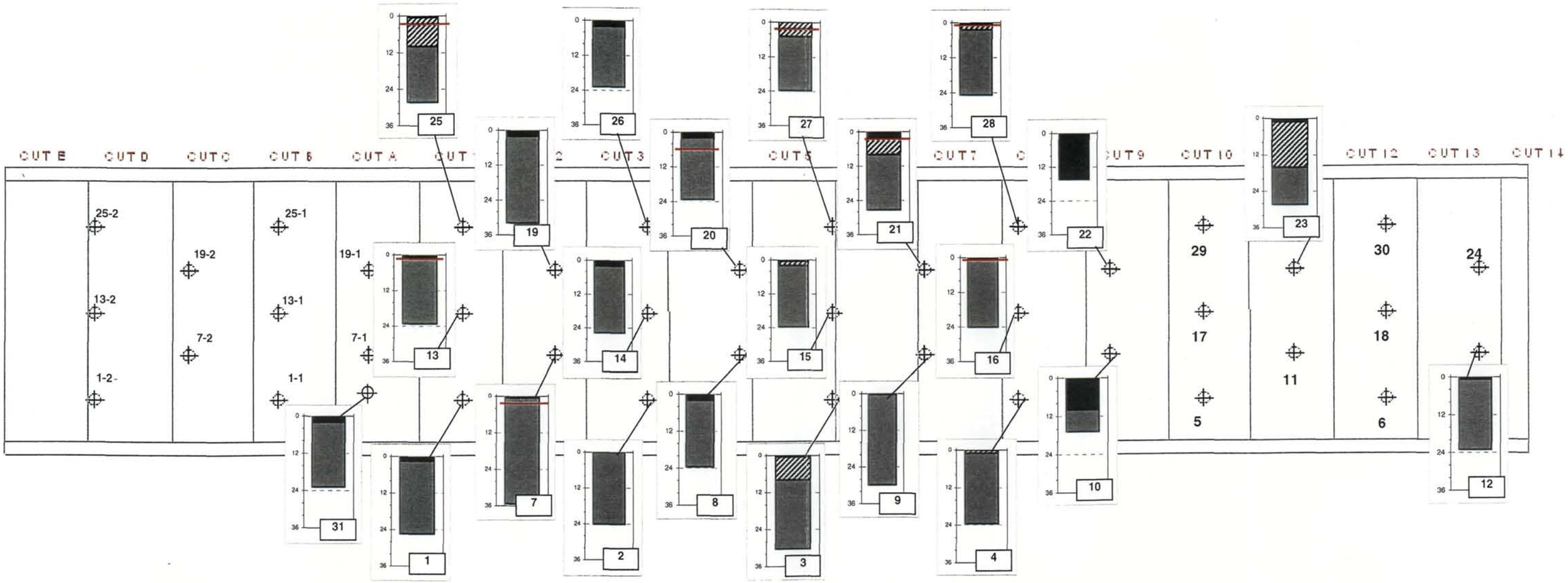
Depths are in inches from the sediment surface.
All PCB data have been surrogate-corrected.
Background stratigraphy is based on field observations.

Total PCB (ppm as total homologues[1])

- < 1 ppm
- 1-10 ppm
- 11-100 ppm
- 101-250 ppm
- 251-500 ppm
- > 500 ppm

[1] Calculated using Foster Wheeler's (February 2001) regression equation.
Total PCBs as homologues = NOAA 18 sum (ppm) * 2.5

Figure J-4
Pre-Dredge Core Logs+PCB
06-06-01



Visual Classification of Sediment Type

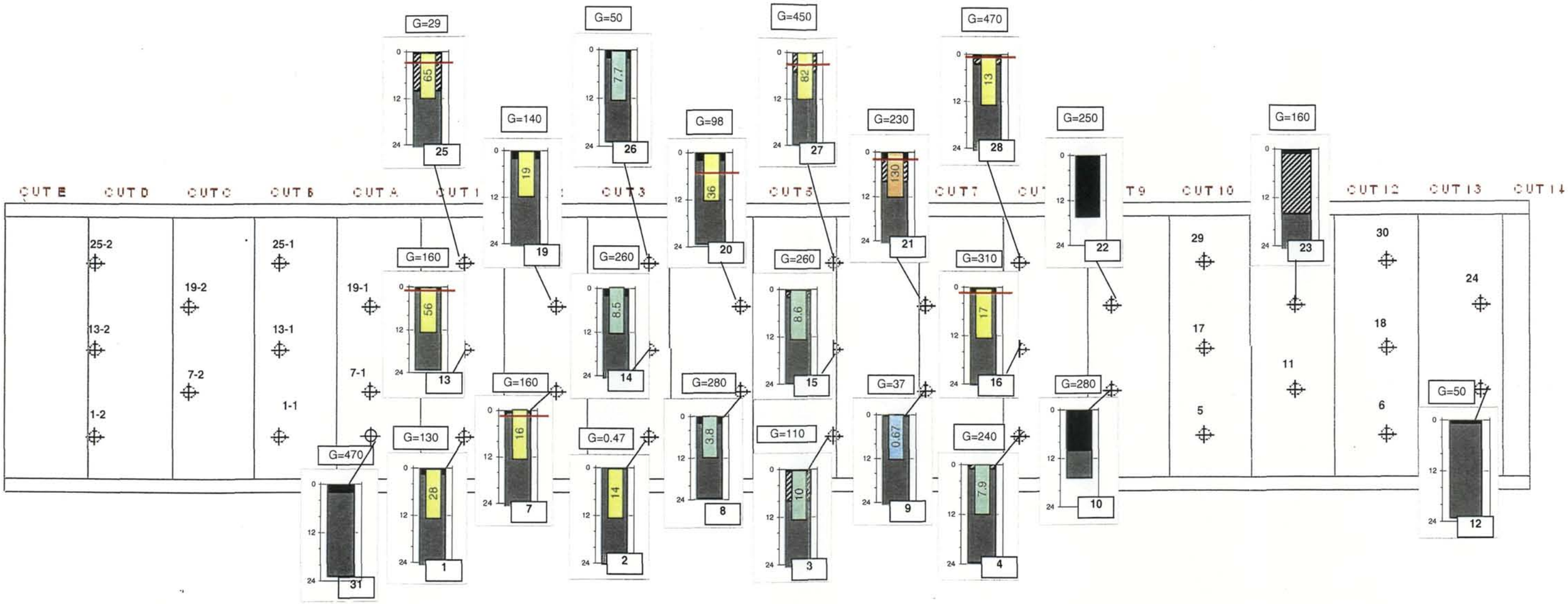
- Black-Very Fine (most with obvious H_2S and/or petroleum odor).
- Dark Grey-Fine
- Transition Layer (may be an artifact of coring)
- Grey Fines
- Light Grey Fines
- Silty Sand
- Coarse Sand
- Fine Sand
- Color Change noted by lab after removing outer layer, for top 12" only.

Notes

Depths are in inches from the sediment surface.
Cores were collected on 17, 18, 21 August 2000.
Cores 10, 12, 22, 23 were collected from area not dredged.

Figure J-5
Post-Dredge Core Logs
06-06-01

FigJ5-CoreLogPlots_August2000_Visual



Visual Classification of Sediment Type

- Black-Very Fine (most with obvious H_2S and/or petroleum odor).
- Dark Grey-Fine
- Transition Layer (may be an artifact of coring)
- Grey Fines
- Light Grey Fines
- Silty Sand
- Coarse Sand
- Fine Sand
- Color Change noted by lab after removing outer layer, for top 12" only.

Notes

Depths are in inches from the sediment surface.
All PCB data have been surrogate-corrected.
"G" = Grab samples were collected from a depth of 0-2cm.
All PCB concentrations are expressed in ppm as total homologues.[1]
Cores 10, 12, 22, 23 were collected from an undredged area.
Background stratigraphy is based on field observations.

Total PCB (ppm as total homologues[1])

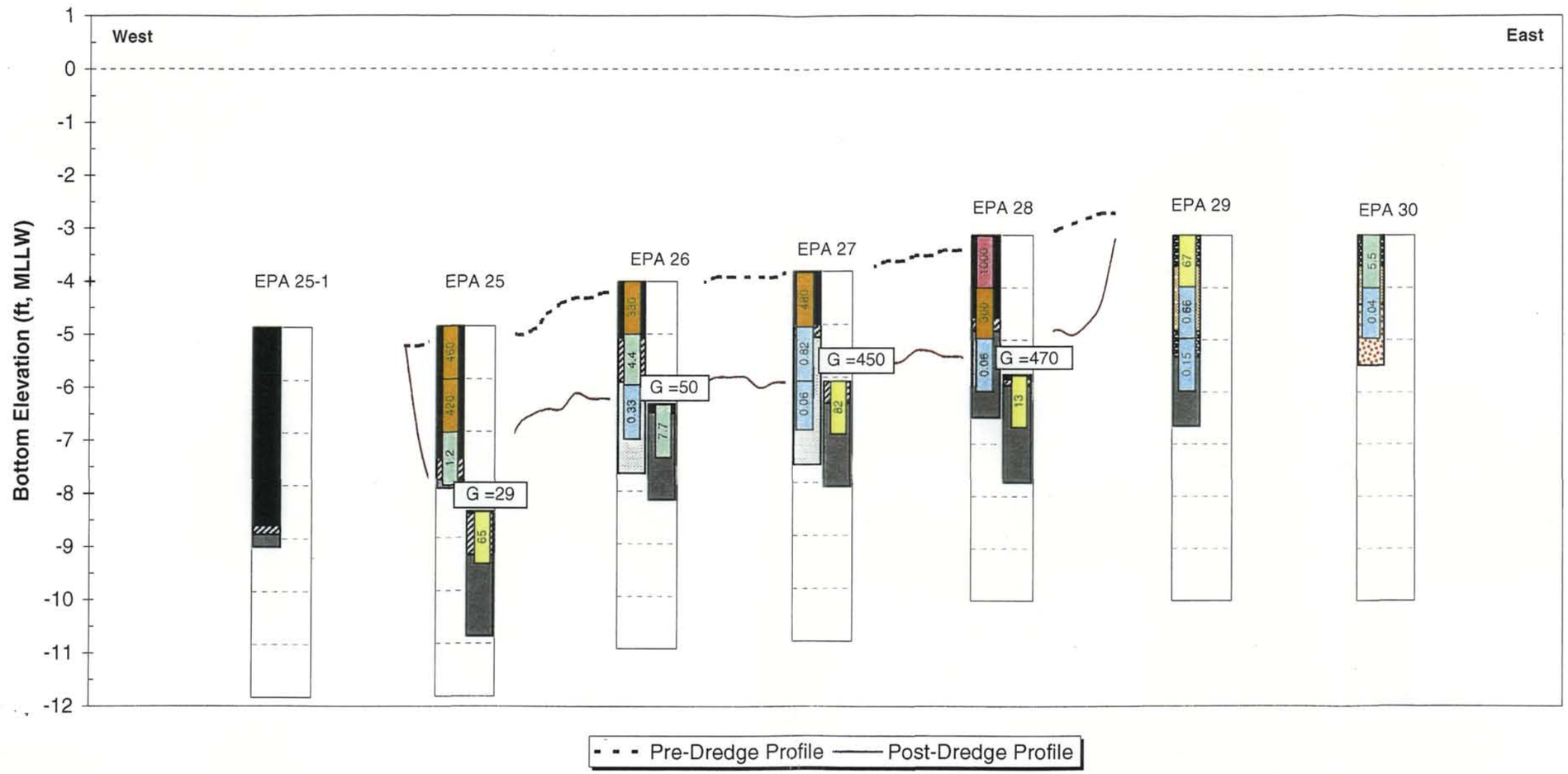
- < 1 ppm
- 1-10 ppm
- 11-100 ppm
- 101-250 ppm
- 251-500 ppm
- > 500 ppm

[1] Calculated using Foster Wheeler's (February 2001) regression equation.
Equation used:
Total PCBs as homologues = NOAA 18 sum (ppm) * 2.5

Figure J-6

Post-Dredge Core Logs+ PCB (Cores and Grabs)

06-06-01



Visual Classification of Sediment Types

- Black-Very Fine (most with obvious H_2S and/or petroleum odor).
- Dark Grey-Fine
- Transition Layer (may be an artifact of coring)
- Grey Fines
- Light Grey Fines
- Silty Sand
- Coarse Sand
- Fine Sand

Notes

Depths are in inches from the sediment surface.
All PCB data have been surrogate-corrected.
"G"= Grab samples were collected at a depth of 0-2cm
All PCB concentrations are expressed in ppm as total homologues.1
Background stratigraphy is based on field observations.

Total PCB (ppm as total homologues[1])

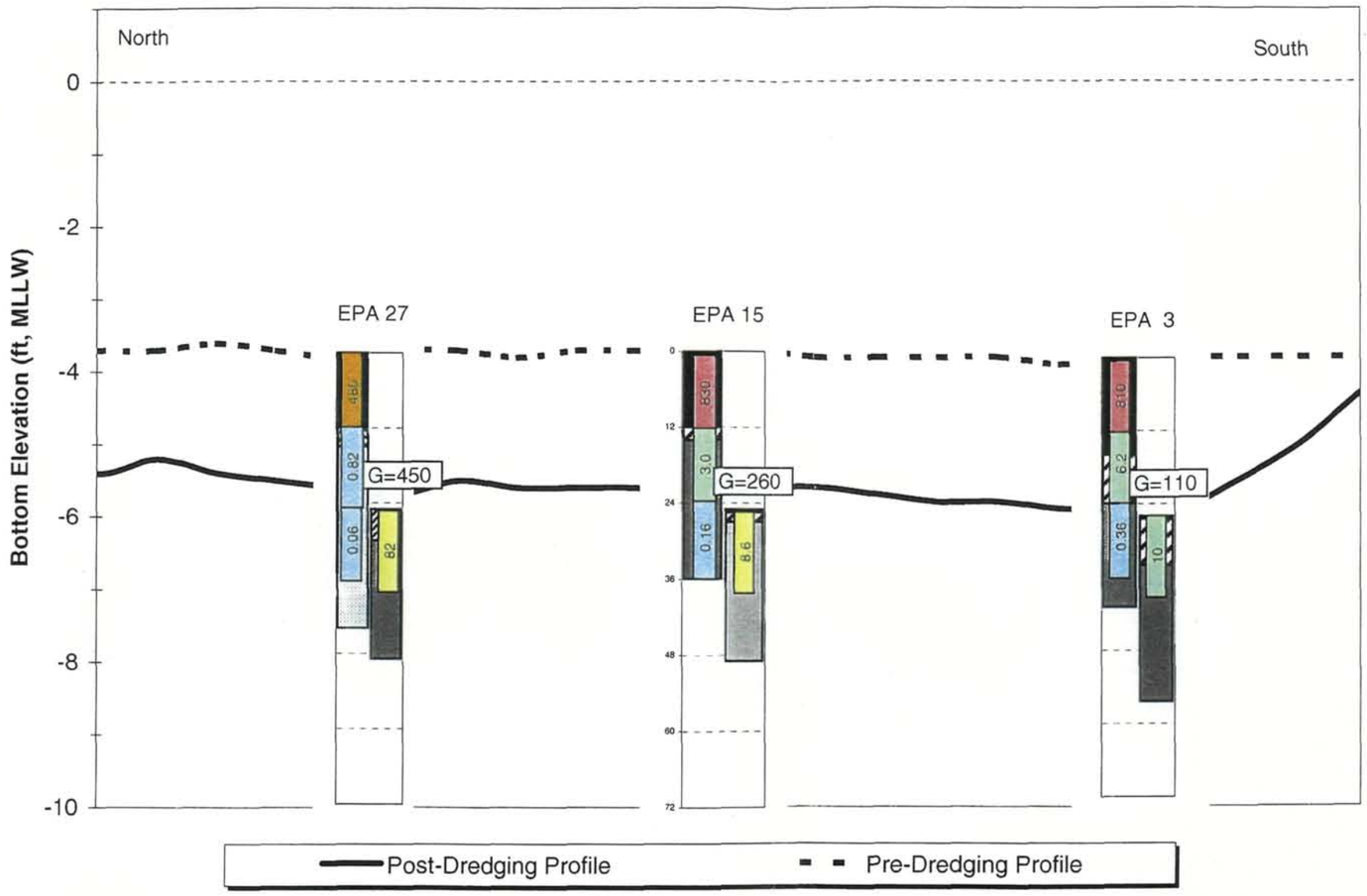
- < 1 ppm
- 1-10 ppm
- 11-100 ppm
- 101-250 ppm
- 251-500 ppm
- > 500 ppm

[1] Calculated using Foster Wheeler's (February 2001) regression equation.
Equation used:
Total PCBs as homologues = NOAA 18 sum (ppm) * 2.5

Figure J-7

Pre- and Post- Dredge Core Logs Along East-West Transect

06-06-01



Visual Classification of Sediment Type

- Black-Very Fine (most with obvious H_2S and/or petroleum odor).
- Dark Grey-Fine
- Transition Layer (may be an artifact of coring)
- Grey Fines
- Light Grey Fines
- Silty Sand
- Coarse Sand
- Fine Sand

Notes

Depths are in inches from sediment surface
All PCB data have been surrogate-corrected.
"G" = Grab samples were collected from a depth of 0-2cm.
All PCB concentrations are expressed in ppm as total homologues.[1]
Pre- and Post- Bathymetry data was provided by Bean Environmental.
Background stratigraphy is based on field observations.

Total PCB (ppm as total homologues[1])

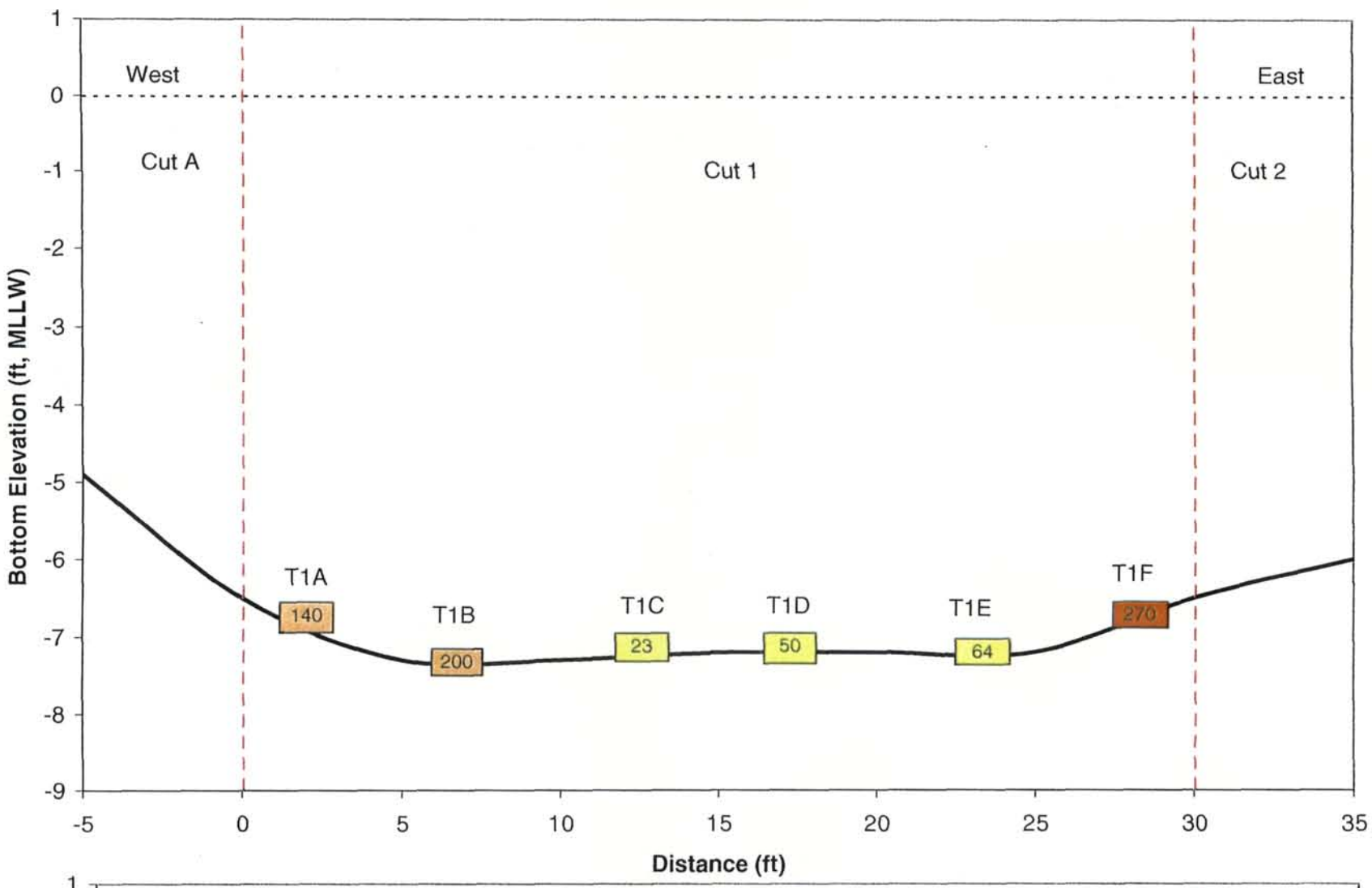
- < 1 ppm
- 1-10 ppm
- 11-100 ppm
- 101-250 ppm
- 251-500 ppm
- > 500 ppm

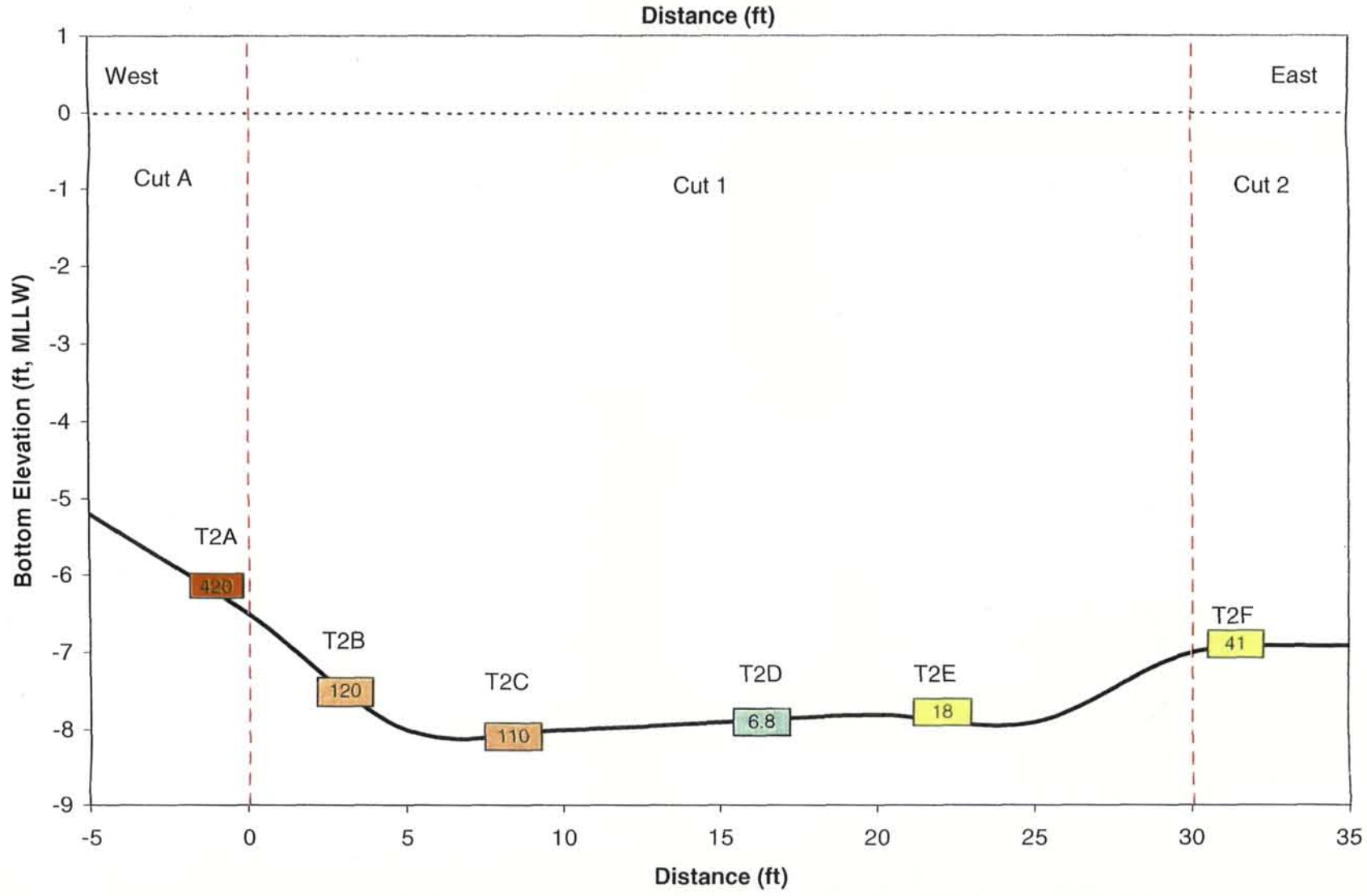
[1] Calculated using Foster Wheeler's (February 2001) regression equation.
Equation used:
Total PCBs as homologues = NOAA 18 sum (ppm) * 2.5

Figure J-8

Pre- and Post- Dredge Core Logs Along North-South Transect

06-06-01





Total PCB (ppm as total homologues[1])

- 0 < 1 ppm
- 7 1-10 ppm
- 46 11-100 ppm
- 150 101-250 ppm
- 300 251-500 ppm
- 1062 > 500 ppm

[1] Calculated using Foster Wheeler's (February 2001) regression equation.

Equation used:

Total PCBs as homologues = NOAA 18 sum (ppm) * 2.5

Notes

All PCB data have been surrogate-corrected.

Grab samples were collected from a depth of 0-2cm.

Bathymetry data provided by Bean Environmental.

Figure J-9
PCB Concentration in Post-Dredge Surficial Sediments Across Cut 1.
06-06-01

Figure J-10. Pre-dredge PCB concentration contours based on inverse-distance weighting interpolation; 0-1' depth sediment horizon.

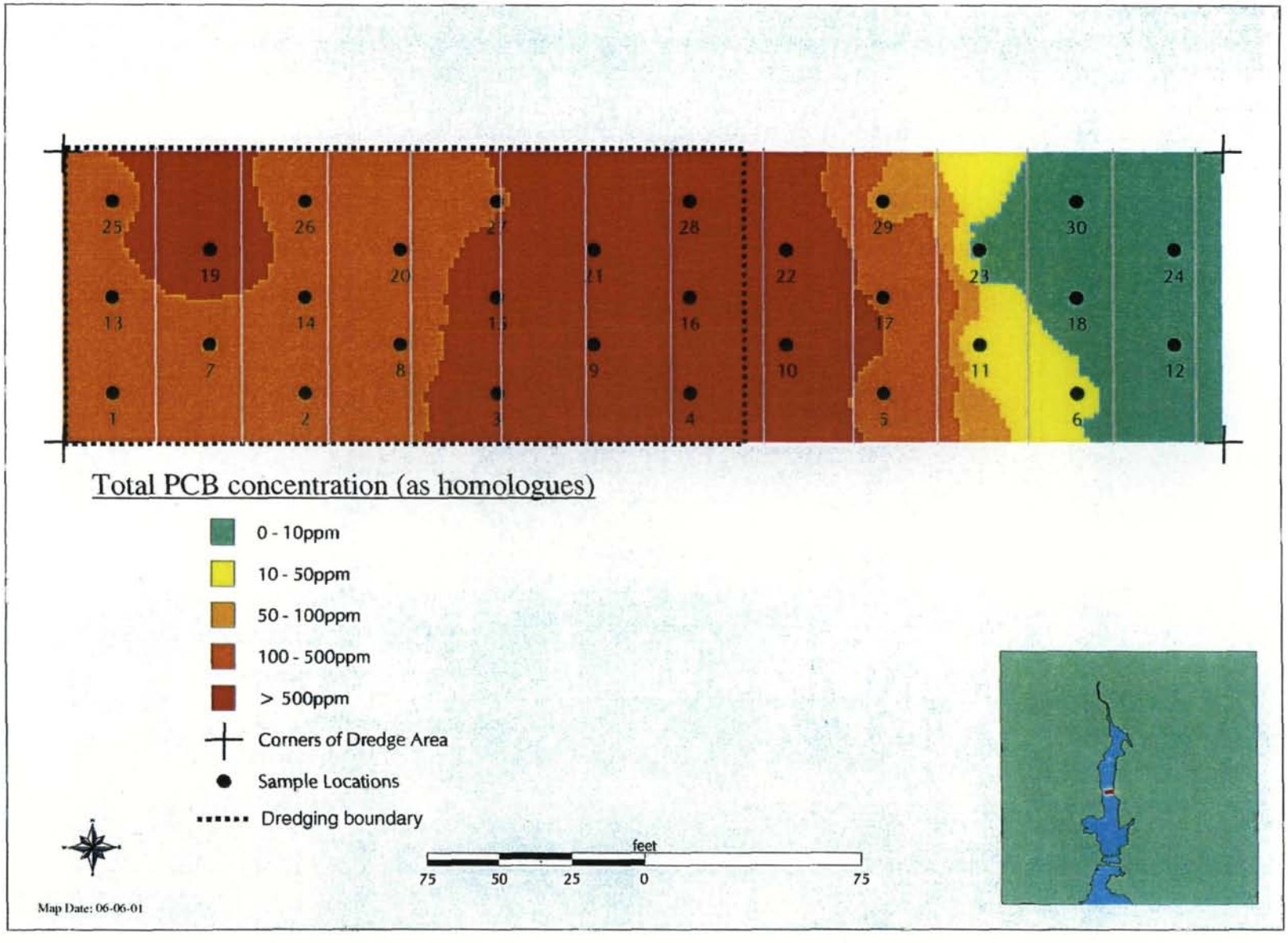
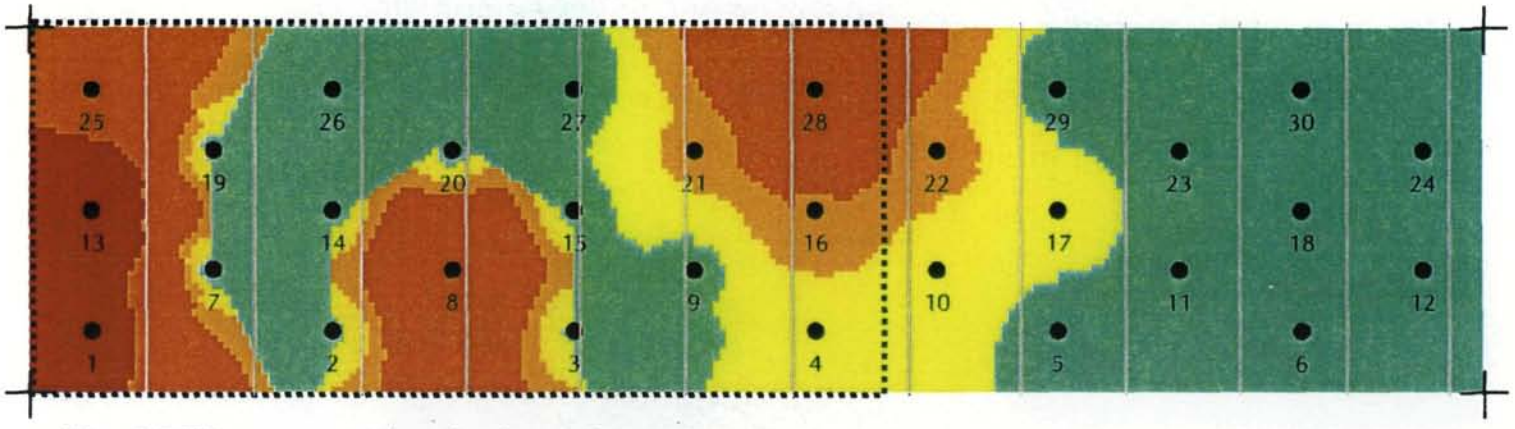


Figure J-11. Pre-dredge PCB concentration contours based on inverse-distance weighting interpolation; 1-2' depth sediment horizon.

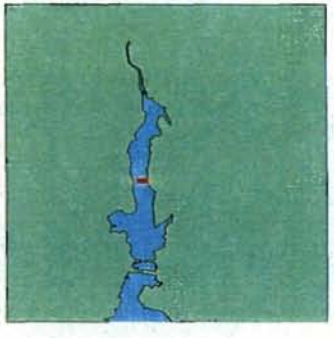
EPA
AED, Narragansett RI



Total PCB concentration (as homologues)

- 0 - 10ppm
- 10 - 50ppm
- 50 - 100ppm
- 100 - 500ppm
- > 500ppm
- Corners of Dredge Area
- Sample Locations
- Dredging boundary

feet
75 50 25 0 75



Map Date: 06-06-01

Figure J-12. Pre-dredge PCB concentration contours based on inverse-distance weighting interpolation; 2-3' depth sediment horizon.

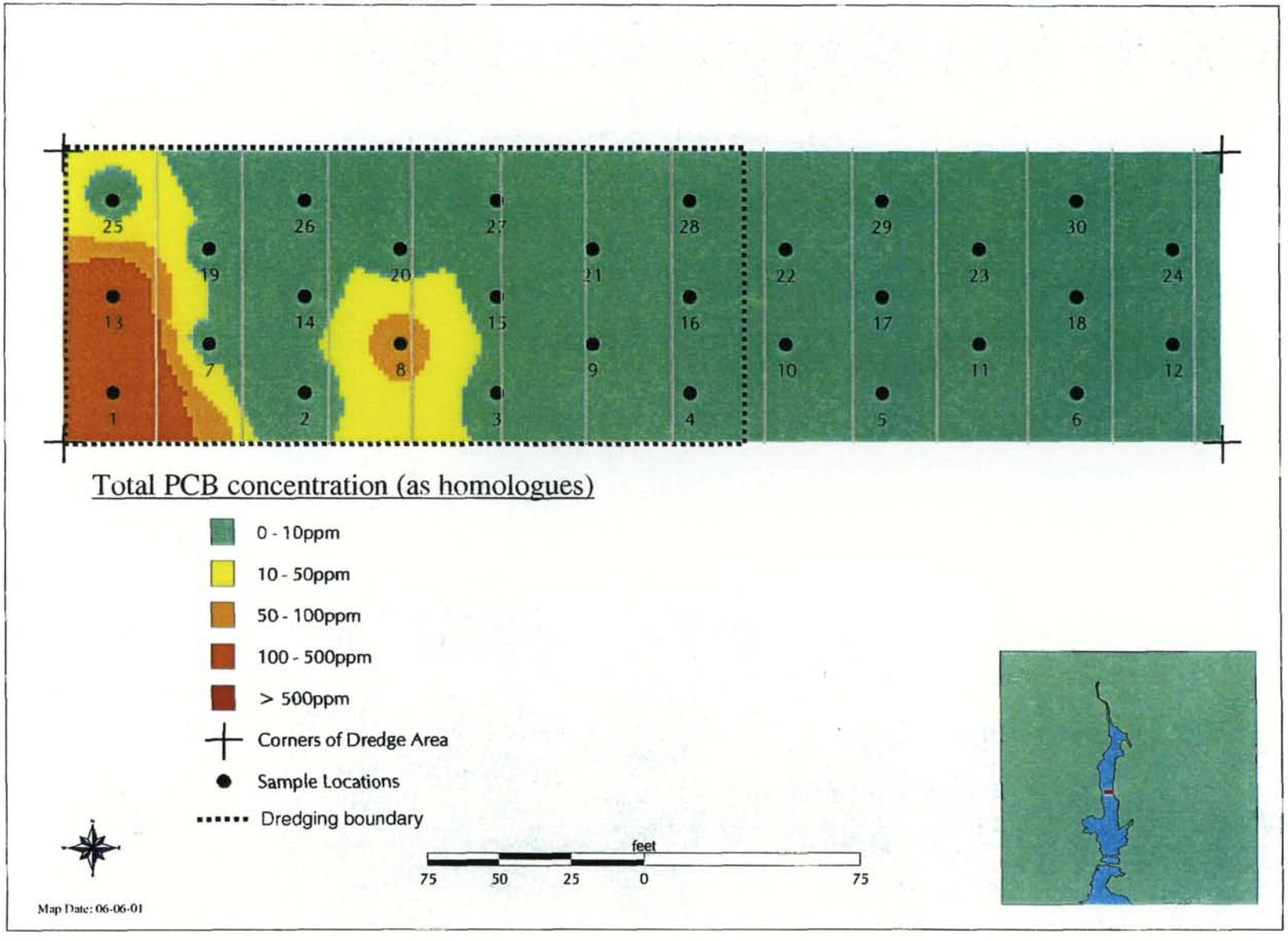
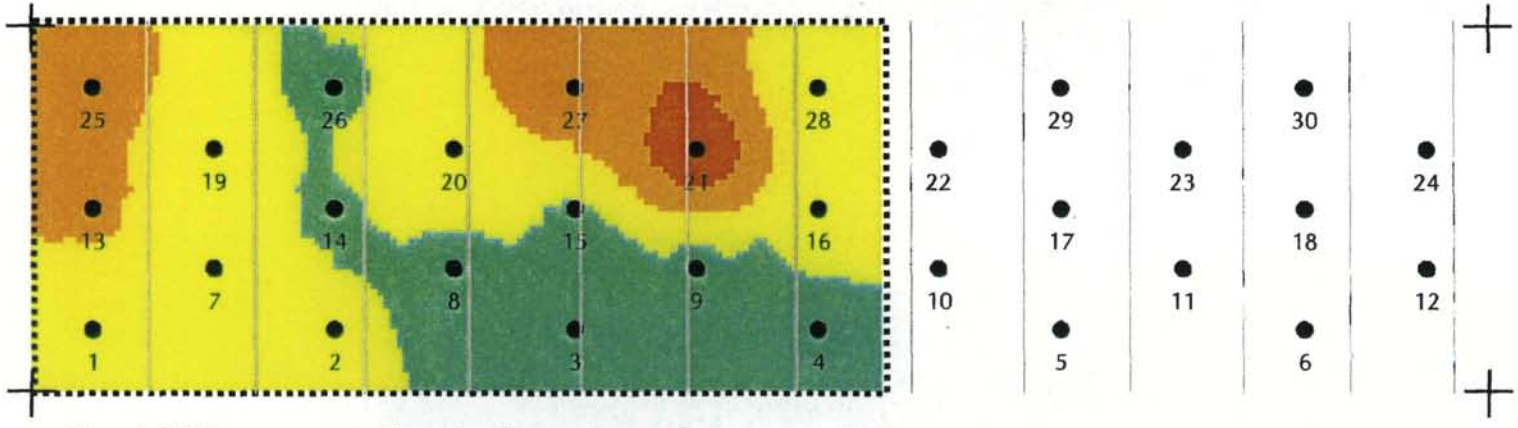


Figure J-13. Post-dredge PCB concentration contours based on inverse-distance weighting interpolation; 0-1' depth sediment horizon.

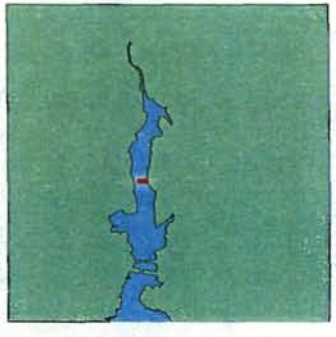
EPA
AED, Narragansett RI



Total PCB concentration (as homologues)

- 0 - 10ppm
- 10 - 50ppm
- 50 - 100ppm
- 100 - 500ppm
- > 500ppm
- Corners of Dredge Area
- Sample Locations
- Dredging boundary

feet
75 50 25 0 75



Map Date: 06-06-01

Table J-1 Pre- and Post-Dredge Target and Actual Coordinates

LOCATION	TARGET		ACTUAL PRE-DREDGE		ACTUAL POST-DREDGE[1]	
CORES	Easting (ft)	Northing (ft)	Easting (ft)	Northing (ft)	Easting (ft)	Northing (ft)
EPA 1	815266.667	2703966.875	815267.700	2703969.800	815265.330	2703967.360
EPA 2	815333.334	2703966.875	815333.500	2703965.900	815331.872	2703965.571
EPA 3	815400.001	2703966.875	815400.400	2703967.500	815398.512	2703965.958
EPA 4	815466.668	2703966.875	815466.000	2703965.700	815465.313	2703968.892
EPA 5	815533.335	2703966.875	815533.000	2703966.500	N/A	N/A
EPA 6	815600.002	2703966.875	815600.400	2703965.600	N/A	N/A
EPA 7	815300.000	2703983.750	815299.500	2703984.600	815300.001	2703983.030
EPA 8	815366.667	2703983.750	815366.200	2703984.800	815365.937	2703983.204
EPA 9	815433.334	2703983.750	815433.500	2703983.800	815433.809	2703983.905
EPA 10	815500.001	2703983.750	815499.700	2703985.600	815500.285	2703984.554
EPA 11	815566.668	2703983.750	815565.700	2703983.000	N/A	N/A
EPA 12	815633.335	2703983.750	815633.400	2703985.300	815632.415	2703984.431
EPA 13	815266.667	2704000.000	815266.500	2703999.200	815265.563	2704001.617
EPA 14	815333.334	2704000.000	815333.700	2703999.600	815334.980	2704000.900
EPA 15	815400.001	2704000.000	815399.000	2703998.800	815399.148	2704000.822
EPA 16	815466.668	2704000.000	815468.000	2703999.400	815467.099	2704000.167
EPA 17	815533.335	2704000.000	815532.600	2704000.000	N/A	N/A
EPA 18	815600.002	2704000.000	815600.700	2703999.400	N/A	N/A
EPA 19	815300.000	2704016.250	815300.900	2704015.400	815299.414	2704015.824
EPA 20	815366.667	2704016.250	815366.700	2704017.600	815367.012	2704016.693
EPA 21	815433.334	2704016.250	815433.300	2704016.900	815433.051	2704015.220
EPA 22	815500.001	2704016.250	815501.000	2704016.200	815499.313	2704017.365
EPA 23	815566.668	2704016.250	815567.200	2704016.300	815566.502	2704017.294
EPA 24	815633.335	2704016.250	815632.200	2704015.600	N/A	N/A
EPA 25	815266.667	2704033.125	815264.500	2704032.300	815268.735	2704033.197
EPA 26	815333.334	2704033.125	815332.000	2704031.700	815333.133	2704033.932
EPA 27	815400.001	2704033.125	815400.800	2704032.600	815400.616	2704033.088
EPA 28	815466.668	2704033.125	815467.800	2704034.800	815466.762	2704033.132
EPA 29	815533.335	2704033.125	815533.300	2704033.600	N/A	N/A
EPA 30	815600.002	2704033.125	815598.100	2704033.900	N/A	N/A
EPA 31 (added pt.)	815233.333	2703966.875	N/A	N/A	815233.611	2703966.810
1-1	815200.000	2703966.875	815199.120	2703965.471	N/A	N/A
1-2	815133.333	2703966.875	815133.418	2703965.458	N/A	N/A
7-1	815233.333	2703983.750	815234.828	2703984.189	N/A	N/A
7-2	815166.666	2703983.750	815166.608	2703985.084	N/A	N/A
13-1	815200.000	2704000.000	815200.899	2703999.829	N/A	N/A
13-2	815133.333	2704000.000	815131.900	2703999.228	N/A	N/A
19-1	815233.333	2704016.250	815232.500	2704015.069	N/A	N/A
19-2	815166.666	2704016.250	815167.025	2704017.042	N/A	N/A
25-1	815200.000	2704033.125	815201.087	2704032.218	N/A	N/A

Table J-1 Pre- and Post-Dredge Target and Actual Coordinates

LOCATION	TARGET		ACTUAL PRE-DREDGE		ACTUAL POST-DREDGE[1]	
CORES	Easting (ft)	Northing (ft)	Easting (ft)	Northing (ft)	Easting (ft)	Northing (ft)
25-2	815133.333	2704033.125	815133.301	2704031.537	N/A	N/A
T2A	N/A	N/A	N/A	N/A	815249.211	2704025.219
T2A-2	N/A	N/A	N/A	N/A	815248.427	2704025.826
T2B*	N/A	N/A	N/A	N/A	815253.185	2704026.004
T2B-2	N/A	N/A	N/A	N/A	815252.080	2704024.824
T2C*	N/A	N/A	N/A	N/A	815258.725	2704025.804
T2C-2	N/A	N/A	N/A	N/A	815257.119	2704025.838
T2D*	N/A	N/A	N/A	N/A	815266.216	2704025.354
T2D-2	N/A	N/A	N/A	N/A	815265.423	2704025.394
T2E*	N/A	N/A	N/A	N/A	815271.967	2704025.413
T2E-2	N/A	N/A	N/A	N/A	815269.517	2704023.687
T2F*	N/A	N/A	N/A	N/A	815281.376	2704025.957
T2F-2	N/A	N/A	N/A	N/A	815280.216	2704025.472
T1A*	N/A	N/A	N/A	N/A	815251.179	2704046.500
T1A-2	N/A	N/A	N/A	N/A	815251.534	2704047.544
T1B*	N/A	N/A	N/A	N/A	815256.550	2704048.625
T1B-2	N/A	N/A	N/A	N/A	815253.712	2704047.834
T1C*	N/A	N/A	N/A	N/A	815262.550	2704046.305
T1C-2	N/A	N/A	N/A	N/A	815263.656	2704047.327
T1D*	N/A	N/A	N/A	N/A	815267.186	2704047.876
T1D-2	N/A	N/A	N/A	N/A	815268.924	2704047.773
T1E*	N/A	N/A	N/A	N/A	815273.201	2704046.615
T1E-2	N/A	N/A	N/A	N/A	815274.684	2704048.700
T1F*	N/A	N/A	N/A	N/A	815278.036	2704046.081
T1F-2	N/A	N/A	N/A	N/A	815280.085	2704047.684
C2N*	N/A	N/A	N/A	N/A	815295.408	2704033.377
C2M*	N/A	N/A	N/A	N/A	Not noted	Not noted
C5S*	N/A	N/A	N/A	N/A	815385.776	2703965.274
C5N*	N/A	N/A	N/A	N/A	815385.464	2704037.880
C5M*	N/A	N/A	N/A	N/A	815385.434	2704001.859
C4S*	N/A	N/A	N/A	N/A	815368.189	2703969.293
C4N*	N/A	N/A	N/A	N/A	815356.412	2704033.442
C4M*	N/A	N/A	N/A	N/A	815356.017	2703994.701

[1] Post-dredge coordinates include collection of both core and grab except where noted by an asterisk (*) only a grab was collected
N/A - No core or grab sample collected

Table J-2 Summary of Collection Efforts

Date	Sites	Time	Method
PRE-DREDGE			
13-Jun-00	EPA-25	16:22	TG&B Push Core from TG&B Skiff
	EPA-19	16:50	TG&B Push Core from TG&B Skiff
14-Jun-00	EPA-26	8:47	TG&B Push Core from TG&B Skiff
	EPA-20	9:07	TG&B Push Core from TG&B Skiff
	EPA-27	9:54	TG&B Push Core from TG&B Skiff
	EPA-21	10:12	TG&B Push Core from TG&B Skiff
	EPA-28	10:24	TG&B Push Core from TG&B Skiff
	EPA-16	10:42	TG&B Push Core from TG&B Skiff
	EPA-4	10:54	TG&B Push Core from TG&B Skiff
	EPA-9	11:04	TG&B Push Core from TG&B Skiff
	EPA-15	11:19	TG&B Push Core from TG&B Skiff
	EPA-3	14:09	TG&B Push Core from TG&B Skiff
	EPA-8	14:45	TG&B Push Core from TG&B Skiff
	EPA-14	15:03	TG&B Push Core from TG&B Skiff
	EPA-2	15:40	TG&B Push Core from TG&B Skiff
	EPA-7	16:04	TG&B Push Core from TG&B Skiff
	EPA-13	16:20	TG&B Push Core from TG&B Skiff
	EPA-1	16:35	TG&B Push Core from TG&B Skiff
15-Jun-00	EPA-12	9:02	TG&B Push Core from TG&B Skiff
	EPA-24	9:37	TG&B Push Core from TG&B Skiff
	EPA-30	10:22	TG&B Push Core from TG&B Skiff
	EPA-18	10:49	TG&B Push Core from TG&B Skiff
	EPA-11	11:35	TG&B Push Core from TG&B Skiff
	EPA-23	11:45	TG&B Push Core from TG&B Skiff
	EPA-29	12:10	TG&B Push Core from TG&B Skiff
	EPA-22	15:28	TG&B Push Core from TG&B Skiff
	EPA-10	15:51	TG&B Push Core from TG&B Skiff
	EPA-5	16:08	TG&B Push Core from TG&B Skiff
	EPA-17	16:24	TG&B Push Core from TG&B Skiff
	EPA-6	16:43	TG&B Push Core from TG&B Skiff
16-Jun-00	EPA-18	8:15	TG&B Vibracore from TG&B Skiff
	EPA-6	8:37	TG&B Vibracore from TG&B Skiff
7-Aug-00	EPA-16	12:43	TG&B Push Core from TG&B Skiff (collected for Bean, not analyzed)
	EPA-28	13:09	TG&B Push Core from TG&B Skiff (collected for Bean, not analyzed)
	7-1	14:50	TG&B Push Core from TG&B Skiff
	19-1	15:25	TG&B Push Core from TG&B Skiff
8-Aug-00	1-1	7:46	TG&B Push Core from TG&B Skiff
	13-1	8:08	TG&B Push Core from TG&B Skiff
	25-1	8:42	TG&B Push Core from TG&B Skiff
	19-2	9:00	TG&B Push Core from TG&B Skiff
	7-2	10:00	TG&B Push Core from TG&B Skiff
	1-2	10:24	TG&B Push Core from TG&B Skiff
	13-2	10:35	TG&B Push Core from TG&B Skiff
	25-2	11:05	TG&B Push Core from TG&B Skiff
POST DREDGE			
12-Aug-00	L6-1	11:00	Bean Petite Ponar from CR Environmental boat
	L6-2	15:13	Bean Petite Ponar from CR Environmental boat
14-Aug-00	L6-3	17:00	Bean Petite Ponar from Bean survey boat
	L7-1	17:00	Bean Petite Ponar from Bean survey boat
	L7-2	17:00	Bean Petite Ponar from Bean survey boat
	L7-3	17:00	Bean Petite Ponar from Bean survey boat
15-Aug-00	L8-1	15:38	Bean Petite Ponar from Bean survey boat
	L8-2	15:44	Bean Petite Ponar from Bean survey boat
	L8-3	15:53	Bean Petite Ponar from Bean survey boat

Table J-2 Summary of Collection Efforts

Date	Sites	Time	Method
POST DREDGE			
17-Aug-00	EPA-4	8:25	TG&B Petite Ponar and Push Core from TG&B Skiff
	C4M	9:30	TG&B Petite Ponar from TG&B Skiff
	C4S	10:02	TG&B Petite Ponar from TG&B Skiff
	C5N	10:15	TG&B Petite Ponar from TG&B Skiff
	C5M	10:25	TG&B Petite Ponar from TG&B Skiff
	C5S	10:35	TG&B Petite Ponar from TG&B Skiff
	EPA-28	11:15	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-16	11:55	TG&B Petite Ponar and Push Core from TG&B Skiff (not analyzed)
	C-EB	13:50	TG&B Push Core from TG&B Skiff
	C4N	13:58	TG&B Petite Ponar from TG&B Skiff
	EPA-21	14:21	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-9	14:45	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA28-2	15:15	TG&B Petite Ponar and Push Core from TG&B Skiff (not analyzed)
	EPA-15	15:55	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-27	16:35	TG&B Petite Ponar and Push Core from TG&B Skiff
18-Aug-00	T1A	8:30	TG&B Petite Ponar from TG&B Skiff
	T1B	8:35	TG&B Petite Ponar from TG&B Skiff
	T1C	8:45	TG&B Petite Ponar from TG&B Skiff
	T1D	8:53	TG&B Petite Ponar from TG&B Skiff
	T1E	8:58	TG&B Petite Ponar from TG&B Skiff
	T1F	9:07	TG&B Petite Ponar from TG&B Skiff
	T2F	9:12	TG&B Petite Ponar from TG&B Skiff
	T2E	9:25	TG&B Petite Ponar from TG&B Skiff
	T2D	9:35	TG&B Petite Ponar from TG&B Skiff
	T2C	9:42	TG&B Petite Ponar from TG&B Skiff
	T2B	9:55	TG&B Petite Ponar from TG&B Skiff
	T2A	10:15	TG&B Petite Ponar and Push Core from TG&B Skiff
	C2M	11:37	TG&B Petite Ponar from TG&B Skiff
	T1F-2	12:06	TG&B Petite Ponar and Push Core from TG&B Skiff
	T1E-2	12:26	TG&B Petite Ponar and Push Core from TG&B Skiff
	T1D-2	12:48	TG&B Petite Ponar and Push Core from TG&B Skiff
	T1C-2	13:15	TG&B Petite Ponar and Push Core from TG&B Skiff
	T1B-2	13:36	TG&B Petite Ponar and Push Core from TG&B Skiff
	T1A-2	13:45	TG&B Petite Ponar and Push Core from TG&B Skiff
	C2N	15:19	TG&B Petite Ponar from TG&B Skiff
	EPA-3	16:00	TG&B Petite Ponar and Push Core from TG&B Skiff
	T2B-2	16:30	TG&B Petite Ponar and Push Core from TG&B Skiff
	T2A-2	16:46	TG&B Petite Ponar and Push Core from TG&B Skiff
	T2C-2	17:02	TG&B Petite Ponar and Push Core from TG&B Skiff
	T2D-2	17:22	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-25	17:35	TG&B Petite Ponar and Push Core from TG&B Skiff
	T2E-2	17:50	TG&B Petite Ponar and Push Core from TG&B Skiff
	T2F-2	18:05	TG&B Petite Ponar and Push Core from TG&B Skiff
21-Aug-00	EPA-8	8:00	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-20	8:24	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-26	8:40	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-14	9:05	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-2	9:24	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-7	9:45	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-19	10:29	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-13	10:50	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-1	11:06	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-16	11:31	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-12	14:04	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-23	14:18	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-10	14:31	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-22	14:55	TG&B Petite Ponar and Push Core from TG&B Skiff
	EPA-31	15:09	TG&B Petite Ponar and Push Core from TG&B Skiff

Table Pre-Dredge Sediment Core PCB Data.

Location	1	1	1	1	2	2	2
Depth	0-1'	1-2'	2-3'	3-4'	0-1'	1-2'	2-3'
Field ID	P1-01 0-1'	P1-01 1-2'	P1-01 2-3'	P1-01 3-4'	P1-02 0-1'	P1-02 1-2'	P1-02 2-3'
Lab ID	20A2372	20A2373	20A2374	20A2375	20A2376	20A2377	20A2378
Sample Size	0.886 g	0.8 g	5.71 g	6.98 g	1.04 g	1.3 g	7.9 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	34.2	33.3	34.2	44	44.3	45.7	51.8
Dilution Factor	5	10.0	50	1	5	1	1
Min Reporting Limit	110	120.0	0.35	0.29	96	77	0.25
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener							
8 - 2,4'-Dichlorobiphenyl	2600	14000 J	2900	20	4700	170	3.9
18 - 2,2',5-Trichlorobiphenyl	5000	32000	5800	46	6800	420	8.6
28 - 2,4,4'-Trichlorobiphenyl	35000 J	52000	27000	57	26000 J	620 U	14
44 - 2,2',3,5'-Tetrachlorobiphenyl	6400	28000	7100	28	5100	390	5.9
52 - 2,2',5,5'-Tetrachlorobiphenyl	12000	40000	14000	34	11000	540	7.2
66 - 2,3',4,4'-Tetrachlorobiphenyl	11000	13000	12000	58	7700	220	5.9
101 - 2,2',4,5,5'-Pentachlorobiphenyl	8400	14000	10000	65	5200	240	7.4
105 - 2,3,3',4,4'-Pentachlorobiphenyl	1300	1400	1400	13	260	14 J	0.43
118 - 2,3',4,4',5-Pentachlorobiphenyl	8700	8800	8700	50	5400	110	5.9
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	870	1100	740 J	10 J	340	16 J	0.30 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	5100	6900	4700	30	2700	86	2.0
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6800	10000	7500	29	4400	150	4.0
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	710	1000	600	1.6	460	9.1 J	0.18 J
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1100	1500	940 J	4.9 J	640	16 J	0.42 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1100	1600	980	4.2	680	16 J	0.46
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	140	190	33 J	1.1 J	78	2.8 J	0.085 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	120 U	210	31 UJ	2.6	96 U	ND	0.25 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	110 U	32 J	7.2 J	1.3	96 U	ND	0.081 J
NOAA 18 Congener total ppm	110	230	100	0.46	81	2.4	0.067
Total PCB (as homologue)[1] -ppm units	270	560	260	1.1	200	6.0	0.17
Internal Standards							
Dibromo-octafluoro-biphenyl	112	209 &	2818 &	110	136 &	87	87
103 - 2,2',4,5',6-Pentachlorobiphenyl	113	108	1733 &	66	117	95	81
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	96	89	125	74	99	102	79

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table J-3 Pre-Dredge Sediment Core PCB Data.

Location	3	3	3	4	4	4	5	5	5
Depth	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'
Field ID	P1-03 0-1'	P1-03 1-2'	P1-03 2-3'	P1-04 0-1'	P1-04 1-2'	P1-04 2-3'	P1-05 0-1'	P1-05 1-2'	P1-05 2-3'
Lab ID	20A2380	20A2381	20A2382	20A2384	20A2385	20A2386	20A2388	20A2389RE	20A2390
Sample Size	1 g	1.3 g	6.56 g	0.927 g	1.2 g	7.89 g	1.17 g	1.28 g	8.3 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	40.5	43.2	42.8	35.1	44.2	50.2	51.6	53.4	50.3
Dilution Factor	20	1	1	50	1	1	5	1	1
Min Reporting Limit	100	77	0.3	110	83	0.25	85	7.8	0.24
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener									
8 - 2,4'-Dichlorobiphenyl	31000	200	8.6	100000	290	3.2	4600	13	2.7
18 - 2,2',5-Trichlorobiphenyl	47000	390	22	160000	620	8.3	10000	28	8.6
28 - 2,4,4'-Trichlorobiphenyl	110000 J	510 U	34	330000 J	1100	13	23000 J	36 U	10
44 - 2,2',3,5'-Tetrachlorobiphenyl	31000	350	11	110000	770	5.8	4600	64	4.7
52 - 2,2',5,5'-Tetrachlorobiphenyl	62000	660	19	140000	1000	6.1	15000	38 U	4.9
66 - 2,3',4,4'-Tetrachlorobiphenyl	12000	280	11	72000	1500	3.8	7100	14	4.4
101 - 2,2',4,5,5'-Pentachlorobiphenyl	7500	150	8.4	67000	1200	4.1	5300	9.7 U	4.7
105 - 2,3,3',4,4'-Pentachlorobiphenyl	630	9.6 J	0.56	2500	93	0.25	350	ND	0.18 J
118 - 2,3',4,4',5-Pentachlorobiphenyl	6800	140	6.4	32000	1100	1.7	5600	7.8 U	2.7
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	730	16 J	1.0 J	1700	72 J	0.42 J	350	2.1 J	0.13 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	4800	85	3.6	10000	460	0.96	2700	4.0	1.1
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6800	140	6.5	32000	740	1.9	4500	8.3 U	2.5
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	870	9.1 J	0.70	1800	53 J	0.088 J	440	11 J	0.060 J
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1300	16 J	1.4 J	2700	91 J	0.33 J	660	4.1 J	0.22 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1200	16 J	1.4	2300	66 J	0.26	690	7.0 J	0.33
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	150	ND	1.8 J	290	6.3 J	0.087 J	85	24 J	0.098 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	140 UJ	4.0 J	3.3	290 UJ	7.8 J	0.25 U	96 UJ	62	0.24 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	160	ND	1.9	110 UJ	ND	0.094 J	85 UJ	20	0.086 J
NOAA 18 Congener total ppm	320	2.5	0.14	1100	9.2	0.050	85	0.25	0.047
Total PCB (as homologue)[1] -ppm units	810	6.2	0.36	2700	23	0.13	210	0.63	0.12
Internal Standards									
Dibromo-octafluoro-biphenyl	236 &	74	92	392 &	84	85	142 &	71	87
103 - 2,2',4,5',6-Pentachlorobiphenyl	119	84	75	111	93	78	121	81	77
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	95	84	76	91	91	79	97	80	79

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table . Pre-Dredge Sediment Core PCB Data.

Location	9	9	10	10	10	11	11	11
Depth	0-1'	1-2'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'
Field ID	P1-09 0-1'	P1-09 1-2'	P1-10 0-1'	P1-10 1-2'	P1-10 2-3'	P1-11 0-1'	P1-11 1-2'	P1-11 2-3'
Lab ID	20A2403	20A2404	20A2407	20A2408	20A2409	20A2411	20A2412RE	20A2413
Sample Size	0.835 g	1.26 g	0.967 g	1.37 g	6.58 g	2.22 g	1.41 g	10.3 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	34.1	46.8	36.5	46.4	43.2	74.4	61.4	64.8
Dilution Factor	50	1	50	1	1	1	1	1
Min Reporting Limit	120	79	100	73	0.3	45	1.4	0.19
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener								
8 - 2,4'-Dichlorobiphenyl	100000	ND	89000	410	2.1	650	ND	0.28
18 - 2,2',5-Trichlorobiphenyl	150000	110	140000	800	5.1	1200	1.4	0.12 J
28 - 2,4,4'-Trichlorobiphenyl	340000 J	300 U	180000	1300	9.1	3100 J	8.5	0.19 U
44 - 2,2',3,5'-Tetrachlorobiphenyl	100000	130	110000	910	4.3	550	ND	ND
52 - 2,2',5,5'-Tetrachlorobiphenyl	140000	160 U	140000	1300	4.6	2100	2.9	0.12 J
66 - 2,3',4,4'-Tetrachlorobiphenyl	73000	180	81000	1600	4.4	1000	ND	0.097 J
101 - 2,2',4,5,5'-Pentachlorobiphenyl	64000	160	81000	1400	4.1	710	3.9	0.19 U
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2200	8.8 J	2700	110	0.48	94	2.4	ND
118 - 2,3',4,4',5-Pentachlorobiphenyl	12000	140	33000	1300	2.9	760	2.4	0.10 J
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1600	12 J	1600	80 J	0.39 J	83	2.9 J	0.067 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	9400	79 U	9800	520	1.4	470	1.4 U	0.030 J
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	13000	100	51000	850	2.2	690	4.2	0.090 J
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1700	6.2 J	1800	60 J	0.10 J	74	ND	ND
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2500	11 J	2800	100 J	0.32 J	120	ND	0.049 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	2200	7.7 J	2400	92	0.50	100	1.1 J	0.19 U
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	270	2.3 J	300	10 J	0.16 J	14 J	ND	0.081 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	280 UJ	2.7 J	310 UJ	14 J	0.31 U	45 U	2.8	0.19 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	120 UJ	ND	100 UJ	3.2 J	0.054 J	45 U	0.90 J	ND
NOAA 18 Congener total ppm	1000	0.87	930	11	0.042	12	0.033	0.0010
Total PCB (as homologue)[1] -ppm units	2500	2.2	2300	27	0.11	29	0.084	0.0026
Internal Standards								
Dibromo-octafluoro-biphenyl	352 &	94	436 &	94	83	98	63	87
103 - 2,2',4,5',6-Pentachlorobiphenyl	106	103	123	103	74	97	66	75
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	95	109	97	97	79	94	59	84

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table J-3 Pre-Dredge Sediment Core PCB Data.

Location	6	6	7	7	8	8	8	8
Depth	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	2-3'	3-4'
Field ID	P1-06 0-1'	P1-06 1-2'	P1-07 0-1'	P1-07 1-2'	P1-08 0-1'	P1-08 1-2'	P1-08 2-3'	P1-08 3-4'
Lab ID	20A2392	20A2393RE	20A2396	20A2397RE	20A2399	20A2400	20A2401	20A2402
Sample Size	2.14 g	1.96 g	1.5 g	1.34 g	0.957 g	1.06 g	7.27 g	8.02 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	74.5	78.3	52.5	50.4	44.5	41.4	47.7	52.2
Dilution Factor	1	1	1	1	5	10	1000	1
Min Reporting Limit	47	1	67	1.5	100	94	0.28	0.25
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener								
8 - 2,4'-Dichlorobiphenyl	190	ND	1800	ND	5700	22000	3300	39
18 - 2,2',5-Trichlorobiphenyl	460	0.54 J	2900	3.2	7800	35000	5700	37
28 - 2,4,4'-Trichlorobiphenyl	1100 J	1.0 U	8600 J	2.2 U	33000 J	40000	5200	12
44 - 2,2',3,5'-Tetrachlorobiphenyl	180	ND	3000	ND	6500	8600	780	1.9
52 - 2,2',5,5'-Tetrachlorobiphenyl	910	1.2 U	4600	3.4 U	20000	36000	6900	8.9
66 - 2,3',4,4'-Tetrachlorobiphenyl	460	0.35 J	4600	1.5	8400	25000	1600	3.4
101 - 2,2',4,5,5'-Pentachlorobiphenyl	290	1.0 U	3700	1.5 U	5000	6800	560	1.4
105 - 2,3,3',4,4'-Pentachlorobiphenyl	40 J	ND	200	ND	260	180	15	0.25 U
118 - 2,3',4,4',5-Pentachlorobiphenyl	320	1.0 U	3600	1.5 U	5200	7800	520	0.96
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	34 J	ND	210	0.16 J	300	150	7.6	ND
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	200	ND	1600	ND	2700	2800	210 J	ND
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	290	ND	2600	1.5 U	4700	7200	1000	1.3
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	26 J	NDL	260	NDUJ	470	570	45	1.0
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	48	ND	400	ND	700	970	56 J	0.12 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	47 U	ND	360	ND	780	1500	160 J	0.33
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	32 J	ND	37 J	ND	79 J	190	19	ND
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	95 U	0.44 J	67 U	0.22 J	100 UJ	240	28	0.25 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	47 U	0.18 J	67 U	ND	100 UJ	46 J	8.1	0.028 J
NOAA 18 Congener total ppm	**4.6**	**0.0015**	**38**	**0.0051**	**100**	**200**	**26**	**0.11**
Total PCB (as homologue)[1]-ppm units	***11***	***0.0038***	***96***	***0.013***	***250***	***490***	***65***	***0.27***
Internal Standards								
Dibromo-octafluoro-biphenyl	78	95	106	77	142 &	183 &	109	97
103 - 2,2',4,5',6-Pentachlorobiphenyl	87	102	108	87	116	117	1639 &	3440 &
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	86	106	90	88	94	87	121	109

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table J-3 Pre-Dredge Sediment Core PCB Data.

Location	12	12	13	13	13	13	14	14
Depth	0-1'	1-2'	0-1'	1-2'	2-3'	3+	0-1'	1-2'
Field ID	P1-12 0-1'	P1-12 1-2'	P1-13 0-1'	P1-13 1-2'	P1-13 2-3'	P1-13 3+	P1-14 0-1'	P1-14 1-2'
Lab ID	20A2415	20A2416RE	20A2418	20A2419	20A2420	20A2421	20A2422	20A2423RE
Sample Size	2.29 g	1.81 g	0.865 g	0.686 g	7.4 g	8.33 g	1.3 g	0.998 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	79.7	80.4	33.8	31.6	47.6	53.7	46	47.5
Dilution Factor	1	1	10	10	20	1	10	1
Min Reporting Limit	44	1.1	120	140	0.27	0.24	77	2
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener								
8 - 2,4'-Dichlorobiphenyl	52	ND	2800	17000	2400	4.7	6500	16
18 - 2,2',5-Trichlorobiphenyl	200	2.1	5600	46000	3600	13	20000	25
28 - 2,4,4'-Trichlorobiphenyl	780 J	7.1	43000 J	63000	10000	23	40000 J	62
44 - 2,2',3,5'-Tetrachlorobiphenyl	270	ND	6900	39000	3800	8.8	5600	91
52 - 2,2',5,5'-Tetrachlorobiphenyl	600	4.1	45000	53000	5900	11	34000	47
66 - 2,3',4,4'-Tetrachlorobiphenyl	440	2.4	11000	24000	9800	10	7800	24
101 - 2,2',4,5,5'-Pentachlorobiphenyl	320	4.1	9700	38000	8700	10	3200	16
105 - 2,3,3',4,4'-Pentachlorobiphenyl	39 J	0.30 J	1400	3500	860	1.4	190	1.3 J
118 - 2,3',4,4',5-Pentachlorobiphenyl	300	1.2	8100	16000	8800	7.4	3300	14
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	27 J	0.31 J	890	1700	570 J	1.2 J	240	0.90 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	180	1.1 U	5100	9800	3600	3.9	2600	6.8 U
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	260	0.76 J	6600	13000	5700	5.5	4300	12
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	22 J	ND	710	1500	540	0.30	440	ND
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	35 J	0.35 J	1100	2200	800 J	0.66 J	640	1.4 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	44 U	0.56 J	1000	2000	670	0.82	890	1.4 J
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	3.9 J	ND	140	230 J	29 J	0.14 J	86	ND
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	44 U	3.6	130 U	230	29 J	0.31 U	96 UJ	2.3
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	44 U	1.1 U	120 UJ	140 U	9.8 J	0.31	77 UJ	2.0 U
NOAA 18 Congener total ppm	3.5	0.027	150	330	66	0.10	130	0.31
Total PCB (as homologue)[1] -ppm units	8.8	0.067	370	830	160	0.26	320	0.79
Internal Standards								
Dibromo-octafluoro-biphenyl	80	58	121	160 &	706 &	100	169 &	57
103 - 2,2',4,5',6-Pentachlorobiphenyl	89	68	124	90	1064 &	77	130 &	68
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	90	68	101	66	61	82	107	67

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table J-3 Pre-Dredge Sediment Core PCB Data.

ocation	15	15	15	16	16	16	17	17	17
epth	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'
ield ID	P1-15 0-1'	P1-15 1-2'	P1-15 2-3'	P1-16 0-1'	P1-16 1-2'	P1-16 2-3'	P1-17 0-1'	P1-17 1-2'	P1-17 2-3'
ab ID	20A2426	20A2427RE	20A2428	20A2429	20A2430	20A2431	20A2433	20A2434	20A2435
ample Size	1.06 g	1 g	8.13 g	0.952 g	0.918 g	6.57 g	1.86 g	1.06 g	8.41 g
Veight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
ercent Solids	42.3	42.1	51.4	33.4	39.9	41.5	64.2	50	52.9
ilution Factor	20	1	1	50	1	1	20	1	1
Min Reporting Limit	94	4	0.25	100	110	0.3	54	94	0.24
Jnits	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener									
1 - 2,4'-Dichlorobiphenyl	39000	96	27	100000	2000	9.9	5900	ND	0.51
18 - 2,2',5-Trichlorobiphenyl	57000	140	18	170000	3500	20	22000	94 U	0.086 J
28 - 2,4,4'-Trichlorobiphenyl	120000 J	160	8.9	190000 J	5000	44	53000 J	180 U	0.30 U
44 - 2,2',3,5'-Tetrachlorobiphenyl	11000	170	1.9	120000	3500	16	14000	490	ND
52 - 2,2',5,5'-Tetrachlorobiphenyl	63000	180	2.9	150000	5000	19	36000	1200	0.13 J
66 - 2,3',4,4'-Tetrachlorobiphenyl	12000	130	1.4	84000	4700	16	20000	1800	0.18 J
101 - 2,2',4,5,5'-Pentachlorobiphenyl	6700	100	1.1	76000	4400	13	14000	2100	0.34
105 - 2,3,3',4,4'-Pentachlorobiphenyl	610	3.6 J	0.18 J	3600	300	2.0	300	220	0.16 J
118 - 2,3',4,4',5-Pentachlorobiphenyl	6400	100	0.87	37000	3600	9.9	6400	2200	0.20 J
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	620	3.2 J	0.20 J	1900	220 J	0.91 J	410	140 J	0.25 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	4300	32	0.30	10000	1700	5.0	3500	920 U	0.076 J
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6400	75	0.74	49000 D	2600	7.0	5800	1200	0.21 J
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	780	ND	0.025 J	1800	230	0.57	630	90 J	ND
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	1200	7.7	0.10 J	2900	370	1.1 J	960	130	0.063 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1200	7.8	0.25 U	2500	320	0.85	1000	96	0.24 U
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	230	1.8 J	0.086 J	310	29 J	0.13 J	120	15 J	ND
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	400 UJ	4.7	0.25 U	310 UJ	110 U	0.30 U	130 UJ	94 U	0.24 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	120 UJ	1.1 J	0.047 J	100 UJ	110 U	0.034 J	54 UJ	94 U	0.052 J
NOAA 18 Congener total ppm	330	1.2	0.064	1000	37	0.17	180	10	0.0023
Total PCB (as homologue)[1] -ppm units	830	3.0	0.16	2500	94	0.41	450	24	0.0056
Internal Standards									
Dibromo-octafluoro-biphenyl	242 &	62	92	437 &	72	89	194 &	61	93
103 - 2,2',4,5',6-Pentachlorobiphenyl	130 &	71	73	115	77	78	140 &	68	77
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	102	66	76	94	63	81	104	59	82

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = *congener is not detected above the MDL*
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table Pre-Dredge Sediment Core PCB Data.

Location	18	18	19	19	20	20
Depth	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'
Field ID	P1-18 0-1'	P1-18 1-2'	P1-19 0-1'	P1-19 1-2'	P1-20 0-1'	P1-20 1-2'
Lab ID	20A2437	20A2438RE	20A2441	20A2442RE	20A2444	20A2445RE
Sample Size	1.91 g	1.7 g	1.06 g	0.978 g	1.04 g	1.18 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	74	76.1	44.2	47.5	42.6	50.2
Dilution Factor	1	1	20	1	5	1
Min Reporting Limit	52	1.2	94	2	96	1.7
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener						
8 - 2,4'-Dichlorobiphenyl	ND	ND	31000	84	4800	ND
18 - 2,2',5-Trichlorobiphenyl	62	3.7	48000	150	6500	3.5
28 - 2,4,4'-Trichlorobiphenyl	180 J	12	110000 J	200	26000 J	17
44 - 2,2',3,5'-Tetrachlorobiphenyl	73	43	28000	170	4200	ND
52 - 2,2',5,5'-Tetrachlorobiphenyl	140	5.1	67000	220	8900	5.3
66 - 2,3',4,4'-Tetrachlorobiphenyl	93 U	3.8	36000	96	4400	2.0
101 - 2,2',4,5,5'-Pentachlorobiphenyl	73	3.3	27000	64	3100	2.8
105 - 2,3,3',4,4'-Pentachlorobiphenyl	11 J	0.28 J	560	6.0	270	0.17 J
118 - 2,3',4,4',5-Pentachlorobiphenyl	66 UJ	2.0	11000	54	2600	1.1 J
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	7.7 J	0.26 J	810	5.0 J	280	ND
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	40 J	1.2 U	6400	36	1700	1.7 U
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	57	1.5	10000	50	2400	1.0 J
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	4.4 J	ND	1200	4.8	270	ND
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	52 U	0.27 J	1800	8.3	430	0.29 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	52 U	0.18 J	1700	7.8	420	0.25 J
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	1.4 J	ND	180	1.2 J	44 J	ND
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	52 U	0.91 J	200 UJ	2.2	96 UJ	2.7
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	ND	1.2 U	94 UJ	2.0 U	96 UJ	0.52 J
NOAA 18 Congener total ppm	**0.65**	**0.076**	**380**	**1.2**	**66**	**0.037**
Total PCB (as homologue)[1] -ppm units	**1.6**	**0.19**	**950**	**2.9**	**170**	**0.092**
Internal Standards						
Dibromo-octafluoro-biphenyl	85	51	217 &	64	135 &	66
103 - 2,2',4,5',6-Pentachlorobiphenyl	96	64	130 &	74	110	72
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	103	63	96	74	96	67

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table J-3 Pre-Dredge Sediment Core PCB Data.

Location	21	21	21	21	22	22	22	22
Depth	0-1'	1-2'	2-3'	3+	0-1'	1-2'	2-3'	3+
Field ID	P1-21 0-1'	P1-21 1-2'	P1-21 2-3'	P1-21 3+	P1-22 0-1'	P1-22 1-2'	P1-22 2-3'	P1-22 3+
Lab ID	20A2447	20A2448	20A2449	20A2450	20A2451	20A2452	20A2453	20A2454
Sample Size	0.844 g	0.971 g	6.31 g	7.06 g	0.823 g	1.03 g	7.91 g	7.16 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	35.3	41.3	42.4	45.6	34.6	46.2	51.2	45.8
Dilution Factor	20	1	1	1	20	1	50	50
Min Reporting Limit	120	100	0.32	0.28	120	97	0.25	0.28
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener								
8 - 2,4'-Dichlorobiphenyl	51000	1600	3.5	11	40000	1100	190	170
18 - 2,2',5-Trichlorobiphenyl	76000	2700	3.2	16	69000	1900	320	300
28 - 2,4,4'-Trichlorobiphenyl	100000	4000	4.0	23 J	86000	3100	1000	980
44 - 2,2',3,5'-Tetrachlorobiphenyl	56000	2500	2.5	12	54000	2100	280	270
52 - 2,2',5,5'-Tetrachlorobiphenyl	75000	3800	4.2	16 J	69000	3100	320	300
66 - 2,3',4,4'-Tetrachlorobiphenyl	62000	3000	4.8	13	33000	3600	200	220
101 - 2,2',4,5,5'-Pentachlorobiphenyl	37000	2400	3.8	10	34000	3300	210	190
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2800	150	0.21 J	0.92	2500	340	48	54
118 - 2,3',4,4',5-Pentachlorobiphenyl	24000	2100	2.8	6.9	9500	2900	110	120
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1600	120 J	ND	1.1	1600	210 J	20	20
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	9300	940 U	ND	5.6	8600	1400	96	90
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	13000	1500	2.4	7.4	12000	2000	120	100
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1700	120	ND	2.3	1600	180	18	16
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2500	190	0.36	1.1	2300	280	26	23
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	2000	170	0.32	1.0	2100	220	19	17
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	250	15 J	ND	0.15 J	280	24 J	2.4	2.2
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	290	100 U	0.32 U	0.28 U	350	97 U	2.3 U	2.1 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	44 J	100 U	0.038 J	0.044 J	86 J	97 U	0.44	0.45
NOAA 18 Congener total ppm	510	24	0.032	0.13	430	26	3.0	2.9
Total PCB (as homologue)[1] -ppm units	1300	61	0.080	0.32	1100	64	7.4	7.2
Internal Standards								
Dibromo-octafluoro-biphenyl	322 &	70	82	91	334 &	69	248 &	218 &
103 - 2,2',4,5',6-Pentachlorobiphenyl	108	78	5268 &	3590 &	116	79	91	90
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	88	67	98	100	94	69	69	70

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table . Pre-Dredge Sediment Core PCB Data.

Location	23	23	23	24	24	25	25	25
Depth	0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	1-2'	2-3'
Field ID	P1-23 0-1'	P1-23 1-2'	P1-23 2-3'	P1-24 0-1'	P1-24 1-2'	P1-25 0-1'	P1-25 1-2'	P1-25 2-3'
Lab ID	20A2455	20A2456RE	20A2457	20A2459	20A2460RE	20A2462	20A2463	20A2464
Sample Size	1.76 g	1.51 g	10.8 g	1.91 g	1.75 g	0.828 g	0.894 g	8.42 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	74.5	66.6	70.1	79.6	80.9	36.5	38.7	55.1
Dilution Factor	1	1	1	1	1	10	5	5
Min Reporting Limit	57	1.3	0.18	52	1.1	120	110	0.24
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener								
8 - 2,4'-Dichlorobiphenyl	140	ND	0.25	30 J	ND	8600	12000	28
18 - 2,2',5-Trichlorobiphenyl	310	1.5	ND	130	1.2	18000	15000	48
28 - 2,4,4'-Trichlorobiphenyl	440 U	11	0.27 U	310 U	6.8	36000	34000	120
44 - 2,2',3,5'-Tetrachlorobiphenyl	160	ND	ND	180	ND	12000	14000	39
52 - 2,2',5,5'-Tetrachlorobiphenyl	630	6.7	0.16 J	380	1.4	28000	17000	51
66 - 2,3',4,4'-Tetrachlorobiphenyl	310	3.8	0.12 J	300	ND	29000	32000	64
101 - 2,2',4,5,5'-Pentachlorobiphenyl	210	5.1	0.19	210	2.1	17000	14000	36
105 - 2,3,3',4,4'-Pentachlorobiphenyl	28 J	1.9	0.066 J	30 J	ND	2300	2000	7.2
118 - 2,3',4,4',5-Pentachlorobiphenyl	230	2.4	0.10 J	210	ND	12000	13000	35
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	26 J	ND	0.072 J	20 J	ND	1200	870 J	3.6 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	130	ND	0.075 J	110	1.1 U	6600	5500	18
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	200	3.4	0.13 J	150	ND	8500	7500	22
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	15 J	ND	ND	13 J	ND	930	790	2.8
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	26 J	ND	ND	19 J	0.15 J	1500	1200	3.8 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	24 J	0.92 J	0.18 U	15 J	ND	1300	1000	3.3
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	7.3 J	ND	0.036 J	2.0 J	ND	170	120 J	0.49 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	14 J	1.8	0.18 U	3.2 J	1.2	190	120 U	0.87 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	8.1 J	2.5	0.020 J	ND	1.1 U	37 J	110 U	0.17 J
NOAA 18 Congener total ppm	2.5	0.041	0.0012	1.8	0.013	180	170	0.48
Total PCB (as homologue)[1] -ppm units	6.2	0.10	0.0030	4.5	0.032	460	420	1.2
Internal Standards								
Dibromo-octafluoro-biphenyl	87	68	87	84	61	141 &	97	94
103 - 2,2',4,5',6-Pentachlorobiphenyl	90	73	72	95	70	113	89	75
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	96	70	82	99	68	104	71	80

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table J-3 Pre-Dredge Sediment Core PCB Data.

Location	26	26	26	27	27	27
Depth	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'
Field ID	P1-26 0-1'	P1-26 1-2'	P1-26 2-3'	P1-27 0-1'	P1-27 1-2'	P1-27 2-3'
Lab ID	20A2465	20A2466RE	20A2467	20A2469	20A2470RE	20A2471
Sample Size	1.04 g	1.13 g	7.46 g	1.08 g	0.998 g	7.22 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	45.4	46.4	47.8	45.8	42.1	47
Dilution Factor	10	1	1	10	1	1
Min Reporting Limit	96	1.8	0.27	92	2	0.28
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener						
8 - 2,4'-Dichlorobiphenyl	11000	140	15	21000	28	2.0
18 - 2,2',5-Trichlorobiphenyl	23000	220	22	31000	49	3.9
28 - 2,4,4'-Trichlorobiphenyl	27000	670	39	37000	58	5.4
44 - 2,2',3,5'-Tetrachlorobiphenyl	6300	140	8.4	15000	84	2.6
52 - 2,2',5,5'-Tetrachlorobiphenyl	37000	280	24	37000	49	3.4
66 - 2,3',4,4'-Tetrachlorobiphenyl	9200	98	9.0	21000	21	2.1
101 - 2,2',4,5,5'-Pentachlorobiphenyl	3300	39	4.1	6500	12	1.1
105 - 2,3,3',4,4'-Pentachlorobiphenyl	190	2.6	0.30	550	1.2 J	0.18 J
118 - 2,3',4,4',5-Pentachlorobiphenyl	4000	40	2.8	7200	10	0.87
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	290	3.5 J	0.31 J	530	0.99 J	0.14 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	3000	31	2.3	4100	5.0 U	0.48
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	5100	51	4.0	6600	7.8	0.87
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	560	5.5	0.28	720	ND	0.023 J
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	800	8.6	0.64 J	1100	1.0 J	0.16 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1000	8.7	0.63	1200	0.98 J	0.28 U
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	100	1.6 J	0.19 J	120	0.91 J	0.098 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	120	2.5	0.27 U	140	2.8	0.28 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	24 J	0.50 J	0.12 J	39 J	2.0 U	0.080 J
NOAA 18 Congener total ppm	130	1.7	0.13	190	0.33	0.023
Total PCB (as homologue)[1] -ppm units	330	4.4	0.33	480	0.82	0.059
Internal Standards						
Dibromo-octafluoro-biphenyl	184 &	60	86	251 &	58	88
103 - 2,2',4,5',6-Pentachlorobiphenyl	112	70	74	113	66	78
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	85	66	81	88	73	81

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table . Pre-Dredge Sediment Core PCB Data.

Location	28	28	28	29	29	29	30	30
Depth	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'
Field ID	P1-28 0-1'	P1-28 1-2'	P1-28 2-3'	P1-29 0-1'	P1-29 1-2'	P1-29 2-3'	P1-30 0-1'	P1-30 1-2'
Lab ID	20A2473	20A2474	20A2475	20A2477	20A2478RE	20A2479	20A2481	20A2482RE
Sample Size	0.866 g	1.02 g	7.1 g	1.78 g	1.51 g	8.25 g	2.06 g	1.6 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	34.8	44.5	45.5	71.7	72.9	52.6	78.5	79.8
Dilution Factor	20	10	1	1	1	1	1	1
Min Reporting Limit	120	98	0.28	56	2.6	0.24	48	1.2
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener								
8 - 2,4'-Dichlorobiphenyl	34000	9100	1.7	2400	ND	1.0	64	ND
18 - 2,2',5-Trichlorobiphenyl	60000	22000	4.9	3800	2.6 U	ND	180	1.8
28 - 2,4,4'-Trichlorobiphenyl	95000	26000	5.8	3900	ND	2.8	360 U	7.7
44 - 2,2',3,5'-Tetrachlorobiphenyl	49000	12000	3.1	2200	ND	2.5	170	ND
52 - 2,2',5,5'-Tetrachlorobiphenyl	65000	22000	2.7	6000	63	10	490	3.8
66 - 2,3',4,4'-Tetrachlorobiphenyl	37000	7600	1.6	2300	10	1.6	310	ND
101 - 2,2',4,5,5'-Pentachlorobiphenyl	34000	8100	1.8	1300	16	8.6	240	2.0
105 - 2,3,3',4,4'-Pentachlorobiphenyl	2600	700	0.14 J	140	4.6	2.5	34 J	ND
118 - 2,3',4,4',5-Pentachlorobiphenyl	12000	3100	0.80	1200	13	2.1	230	ND
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	1600	420 J	0.13 J	160 J	3.1 J	3.3 J	39 J	ND
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	9000	2700	0.58	1100	12 U	1.3	140	1.2 U
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	12000	4100	0.98	1500	14	2.8	200	ND
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	1500	620	0.039 J	170 J	ND	ND	15 J	ND
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	2300	680	0.26 J	270 J	11	1.9 J	37 J	ND
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	1900	720	0.28 U	290	15	2.4	18 J	ND
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	240	69 J	0.096 J	31 J	26 J	4.6 J	5.6 J	0.22 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	260	98 U	0.28 U	36 J	68	8.3	24 J	1.2 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	49 J	98 U	0.078 J	6.0 J	22	5.4	16 J	ND
NOAA 18 Congener total ppm	420	120	0.025	27	0.27	0.061	2.2	0.017
Total PCB (as homologue)[1] -ppm units	1000	300	0.062	67	0.66	0.15	5.5	0.042
Internal Standards								
Dibromo-octafluoro-biphenyl	288 &	59	88	106	63	102	67	65
103 - 2,2',4,5',6-Pentachlorobiphenyl	102	81	75	93	68	80	77	74
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	87	75	80	72	74	68	75	84

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data
All results are surrogate corrected

Table J-4 Post-Dredge Sediment Core and Surface Grab PCB Data

Location	1	1	2	2	3	3	4	4	7	7
Depth	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm
Field ID	NBPD2-EPA01-C	NBPD2-EPA01-G	NBPD2-EPA02-C	NBPD2-EPA02-G	NBPD2-EPA03-C	NBPD2-EPA03-G	NBHPD2-EPA4-C	NBHPD2-EPA4-G	NBPD2-EPA07-C	NBPD2-EPA07-G
Lab ID	20A3244	20A3256RE	20A3243	20A3257RE	20A3217	20A3215RE	20A3190	20A3198RE	20A3239	20A3254RE
Sample Size	5.92 g	0.802 g	6.81 g	0.955 g	7.85 g	0.862 g	7.05 g	0.801 g	7.63 g	0.988 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	39.5	37.3	44.8	44.4	51.5	39.2	45.5	31.1	49.2	40.5
Dilution Factor	50	1	40	1	40	1	50	1	100	1
Min Reporting Limit	0.34	100	0.29	17	0.25	2300	0.28	5000	0.26	810
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener										
8 - 2,4'-Dichlorobiphenyl	1100	5300	410	36	350	3400	280	7200	470	3100
18 - 2,2',5-Trichlorobiphenyl	1700	8200 J	630	55 U	550	5800 J	430	13000 J	780	7700 J
28 - 2,4,4'-Trichlorobiphenyl	2200	9300 J	1000	79 U	910	8800 J	630	19000 J	1400	13000 J
44 - 2,2',3,5'-Tetrachlorobiphenyl	1000	5100	380	45	310	3500	320	9400	560	6000
52 - 2,2',5,5'-Tetrachlorobiphenyl	2100	10000	1100	82	740	8300	530	16000	1000	12000
66 - 2,3',4,4'-Tetrachlorobiphenyl	1000	5100	610	50 U	370	4000	280	9200	660	7300
101 - 2,2',4,5,5'-Pentachlorobiphenyl	670	3100	440	34 U	250	2900	220	7200	510	5600
105 - 2,3,3',4,4'-Pentachlorobiphenyl	26	230	25	17 U	23	170 J	23	470 J	48	860 U
118 - 2,3',4,4',5-Pentachlorobiphenyl	450	1800	370	24 U	180	1900 J	140	4300 J	320	4000
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	23	150	14	1.9 J	12	170 J	10	330 J	22	400 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	330	1600 U	160	17 U	110	1200 J	89	2600 J	180	2400 U
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	530	2800	370	25 U	220	2100 J	150	4800 J	340	4100
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	46	180	32	2.2 J	28	190 J	18	340 J	40	240 J
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	40	340	28	2.9 J	21	290 J	16	540 J	34	420 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	49	460	31	2.6 J	20	280 J	14	640 J	31	500 J
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	4.7	45 J	3.1	0.29 J	2.3	32 J	1.8	53 J	3.4	53 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	7.1	69 J	3.8	17 UJ	2.5	41 J	2.2	70 J	4.4	43 J
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	2.1	15 J	0.82 U	17 U	0.57 U	12 J	0.93	17 J	1.0	13 J
NOAA 18 Congener total ppm	**11**	**52**	**5.6**	**0.19**	**4.1**	**43**	**3.2**	**95**	**6.4**	**64**
Total PCB (as homologue)[1] -ppm units	**28**	**130**	**14**	**0.47**	**10**	**110**	**7.9**	**240**	**16**	**160**
Internal Standards										
Dibromo-octafluoro-biphenyl	84	79	74	76	86	98	74	113	62	69
103 - 2,2',4,5',6-Pentachlorobiphenyl	55	99	73	79	62	108	79	121	81	84
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	53	68	62	73	77	98	68	96	56	58

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data

All results are surrogate corrected

Table [illegible] Post-Dredge Sediment Core and Surface Grab PCB Data

Location	8	8	9	9	10	12	13	13	14	14
Depth	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Grab 0-2cm	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm
Field ID	NBPD2-EPA08-C	NBPD2-EPA08-G	NBHPD2-EPA9-C	NBHPD2-EPA9-G	NBPD2-EPA10-G	NBPD2-EPA12-G	NBPD2-EPA13-C	NBPD2-EPA13-G	NBPD2-EPA14-C	NBPD2-EPA14-G
Lab ID	20A3241	20A3261RE	20A3192	20A3200RE	20A3266RE	20A3263RE	20A3240	20A3258RE	20A3238	20A3255RE
Sample Size	7.63 g	0.757 g	7.87 g	0.842 g	0.77 g	1.5 g	7.79 g	0.981 g	7.2 g	0.9 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	50.5	34.9	51.4	38.8	35.8	67.6	49.4	39.4	46.5	41.3
Dilution Factor	20	1	10	1	1	1	200	1	40	1
Min Reporting Limit	0.26	1000	0.25	480	2100	270	0.26	820	0.28	890
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener										
8 - 2,4'-Dichlorobiphenyl	160	8900	7.7	1200	5000	980	1800	3100	290	8600
18 - 2,2',5-Trichlorobiphenyl	220	16000 J	14	1800 J	12000 J	2400 J	2700	6600 J	450	15000 J
28 - 2,4,4'-Trichlorobiphenyl	330	22000 J	20	3000 J	23000 J	4200 J	4800	11000 J	750	21000 J
44 - 2,2',3,5'-Tetrachlorobiphenyl	100	8500	22	1400	11000	1800	2000	5600	230	7100
52 - 2,2',5,5'-Tetrachlorobiphenyl	300	24000	81	2400	24000	4300	3200	9600	680	22000
66 - 2,3',4,4'-Tetrachlorobiphenyl	140	11000	36	1200	12000	2100	2400	9000	300	10000
101 - 2,2',4,5,5'-Pentachlorobiphenyl	93	6600	22	1000	8000	1500	1800	7400	200	6300
105 - 2,3,3',4,4'-Pentachlorobiphenyl	6.7	1000 U	0.74	86 J	2100 U	270 U	250	820 U	16	890 U
118 - 2,3',4,4',5-Pentachlorobiphenyl	43	4700	21	640	5800	1000	1200	5500	140	4700
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	3.9	320 J	1.1	130 J	580 J	91 J	33 J	280 J	9.6	420 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	31	3000 U	12	430 J	4300 U	740 U	630	2300 U	96	3000 U
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	47	6400	24	750	7300	1300	1100	4800	180	5800
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	9.6	210 J	0.62	90 J	410 J	80 J	49 J	240 J	20	400 J
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	6.0	590 J	1.5	180 J	810 J	130 J	120	470 J	17	630 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	8.2	830 J	3.3	120 J	910 J	160 J	140	500 J	18	750 J
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.75	73 J	0.22 J	35 J	120 J	16 J	5.1 J	50 J	1.9	73 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.90	93 J	0.34	100 J	97 J	22 J	6.0 J	62 J	2.2	86 J
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.26 U	14 J	0.25 U	86 J	25 J	270 U	1.3 J	21 J	0.44 U	23 J
NOAA 18 Congener total ppm	1.5	110	0.27	15	110	20	22	64	3.4	100
Total PCB (as homologue)[1] -ppm units	3.8	280	0.67	37	280	50	56	160	8.5	260
Internal Standards										
Dibromo-octafluoro-biphenyl	70	69	84	67	87	56	45	71	70	63
103 - 2,2',4,5',6-Pentachlorobiphenyl	70	89	67	73	109	74	54	94	72	83
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	58	64	68	78	68	56	31 &	64	60	56

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data

All results are surrogate corrected

Table J-4 Post-Dredge Sediment Core and Surface Grab PCB Data

ocation	15	15	16	16	19	19	20	20	21	21
lepth	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm
ield ID	NBHPD2-EPA15-C	NBHPD2-EPA15-G	NBPD2-EPA16-C	NBPD2-EPA16-G	NBPD2-EPA19-C	NBPD2-EPA19-G	NBPD2-EPA20-C	NBPD2-EPA20-G	NBHPD2-EPA21-C	NBHPD2-EPA21-G
.ab ID	20A3194	20A3202RE	20A3247	20A3260RE	20A3242	20A3253RE	20A3246	20A3262RE	20A3191	20A3199RE
ample Size	7.71 g	0.926 g	6.56 g	0.757 g	7.35 g	0.906 g	6.6 g	0.847 g	7.79 g	0.827 g
Veight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
'ercent Solids	50.5	37.5	43.5	34.1	48.1	40.1	43.7	39.4	50.8	39
)ilution Factor	40	1	100	1	100	1	200	1	1000	1
Min Reporting Limit	0.26	4300	0.3	1000	0.27	880	0.3	470	0.26	4800
Jnits	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener										
1 - 2,4'-Dichlorobiphenyl	320	8800	590	9900	580	2800	1400	3000	5800 J	7700 J
18 - 2,2',5-Trichlorobiphenyl	480	14000 J	920	18000 J	910	6700 J	2200	5600 J	7800 J	13000 J
28 - 2,4,4'-Trichlorobiphenyl	800	21000 J	1500	29000 J	1700	13000 J	3300	8300 J	12000 J	22000 J
44 - 2,2',3,5'-Tetrachlorobiphenyl	250	8200	630	12000	630	5100	920	2900	5400 J	9700 J
52 - 2,2',5,5'-Tetrachlorobiphenyl	620	19000	1100	23000	1200	10000	2900	9000	7900 J	14000 J
66 - 2,3',4,4'-Tetrachlorobiphenyl	300	9400	630	11000	730	5900	1300	3800	5400 J	8300 J
101 - 2,2',4,5,5'-Pentachlorobiphenyl	200	7400	510	8600	580	4500	700	2200	3400 J	7000 J
105 - 2,3,3',4,4'-Pentachlorobiphenyl	16	450 J	31	1000 U	47	880 U	30	470 U	470 J	460 J
118 - 2,3',4,4',5-Pentachlorobiphenyl	140	5000	300	4700	380	3000	520	1600	2100 J	3700 J
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	9.3	440 J	18 J	380 J	23	230 J	32	120 J	170 J	320 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	86	3100 J	180	3300 U	230	1800 U	360	1100 U	1100 J	2200 J
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	170	5100	330	6200	400	3200	640	2200	1800 J	3700 J
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	20	470 J	31	290 J	43	190 J	34 J	98 J	80 J	320 J
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	16	710 J	29 J	690 J	36	340 J	54	210 J	200 J	490 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	17	750 J	27	740 J	32	390 J	100	280 J	230 J	490 J
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	1.6	75 J	3.0	71 J	3.9	880 U	6.5	23 J	18 J	47 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	1.9	95 J	3.6 J	93 J	4.1	34 J	8.3	26 J	20 J	53 J
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.54 U	24 J	0.80 U	18 J	0.94	880 U	2.3	7.8 J	5.3 J	11 J
NOAA 18 Congener total ppm	3.4	100	6.8	130	7.5	55	15	39	54 J	93
Total PCB (as homologue)[1] -ppm units	8.6	260	17	310	19	140	36	98	130	230
Internal Standards										
Dibromo-octafluoro-biphenyl	70	125	60	59	65	68	64	56	2171 &	129 &
103 - 2,2',4,5',6-Pentachlorobiphenyl	64	122	79	79	87	85	102	74	168 &	133 &
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	60	96	54	51	60	62	54	57	59	119

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data

All results are surrogate corrected

Table J- .Post-Dredge Sediment Core and Surface Grab PCB Data

ocation	22	23	25	25	26	26	27	27	28
epth	Grab 0-2cm	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'	Grab 0-2cm	Core 0-1'
ield ID	NBPD2-EPA22-G	NBPD2-EPA23-G	NBPD2-EPA25-C	NBPD2-EPA25-G	NBPD2-EPA26-C	NBPD2-EPA26-G	NBHPD2-EPA27-C	NBHPD2-EPA27-G	NBHPD2-EPA28-C
ab ID	20A3265RE	20A3264RE	20A3218	20A3214RE	20A3245	20A3259RE	20A3193	20A3201RE	20A3187
ample Size	0.83 g	1.29 g	7.63 g	0.98 g	8.55 g	0.93 g	6.74 g	0.863 g	7.01 g
Veight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
ercent Solids	37.9	60.4	50	40.5	54.8	41.9	44.6	32.8	45.6
ilution Factor	1	1	200	1	40	1	500	1	50
Min Reporting Limit	960	310	0.26	410	0.23	430	0.3	9300	0.28
Inits	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener									
- 2,4'-Dichlorobiphenyl	5800	6300	1400	460 J	270	1400	3300	17000 J	520
8 - 2,2',5-Trichlorobiphenyl	13000 J	9000 J	2500	1100 J	430	3100 J	4500	27000 J	750
8 - 2,4,4'-Trichlorobiphenyl	20000 J	15000 J	5500	1700	670	4400 J	7700	36000 J	1100
4 - 2,2',3,5'-Tetrachlorobiphenyl	9100	5700	2200	960	210	1600	2500	15000 J	560
2 - 2,2',5,5'-Tetrachlorobiphenyl	21000	12000	3800	1800	590	4800	5700	33000 J	880
6 - 2,3',4,4'-Tetrachlorobiphenyl	10000	5000	3200	1200	270	2100	2900	15000 J	470
01 - 2,2',4,5,5'-Pentachlorobiphenyl	7400	4000	2300	1100	180	1300	1900	11000 J	370
05 - 2,3,3',4,4'-Pentachlorobiphenyl	960 U	310 U	350	230 J	10	430 U	80	760 J	28
18 - 2,3',4,4',5-Pentachlorobiphenyl	5400	2400	1700	900	120	870	1300	7400 J	210
28 - 2,2',3,3',4,4'-Hexachlorobiphenyl	490 J	220 J	140	150 J	8.9	53 J	94 J	700 J	14
38 - 2,2',3,4,4',5'-Hexachlorobiphenyl	3700 U	1700 U	850	720	81	620 U	770	4800 J	130
53 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6500	3200	1500	760	160	1200 U	1500	8100 J	240
70 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	400 J	140 J	62	100 J	28	76 J	66 J	770 J	25
80 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	680 J	340	180	160 J	14	120 J	180	1200 J	23
87 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	890 J	420	190	130 J	16	130 J	200	1200 J	23
95 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	82 J	38 J	19	18 J	1.4	10 J	14	120 J	2.4
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	98 J	45 J	19	24 J	1.6	29 J	17	130 J	2.8
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	20 J	14 J	5.7	20 J	0.28 U	430 U	4.6	32 J	0.79 U
NOAA 18 Congener total ppm	**100**	**64**	**26**	**12**	**3.1**	**20**	**33**	**180**	**5.3**
Total PCB (as homologue)[1] -ppm units	**250**	**160**	**65**	**29**	**7.7**	**50**	**82**	**450**	**13**
Internal Standards									
Dibromo-octafluoro-biphenyl	65	61	81	106	70	57	58	195 &	45
103 - 2,2',4,5',6-Pentachlorobiphenyl	88	88	199 &	115	75	74	133 &	153 &	50
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	59	59	70	100	56	59	61	125	49

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data

All results are surrogate corrected

Table J-4 Post-Dredge Sediment Core and Surface Grab PCB Data

Location	28	31
Depth	Grab 0-2cm	Grab 0-2cm
Field ID	NBHPD2-EPA28-G	NBPD2-EPA31-G
Lab ID	20A3195RE	20A3267RE
Sample Size	0.878 g	0.673 g
Weight Basis	DRY	DRY
Percent Solids	36	32.2
Dilution Factor	1	1
Min Reporting Limit	9100	2400
Units	ug/Kg	ug/Kg
PCB Congeners		
8 - 2,4'-Dichlorobiphenyl	19000 J	18000
18 - 2,2',5-Trichlorobiphenyl	31000 J	29000 J
28 - 2,4,4'-Trichlorobiphenyl	42000 J	36000 J
44 - 2,2',3,5'-Tetrachlorobiphenyl	20000 J	18000
52 - 2,2',5,5'-Tetrachlorobiphenyl	31000 J	46000
66 - 2,3',4,4'-Tetrachlorobiphenyl	15000 J	18000
101 - 2,2',4,5,5'-Pentachlorobiphenyl	12000 J	8600
105 - 2,3,3',4,4'-Pentachlorobiphenyl	460 J	2400 U
118 - 2,3',4,4',5-Pentachlorobiphenyl	5300 J	4000
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	420 J	450 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	3700 J	5400 U
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	6500 J	8400
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	540 J	540 J
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	830 J	900 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	910 J	1500 J
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	79 J	150 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	94 J	210 J
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	9100 U	54 J
NOAA 18 Congener total ppm	190	190
Total PCB (as homologue)[1] -ppm units	470	470
Internal Standards		
Dibromo-octafluoro-biphenyl	182 &	80
103 - 2,2',4,5',6-Pentachlorobiphenyl	153 &	91
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	114	64

[1]Calculated using Foster Wheeler's (January, 2001) *regression equation: Total PCBs as homologues =* NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data

All results are surrogate corrected

Table Post Dredge Cut 1 Transect - Sediment Grab PCB Data.

Location	T1A	T1B	T1C	T1D	T1E	T1F	T2A
Depth	Grab 0-2cm	Grab 0-2cm	Grab 0-2cm	Grab 0-2cm	Grab 0-2cm	Grab 0-2cm	Grab 0-2cm
Field ID	NBPDT1A-2	NBPDT1B-2	NBPDT1C-2	NBPDT1D-2	NBPDT1E-2	NBPDT1F-2	NBPD-T2A-2
Lab ID	20A3232RE	20A3233RE	20A3234RE	20A3235RE	20A3236RE	20A3237RE	20A3210RE
Sample Size	0.888 g	0.951 g	0.958 g	1.03 g	0.998 g	0.867 g	0.723 g
Weight Basis	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Percent Solids	42.3	38.5	45.4	45	48.2	40.7	31.3
Dilution Factor	1	1	1	1	1	1	1
Min Reporting Limit	2200	4200	420	390	400	920	11000
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congener							
8 - 2,4'-Dichlorobiphenyl	3400	4600	520	1100 J	1400	8400	4300 J
18 - 2,2',5-Trichlorobiphenyl	6700	9100 J	1000 J	2200 J	2900 J	14000 J	12000 J
28 - 2,4,4'-Trichlorobiphenyl	11000 J	16000 J	1800 J	3800 J	5000 J	23000 J	32000 J
44 - 2,2',3,5'-Tetrachlorobiphenyl	5200	7200	840	1700 J	2500	10000 J	13000
52 - 2,2',5,5'-Tetrachlorobiphenyl	8600	12000	1400	3000 J	4600	19000	25000
66 - 2,3',4,4'-Tetrachlorobiphenyl	6100	8500	1000	2300 J	3200	11000	22000
101 - 2,2',4,5,5'-Pentachlorobiphenyl	5100	7100	780	1800 J	2400	7900	19000
105 - 2,3,3',4,4'-Pentachlorobiphenyl	560 J	650 J	74 J	230 J	400 U	920 U	2000 J
118 - 2,3',4,4',5-Pentachlorobiphenyl	3500	4800	560	1400 J	1600	5000	14000
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	330 J	530 J	47 J	120 J	100 J	400 J	1100 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	2100 J	2800 J	320 J	820 J	950 U	3200 U	7700 J
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	3200	4400	490	1200 J	1600	5600	12000
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	300 J	410 J	43 J	120 J	140 J	270 J	1000 J
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	450 J	700 J	67 J	180 J	140 J	610 J	1500 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	430 J	580 J	66 J	170 J	180 J	700 J	1500 J
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	42 J	62 J	6.2 J	19 J	17 J	59 J	150 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	66 J	210 J	7.8 J	21 J	15 J	78 J	140 J
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	26 J	150 J	1.3 J	3.4 J	400 U	18 J	11000 U
NOAA 18 Congener Total ppm	57	80	9.0	20	26	110	170
Total PCB (as homologue)[1] -ppm units	140	200	23	50	64	270	420
Internal Standards							
Dibromo-octafluoro-biphenyl	99	115	98	135 &	69	80	111
103 - 2,2',4,5',6-Pentachlorobiphenyl	110	124	114	127 &	89	110	119
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	97	111	95	111	71	74	105

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data

All results are surrogate corrected

Table J-5 Post Dredge Cut 1 Transect - Sediment Grab PCB Data.

Location	T2B	T2C	T2D	T2E	T2F
Depth	Grab 0-2cm	Grab 0-2cm	Grab 0-2cm	Grab 0-2cm	Grab 0-2cm
Field ID	NBPD-T2B-2	NBPDT2C	NBPDT2D	NBPDT2E	NBPD-T2F-2
Lab ID	20A3211RE	20A3221RE	20A3224RE	20A3223RE	20A3212RE
Sample Size	1.15 g	1.17 g	1.24 g	1.14 g	1.2 g
Weight Basis	DRY	DRY	DRY	DRY	DRY
Percent Solids	48.4	47.1	52.4	50.7	46.4
Dilution Factor	1	1	1	1	1
Min Reporting Limit	1700	340	130	140	330
Units	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
PCB Congeners					
8 - 2,4'-Dichlorobiphenyl	2400	2500 J	170	410	1000 J
18 - 2,2',5-Trichlorobiphenyl	4700 J	4500 J	390	840	2000 J
28 - 2,4,4'-Trichlorobiphenyl	8900 J	8000 J.	490 J	1300 J	3100 J
44 - 2,2',3,5'-Tetrachlorobiphenyl	4000	3500 J	240	650	1500 J
52 - 2,2',5,5'-Tetrachlorobiphenyl	7100	6200 J	430	1000	2600 J
66 - 2,3',4,4'-Tetrachlorobiphenyl	5100	4700 J	270	870	1700 J
101 - 2,2',4,5,5'-Pentachlorobiphenyl	4200	3700 J	240	630	1400 J
105 - 2,3,3',4,4'-Pentachlorobiphenyl	450 J	430 J	18 J	87 J	160 J
118 - 2,3',4,4',5-Pentachlorobiphenyl	3100	2900 J	160	490	1000 J
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	300 J	280 J	14 J	42 J	98 J
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	1800	1800 J	98 J	270	620 J
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	2800	2500 J	160	400	920 J
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	270 J	280 J	14 J	38 J	87 J
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	400 J	410 J	20 J	54 J	140 J
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	390 J	400 J	20 J	53 J	130 J
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	45 J	45 J	1.8 J	5.0 J	14 J
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	65 J	50 J	3.1 J	6.6 J	17 J
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	25 J	14 J	0.86 J	1.6 J	4.1 J
NOAA 18 Congener Total ppm	46	42	2.7	7.1	16
Total PCB (as homologue)[1] -ppm units	120	110	6.8	18	41
Internal Standards					
Dibromo-octafluoro-biphenyl	97	215 &	81	85	146 &
103 - 2,2',4,5',6-Pentachlorobiphenyl	110	154 &	93	99	122
198 - 2,2',3,3',4,5,5',6-Octachlorobiphenyl	98	104	87	88	96

[1]Calculated using Foster Wheeler's (January, 2001) regression equation: Total PCBs as homologues = NOAA 18 Congener sum (ppm) * 2.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = value is estimated
& = QC criteria failure

Total PCB summations do not include U-qualified data

All results are surrogate corrected

Table J-6
Summary of PCB Concentrations in Sediments

Station	Pre-Dredge Cores Sediment Depth 0-1 ft	1-2 ft	2-3 ft	3-4 ft	Post Dredge Core 0-1 ft	Grab 0-2 cm	T1 0-5 CM	T2 0-5 cm	Station
1	270	560	260	1.1	28	130	140	420	A
2	200	6.0	0.17		14	0.47	200	120	B
3	810	6.2	0.36		10	110	23	110	C
4	2700	23	0.13		7.9	240	50	6.8	D
5	210	0.63	0.12				64	18	E
6	11	0.0038					270	41	F
7	96	0.013			16	160			
8	250	490	65	0.27	3.8	280			
9	2500	2.2			0.67	37			
10	2300	27	0.11			280			
11	29	0.084	0.0026						
12	8.8	0.067				50			
13	370	830	160	0.26	56	160			
14	320	0.79			8.5	260			
15	830	3.0	0.16		8.6	260			
16	2500	94	0.41		17	310			
17	460	24	0.0056						
18	1.6	0.19							
19	950	2.9			19	140			
20	170	0.092			36	98			
21	1300	61	0.080	0.32	130	230			
22	1100	64	7.4	7.2		250			
23	6.2	0.10	0.0030			160			
24	4.5	0.032							
25	460	420	1.2		65	29			
26	330	4.4	0.33		7.7	50			
27	480	0.82	0.059		82	450			
28	1000	300	0.062		13	470			
29	67	0.66	0.15						
30	5.5	0.042							
31						470			

Note: All concentrations reported as total PCB (as homologue) in ppm

Table J-7. Calculation of Average PCB Concentration in Sediments

	Pre-Dredge			Post-Dredge
	0 – 1 foot	1 – 2 feet	2 – 3 feet	0 – 1 foot
Entire Horizon	654	91	15	
Dredging boundaries	857	147	26	29

Notes:

1) All concentrations reported as total PCB (as homologues) in ppm
2) PCB concentrations (ppm) within each 1 foot depth horizon in the pre-design study area based on an inverse-distance weighting interpolation procedure. Values are shown for each complete horizon (100 feet x 400 feet), as well as within the dredging boundaries (100 feet x 240 feet) for each horizon (used in mass PCB removal calculations).

Table J-8. Calculation of PCB Mass Removal Efficiency

Depth Horizon	Sediment Mass (Kg)	Average PCB Concentration (ppm)	Mass of PCBs (Kg)
Pre-dredge: 0-1 foot	1495022	857	1281
Pre-dredge: 1-2 feet	1495022	147	220
Pre-dredge: 2-3 feet	1495022	26	38
Pre-dredge: Sum	4485066		1539
Post-dredge: 0-1 foot	1495022	29	44
PCB Mass Removal Efficiency = 97%			

Notes:

1) All concentrations reported as total PCB (as homologues) in ppm.

2) Removal efficiency was calculated as the percent of PCB mass remaining post-dredge compared to the mass of PCBs before dredging.

Formulas & Constants:

Volume = L x W x H

Cubic feet / 27 = cubic yards

Cubic yards x 0.7645 = cubic meters

1 cubic meter of sediment = 2200 Kg

Mass of PCBs (Kg) = Kg-sed x ug/g PCB x 1e-6g/ug

Table J-9. Calculation of the Thickness of Contaminated Surficial Sediment that would result in a 10ppm Concentration in the 0-1' Composite Sample.

Equation 1: Number of grams of sediment in 1ft^3

Cubic ft	Cubic yds	Cubic m	Kg	grams
1.00	0.037037	0.028148	61.926	61925.93

Equation 2: Mass of PCB's needed to contaminate 1ft^3 of clean sediment to a concentration of 10ppm.

[PCB] ppm	[PCB] ug/g	1 cu.ft (grams)	ug PCB present
10	10	61926	619259

Calculations: The estimated depth of contaminated surficial sediments (cs) needed to contaminate 1ft^3 of clean sediments to a concentration of 10ppm, listed by degree of overlying contamination.

Assumed Surficial Sediment Concentration		Mass PCB in 1 cubic foot sample with 10 ppm average concentration (ug)	Mass of Surficial Sediment with given PCB concentration		Associated Volume of Surficial Sediment with Given PCB Concentration		Thickness of Surficial Sediment Layer with Given PCB Concentration (inches)
[PCB] ppm	[PCB] ug/g (cs)		g	Kg	cubic m (cs)	cubic in (cs)	
4000	4000	619259	154.815	0.155	0.00007	4.3	0.03
1000	1000	619259	619.259	0.619	0.00028	17.3	0.12
500	500	619259	1238.518	1.239	0.00056	34.6	0.24
100	100	619259	6192.590	6.193	0.00281	172.8	1.20
50	50	619259	12385.180	12.385	0.00563	345.6	2.40

Calculation explaination:
1: Calculations were preformed to determine the depth of contaminated surficial sediments needed to contaminate 1 cubic foot of clean sediments to a concentration of 10ppm. This was determined by first finding the number of grams in 1 cubic foot of sediment. It was assumed that 1 cubic meter of sediment is equal to 2200kg. This information was then used to convert cubic feet to grams of sediment. The result of this calculation is shown in Equation 1, as 61926g.

2: The mass of PCB's needed to contaminate 1ft3 of clean sediment to a concentration of 10ppm was determined as shown in equation 2. This was determined by multiplying the mass of 1ft3 of clean sediment by 10ppm of PCB's.

3: The final calculations were determined as shown in the Calculations box. The assumed surficial sediment concentration is multiplied by the mass of PCBs in 1ft3 of sediment wit a 10ppm average concentration to give the mass of surficial sediment with given PCB concentration. The mass of sediment is then converted to sediment volume using a standard assumption. The volume is then converted into a depth using a box of 12 inches in length and width.

Formulas, Constants and Assumptions
1 cubic meter of sediment = 2200 Kg
Volume = L x W x H
Cubic inches/1728 = cubic feet
Cubic feet / 27 = cubic yards
Cubic yards x 0.7645 = cubic meters
Mass of PCBs (kg) = Kg-sed x ug/g PCB x 1e-6g/ug

Appendix K
Water Quality Monitoring

APPENDIX K

Water Quality Monitoring
Pre-Design Field Test Dredge Technology Evaluation Report
New Bedford Harbor Superfund Site

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APPENDIX K – WATER QUALITY MONITORING
PRE-DESIGN FIELD TEST - DREDGE TECHNOLOGY EVALUATION REPORT
NEW BEDFORD HARBOR SUPERFUND SITE

K.1 INTRODUCTION

The Pre-Design Field Test was undertaken to evaluate the performance of a dredge system being considered for use at the New Bedford Harbor Superfund Site. The objectives of the Pre-Design Field Test included: 1) evaluating actual dredge performance relative to removal of contaminated sediments; 2) evaluating the dredge's ability to minimize environmental impact to water quality by measuring the extent of contaminated sediment resuspension and transport; and 3) evaluating the dredge's ability to operate within acceptable air quality levels. The technology selected for the study was a hydraulic excavator equipped with a slurry-processing unit (provided and operated by Bean Environmental, LLC). The field test was performed in August 2000 in a 100-foot by 550-foot (30.5 x 168m) area within New Bedford's Upper Harbor (Figures K-1, K-2).

This appendix evaluates water quality impacts associated with the Pre-Design Field Test and includes the following components:

- Predictive modeling used to aid in the design of the water quality monitoring field program and to assess the utility of modeling for the full-scale remediation effort;
- Field monitoring to assess sediment resuspension during the dredging operation, to collect water samples for laboratory analysis, and to ground-truth the predictive modeling;
- Laboratory analysis of water samples (TSS, PCBs) to assess water quality impacts; and
- Correlation assessment between the field and laboratory data.

The predictive modeling included development of a numerical hydrodynamic and sediment transport model based on previous work in New Bedford Harbor (USACE, 1998 and 2000). Modeling was used to predict the expected suspended sediment concentration resulting from dredging activities under a variety of transport assumptions. These predictions were used to help design the field monitoring program.

Field monitoring was performed in parallel with the dredging activities in August 2000. Objectives of the monitoring included real-time location and mapping of any turbidity plume associated with the dredging as well as collection of water samples at designated stations downstream of the dredge for laboratory analysis. The monitoring program was structured to document water column conditions in the Upper Harbor over the course of ebb and flood tidal events during dredging operations. Water samples were analyzed for total suspended solids (TSS) and dissolved and particulate PCBs. An assessment of the correlation between field turbidity as measured by an optical backscatter sensor and laboratory TSS data was performed. In addition, the laboratory TSS data were compared to PCB concentrations.

This appendix represents a joint effort by the U.S. EPA, the U.S. Army Corps of Engineers (USACE, New England District), and ENSR International (under contract DACW 33-96-D-004 to the USACE).

K.2 PREDICTIVE NUMERICAL MODELING

A numerical model of Upper New Bedford Harbor was developed and applied to predict concentrations of suspended sediment in the water column resulting from dredging activities. The predictions were used in the initial design of the water quality field-sampling program for the Pre-Design Field Test. Subsequent to the Field Test, the accuracy of the model was assessed to evaluate its efficacy as a predictive tool for monitoring during full-scale remediation at the site. The model was based on previous hydrodynamic modeling of New Bedford Harbor performed by the U.S. Army Corps of Engineers (USACE, 1998 and 2000). The computer models RMA2 and SED2D were used to simulate hydrodynamics and sediment transport, respectively (USACE, 1997 and Letter *et al.*, 1998).

K.2.1 Methods

Hydrodynamic Model

RMA2 is a two-dimensional depth-averaged finite element model that simulates free surface flow (USACE, 1997). The present application of the model builds on previous modeling carried out in 1988 and early 2000 (USACE, 1998 and 2000). The domain and model mesh, as revised for this effort, is shown in Figure K-3. The domain covers the upper portion of New Bedford Harbor from the Coggeshall Bridge at the south, to the Wood Street Bridge at the north. The mesh size ranged from 30 meters (98 feet) over most of the domain to 5 meters (16 feet) in the vicinity of the dredging area. This finer mesh provided the level of detail required to simulate sediment transport.

The hydrodynamics model RMA2 was applied to New Bedford Harbor in 1988 and was calibrated to two sets of conditions; a spring high tide, corresponding to conditions measured in March 1986, and a tide between mean high tide and mean spring tide measured in April 1986 (USACE, 1998). The 1988 model was rerun in early 2000 to study the potential impact of confined disposal facility construction on the hydrodynamics of New Bedford Harbor (USACE, 2000). The 1988 and 2000 model was used in the present study to provide boundary conditions for the Upper New Bedford Harbor model. The predicted water surface elevation at the Coggeshall Bridge was used to drive the new Upper New Bedford Harbor hydrodynamic model at the southern boundary, while the same freshwater inflow used in the initial model was used at the northern boundary.

Sediment Transport Model

The SED2D model was used to simulate sediment transport resulting from dredging activities. The model calculates suspended sediment concentration and change in bed elevation (Letter *et al*, 1998). Under the normal range of environmental conditions in the Upper Harbor, waves, tidal currents, and precipitation runoff can cause resuspension of sediments. However, for the present application, it was assumed that the bed-surface was non-erodible; therefore, the only sediment source was that resulting from dredging operations. This allowed for a clearer presentation of the potential suspended solids impacts of dredging.

The sediment source was defined as a constant input mass rate of sediment released in the water column at four mesh elements. The resolution of the model mesh in the dredging area is roughly 5 m (16 feet) square. The source was assumed to cover an area of four mesh elements at any time, an area approximately equal to that of the dredge moon pool (10 m x 10 m) (33 feet x 33 feet). The source strength was estimated from the

expected production rate of 69 m^3/hr (90 yd^3/hr), and from Bean's assessment of the fraction of sediment lost to the water column by the environmental bucket used. Bean estimated the fraction lost to no more than 1%. Combining the production rate and the percent loss, the total sediment release rate to the water column was calculated to be approximately 482 kg/hr (1063 lb/hr).

The sediments were assumed to be composed of 3 main sediment fractions presented in Table K.2-1 and are based on grain size data presented in the work plan for the Pre-Design Field Test (FWENC, 2000). All three fractions were assumed to be non-cohesive with fall velocities calculated using Stokes equation. Since the SED2D model can only simulate one sediment type at a time, each fraction was run independently, and the results were combined to obtain the total suspended solids concentration.

Table K.2-1: Sediment Characteristics

Fraction Name	Fraction by weight (%)	Mass Release Rate (kg/hr)	Representative grain diameter (mm)	Fall velocity from Stokes equation[1] (m/s)	Comments
Sand	19%	91.5	2.0	3.21	Corresponds to the middle of the "fine sand" classification (ASTM, 1990).
Silt	53%	255.2	0.02	3.21×10^{-4}	Corresponds to the middle of the "silt" classification (ASTM, 1990).
Clay	28%	134.8	0.002	3.21×10^{-6}	Corresponds to the middle of the "clay" classification (ASTM, 1990).

[1] Fall velocity is calculated using Stokes equation $\omega = gd^2(\rho s - \rho)/18\mu$, where g is the gravitational acceleration (9.81 m/s^2), d is the diameter of a spherical grain (m), ρs is the density of sediment particles (kg/m^3), ρ is the density of water (kg/m^3), and μ is the dynamic viscosity of water ($N\text{-}s/m^2$). A dry density of 700 kg/m^3 was assumed for all sediments. Water density and viscosity were respectively taken as 999 kg/m3 and $1.12E^{-3}$ Ns/m^2 for fresh water at 15.6°C. Note that the Stokes equation assumes that sediments settle as discrete particles. For fine particles, a better estimate of the fall velocity would be obtained through laboratory measurements. In the current application, Stokes equation was assumed to provide a suitable estimate of the fall velocity.

Model Parameters and Variables

Transport in surface water systems is highly dependent on the dispersion coefficient, a parameter that determines the extent of "spreading" of a transported substance under ambient flow conditions. Typical literature values for dispersion coefficients vary widely and are usually determined by calibrating the model to field measurements. In the absence of field measurements to calibrate the present model, a series of simulations were performed with dispersion coefficient values of 0.1, 1.0, 10 and 100 m^2/s (1, 11, 108, 1076 ft^2/s). As expected, the dispersion coefficient had a major impact on the extent of the suspended sediment plume and predicted concentrations. Comparison of model predictions with field data collected in August 2000 during the Pre-Design Field Test is presented in Section K.6.3.

K.2.2 Results

The Upper New Bedford Harbor model was used to predict suspended sediment concentrations (above background) resulting from dredging activities. The model was run with a constant sediment source at the point of dredging for two tide cycles, and the results for each sediment fraction were combined to predict the total suspended sediment concentration throughout Upper New Bedford Harbor at ½ hour intervals. Figures K-4 and K-5 present an example of modeled suspended sediment concentrations during flood tide and ebb tide, respectively. Figure K-6 presents a time series of predicted suspended sediment concentration at specified distances north and south of the dredge, along with water surface elevation at the Coggeshall Street Bridge. The three figures present results of a simulation for which the dredge was situated in cut #1 of the dredging area (see Figure K-2 for location), and the dispersion coefficient was set to 10 m^2/s (108 ft^2/s).

Numerous scenarios were considered with different combinations of dredge location within the test area, mass release rate, and dispersion coefficients. Predicted local TSS concentrations were greatest when the dredge was in the shallower waters at the eastern end of the test area; however, far-field TSS levels were similar to those levels predicted to be present when dredging in deeper waters. The peak concentration predicted (immediately adjacent to the sediment release/dredge location) decreased with increasing dispersion coefficients and varied from a maximum of about 390 mg/L for dispersion coefficient of 0.1 m^2/s (1 ft^2/s), to less than 5 mg/L for a coefficient of 100 m^2/s (1076 ft^2/s). The later value is within the variability of background measurements; therefore, it is difficult to detect above ambient conditions. Table K.2-2 presents the peak suspended sediment concentration predicted for different dispersion coefficient values. In all cases, the results predicted no re-suspended sediment transport under the Coggeshall Street Bridge to the Lower Harbor while the dredge operated within the designated Pre-Design Field Test area. A comparison of the model predictions and field measurements is presented in Section K.6.3.

Table K.2-2: Impact of Dispersion Coefficient on Predicted Peak Concentration and Length of Suspended Sediment Plume.

Dispersion coefficient (m^2/s)	Peak suspended sediment concentration in immediate vicinity of dredge (mg/L) – above ambient conditions	Approximate length of plume at 5 mg/L contour (m)
0.1	390	900
1.0	72	800
10	13	120
100	2	0

K.3 METHODS FOR MONITORING THE PRE-DESIGN EFFORT

K.3.1 Navigation and Positioning

The environmental monitoring program was conducted using the 19' survey vessel *Cobia* and the 35' support vessel *Sakonnet*, leased from, and operated by CR Environmental, Inc. The *Sakonnet* was anchored in the lower part of the estuary near the USACE Sawyer Street Project Office and served as the platform for staging the monitoring effort. The *Cobia* served as the mobile survey platform and was equipped with a Trimble Pro-XRS GPS system to achieve real-time sub-meter accuracy. The output of the Trimble GPS system was integrated into HYPACK; a PC-based software package which displays navigational information and electronic sensor data on a digital base map of the survey area. The HYPACK system allowed the boat operator to view the actual vessel position relative to physical features including geographic landmarks and, more importantly, the outline boundaries of the 100-foot x 550-foot (30.5 x 168 m) test area. The system has the added capability of storing waypoint information; this feature enabled the boat operator to mark and revisit sampling stations or points of interest during the study to ensure that composite samples were collected at the same location.

K.3.2 Characterizing Current / Tidal Profiles in the Upper Harbor

Current and tidal profile measurements needed to confirm the accuracy of the numerical model predictions presented in Section K.2 were performed using a Nortek Aquadopp current meter. The sensor operates by measuring the Doppler shift of an acoustic signal transmitted into the water column that is reflected off suspended material carried in the flow field. The unit consists of three acoustic heads, two positioned roughly parallel to the horizon (separated by an angle of 45 degrees) and a third centered between these two oriented up at a 45 degree angle from the horizon. Each head transmits a narrow beam signal and detects the frequency shift in the parent signal caused by particles passing parallel to the beam. The individual contribution made by the three sensor heads allows the unit to resolve the 3-D velocity of the flow field; an internal magnetic compass enables the unit to convert XYZ velocity into the east-north-up (ENU) vector. The Aquadopp unit is also equipped with a pressure sensor to record the hydrostatic head (converted to water depth) over the top of the sensor package, as well as a water temperature sensor.

The unit was mounted in a stainless steel frame and placed on the harbor bottom approximately 1500 feet (457 m) south of the dredge evaluation area. Water velocity measurements were made every 10 minutes during the course of the eight-day deployment (11 August to 18 August 2000).

K.3.3 Measurement of Water Column Turbidity

Water column turbidity measurements were performed using an optical backscatter sensor (OBS). The OBS sensor used for this effort was the OBS-3 sensor with a range of 0-2000 Nephelometric Turbidity Units (NTU) manufactured by D&A Instruments of Port Townsend, WA. The OBS sensor is a mini-nephelometer that operates by flashing a parcel of water with an optical signal, then measuring the infrared radiation scattered back to the sensor by suspended particles and displaying the output in NTUs. The sensor was fixed to an adjustable vertical mount that allowed it to be positioned to a constant depth of 18, 24, 30, or 36 inches (46, 61, 76 or 91 cm) while collecting transect data. The sensor could also be removed for deeper measurements. A sampling depth of 24 or 30 inches (61 or 76 cm) was used for most of the transects

located in the shallow water of the estuary surrounding the test area. This sensor depth resulted in data collection near the midpoint of the water column in the deepest areas along the center of the channel.

Turbidity monitoring was initiated prior to the start of dredging operations in order to characterize baseline turbidity conditions within the Upper Harbor. After dredging began, the water quality conditions were closely monitored to assess the development and the areal extent of any elevations of turbidity from baseline conditions. The results of the model predictions presented above in Section K.2 were used to set target distances for the initial transects (locations where an elevation of turbidity was expected). This initial turbidity tracking was conducted for one hour after the start of active production dredging, after which the positions of down-current stations were set for collecting TSS and PCB samples. Turbidity data continued to be collected in the Upper Harbor during each monitoring event, and selective east-west or north-south transects were performed to document changing water column conditions.

K.3.4 Sample Collection for TSS and PCB Analyses

Sampling for TSS and PCB analyses was performed over four discrete tidal events (ebb/flood on 16 August and ebb/flood on 17 August) while dredging operations were ongoing. The predicted tide change (based on NOAA tables) was confirmed by the change in current direction indicated by movement of a drogue buoy. The track of the drogue buoy down current of the dredge also provided insights into the potential site-specific path for plume migration. Turbidity mapping was performed for the first hour of each event to track the development of any plume and to aid in setting sampling station locations. The data from the turbidity transects were compared with the initial station locations (based on model predictions), and the locations of the down-current stations were finalized. For the monitoring performed on 16 August, stations were set at 50 feet, 100 feet, and 500 feet (15, 30 and 152 m) down current of the dredging and 1000 feet (305 m) up-current. The up-current station was considered a reference station. Because elevated turbidity readings were noted down current beyond the sampling stations on 16 August (although the elevations were most likely due to rainfall run off and not dredging), an additional down-current station was added for the 17 August monitoring. Stations were set at 50 feet, 300 feet, 700 feet, and 1000 feet (15, 91, 213 and 305 m) down current of the dredging.

Consecutive hourly sampling was performed at each station during the course of the monitored tidal event, provided dredging activities were sustained. The hourly samples were combined to form an "event composite" for each station. The number of samples included in the composites ranged from two to four depending on the dredging schedule for a given monitoring event. Water samples were collected from designated stations using a 12-volt diaphragm pump equipped with fluoropolymer tubing. The tubing inlet was placed alongside the OBS sensor to match the water samples collected for TSS analysis with turbidity measurements. In general, samples were collected from approximately mid-water column after flushing the pump and tubing with a minimum of 3-volumes of ambient station water. The specific protocols applied during the collection of TSS and PCB samples in the field are detailed in the QAPP (ENSR, 2000).

In addition to the composite samples, the following discreet samples were collected as part of the monitoring:

- Reference samples were collected for analysis of PCBs and TSS prior to the start of the Pre-Design Field Test (7 August) and prior to the start of dredging on each monitoring day (16-18 August).

- Specific events of interest were sampled for PCBs. These included a surface oil sheen noted on 16 August, the plume associated with positioning of the support vessel *Miami II* on 17 August, and a moonpool sample on 18 August.

- The discreet samples taken at the same location and time as the samples used to build the event composites were also analyzed individually for TSS to assess the relationship between turbidity and TSS.

K.3.5 Laboratory Analysis

Dissolved and Particulate PCBs

Water quality samples collected for PCB analysis were transferred to Woods Hold Group (Raynham, MA) for initial sample filtering to separate the dissolved and particulate PCB fractions. Samples were filtered within 24 hours using glass fiber filters as specified in the QAPP (ENSR, 2000). Soluble PCB fractions were stored at 4°C, and particulate fractions were stored frozen until further processing and analysis. Two laboratories supported ENSR analytically; Woods Hole Group (Raynham, MA) was selected as the primary laboratory, and Arthur D. Little (Cambridge, MA) participated as the backup/QA laboratory.

The 18 PCB congeners selected by NOAA for the National Status and Trends program and by the EPA EMAP program were selected for analysis in this study. The preparation methods used to generate these data were selected to match those used by previous investigators and are detailed in the project QAPP (ENSR 2000). Dissolved PCB fractions were extracted using methylene chloride, reduced in volume and exchanged into hexane, cleaned with sulfuric acid and analyzed using gas chromatography/electron capture detection (GC/ECD) for the 18 target congeners. Particulate fractions were treated in a similar manner but included a maceration step using stainless steel homogenizing cutting blades (Tissuemizer).

The compounds dibromo-octafluoro-biphenyl (DBOFB) and PCB-198 were added to all samples as surrogate internal standards (SIS) and carried through the sample preparation and analysis process as a measure of accuracy. The Pre-Design Field Test water quality data sets were SIS corrected using PCB-198 for consistency with earlier water quality investigations. Final (hexane) extracts were analyzed using a single chromatographic column to speed data delivery and provide comparability with earlier New Bedford Harbor aqueous PCB investigations.

The congener data were summed to simplify comparisons between stations. This sum represents only the 18 NOAA PCB congeners and has no relation to total PCBs as homologues or Arochlors. The relationship for converting PCB congener to total PCB as homologues developed for this project (FWENC 2000) is for sediments and cannot be applied to aqueous measurements.

Total Suspended Solids

Water samples collected for the total suspended solids (TSS) analyses were transferred to Woods Hole Group (Raynham, MA) for filtration and analysis. Samples were filtered using membrane filters, rinsed with buffered deionized water to remove salts before desiccating and submitting for gravimetric TSS analysis as specified in the QAPP (ENSR, 2000). Woods Hole Group performed all of the TSS measurements.

Quality Assurance

The laboratory data was validated by ENSR's QA department and included the following review elements as described in the Quality Assurance Project Plan (QAPP; ENSR, 2000):

- Analytical completeness (agreement with chain-of-custody and project requirements);
- Sample preservation and holding times;
- Instrument initial and continuing calibration information;
- Laboratory method blank/equipment blank contamination;
- Surrogate spike recoveries;
- Matrix spike/matrix spike duplicate (MS/MSD) results;
- Laboratory control sample (LCS) results;
- Internal standard performance; and
- Quantitation limits.

The validation was used to potentially qualify or reject sample or individual congener data that did not meet the data quality objectives established in the QAPP (ENSR, 2000).

Equipment blanks were collected twice during the field effort. Blanks were collected at the end of the day after the investigative sampling effort was complete and after the system was rinsed with tap and deionized water. First, the pump inlet tube was placed in a reservoir of tap water and approximately four liters were pumped through the system. Next, the pump inlet tube was placed in deionized water (DIW), three liters of DIW were flushed through the system, and the fourth liter was collected for analysis.

K.4 CHRONOLOGY OF WATER QUALITY MONITORING

The chronology of water quality monitoring is summarized in Table K.4-1. A series of dredge equipment and operational modifications during the first six days of dredging (10-15 August) resulted in limited periods of continuous dredging each day. As a result, turbidity monitoring was performed during part of the day, but monitoring/sample collection over a full ebb or flood tide could not be performed. Dredge operations were much more continuous on 16-17 August, and both ebb and flood tide monitoring events were performed each day.

Table K.4-1 Chronology of Water Quality Monitoring

Date	Dredging Operations	Field Monitoring
Friday, 04 August	Assembly and testing. Dredging start tentatively set for 08 August.	Mobilization of field equipment completed in New Bedford.
Monday, 07 August	Final assembly and testing of dredge platform continues. Start of actual dredging operations is rescheduled for 10 August.	Field testing of monitoring and sampling equipment. Pre-dredge baseline water quality samples were collected.
Thursday, 10 August	Dredging operations begin in cut #6. Operational difficulties encountered with the handling of sediments containing significant quantities of embedded shells	Turbidity monitoring only. No formal sampling events were performed due to the limited period of dredging.
Friday, 11 August	Dredging operations continue in cut #6. Operational difficulties continue to limit the periods of continuous dredging.	Turbidity monitoring only. No formal sampling events were performed due to limited period of dredging. Current meter programmed and deployed.
Saturday, 12 August	Dredging operations continue in cut #6. Operational difficulties continue. Dredging operations are suspended to initiate equipment and operational modifications to improve dredge performance.	Turbidity monitoring only. No formal sampling events were performed due to limited period of dredging. Water quality monitoring discontinued during the dredge modification period with the understanding that the dredge would only operate in the eastern half of the test area.
Sunday, 13 August	Dredging operations resume in cut #6.	No monitoring performed.
Monday, 14 August	Dredging operations continue in cuts #7 and #8.	No monitoring performed.
Tuesday, 15 August	Dredging operations completed in cut #8. Dredge shifted to cut #5.	Continuity of dredging is insufficient to support a full sampling event. Turbidity monitoring with grab samples collected for TSS analysis.
Wednesday, 16 August	Dredging operations completed in cut #5 and later in cut #4. Dredge shifted to cut #3.	One EBB and one FLOOD tide sampling event completed.
Thursday, 17 August	Dredging operations completed in cut #3 and later in cut #2. Dredge shifted to cut #1.	One EBB and one FLOOD tide sampling event completed.
Friday, 18 August	Dredging operations completed in cut #1. Operational difficulties resulted in reduced rate of dredging. Dredge shifted into the provisional test area and operated for one set in cut A. The dredging operations as part of the Pre-Design Evaluation were concluded. Demobilization of equipment begins.	Continuity of dredging is insufficient to support an additional full sampling event. Turbidity monitoring and collection of grab samples for TSS and PCB analysis. Demobilization of equipment begins. Current meter recovered.

K.5 MONITORING RESULTS FOR THE PRE-DESIGN EFFORT

K.5.1 Tidal and Current Data

Measurements of current velocity and tidal elevations were obtained using a Nortek Aquadopp current meter as outlined in Section K.3.2. The unit was mounted in a stainless steel tripod frame and lowered to the bottom of the harbor at a point approximately 1500 feet (457 m) south of the dredge evaluation area. The height of the sensor over the bottom was approximately 3.5 feet (1.1 m), and the current measurements were then performed on a water parcel approximately 3.5 to 4.5 feet (1.1-1.4 m) above the bottom. This measurement depth was generally representative of the middle portion of the water column (the total water depth ranged from approximately 7 feet (2 m) at low tide to 10.5 feet (3.2 m) at high tide at this location.

Figure K-7 presents current and water depth data that were obtained from the Nortek unit. As would be expected from the geographic orientation of the Upper Harbor, the principal velocity component (V_y) is approximately oriented along the north-south axis of the Harbor. From 12-14 August, the northerly component of velocity peaked at 12 to 14 cm/sec (0.4 –.0.5 ft/sec) during the early to mid portion of the flood tide. A limited southerly component of current was detected for the mid-water column over the ebb tide, indicating a stratified flow system (the lower portion of the water column moving south with the ebb tide while the middle/upper portion remained more stagnant). From 15-18 August (including the water quality monitoring period), a reversing north-south current was recorded, but the northerly component was generally greater in magnitude and longer in duration than the southerly component.

The current velocity component across the Upper Harbor (V_x), (current aligned in the east-west direction) was significantly smaller than V_y, with magnitudes of less than 5 cm/sec (0.2 ft/s) and generally moving towards the east on both the ebb and flood tide. A measurable component of vertical current (V_z) was also observed with variations that generally correlated with the tidal cycle.

The data presented in Figure K-7 indicate that the hydraulics of the Upper Harbor were influenced by wind forces aligned along the north-south axis of the estuary. For the period of 12 August through 15 August, the wind velocity recorded at the Sawyer Street site had a southerly component (see notes along x-axis in Figure K-7). The V_y current measured during this period generally remained positive (or directed to the north) throughout the tidal cycle, implying that a wind-generated counter current existed during the ebb (southerly moving) portion of the tide. This condition persisted until the arrival of a frontal system late on 15-16 August with an accompanying shift in wind direction. As winds with a southerly component (blowing towards the North) are a common summer feature, this three-dimensional flow regime is expected to occur on a regular basis.

Figure K-8 presents the relationship between three independent records for the tidal elevations in New Bedford Harbor. Data shown on the tidal sinusoid were predicted by: 1) computer software for the harmonic tide station in New Bedford Harbor, 2) the hydraulic head recorded above the Nortek sensor package, and 3) visual measurements recorded from a surveyed tide staff installed along the banks of the estuary at the dredge area. Figure K-8 indicates that the three tidal elevation data sets are generally in agreement along the timeline of the recording period. It should be noted that the elevation recorded by the Nortek sensor is an indication of the height of the water column above the sensor. The tidal range and period measured by the sensor can be compared with the other measurements/predictions. However, the actual elevation should be considered approximate, as the exact height of the sensor above the bottom was not measured.

Comparison of the predicted and measured tidal sinusoids in Figure K-8 reveals a small timing delay between the measurements in the Upper Harbor and the predictions for the harmonic tide station positioned in the Lower Harbor. In addition, the actual measured tidal elevation in the Upper Harbor varied occasionally from the predictions by values less than 0.5 feet (0.2 m). Both of these offsets (time and elevation) are expected given the hydraulic constriction between the Upper and Lower Harbor (I-195 and Coggeshall St. bridges) and the potential for weather impacts on actual tidal levels (not considered in the predictions).

K.5.2 Turbidity Measurements

Detailed turbidity measurements were performed during dredging operations on 16-18 August, and the results are presented below and summarized in Figures K-9 through K-19. Figure K-20 depicts the instrument setup for the turbidity measurements. The reference turbidity values (measured outside of the influence of the dredging operation) often varied significantly over the course of a monitoring effort due to normal environmental influences, i.e. tide, wind, and rainfall runoff. Hence, all values reported below and in the accompanying figures are actual measured values unless specifically noted as "turbidity excursions above background."

Event Number 1 - Ebb Tide Monitoring 16 August

Monitoring was performed during the morning/afternoon ebb tide on 16 August. The predicted tides for New Bedford Harbor (NOAA) for this period were a 0927 high and a 1440 low. A reference sample was collected prior to the start of dredging at 0920, approximately 1000 feet (305 m) north of the dredging operation. Start up of dredging was delayed until almost 1100 due to thunderstorms in the area. Rainfall in the area varied with some isolated heavy squalls. Monitoring resumed from 1110 to the end of the ebb tide with samples collected over a two-hour period. Dredging operations were completed in cut #5 at approximately 1130. The dredge was then relocated to cut #4 for the remainder of the ebb tide monitoring period. According to the operational logs, a combined total of 2-hours 50-minutes of active dredging was accomplished during this tidal event.

Turbidity measurements performed during the monitoring event are presented on Figures K-9 and K-10. The floating discharge pipeline from the dredge prevented transects from being run across the entire width of the harbor down current of the dredge. Consequently, separate sets of measurements were performed to the east and to the west of the pipeline.

Sensor data indicate that the up-current (background) values during the monitoring period were 12 NTU or less approximately 1000 feet (305 m) up-current from the dredging operation. Down-current turbidity data peaked at 61 NTU approximately 250 feet (76 m) from the dredge. This peak is attributed to dredge repositioning and support vessel operations rather than actual dredging (based on the timing and locations of the peaks). Typical down-current turbidity values ranged from 14 to 35 NTU, representing excursions over background of 25 NTU or less (within 500 feet (152 m) down current of the dredge). An easterly component to the ebb tide current resulted in the turbidity excursions being located on the eastern side of the Upper Harbor.

Event Number 2 - Flood Tide Monitoring 16 August

Monitoring was performed during the afternoon/evening flood tide on 16 August. The predicted tides for New Bedford Harbor (NOAA) for the period were a 1440 low and a 2143 high. Monitoring was performed from 1530 to 1941. The dredge was shut down for maintenance for nearly an hour early in the flood tide cycle. As a result, initiation of sample collection was delayed until dredging resumed. Water samples were collected over a two-hour period beginning at approximately 1700. Dredging operations were completed in cut #4 at approximately 1645. The dredge was then relocated to cut #3 for the remainder of the flood tide monitoring period. According to operational logs, a combined total of 2-hours 34-minutes of active dredging was accomplished during this tidal event.

Turbidity measurements made during this monitoring event are presented on Figures K-11 through K-13. Sensor data indicate that the background values were initially in the range of 6 to 15 NTU (approximately 1000 feet (305 m) up current of the dredge operation). During the second hour of sampling, reference values were significantly higher, ranging from 38 to 48 NTU. Transects performed further south (up to 2000 feet (610 m) up current of the dredge operation) identified turbidity values as high as 192 NTU (Figure K-12). This elevated background turbidity was attributed to the inflow of storm water runoff as a result of the heavy rain that occurred earlier in the day. The run-off may have been discharged into the Upper Harbor directly, or discharged into the Lower Harbor and then transported north with the flood tide. Waters within the Upper Harbor were visibly cloudy later in the flood tidal cycle, beginning in the south (up current of the dredge operation) and then moving north with the flood tide.

Typical down-current turbidity values were in the range of 18 to 89 NTU, representing excursions over background of 50 NTU or less. Intermittent higher spikes above 100 NTU were also recorded, with a peak value of 202 NTU. Based on the timing and observations of the dredge activity, these elevated values were attributed to dredge repositioning and support vessel operations rather than the dredging activity itself.

Dredging activity was completed for the day at 1906. A transect performed at 1930 extending from approximately 1500 feet (457 m) up current of the test area to 1500 feet (457 m) down current revealed a general elevated turbidity over the entire transect apparently unrelated to dredging with values generally ranging from 25 to 50 NTU (Figure K-13).

Event Number 3 - Ebb Tide Monitoring 17 August

Monitoring was performed during the morning/afternoon ebb tide on 17 August. The predicted tides for New Bedford Harbor (NOAA) for the period were a 1007 high and a 1518 low. A reference sample was collected just after the start of dredging at 1058, approximately 1000 feet (305 m) north of the dredging operations. Monitoring down current of the dredge began at 1107 and continued to the end of the ebb tide with water samples collected over a four-hour period. Dredging operations were completed in cut #3 at approximately 1220. The dredge was then relocated to cut #2 and dredging continued for the remainder of the ebb tide monitoring period and into the flood tide. According to operational logs, a combined total of 2-hours 59-minutes of active dredging was accomplished during this tidal event.

Turbidity measurements performed during the course of the monitoring event are presented on Figures K-14 through K-16. Turbidity at the reference station was elevated at the start of monitoring (23-27 NTU at 1058), but had dropped by the next set of measurements and ranged from 5 to 18 NTU over the remainder of the monitoring period. Turbidity values down current of the dredging operation were generally 25 NTU

or less. A localized plume was identified in the wash of the *Miami II* as it maneuvered around the dredge with a peak turbidity measured at 101 NTU (Figure K-15). Elevated turbidity was measured later in the monitoring period at approximately 1530 down current of the dredge from approximately 200-500 ft (61-152 m) with values generally ranging from 50 to 100 NTU and a peak value of 111 NTU (Figure K-16). Based on the timing and position of these measurements, the elevated values are attributed to observed support vessel activity rather than the actual dredging.

Event Number 4 - Flood Tide Monitoring 17 August

Monitoring was performed during the afternoon/evening flood tide on 17 August. The predicted tides for New Bedford Harbor (NOAA) for the period were a 1518 low and a 2224 high. Monitoring was performed from 1530 to 1948, beginning with the reference station approximately 1000 feet (305 m) up current from the dredge. Water samples were collected over a three-hour period. Dredging operations were completed in cut #2 at approximately 1700. The dredge was then relocated to cut #1 for the remainder of the flood tide monitoring period. Dredging was completed for the day at 20:06. According to operational logs, a combined total of 3-hours 08-minutes of active dredging was accomplished during this tidal sampling event.

Turbidity measurements performed during the course of the monitoring event are presented on Figures K-17 through K-19. Turbidity measured at the reference station, approximately 1000 feet (305 m) up current from the dredge ranged from 4 to 13 NTU. Down-current turbidity values were generally well under 25 NTU (less than 10 NTU over background). Values of 60 to 70 NTU were observed during the sampling at station 3 at 1712 with an associated TSS of 210 mg/l. These elevated values are attributed to the earlier grounding of the support vessel *Miami II* to the east of the dredge (see Figure K-17 for location) and the subsequent efforts to free it.

Monitoring 18 August

A third ebb tide monitoring event was scheduled for 18 August to coincide with the predicted tide (1049 high to 1557 low). Operational constraints including pipe clogs necessitating backwashing, an electrical breakdown, and a computer problem aboard the dredge limited the extent of continuous dredging, and a formal monitoring event could not be performed. Turbidity monitoring was performed during the periods that dredging was performed from 1033 to 1747. The monitoring revealed that conditions around the dredge during operation did not vary much above the background values in the area.

Dredging proceeded at a high rate of nearly uninterrupted production during the last hour of operation on 18 August. Immediately following the cessation of dredging operations, the turbidity sensor was lowered into the moon pool just over the silt curtain. As the tide was well into flood conditions, this location was at the down-current end of the dredge. Turbidity ranged from 15 to 50 NTU in the mid- to upper-water column. Turbidity just outside of the silt curtain ranged from 16 to 63 NTU. Upper water column turbidity values were generally below 40 NTU along a transect extending approximately 150 feet down current of the dredge. Turbidity values of over 200 NTU were recorded just above the bottom (less than 1 foot (30 cm)) approximately 150 feet (46 m) down current of the dredge. The elevated turbidity may have been the result of dredging operations although elevated turbidity is typical in near-bottom waters, especially at the lower stages of the tide. Any significant "near-bottom" turbidity elevation would result re-deposition in the vicinity of the dredging area as discussed in Appendix J.

K.5.3 Analytical Results

A summary of all of the water samples (both grab and composite) collected for laboratory analysis as part of the water quality monitoring program is presented in the table shown on Figure K-21. This table includes a summary of the analytical results. The field-measured turbidity associated with each sample is presented as a range because the instantaneous turbidity readings (multiple readings each second were averaged and recorded every 2 seconds) often varied over the time required to fill the sample bottle. PCB data that did not meet the data quality objectives (DQO's) established in the QAPP (ENSR 2000) were flagged/qualified. None of the findings warranted rejection of data; selected sample or congener results were qualified with a "J" to indicate that the result did not meet project DQO's and should be considered an estimate.

Total Suspended Solids

Physical samples for the determination of total suspended solids (TSS) were collected prior to the start of dredging and during each of the four monitoring events described above in Section K.5.2. For each event the TSS concentration was measured in the composite sample representing average conditions as well as in individual grab samples. Results of the TSS analysis are presented in the table shown on Figure K-21. Results of the TSS analysis are also presented on the turbidity mapping figures for each event (Figures K-9 through K-19). In general, the TSS measurements did not display as large a degree of variability as the turbidity data. A summary of the TSS distribution is presented in Table M5-1 below.

Table K.5-1: Distribution of TSS concentrations determined from field samples.

Range of TSS concentrations determined from field samples (mg/L)					
Under 10	11 to 15	16 to 20	21 to 25	26 to 30	Over 30
10 samples	17 samples	17 samples	5 samples	3 samples	6 samples
17.2%	29.3%	29.3%	8.6%	5.2%	10.3%

The highest TSS concentrations attributed to "general dredging" were collected during the ebb tide monitoring event that was performed on 17 August; TSS observed approximately 50 feet down current of the dredge ranged up to 62 mg/L. A peak TSS concentration of 300 mg/l was measured in the sample collected in the prop-wash plume generated by the dredge support vessel *Miami-II.* A sample collected directly from the dredge moon-pool immediately following an extended period of continuous dredging had a TSS concentration of 120 mg/L. The background concentration was measured at 6 mg/L earlier in the day.

PCBs

Physical samples for the determination of PCB concentrations (dissolved and particulate) were collected prior to the start of dredging and during each of the four monitoring events described above in Section K.5.2. For each event dissolved and particulate PCB concentrations (18 NOAA congeners) were measured in the composite samples representing average conditions as well as for a limited number of individual grab samples. Summary results of total PCB concentrations (sum of the 18 individual congener concentrations) are presented below in the table shown on Figures K-21 and on the turbidity mapping figures for each event (Figures K-9 through K-19). A complete summary of the individual congener analysis can be found in the table presented on Figure K-22 for the particulate PCBs and in Figure K-23 for the dissolved PCBs. Plots of

the composite sample concentrations versus distance from the dredging operation are presented on Figures K-24 and K-25.

Particulate PCBs - On 7 August, just prior to the start of dredging, total particulate PCB concentrations were measured at 0.25 ug/L approximately 1000 feet (305 m) to the south of the test area and at 0.89 ug/L in the shallower waters approximately 1000 feet (305 m) to the north of the test area. Total particulate PCB concentrations at the reference station ranged from 0.11 ug/L to 0.89 ug/L during the 16-18 August monitoring period. Down-current composite sample concentrations ranged from a low of 0.85 ug/L (16 August ebb tide at station 500 feet (152 m) down current) to a high of 2.6 ug/L (16 August flood tide at station 50 feet (15 m) down current and 17 August flood tide at station 700 feet (213 m) down current). Total Particulate PCBs were also collected as grab samples during specific events. A total particulate PCB concentration of 23.0 ug/L was measured for the grab sample collected directly from the moon pool, and a concentration of 26.0 ug/l was measured for the grab sample collected in the plume down current of the support vessel *Miami II.*

Dissolved PCBs - On 7 August, just prior to the start of dredging, total dissolved PCB concentrations were measured at 0.18 ug/L approximately 1000 feet (305 m) to the south of the test area and at 0.52 ug/L in the shallower waters approximately 1000 feet (305 m) to the north of the test area. Reference station total dissolved PCB concentrations ranged from 0.21 ug/L to 0.9 ug/L during the 16-18 August monitoring period. Down-current composite sample concentrations ranged from a low of 0.52 ug/L (16 August flood tide at station 500 feet (152 m) down current) to a high of 2.7 ug/L (17 August ebb tide at station 50 feet (15 m) down current). Grab samples were collected during specific events. A total dissolved PCB concentration of 4.6 ug/L was measured for the grab sample collected directly from the moon pool, and a concentration of 2.7 ug/L was measured for the grab sample collected in the plume down current of the support vessel *Miami II.*

The equipment blanks did contain detectable (but very low) levels of selected PCB congeners. On an 18-congener sum total basis, the particulate PCB concentrations in the blanks were lower than the "cleanest" field sample particulate PCB concentrations by more than two orders of magnitude. The dissolved PCB concentrations in the blanks were lower than the "cleanest" field sample dissolved concentration by a factor of five, and most field samples had dissolved concentrations an order of magnitude or more greater than the concentrations in the blanks. As these blank concentrations were much lower than those measured for the field samples, the teflon sampling tube/pump system and designated flushing procedures were considered to be sufficient to maintain sample integrity. Nonetheless, an action level five times higher than the equipment blank detected concentration was established, and individual congener results were qualified (U) if determined to be below this action level to account for any possible impact.

K.6 DISCUSSION

K.6.1 Dredge Performance

The water quality monitoring performed during dredging on 16-18 August provided data over a range of operational and environmental conditions. Upon examination of the data, the following conclusions can be made:

- The actual dredging process (removal of sediments with the hydraulic excavator) appeared to have a limited impact on the water column;

- Activities performed in support of the dredging (operation of support vessels) appeared to have a much greater impact on water quality than the dredging; and

- Normal fluctuations in water quality occur in the Upper Harbor related to changing environmental conditions that appear similar or greater in scale than the overall impacts related to the actual dredging process.

Water Quality Impacts Related Specifically to Dredging

The monitoring performed during the ebb tide on 16 August provides the best representation of impacts associated specifically with dredging. Dredging was performed with limited shutdown during this monitoring period, and there was limited support vessel activity. Although rainfall occurred on the morning of the 16th, the effect of the runoff was assumed similar for all the composite samples (both up and down current). Field measured turbidity showed some spikes in the vicinity of the dredge but generally returned to background levels within 500 feet (152 m) down current of the dredge. Total particulate PCB concentrations were elevated (approximately 50% greater then background) in the vicinity of the dredge, but returned to background levels within 500 feet (152 m) down current of the dredge. During the other monitoring events, some of the turbidity transects revealed little or no detectable elevation of turbidity down current of the dredge. Larger increases in turbidity were generally traceable to dredge support activities or environmental conditions as discussed below.

The limited water column impacts associated specifically with the dredging are attributed to both operational and environmental factors. The design of the bucket (tight closing with limited leakage), the configuration of the dredge (with a "moon-pool" work area enclosed behind a 36-inch (0.6 m) silt curtain), and the controlled manner in which the operation was executed all contributed to minimizing the release of material to the water column. The shallowness of the area (maximum depth of the dredged area was less than 10 feet (3 m) at high tide) and the limited currents (maximum currents generally less than 0.5 feet/sec (15 cm/sec)) limited transport away from the dredging area.

Difficulties associated with handling and transferring sediments containing debris and large components of embedded shells did cause regular suspensions of dredging operations. However, the periods of continuous dredging were sufficient enough to allow setup of "steady state" conditions in the near field area (within 200 feet (61 m) of the dredge) to be included in the monitoring. More continuous dredging over a full or multiple tidal cycles would not be expected to generate a turbidity plume of greater extent in the nearfield area down current of the dredge than that observed during the field test. Based on the modeling predictions presented in Section K.2, any additional farfield increases are expected to be limited to the Upper Harbor.

Water Quality Impacts Related to Dredging Support Activities

The photographs presented in Figure K-26 provide a good example of the potential water quality impacts of support activities relative to the dredging operation. The photos were taken approximately 1.5 to 2 hours into the ebb tide on 17 August. At the time the upper photo was taken, the dredge was not in operation, and

the tug *Miami II* was returning a support barge from the dredge to the shore. Due to the pipeline/dredge configuration, the tug had to transit in shallow water to the east of the dredge (estimated at 4 to 5 feet (1.2-1.5 m) in depth at this tidal stage) and subsequently created a large turbidity plume. The water-quality monitoring vessel can be seen taking measurements within the plume in the same photograph. A water sample collected within 50 feet (15 m) of the tug after its passage had a suspended solids concentration of 300 mg/L and particulate and dissolved PCB concentrations of 26 and 2.7 ug/L, respectively (reported as the sum of the 18 NOAA congeners). In the lower photo taken approximately 30 minutes later, the dredge had resumed operations, and the tug was pushing ahead to hold the barge at the shore support area. A large turbidity plume is again visible behind the tug, being carried to the south on the ebb tide.

Although the dredge was not operating when the upper photo was taken, monitoring performed earlier during nearly continuous operations recorded a plume of much less extent than that associated with the tug. In the lower photograph the dredge was in operation. Water depths are approximately 6 feet (1.8 m) in the vicinity of the dredge (operating in cut 2).

Water Quality Fluctuations Related to Environmental Factors

The monitoring performed in support of this field test reinforced the importance of understanding the normal fluctuations in water quality that occur independent of the operation being monitored. An example of these fluctuations was captured on August 7th in the Upper Harbor reference samples collected for PCBs. The reference stations were collected prior to the start of dredging operations and were higher by a factor of three for the station 1000 feet (305 m) north of the pre-design area than for a station 1000 feet (305 m) south of the pre-design area (both particulate and dissolved PCB).

The flood-tide monitoring performed on 16 August provides a good example of normal fluctuations of turbidity within the Upper Harbor. Turbidity values at the background station increased from approximately 10 NTU at the start of monitoring to nearly 200 NTU an hour later (higher values than those recorded downstream of the dredge, see Figure K-12). This increase in turbidity was attributed to storm-water discharge to the harbor following the rainfall earlier in the day. At the end of the monitoring period, the entire monitoring area displayed an elevated turbidity of approximately 30-60 NTU (Figure K-13). The elevated turbidity values were not, however, accompanied by increased PCB concentrations at the reference station.

K.6.2 Correlation Analysis

The data revealed an excellent correlation between TSS and total particulate PCB concentrations. As shown in Figure K-27, the coefficient of fit for the linear relationship between these two parameters was 0.84. This relationship demonstrates the general uniformity of contamination within the sediments disturbed during the dredging, i.e., processes that resulted in increasing the suspended solids load to the water column resulted in a concomitant increase in the particulate-related contaminant load to the water column. The strength of this linear relationship allows TSS to serve as a good indicator of particulate PCB concentrations associated with operations of similar scope to the pre-design work.

A poor correlation was achieved for the linear relation between total dissolved PCB concentrations and both total particulate PCB concentrations and TSS, with an exponential function providing a better fit to the data (see Figures K-28 and K-29). This type of correlation is expected given that different processes can be

responsible for controlling the concentration of dissolved PCB and the particulate load in the water column. A review of the individual dissolved/particulate data pairs reveals the following:

- For the reference samples (up current of the dredging operations), the dissolved and particulate PCB concentrations were generally similar (on a per liter basis), with the dissolved concentrations sometimes exceeding the particulate. This accounts for the portion of the regression line with a slope near 1 in Figure K-28, (between 0 and 1 ug/L total particulate PCBs).

- For the samples impacted by the dredging operations, the total particulate PCB concentration was generally increased to a much greater degree than the dissolved PCB concentration. This accounts for the portion of the regression with a flatter slope in Figure K-28, (>1 ug/L total particulate PCBs).

The data revealed a moderate correlation between lab-measured total suspended solids (TSS) and field-measured turbidity. As shown in Figure K-30, the coefficient of fit for the linear relationship between these two parameters was 0.56. The extreme values associated with the grab samples collected from the *Miami II* plume and the dredge moon-pool were not included in the regression as they were far outside of the range of the main body of data points. It should also be noted that although the tube-intake for the pumped sample (for TSS analysis) was located near the in-water turbidity sensor, the two data sets could differ due to small-scale variations in the water column. Measurement of both parameters from the exact same water parcel would be expected to increase the strength of the relationship. Given the strength of this relationship and the related relationship of TSS and total particulate PCB, field measurement of turbidity could be used as an indicator of mobilization and transport of particulate-bound PCB during full-scale remediation.

K.6.3 Comparison of Predictive Modeling and Field Measurements

The predicted transport of suspended solids using a dispersion coefficient of 10 m^2/s (108 ft^2/s) (presented in Section K.2) provides a reasonable match with the results of the field monitoring. The model predicted a maximum elevation of TSS over background of 13 mg/L, and an elevation of 5 mg/L extending approximately 400 feet (122 m) down current. The TSS levels measured in the samples collected during the field test displayed some elevations above background that were slightly higher and extended further downstream than the predictions. In addition, the turbidity measurements and TSS data revealed much greater variability in the distribution of elevations than the model predictions of TSS. These differences between predictions and measured values are understandable given the following:

- Dredging source term differences – The model assumed a constant, steady source of sediment introduced to the water column while actual dredging proceeds at a highly variable pace. The model also assumes release of the sediment over the entire water column of the designated source cells. The actual release of material during the dredging process can be much more focused at a particular location (both in x-y space and in depth).

- Additional source terms – The model did not include additional source terms from support activities in the area. In particular, the operation and grounding of the *Miami II* during the monitoring period are thought to have contributed to some of the elevations noted in the TSS data.

Comparison of the model predictions with the field measurements provided two additional insights that are important in planning additional modeling and monitoring efforts in the Upper Harbor:

- Three-dimensional flow field – Despite the shallowness of the Upper Harbor, the field measurements revealed distinct variations in the flow field over depth. Although a two-dimensional simulation provides a reasonable approximation for overall circulation, consideration must be given to the vertical variation in flow when addressing transport issues.

- Environmental factors – Even the moderate winds that occurred during the field test had a measurable impact on the current regime. This highlights the importance of the use of field measurements to assess model predictions and sample collection locations on a daily basis.

K.7 REFERENCES

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New Bedford Harbor Superfund Project

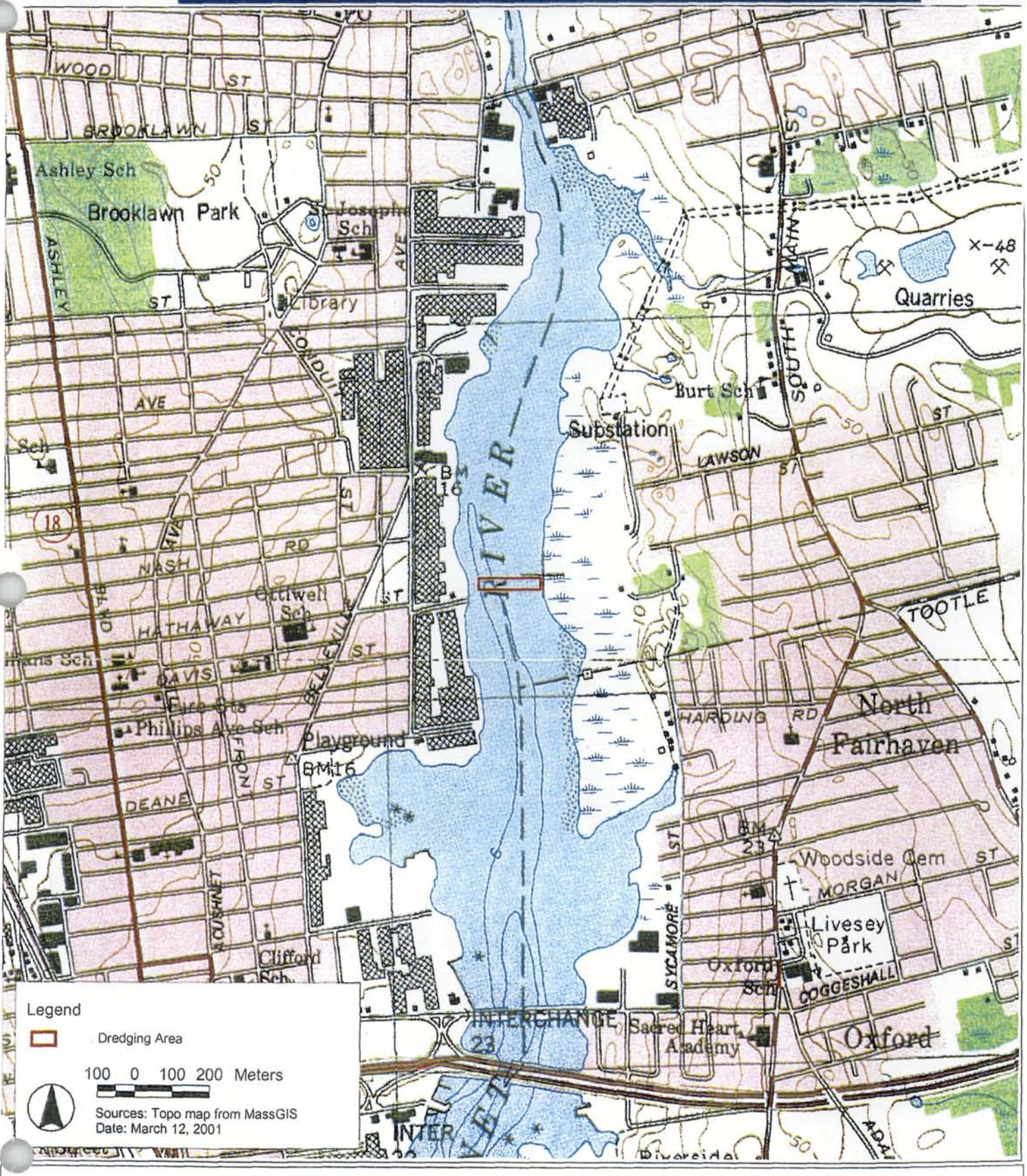
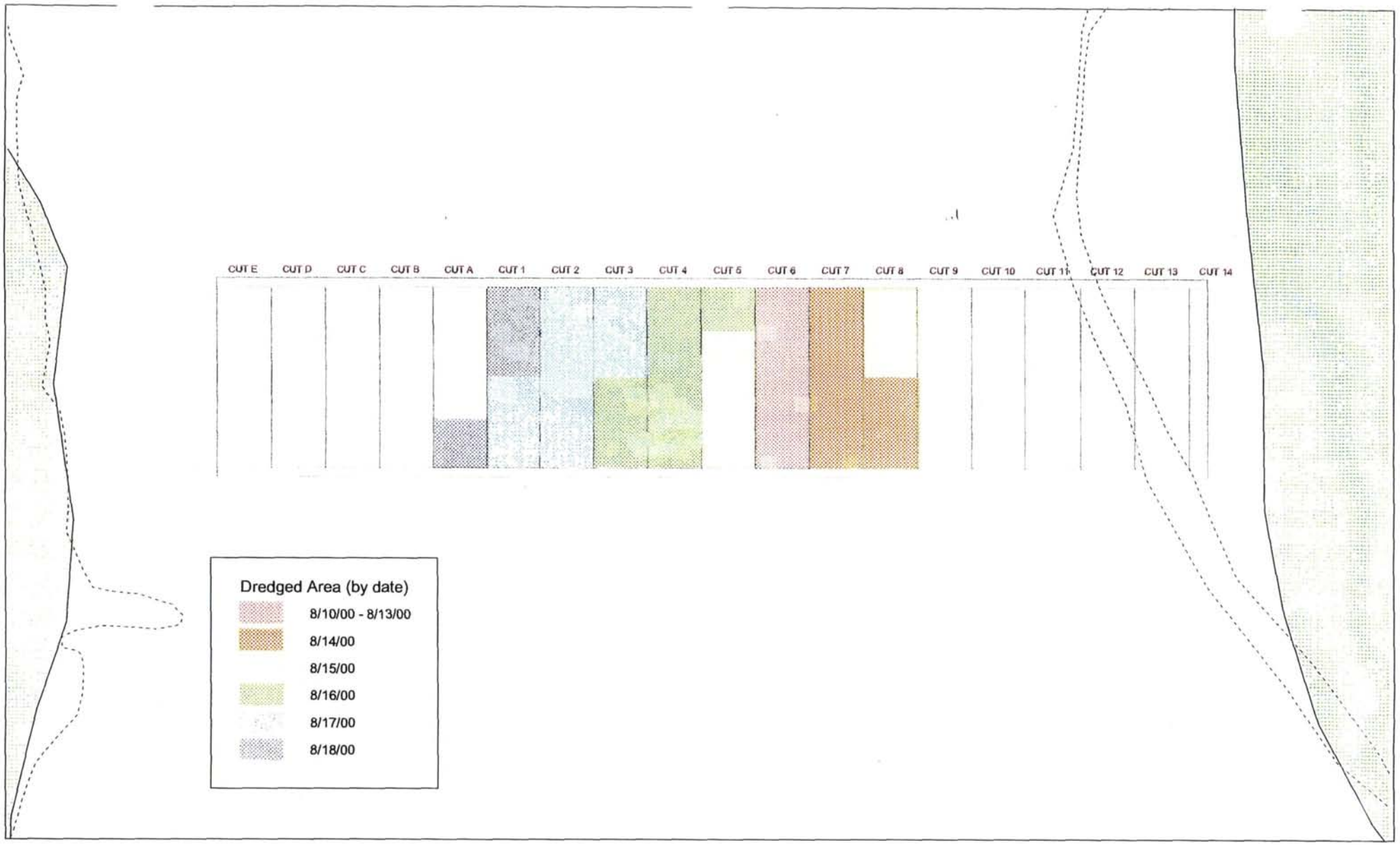


Figure K-1 Upper New Bedford Harbor Showing Pre-Design Field Test Area



50 0 50 100 150 Feet

March 14, 2001

Figure K-2: Pre-Design Field Test Area

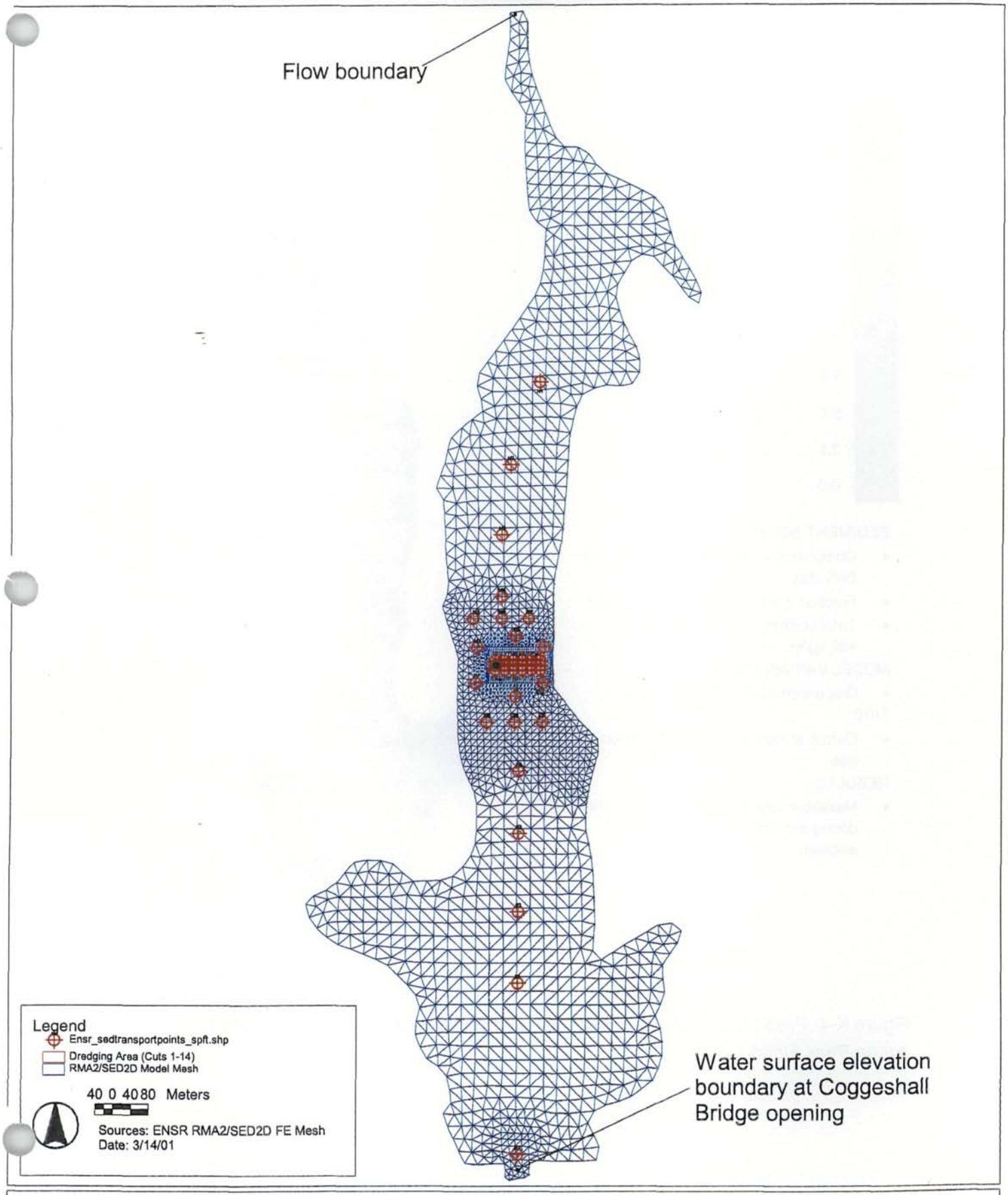


Figure K3: Upper New Bedford Harbor Numerical Model, Finite Element Mesh

Total suspended sediment concentration (mg/L)

SEDIMENT SOURCE:

- Composed of 19% sand, 53% silt, and 28% clay
- Fraction lost by dredge is 1% by mass
- Total sediment source strength of 482 kg/hr

MODEL VARIABLES:

- Dispersion coefficient of 10 m^2/s

TIDE:

- Output at Hour 20 during peak flood tide

RESULTS

- Maximum total concentration predicted during simulation is 13 mg/L above ambient

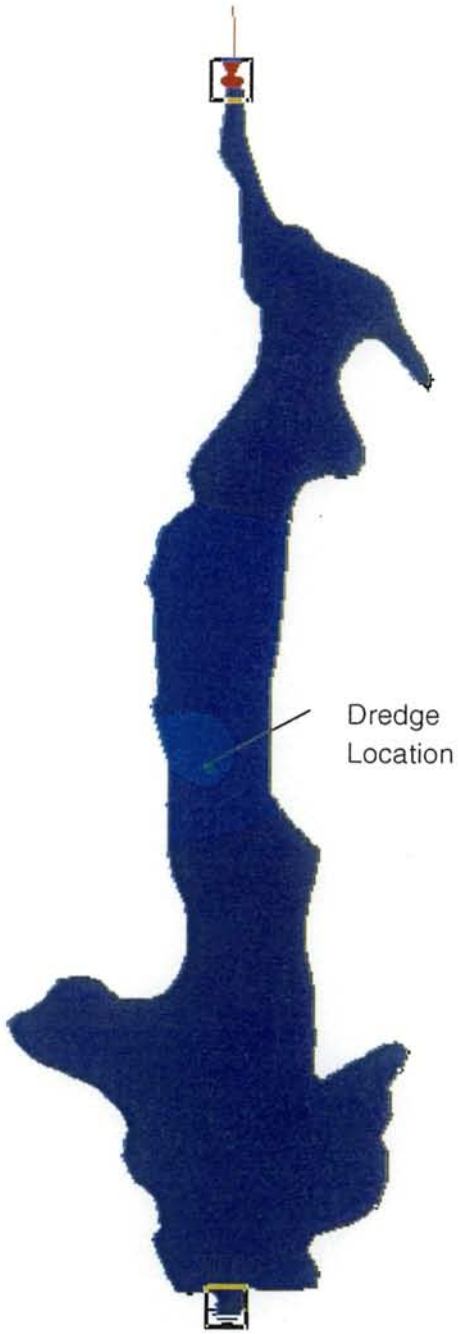


Figure K-4: Predicted Suspended Sediment Concentrations Resulting from Dredging during Peak Flood Tide.

Total suspended sediment concentration (mg/L)

SEDIMENT SOURCE:

- Composed of 19% sand, 53% silt, and 28% clay
- Fraction lost by dredge is 1% by mass
- Total sediment source strength of 482 kg/hr

MODEL VARIABLES:

- Dispersion coefficient of 10 m^2/s

TIDE:

- Output at Hour 26 during peak ebb tide

RESULTS

- Maximum total concentration predicted during simulation is 13 mg/L above ambient

Figure K-5: Predicted Suspended Sediment Concentrations Resulting from Dredging during Peak Ebb Tide.

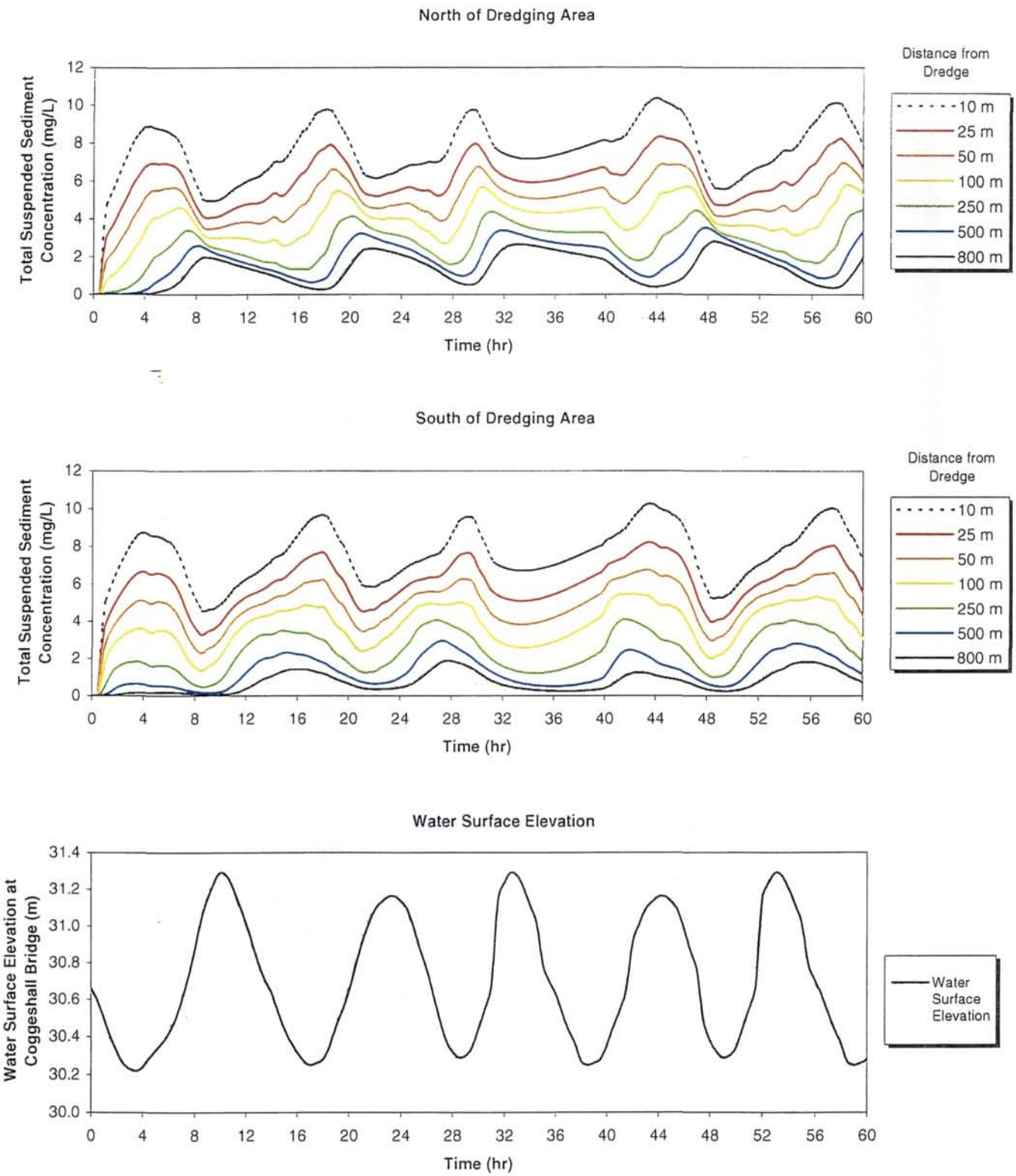


Figure K-6: Time Series of Predicted Suspended Sediment Concentrations (dredge in middle of cut 1; dispersion coefficient 10 m^2/s; source strength 482 kg/hr or 1% loss).

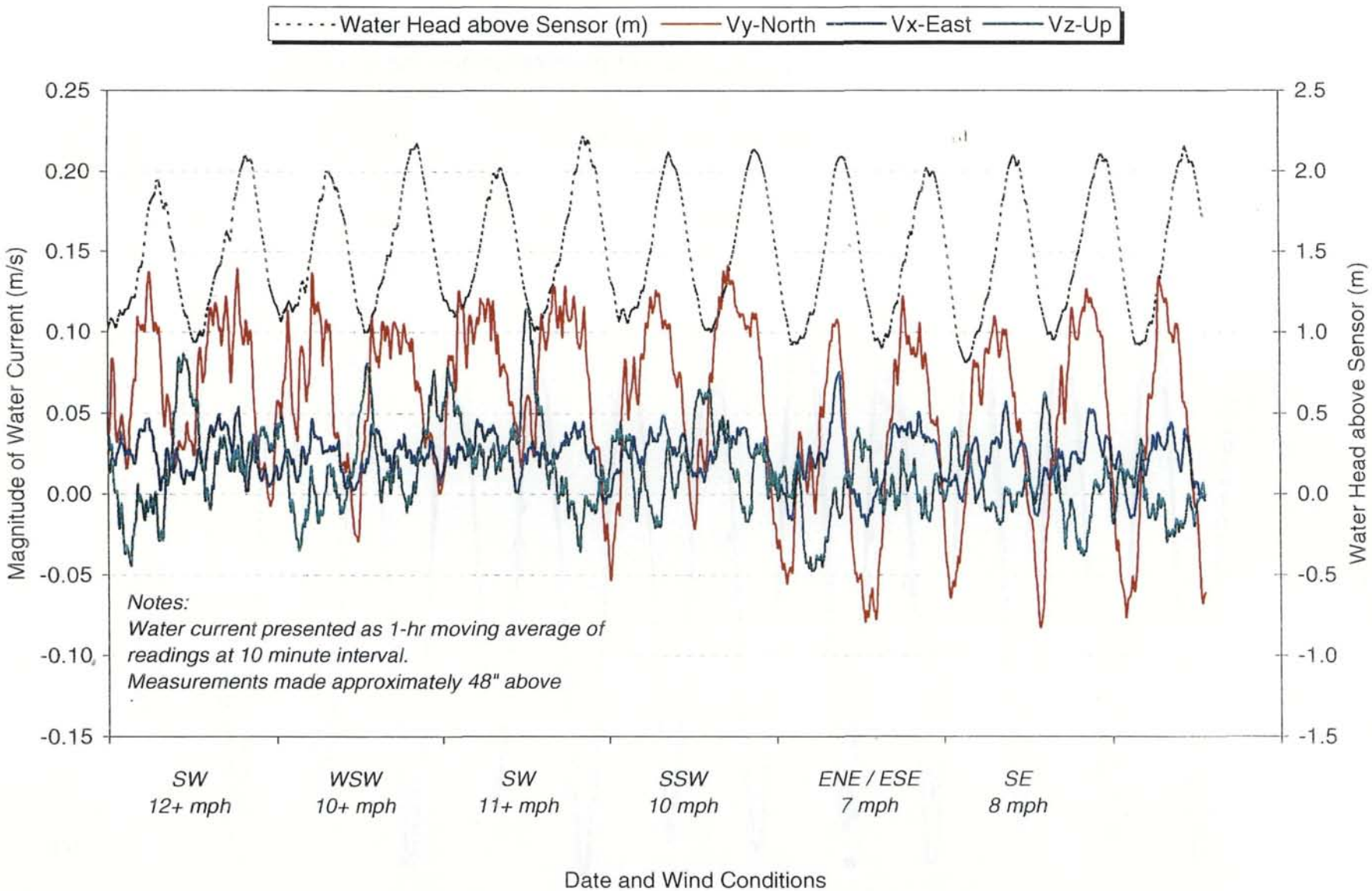


Figure K7: Aquadopp Water Current and Pressure Sensor Data

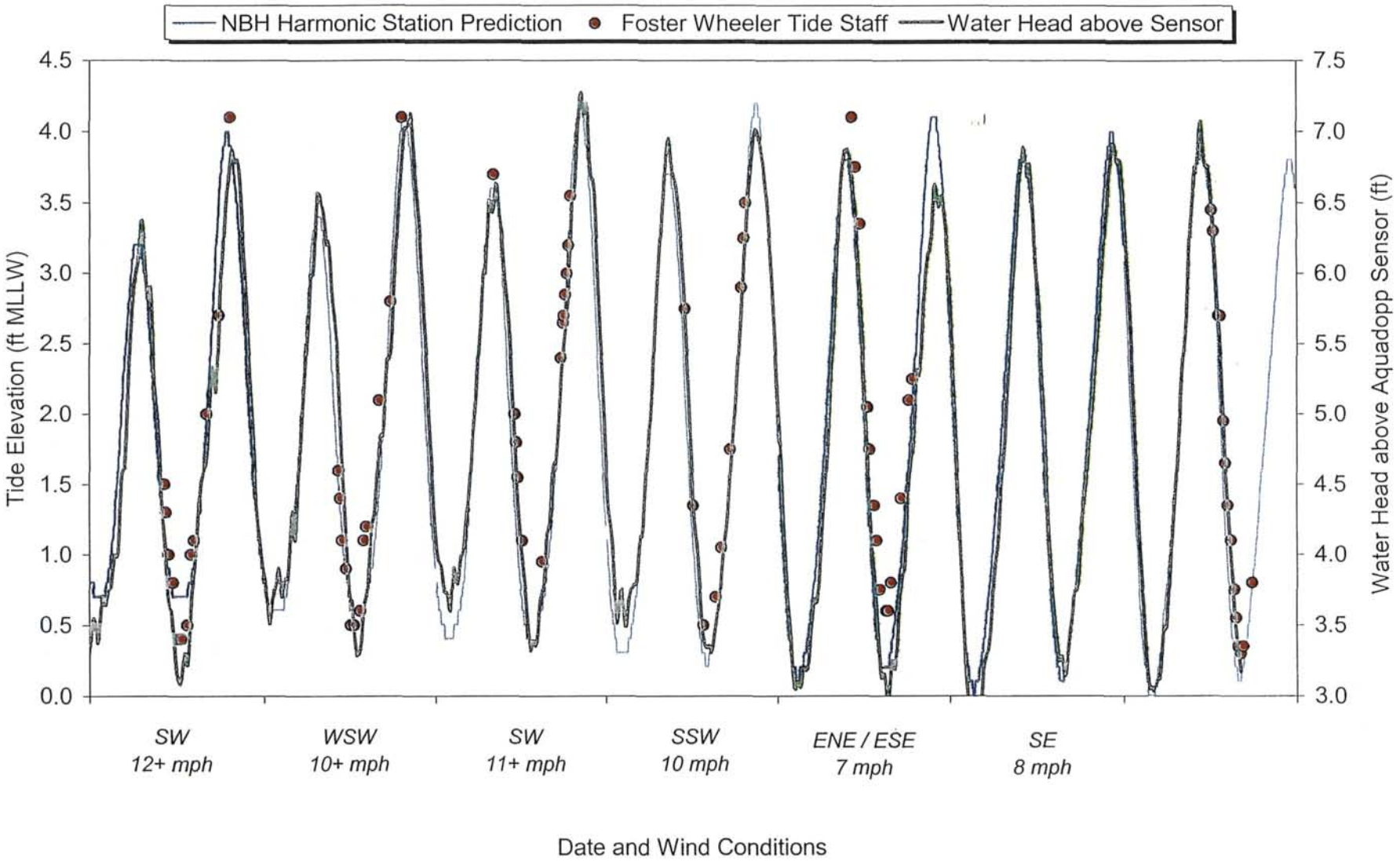
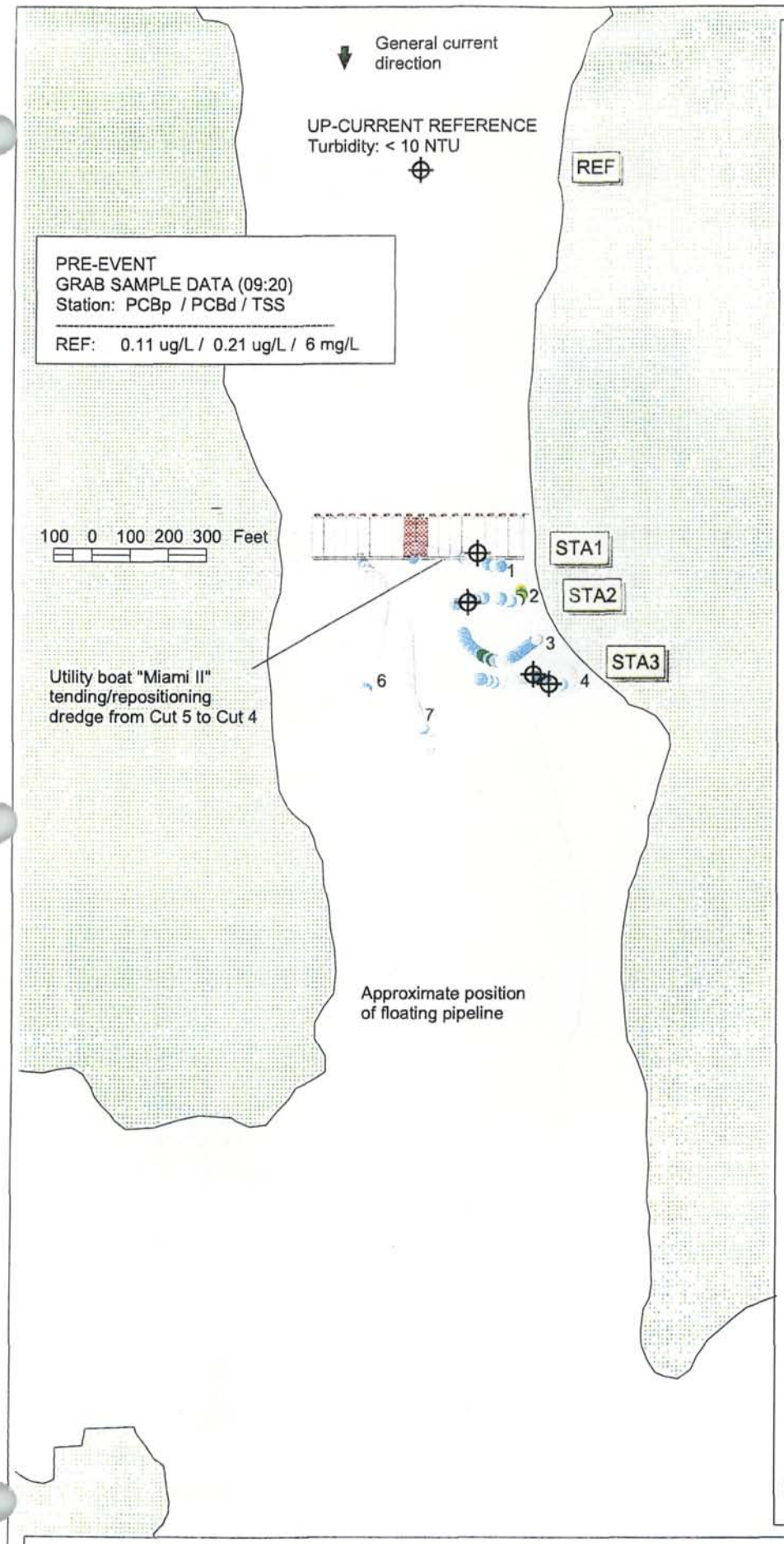


Figure K-8: Predicted/Measured Tide and Water Depth over Current Meter Sensor



New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
16 August 2000, Ebb Tide
11:32 to 11:46
Data Groups G1 and G2

STA1
Water Quality Station

Active Dredging Operation
Cut 4
Cut 5

Measured Turbidity
0 - 10 NTU
10 - 25 NTU
25 - 50 NTU
50 - 100 NTU
100 - 250 NTU
> 250 NTU

Predicted Tide
High 09:27 / Low 14:40

Weather recorded during period:
SSW wind roughly 9 mph.
Peak wind speed 8.8 mph.
Recorded rainfall:
00:00-06:00: 0.0 in
06:00-12:00: 0.03 in

Transects (Start Time / Peak Turbidity)
T1 (11:32 / 24 NTU)
T2 (11:33 / 61 NTU)
T3 (11:35 / 35 NTU)
T4 (11:36 / 27 NTU)
T6: (11:44 / 11 NTU)
T7: (11:46 / 12 NTU)

NOTES:
-- Actual turbidity values are reported (not excursions over background).
-- PCB concentrations represent the sum of the 18 NOAA congeners.

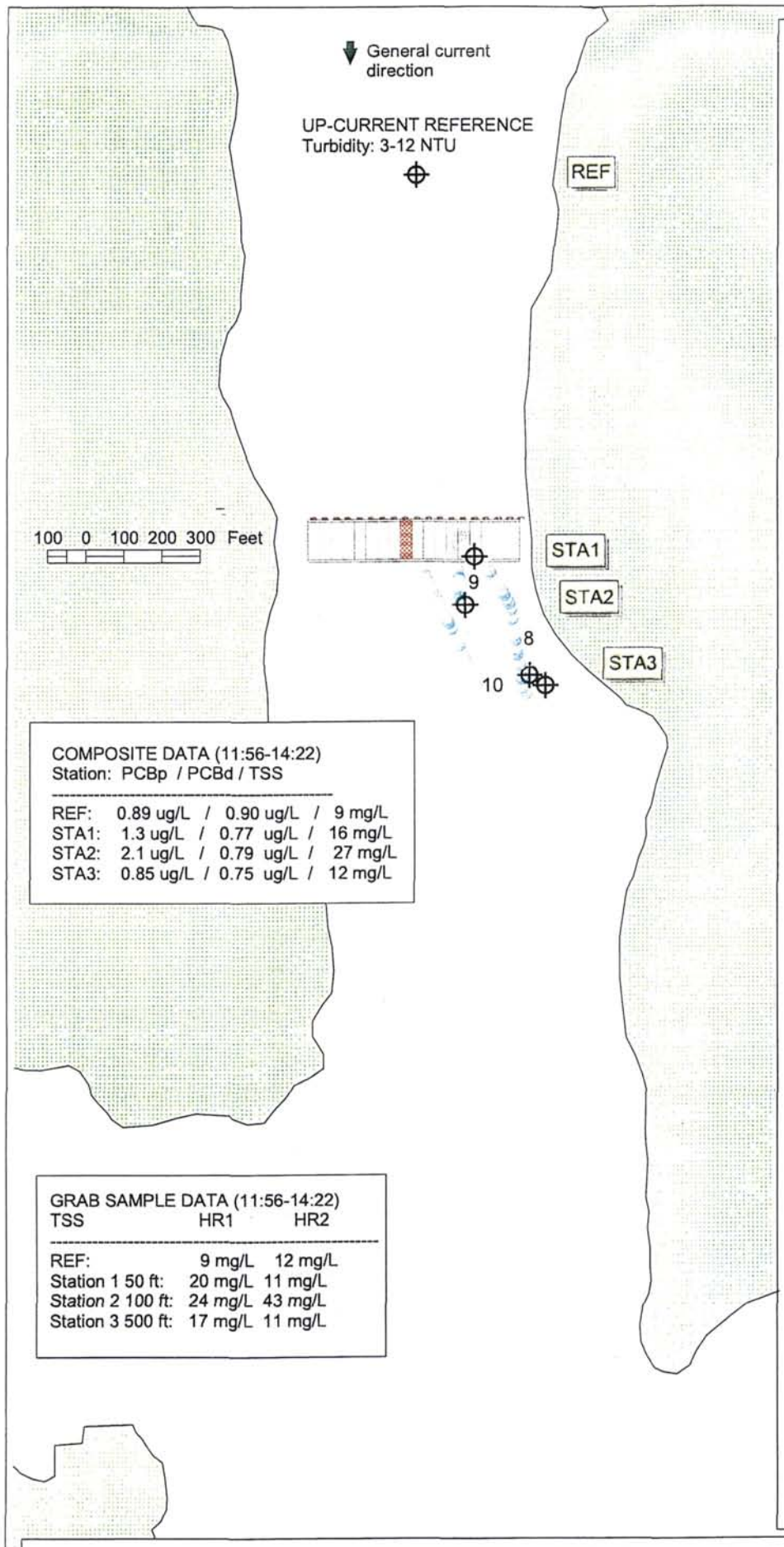
PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

200 0 200 400 600 Feet

Figure K-9: Turbidity Monitoring Data, 16 August 2000, Ebb Tide, 11:32 to 11:46

ENSR INTERNATIONAL



COMPOSITE DATA (11:56-14:22)
Station: PCBp / PCBd / TSS

REF:	0.89 ug/L	0.90 ug/L	9 mg/L
STA1:	1.3 ug/L	0.77 ug/L	16 mg/L
STA2:	2.1 ug/L	0.79 ug/L	27 mg/L
STA3:	0.85 ug/L	0.75 ug/L	12 mg/L

GRAB SAMPLE DATA (11:56-14:22)

TSS	HR1	HR2
REF:	9 mg/L	12 mg/L
Station 1 50 ft:	20 mg/L	11 mg/L
Station 2 100 ft:	24 mg/L	43 mg/L
Station 3 500 ft:	17 mg/L	11 mg/L

New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
16 August 2000, Ebb Tide
12:14 to 12:18
Data Group G3

STA1
Water Quality Station
Active Dredging Operation
Cut 4
Measured Turbidity
- 0 - 10 NTU
- 10 - 25 NTU
- 25 - 50 NTU
- 50 - 100 NTU
- 100 - 250 NTU
- > 250 NTU

Predicted Tide:
High 09:27 / Low 14:40

Weather recorded during period:
SW winds roughly 10 mph.
Peak wind speed of 10.9 mph.
Recorded rainfall:
00:00-06:00: 0.0 in.
06:00-12:00: 0.03 in.
12:00-18:00: 0.01 in.

Transects (Start time / Peak Turbidity)
T8 (12:14 / 17 NTU)
T9 (12:16 / 15 NTU)
T10 (12:18 / 14 NTU)

NOTES:
-- Actual turbidity values are reported (not excursions over background).
-- PCB concentrations represent the sum of the 18 NOAA congeners.

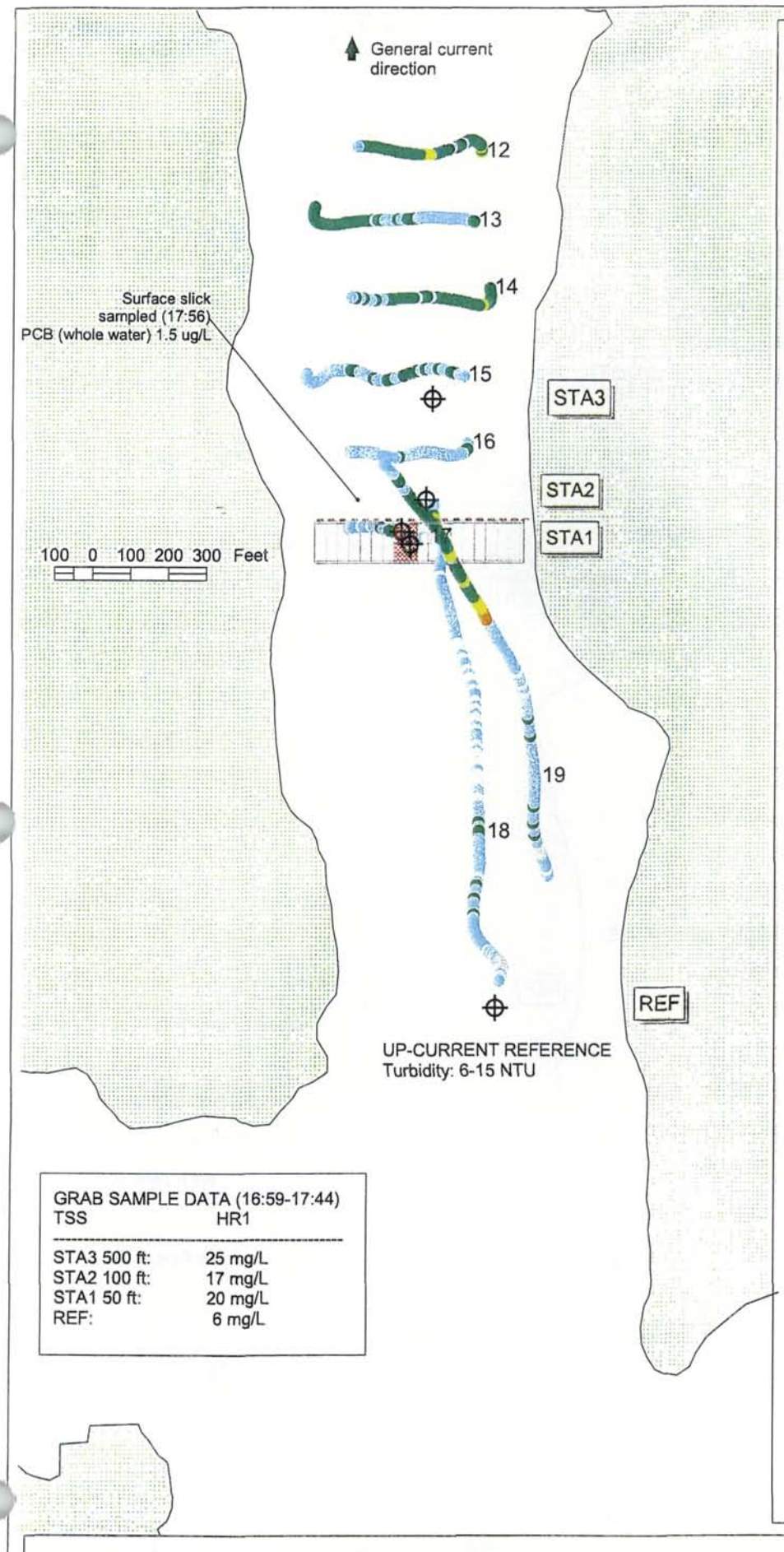
PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

200 0 200 400 600 Feet

Figure K-10: Turbidity Monitoring Data, 16 August 2000, Ebb Tide, 12:14 to 12:18, Including Event Composite Sample Data

ENSR INTERNATIONAL



New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
16 August 2000, Flood Tide
17:27 to 17:50
Data Groups G4 and G5

STA1
Water Quality Station

Active Dredging Operation
- Cut 3
- Cut 4

Measured Turbidity
- 0 - 10 NTU
- 10 - 25 NTU
- 25 - 50 NTU
- 50 - 100 NTU
- 100 - 250 NTU
- > 250 NTU

Predicted Tide:
Low 14:40 / High 21:43

Weather recorded during period:
SW wind shifting to WNW at roughly 8 mph.
Peak wind speed 8.5 mph.
Rainfall recorded:
00:00-06:00 -- 0.0 in.
06:00-12:00 -- 0.03 in.
12:00-18:00 -- 0.01 in.

Transects (Start Time / Peak Turbidity)
T12 (17:27 / 89 NTU)
T13 (17:30 / 47 NTU)
T14 (17:32 / 59 NTU)
T15 (17:34 / 35 NTU)
T16 (17:37 / 26 NTU)
T17 (17:39 / 41 NTU)
T18 (17:42 / 59 NTU)
T19 (17:50 / 202 NTU*)
* Localized plume generated by support vessel activity, dredge repositioning is initiated at 1804.

NOTES:
-- Actual turbidity values are reported (not excursions over background).
-- PCB concentrations represent the sum of the 18 NOAA congeners.

PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

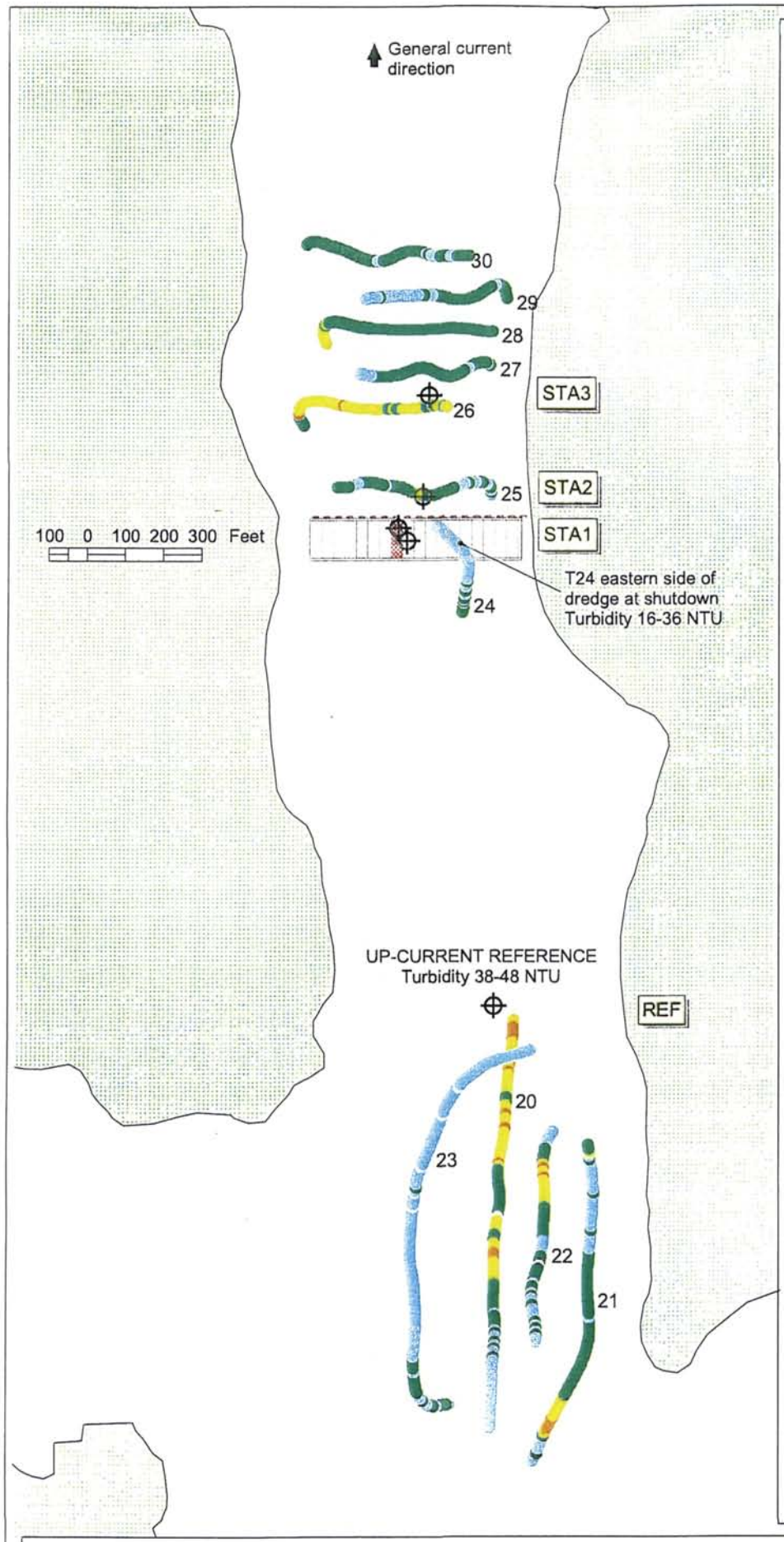
200 0 200 400 600 Feet

GRAB SAMPLE DATA (16:59-17:44)

TSS	HR1
STA3 500 ft:	25 mg/L
STA2 100 ft:	17 mg/L
STA1 50 ft:	20 mg/L
REF:	6 mg/L

Figure K-11: Turbidity Monitoring Data, 16 August 2000, Flood Tide, 17:27 to 17:50

ENSR INTERNATIONAL



New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
16 August 2000, Flood Tide
18:41 to 19:22
Data Groups G6 and G7

STA1
Water Quality Station
Active Dredging Operation
Cut 3
Measured Turbidity
- 0 - 10 NTU
- 10 - 25 NTU
- 25 - 50 NTU
- 50 - 100 NTU
- 100 - 250 NTU
- > 250 NTU

Predicted Tide:
Low 14:40 / High 21:43

Weather recorded during period:
WNW winds roughly 8 mph diminishing to 6 mph from the NW.
Recorded rainfall:
06:00-12:00 -- 0.03 in.
12:00-18:00 -- 0.01 in.
18:00-24:00 -- 0.0 in.

Transect (Start Time / Peak Turbidity)
T20 (18:41 / 192 NTU)
T21 (18:46 / 134 NTU)
T22 (18:49 / 111 NTU)
T23 (18:52 / 31 NTU)
T24 (19:05 / 36 NTU)
T25 (19:09 / 19-53 NTU)
T26 (19:12 / 28-102 NTU)
T27 (19:14 / 23-47 NTU)
T28 (19:17 / 31-42 NTU*)
T29 (19:19 / 18-38 NTU)
T30 (19:22 / 23-36 NTU)
* Values of 44-76 NTU observed during the first 15 seconds of transect. Attributed to vessel maneuvering.

NOTES:
-- Suspected influx of turbid waters from the lower harbor carrying influences of storm event i.e., surface run-off and stormwater discharges.
-- Actual turbidity values are reported (not excursions over background).

PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

200 0 200 400 600 Feet

Figure K-12: Turbidity Monitoring Data, 16 August 2000, Flood Tide, 18:41 to 19:22

ENSR INTERNATIONAL

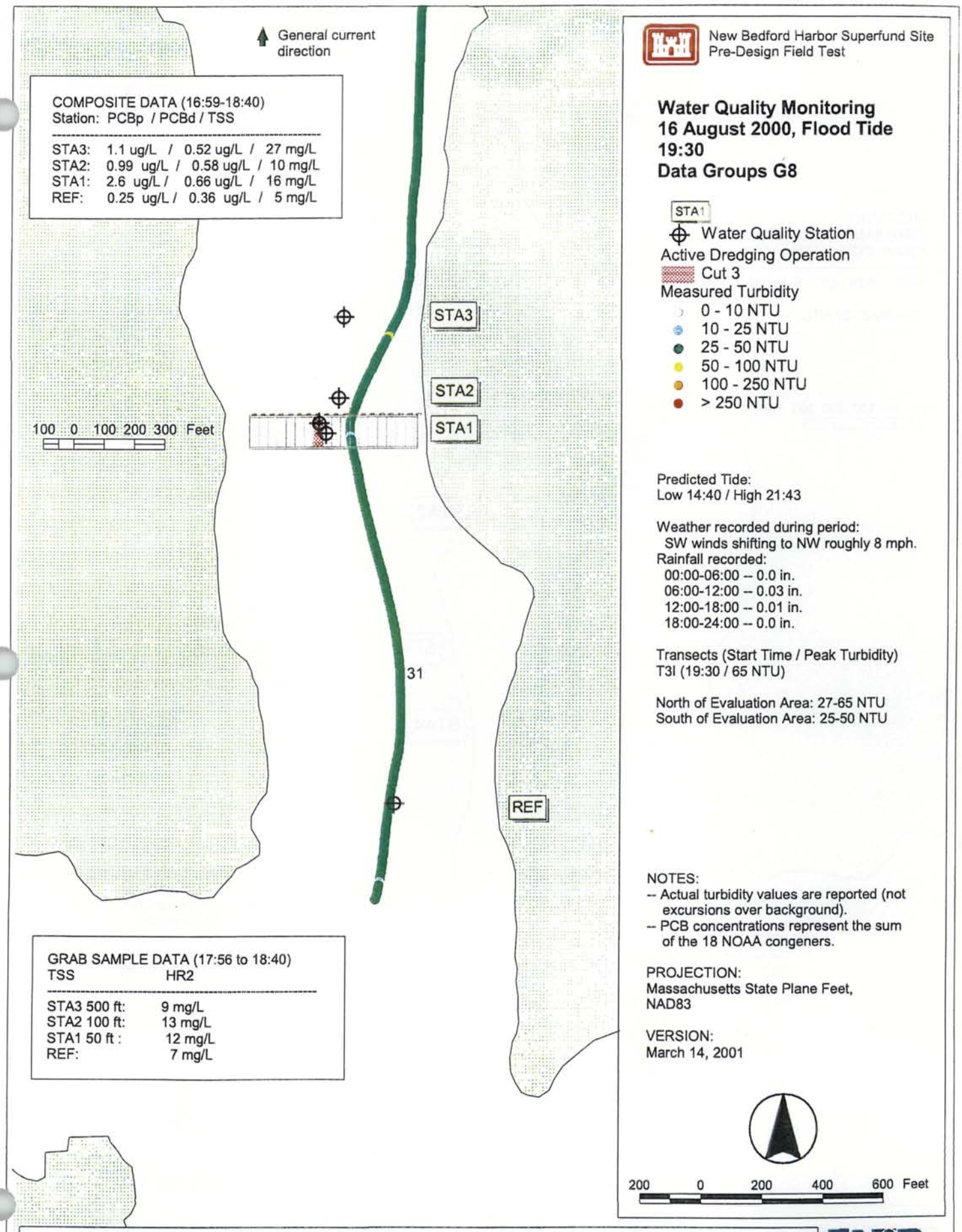
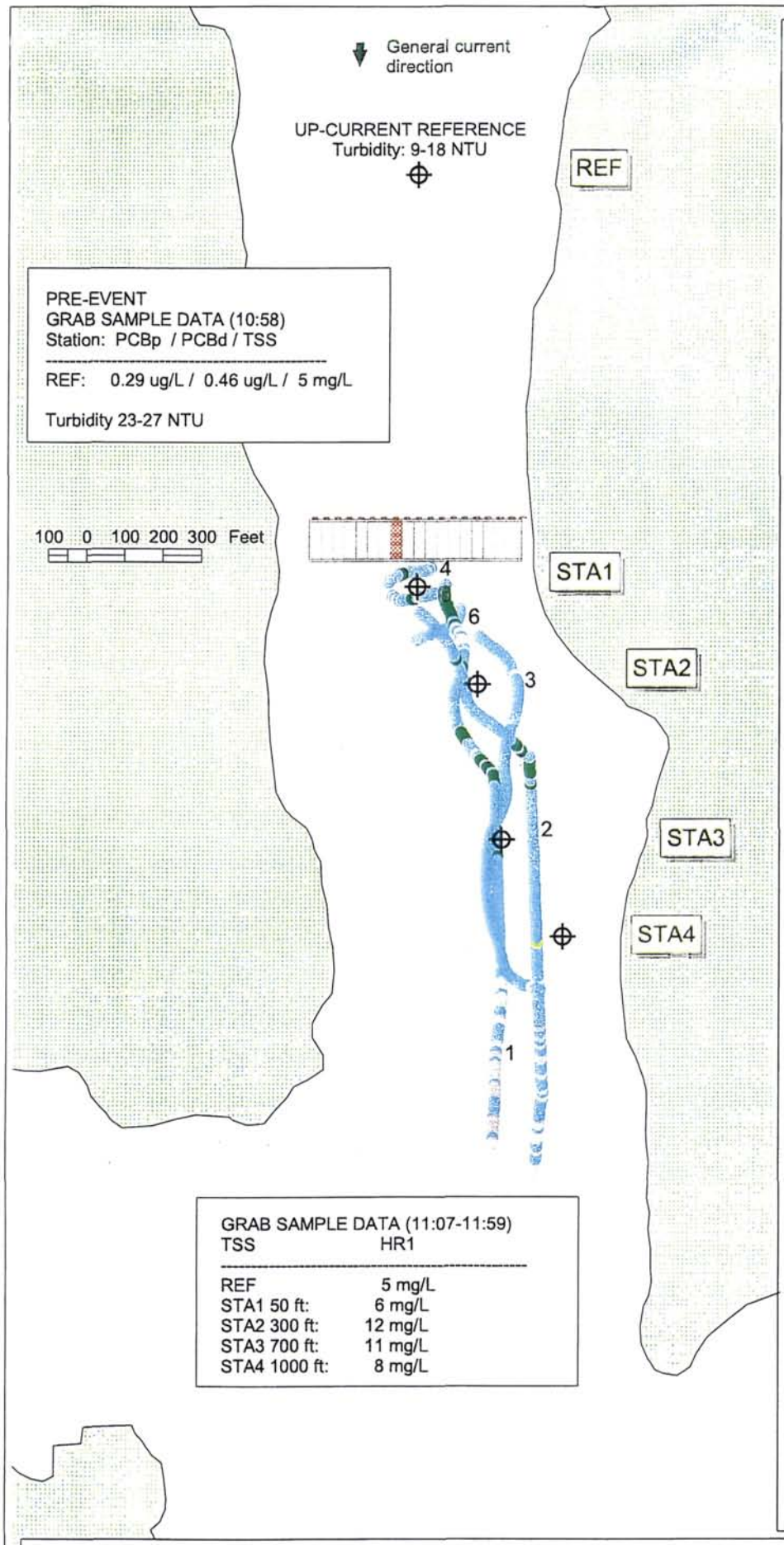


Figure K-13: Turbidity Monitoring Data, 16 August 2000, Flood Tide at 19:30, Including Event Composite Sample Data

ENSR INTERNATIONAL



New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
17 August 2000, EbbTide
11:17 to 12:10
Data Groups G1 and G2

STA1
Water Quality Station
Active Dredging Operation
Cut 3
Measured Turbidity
- 0 - 10 NTU
- 10 - 25 NTU
- 25 - 50 NTU
- 50 - 100 NTU
- 100 - 250 NTU
- > 250 NTU

Predicted Tide:
High 10:07 / Low 15:18

Weather recorded during period:
WNW wind roughly 10 mph.
Peak wind speed 11.2 mph.
Rainfall recorded:
00:00-06:00: 0.0 in
06:00-12:00: 0.0 in
12:00-18:00: 0.0 in.

Transects (Start Time / Peak Turbidity)
T1 (11:17 / 46 NTU)
T2 (11:23 / 32 NTU)
T3 (11:32 / 23 NTU)
T4 (12:08 / 30 NTU)
T5 (12:09 / 33 NTU)
T6 (12:10 / 23 NTU)

T1 peak capturing small localized plume of dredge repositioning on wire and respudding

NOTES:
-- Actual turbidity values are reported (not excursions over background).
-- PCB concentrations represent the sum of the 18 NOAA congeners.

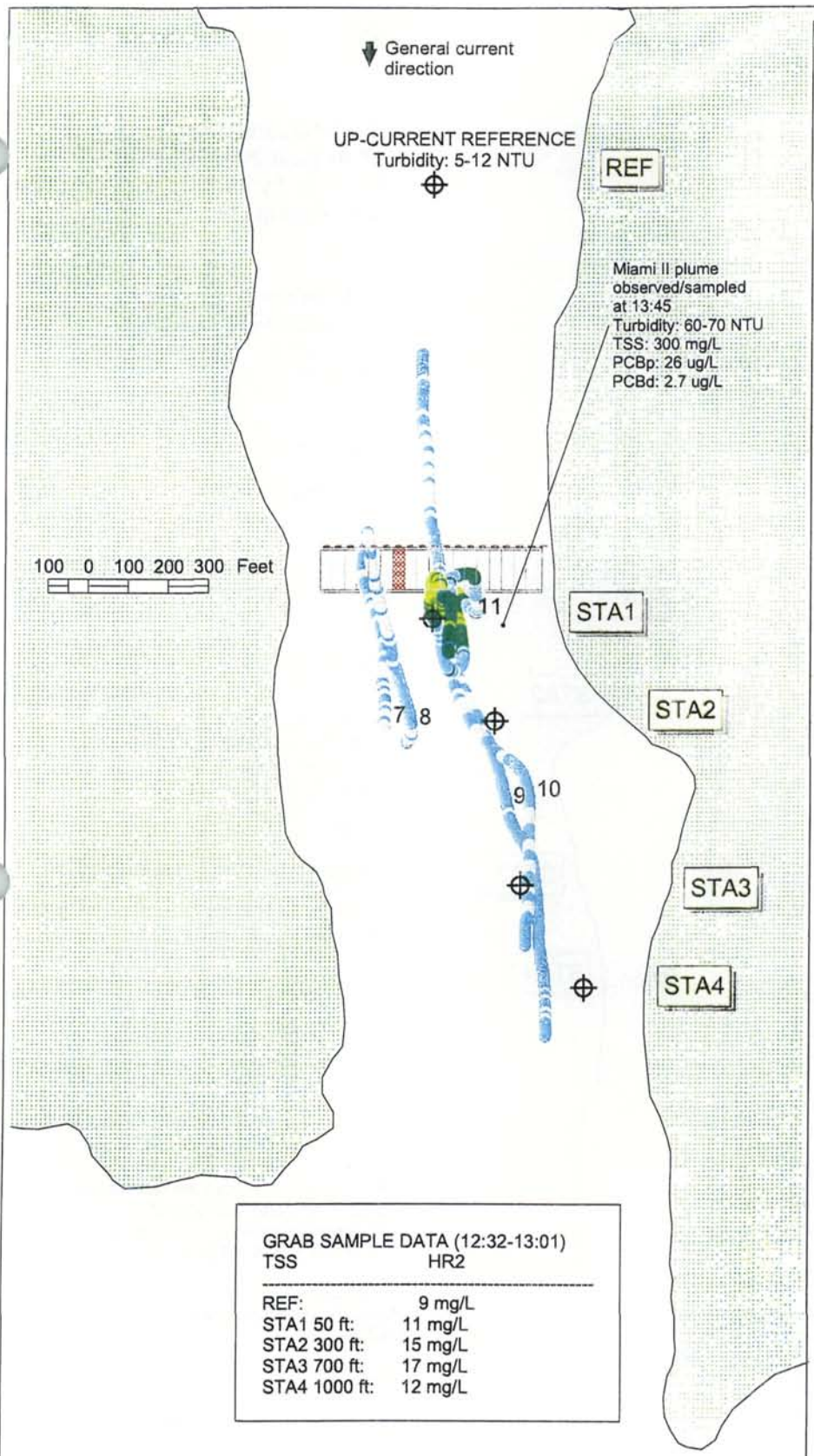
PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

200 0 200 400 600 Feet

Figure K-14: Turbidity Monitoring Data, 16 August 2000, EbbTide 11:17 to 12:10

ENSR INTERNATIONAL



GRAB SAMPLE DATA (12:32-13:01)

TSS	HR2
REF:	9 mg/L
STA1 50 ft:	11 mg/L
STA2 300 ft:	15 mg/L
STA3 700 ft:	17 mg/L
STA4 1000 ft:	12 mg/L

New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
17 August 2000, EbbTide
12:16 to 13:34
Data Group G3

STA1
Water Quality Station
Active Dredging Operation
Cut 2
Measured Turbidity
- 0 - 10 NTU
- 10 - 25 NTU
- 25 - 50 NTU
- 50 - 100 NTU
- 100 - 250 NTU
- > 250 NTU

Predicted tide:
High 10:07 / Low 15:18

Weather recorded during period:
WNW wind averaging 11 mph.
Peak wind speed 11.2 mph.
Rainfall recorded:
00:00-06:00: 0.0 in.
06:00-12:00: 0.0 in.
12:00-18:00: 0.0 in.

Transects (Start Time / Peak Turbidity)
T7 (12:16 / 16 NTU)
T8 (12:18 / 21 NTU)
T9 (12:24 / 23 NTU)
T10 (13:04 / 19 NTU)
T11 (13:34 / 101 NTU)

T7/T8: performed west of floating pipeline.
T11: performed in the surrounding area of the Miami II operations.

NOTES:
-- Actual turbidity values are reported (not excursions over background).
-- PCB concentrations represent the sum of the 18 NOAA congeners.

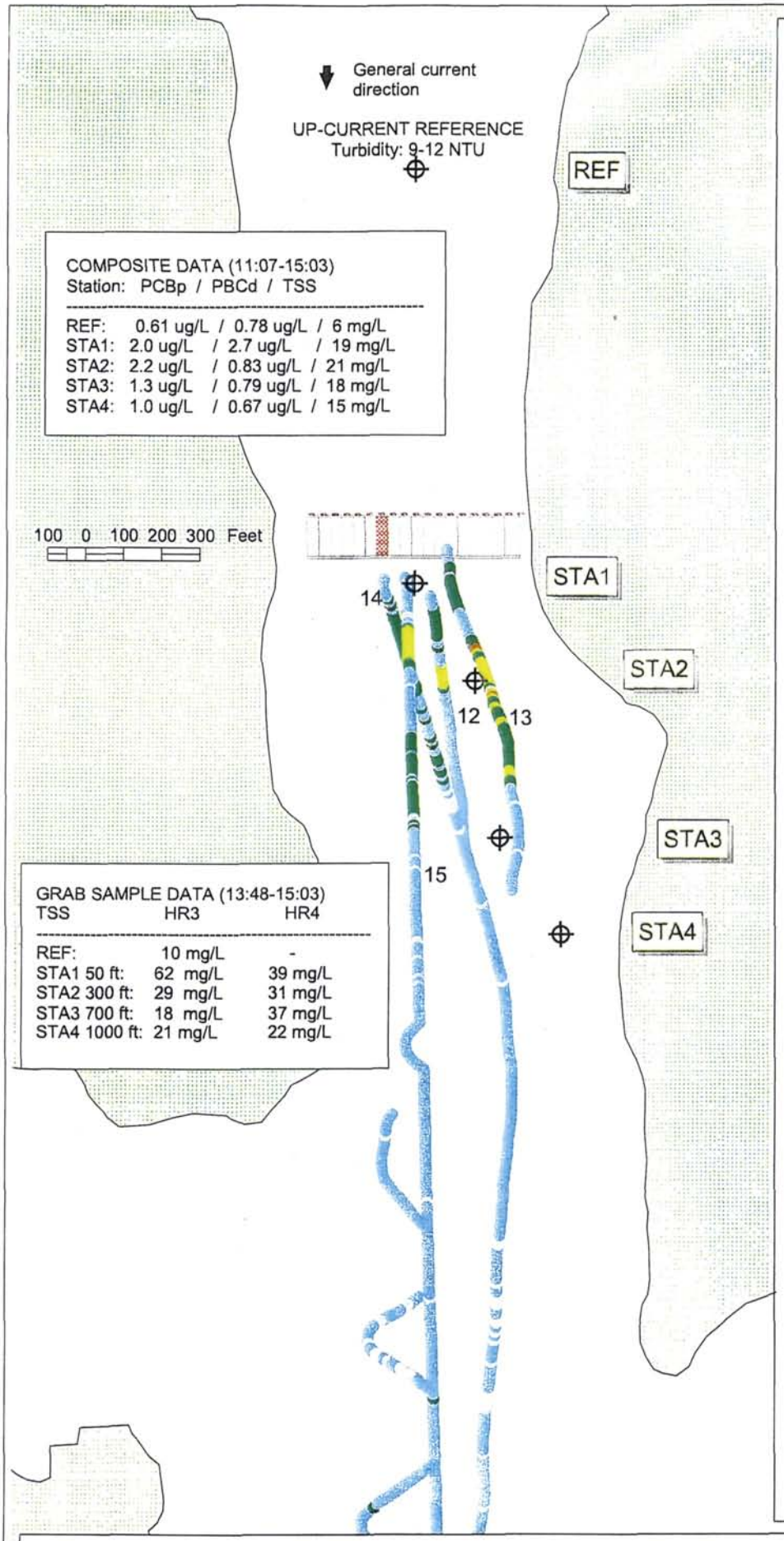
PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

200 0 200 400 600 Feet

Figure K-15: Turbidity Monitoring Data, 17 August 2000, Ebb Tide 12:16-13:34

ENSR INTERNATIONAL



COMPOSITE DATA (11:07-15:03)

Station:	PCBp	PBCd	TSS
REF:	0.61 ug/L	0.78 ug/L	6 mg/L
STA1:	2.0 ug/L	2.7 ug/L	19 mg/L
STA2:	2.2 ug/L	0.83 ug/L	21 mg/L
STA3:	1.3 ug/L	0.79 ug/L	18 mg/L
STA4:	1.0 ug/L	0.67 ug/L	15 mg/L

GRAB SAMPLE DATA (13:48-15:03)

TSS	HR3	HR4
REF:	10 mg/L	-
STA1 50 ft:	62 mg/L	39 mg/L
STA2 300 ft:	29 mg/L	31 mg/L
STA3 700 ft:	18 mg/L	37 mg/L
STA4 1000 ft:	21 mg/L	22 mg/L

New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
17 August 2000, EbbTide
15:25 to 15:45
Data Group G4

STA1
Water Quality Station
Active Dredging Operation
Cut 2
Measured Turbidity
- 0 - 10 NTU
- 10 - 25 NTU
- 25 - 50 NTU
- 50 - 100 NTU
- 100 - 250 NTU
- > 250 NTU

Predicted tide:
High 10:07 / Low 15:15

Weather Observed during period:
WNW winds steady at 10 mph.
Rainfall recorded:
00:00-06:00: 0.0 in.
06:00-12:00: 0.0 in.
12:00-18:00: 0.0 in.

Transects (Start Time / Peak Turbidity)
T12 (15:25 / 70 NTU)
T13 (15:36 / 111 NTU)
T14 (15:41 / 40 NTU)
T15 (15:45 / 80 NTU)

NOTES:
-- Actual turbidity values are reported (not excursions over background).
-- PCB concentrations represent the sum of the 18 NOAA congeners.

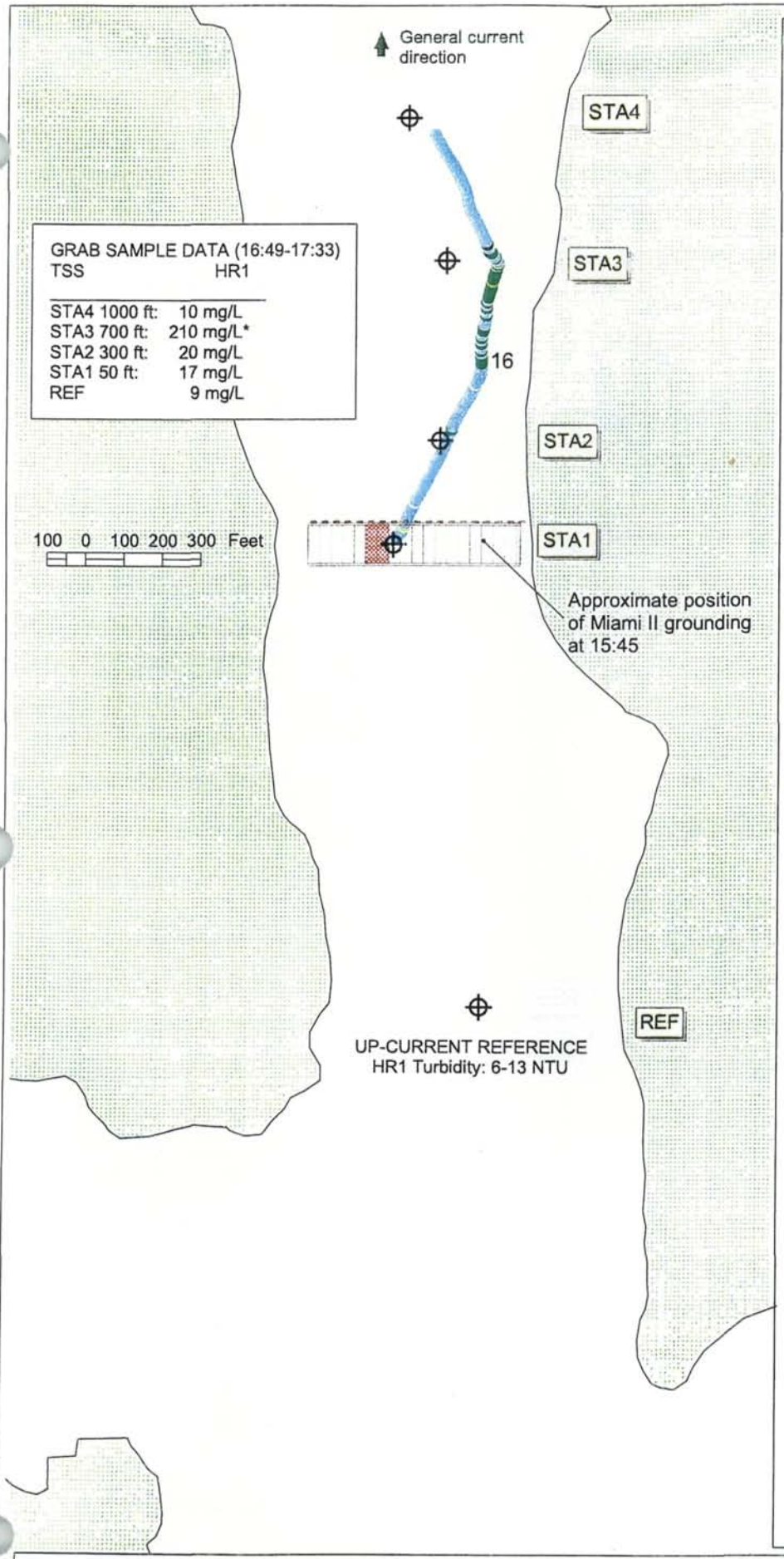
PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

200 0 200 400 600 Feet

Figure K-16: Turbidity Monitoring Data, 17 August 2000, Ebb Tide 15:25 to 15:45, Including Event Composite Sample Data

ENSR INTERNATIONAL



New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
17 August 2000, Flood Tide
16:54
Data Group G5

STA1
Water Quality Station
Active Dredging Operation
Cut 1
Cut 2
Turbidity - August 17, 2000, G5
0 - 10 NTU
10 - 25 NTU
25 - 50 NTU
50 - 100 NTU
100 - 250 NTU
> 250 NTU

Predicted tide:
Low 15:18 / High 22:24

Weather recorded during period:
NW winds averaging 10 mph.
Rainfall recorded:
0000-0600: 0.0 in.
0600-1200: 0.0 in.
1200-1800: 0.0 in.

Transects (Start Time / Peak Turbidity)
T17 (16:54 / 24 NTU)

* Turbidity values of 60-70 NTU were recorded during sampling. Suspect Miami II running aground just after tide change as the source of localized slug of elevated turbidity.

NOTES:
-- Actual turbidity values are reported (not excursions over background).
-- PCB concentrations represent the sum of the 18 NOAA congeners.

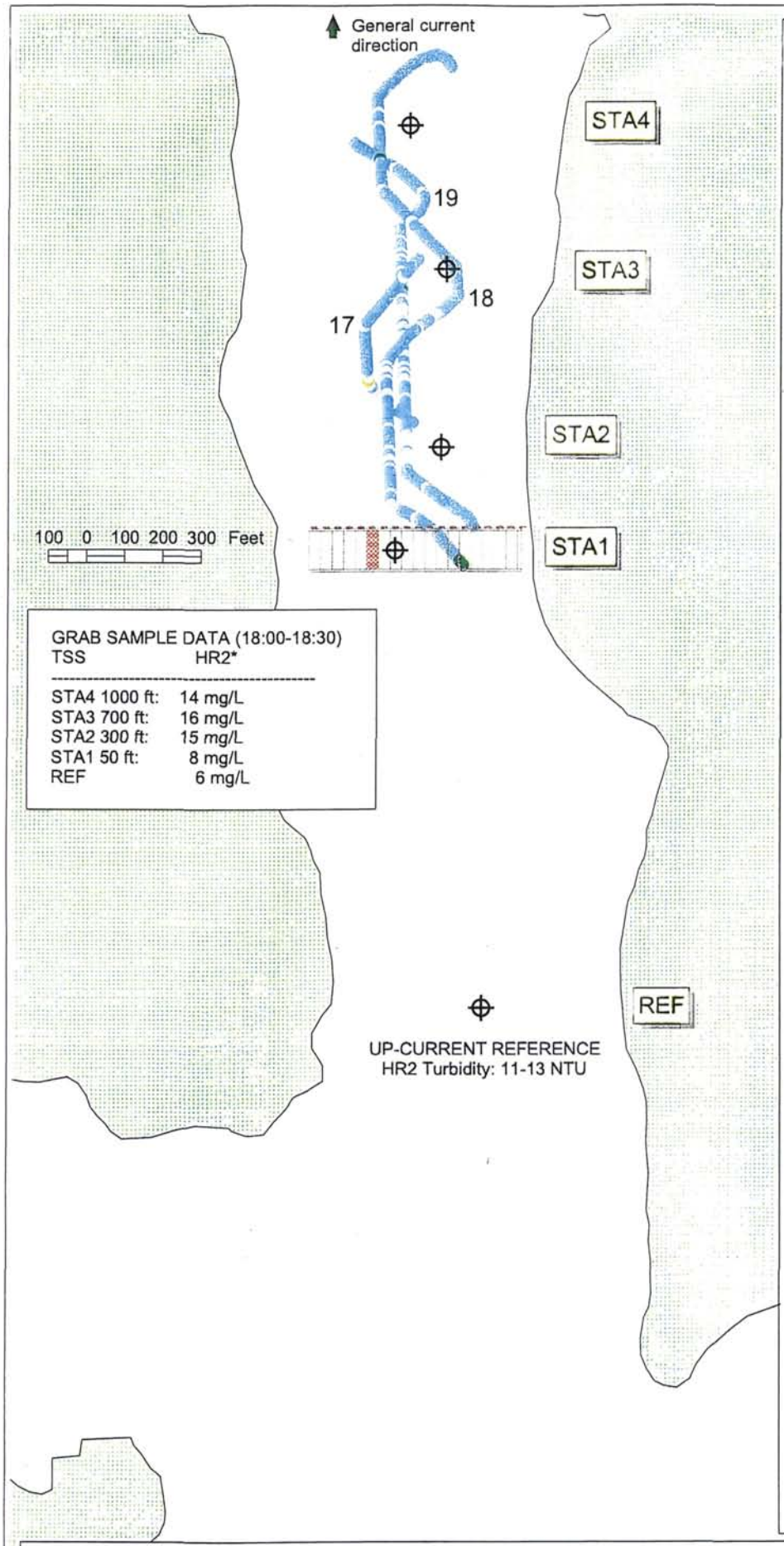
PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

200 0 200 400 600 800 Feet

Figure K-17: Turbidity Monitoring Data, 17 August 2000, Flood Tide at 16:54

ENSR INTERNATIONAL



GRAB SAMPLE DATA (18:00-18:30)

TSS	HR2*
STA4 1000 ft:	14 mg/L
STA3 700 ft:	16 mg/L
STA2 300 ft:	15 mg/L
STA1 50 ft:	8 mg/L
REF	6 mg/L

New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
17 August 2000, Flood Tide
18:04 to 18:54
Data Groups G6 and G7

STA1
Water Quality Station
Active Dredging Operation
Cut 1
Measured Turbidity
- 0 - 10 NTU
- 10 - 25 NTU
- 25 - 50 NTU
- 50 - 100 NTU
- 100 - 250 NTU
- > 250 NTU

Predicted Tide:
Low 15:18 / High 22:24

Weather recorded during period:
NW winds 10 mph diminishing to 8 mph.
Rainfall recorded:
00:00-06:00: 0.0 in.
06:00-12:00: 0.0 in.
12:00-18:00: 0.0 in.

Transects (Start Time / Peak Turbidity)
T17 (16:54 / 24 NTU)
T18 (18:16 / 32 NTU)
T19 (18:54 / 29 NTU)

* Nearly continuous dredging activity from 17:40 to 18:29.
Backwashing between 18:04-18:08 was the only recorded downtime during this observation period.

NOTES:
-- Actual turbidity values are reported (not excursions over background).
-- PCB concentrations represent the sum of the 18 NOAA congeners.

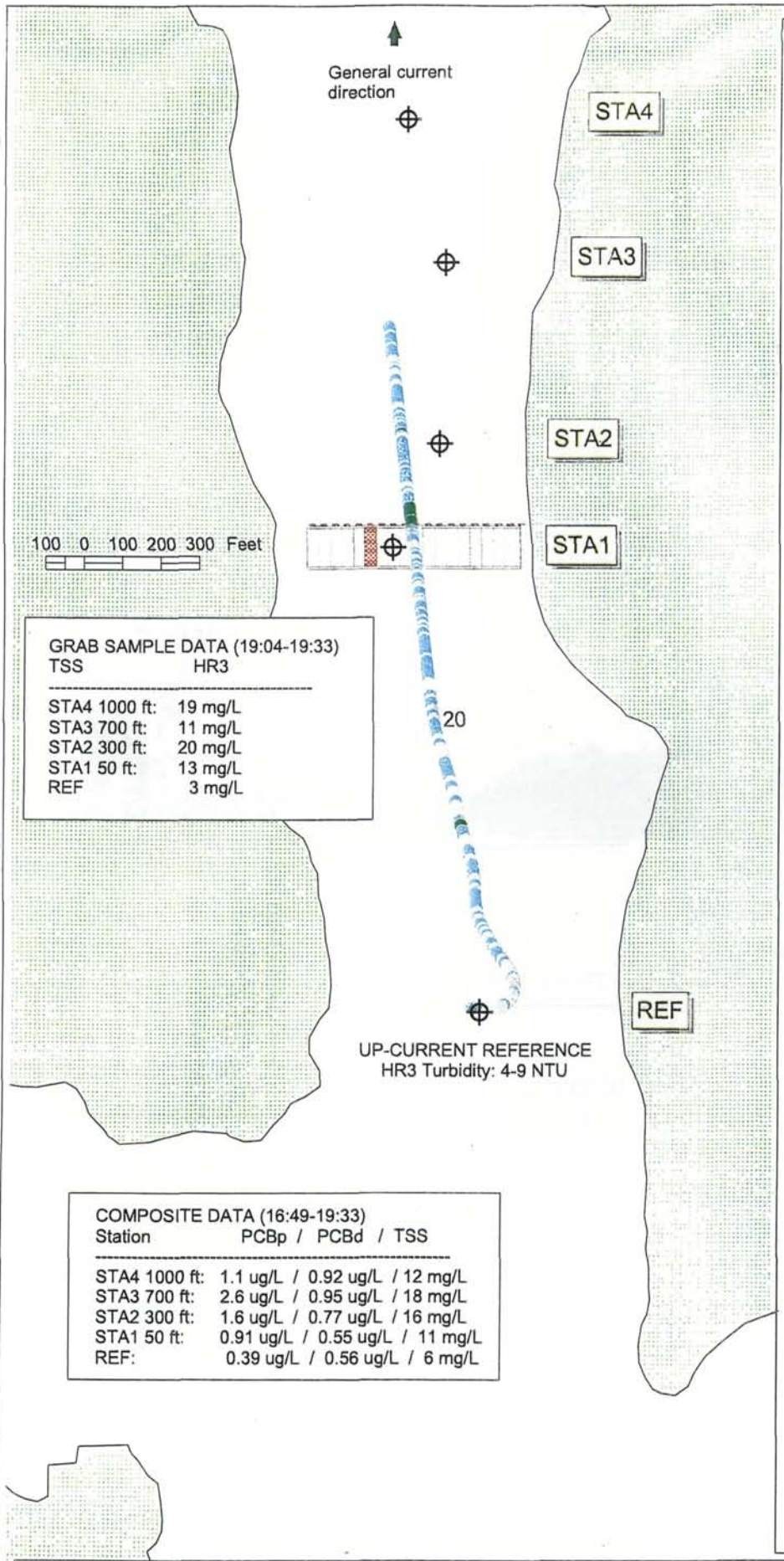
PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

200 0 200 400 600 Feet

Figure K-18: Turbidity Monitoring Data, 17 August 2000, Flood Tide, 18:04 to 18:54

ENSR INTERNATIONAL



GRAB SAMPLE DATA (19:04-19:33)

TSS	HR3
STA4 1000 ft:	19 mg/L
STA3 700 ft:	11 mg/L
STA2 300 ft:	20 mg/L
STA1 50 ft:	13 mg/L
REF	3 mg/L

COMPOSITE DATA (16:49-19:33)

Station	PCBp / PCBd / TSS
STA4 1000 ft:	1.1 ug/L / 0.92 ug/L / 12 mg/L
STA3 700 ft:	2.6 ug/L / 0.95 ug/L / 18 mg/L
STA2 300 ft:	1.6 ug/L / 0.77 ug/L / 16 mg/L
STA1 50 ft:	0.91 ug/L / 0.55 ug/L / 11 mg/L
REF:	0.39 ug/L / 0.56 ug/L / 6 mg/L

New Bedford Harbor Superfund Site
Pre-Design Field Test

Water Quality Monitoring
17 August 2000, Flood Tide
19:20
Data Group G8

STA1
Water Quality Station
Active Dredging Operation
Cut 1
Measured Turbidity
0 - 10 NTU
10 - 25 NTU
25 - 50 NTU
50 - 100 NTU
100 - 250 NTU
> 250 NTU

Predicted Tide:
Low 15:18 / High 22:24

Weather recorded during period:
NW winds changing to NNW.
Wind speed steady at 9 mph.
Rainfall recorded:
00:00-06:00: 0.0 in.
06:00-12:00: 0.0 in.
12:00-18:00: 0.0 in.

Transects (Start Time / Peak Turbidity)
T20 (19:20 / 39 NTU)

NOTES:
-- Actual turbidity values are reported (not excursions over background).
-- PCB concentrations represent the sum of the 18 NOAA congeners.

PROJECTION:
Massachusetts State Plane Feet, NAD83

VERSION:
March 14, 2001

200 0 200 400 600 Feet

Figure K-19: Turbidity Monitoring Data, 17 August 2000, Flood Tide at 19:20, Including Event Composite Sample Data

ENSR INTERNATIONAL

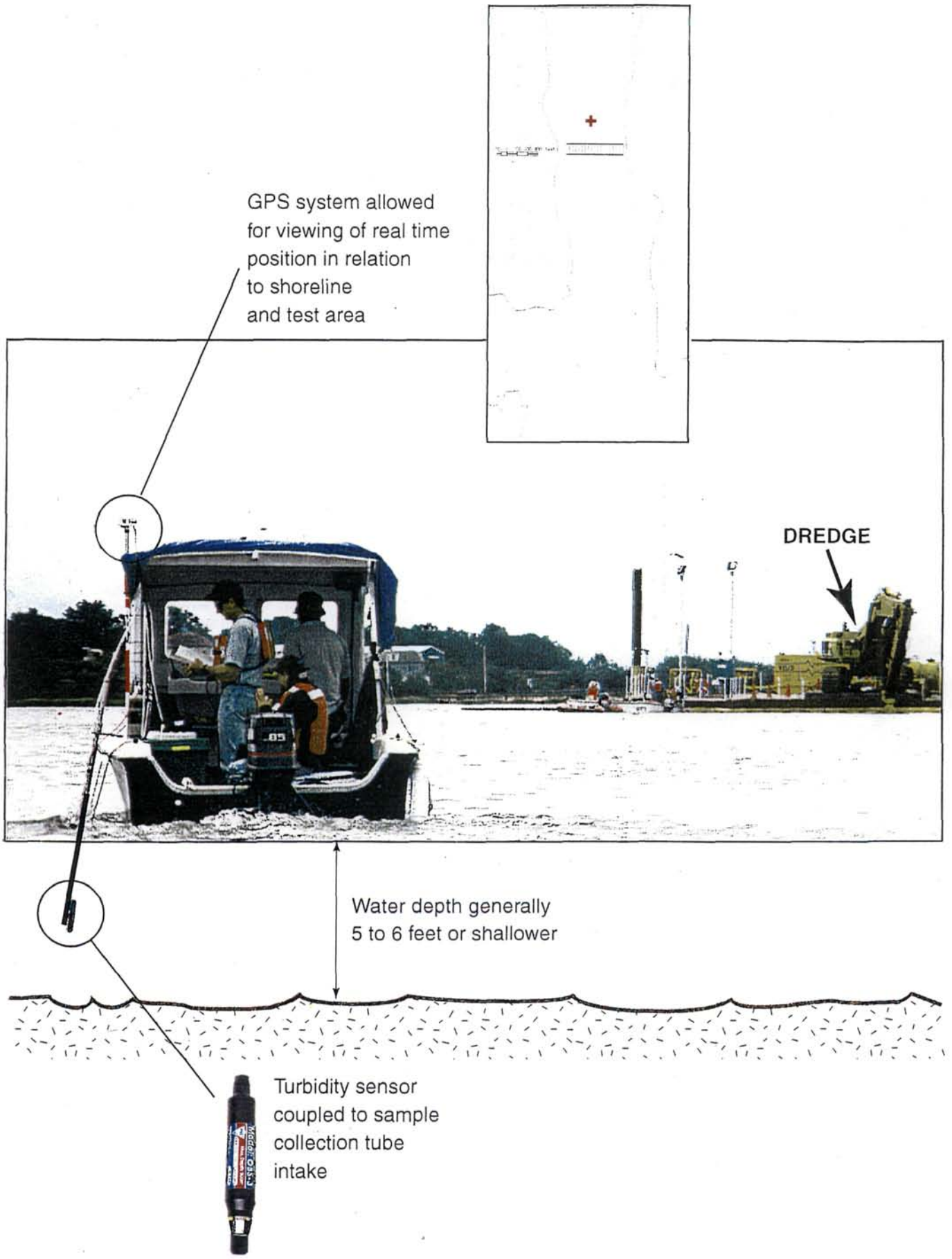


FIGURE K-20
Setup for Turbidity Monitoring

FIGURE K21

Summary of Field Samples and Analytical Data

Field Sample ID	Date and Time Collected			POSITION Northing	POSITION Easting	Brief	Turbidity Range (NTU) MIN	MAX	AVG	TSS (mg/L)	Total PCB (ug/L) particulate	dissolved	particulate + dissolved
NBPDWQ1000N	07-Aug-00	16:26	Grab	2704955	815354	Background Value - Acushnet Estuary 1000ft N				10	0.89	0.52	1.41
NBPDWQ1000S	07-Aug-00	16:36	Grab	2703124	815820	Background Value - Acushnet Estuary 1000ft S				4	0.25	0.18	0.43
NBH815-1752	15-Aug-00	17:52	Grab	2704040	815356	Turbidity / TSS - Acushnet Estuary	26.0	26.0	26.0	53			
NBH0815-1805	15-Aug-00	18:05	Grab			Turbidity / TSS - Acushnet Estuary	12.0	12.0	12.0	22			
NBH815-1807	15-Aug-00	18:08	Grab			Turbidity / TSS - Acushnet Estuary	3.0	5.0	4.0	5.0			
NBH0816-R1 TSS/PCB	16-Aug-00	9:20	Grab	2703129	815608	Up-current reference sample	3.0	6.0	4.5	6.0	0.11	0.21	0.32
NBPDWQ E1-STA1-HR1	16-Aug-00	11:56	EBB			Sampling HR1 - Station 1 (50ft)	7.0	10.0	8.5	20			
NBPDWQ E1-STA2-HR1	16-Aug-00	12:02	EBB	2703959	815530	Sampling HR1 - Station 2 (100ft)	16.0	21.0	18.5	24			
NBPDWQ E1-STA3-HR1	16-Aug-00	12:11	EBB	2703621	815717	Sampling HR1 - Station 3 (500ft)	5.0	12.0	8.5	17			
NBPDWQ E1-STA4-HR1	16-Aug-00	12:22	EBB	2704948	815379	Sampling HR1 - REF (1000ft-up-current)	3.0	12.0	7.5	9.0			
NBPDWQ E1-STA1-HR2	16-Aug-00	13:16	EBB			Sampling HR2 - Station 1 (50ft)				11			
NBPDWQ E1-STA2-HR2	16-Aug-00	14:06	EBB	2703833	815506	Sampling HR2 - Station 2 (100ft)				43			
NBPDWQ E1-STA3-HR2	16-Aug-00	14:15	EBB	2703647	815675	Sampling HR2 - Station 3 (500ft)				11			
NBPDWQ E1-STA4-HR2	16-Aug-00	14:22	EBB	2704948	815379	Sampling HR2 - REF (1000ft-up-current)				12			
NBPDWQ E1 STA01	16-Aug-00		COMPOSITE			Composite - Station 1				16	1.30	0.77	2.07
NBPDWQ E1 STA02	16-Aug-00		COMPOSITE			Composite - Station 2				27	2.10	0.79	2.89
NBPDWQ E1 STA03	16-Aug-00		COMPOSITE			Composite - Station 3	23.0	27.0	25.0	12	0.85	0.75	1.60
NBPDWQ E1 STA04	16-Aug-00		COMPOSITE			Composite - REF	10.0	17.0	13.5	9.0	0.89	0.90	1.79
NBPDWQ F1-STA1-HR1	16-Aug-00	16:59	FLOOD	2703995	815351	Sampling HR1 - Station 1 (50ft)				20			
NBPDWQ F1-STA2-HR1	16-Aug-00	17:17	FLOOD	2704110	815393	Sampling HR1 - Station 2 (100ft)	20.0	20.0	20.0	17			
NBPDWQ F1-STA3-HR1	16-Aug-00	17:23	FLOOD	2704375	815410	Sampling HR1 - Station 3 (500ft)	40.0	40.0	40.0	25			
NBPDWQ F1-STA4-HR1	16-Aug-00	17:44	FLOOD	2702780	815578	Sampling HR1 - REF (1000ft-up-current)	6.0	15.0	10.5	6.0			
NBPDWQ F1-STA1-HR2	16-Aug-00	17:56	FLOOD	2704028	815329	Sampling HR2 - Station 1 (50ft)	21.0	27.0	24.0	12			
NBHPDWQ-SLICK-2	16-Aug-00	17:56	Grab			Surface oil slick observed at HR1 - Station 1 (50ft)						1.50	1.50
NBPDWQ F1-STA2-HR2	16-Aug-00	17:58	FLOOD	2704140	815363	Sampling HR2 - Station 2 (100ft)	10.0	15.0	12.5	13			
NBPDWQ F1-STA3-HR2	16-Aug-00	18:19	FLOOD	2704375	815410	Sampling HR2 - Station 3 (500ft)	39.0	42.0	40.5	9.0			
NBPDWQ F1-STA4-HR2	16-Aug-00	18:40	FLOOD	2702780	815578	Sampling HR2 - REF (1000ft-up-current)	38.0	42.0	40.0	7.0			
NBPDWQ F1 STA01	16-Aug-00		COMPOSITE			Composite - Station 1				27	2.60	0.66	3.26
NBPDWQ F1 STA02	16-Aug-00		COMPOSITE			Composite - Station 2				10	0.99	0.58	1.57
NBPDWQ F1 STA03	16-Aug-00		COMPOSITE			Composite - Station 3				16	1.10	0.52	1.62
NBPDWQ F1 STA04	16-Aug-00		COMPOSITE			Composite - REF				5.0	0.25	0.36	0.61
													0.00
NBH817-R1 TSS	17-Aug-00	10:58	EBB			Sampling - Up-current reference	23.0	27.0	25.0	5	0.29	0.46	0.75
NBPDWQ E2 STA1 HR1	17-Aug-00	11:07	EBB	2703878	815379	Sampling HR1 - Station1 (50ft)	11.0	18.0	14.5	6			
NBPDWQ E2 STA4 HR1	17-Aug-00	11:42	EBB	2702964	815758	Sampling HR1 - Station 4 (1000ft)	10.0	17.0	13.5	12			
[illegible] E2 STA3 HR1	17-Aug-00	11:46	EBB	2703218	815599	Sampling HR1 - Station 3 (700ft)	10.0	17.0	13.5	17			
NBPDWQ E2 STA2 HR1	17-Aug-00	11:50	EBB	2703625	815534	Sampling HR1 - Station 2 (300ft)	[illegible]	[illegible]	14.5	12			
NBPDWQ E2 STA5 HR1	17-Aug-00	11:59	EBB	2704948	815379	Sampling HR1 - REF (1000ft-up-current)	9.0	18.0	13.5	9			
NBPDWQ E2 STA4 HR2	17-Aug-00	12:32	EBB	2702964	815758	Sampling HR2 - Station 4 (1000ft)	6.0	10.0	8.0	8			
NBPDWQ E2 STA3 HR2	17-Aug-00	12:38	EBB	2703218	815599	Sampling HR2 - Station 3 (700ft)	12.0	17.0	14.5	11			
NBPDWQ E2 STA2 HR2	17-Aug-00	12:45	EBB	2703625	815534	Sampling HR2 - Station 2 (300ft)	11.0	17.0	14.0	15			
NBPDWQ E2 STA1 HR2	17-Aug-00	12:52	EBB	2703878	815379	Sampling HR2 - Station1 (50ft)	9.0	15.0	12.0	11			
NBPDWQ E2 STA5 HR2	17-Aug-00	13:01	EBB	2704948	815379	Sampling HR2 - REF (1000ft-up-current)	5.0	12.0	8.5	7			
NBH0817-1345 TSS	17-Aug-00	13:45	Grab			MIAMI II Plume (peak field turbidity)	60.0	70.0	65.0	300	26.00	2.70	28.70
NBPDWQ E2 STA1 HR3	17-Aug-00	13:48	EBB	2703878	815379	Sampling HR3 - Station1 (50ft)	28.0	34.0	31.0	62			
NBPDWQ E2 STA2 HR3	17-Aug-00	13:58	EBB	2703625	815534	Sampling HR3 - Station 2 (300ft)	19.0	23.0	21.0	29			
NBPDWQ E2 STA3 HR3	17-Aug-00	14:03	EBB	2703218	815599	Sampling HR3 - Station 3 (700ft)	13.0	18.0	15.5	18			

FIGURE K21

Summary of Field Samples and Analytical Data

Field Sample ID	Date and Time Collected			POSITION Northing	POSITION Easting	Brief	Turbidity Range (NTU) MIN	MAX	AVG	TSS (mg/L)	Total PCB (ug/L) particulate	dissolved	particulate + dissolved
NBPDWQ E2 STA4 HR3	17-Aug-00	14:08	EBB	2702964	815758	Sampling HR3 - Station 4 (1000ft)	13.0	21.0	17.0	21			
NBPDWQ E2 STA5 HR3	17-Aug-00	14:38	EBB	2704948	815379	Sampling HR3 - REF (1000ft-up-current)	9.0	12.0	10.5	10			
NBPDWQ E2 STA1 HR4	17-Aug-00	14:47	EBB	2703878	815379	Sampling HR4 - Station1 (50ft)	26.0	29.0	27.5	39			
NBPDWQ E2 STA2 HR4	17-Aug-00	14:53	EBB	2703625	815534	Sampling HR4 - Station 2 (300ft)	19.0	26.0	22.5	31			
NBPDWQ E2 STA3 HR4	17-Aug-00	14:57	EBB	2703218	815599	Sampling HR4 - Station 3 (700ft)	27.0	29.0	28.0	37			
NBPDWQ E2 STA4 HR4	17-Aug-00	15:03	EBB	2702964	815758	Sampling HR4 - Station 4 (1000ft)	13.0	18.0	15.5	22			
NBPDWQ E2 STA01	17-Aug-00		COMPOSITE			Composite - Station 1	10.0	16.0	12.0	19	2.00	2.70	4.70
NBPDWQ E2 STA02	17-Aug-00		COMPOSITE			Composite - Station 2	21.0	29.0	25.0	21	2.20	0.83	3.03
NBPDWQ E2 STA03	17-Aug-00		COMPOSITE			Composite - Station 3	18.0	24.0	21.0	18	1.30	0.79	2.09
NBPDWQ E2 STA04	17-Aug-00		COMPOSITE			Composite - Station 4	20.0	24.0	22.0	15	1.00	0.67	1.67
NBPDWQ E2 STA05	17-Aug-00		COMPOSITE			Composite - REF	13.0	18.0	15.5	6	0.61	0.78	1.39
NBPDWQ F2 STA1 HR1	17-Aug-00	16:49	FLOOD	2704000	815321	Sampling HR1 - Station1 (50ft)	13.0	16.0	14.5	17			
NBPDWQ F2 STA2 HR1	17-Aug-00	17:06	FLOOD	2704266	815441	Sampling HR1 - Station 2 (300ft)	14.0	19.0	16.5	20			
NBPDWQ F2 STA3 HR1	17-Aug-00	17:12	FLOOD	2704727	815455	Sampling HR1 - Station 3 (700ft)	60.0	70.0	65.0	210			
NBPDWQ F2 STA4 HR1	17-Aug-00	17:18	FLOOD	2705097	815357	Sampling HR1 - Station 4 (1000ft)	10.0	13.0	11.5	10			
NBPDWQ F2 STA5 HR1	17-Aug-00	17:33	FLOOD	2702805	815548	Sampling HR1 - Station 5 (1000ft-up-current)	6.0	13.0	9.5	9			
NBPDWQ F2 STA1 HR2	17-Aug-00	18:00	FLOOD	2704000	815321	Sampling HR2 - Station1 (50ft)	6.0	13.0	9.5	8			
NBPDWQ F2 STA2 HR2	17-Aug-00	18:06	FLOOD	2704266	815441	Sampling HR2 - Station 2 (300ft)	15.0	18.0	16.5	15			
NBPDWQ F2 STA3 HR2	17-Aug-00	18:12	FLOOD	2704727	815455	Sampling HR2 - Station 3 (700ft)	11.0	19.0	15.0	16			
NBPDWQ F2 STA4 HR2	17-Aug-00	18:15	FLOOD	2705097	815357	Sampling HR2 - Station 4 (1000ft)	12.0	17.0	14.5	14			
NBPDWQ F2 STA5 HR2	17-Aug-00	18:30	FLOOD	2702805	815548	Sampling HR2 - REF (1000ft-up-current)	11.0	13.0	12.0	6			
NBPDWQ F2 STA1 HR3	17-Aug-00	19:04	FLOOD	2704000	815321	Sampling HR3 - Station1 (50ft)	12.0	15.0	13.5	13			
NBPDWQ F2 STA2 HR3	17-Aug-00	19:08	FLOOD	2704266	815441	Sampling HR3 - Station 2 (300ft)	11.0	16.0	13.5	20			
NBPDWQ F2 STA3 HR3	17-Aug-00	19:12	FLOOD	2704727	815455	Sampling HR3 - Station 3 (700ft)	8.0	13.0	10.5	11			
NBPDWQ F2 STA4 HR3	17-Aug-00	19:16	FLOOD	2705097	815357	Sampling HR3 - Station 4 (1000ft)	12.0	19.0	15.5	19			
NBPDWQ F2 STA5 HR3	17-Aug-00	19:33	FLOOD	2702805	815548	Sampling HR3 - REF (1000ft-up-current)	4.0	9.0	6.5	3			
NBPDWQ F2 STA01	17-Aug-00		COMPOSITE			Composite - Station 1				11	0.91	0.55	1.46
NBPDWQ F2 STA02	17-Aug-00		COMPOSITE			Composite - Station 2				16	1.60	0.77	2.37
NBPDWQ F2 STA03	17-Aug-00		COMPOSITE			Composite - Station 3				18	2.60	0.95	3.55
NBPDWQ F2 STA04	17-Aug-00		COMPOSITE			Composite - Station 4				12	1.10	0.92	2.02
NBPDWQ F2 STA05	17-Aug-00		COMPOSITE			Composite - REF				6	0.39	0.56	0.95
NBH0818-R1 TSS	18-Aug-00	10:48	Grab			Sample Up-current-reference (Event scrubbed)	10.0	15.0	12.5	6	0.13	0.22	0.35
NBH0818-Moon TSS	18-Aug-00	17:44	Grab			Sample inside moonpool during active dredging	44.0	50.0	47.0	120	23.00	4.60	27.60

Figure K-22 - Particulate PCB Data

Field ID	E1-STA01	E1-STA02	E1-STA03	E1-STA04	Equipment Blank	F1-STA01 Comp	F1-STA02 Comp
Lab ID	44730-11	44730-12	44730-13	44730-14	44747-18	44730-15	44730-16
Matrix	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PCB Congener							
8 - 2,4'-Dichlorobiphenyl	0.045	0.069	0.025	0.023	0.0018 U	0.11	0.023
18 - 2,2',5-Trichlorobiphenyl	0.13	0.17	0.081	0.084	0.0018 U	0.24	0.089
28 - 2,4,4'-Trichlorobiphenyl	0.27	0.48	0.18	0.26	0.0044 U	0.68	0.21
44 - 2,2',3,5'-Tetrachlorobiphenyl	0.096	0.14	0.069	0.047	0.0018 U	0.17	0.069
52 - 2,2',5,5'-Tetrachlorobiphenyl	0.28	0.44	0.17	0.16	0.0018 U	0.56	0.2
66 - 2,3',4,4'-Tetrachlorobiphenyl	0.11	0.18	0.08	0.065	0.0024	0.24	0.082
101 - 2,2',4,5,5'-Pentachlorobiphenyl	0.089	0.16	0.07	0.084	0.0047 U	0.17	0.067
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.01	0.023	0.0091	0.0065	0.0018 U	0.016	0.01
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.082	0.14	0.063	0.081	0.0018 U	0.18	0.11
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	0.0086	0.016	0.0068 U	0.0044	0.0018 U	0.012	0.0077
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	0.054	0.072	0.041	0.024	0.0018 U	0.078	0.043
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	0.076	0.14	0.055	0.045	0.0018 U	0.15	0.06
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.0072	0.013	0.0068 U	0.0029	0.0018 U	0.0084	0.0061
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.0072	0.0034 U	0.0068 U	0.0021 U	0.0021 U	0.0073 U	0.0059
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	0.011	0.017	0.0074	0.0052	0.0018 U	0.008	0.0086
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.0014 U	0.0034 U	0.0068 U	0.0014 U	0.0018 U	0.0073 U	0.0014 U
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.0014 U	0.0034 U	0.0068 U	0.0014 U	0.0018 U	0.0073 U	0.0014 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.0014 U	0.0034 U	0.0068 U	0.0014 U	0.0018 U	0.0073 U	0.0014 U
NOAA Congener Total ppb	1.3	2.1	0.85	0.89	0.0024	2.6	0.99

Qualifiers and Notes
U = congener is not detected above the MDL
J = congener concentration is estimated

All results are surrogate corrected using PCB 198

Figure K-22 - Particulate PCB Data (Continued)

Field ID	F1-STA03	F1-STA04	NBH0816-R1 PCB	NBH0817-1345 PCB	NBH0818-MOON	NBH0818-R1 PCB	NBH817-R1 PCB
Lab ID	44730-19	44730-20	44730-18	44747-26	44750-06	44750-08	44747-24
Matrix	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PCB Congener							
8 - 2,4'-Dichlorobiphenyl	0.029	0.0066	0.0022	2.5	2	0.0021	0.012
18 - 2,2',5-Trichlorobiphenyl	0.099	0.028	0.0057	3.2	2.1	0.015	0.03
28 - 2,4,4'-Trichlorobiphenyl	0.22	0.061	0.022	8.2	5.6	0.031	0.071
44 - 2,2',3,5'-Tetrachlorobiphenyl	0.073	0.019	0.0097	1.6	2	0.011	0.02
52 - 2,2',5,5'-Tetrachlorobiphenyl	0.22	0.054	0.026	5.2	5.6	0.03	0.054
66 - 2,3',4,4'-Tetrachlorobiphenyl	0.088	0.025	0.014	2.1	1.7	0.016	0.031
101 - 2,2',4,5,5'-Pentachlorobiphenyl	0.14	0.032 U	0.0225 U	1 U	0.64	0.026 U	0.022 U
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.012	0.0036	0.0027	0.11 U	0.088	0.0029	0.003
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.12	0.026	0.017	1.1	1.2	0.0045	0.038
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	0.0089	0.0015 U	0.0015 U	0.11 U	0.089 J	0.0015 U	0.0017 U
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	0.048	0.0087	0.006	0.55 J	0.65 J	0.0071	0.01 J
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	0.067	0.014	0.0079	1.1	1.1	0.0083	0.019
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.0072	0.0015 U	0.0015 U	0.11 U	0.11 J	0.002	0.0017 U
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.0065	0.0021 U	0.0021 U	0.11 U	0.056 U	0.0021 U	0.0021 U
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	0.0093	0.0015 U	0.0015 U	0.11 U	0.14	0.0015 U	0.0017 U
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.0014 U	0.0015 U	0.0015 U	0.11 U	0.056 U	0.0015 U	0.0017 U
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.0014 U	0.0015 U	0.0015 U	0.11 U	0.056 U	0.0015 U	0.0017 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.0014 U	0.0015 U	0.0015 U	0.11 U	0.056 U	0.0015 U	0.0017 U
NOAA Congener Total ppb	1.1	0.25	0.11	26	23	0.13	0.29

Qualifiers and Notes
U = congener is not detected above the MDL
J = congener concentration is estimated

All results are surrogate corrected using PCB 198

Figure K-22 - Particulate PCB Data (Continued)

Field ID	NBHPDWQ-Slick-1	NBPDWQ E2 STA01	NBPDWQ E2 STA02	NBPDWQ E2 STA03	NBPDWQ E2 STA04	NBPDWQ E2 STA05
Lab ID	44751-02	44747-19	44747-20	44747-21	44747-22	44747-23
Matrix	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PCB Congener						
8 - 2,4'-Dichlorobiphenyl	0.12	0.066	0.092	0.042	0.03	0.019
18 - 2,2',5-Trichlorobiphenyl	0.23	0.14	0.18	0.11	0.088	0.081
28 - 2,4,4'-Trichlorobiphenyl	0.58	0.59	0.7	0.27	0.22 J	0.15
44 - 2,2',3,5'-Tetrachlorobiphenyl	0.16	0.11	0.14	0.093	0.076 J	0.046
52 - 2,2',5,5'-Tetrachlorobiphenyl	0.48	0.36	0.4	0.25	0.21	0.13
66 - 2,3',4,4'-Tetrachlorobiphenyl	0.19	0.14	0.19	0.12	0.1 J	0.053
101 - 2,2',4,5,5'-Pentachlorobiphenyl	0.11 U	0.17	0.21 U	0.079	0.07 U	0.035 U
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.011	0.014	0.017	0.013	0.011	0.0051
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.16	0.19	0.25	0.15	0.13	0.062
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	0.009	0.02	0.008 U	0.01	0.0092	0.0034
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	0.064 J	0.079 J	0.084 J	0.057 J	0.044 J	0.019 J
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	0.13	0.1	0.12	0.076	0.064	0.033
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.0073 U	0.011	0.008 U	0.01	0.0085 J	0.0019
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.0073 U	0.0032 U	0.008 U	0.0021	0.0021 U	0.0021 U
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	0.0073 U	0.012	0.008 U	0.011	0.011	0.003
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.0073 U	0.0032 U	0.008 U	0.0014 U	0.0012 U	0.0016 U
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.0073 U	0.0032 U	0.008 U	0.0014 U	0.0012 U	0.0016 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.0073 U	0.0032 U	0.008 U	0.0014 U	0.0013 U	0.0016 U
NOAA Congener Total ppb	2.1	2.0	2.2	1.3	1.0	0.61

Qualifiers and Notes
U = congener is not detected above the MDL
J = congener concentration is estimated

All results are surrogate corrected using PCB 198

Figure K-22 - Particulate PCB Data (Continued)

Field ID	NBPDWQ F2 STA01	NBPDWQ F2 STA02	NBPDWQ F2 STA03	NBPDWQ F2 STA04	NBPDWQ F2 STA05	NBPDWQ1000N	NBPDWQ1000S
Lab ID	44747-13	44747-14	44747-15	44747-16	44747-17	44673-13	44673-16
Matrix	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE	PARTICULATE
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PCB Congener							
8 - 2,4'-Dichlorobiphenyl	0.031	0.083	0.12	0.042	0.019	0.036	0.0036
18 - 2,2',5-Trichlorobiphenyl	0.096	0.16	0.21	0.13	0.043	0.093	0.017
28 - 2,4,4'-Trichlorobiphenyl	0.23	0.43	0.83	0.29	0.1	0.19	0.038
44 - 2,2',3,5'-Tetrachlorobiphenyl	0.068	0.11	0.16	0.009	0.03	0.066	0.018
52 - 2,2',5,5'-Tetrachlorobiphenyl	0.17	0.32	0.44	0.22	0.073	0.18	0.045
66 - 2,3',4,4'-Tetrachlorobiphenyl	0.084	0.13	0.19	0.097	0.036	0.072	0.031
101 - 2,2',4,5,5'-Pentachlorobiphenyl	0.064 U	0.1	0.22	0.074 U	0.025 U	0.095	0.041
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.0089	0.013	0.015	0.011	0.0032	0.0084	0.0045
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.11	0.084	0.22	0.13	0.045	0.059	0.02
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	0.007	0.01	0.0093	0.009	0.002	0.0054	0.0019
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	0.036 J	0.05 J	0.1 J	0.042 J	0.014 J	0.029	0.01
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	0.054	0.089	0.12	0.066	0.023	0.049	0.016
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.0041	0.013	0.012	0.0061	0.0014 U	0.0029	0.0015 U
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.0021 U	0.0031 U	0.0085 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	0.007	0.011	0.0085 U	0.0089	0.0016	0.0064	0.0015 U
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.0014 U	0.0031 U	0.0085 U	0.0015 U	0.0014 U	0.0015 U	0.0015 U
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.0014 U	0.0031 U	0.0085 U	0.0015 U	0.0014 U	0.0015 U	0.0015 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.0014 U	0.0031 U	0.0085 U	0.0015 U	0.0014 U	0.0015 U	0.0015 U
NOAA Congener Total ppb	0.91	1.6	2.6	1.1	0.39	0.89	0.25

Qualifiers and Notes
U = congener is not detected above the MDL
J = congener concentration is estimated

All results are surrogate corrected using PCB 198

Figure K-23 - Dissolved PCB Data

Field ID	E1-STA01	E1-STA02	E1-STA03	E1-STA04	Equipment Blank	F1-STA01 Comp	F1-STA02 Comp	F1-STA03
Lab ID	44730-01	44730-02	44730-03	44730-04	44747-06	44730-05	44730-06	44730-09
Matrix	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PCB Congener								
8 - 2,4'-Dichlorobiphenyl	0.12	0.11	0.11	0.12	0.007	0.063	0.076	0.048
18 - 2,2',5-Trichlorobiphenyl	0.2	0.17	0.19	0.25	0.009	0.17	0.16	0.14
28 - 2,4,4'-Trichlorobiphenyl	0.23	0.2	0.22	0.25	0.016	0.17	0.16	0.15
44 - 2,2',3,5'-Tetrachlorobiphenyl	0.049	0.056	0.048	0.05	0.002	0.043	0.041	0.039
52 - 2,2',5,5'-Tetrachlorobiphenyl	0.12	0.13	0.12	0.16	0.007	0.11	0.097	0.094
66 - 2,3',4,4'-Tetrachlorobiphenyl	0.036	0.04	0.034	0.042	0.004	0.03	0.034	0.033
101 - 2,2',4,5,5'-Pentachlorobiphenyl	0.014 U	0.041	0.015 U	0.011 U	0.011 U	0.039	0.012 U	0.0056 U
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.0026	0.0029	0.004	0.0037	0.0016 U	0.0026	0.0022	0.0021
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.0058	0.013	0.012	0.012	0.0016 U	0.011	0.0076	0.01
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	0.0017 U	0.0012	0.0017 U	0.002 U	0.0016 U	0.002 U	0.0021 U	0.0018 U
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	0.0017 U	0.0088	0.0024	0.0029	0.0016 U	0.0054	0.0021 U	0.0021
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	0.0034	0.013	0.0073	0.0076	0.0016 U	0.011	0.0044	0.0049
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.0017 U	0.001 U	0.0017 U	0.002 U	0.0016 U	0.0018 U	0.0021 U	0.0018 U
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.0017 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	0.0017 U	0.0011	0.0017 U	0.002 U	0.0016 U	0.0018 U	0.0021 U	0.0018 U
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.0017 U	0.001 U	0.0017 U	0.002 U	0.0016 U	0.0018 U	0.0021 U	0.0018 U
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.0017 U	0.001 U	0.0017 U	0.002 U	0.0016 U	0.0018 U	0.0021 U	0.0018 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.0017 U	0.001 U	0.0017 U	0.002 U	0.0016 U	0.0018 U	0.0021 U	0.0018 U
NOAA Congener Total ppb	0.77	0.79	0.75	0.90	0.045	0.66	0.58	0.52

Qualifiers and Notes
U = congener is not detected above the MDL
J = congener concentration is estimated

All results are surrogate corrected using PCB 198

Figure K-23 - Dissolved PCB Data (Continued)

Field ID	F1-STA04	NBH0816-R1 PCB	NBH0817-1345 PCB	NBH0818-MOON	NBH0818-R1 PCB	NBH817-R1 PCB	NBHPDWQ-Slick-1
Lab ID	44730-10	44730-08	44747-25	44750-02	44750-04	44747-12	44751-01
Matrix	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PCB Congener							
8 - 2,4'-Dichlorobiphenyl	0.043	0.017	0.85	1.2	0.028	0.043	0.11
18 - 2,2',5-Trichlorobiphenyl	0.094	0.055	0.69	0.66	0.058	0.11	0.14
28 - 2,4,4'-Trichlorobiphenyl	0.12	0.07	0.74	1.2	0.076	0.15	0.17
44 - 2,2',3,5'-Tetrachlorobiphenyl	0.026	0.015	0.089	0.33 J	0.013	0.033	0.032
52 - 2,2',5,5'-Tetrachlorobiphenyl	0.068	0 041	0.29	0.76	0.038	0.09	0.091
66 - 2,3',4,4'-Tetrachlorobiphenyl	0.022 U	0.015 U	0.023	0.22 J	0.013 U	0.024	0.012 U
101 - 2,2',4,5,5'-Pentachlorobiphenyl	0.012 U	0.015 U	0.043	0.085	0.0017 U	0.024 U	0.01 U
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.0018	0.0017	0.011 U	0.02 U	0.0017 U	0.0021 U	0.0023 U
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.0066	0.0059	0.022	0.053	0.005	0.005	0.005
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	0.0017 U	0.0016 U	0.011 U	0.02 U	0.0017 U	0.0021 U	0.0023 U
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	0.0017 U	0.0016 U	0.011 U	0.03 J	0.0017 U	0.0021 U	0.0023 U
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	0.0024	0.0016 U	0.011 U	0.072 J	0.0017 U	0.0021 U	0.0023 U
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.0017 U	0.0016 U	0.011 U	0.02 U	0.0017 U	0.003	0.0023 U
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.0021 U	0.0021 U	0.011 U	0.02 U	0.0021 U	0.0021 U	0.0023 U
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	0.0017 U	0.0016 U	0.011 U	0.02 U	0.0017 U	0.0021 U	0.0023 U
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.0017 U	0.0016 U	0.011 U	0.02 U	0.0017 U	0.0021 U	0.0023 U
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.0017 U	0.0016 U	0.011 U	0.02 U	0.0017 U	0.0021 U	0.0023 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.0017 U	0.0016 U	0.011 U	0.02 U	0.0017 U	0.0021 U	0.0023 U
NOAA Congener Total ppb	0.36	0.21	2.7	4.6	0.22	0.46	0.55

Qualifiers and Notes
U = congener is not detected above the MDL
J = congener concentration is estimated

All results are surrogate corrected using PCB

Figure K-23 - Dissolved PCB Data (Continued)

Field ID	NBPD-EB-D1	NBPDWQ E2 STA01	NBPDWQ E2 STA02	NBPDWQ E2 STA03	NBPDWQ E2 STA04	NBPDWQ E2 STA05	NBPDWQ F2 STA01
Lab ID	44730-07	44747-07	44747-08	44747-09	44747-10	44747-11	44747-01
Matrix	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PCB Congener							
8 - 2,4'-Dichlorobiphenyl	0.0016 U	0.25	0.12	0.12	0.082	0.1	0.064
18 - 2,2',5-Trichlorobiphenyl	0.002	0.38	0.17	0.17	0.14	0.2	0.15
28 - 2,4,4'-Trichlorobiphenyl	0.0066	0.56	0.25	0.26	0.22	0.24	0.17
44 - 2,2',3,5'-Tetrachlorobiphenyl	0.0016 U	0.87	0.054	0.051	0.044 J	0.047	0.036
52 - 2,2',5,5'-Tetrachlorobiphenyl	0.0058	0.35	0.14	0.14	0.12	0.15	0.086
66 - 2,3',4,4'-Tetrachlorobiphenyl	0.0043	0.11	0.042	0.04	0.035	0.035	0.03
101 - 2,2',4,5,5'-Pentachlorobiphenyl	0.0058	0.066	0.029	0.023 U	0.012 U	0.012 U	0.015 U
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.0016 U	0.0041 U	0.002 U	0.0021 U	0.002 U	0.0019 U	0.0019 U
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.0016 U	0.053	0.018	0.005	0.011	0.006	0.007
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	0.0016 U	0.023	0.002 U	0.0021 U	0.002 U	0.0019 U	0.0019 U
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	0.0016 U	0.023	0.003	0.0021 U	0.002 U	0.0019 U	0.0024
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	0.0016 U	0.045	0.007	0.0021 U	0.002 U	0.0019 U	0.0049
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.0016 U	0.0041 U	0.002 U	0.004	0.017	0.0019 U	0.0019 U
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.0021 U	0.0041 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	0.0016 U	0.0041 U	0.002 U	0.0021 U	0.002 U	0.0019 U	0.0019 U
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.0016 U	0.0041 U	0.002 U	0.0021 U	0.002 U	0.0019 U	0.0019 U
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.0016 U	0.0041 U	0.002 U	0.0021 U	0.002 U	0.0019 U	0.0019 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.0016 U	0.0041 U	0.002 U	0.0021 U	0.002 U	0.0019 U	0.0019 U
NOAA Congener Total ppb	0.025	2.7	0.83	0.79	0.67	0.78	0.55

Qualifiers and Notes
U = congener is not detected above the MDL
J = congener concentration is estimated

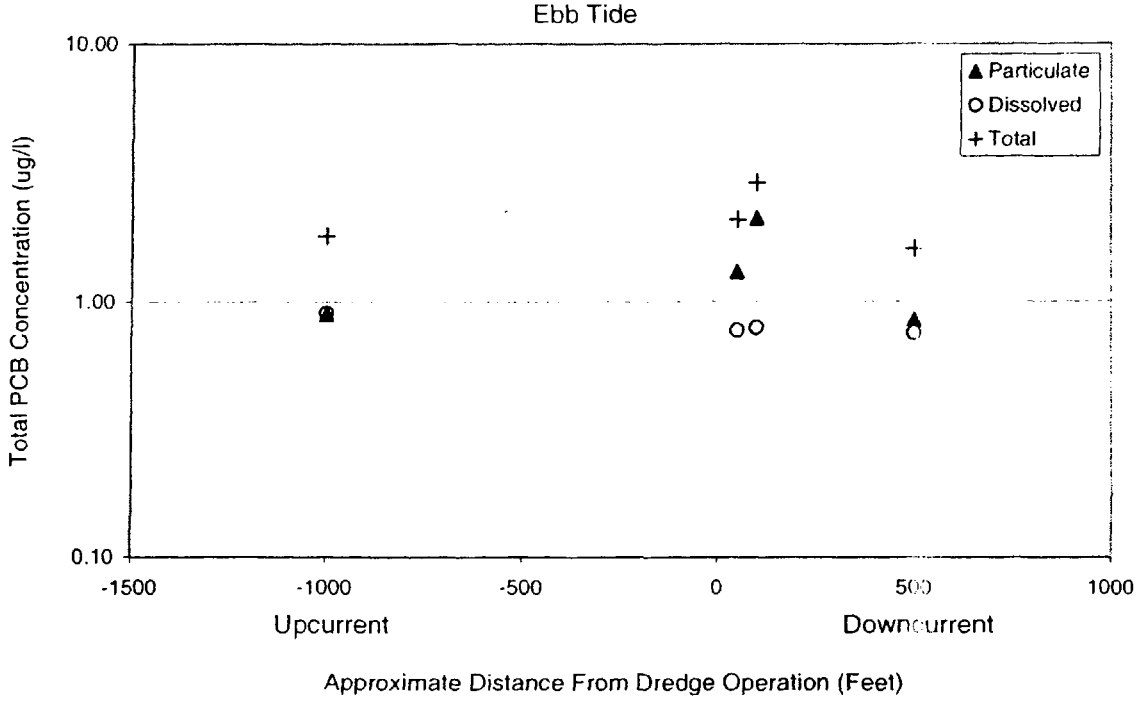
All results are surrogate corrected using PCB

Figure K-23 - Dissolved PCB Data (Continued)

Field ID	NBPDWQ F2 STA02	NBPDWQ F2 STA03	NBPDWQ F2 STA04	NBPDWQ F2 STA05	NBPDWQ1000N Diss.	NBPDWQ1000S	NBPDWQ-SLICK-2
Lab ID	44747-02	44747-03	44747-04	44747-05	44673-07	44673-10	44730-29
Matrix	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
PCB Congener							
8 - 2,4'-Dichlorobiphenyl	0.12	0.17	0.15	0.08	0.11	0.0027	0.13
18 - 2,2',5-Trichlorobiphenyl	0.2	0.22	0.23	0.14	0.12	0.045	0.25
28 - 2,4,4'-Trichlorobiphenyl	0.25	0.3	0.28	0.18	0.12	0.056	0.39
44 - 2,2',3,5'-Tetrachlorobiphenyl	0.05	0.061	0.055	0.034	0.031	0.012	0.094
52 - 2,2',5,5'-Tetrachlorobiphenyl	0.12	0.15	0.15	0.089	0.072	0.032	0.26
66 - 2,3',4,4'-Tetrachlorobiphenyl	0.025	0.028	0.043	0.026	0.024	0.013	0.098
101 - 2,2',4,5,5'-Pentachlorobiphenyl	0.026 U	0.01 U	0.012 U	0.022 U	0.026	0.017	0.11
105 - 2,3,3',4,4'-Pentachlorobiphenyl	0.0021 U	0.0021 U	0.0024 U	0.002 U	0.0023	0.0016 U	0.0064
118 - 2,3',4,4',5-Pentachlorobiphenyl	0.0095	0.015	0.008	0.006	0.0076	0.0023	0.089
128 - 2,2',3,3',4,4'-Hexachlorobiphenyl	0.0021 U	0.0021 U	0.0024 U	0.002 U	0.0019 U	0.0016 U	0.0035
138 - 2,2',3,4,4',5'-Hexachlorobiphenyl	0.0021 U	0.0021	0.0024 U	0.002 U	0.0023	0.0016 U	0.03
153 - 2,2',4,4',5,5'-Hexachlorobiphenyl	0.0021 U	0.003	0.0024 U	0.002 U	0.0052	0.0016 U	0.042
170 - 2,2',3,3',4,4',5-Heptachlorobiphenyl	0.0021 U	0.0021 U	0.0024 U	0.002 U	0.0019 U	0.0016 U	0.0027
180 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl	0.0021 U	0.0021 U	0.0024 U	0.0021 U	0.0021 U	0.0021 U	0.0021 U
187 - 2,2',3,4',5,5',6-Heptachlorobiphenyl	0.0021 U	0.0021 U	0.0024 U	0.002 U	0.0019 U	0.0016 U	0.0046
195 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl	0.0021 U	0.0021 U	0.0024 U	0.002 U	0.0019 U	0.0016 U	0.002 U
206 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	0.0021 U	0.0021 U	0.0024 U	0.002 U	0.0019 U	0.0016 U	0.002 U
209 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	0.0021 U	0.0021 U	0.0024 U	0.002 U	0.0019 U	0.0016 U	0.002 U
NOAA Congener Total ppb	0.77	0.95	0.92	0.56	0.52	0.18	1.5

Qualifiers and Notes
U = congener is not detected above the MDL
J = congener concentration is estimated

All results are surrogate corrected using PCB



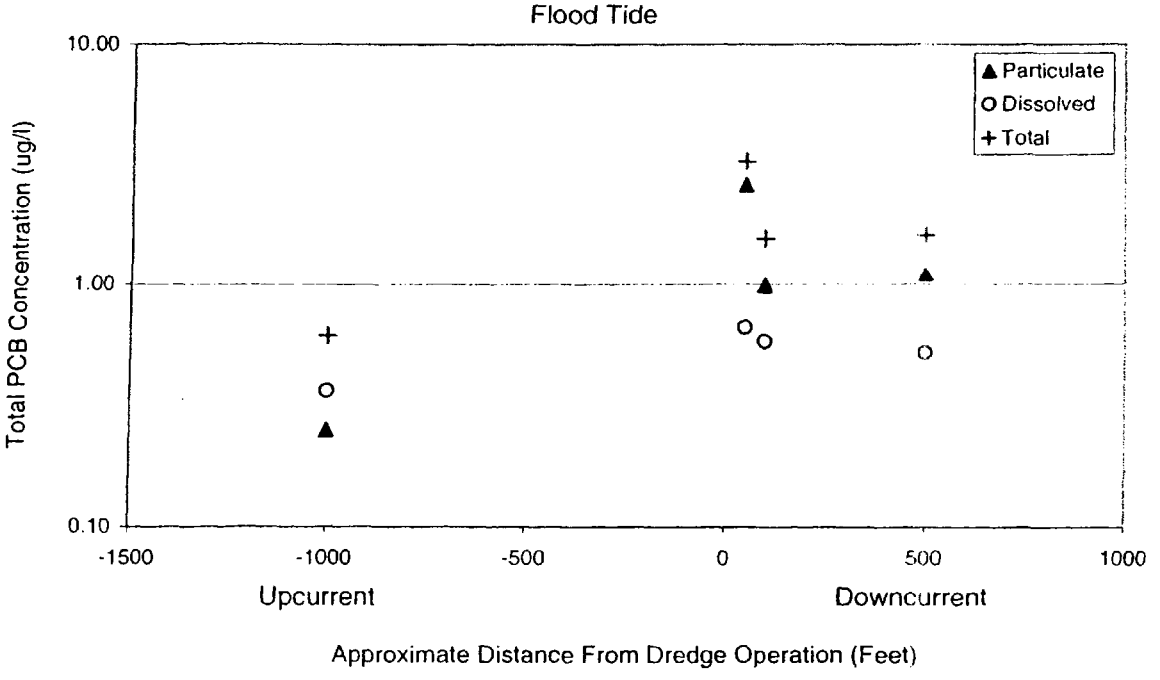
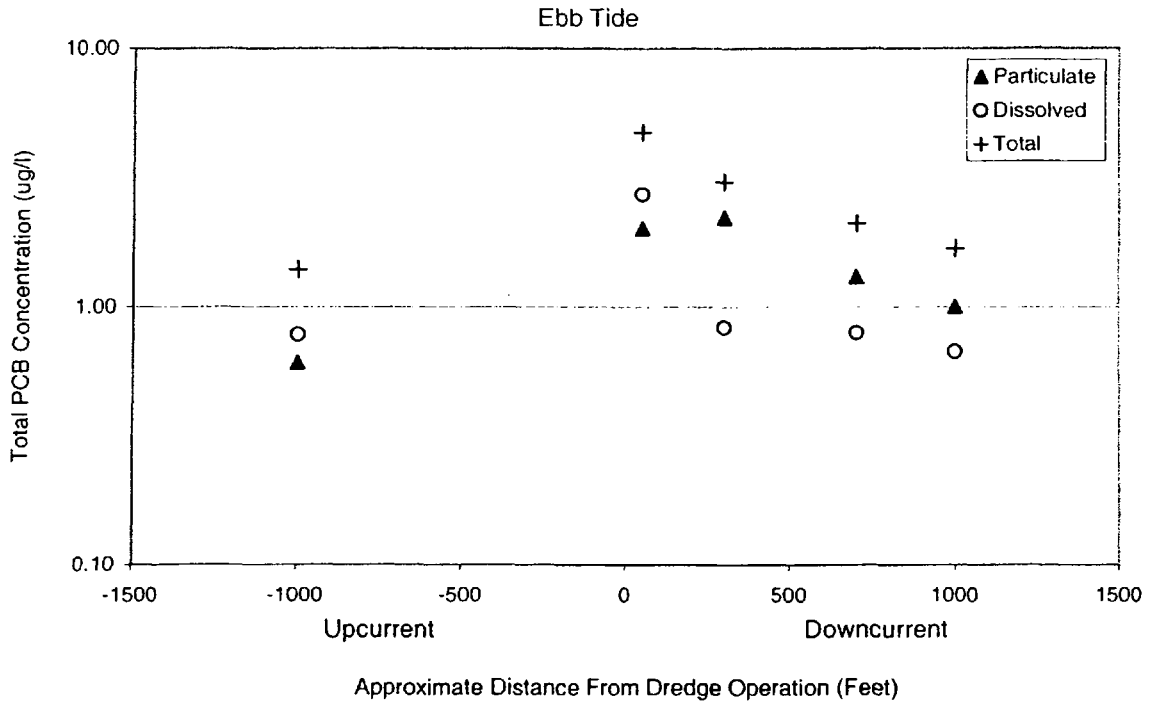


FIGURE K-24

Total PCB Concentrations (Sum of 18 Congeners) in Composite Samples for 16 August Monitoring Events



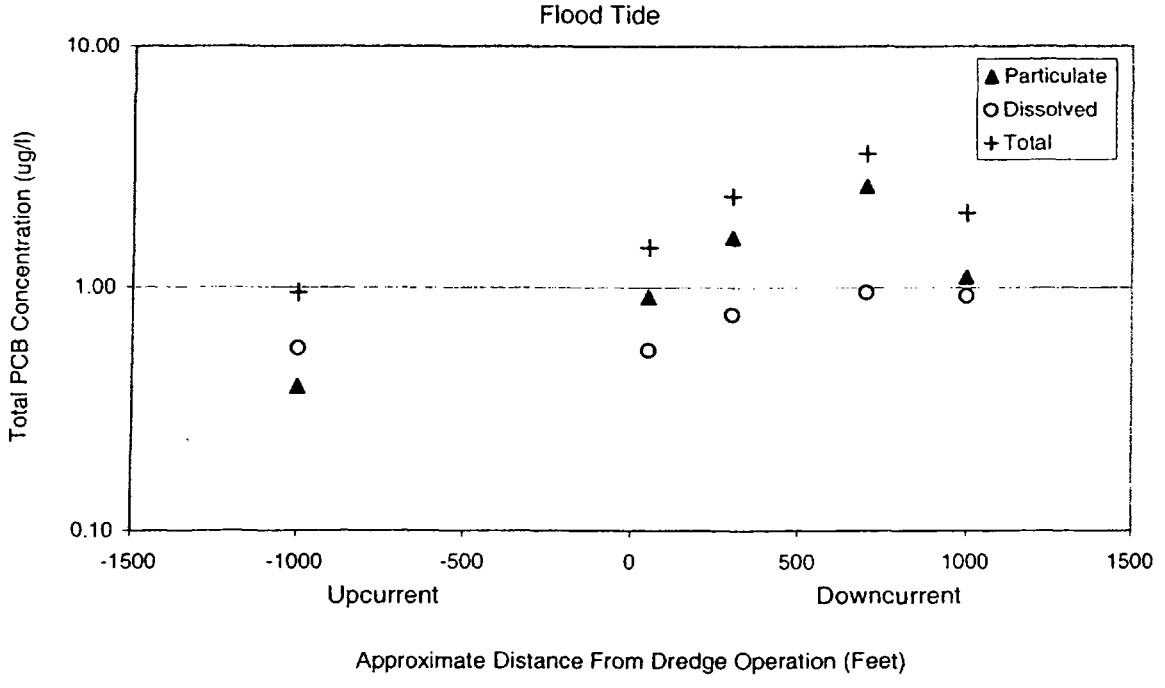
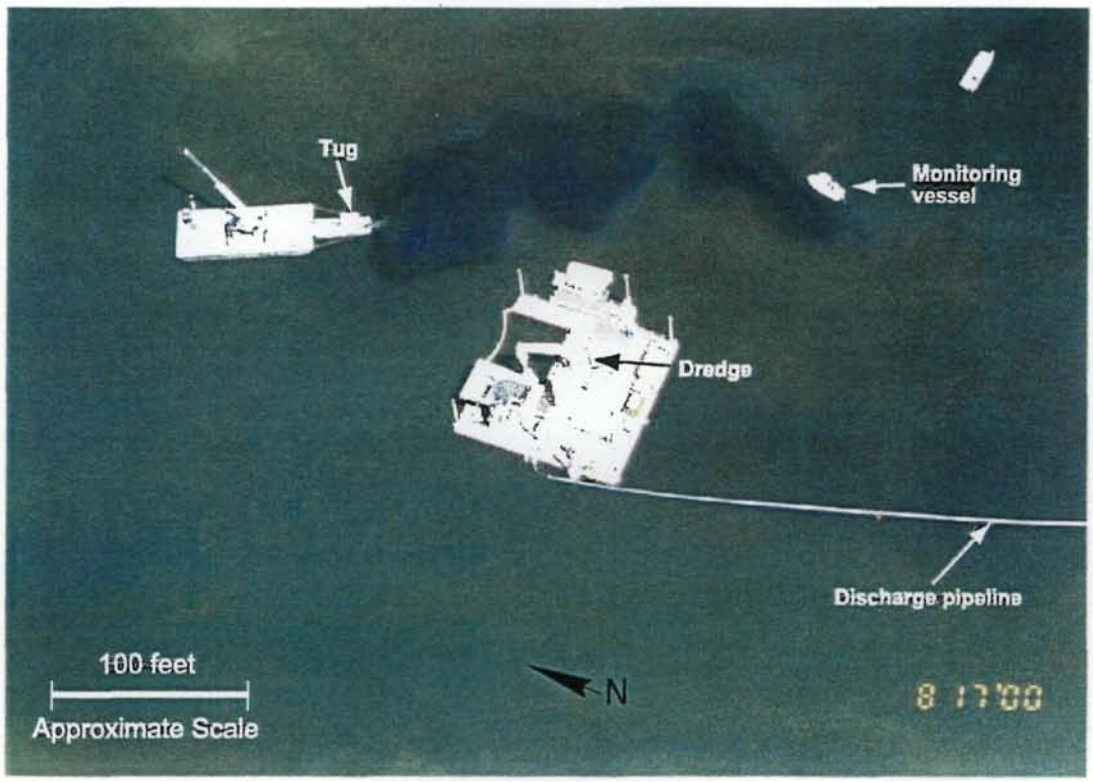
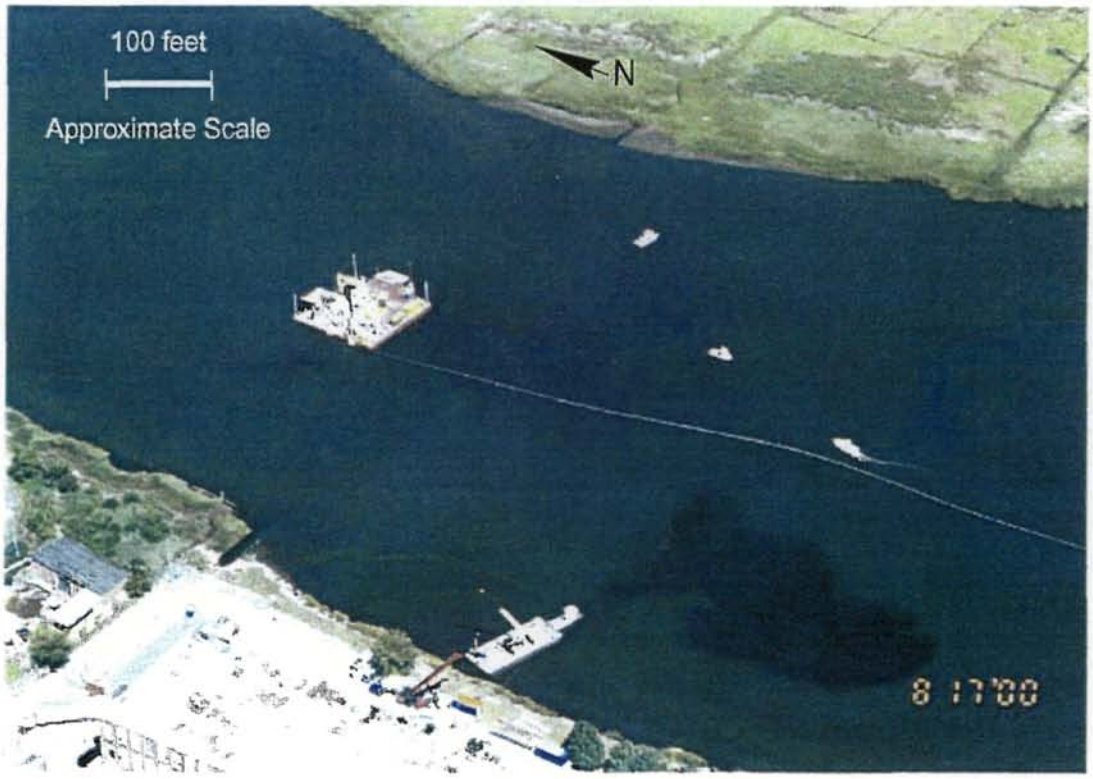


FIGURE K-25

Total PCB Concentrations (Sum of 18 Congeners) in Composite Samples for 17 August Monitoring Events





M010066

FIGURE K-26
Aerial View of Support Vessel and Dredging Operations

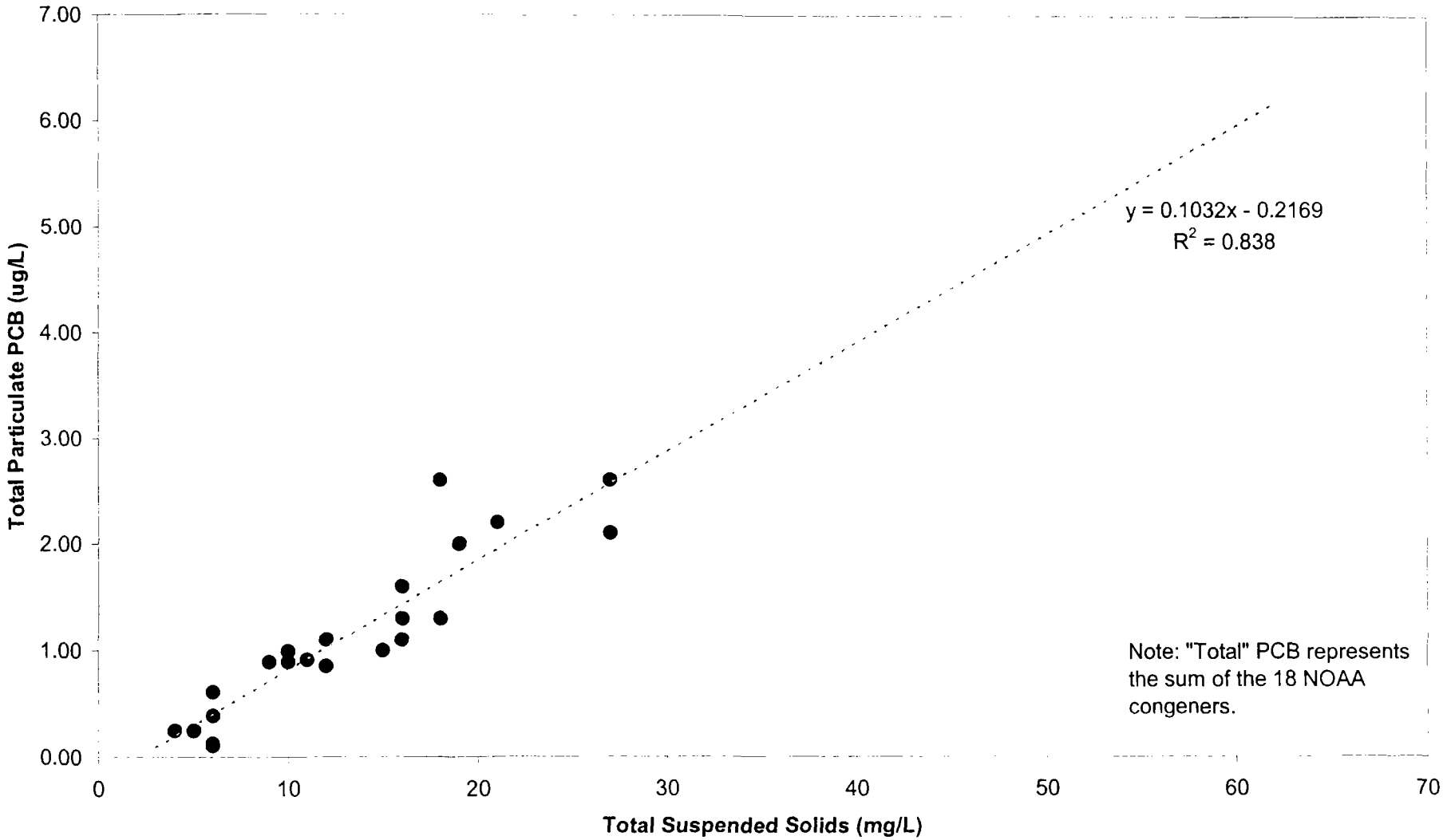


Figure K-27: Correlation between Total Suspended Solids and Total Particulate PCB

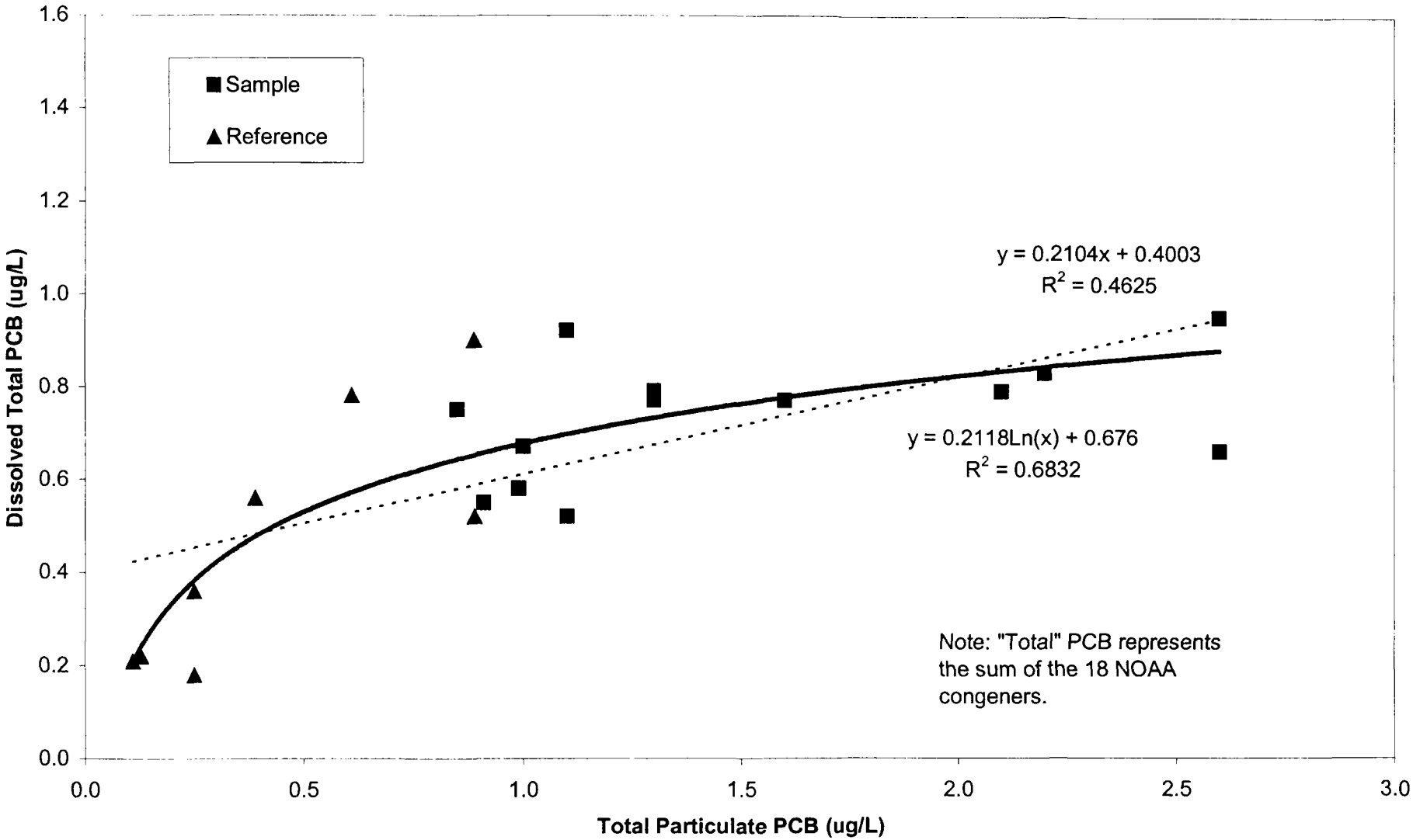


Figure K-28: Correlation between Total Particulate PCB and Total Dissolved PCB

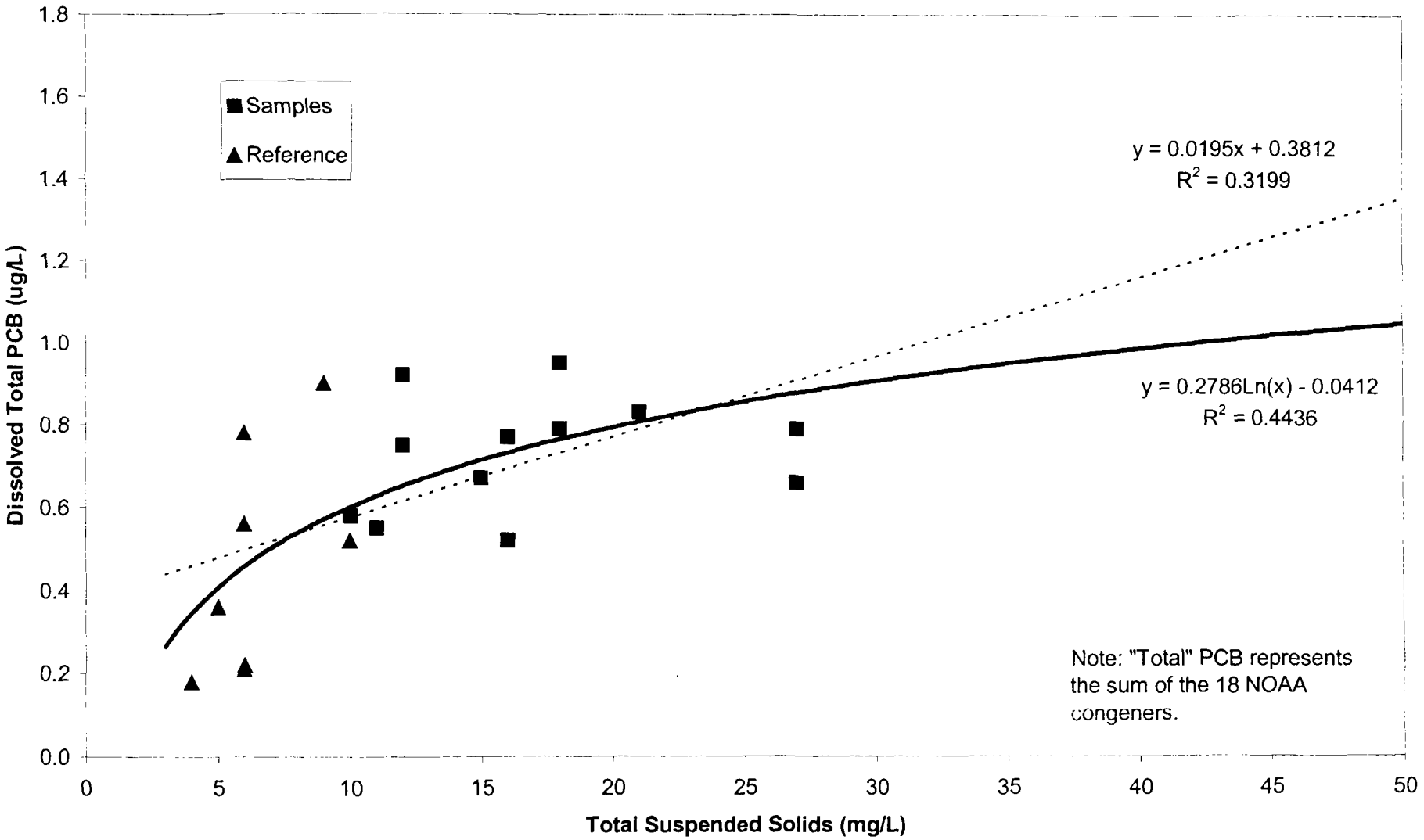


Figure K-29: Correlation between Total Suspended Solids and Total Dissolved PCB

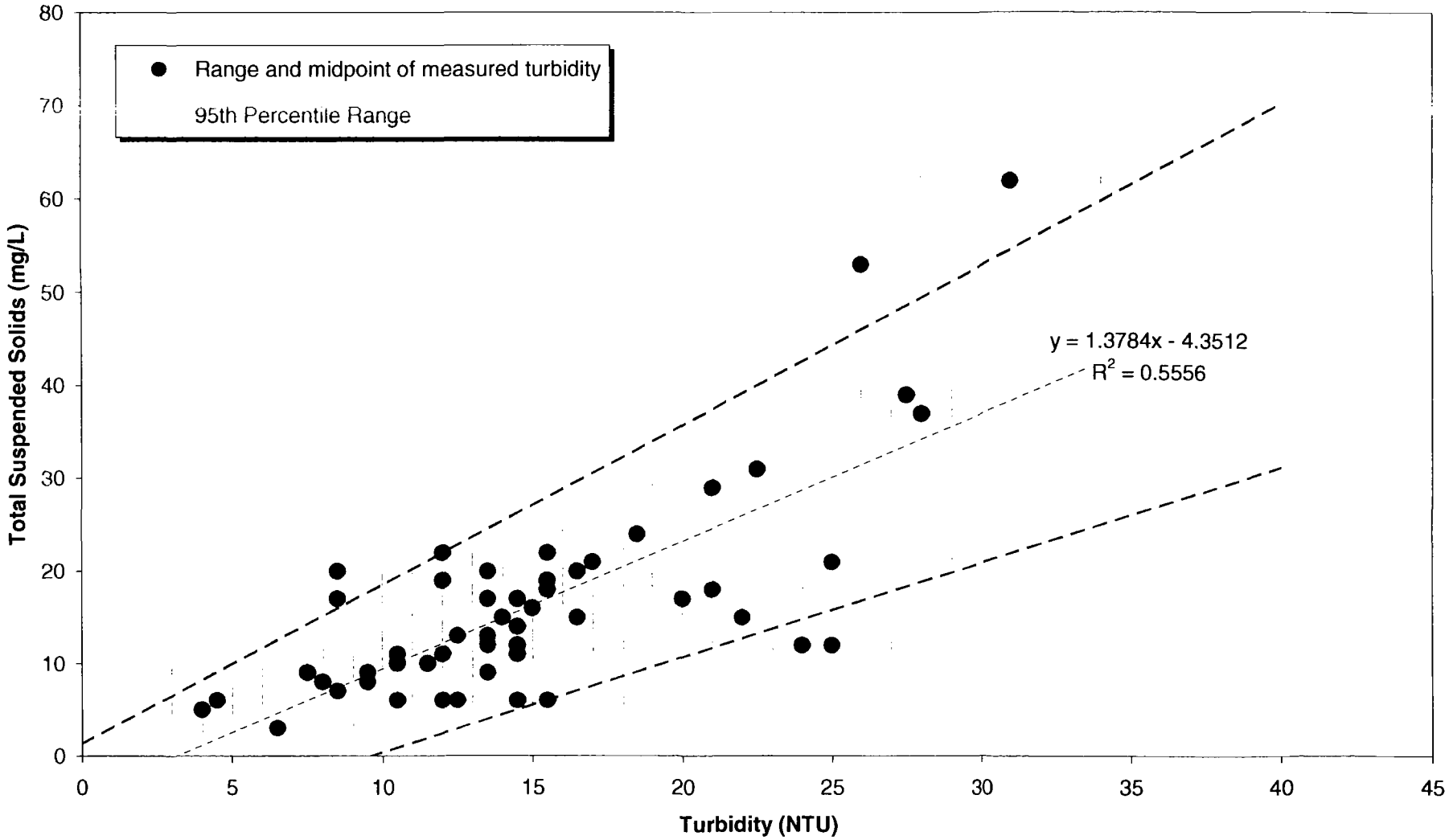


Figure K-30: Correlation between Turbidity (field) and Total Suspended Solids (Lab)

Appendix L
Flux Chamber and Ambient Air Sampling and Analysis

805407.01

Flux Chamber Sampling and Analysis
Pre-Design Field Test
New Bedford Harbor Superfund Site

Final Report

Subcontract No. 028252

Prepared for:

Foster Wheeler Environmental Corporation
133 Federal Street, 6th Floor
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Attention: Helen Douglas

Prepared by:

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15 June 2001

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ACRONYMS AND ABBREVIATIONS

Avg	Average
CB	Chlorinated biphenyl
CDF	Confined disposal facility
CoC	Chain-of-Custody
Conc	Concentration
% CV	Percent coefficient of variation
DL	Detection limit
deg	Degree
EPA	Environmental Protection Agency
ft	Feet
FWENC	Foster Wheeler Environmental Corporation
IUPAC	International Union of Pure and Applied Chemistry
LCS	Laboratory control sample
MS	Matrix spike
MSD	Matrix spike duplicate
NA or n/a	Not applicable
NC	Not calculated
ND	Not detected
ng	Nanogram (1 ng = 10^{-9} g)
NIST	National Institute for Standards and Testing
NOAA	National Oceanic and Atmospheric Administration
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated biphenyls
ppm	Parts-per-million
ppm-v	Parts-per-million on a volume basis
ppm-w	Parts-per-million on a weight basis
QA	Quality assurance
QAPP	Quality assurance project plan
QC	Quality control
RPD	Relative percent difference
T	Temperature
µg	Microgram (1 µg = 10^{-6} g)
VOC	Volatile organic compound
WHO	World Health Organization

METRIC CONVERSIONS

Non-Metric Unit	Multiplied by	Yields Metric Unit
Degree Fahrenheit (°F)	0.555556 (°F-32)	Degree Celsius (°C)
Inch (in.)	2.54	Centimeter (cm)
Foot (ft.)	0.3048	Meter (m)
Mile	1609.344	Meter (m)
Pound (lb.)	0.453592	Kilogram (kg)
Gallon (gal.)	3.78541	Liter (L)
Miles per hour (mph)	0.44704	Meters per second (m/sec)

1.0 Introduction

URS Corporation (URS), under contract to Foster Wheeler Environmental Corporation (FWEC), measured the emission flux of polychlorinated biphenyls (PCBs) associated with dredging operations. This report summarizes the results of the testing performed by URS.

1.1 Background

The New Bedford Harbor Superfund site is located in New Bedford, Massachusetts. The 18,000-acre site is an urban tidal estuary with sediments that are contaminated with PCBs. Local manufacturers of electric devices used PCBs from 1940 to the late 1970s, when the US EPA banned the use of PCBs. Industrial wastes containing PCBs were discharged directly into the harbor and indirectly, via the city's sewer system. As a result, the harbor is contaminated in varying degrees from the upper Acushnet River to Buzzards Bay. The highest levels of PCBs occur in the northern Acushnet River Estuary. Tidal action transports contamination from the upper harbor to the lower harbor, and ultimately into Buzzrds Bay.

A pre-design field test was performed during August 2000 to evaluate one dredging approach being considered for use during the future full-scale remediation. The dredge was floated on a barge. Sediments were dredged from several cuts (areas) in the harbor where the level of PCB contamination has previously been characterized. Sediments were removed from several cells within each cut. The dredging approach utilized equipment to accurately position the dredge at areas of suspected contamination to minimize the amount of sediment to be removed. The dredged material was placed into a hopper on the barge and ultimately pumped to a confined disposal facility (CDF) located on shore. The dredge bucket was self-sealing to minimize loss of water and sediment during transfer of the dredged material from the harbor to the hopper. Equipment on the barge was used to control the percent solids in the pumped material and thereby minimize the amount of wastewater to be treated.

1.2 Objective

URS used a flux chamber to collect samples of gas-phase PCBs, which were sent to an off-site laboratory for analysis. The flux chamber was placed over the emitting material and operated as specified in "Measurement of Gaseous Emission Rates from Land Surfaces Using an Emission Isolation Flux Chamber - User's Guide", EPA/600/8-86/008, February 1986. XAD resin was used to collect the PCBs.

The overall objective of the sampling effort was to characterize the emission flux of PCBs from each emission source associated with dredging operations. The emission flux was measured at and around the dredge barge, as well as at the CDF where dredged material was pumped for storage. The effect of additives (e.g., surfactants) was measured. Ultimately, the measured emission rates will be used as input to an atmospheric dispersion model to estimate impacts to local air quality.

2.0 Technical Approach

This section contains a description of the technical approach that was employed in the study. The test matrix is given below, followed by presentation of the sampling procedures, test description, analytical procedures, calibration procedures, and sample handling procedures.

2.1 Test Matrix

A total of 27 emission flux tests were performed, following the test matrix summarized in Table L-1. The tests fall into three general categories: 1) Tests to characterize the emissions from the dredge barge; 2) Tests to characterize the emissions from the confined disposal facility; and 3) Tests to characterize the effectiveness of various options for emission control at the CDF.

2.2 Sampling Procedures

2.2.1 Flux Chamber Sampling

The air emissions of PCB's from the various sources were measured using a flux chamber, a standard US EPA measurement method (Ref. 1). Flux chambers have been widely used to measure emission fluxes of volatile organic compounds (VOCs) and inorganic gaseous pollutants from a wide variety of sources. The method has been applied to measuring emission rates from quiescent surface impoundments (Refs. 2, 3).

The flux chamber is an enclosure, which is used to isolate and sample gaseous emissions from a defined surface area (0.13 m^2). Clean, dry sweep air is added to the chamber at a fixed, controlled rate (e.g., 0.005 m^3/min). The volumetric flow rate of sweep air through the chamber is recorded and the concentration of the species of interest is measured at the exit of the chamber.

Emission flux measurements provide an estimate of the amount of a single species or multiple species being emitted from a given surface area per unit time. These data can then be used to develop emission rates for a given source for purposes of predictive modeling for population exposure assessments.

The flux chamber is effectively isolated from most external environmental conditions such as wind speed. Therefore, the measurement data are not strongly dependent on the meteorological conditions present at the site on the days of sampling. The data are thus directly comparable from day to day and site to site.

Table L-1. Test Matrix

Test Series	Location	Description of Test	No. of Tests	Notes
A	CDF	Fresh slurry transferred into container	3	
B	CDF	Water surface of CDF	3	Test series A material + water layer
C	CDF	Sheen on surface of CDF	3	
D	CDF	Water surface near sheen	2	
E	CDF	Sheen + surfactant	3	Test series C location + surfactant. Three separate surfactants were tested
F	Dredge Barge	Moon pool	4	
G	Dredge Barge	Outside silt fence	3	Measurements made in area immediately after dredge moved out of area
H	Dredge Barge	Hopper / grizzly screen	3	Headspace sample
I	Harbor	Mud flat in harbor	3	Measurements to be made at areas with relatively high levels of PCB contamination
	N/A	Reagent Blanks	2	One blank included per shipment of samples to off-site laboratory

Data Comparisons:

A vs. B = Control effectiveness of water cover
C vs. E = Control effectiveness of surfactant
C vs. D = Evaluate model assumption that floating oil layer reduces emissions
C vs. F = "Reality check" of measured emission levels
A vs. I = "Reality check" of measured emission levels
F + G + H = Total emissions from dredging barge

There is a practical limit to the size of the flux chamber. Therefore, it is necessary to make a series of flux measurements to assess the spatial variability in emissions for a given source. These data allow estimation of an emission rate with a known confidence limit; i.e., a set of emission flux (mass/time-area) measurements are necessary to estimate an emission rate (mass/time) for an entire source. Repeated measurements at a given location can be performed to assess temporal variability.

The testing procedures used during this study were based on the EPA User's Guide for flux chamber monitoring prepared by URS (Radian) for the U.S. EPA in the 1980's. A boat was used to access the sampling points, both at the dredge barge and at the CDF. The flux chamber was outfitted with a flotation system (i.e., inner tube from an automobile tire) and operated adjacent to the boat. Two flux chambers were operated simultaneously for some sources. The generic sampling procedure was as follows:

- Move equipment to the location to be sampled;
- Begin sweep air flow;
- Record time, meteorological conditions, and temperatures;
- Place clean enclosure on emitting surface;
- Monitor flowrates and note when steady-state concentrations are reached;
- Record air temperature inside the chamber;
- Collect samples;
- Remove enclosure; and
- Decontaminate enclosure prior to next use.

The flux chamber was operated at a sweep airflow rate of 5 liters per minute (0.005 m^3/min). It typically takes three to four residence times before steady-state concentrations are reached inside the chamber and sampling can be initiated. The residence time,τ, is defined as the chamber volume divided by the sweep air flow rate. For this study, the volume of the flux chambers was 30 liters, so steady state conditions were reached after 24 minutes [(30/5) x 4 = 24]. Sample collection began 24 minutes after the start of each run and samples were collected over a period of 60 to 120 minutes.

2.2.2 Air Samples

Once steady state concentrations were achieved inside the flux chamber atmosphere, the PCB samples were collected. The samples were collected through one of two sample ports at the top of the flux chamber. Each sample port consisted of a perforated sampling tube extending about six inches into the flux chamber headspace to ensure a representative sample.

PCB samples were collected using about 40g of XAD resin contained within a standard glass trap used in stack sampling by modified method 5 (MM5). The inlet to the glass trap was connected to the flux chamber sample port using teflon tubing. A sampling pump was used to collect the PCB samples at a flowrate of approximately 2.5 L/min. The flowrate was determined using a rotometer attached to the outlet of the PCB sampling apparatus. The samples typically ran for 60 minutes, yielding a total sample volume of 150 L. At the conclusion of the sampling, the glass trap was removed from the apparatus, wrapped in aluminum foil, and placed into a transport container. The transport container was labeled with all necessary sampling information.

2.2.3 Source Samples

Samples of the water, slurry, or other contaminated material under the flux chamber were collected as part of each emission flux test. Grab samples were collected from the surface immediately under the flux chamber, if this area could be accessed, or immediately adjacent to the flux chamber, if the area under the chamber could not be accessed. The samples were collected in 125-mL glass containers with minimal headspace present and stored on-site at 4°C. FWEC was responsible for the analysis of these samples. Results of these analyses are given in Attachment F.

2.3 Description of Tests

Each of the series of tests presented in Table L-1 is described in the following subsections. Additional information may be found in the field data sheets (see Attachment B).

2.3.1 Test Series A - Fresh Slurry

The dredged sediments were placed into a hopper on the barge, mixed with recirculating water, and pumped about 1 kilometer to the CDF through a flexible pipe. While dredging was underway, slurry was continuously discharged into the CDF from the end of the pipe, suspended about two meters above the water surface.

Surface emission isolation flux chamber tests were performed on three samples of fresh slurry to determine the steady-state air emissions from exposed slurry and sediment within the CDF. Samples of fresh slurry were collected from the discharge end of the pipe using a 5-gallon plastic bucket fixed to the end of a pole. The samples were transferred to a galvanized metal wash basin that was approximately 0.5m (20 in) in diameter at its base and 0.6m (24 in) at its mouth. The depth of slurry in the basins was about 7.5 cm (3 in), yielding a total volume of about 15 L (4 gal) of material. The percent solids content of the three batches of slurry appeared to vary, with the 2nd test (A2) having the highest solids content and the 3rd test (A3) having the lowest solids content.

The flux chamber was placed within the wash basin with the bottom edge of the chamber beneath the liquid surface to seal the chamber. The tests were performed as described in section 2.2.

2.3.2 Test Series B - Water Cover Over Fresh Slurry

This test series was performed to evaluate the effectiveness of a water cover at the CDF for reducing air emissions from the quiescent waste material. Immediately after the completion of test series A (see 2.3.1), the flux chambers were removed from the basins and 7.5 L (2 gal) of water from the harbor was slowly added to the slurry surface. The added water diluted the slurry and increased the depth of liquid in the basins by about 5 cm (2 in). The flux chamber was placed within the wash basin with the bottom edge of the chamber beneath the liquid surface to seal the chamber. The tests were performed as described in section 2.2.

2.3.3 Test Series C - Sheen on Water Surface

The emissions modeling performed by FWENC prior to the measurement program indicated that emissions from the CDF should be reduced by the oil sheen that forms on the water surface. The sheen serves as a floating cover or barrier to volatilization of the PCBs present in the underlying water. Surface emission isolation flux chamber tests were performed on three areas of floating sheet to determine the steady-state air emissions from areas covered by sheen within the CDF. During the initial days of dredging, a floating boom was used to contain the sheen around the area where slurry was discharged entered the CDF. The first two tests in the series (C1 and C2) were performed simultaneously at adjacent locations within the boom about 10m from the discharge end of the pipe. Continued discharge of fresh slurry may have contributed to mixing of the material under the flux chamber during these two tests.

The third test in the series (C3) was performed the following day, by which time large volumes of slurry had been pumped to the CDF and a "sand bar" of sediment had formed. Test C3 was performed over a light sheen outside the boom in an area containing large amounts of sediment and not affected by the further discharge of fresh slurry. All three tests were performed from a small boat in the CDF. The flux chambers were floated next to the boat and the tests were performed as described in section 2.2.

2.3.4 Test Series D - Water Surface Near Sheen

This series of tests was performed to determine if the emissions modeling was correct in predicting that the air emissions from water surfaces near a floating oil sheen are higher than air emissions from the oil sheen itself. Tests D1 and D2 were performed consecutively at locations along the east wall of the CDF. Test D1 was performed about 4.5m (15 ft) away from the location of tests C3 and E3, near the area of light sheen. For Test D2, the flux chamber was moved another 3m (10 ft) away from the area of light sheen. Flux chamber testing and measurements were conducted as described in Section 2.2.

2.3.5 Test Series E - Sheen + Surfactant

This test series was conducted in conjunction with test series C. Immediately after the conclusion of tests C1, C2, and C3, a surfactant was introduced and the emission flux test repeated. Five to six squirts of surfactant from a hand-pump sprayer were introduced directly into the flux chamber through the pressure relief hole on the top of the chamber. The tests were as follows:

- Test D1 = Dawn surfactant added to Test C1;
- Test D2 = Biosolve surfactant added to Test C2; and
- Test D3 = Simple Green surfactant added to Test C3.

Flux chamber testing and measurements were conducted as described in Section 2.2.

2.3.6 Test Series F - Moon Pool at Dredge Barge

Dredging was conducted in a rectangular area called the moon pool, which was bounded on three sides by the barge and on the fourth side by a sediment fence. Surface emission isolation flux chamber tests were performed at four locations to determine the steady-state air emissions from water and sediment stirred-up by the dredging action.

The first two tests (F1 and F2) were performed immediately after dredging concluded for the day on August 11 to avoid interfering with the movement of the dredge bucket. The two tests were performed simultaneously from the edge of the barge. Tests F3 and F4 were performed on August 14 while dredging was underway at the top of Cut 8. The two flux chambers were positioned adjacent to one another just within the sediment fence and outside the reach of the dredge bucket. In all cases, flux chamber testing and measurements were conducted as described in Section 2.2.

2.3.7 Test Series G - Outside the Silt Fence at Dredge Barge

This test series was performed to qualitatively evaluate the air emissions from the sediment plume outside the silt fence. Surface emission isolation flux chamber tests were performed at three locations to determine the steady-state air emissions from water and sediment stirred-up by the dredging action. The sediment plume and any associated emissions can also be estimated from water quality measurements performed by other contractors at the site, and these water quality measurements should provide much better plume definition than the limited number of air emission tests.

The first test in the series, F1, was conducted on August 11 at a location just outside the silt fence while dredging was underway. Moon pool test G2 was performed at a nearby location immediately after the conclusion of test F1. Tests G2 and G3 were performed simultaneously at adjacent locations about 12m (40 ft) outside the site fence while dredging was underway. Test G3 was performed at a slightly farther distance from the dredging than Test G2. In all cases, flux chamber testing and measurements were conducted as described in Section 2.2.

2.3.8 Test Series H - Hopper / Grizzly Screen

The dredged material was placed into a large hopper, where a grate (i.e., the grizzly) was used to remove large objects. The material that passed the grizzly was mixed with water and pumped to the CDF. The hopper was not suited for flux chamber testing, so an alternative approach was employed. A sampling line was extended down into the hopper to a level 10 to 15 cm (4 to 6 in) below the grizzly and a "headspace" sample within the hopper was collected while dredging was underway and the hopper was being used. Three "headspace" samples were collected.

2.3.9 Test Series I - Mud Flat in Harbor

The mud flats along the Acushnet River at the extreme north end of the harbor include areas that are heavily contaminated with PCBs. Surface emission isolation flux chamber tests were performed at three locations to determine the steady-state air emissions from contaminated soils. The samples were collected for comparison to the fresh slurry tested in test series A.

The three sampling locations were selected from a map provided by FWENC showing the results of shallow soil borings collected during a previous sampling effort this year. The tests were as follows:

- Test I1 = Soil boring SB-657, which contains 15,500 ppmw (dry) total aroclors at the 0-1 ft depth;
- Test I2 = Soil boring SB-602, which contains 9,500 ppmw (dry) total aroclors at the 0-1 ft depth; and
- Test I3 = Soil boring SB-650, which contains 16,600 ppmw (dry) total aroclors at the 1-2 ft depth.

The sampling locations are shown in Figure L-1. The sampling locations are close together and the survey markers were no longer present at some locations, so it was difficult to tell if locations I2 and I3 were at the soil borings identified above. Test I3 was performed about 2.5m (8 ft) from the water's edge and test I2 was performed another 2.5m (8 ft) further inland.

All three tests were performed in areas that were wet and muddy, with lots of organic matter in the soil. Some vegetation was removed to allow the flux chamber to be placed onto the location and worked into the ground to effect a good seal. The flux chamber testing and measurements were conducted as described in Section 2.2.

2.4 Analytical Procedures

All air samples were shipped to Alta Analytical Laboratory (Alta) in El Dorado Hills, CA for analysis. Alta maintains USACE validation. The PCB analysis was performed using high resolution gas chromatography with high resolution gas spectromery (HRGCMS)(mass resolution $\geq$10,000) operating in selected ion (SIM) mode for total PCB homologue groups and 30 individual PCB congeners. The samples were extracted within 10 days of the date sampled and the extracts were analyzed within 40 days of extraction.

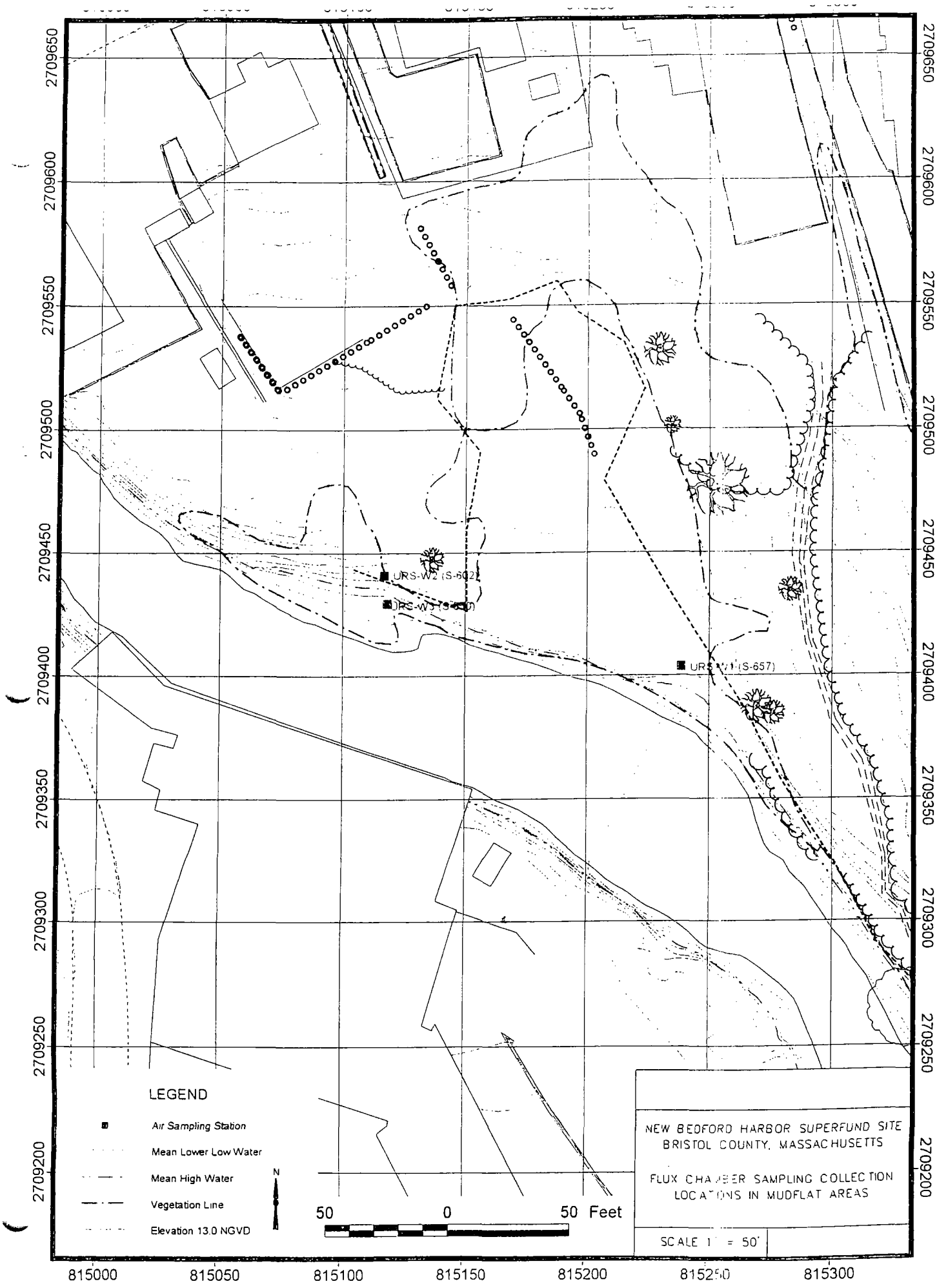
All liquid and solid samples were turned over to FWENC for compositing and off-site analysis for PCBs. The results of these analyses are shown in Attachment F.

2.5 Calibration Procedures

Rotometers were used to maintained sample and sweep air flow. The calibrations of the rotometers were completed at the URS Austin laboratory, prior to shipment to the field. Using these calibration data, URS calculated sample flows. The results of the various calibrations that were performed are summarized in Section 5 along with other quality control results.

2.6 Sample Handling and Chain of Custody Procedures

Upon completion of the collection of each field sample, the sample was labeled with the project sample number (e.g., URS A1). The project sample number, along with the date, time, location, and test number were recorded in the master data logbook. The samples were decontaminated, if needed, and taken out of the exclusion zone. The samples were then packed for shipment and chain-of-custody forms were filled out to accompany the samples.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815250
815300
URS-W2 (S-602)
URS-W1 (S-657)
LEGEND
Air Sampling Station
Mean Lower Low Water
Mean High Water
Vegetation Line
Elevation 13.0 NGVD
N
50
0
50 Feet
NEW BEDFORD HARBOR SUPERFUND SITE
BRISTOL COUNTY, MASSACHUSETTS
FLUX CHAMBER SAMPLING COLLECTION
LOCATIONS IN MUDFLAT AREAS
SCALE 1" = 50'

Figure L-1

3.0 Results

This section presents the summarized results of the field measurements, with the exception of the results of QC checks, which are presented in Section 5.

3.1 Summary of Tests

The key information for the 27 flux chamber tests is summarized in Table L-2. The master logbook and the individual field data sheets may be found in Attachments A and B, respectively.

3.2 Measured Mass of PCBs

The exhaust gas from the flux chamber was passed through XAD resin for subsequent off-site analysis of PCBs. These data are presented in Table L-3 along with the total volume of air drawn through the sorbent. The average concentration (ng/m^3) of PCBs within the flux chamber can be calculated by dividing the mass of PCBs in ng by the sample size in m^3. The laboratory analytical summary is Attachment C to this report.

3.3 Calculated Emission Fluxes

Emission fluxes for each of the flux chamber tests are given in Table L-4. The emission fluxes for each test were calculated as follows:

$$E = \frac{(C)(Q)}{A}$$

where:
- E = emission flux (μg/m^2 - min);
- C = concentration (μg/m^3);
- Q = sweep air flow rate (m^3/min); and
- A = surface area (m^2).

For all of the flux chamber tests, the sweep air flow rate was 5 L/min (0.005 m^3/min) and the surface area of source material that was monitored was 0.13 m^2. Therefore, the above equation reduces to: E = (0.038)(C).

Note that the samples collected from the hopper are reported in Table L-4 as a concentration (ng/m^3), rather than as an emission flux. As discussed in Section 2, these samples are a headspace concentration of the air within the hopper.

Table L-2. Summary of Flux Chamber Tests

Test ID[a]	Sample No.	Date	Test Type	Location	Duration of Sample Collection (min)	Comments
A1	URS A16	15-Aug	Fresh Slurry	CDF	66	Slurry appears to be about 5% solids.
A2	URS A17	15-Aug	Fresh Slurry	CDF	65	Highest solids loading of the three slurry samples.
A3	URS A18	15-Aug	Fresh Slurry	CDF	64	Lowest solids loading of the three slurry samples.
B1	URS A19	15-Aug	Slurry + water	CDF	60	Two in. layer of harbor water added to A1.
B2	URS A20	15-Aug	Slurry + water	CDF	60	Two in. layer of harbor water added to A2.
B3	URS A21	15-Aug	Slurry + water	CDF	60	Two in. layer of harbor water added to A3.
C1	URS A10	14-Aug	Sheen	CDF	60	Sample collected within boom 50 ft. from discharge end of pipe
C2	URS A11	14-Aug	Sheen	CDF	60	Sample collected within boom 50 ft. from discharge end of pipe
C3	URS A23	15-Aug	Sheen	CDF	62	Sample collected in area of sediment "sand bar"
D1	URS A22	15-Aug	Water near sheen	CDF	63	Sample collected 15 ft. from location C3.
D2	URS A25	15-Aug	Water near sheen	CDF	60	Sample collected 25 ft. from location C3.
E1	URS A12	14-Aug	Sheen + surfactant	CDF	60	Same location as C1. Surfactant = dawn.
E2	URS A13	14-Aug	Sheen + surfactant	CDF	60	Same location as C2. Surfactant = biosolve.
E3	URS A24	15-Aug	Sheen + surfactant	CDF	60	Same location as C3. Surfactant = simple green
F1	URS A8	11-Aug	Moon pool	Barge	60	Sample collected on starboard side, 10 ft. from aft, starboard corner of moon pool
F2	URS A9	11-Aug	Moon pool	Barge	60	Sample collected on starboard side, 25 ft. from aft, starboard corner of moon pool
F3	URS A14	14-Aug	Moon pool	Barge	60	Sample collected on starboard side at fore, starboard corner of moon pool.
F4	URS A15	14-Aug	Moon pool	Barge	60	Sample collected on starboard side at fore, starboard corner of moon pool, just beyond location F3.
G1	URS A7	11-Aug	Outside Silt Fence	Barge	60	Sample collected just outside silt fence on starboard side of moon pool
G2	URS A26	16-Aug	Outside Silt Fence	Barge	60	Sample collected about 40 ft. from silt fence.
G3	URS A27	16-Aug	Outside Silt Fence	Barge	60	Sample collected about 47 ft. from silt fence.
H1	URS A4	10-Aug	Hopper / Grizzly	Barge	53	Start/Stop over 120 minute period. Dredging cycle = 1 bucket every 4-5 min
H2	H2	11-Aug	Hopper / Grizzly	Barge	46	Start/Stop over 125 minute period

Table L-2. Summary of Flux Chamber Tests (Continued)

Test ID[a]	Sample No.	Date	Test Type	Location	Duration of Sample Collection (min)	Comments
H3	URS A6	11-Aug	Hopper / Grizzly	Barge	43	Continuous sample
I1	URS A1	8-Aug	Mud flat	Along river	128	Location SB-657
I2	URS A2	8-Aug	Mud flat	Along river	120	Location SB-602
I3	URS A3	8-Aug	Mud flat	Along river	120	Location SB-650

[a]A = Fresh slurry
B = Water cover over fresh slurry
C = Sheen on water surface
D = Water surface near sheen
E = Sheen plus surfactant
F = Moon pool at dredge barge
G = Outside the silt fence at dredge barge
H = Hopper/grizzly screen
I = Mud flat in harbor

Table L-3. Measured Values from Flux Chamber Tests

Congener	Mass of Analyte (ng)								
	Test A1 Fresh Slurry	Test A2 Fresh Slurry	Test A3 Fresh Slurry	Test B1 Water + Slurry	Test B2 Water + Slurry	Test B3 Water + Slurry	Test C1 Sheen	Test C2 Sheen	Test C3 Sheen
Sample size (m^3)	0.162	0.201	0.177	0.148	0.187	0.169	0.199	0.142	0.154
PCB-8	450	1,800	2,400	230	1,600	1,700	2,800	1,800	710
PCB-18	470	1,600	2,900	240	1,900	2,200	2,000	1,100	840
PCB-28	130	380	610	110	690	880	360	160	100
PCB-44	88	190	260	88	250	430	150	75	93
PCB-52	160	370	520	140	450	740	290	120	170
PCB-66	3.9	9.4	--	7.2	15	21	6.8	3.7	1.6
PCB-77, PCB-81	--	--	--	--	--	--	--	--	--
PCB-90/101	9.4	21	22	14	32	47	8.5	--	4.2
PCB-118, PCB-123	--	--	--	--	1.2	1.7	--	--	--
PCB-105, PCB-114, PCB-126	--	--	--	--	--	--	--	--	--
PCB-151	--	1.0	1.2	--	2.6	3.2	--	--	--
PCB-128	--	--	--	--	--	--	--	--	--
PCB-138	--	--	--	--	--	--	--	--	--
PCB-153	--	--	--	--	--	1.3	--	--	--
PCB-167, -156, -157, -169, -170, -180, -187, -189, -195, -206, -209	--	--	--	--	--	--	--	--	--
Total mono-CB	37	250	200	12	120	91	620	460	49
Total di-CB	1,400	5,900	7,400	700	5,000	5,300	9,700	6,400	2,200
Total tri-CB	1,600	4,900	8,900	1,100	6,800	8,400	5,500	2,900	2,300
Total tetra-CB	700	1,600	2,200	660	2,000	3,300	1,300	580	680
Total penta-CB	66	120	160	79	280	470	59	28	74
Total hexa-CB	3.7	7.7	9.2	6.4	12	5.5	2.7	1.5	1.1
Total hepta-CB	--	--	--	--	--	--	--	--	--
Total Octa CB	--	--	--	--	--	--	--	--	--
Total Non-CB	--	--	--	--	--	--	--	--	--
Total PCBs	3,810	12,800	18,900	2,560	14,200	17,600	17,200	10,400	5,300

"--" = Not detected

Table L-3. Continued

Table L-3. Measured Values from Flux Chamber Tests (Continued)

Congener	Mass of Analyte (ng)								
	Test D1 Water Near Sheen	Test D2 Water Near Sheen	Test E1 Sheen + Surfactant	Test E2 Sheen + Surfactant	Test E3 Sheen + Surfactant	Test F1 Moon Pool	Test F2 Moon Pool	Test F3 Moon Pool	Test F4 Moon Pool
Sample size (m^3)	0.187	0.178	0.195	0.142	0.149	0.148	0.157	0.195	0.142
PCB-8	680	650	3,900	2,000	280	31	120	440	360
PCB-18	810	1,100	2,600	1,600	520	42	140	460	470
PCB-28	290	280	650	320	200	14	62	230	130
PCB-44	120	140	240	140	92	9.8	36	140	91
PCB-52	210	230	420	250	160	28	78	230	160
PCB-66	6.9	6.9	14	7.9	2.2	1.9	9.7	11	2.7
PCB-77, PCB-81	--	--	--	--	--	--	--	--	--
PCB-90/101	16	16	17	9.2	7.8	3.3	17	16	5.8
PCB-118, PCB-123	--	--	--	--	--	--	--	--	--
PCB-105, PCB-114, PCB-126	--	--	--	--	--	--	--	--	--
PCB-151	--	--	--	--	--	--	1.2	--	--
PCB-128	--	--	--	--	--	--	--	--	--
PCB-138	--	--	--	--	--	--	--	--	--
PCB-153	--	--	--	--	--	--	--	--	--
PCB-167, -156, -157, -169, -170, -180, -187, -189, -195, -206, -209	--	--	--	--	--	--	--	--	--
Total mono-CB	90	46	670	380	9.3	--	4.3	29	17
Total di-CB	2,300	2,000	13,000	6,600	820	64	290	1,400	1,100
Total tri-CB	2,800	3,400	8,000	4,400	2,000	140	520	2,000	1,600
Total tetra-CB	920	1,000	2,000	1,200	670	110	340	1,000	690
Total penta-CB	130	160	110	64	90	16	76	100	47
Total hexa-CB	3.6	3.4	5.1	2.4	1.9	1.5	8.3	5.9	1.6
Total hepta-CB	--	--	--	--	--	--	--	--	--
Total Octa CB	--	--	--	--	--	--	--	--	--
Total Non-CB	--	--	--	--	--	--	--	--	--
Total PCBs	6,240	6,610	23,800	12,600	3,590	332	1,240	4,530	3,460

"--" = Not detected

Table L-3. Measured Values from Flux Chamber Tests (Continued)

Congener	Mass of Analyte (ng)								
	Test G1 Outside Silt Fence	Test G2 Outside Silt Fence	Test G3 Outside Silt Fence	Test H1 Hopper	Test H2 Hopper	Test H3 Hopper	Test I1 Mud Flat	Test I2 Mud Flat	Test I3 Mud Flat
Sample size (m^3)	0.163	0.164	0.191	0.185	0.203	0.150	0.315	0.370	0.352
PCB-8	41	94	81	57	120	120	15	84	25
PCB-18	68	130	110	57	160	150	160	140	66
PCB-28	27	90	68	2.7	5	11	280	71	32
PCB-44	20	28	39	3.2	11	19	370	22	13
PCB-52	49	45	62	9.4	29	46	640	93	51
PCB-66	5.7	5.4	3.8	--	--	--	--	2.5	--
PCB-77, PCB-81	--	--	--	--	--	--	--	--	--
PCB-90/101	5.9	11	9.5	--	--	--	50	3.6	2.1
PCB-118, PCB-123	--	--	--	--	--	--	1.5	--	--
PCB-105, PCB-114, PCB-126	--	--	--	--	--	--	--	--	--
PCB-151	--	--	--	--	--	--	3.2	--	--
PCB-128	--	--	--	--	--	--	--	--	--
PCB-138	--	--	--	--	--	--	1.4	--	--
PCB-153	--	--	--	--	--	--	1.4	--	--
PCB-167, -156, -157, -169, -170, -180, -187, -189, -195, -206, -209	--	--	--	--	--	--	--	--	--
Total mono-CB	2.3	--	--	8.4	22	16	--	7.7	--
Total di-CB	80	310	270	210	420	370	170	350	120
Total tri-CB	230	600	500	130	320	360	1,600	580	270
Total tetra-CB	200	220	290	33	100	160	2,800	310	170
Total penta-CB	27	76	80	1.2	3.4	10	320	23	14
Total hexa-CB	2.2	--	--	--	--	--	27	1.6	--
Total hepta-CB	--	--	--	--	--	--	--	--	--
Total Octa CB	--	--	--	--	--	--	--	--	--
Total Non-CB	--	--	--	--	--	--	--	--	--
Total PCBs	542	1,210	1,140	383	865	916	4,920	1,270	574

"--" = Not detected

Table L-4. Measured Emission Fluxes

Congener	Measured Emission Flux by Test (ng/m^2-min)								
	Test A1 Fresh Slurry	Test A2 Fresh Slurry	Test A3 Fresh Slurry	Test B1 Water + Slurry	Test B2 Water + Slurry	Test B3 Water + Slurry	Test C1 Sheen	Test C2 Sheen	Test C3 Sheen
PCB-8	110	340	520	60	330	390	540	490	180
PCB-18	110	310	630	62	390	500	390	300	210
PCB-28	31	73	130	29	140	200	70	43	25
PCB-44	21	36	56	23	52	98	29	20	23
PCB-52	38	71	110	36	93	170	56	32	42
PCB-66	0.9	1.8	--	1.9	3.1	4.8	1.3	1.0	0.4
PCB-77, PCB-81	--	--	--	--	--	--	--	--	--
PCB-90/101	2.2	4.0	4.8	3.6	6.6	11	1.6	--	1.0
PCB-118, PCB-123	--	--	--	--	0.2	0.4	--	--	--
PCB-105, PCB-114, PCB-126	--	--	--	--	--	--	--	--	--
PCB-151	--	0.2	0.3	--	0.5	0.7	--	--	--
PCB-128	--	--	--	--	--	--	--	--	--
PCB-138	--	--	--	--	--	--	--	--	--
PCB-153	--	--	--	--	--	0.3	--	--	--
PCB-167, -156, -157, -169, -170, -180, -187, -189, -195, -206, -209	--	--	--	--	--	--	--	--	--
Total mono-CB	8.8	48	43	3.1	25	21	120	120	12
Total di-CB	330	1,100	1,600	180	1,000	1,200	1,900	1,700	550
Total tri-CB	380	940	1,900	290	1,400	1,900	1,100	780	570
Total tetra-CB	170	310	480	170	410	750	250	160	170
Total penta-CB	16	23	35	21	58	110	11	7.6	18
Total hexa-CB	0.9	1.5	2.0	1.7	2.5	1.2	0.5	0.4	0.3
Total hepta-CB	--	--	--	--	--	--	--	--	--
Total Octa CB	--	--	--	--	--	--	--	--	--
Total Non-CB	--	--	--	--	--	--	--	--	--
Total PCBs	901	2,440	4,090	666	2,930	3,990	3,320	2,800	1,320

"--" = Not calculated

Table L-4. Measured Emission Fluxes(Continued)

Congener	Measured Emission Flux by Test (ng/m^2-min)								
	Test D1 Water Near Sheen	Test D2 Water Near Sheen	Test E1 Sheen + Surfactant	Test E2 Sheen + Surfactant	Test E3 Sheen + Surfactant	Test F1 Moon Pool	Test F2 Moon Pool	Test F3 Moon Pool	Test F4 Moon Pool
PCB-8	140	140	770	540	72	8.1	29	87	97
PCB-18	170	240	510	430	130	11	34	91	130
PCB-28	60	60	130	86	52	3.6	15	45	35
PCB-44	25	30	47	38	24	2.6	8.8	28	25
PCB-52	43	50	83	68	41	7.3	19	45	43
PCB-66	1.4	1.5	2.8	2.1	0.6	0.5	2.4	2.2	0.7
PCB-77, PCB-81	--	--	--	--	--	--	--	--	--
PCB-90/101	3.3	3.5	3.4	2.5	2.0	0.9	4.2	3.2	1.6
PCB-118, PCB-123	--	--	--	--	--	--	--	--	--
PCB-105, PCB-114, PCB-126	--	--	--	--	--	--	--	--	--
PCB-151	--	--	--	--	--	--	0.3	--	--
PCB-128	--	--	--	--	--	--	--	--	--
PCB-138	--	--	--	--	--	--	--	--	--
PCB-153	--	--	--	--	--	--	--	--	--
PCB-167, -156, -157, -169, -170, -180, -187, -189, -195, -206, -209	--	--	--	--	--	--	--	--	--
Total mono-CB	18	9.9	130	100	2.4	--	1.1	5.7	4.6
Total di-CB	470	430	2,600	1,800	210	17	71	280	300
Total tri-CB	580	730	1,600	1,200	520	36	130	400	430
Total tetra-CB	190	220	400	320	170	29	83	200	190
Total penta-CB	27	34	22	17	23	4.2	19	20	13
Total hexa-CB	0.7	0.7	1.0	0.6	0.5	0.4	2.0	1.2	0.4
Total hepta-CB	--	--	--	--	--	--	--	--	--
Total Octa CB	--	--	--	--	--	--	--	--	--
Total Non-CB	--	--	--	--	--	--	--	--	--
Total PCBs	1,280	1,430	4,700	3,420	925	86.3	303	896	934

"--" = Not calculated

Table L-4 Measured Emission Fluxes (Continued)

Congener	Measured Emission Flux by Test (ng/m^2-min)								
	Test G1 Outside Silt Fence	Test G2 Outside Silt Fence	Test G3 Outside Silt Fence	Test H1 Hopper (ng/m3)	Test H2 Hopper (ng/m3)	Test H3 Hopper (ng/m3)	Test I1 Mud Flat	Test I2 Mud Flat	Test I3 Mud Flat
PCB-8	9.6	22	16	308	592	798	1.8	8.7	2.7
PCB-18	16	30	22	308	789	998	20	14	7.2
PCB-28	6.4	21	14	14.6	24.7	73.2	34	7.4	3.5
PCB-44	4.7	6.6	7.9	17.3	54.3	126	45	2.3	1.4
PCB-52	12	10	12	50.7	143	306	78	9.7	5.6
PCB-66	1.3	1.3	0.8	--	--	--	--	0.3	--
PCB-77, PCB-81	--	--	--	--	--	--	--	--	--
PCB-90/101	1.4	2.6	1.9	--	--	--	6.1	0.4	0.2
PCB-118, PCB-123	--	--	--	--	--	--	0.2	--	--
PCB-105, PCB-114, PCB-126	--	--	--	--	--	--	--	--	--
PCB-151	--	--	--	--	--	--	0.4	--	--
PCB-128	--	--	--	--	--	--	--	--	--
PCB-138	--	--	--	--	--	--	0.2	--	--
PCB-153	--	--	--	--	--	--	0.2	--	--
PCB-167, -156, -157, -169, -170, -180, -187, -189, -195, -206, -209	--	--	--	--	--	--	--	--	--
Total mono-CB	0.5	--	--	45.3	108	106	--	0.8	--
Total di-CB	19	73	54	1,130	2,070	2,460	21	36	13
Total tri-CB	54	140	100	702	1,580	2,400	200	60	30
Total tetra-CB	47	52	58	178	493	1,060	340	32	19
Total penta-CB	6.4	18	16	6.5	16.8	66.5	39	2.4	1.5
Total hexa-CB	0.5	--	--	--	--	--	3.3	0.2	--
Total hepta-CB	--	--	--	--	--	--	--	--	--
Total Octa CB	--	--	--	--	--	--	--	--	--
Total Non-CB	--	--	--	--	--	--	--	--	--
Total PCBs	127	282	230	2,070	4,270	6,100	600	132	62.7

"--" = Not calculated

4.0 Discussion of Results

This section contains a brief discussion of the results presented in Section 3. The general analytical results are discussed first, followed by a discussion of each test series, and the total estimated emission rate from the CDF and from the dredge barge. A discussion of the data limitations also is included.

4.1 Analytical Results

Polychlorinated biphenyls (PCBs) are aromatic compounds containing two benzene rings with one or more substituent chlorine atoms. There are 209 individual chlorinated chemicals (known as congeners). PCBs include compounds with a range of molecular weights, so they exhibit a range of physical properties. They exist at room temperature as oily liquids or solids. PCBs have no odor. Some commercial PCB mixtures are known in the United States by their industrial trade name, Aroclor.

The samples were analyzed for 30 individual PCB congeners and for class totals, based on the number of chlorine atoms present in the molecule (e.g., di-substituted, tri-substituted). Because they represent all 209 possible congeners, the class totals typically exceed the sum of the 30 individual PCB congeners on the target analyte list. The PCB congeners chosen by the project team include the combined NOAA and WHO list of 28 congeners. The congener number and IUPAC name for each of the 30 target analytes are shown in Table L-5 (all tables appear at the end of the section).

All of the emission flux samples had a similar composition of PCB congeners. Di-, tri-, and tetra-substituted chlorinated biphenyls (CBs) were the most common PCBs in each sample. Lesser amounts of mono-, penta-, and hexa-substituted CBs also were present in most of the samples.

4.2 Results by Test Series

4.2.1 Test Series A - Fresh Slurry

Flux chamber tests were performed on three samples of fresh slurry to determine the steady-state emissions of this material. No floating sheen or phase separation was observed for any of the tests. All three samples contained a similar composition of PCB congeners. Di-, tri-, and tetra-substituted chlorinated biphenyls (CBs) were the most common PCBs in each sample. Lesser amounts of mono-, penta-, and hexa-substituted CBs also were present in each sample.

The largest emission flux for any single congener in this test series was 630 ng/m^2-min for PCB-18 (a tri-chlorinated congener) in test A3.

Tests A2 and A3 exhibited a similar range of emission fluxes with the values generally being within a factor of 2x between the two samples. Test A1 had lower emission fluxes, roughly 1/3 of the emission fluxes measured for test A2 and 1/5 of those for test A3. The variability in emissions is thought to be due to the short-term variability in the contaminant level of the slurry being discharged from the pipe.

The floating boom within the CDF was constructed of 20 floats, each of which was 3m (10 ft) in length. Taking the overlap between floats into account, the circumference of the boom was about 50m (160 ft). The surface area enclosed within the boom is estimated to be 190 m^2 (2,000 ft^2). If this entire area was covered with fresh slurry, the emission rate could be as high as 120 µg/min for PCB-18 and 780 µg/min for total PCBs (based on the results from test A3). If maintained for 24 hours, this emission rate is equivalent to 0.17 g/day of PCB-18 and 1.1 g/day of total PCBs.

4.2.2 Test Series B - Water Cover Over Fresh Slurry

A series of tests were performed to measure the reduction in emissions after a 5 cm (2 in) water layer was added over the fresh slurry. The % control efficiency for each test pair is shown in Table L-6. In general, the addition of a water layer did not achieve a significant reduction in emissions. The average emission flux for the three tests of fresh slurry was actually 2% lower than the average emission flux for the three tests after addition of water (2,480 versus 2,530 ng/m^2-min). The individual tests exhibited some variability in results. Test B1 showed that total PCB air emissions were reduced by 26%, whereas test B2 showed an increase in total PCB air emissions of 20% and test B3 had essentially no change versus the fresh slurry before the addition of water. The original slurry had a relatively low solids content and the addition of water served primarily to further dilute the slurry.

4.2.3 Test Series C -Sheen on Water Surface

Three tests were performed to measure the emission flux from sheen floating on the water surface within cell 1 of the CDF. The first two tests, C1 and C2, were performed at adjacent locations. As expected, the results for these two tests were equivalent. The same congeners were found in each sample and the measured emission flux for each congener and class total generally agreed within ±20%. The water surface during these two tests was covered by a foam or froth resulting from the nearby discharge of fresh slurry. The third test, C3, was performed

near an area of exposed sediment (i.e., a "sand bar"). The measured emission flux at this location was a factor of 2x to 3x lower than the emission flux measured during tests C1 and C2.

The emission fluxes for the sheen were comparable to the emission fluxes measured for the fresh slurry and for the fresh slurry with added water. The average emission flux for the three tests on sheen was 2,480 ng/m^2-min, the same as the average emission flux for the three tests performed with fresh slurry. This suggests the sheen contains PCB's dissolved in oil. For estimating the total emission rate for the CDF, it may not be necessary to differentiate between areas of fresh slurry and areas covered by sheen.

The total surface area within the CDF covered by sheen varied over the course of testing. During the initial days of dredging, the sheen appeared to be largely contained within the floating boom. During the subsequent days of dredging, however, the area within the boom filled with sediment and the boom became less effective at containing the discharged slurry. A large sheen developed outside the boom and, at times, covered an area of several hundred square meters.

4.2.4 Test Series D - Water Surface Near Sheen

Two tests were performed to measure the emission flux from the water surface near areas of sheen to evaluate the effects of a sheen on air emissions. The two tests were performed at differing distances from the nearest layer of sheen, but the measured emission fluxes are essentially identical. As shown in Table L-4, the results for tests D1 and D2 agree even more closely with one another than the tests C1 and C2 where the flux chambers were positioned side-by-side. This suggests that the spatial variability in the emission flux from the water surface within cell 1 of the CDF is not large.

The measured emission fluxes for this test series are compared in Table L-7 with the results from the measurements made over sheen. In general, the measured emission fluxes of total PCBs from the water surface near sheen are about 45% lower than the measured emission fluxes from the sheen itself. The measurements over the water surface had reduced emissions of mono-, di-, and tri-substituted CBs, but higher emissions of the heavier classes of PCBs.

The two tests, D1 and D2, were conducted near the location of test C3 and at roughly the same time. If the comparison is limited to just this one measurement over sheen, the measured emission fluxes from the water surface are essentially identical to the measured emission fluxes from sheen. For example, the emission flux of total PCBs for test C3 was 1,320 ng/m^2-min versus emission fluxes of 1,280 and 1,430 ng/m^2-min for tests D1 and D2, respectively.

The data suggest that the hypothesis is incorrect and that the areas of sheen may not act as a barrier to air emissions.

Cell 1 of the CDF has dimensions of 122m (400 ft) by 73m (240 ft), giving a total surface area of 8,900 m^2 (96,000 ft^2). If this entire area were water cover over fresh slurry, the emission rate could be as high as 2,100 µg/min for PCB-18 and 12,700 µg/min for total PCBs (based on the results from test D2). If maintained for 24 hours, this emission rate is equivalent to 3.1 g/day of PCB-18 and 18 g/day of total PCBs.

During the testing performed at the CDF, it was estimated that fresh slurry covered an area of 190 m^2, so the total area covered by water was 8,700 m^2. Given the large surface area of this source and the relatively high emission flux that was measured, it would have been preferable to have conducted additional emission flux measurements of this source to better characterize the average emission flux and the spatial distribution of emissions.

4.2.5 Test Series E - Sheen + Surfactant

One test was performed with each of three different surfactants to measure the effectiveness of the surfactants in reducing air emissions. As noted above, areas with sheen had higher emission fluxes than adjacent areas without sheen, so removal of the sheen by a surfactant should reduce the measured emission flux. The tests were performed by adding surfactant to the flux chambers immediately after the end of each test in test series C. The % control efficiency for each test pair is shown in Table L-8. The most effective surfactant at achieving emissions reduction was simple green, which showed an average reduction of 30% in air emissions for post-application versus pre-application.

There was an increase in air emissions after the addition of the other two surfactants: Dawn and Biosolve. Even for the Simple Green, there were reduced emissions of mono-, di-, and tri-substituted CBs, but higher emissions of the heavier classes of PCBs than for the pre-application test. It is possible that the tests of Dawn and Biosolve were affected by changes in contaminant level of fresh slurry added to the boom area during the performance of the tests. An increase in PCB level in the fresh slurry could have increased the emission flux in the boom area and masked any reduction in emissions caused by the addition of surfactant. As previously noted, tests C3 and E3 (i.e., Simple Green) were performed outside the range of influence of the discharge end of the pipe.

4.2.6 Test Series F - Moon Pool at Dredge Barge

Four tests were performed within the moon pool at the dredge barge. Tests F1 and F2 were conducted immediately after dredging had been completed on August 11. Tests F3 and F4 were conducted while dredging was underway on August 14. All four tests showed a similar composition of PCBs. The measured emission flux of total PCBs was:

Test	Total PCBs (ng/m^2-min)
F1	86.3
F2	303
F3	896
F4	934

The variability between the results of test F1 and test F2 indicates that there may be significant spatial variability in emissions across the moon pool. Furthermore, it appears that the emission flux was much higher during active dredging than in the hour immediately after dredging had been completed for the day, assuming the level of contamination in both cells was roughly equivalent.

The emission fluxes measured at the moon pool were significantly lower than the emission fluxes measured for fresh sediment (test series A) and for sheen (test series B) at the CDF. It is thought that the water within the moon pool acts to reduce air emissions from the sediments stirred up from the harbor bottom.

The moon pool was roughly 7.6m (25 ft) by 9m (30 ft). The total area within the silt fence is estimated to be 85 m^2 (915 ft^2). The data from tests F3 and F4 indicate that the emission flux of total PCBs from the moon pool during dredging were approximately 78 μg/min.

4.2.7 Test Series G - Outside the Silt Fence at Dredge Barge

Three tests were performed outside the silt fence of the moon pool at the dredge barge. Test G1 was conducted immediately outside the silt fence during dredging, just before tests F1 and F2 were conducted on August 11. Tests G2 and G3 were conducted on August 16 from a boat some distance from the silt fence during dredging. The measured emission flux of total PCBs was:

Test	Total PCBs (ng/m^2-min)
G1	127
G2	282
G3	230

The results from test G1 were comparable to the results from tests F1 and F2, indicating that the emission flux immediately on either side of the silt fence was the same.

The area of the plume outside the silt fence is not known. The measurements in the boat were made about 15m away from the silt fence, so it is safe to assume that the plume is at least 15m by 10m (the width of the moon pool), or 150 m^2. If so, the emission flux of total PCBs from this area during dredging was approximately 38 μg/min.

4.2.8 Test Series H - Hopper / Grizzly at Dredge Barge

Three headspace samples were collected from the hopper at the dredge barge. The measured concentration of total PCBs was:

Test	Total PCBs (ng/m^3)	Estimated Emission Rate (μg/min)
H1	2,070	10
H2	4,270	20
H3	6,100	30

The volume of the hopper below the grizzly screen is estimated to be 72 m^3 (3m x 6m x 4m in height). This volume is large relative to the volume of the dredge bucket. An air emission rate can be estimated for the hopper by multiplying the measured headspace concentration by the volume of the hopper by the number of times per hour the air within the hopper is purged out from dredged material, wind, and other factors. The emission rates shown above were calculated assuming the hopper air is purged out once every 15 minutes.

4.2.9 Test Series I - Mud Flat in Harbor

Three tests were performed at areas known to be contaminated with relatively high levels of PCBs. The measured emission flux of total PCBs was:

Test	Total PCBs (ng/m^2-min)
I1	600
I2	132
I3	62.7

These emission fluxes are low compared with the average emission flux measured from fresh slurry during test series A (2,480 ng/m^2-min). It is likely that the surface soil in the mud flat has been depleted of PCBs over time via volatilization.

The spatial variability in air emissions at the mud flat is expected to be very large, based on the existing PCBs in soils data. No attempt was made to estimate an overall emission rate for the mud flat area.

4.3 Estimated Emission Rate from the CDF and Dredge Barge

The estimated emission rate of total PCBs from the CDF and from the dredge barge are shown in Table L-9. The emission rate of PCBs from the dredge barge is estimated to be 140 µg/min, with about one-half of that amount coming from the moon pool. The emissions from the dredge bucket itself are assumed to be zero. The emission rate of PCBs from the CDF is estimated to be 12,000 µg/min, with over 90% of that coming from the water surface of the CDF and only an insignificant fraction of the total emissions coming from the fresh slurry within the boom.

Overall, the PCB emissions are dominated by the emissions from the water surface of the CDF. All of the other air emission sources are small relative to this source. While other air emission sources had a larger emission flux, the surface area of these other sources is small relative to the nearly 8,700 m^2 of the CDF. The CDF contained only clean water at the start of the study and it is likely that the relative contribution of the CDF to the total emissions would increase over time as more slurry is added.

4.4 Limitations of the Data Set

The purpose of this study was to measure the emission flux of PCBs during dredging operations. Only a very limited number of data points were collected for each emission source

associated with the dredging, so the absolute magnitude of each emission source can not be reported with confidence. Instead, the measurement data should be viewed as providing information about the relative strength of the various emission sources.

Measurements were made during a one-week period when dredging operations were in a start-up mode. No attempt was made to determine the short-term or long-term variation in emissions from the various sources. The emission fluxes at the site may change with time. For example, emission fluxes from the dredge barge should vary as a function of the PCB concentration in the sediments being dredged. The emission fluxes from the CDF may change as the amount of sediments in the basin increases and as the average PCB level and % solids in the discharged material varies.

It was not the objective of this study to characterize the local air quality. The data presented in this report do not directly address this issue, but the data set can be used as an input to an atmospheric dispersion model to estimate short-term and long-term ambient concentrations at various locations within the community. These data then could be compared with existing regulatory and health standards as part of an air pathway assessment.

Table L-5. PCB Congener Number and IUPAC Naming Convention

Congener	IUPAC Chemical Name
PCB-8	2,4'-Dichlorobiphenyl
PCB-18	2,2',5-Trichlorobiphenyl
PCB-28	2,4,4'-Trichlorobiphenyl
PCB-44	2,2',3,5'-Tetrachlorobiphenyl
PCB-52	2,2',5,5'-Tetrachlorobiphenyl
PCB-66	2,3',4,4'-Tetrachlorobiphenyl
PCB-77	3,3',4,4'-Tetrachlorobiphenyl
PCB-81	3,3,4',5-Tetrachlorobiphenyl
PCB-90[1]	2,2',3,4',5-Pentachlorobiphenyl
PCB-101[1]	2,2',4,5,5'-Pentachlorobiphenyl
PCB-118	2,3',4,4',5-Pentachlorobiphenyl
PCB-123	2',3,4,4',5-Pentachlorobiphenyl
PCB-105	2,3,3',4,4'-Pentachlorobiphenyl
PCB-114	2,3,4,4',5-Pentachlorobiphenyl
PCB-126	2,2,3,4,5,-Pentachlorobiphenyl
PCB-151	2,2',3,5,5',6-Hexachlorobiphenyl
PCB-128	2,2',3,3',4,4'-Hexachlorobiphenyl
PCB-138	2,2',3,4,4',5-Hexachlorobiphenyl
PCB-153	2,2',4,4',5,5'-Hexachlorobiphenyl
PCB-167	2,3',4,4',5,5'-Hexachlorobiphenyl
PCB-156	2,3,3',4,4',5-Hexachlorobiphenyl
PCB-157	2,3,3',4,4',5'-Hexachlorobiphenyl
PCB-169	3,3',4,4',5,5'-Hexachlorobiphenyl
PCB-170	2,2',3,3',4,4',5-Heptachlorobiphenyl
PCB-180	2,2',3,4,4',5,5'-Heptachlorobiphenyl
PCB-187	2,2',3,4',5,5',6-Heptachlorobiphenyl
PCB-189	2,3,3',4,4',5,5'-Heptachlorobiphenyl
PCB-195	2,2',3,3',4,4',5,6-Octachlorobiphenyl
PCB-206	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl
PCB-209	Decachlorobiphenyl

[1] These two congeners co-elute.

Note: PCB-90 and PCB-151 are not on the WHO or NOAA list of congeners.

Table L-6. Measured Emission Reduction after Application of Water Layer to Fresh Slurry

Congener	Reduction in Emissions Test B1 vs. Test A1 (%)	Reduction in Emissions Test B2 vs. Test A2 (%)	Reduction in Emissions Test B3 vs. Test A3 (%)
PCB-8	-44	-4.2	-26
PCB-18	-44	+28	-21
PCB-28	-6.9	+96	+51
PCB-44	+10	+42	+73
PCB-52	-3.8	+31	+49
PCB-66	+103	+72	--
PCB-90/101	+64	+64	+124
PCB-151	--	+180	+180
PCB-128	--	--	--
PCB-138	--	--	--
PCB-153	--	--	--
Total mono-CB	-64	-48	-52
Total di-CB	-45	-8.7	-25
Total tri-CB	-24	+50	-1.2
Total tetra-CB	+3.7	+35	+57
Total penta-CB	+32	+151	+208
Total hexa-CB	+90	+68	-37
Total hepta-CB	--	--	--
Total octa-CB	--	--	--
Total nona-CB	--	--	--
Total PCBs	-26	+20	-2.6

Notes: 1. A positive value (e.g., +64%) indicates that the emissions increased after the water layer was applied.
2. "--" indicates that the value was not calculated because no PCBs were detected.

Table L-7. Comparison of Measured Emission Flux from Areas of Water Near Sheen With Areas of Sheen

Congener	Average Emission Flux Test Series C - Sheen (ng/m2-min)	Average Emission Flux Test Series D - Water Near Sheen (ng/m2-min)	Reduction in Emissions Test Series D vs. C (%)
PCB-8	402	140	-65
PCB-18	298	202	-32
PCB-28	45.9	60.0	+31
PCB-44	24.1	27.4	+14
PCB-52	43.6	46.4	+6.4
PCB-66	0.9	1.5	+61
PCB-90/101	1.3	3.4	+151
PCB-151	--	--	--
PCB-128	--	--	--
PCB-138	--	--	--
PCB-153	--	--	--
Total mono-CB	85.4	14.2	-83
Total di-CB	1,380	452	-67
Total tri-CB	807	655	-19
Total tetra-CB	192	202	+5.2
Total penta-CB	12.5	30.6	+146
Total hexa-CB	0.4	0.7	+84
Total hepta-CB	--	--	--
Total octa-CB	--	--	--
Total nona-CB	--	--	--
Total PCBs	2,480	1,350	-45

Notes: 1. A positive value (e.g., +64%) indicates that the emissions from the water surface were higher than emissions from the sheen.
2. "--" indicates that the value was not calculated because no PCBs were detected.

Table L-8. Measured Emission Reduction after Application of Surfactant

Congener	Reduction in Emissions Test E1 vs. Test C1 Dawn (%)	Reduction in Emissions Test E2 vs. Test C2 Biosolve (%)	Reduction in Emissions Test E3 vs. Test C3 Simple Green (%)
PCB-8	+42	+11	-59
PCB-18	+33	+46	-36
PCB-28	+85	+100	+107
PCB-44	+64	+87	+2.2
PCB-52	+48	+108	-2.7
PCB-66	+110	+114	+42
PCB-90/101	+104	--[a]	+92
PCB-151	--	--	--
PCB-128	--	--	--
PCB-138	--	--	--
PCB-153	--	--	--
Total mono-CB	+10	-17	-80
Total di-CB	+37	+3.1	-62
Total tri-CB	+49	+52	-10
Total tetra-CB	+57	+107	+1.8
Total penta-CB	+90	+129	+26
Total hexa-CB	+93	+60	+79
Total hepta-CB	--	--	--
Total octa-CB	--	--	--
Total nona-CB	--	--	--
Total PCBs	+42	+22	-30

a - PCB-90/101 was detected after surfactant addition, but not before.

Notes: 1. A positive value (e.g., +64%) indicates that the emissions increased after the surfactant was applied.
2. "--" indicates that the value was not calculated because no PCBs were detected.

Table L-9. Estimated Emission Rate for CDF and Dredge Barge

Emission Source	Emission Flux Total PCBs (ng/m^2-min)	Data Source	Surface Area (m^2)	Emission Rate Total PCBs (µg/min)
CDF - Fresh Slurry	2,480	Tests A1, A2, A3	190	470
CDF - Water Surface	1,360	Tests D1, D2	8,700	12,000
				Total for CDF = 12,000
Moon Pool	915	Tests F3, F4	85	78
Outside Silt Fence	256	Tests G2, G3	150	38
Hopper	n/a	Tests H1, H2, H3	n/a	20
				Total for Dredge Barge = 140

5.0 Quality Assurance and Quality Control Measures

The quality assurance and quality control (QA/QC) measures used during the monitoring program focused on defining the various elements of the monitoring in terms of precision, accuracy, and background contamination. Specific QA/QC actions during this program were:

- Use of pre-sampling surrogate spiking to assess sample collection efficiency;
- Collection of field blank samples to assess potential background contamination due to residual media background and sample handling;
- Calibration of thermocouples used to measure temperature; and
- Calibration of flow meters used to determine flow rates of the sweep air and sample collection.

Each of these elements is discussed in the following subsections.

5.1 Background Assessments

Background assessments were accomplished by collecting and analyzing two field blanks (one with each sample shipment to the off-site analytical laboratory). The field blanks were prepared and spiked sampling media that were sent to the field and handled in the same manner as a field sample, except that no sample air was drawn through the media. These samples were handled, shipped, extracted, and analyzed exactly the same as the regular field samples. Sorbent media is prone to residual contamination, which may occur due to laboratory contamination, exposure to environmental conditions at the monitoring site, or from handling and shipping. The field blank results include the contribution from all of these sources.

The field blank results are included in Attachment C. None of the individual 30 PCB congeners were detected in either of the blank samples above the reporting limit of 1 ng. A small amount of di-chlorinated biphenyl (1.4 ng) was detected in one blank, with no other congeners being detected. The total di-chlorinated biphenyl concentrations in the regular samples ranged from 64 ng to 13,000 ng per sample. Therefore, this blank value represents, at most, 1% or less of the total di-chlorinated biphenyl concentration. Therefore, neither laboratory nor environmental contamination had a significant impact on the sample concentrations.

5.2 Precision Assessments

No duplicate or replicate samples were included in the test matrix, so no field checks of combined sampling and analytical precision were performed. It is possible, however, to estimate the overall field precision from side-by-side samples collected over similar emitting surfaces (e.g., tests C1 and C2). As shown in Section 3, the results of these tests generally agreed with ±20% for each congener and class total.

The analytical precision was determined from the replicate analysis of laboratory control samples (LCS). These results of two sets of LCS1/LCS2 analyses are contained in Attachment C. The percent relative percent difference (%RPD) for all 28 congeners was generally less than 5% and always was less than or equal to 11%.

5.3 Accuracy Assessments

No checks of total sampling plus analytical accuracy, such as performance audit samples, were attempted during this short-term field sampling effort.

Analytical accuracy was assessed through the use of pre-sampling surrogates. Each sampling cartridge was spiked prior to sample collection with two deuterated surrogates; ^{13}C-PCB-52 and ^{13}C-PCB-178. The recovery of these two compounds includes losses due to sampling, extraction, and analytical recovery and the values should be representative of the recovery of native compounds. The surrogate recoveries are summarized in Table L-10. In general, surrogate recoveries of ± 30% (e.g., 70 – 130% recovery) are considered good. All surrogate recoveries for all 29 samples were within ± 30%. These data indicate that the PCB congeners were being collected efficiently and were not being lost during the extraction and analysis procedures.

The accuracy of the measurement equipment was checked. This included checks of the rotometers used to control and measure the flow of sweep air flow rate into the flux chamber, the rotometers used to measure the flow rate of sample through the sorbent cartridge, and the thermocouples used to measure the ambient and chamber temperatures. All were calibrated against primary measurement standards.

The flow meters used to regulate the flow of sweep air into the flux chamber were calibrated at a single point (5 L/min) since the flow rate for this parameter was kept constant during all of the flux chamber sampling runs. Following the determination of flow meter setting

for 5 L/min, the setting was written on each flow meter so the flow could be set and maintained during each run. The flow meters used to measure the flow rate for each sample were multipoint calibrated because these flows were subject to change due to differences in sorbent loading and cartridge back pressure. These flow meters were calibrated at four points over the range of the meter. All of these flow meters had correlation coefficients (r^2 values) of greater than 0.999. The calibration curves for the flow meters are shown in Attachment E.

The thermocouples were calibrated at three points (ice point, ambient temperature, and boiling water). The temperature measured with the thermocouple was compared against a NIST traceable mercury in glass thermometer. The thermocouples were accepted if the difference between the thermocouple temperature and the traceable thermometer were within 5%. Copies of the thermocouple calibrations are contained in Attachment E.

Table L-10. Summary of Surrogate Spike Recoveries

Sample	Surrogate Recovery (%)	
	^{13}C-PCB-52	^{13}C-PCB-178
URS -A1	102	106
URS -A2	110	110
URS -A3	114	110
URS-B1	106	106
URS -A4	104	106
URS -A5	114	102
URS -A6	102	104
URS -A7	108	104
URS -A8	104	112
URS -A9	88	98
URS -A10	112	100
URS -A11	90	98
URS -A12	96	102
URS -A13	110	104
URS -A14	103	105
URS -A15	101	109
URS -A16	105	105
URS -A17	105	104
URS -A18	101	102
URS -A19	105	109
URS -A20	94	101
URS -A21	103	104
URS -A22	85	91
URS -A23	76	102
URS -A24	89	101
URS -A25	70	78
URS -A26	87	98
URS -A27	83	104
URS-B2	90	105
Min	70	78
Max	114	112
Mean	98.5	102.8

6.0 References

1. Radian Corporation. Measurement of Gaseous Emission Rates from Land Surfaces Using an Emission Isolation Flux Chamber - User's Guide. EPA 600/8-86-008. February 1986.

2. Eklund, B., M. Kienbusch, D. Ranum, and T. Harrison. "Development of a Sampling Method for Measuring VOC Emissions from Surface Impoundments." Presented at the EPA/APCA Symposium on Measurement of Toxic and Related Air Pollutants, May 1987.

3. Gholson, A.R., J.R. Albritton, and R.K. Jayanty. "Evaluation of an Enclosure Method for Measuring Emissions of Volatile Organic Compounds from Quiescent Liquid Surfaces". ES&T, Vol. 25, No. 3, pp519-524, 1991.

Attachment A

Master Logbook

A = Air Samples

W = Water or Waste Samples

Project No. ____ Book No. 34336 TITLE New Bedford

From Page No. ____

Date	Sample ID	Test	Location	Sample Time Start	Sample Time Stop	Comments
8-08-00	URS A1	I-1	657 Mudflat	0850	1058	
	URS A2	I-2	602	0908	1108	
	URS A3	I-3	650	0908	1108	
	URS B1	—	—	—	—	Blank
8-10-00	URS A4	H-1	Barge hopper	1529	1729	53 min total sampling
8-11-00	URS A5	H-2		1425	1630	48 min total sampling time
	URS A6	H-3		1639	1722	43 min total sampling time
	URS A7	G-1	Outside silt fence	1729	1829	
	URS A8	F1	Moon pool	1809	1909	
	URS A9	F2	Moon pool	1851	1951	
8-14-00	URS A10	C1	CDF	0956	1056	Sheen inside boom
	URS A11	C2	CDF	1005	1105	Sheen inside boom F/c 0
	URS A12	E1	CDF	1108	1208	Dawn surfactant
	URS A13	E2	CDF	1102	1202	Biosolve " R/C 003
	URS A14	F3	Moon Pool	1605	1705	
	URS A15	F4	Moon Pool	1605	1705	
8-15-00	URS A16	A1	Fresh sediment	0936	1042	
	URS A17	A2	Fresh sediment	~~0946~~ 0939	1044	
	URS A18	A3	Fresh sediment	0940	1044	
	URS A19	B1	Sediment + water	1127	1227	
	URS A20	B2		1128	1228	
	URS A21	B3		1130	1230	
	URS A22	D1	Water nr sheen	1508	1611	
	URS A23	C3	Sheen in CDF	1513	1615	
	URS A24	E3	Sheen + surf	1622	1722	CDF
	URS A25	D2	Water nr sheen	1640	1740	
8-16-00	URS A26	G2	Outside silt fence	1409	1509	start at t = 1409
	URS A27	G3		1410	1510	start at t = 1410
	URS B2	—	—	—	—	Blank

To Page No. ____

Witnessed & Understood by me, | Date | Invented by | Date | Recorded by

[redacted] L-A2 [redacted]

TITLE New Bedford

Project No.

Book No. 34336

From Page No.

Date	Sample ID	Test	Location	Sample Time Start	Stop	Comments
~~8-08-00~~	~~657 Mud Flat~~	~~I-1~~	~~Mud Flat~~	~~0816~~		~~8-08-00 BME~~
	~~602~~	~~I-2~~		~~0825~~		
	~~650~~	~~I-3~~		~~0827~~		
8-08-00	URS-W1	I-1	657 Mud flat	0816		Mud
	URS W2	I-2	602	0825		
	URS W3	I-3	650	0827		
8-11-00	URS W7	G-1	outside silt fence	1712		water sample
	URS W8	F1	Moon Pool	1820		
	URS W9	F2	Moon Pool	1915		
8-14-00	URS W10	C1	CDF	0945		Sheen
	URS-W11	C2	CDF	0943		Sheen
	URS - W12	E1	CDF	1210		sheen + surfactant
	URS - W13	E2	CDF	1210		sheen + surfactant
	URS - W14	F3	Moon Pool	1640		water sample
	URS-W15	F4	Moon Pool	1640		water sample
8-15-00	URS-W16	A1	Fresh sediment	1050		sediment sample
	URS-W17	A2		1051		
	URS-W18	A3		1052		
	URS-W19	B1	Sediment + water	1235		CDF
	URS-W20	B2	Sediment + water	1235		CDF
	URS-W21	B3	Sediment + water	1235		CDF
	URS-W22	D1	CDF	1615		Near sheen
	URS-W23	C3		N/A		No Sample
	URS-W24	E3		N/A		No Sample
	URS-W25	D2		1616		Near sheen
8-16-00	URS-W26	G1	Outside silt fence	1425		cut 4
	URS-W27	G2		1426		cut 4

The following samples are nearly identical & can be composited

i) F1 & F2 (URS W8 & URS W9)
ii) C1 & C2 (URS W10 & URS W11)
iii) F3 & F4 (URS W14 & URS W15)
iv) G1 & G2 (URS W26 & URS W27)

To Page No.

Witnessed & Understood by me, | Date | Invented by | Date

Recorded by

L-A3

Attachment B

Flux Chamber

Field Data Sheets

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	8 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	I-3	Location:	Mud flat 650
Flux Chamber #:	2	Sampler(s):	EPA, BMC
Sweep Air Flow Meter #:	7067-002	PCB Collection Time:	0908-1108 URS A3
Sample Flow Meter #	7063-002 625=2L/min	Weather:	Hot, humid, hazy

	Time	Sweep Air Rote Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Rote Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
	0828	69 / 5.0	0					
	0840	69 / 5.0	2					
	0904	69 / 5.0	6			26	27	
START	0908			100				
	0914	69 5.0		97		27	26	
	0920	69 5.0		97				
	0958	69 5.0	15	90		27	27	
	1040	69 5.0	22	88		29	30	
STOP	1108							

Comments: Sample = URS W3 URS-A-3

surface = wet, mud, lots of organic matter
Moved reeds out of way

Figure 1. Flux Chamber Sampling Form

0602
8'
0650
8'
water

L-B2

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	8 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	I-2	Location:	Mud Flat 602
Flux Chamber #:	3	Sampler(s):	BMZ, EPA
Sweep Air Flow Meter #:	7067-003	PCB Collection Time:	0908-1108 URS-A2
Sample Flow Meter #	7063-001 2L/min = 63	Weather:	Hot, humid, hazy

	Time	Sweep Air Rota Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Rota Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
	0828	71.5 / 5.0	0					
	0840	71.5 / 5.0	2					
	0904	71.5 5.0	6	98		27	26	
START	0908			~~100~~ BMZ				
	0914	71.5 / 5.0		96		27	26	
	0920	71.5 / 5.0		96		27	26	
	0958	71.5 / 5.0	15	95		27	29	
	1040	70 / 5.0	22	95		30	30	
STOP—	1108							

Comments: Surface = wet, mud, lots of organic material
Sample = URS W2

Sample at unmarked post (may be 650)
Sample ID - URS-A-2

Figure 1. Flux Chamber Sampling Form

L-B3

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	8 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	I-1	Location:	657 / Mud flats
Flux Chamber #:	001	Sampler(s):	BME / EPA
Sweep Air Flow Meter #:	7067-007	PCB Collection Time:	0850-1058 URS-A1
Sample Flow Meter #	7063-004	Weather:	Hot, clear, humid 80°, still

	Time	Sweep Air Rote Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Rote Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
	0816	71 5.0	0					
	0840	71 5.0	4			23	26	
~~START~~ ?	0850			78	63=24/min	~~26~~	~~26~~	
	0852	71 5.0	6			26	26	
START	0858	71 5.0	7	77		26	25	
	0912	71		76		26	25	
	0923	71		76		26	24	
	0956	71		76		26	25	
	1043	71		76		27	26	
STOP	1058	STOP		76				
		128 minutes	on Counter			Sample URS-A-1		

Comments: 0816 collected soil/waste sample 0-4" under chamber URS W1

Surface = Moist, humic material, cleared of vegetation ~20' from water

Figure 1. Flux Chamber Sampling Form

L-B4

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	10 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	H-1	Location:	Dredge / Hopper
Flux Chamber #:	N/A	Sampler(s):	EPA
Sweep Air Flow Meter #:	N/A	PCB Collection Time:	1529 - 1729 URS A-4
Sample Flow Meter #	7063-004	Weather:	Hot, Humid, Sunny

Time	Sweep Air Rote Setting/ Flow L/min	PCB Sampling Tan	Rote Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
1529	N/A		107				
1536	STOP for	Dredge	?				
1545	Resume		107				
1555			105				
1625	STOP						
1723	Resume		105				
1729	Stop						

Comments: Started Run After 3rd load into hopper
Running A bucket (6 yds) every 4-5 minutes
Dredging up Very thick Silty Clay - Requiring small track-hoe
to "mush" down - Run stopped 1625 Duete Clay Plugging

Figure 1. Flux Chamber Sampling Form

L-B5

Flux Chamber Measurement Field Data Sheet

2000		Sample Site:	New Bedford Harbor Superfund Site
-A-5		Location:	Hopper / Grizzly
		Sampler(s):	EPA
3 N/A		PCB Collection Time:	1425 - 1630
		Weather:	
-004			

	PCB Sampling			Temperature (°C)		
	Tau	Rate Setting	Flow L/min	Ambient	Chamber	Surface
		105				
		105				
		105	Found Pump unplugged -			
		105	Likely less than 5min			
			- Dredging stopped for Plugging			
Stopped	Due to	uncertainty of Re-start				
		105				

~ 30 minutes Prior to start
during 1505 - 1515 - Blower Seal.

L-B6

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	11 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	URS-A-6	Location:	Hopper / Grizzly
Flux Chamber #:	N/A	Sampler(s):	EPA
Sweep Air Flow Meter #:	N/A	PCB Collection Time:	1639-1722
Sample Flow Meter #	7063-004	Weather:	

	Time	Sweep Air Rota Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Rota Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
START	1639			105				
	1712			105				
STOP	1722			105	–	Stop for Day		

Comments: Started After Dredge Move. @ 1715 started Dumping Water into Hopper - To Clean Clay out? - Stopped Run 1722 until Normal Dredging Resumes

Figure 1. Flux Chamber Sampling Form

L-B7

URS A7

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	11 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	G-1	Location:	outside silt fence
Flux Chamber #:	003	Sampler(s):	BMC/CPA.
Sweep Air Flow Meter #:	7067-002	PCB Collection Time:	URSA7 1724-1824
Sample Flow Meter #	7063-002	Weather:	clear, sunny, breeze

Time	Sweep Air Rote Setting/ Flow L/min		PCB Sampling Tau	Rote Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
1700	69	5.0	0					
1706	69	5.0	1			27		
1712	69	5.0	2			28		
1718	69	5.0	3			27		
1724	69	5.0	4	85	62.3= 2L/min		start sample	
1730	69	5.0	5	85	>2	26		
1736	69	5.0	.6	85	>2	26		
1800	69	5.0	10	85	>2	26		
1812	69	5.0	12	85	>2	26		
1824	69	5.0	14	85	>2	26		

Collected sample URSW-7 by jiggling surface water next to chamber & transferring to bottle.

Comments: Tied off F/C from barge just outside fence in area dredged.

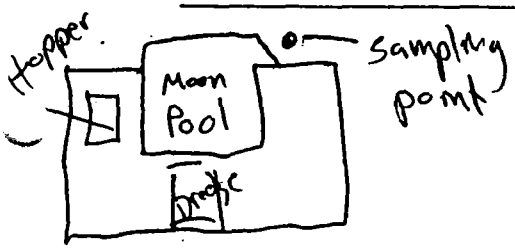


Figure 1. Flux Chamber Sampling Form

L-B8

URS A-8

RADIAN

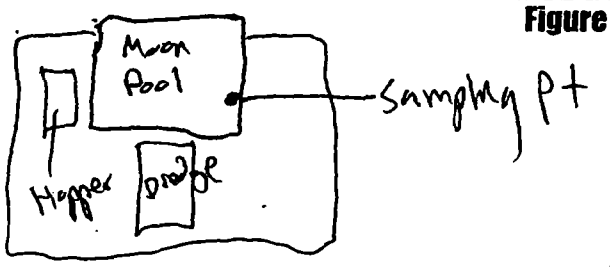
Flux Chamber Measurement Field Data Sheet

Date:	11 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	F1	Location:	Moon Pool
Flux Chamber #:	002	Sampler(s):	BMC/GAA
Sweep Air Flow Meter #:	7067-003	PCB Collection Time:	URS A-8 1809-1909
Sample Flow Meter #	7063-004	Weather:	clear, sunny, breeze

Time	Sweep Air Rota Setting/ Flow L/min	PCB Sampling Tau	Rota Setting	Flow L/min	Temperature [°C] Ambient	Chamber	Surface
1745	71.5 5.0	0			26		
1751	71.5 5.0	1			26		
1803	71.5 5.0	3			26		
1809	71.5 5.0	4	76	63=2 L/min	26	start	sample
1815	71.5 5.0	5	75		25		
1821	71.5 5.0	6	76		25		
1833	71.5 5.0	8	76		25		
1845	71.5 5.0	10	76		25		
1857	71.5 5.0	12	76	>2	26		
1909	71.5 5.0	14	76	>2	25	End Sample	

Comments: sun at ~20° to horizon at start of sampling
Sample collected 2/3 from inside of "U"

Figure 1. Flux Chamber Sampling Form



5' between posts

L-B9

URS-A9

RADIAN

Flux Chamber Measurement Field Data Sheet

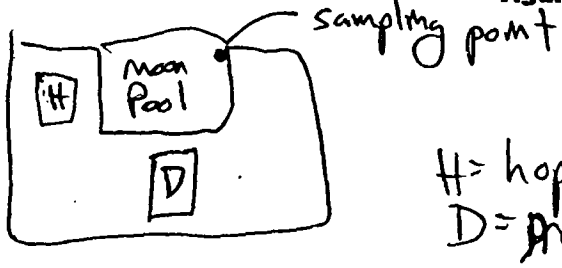
Date:	11 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	F2	Location:	Moon pool
Flux Chamber #:	003	Sampler(s):	BMC/EPA
Sweep Air Flow Meter #:	7067-002	PCB Collection Time:	URS-A9 1851-1951
Sample Flow Meter #	7063-002	Weather:	clear, dusk

Time	Sweep Air Rota Setting/ Flow L/min		PCB Sampling Tan	Rota Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
1827	69	5.0	0		~~25~~ BMC	25		
1833	69	5.0	1			25		
1839	69	5.0	2			25		
1845	69	5.0	3			25		
1851	69	5.0	4	84	62.5 = 2 L/min	25	start sample	
1857	69	5.0	5	84		26		
1903	69	5.0	6	83		26		
1915	69	5.0	8	83		25		
1927	69	5.0	10	82		25		
1939	69	5.0	12	81		24		
1947	condensation (minor) noted in chamber							
1951	69	5.0	14	81		24	END	sample

Comments:

Sample collected below/next to 5th of 5 posts from inside of U (see diagram)

Figure 1. Flux Chamber Sampling Form



H= hopper
D= dredge

L-B10

RADIAN

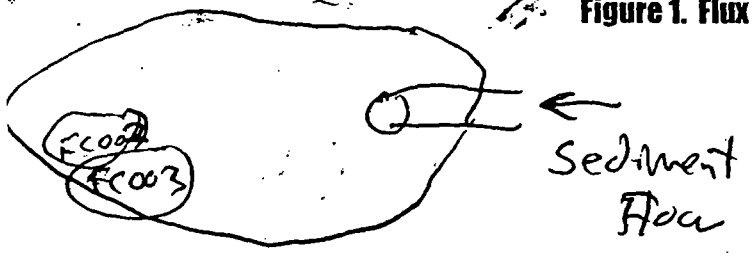
Flux Chamber Measurement Field Data Sheet

Date:	14 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	Sheen-1 C1	Location:	CDF
Flux Chamber #:	002	Sampler(s):	BME
Sweep Air Flow Meter #:	7067-003	PCB Collection Time:	URS-A10 1005-1105
Sample Flow Meter #	7063-004	Weather:	Cloudy, cool

Time	Sweep Air Roto Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Roto Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
0930	~~66~~ 5.0	0					
0936	~~71.5~~ 5.0	1			22		
0942	71.5 5.0	2			22		
0956		4			22	~~Start sample~~	
1005		~6	100	63=20L		Start sample	
1012	~71 5.0	7	100		22		
1024	~71	9	100		22		
1036	~71 5.0	11	100		22		
1048	~71 5.0	13	100		23		
1105	~70				22	Stop sample	

Comments: Inside white boom
t=1012 scum layer on water surface
t=0945 collected grab sample of surface water next to F/C

Figure 1. Flux Chamber Sampling Form



L-B11

RADIAN

C2

Flux Chamber Measurement Field Data Sheet

Date:	4 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	Sheet 2 C2	Location:	CDF
Flux Chamber #:	003	Sampler(s):	BMS
Sweep Air Flow Meter #:	7067-002	PCB Collection Time:	URS-A11 0956-1056
Sample Flow Meter #	7063-002	Weather:	Cloudy, cool

Time	Sweep Air Rote Setting/ Flow L/min		PCB Sampling Tau	Rote Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
0930	69	5.0	0					
0936	69	5.0	1			22		
0942	69	5.0	2			22		
0956			~4	75	62.5-20	22	Start sample	
1006			6	75		22		
1012	69	5.0	7	75		22		
1024	~69		9	75		22		
1036	~69	5.0	11	75		22		
1048	~70	5.0	13	75		23		
1056							Stop sample	

Comments: Inside white boom
t= 0945 collected grab sample of surface water next to F/C
Continuous flow of sediment from pipe since ~0900

Figure 1. Flux Chamber Sampling Form

L-B12

E1

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	Dawn Surfactant E1	Location:	CDF
Flux Chamber #:	002	Sampler(s):	BMS
Sweep Air Flow Meter #:	7067-003	PCB Collection Time:	1108-1208 URS-A12
Sample Flow Meter #	7063-004	Weather:	cloudy & cool, slight breeze

Time	Sweep Air Roto Setting/ Flow L/min		PCB Sampling Tan	PCB Sampling Roto Setting	PCB Sampling Flow L/min	Temperature [°C] Ambient	Temperature [°C] Chamber	Temperature [°C] Surface
0930	71.5	5.0						
1106	Spray		5-6 Squirts of Dawn into F/C					
1108		0	>10				Start Sample	
1114	~70	5.0		98		24		
1126	~70	5.0		98		23		
1138	~70	5.0		98		23		
1150	~70	5.0		98		23		
1202	~70	5.0		98		23		
1208							End Sample	

Comments: t=1121 a few soap bubbles on water surface inside F/C. Still there at t=1150

Figure 1. Flux Chamber Sampling Form

L-B13

E2

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	4 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	Biosolve surfactant E1	Location:	CDF
Flux Chamber #:	OC3	Sampler(s):	BME
Sweep Air		PCB Collection	URSA13
Flow Meter #:	7067-002	Time:	1102-1202
Sample		Weather:	cloudy + cool, a little wind
Flow Meter #	7063-002		

Time	Sweep Air Rote Setting/ Flow L/min		PCB Sampling Tan	Rote Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
0930	69	5.0						
1100	spray 5		squirts of Biosolve			into chamber		
1102	~70	0	>10	75	60.5 = 2 L/min	22	start sample	
1114	~70	5.0		75		24		
1126	~70	5.0		75		23		
1138	~70	5.0		75		23		
1150	~70	5.0		75		23		
1202	~70	5.0		75		23	stop sample	

Comments:

Boom made of 20 floats, each of which is ~10' long w/some overlap (~1 ft') at each end of each segment.
$2\pi r = \sim 160$ ft

Figure 1. Flux Chamber Sampling Form

L-B14

RADIAN

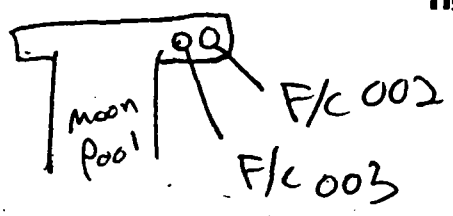
Flux Chamber Measurement Field Data Sheet

Date:	4 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	F3	Location:	Moon Pool
Flux Chamber #:	003	Sampler(s):	BMI/EPA
Sweep Air Flow Meter #:	7067-002	PCB Collection Time:	1605 – 1705 VRS-A14
Sample Flow Meter #	7063-004	Weather:	cloudy, warm, light breeze

Time	Sweep Air Rote Setting/ Flow L/min		PCB Sampling Tau	Rote Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
1454	69	5.0	0			22		
1506	~70	5.0	2			23		
1509		Shut	off.	Barge to be moved.				
1535	69	5.0	0	BACK ON. NEW START				
1549	~70	5.0	2			23		
1605	~70	5.0	5	98	63=2.0 L/min	22	Start SAMPLE	
1617	~70	5.0	7	98		23		
1629	~70	5.0	9	98		23		
1641	~70	5.0	11	98		22		
1653	~70	5.0	13	98		22		
1705	~70	5.0	15	98		22	END SAMPLE	

Comments: t=1549 start dredging
~t=1620 At least 2 bucket load taken immediately adjacent to F/C-003.
T = 1640 Dipped surface sample VRS-W14 from next to F/C
t=1645 stopped dredging. Apparently a flow problem.

Figure 1. Flux Chamber Sampling Form



Approximate # Buckets Dredged
1607 – 1615 |
1615 – 1635 ~~||||~~ |||

L-B15

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	14 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	~~F-14~~ BME 8-14-00 F-4	Location:	Moon Pool
Flux Chamber #:	002	Sampler(s):	BME/EPA
Sweep Air Flow Meter #:	7067-003	PCB Collection Time:	1605-1705 VRS-A15
Sample Flow Meter #	7063-002	Weather:	cloudy, warm

Time	Sweep Air Rote Setting/ Flow L/min		PCB Sampling Tau	Rote Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
1454	71.5	5.0	0			23		
1506	~70	5.0	2			23		
1509	SHUT OFF. BARGE TO BE MOVED							
1535	71.5	5.0	0	New start.				
1549	~70	5.0	2			23		
1605	70	5.0	5	76	62.5=24/min	22	Start Sample	
1617	~70	5.0	7	75		23		
1629	~70	5.0	9	75		23		
1641	~70	5.0	11	75		22		
1653	~70	5.0	13	75		22		
1705	~70	5.0	15	75		22	END SAMPLE	

Comments: t=1535. Moved to top of cut 8

Figure 1. Flux Chamber Sampling Form

L-B16

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	15 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	A1	Location:	Fresh Sediment CDF
Flux Chamber #:	002	Sampler(s):	BME/EPA
Sweep Air Flow Meter #:	7067-001	PCB Collection Time:	0936 - 1042 A016
Sample Flow Meter #	7063-004	Weather:	Cloudy, warm, almost no breeze

Time	Sweep Air Rota Setting/ Flow L/min	PCB Sampling Tan	PCB Sampling Rota Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
0912	71 5.0	0					
0936	71. 5.0	4	76	63 5.0	22		
0951	~70	6	76		22	Rain	
1014	70		76		22		
1028	70		76				
1042	70		76		22	Stop	Sample

Comments: Dipped sample from end of discharge pipe. Put 3-4 inch layer of sediment in each wash tub. Appears to be ~5% solids.

Collected VRSW016 from tub after sample. Mixed water before sample collection

Figure 1. Flux Chamber Sampling Form

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	15 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	A2	Location:	Fresh Sediment CDF
Flux Chamber #:	003	Sampler(s):	BMS/EPA
Sweep Air Flow Meter #:	7067-004	PCB Collection Time:	0939-1024 URS A17
Sample Flow Meter #	7063-	Weather:	cloudy, warm

Time	Sweep Air Rota Setting/ Flow L/min	PCB Sampling Tau	Rota Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
0915	69 5.0	0					
0939	69 5.0	4	96	62.5 = 20	22		
0951	~70	6	95	60	22	Rain	
1014	69		96		22		
1028	69		96				
1034	70		95		22	Stop Sample	
1044	70		95		22		

Comments: This sample appears to have the most solids of the 3 collected.

Collected URS W017 in same manner as URS W016

Figure 1. Flux Chamber Sampling Form

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	15 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	A3	Location:	Fresh Sediment CDF
Flux Chamber #:	001	Sampler(s):	BME/EPA
Sweep Air Flow Meter #:	7067-003	PCB Collection Time:	0940-1044 URS A18
Sample Flow Meter #	7063-001	Weather:	cloudy, warm, little breeze

Time	Sweep Air Rote Setting/ Flow L/min	PCB Sampling Tau	Rote Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
0916	71.5 5.0	0					
0940	71.5 5.0	4	88		22		
0952	~70	6	85		22	Rain	
1015	71		86		22		
1028	71		87				
1044	~70 5.0		86		22	stop	Sample

Comments: URS A18
Sediment sample had more water than other samples. Momentum carried bucket into CDF during filling.
Collected URS W18 in same manner as URS W16

Figure 1. Flux Chamber Sampling Form

L-B19

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	15 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	B1	Location:	Sediment + water
Flux Chamber #:	002	Sampler(s):	EPA/BME
Sweep Air Flow Meter #:	7067-001	PCB Collection Time:	URSA19 1127-1227
Sample Flow Meter #	7063-004	Weather:	Light rain

Time	Sweep Air Rote Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Rote Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
1100	71 5.0	0			22		
1112	~70	2			23		
1127	~70	4T	76	63=2.0 L/min	24	Sample	Start
1142	~70	7T	76		25		
1154	~70	9	76		25	No more	rain
1218	70 5.0	13	76		24		
1227					24	END	SAMPLE

1000 psi

Comments: F/c removed from basins prior to start of sampling. Added 2 gallons of harbor water to each basin (~2" water layer). The effect, at least initially, appears to be to dilute the sample more than to add a water layer. Poured water in slowly using hand as a deflection plate.

Figure 1. Flux Chamber Sampling Form

L-B20

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	15 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	B2	Location:	Sediment + water
Flux Chamber #:	003	Sampler(s):	EPA - BMS VRS A2C
Sweep Air Flow Meter #:	7067-004	PCB Collection Time:	1128 - 1228
Sample Flow Meter #	7063-	Weather:	Rain

Time	Sweep Air Rota Setting/ Flow L/min		PCB Sampling Tan	Rota Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
1101	69	5.0	0			22		
1113	~70		2			23		
1128	~70		4	98	2.0 L/min =62.5	24	Sample Start	
1143	~70		7	95		25		
1155	70		9	96		25		
1219	~70	5.0	13	96		24		
1228							END Sample	

300psi

Comments: t=1152 changed out gas cylinder <1 min

Figure 1. Flux Chamber Sampling Form

L-B21

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	15 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	B3	Location:	Sediment + water
Flux Chamber #:	001	Sampler(s):	EPA/BMS
Sweep Air		PCB Collection	VRS-A21
Flow Meter #:	7067-003	Time:	1130-1230
Sample		Weather:	
Flow Meter #	7063-001		Rain

Time	Sweep Air Rote Setting/ Flow L/min		PCB Sampling Tau	Rote Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
1101	71.5	5.0	0			22		
1113	~70		2			23	(first sunshine of days, still light rain)	
1130	~70		4	88		24		
1143	~70		7	87		25		
1155	70	5.0	9	88		25		
1215	~70	5.0	13	87		24		
1230						24	End sample	

sample start 300psi

Comments: t=1152 Changed out gas cylinder <1 min

Figure 1. Flux Chamber Sampling Form

L-B22

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	15 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	D1	Location:	water near sheen
Flux Chamber #:	002	Sampler(s):	BME/EPA
Sweep Air Flow Meter #:	7067-002	PCB Collection Time:	URS A22 1508-1611
Sample Flow Meter #	7063-~~004~~ 002 BME 8-13-00	Weather:	Cloudy, warm

Time	Sweep Air Rota Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Rota Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
1444	69 5.0	0		63 ± 20	23		
1456	~70	2			21		
1508	~70	4	98		20	Rain	
1514		5	94				
1530	70		90		20	Heavy rain	
1555	70		92		20		
1611	STOP						

Comments: Hard rain before start of sampling
Oil boom is doing nothing to contain flow of fresh material. Boom was moved about ~1330.
Sampling done from shore

Figure 1. Flux Chamber Sampling Form

7063-002 used for tests A2 & B2

L-B23

RADIAN

Flux Chamber Measurement Field Data Sheet

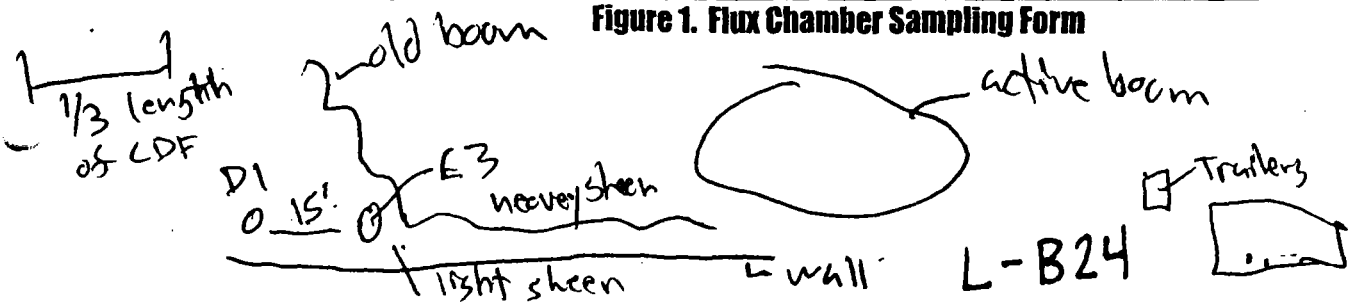
Date:	15 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	C3	Location:	Sheen in CDF
Flux Chamber #:	003	Sampler(s):	EPA; BMS
Sweep Air Flow Meter #:	7067-001	PCB Collection Time:	VRS-A23 1513-1615
Sample Flow Meter #	7063-001	Weather:	Cloudy, warm, some drizzle

Time	Sweep Air Rota Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Rota Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
1449	71 5.0	0		63 = 0.04 L/min	21		
1455	~70	1			21		
1513	~70	4	78		20		
1530	~70		78		20	Heavier rain	
1555	70		78		20		
~~1515~~	STOP						
1615						End of Sample	

Start (BMS 8-15-00)

Comments: Put F/C in area with minimal water depth. Area w/ heavy sheen is ~sand bar, can't access by boat

Figure 1. Flux Chamber Sampling Form



RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	E-3 (Simple Green)	Location:	Oil Sheen
Flux Chamber #:	003	Sampler(s):	BME/EPA
Sweep Air		PCB Collection	VRS-429
Flow Meter #:	7067-001	Time:	1622 - 1722
Sample		Weather:	
Flow Meter #	7063-001		

Time	Sweep Air Rota Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Rota Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
1622	70	0	78				
~~START~~ 1640	70	4	77				
1656	70 5.0	6	77		20		
1722	70 5.0	10	78		20		

Comments: Applied ~6 squirts of simple green directly into chamber from boat at about 1615. Chamber is next to wall in area of heavy sediment loading.

Figure 1. Flux Chamber Sampling Form

L-B25

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	15 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	D-2	Location:	H_2O Near Shear
Flux Chamber #:	002	Sampler(s):	EPA/BME URS-A25
Sweep Air Flow Meter #:	7067-002	PCB Collection Time:	1640-1710
Sample Flow Meter #	7063-002	Weather:	RAIN

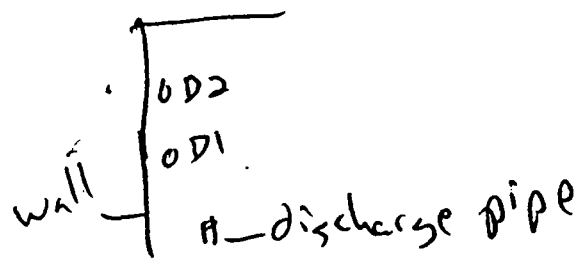
	Time	Sweep Air Rota Setting/ Flow L/min	PCB Sampling Tau	PCB Sampling Rota Setting	PCB Sampling Flow L/min	Temperature (°C) Ambient	Temperature (°C) Chamber	Temperature (°C) Surface
	1616	69	0					
Start	1640	69	4	92				
	1658	~70 5.0	7	92		21	Norgin	
	1720	~70 5.0	~10	92		21		
	1740						END of Sample	

URS-A-25

Comments:

Chamber was moved down wall ~10 ft from location of D1

Figure 1. Flux Chamber Sampling Form



L-B26

A26
G5

RADIAN

Flux Chamber Measurement Field Data Sheet

Date:	16 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	62	Location:	~40' from silt fence
Flux Chamber #:	003	Sampler(s):	BMC
Sweep Air		PCB Collection	VRS A26
Flow Meter #:	7067-003	Time:	1409-
Sample		Weather:	cloudy, warm, light breeze
Flow Meter #	7063-001		

Time	Sweep Air Rota Setting/ Flow L/min		PCB Sampling Tau	Rota Setting	Flow L/min	Temperature (°C) Ambient	Chamber	Surface
1345	70	5.0	0		69=2.0 L/min	16	Readout faulty	
1357	70	5.0	2	85		15		
1409	70	5.0	4	~~98~~ 85	8-16cc		Start sample	
1421	70	5.0	6	85				
1433	70	5.0	8	85				
1451	70	5.0	11	85				
1509	70	5.0	14	85			END	Sample

Comments: No visible sheen or plume
Cut A in location of 2nd set, while 3rd set is being dredged
VRS w26 collected next to chamber at t=1425

Figure 1. Flux Chamber Sampling Form

L-B27

A27
G3

RADIAN

Flux Chamber Measurement Field Data Sheet

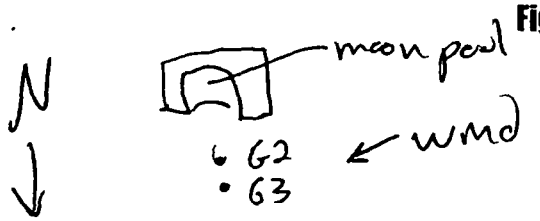
Date:	16 August 2000	Sample Site:	New Bedford Harbor Superfund Site
Test #:	G3	Location:	~ 47' from silt fence
Flux Chamber #:	002	Sampler(s):	BMS
Sweep Air Flow Meter #:	7067-001	PCB Collection Time:	1410-1510 VRS A27
Sample Flow Meter #	7063-002	Weather:	cloudy, warm

Time	Sweep Air Rote Setting/ Flow L/min		PCB Sampling Tau	Rote Setting	Flow L/min	Temperature [°C] Ambient	Chamber	Surface
1346	70	5.0	0		62.5 = 2.04 lpm	17		
1358	70	5.0	2			15		
1410	70	5.0	4	98			Start sample	
1422	70	5.0	6	98				
1434	70	5.0	8	98				
1452	70	5.0	11	98				
1500	70	5.0	14	98		1510	END sample	

t=1500 (to the south)

Comments: Silt fence edging into moon pool, implying flow of surface water is away from samples. Wind from W.

Figure 1. Flux Chamber Sampling Form



L-B28

Attachment C

Summary of Analytical Data

For Emission Flux Air Samples

ALTA

August 24, 2000

Alta Batch I.D.: 8950

Mr. Eric Anderson
Radian Corporation
8501 Mo-Pac Blvd.
Austin, TX 78720

Dear Mr. Anderson,

Enclosed are the results for nine MM5 trains received at Alta Analytical Laboratory on August 17, 2000. This work was authorized under your BOA #AO6 and Work Order #756661.UA. These trains were extracted and analyzed using EPA Method 1668 for PCB congeners and Total PCB's (as per your attached list) using High Resolution Mass Spectrometry (HRMS). A standard turnaround time was requested for this work.

The following report consists of a Sample Inventory (Section I), Analytical Results (Section II) and the Appendix. The Appendix contains a copy of the chain-of-custody, a list of data qualifiers and abbreviations, our current certifications, copies of the raw data.

If you have any questions regarding this report please feel free to contact me.

Sincerely,

Robert S. Mitzel
Vice-President of HRMS Operations

L-C2

Alta Analytical Laboratory Inc.
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762
FAX (916) 933-0940

ALTA

Sample Inventory Report: MM5 Sampling Train

Project No.: 8950 **Project Name:** New Bedford Harbor
Date Rec.: 8/17/00

Lab. Sample ID	Client Sample ID	Component ID
001	URS-A-20	XAD
002	URS-A-21	XAD
003	URS-A-22	XAD
004	URS-A-23	XAD
005	URS-A-24	XAD
006	URS-A-25	XAD
007	URS-A-26	XAD
008	URS-A-27	XAD
009	URS-B-2	XAD

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Method Blank		**Date Received:**	NA	**QC Lot:**	LC0818M
Lab ID:	8950-MB	**Date Extracted:**	8/18/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	ND	1.0	
PCB-18	ND	1.0	
PCB-28	ND	1.0	
PCB-44	ND	1.0	
PCB-52	ND	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	ND	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND		
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	ND	1.0	
Total diCB	ND	1.0	
Total triCB	ND	1.0	
Total tetraCB	ND	1.0	
Total pentaCB	ND	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer: [signature]

L-C4

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Method Blank
Lab ID: 8950-MB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	49	
^{13}C-PCB-9	66	
^{13}C-PCB-28	72	
^{13}C-PCB-37	71	
^{13}C-PCB-77	66	
^{13}C-PCB-101	61	
^{13}C-PCB-118	51	
^{13}C-PCB-105	53	
^{13}C-PCB-126	51	
^{13}C-PCB-138	60	
^{13}C-PCB-156	59	
^{13}C-PCB-157	60	
^{13}C-PCB-169	57	
^{13}C-PCB-180	62	
^{13}C-PCB-202	70	
^{13}C-PCB-194	56	
^{13}C-PCB-208	61	
^{13}C-PCB-209	66	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	NA	
^{13}C-PCB-178	NA	

Dates Analyzed:

DB-1: 8/22/00

Analyst: BS

Reviewer:

L-C5

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

LCS1/LCS2 RESULTS
Lab ID: 8950-LCS1/LCS2
Matrix: MM5

Date Received: NA
Date Extracted: 8/18/00
Sample Amount: Sample

ICAL ID: I1668
QC Lot: LC0818M
Units: NA

Compound	LCS1 %R	LCS2 %R	RPD %
PCB-8	103	105	1.9
PCB-18	81	82	1.2
PCB-28	95	99	4.1
PCB-44	83	82	1.2
PCB-52	80	80	0.0
PCB-66	89	87	2.3
PCB-77	90	90	0.0
PCB-81	85	84	1.2
PCB-90/101	88	99	12
PCB-118	106	104	1.9
PCB-123	103	104	0.97
PCB-105	101	107	5.8
PCB-114	107	109	1.9
PCB-126	97	100	3.0
PCB-151	108	106	1.9
PCB-128	103	103	0.0
PCB-138	101	99	2.0
PCB-153	101	102	0.99
PCB-167	98	106	7.8
PCB-156	103	100	3.0
PCB-157	102	104	1.9
PCB-169	108	105	2.8
PCB-170	108	108	0.0
PCB-180	97	100	3.0
PCB-187	105	104	0.96
PCB-189	106	105	0.95
PCB-195	111	111	0.0
PCB-206	92	99	7.3
PCB-209	99	97	2.0

Analyst: BS

Reviewer:

L-C6

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

LCS1/LCS2 RESULTS
Lab ID: 8950-LCS1/LCS2

Internal Standard:	Isotopic Recovery Results LCS1 %R	LCS2 %R
^{13}C-PCB-3	50	49
^{13}C-PCB-9	62	63
^{13}C-PCB-28	67	65
^{13}C-PCB-37	68	73
^{13}C-PCB-77	68	75
^{13}C-PCB-101	64	67
^{13}C-PCB-118	52	58
^{13}C-PCB-105	53	57
^{13}C-PCB-126	48	57
^{13}C-PCB-138	55	62
^{13}C-PCB-156	55	66
^{13}C-PCB-157	56	64
^{13}C-PCB-169	46	58
^{13}C-PCB-180	65	77
^{13}C-PCB-202	69	82
^{13}C-PCB-194	57	67
^{13}C-PCB-208	60	71
^{13}C-PCB-209	61	76

Dates Analyzed:

DB-1: 8/22/00

Analyst: BS

Reviewer:

L-C7

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-20	Date Received:	8/17/00	QC Lot:	LC0818M
Lab ID:	8950-0001-PCB	Date Extracted:	8/18/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	1600	1.0	
PCB-18	1900	1.0	
PCB-28	690	1.0	
PCB-44	250	1.0	
PCB-52	450	1.0	
PCB-66	15	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	32	1.0	
PCB-118	1.2	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	2.6	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	120	1.0	
Total diCB	5000	1.0	
Total triCB	6800	1.0	
Total tetraCB	2000	1.0	
Total pentaCB	280	1.0	
Total hexaCB	12	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer: [signature]

L-C8

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8950-0001-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	57	
^{13}C-PCB-9	67	
^{13}C-PCB-28	71	
^{13}C-PCB-37	76	
^{13}C-PCB-77	73	
^{13}C-PCB-101	71	
^{13}C-PCB-118	65	
^{13}C-PCB-105	65	
^{13}C-PCB-126	65	
^{13}C-PCB-138	64	
^{13}C-PCB-156	74	
^{13}C-PCB-157	68	
^{13}C-PCB-169	65	
^{13}C-PCB-180	64	
^{13}C-PCB-202	71	
^{13}C-PCB-194	60	
^{13}C-PCB-208	59	
^{13}C-PCB-209	60	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	94	
^{13}C-PCB-178	101	

Dates Analyzed:

DB-1: 8/22/00

Analyst: BS

Reviewer:

L-C9

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-21	**Date Received:**	8/17/00	**QC Lot:**	LC0818M
Lab ID:	8950-0002-PCB	**Date Extracted:**	8/18/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	1700	1.0	
PCB-18	2200	1.0	
PCB-28	880	1.0	
PCB-44	430	1.0	
PCB-52	740	1.0	
PCB-66	21	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	47	1.0	
PCB-118	1.7	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	3.2	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	1.3	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	91	1.0	
Total diCB	5300	1.0	
Total triCB	8400	1.0	
Total tetraCB	3300	1.0	
Total pentaCB	470	1.0	
Total hexaCB	5.5	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C10

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-21
Lab ID: 8950-0002-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
13C-PCB-37	36	
^{13}C-PCB-9	45	
^{13}C-PCB-28	49	
^{13}C-PCB-37	49	
^{13}C-PCB-77	45	
^{13}C-PCB-101	47	
^{13}C-PCB-118	38	
^{13}C-PCB-105	39	
^{13}C-PCB-126	40	
^{13}C-PCB-138	43	
^{13}C-PCB-156	46	
^{13}C-PCB-157	43	
^{13}C-PCB-169	42	
^{13}C-PCB-180	46	
^{13}C-PCB-202	48	
^{13}C-PCB-194	38	
^{13}C-PCB-208	45	
^{13}C-PCB-209	44	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	103	
^{13}C-PCB-178	104	

Dates Analyzed:

DB-1: 8/22/00

Analyst: BS

Reviewer:

L-C11

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-22	**Date Received:**	8/17/00	**QC Lot:**	LC0818M
Lab ID:	8950-0003-PCB	**Date Extracted:**	8/18/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	680	1.0	
PCB-18	810	1.0	
PCB-28	290	1.0	
PCB-44	120	1.0	
PCB-52	210	1.0	
PCB-66	6.9	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	16	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	90	1.0	
Total diCB	2300	1.0	
Total triCB	2800	1.0	
Total tetraCB	920	1.0	
Total pentaCB	130	1.0	
Total hexaCB	3.6	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer: [illegible]

L-C12

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-22
Lab ID: 8950-0003-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	57	
^{13}C-PCB-9	69	
^{13}C-PCB-28	72	
^{13}C-PCB-37	83	
^{13}C-PCB-77	78	
^{13}C-PCB-101	74	
^{13}C-PCB-118	71	
^{13}C-PCB-105	69	
^{13}C-PCB-126	69	
^{13}C-PCB-138	71	
^{13}C-PCB-156	75	
^{13}C-PCB-157	73	
^{13}C-PCB-169	76	
^{13}C-PCB-180	73	
^{13}C-PCB-202	72	
^{13}C-PCB-194	66	
^{13}C-PCB-208	65	
^{13}C-PCB-209	63	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	85	
^{13}C-PCB-178	91	

Dates Analyzed:

DB-1: 8/22/00

Analyst: BS

Reviewer: MF

L-C13

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-23	**Date Received:**	8/17/00	**QC Lot:**	LC0818M
Lab ID:	8950-0004-PCB	**Date Extracted:**	8/18/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	710	1.0	
PCB-18	840	1.0	
PCB-28	100	1.0	
PCB-44	93	1.0	
PCB-52	170	1.0	
PCB-66	1.6	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	4.2	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	49	1.0	
Total diCB	2200	1.0	
Total triCB	2300	1.0	
Total tetraCB	680	1.0	
Total pentaCB	74	1.0	
Total hexaCB	1.1	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C14

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-23
Lab ID: 8950-0004-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	54	
^{13}C-PCB-9	69	
^{13}C-PCB-28	89	
^{13}C-PCB-37	81	
^{13}C-PCB-77	76	
^{13}C-PCB-101	70	
^{13}C-PCB-118	64	
^{13}C-PCB-105	64	
^{13}C-PCB-126	65	
^{13}C-PCB-138	71	
^{13}C-PCB-156	74	
^{13}C-PCB-157	72	
^{13}C-PCB-169	73	
^{13}C-PCB-180	65	
^{13}C-PCB-202	73	
^{13}C-PCB-194	57	
^{13}C-PCB-208	61	
^{13}C-PCB-209	65	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	76	
^{13}C-PCB-178	102	

Dates Analyzed:

DB-1: 8/22/00

Analyst: BS

Reviewer:

L-C15

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-24	**Date Received:**	8/17/00	**QC Lot:**	LC0818M
Lab ID:	8950-0005-PCB	**Date Extracted:**	8/18/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	280	1.0	
PCB-18	520	1.0	
PCB-28	200	1.0	
PCB-44	92	1.0	
PCB-52	160	1.0	
PCB-66	2.2	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	7.8	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	9.3	1.0	
Total diCB	820	1.0	
Total triCB	2000	1.0	
Total tetraCB	670	1.0	
Total pentaCB	90	1.0	
Total hexaCB	1.9	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C16

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-24
Lab ID: 8950-0005-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	52	
^{13}C-PCB-9	67	
^{13}C-PCB-28	62	
^{13}C-PCB-37	79	
^{13}C-PCB-77	76	
^{13}C-PCB-101	73	
^{13}C-PCB-118	67	
^{13}C-PCB-105	68	
^{13}C-PCB-126	66	
^{13}C-PCB-138	71	
^{13}C-PCB-156	76	
^{13}C-PCB-157	75	
^{13}C-PCB-169	72	
^{13}C-PCB-180	69	
^{13}C-PCB-202	75	
^{13}C-PCB-194	63	
^{13}C-PCB-208	65	
^{13}C-PCB-209	69	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	89	
^{13}C-PCB-178	101	

Dates Analyzed:

DB-1: 8/22/00

Analyst: BS

Reviewer:

L-C17

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-25	**Date Received:**	8/17/00	**QC Lot:**	LC0818M
Lab ID:	8950-0006-PCB	**Date Extracted:**	8/18/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	650	1.0	
PCB-18	1100	1.0	
PCB-28	280	1.0	
PCB-44	140	1.0	
PCB-52	230	1.0	
PCB-66	6.9	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	16	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	46	1.0	
Total diCB	2000	1.0	
Total triCB	3400	1.0	
Total tetraCB	1000	1.0	
Total pentaCB	160	1.0	
Total hexaCB	3.4	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C18

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-25
Lab ID: 8950-0006-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	43	
^{13}C-PCB-9	59	
^{13}C-PCB-28	54	
^{13}C-PCB-37	69	
^{13}C-PCB-77	69	
^{13}C-PCB-101	71	
^{13}C-PCB-118	52	
^{13}C-PCB-105	52	
^{13}C-PCB-126	48	
^{13}C-PCB-138	63	
^{13}C-PCB-156	63	
^{13}C-PCB-157	63	
^{13}C-PCB-169	58	
^{13}C-PCB-180	68	
^{13}C-PCB-202	79	
^{13}C-PCB-194	51	
^{13}C-PCB-208	64	
^{13}C-PCB-209	67	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	70	
^{13}C-PCB-178	78	

Dates Analyzed:

DB-1: 8/23/00

Analyst: BS

Reviewer:

L-C19

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-26	**Date Received:**	8/17/00	**QC Lot:**	LC0818M
Lab ID:	8950-0007-PCB	**Date Extracted:**	8/18/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	94	1.0	
PCB-18	130	1.0	
PCB-28	90	1.0	
PCB-44	28	1.0	
PCB-52	45	1.0	
PCB-66	5.4	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	11	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	ND	1.0	
Total diCB	310	1.0	
Total triCB	600	1.0	
Total tetraCB	220	1.0	
Total pentaCB	76	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C20

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-26
Lab ID: 8950-0007-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	41	
^{13}C-PCB-9	54	
^{13}C-PCB-28	47	
^{13}C-PCB-37	58	
^{13}C-PCB-77	63	
^{13}C-PCB-101	59	
^{13}C-PCB-118	42	
^{13}C-PCB-105	44	
^{13}C-PCB-126	40	
^{13}C-PCB-138	54	
^{13}C-PCB-156	56	
^{13}C-PCB-157	56	
^{13}C-PCB-169	51	
^{13}C-PCB-180	57	
^{13}C-PCB-202	64	
^{13}C-PCB-194	41	
^{13}C-PCB-208	50	
^{13}C-PCB-209	56	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	87	
^{13}C-PCB-178	98	

Dates Analyzed:

DB-1: 8/23/00

Analyst: BS

Reviewer:

L-C21

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-27	Date Received:	8/17/00	QC Lot:	LC0818M
Lab ID:	8950-0008-PCB	Date Extracted:	8/18/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	81	1.0	
PCB-18	110	1.0	
PCB-28	68	1.0	
PCB-44	39	1.0	
PCB-52	62	1.0	
PCB-66	3.8	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	9.5	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	ND	1.0	
Total diCB	270	1.0	
Total triCB	500	1.0	
Total tetraCB	290	1.0	
Total pentaCB	80	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C22

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-27
Lab ID: 8950-0008-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	52	
^{13}C-PCB-9	69	
^{13}C-PCB-28	80	
^{13}C-PCB-37	78	
^{13}C-PCB-77	85	
^{13}C-PCB-101	76	
^{13}C-PCB-118	60	
^{13}C-PCB-105	59	
^{13}C-PCB-126	61	
^{13}C-PCB-138	74	
^{13}C-PCB-156	75	
^{13}C-PCB-157	78	
^{13}C-PCB-169	71	
^{13}C-PCB-180	73	
^{13}C-PCB-202	81	
^{13}C-PCB-194	54	
^{13}C-PCB-208	64	
^{13}C-PCB-209	70	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	83	
^{13}C-PCB-178	104	

Dates Analyzed:

DB-1: 8/23/00

Analyst: BS

Reviewer:

L-C23

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-B-2	**Date Received:**	8/17/00	**QC Lot:**	LC0818M
Lab ID:	8950-0009-PCB	**Date Extracted:**	8/18/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	ND	1.0	
PCB-18	ND	1.0	
PCB-28	ND	1.0	
PCB-44	ND	1.0	
PCB-52	ND	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	ND	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	ND	1.0	
Total diCB	ND	1.0	
Total triCB	ND	1.0	
Total tetraCB	ND	1.0	
Total pentaCB	ND	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C24

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-B-2
Lab ID: 8950-0009-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	50	
^{13}C-PCB-9	66	
^{13}C-PCB-28	91	
^{13}C-PCB-37	75	
^{13}C-PCB-77	74	
^{13}C-PCB-101	76	
^{13}C-PCB-118	60	
^{13}C-PCB-105	57	
^{13}C-PCB-126	57	
^{13}C-PCB-138	69	
^{13}C-PCB-156	74	
^{13}C-PCB-157	76	
^{13}C-PCB-169	68	
^{13}C-PCB-180	69	
^{13}C-PCB-202	76	
^{13}C-PCB-194	53	
^{13}C-PCB-208	61	
^{13}C-PCB-209	70	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	90	
^{13}C-PCB-178	105	

Dates Analyzed:

DB-1: 8/23/00

Analyst: BS

Reviewer:

L-C25

DATA QUALIFIERS & ABBREVIATIONS

A	The amount detected is below the Method Calibration Limit.
B	This compound was also detected in the blank.
C	The amount detected is less than five times the Method Quantitation Limit.
D	The amount reported is the maximum possible concentration.
E	The detection limit was raised above the Method Quantitation Limit due to chemical interference's.
F	This result has been confirmed on a DB-225 column.
G	This result has been confirmed on a SP-2331 column.
H	The signal-to-noise ratio is greater than 10:1.
I	Chemical Interference

Conc.	Concentration
D.L.	Detection Limit
NA	Not applicable
S/N	Signal-to-noise
*	See Cover Letter
ND	Not Detected
MPC	Maximum Possible Concentration

CURRENT CERTIFICATIONS

ALTA

Bureau of Reclamation-Mid-Pacific Region---(MP-470, Res-1.10)

Commonwealth of Kentucky---(Certificate No. 90063)

Commonwealth of Virginia---(Certificate No. 00013)

State of Alaska, Department of Environmental Conservation---(Certificate No. OS-00197)

State of Arkansas, Department of Health---(Approval granted through CA certification)

State of Arkansas, Department of Environmental Quality---

State of California---(Certificate No. 1640)

State of Connecticut---(Certificate No. PH-0182)

State of Florida---(Certificate No. 87456)

State of Louisiana---(Certificate No. 98-33)

State of Mississippi---(Approval granted through CA certification)

State of Nevada---(Certificate No. CA413)

State of New York, Department of Health---(Certificate No. 11411)

State of North Carolina---(Certificate No. 06700)

State of North Dakota, Department of Health---(Certificate No. R-078)

State of Oregon---

State of Pennsylvania---(Certificate No. 68-490)

State of South Carolina---(Certificate No. 87002001)

State of Texas — (Certificate No. TX247-2000A)

State of Tennessee---(Certificate No. 02996)

State of Utah---(Certificate No. E-201)

State of Washington, Department of Ecology---(Certification No. C091)

State of Wisconsin---(Certificate No. 998036160)

State of Wyoming---(Ref: 8ES-LB)

U.S. Army Corps of Engineers

U.S. 5 EPA Region

May 2000

L-C27

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

Chain of Custody Record

Page 1 of 1

PROJECT: Foster Wheeler

SITE: New Bedford Harbor

PREPARED BY (Signature):

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	ANALYSES: PCB										REMARKS
URS-A20	KAD	8/15/1128-1228			X										Test B-2
URS A21		8/15/1130-1230			X										Test B-3
URS A22		8/15/1508-1611			X										Test D-1 (FIA)
URS A23		8/15/1513-1615			X										Test ~~E-3~~ C-B
URS-A24		8/15/1622-1722			X										Test ~~E~~-3
URS-A25		8/15/1640-1740			X										Test D-2
URS A26		8/16/1409-1509			X										Test 6-2
URS A27		8/16/1410-1510			X										Test 6-3
URS B-2		8/16			X										Field Blank

REMARKS

RELINQUISHED BY: DATE 8/16 TIME 1440

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
	8/17	1020							

REMARKS:

IEG-AVFH13-96-30337coc.FH8

L-C28

Statement of Work

Plus - Mono - Deca Totals

Table 1
NOAA and WHO List of PCB Congeners

Analyte	BZ#	NOAA	WHO
2,4'-DiCB	8	X	
2,5,2'-TriCB	18	X	
2,4,4'-TriCB	28	X	
2,3,6,2'-TetraCB	44	X	
2,5,2',5'-TetraCB	52	X	
2,4,3',4'-TetraCB	66	X	
3,4,3',4'-TetraCB	77		X
3,4,5,4'-TetraCB	81		X
2,4,5,2',5'-PentaCB	101	X	
2,3,4,3',4'-PentaCB	105	X	X
2,3,4,5,4'-PentaCB	114		X
2,4,5,3',4'-PentaCB	118	X	X
3,4,5,2',4'-PentaCB	123		X
3,4,5,3',4'-PentaCB	126		X
2,3,4,2',3',4'-HexaCB	128	X	
2,3,4,2',4',5'-HexaCB	138	X	
2,4,5,2',4',5'-HexaCB	153	X	
2,3,4,5,3',4'-HexaCB	156		X
2,3,4,3',4',5'-HexaCB	157		X
2,4,5,3',4',5'-HexaCB	167		X
3,4,5,3',4',5'-HexaCB	169		X
2,3,4,5,2',3',4'-HeptaCB	170	X	X
2,3,4,5,2',4',5'-HeptaCB	180	X	X
2,3,5,6,2',4',5'-HeptaCB	187	X	
2,3,4,5,3',4',5'-HeptaCB	189		X
2,3,4,5,6,2',3',4'-OctaCB	195	X	
2,3,4,5,6,2',3',4',5'-NonaCB	206	X	
Deca-CB	209	X	

$1200

detail the minimum quality control criteria used to measure acceptability of the method performance. At a minimum these documents will include the following:

AP 11
- Procedure and documentation for the preparation of analyte free sample media

SOP 10B
- Procedure for receiving and storing samples and sample extracts

SOP 7B
- Procedure for reporting laboratory data, including documentation of the ability to provide electronic data deliverables in the required format.
- Procedure for implementing and maintaining Y2K compliance for all aspects of laboratory operations

AP 30
- Reporting limits for PCB homologue groups and selected congeners
- Initial and continuing calibration frequency, target analyte list, concentration, and acceptance criteria
- Surrogate compound list, concentration, and acceptable recovery limits
- Internal standard compound list, concentration, and acceptable recovery limits
- Cleanup recovery standard compound list, concentration, and acceptable recovery limits

L-C29

Attachment 10.B.1

SAMPLE LOG-IN CHECKLIST

ALTA Project No.: 8950 **Client/Protocol No.** N/A

1. Date Samples Arrived: 8-17-00 Initials: [illegible] Location: WR-1			
2. Time / Date logged in: 8-17-00 1400 Initials: [illegible] Location: WR-1			
3. Samples Arrived By: (circle) (FedEx) UPS World Courier Other:			
4. Shipping Preservation: (circle) Ice / (Blue Ice) / Dry Ice / None **Temp** °C 3			
	YES	**NO**	**NA**
5. Shipping Container(s) Intact"? If not, describe condition in comment section.	X		
6. Shipping Container(s) Custody Seals Present?		X	
Intact? If not intact, describe condition in comment section.			X
7. Shipping Documentation Present? (circle) Shipping Label (Airbill) Tracking Number FedEx 8110 6516 0818 FedEx Tracking Number for Customer	X		
8. Sample Custody Seal(s) Present? No. of Seals____ or Seal No.____		X	
Intact? If not intact, describe condition in comment section.			X
9. Sample Container Intact? If no, indicate sample condition in comment section.	X		
10. Chain of Custody (COC) or other Sample Documentation Present?	X		
11. COC/Documentation Acceptable? If no, complete COC Anomaly Form.	X		
12. Shipping Container (circle): (ALTA) Client (Retain) or Return or Disposed			
13. Container(s) and/or Bottle(s) Requested?		X	
14. Sample Control Check In/Out Log Completed? (HRMS Only)	X		
15. Drinking Water Sample? (HRMS Only) If yes, Acceptable Preservation? Y or N Preservation Info From? (circle) COC or Sample Container or None Noted			X
16. Number of Samples Received: N/A			

Name: _____ Date Samples Reconciled: _____
(Signature Required for LCMS Only)

Comments:

L-C30

ALTA

August 29, 2000

Alta Batch I.D.: 8944

Mr. Eric Anderson
Radian Corporation
8501 Mo-Pac Blvd.
Austin, TX 78720

Dear Mr. Anderson,

Enclosed are the results for twenty MM5 trains received at Alta Analytical Laboratory on August 17, 2000. This work was authorized under your BOA #AO6 and Work Order #756661.UA. These trains were extracted and analyzed using EPA Method 1668 for PCB congeners and Total PCB's (as per your attached list) using High Resolution Mass Spectrometry (HRMS). A standard turnaround time was requested for this work.

The following report consists of a Sample Inventory (Section I), Analytical Results (Section II) and the Appendix. The Appendix contains a copy of the chain-of-custody, a list of data qualifiers and abbreviations, our current certifications, copies of the raw data.

If you have any questions regarding this report please feel free to contact me.

Sincerely,

Robert S. Mitzel
Vice-President of HRMS Operations

L-C31

Alta Analytical Laboratory Inc.
5070 Robert J. Mathews Parkway
El Dorado Hills, CA 95762
FAX (916) 933-0940

ALTA

Sample Inventory Report: MM5 Sampling Train

Project No.: 8944 **Project Name:** New Bedford Harbor
Date Rec.: 8/16/00

Lab. Sample ID	Client Sample ID	Component ID
001	URS-A-1	XAD
002	URS-A-2	XAD
003	URS-A-3	XAD
004	URS-B-1	XAD
005	URS-A-4	XAD
006	URS-A-5	XAD
007	URS-A-6	XAD
008	URS-A-7	XAD
009	URS-A-8	XAD
010	URS-A-9	XAD
011	URS-A-10	XAD
012	URS-A-11	XAD
013	URS-A-12	XAD
014	URS-A-13	XAD
015	URS-A-14	XAD
016	URS-A-15	XAD
017	URS-A-16	XAD
018	URS-A-17	XAD
019	URS-A-18	XAD
020	URS-A-19	XAD

SECTION II.

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Method Blank		Date Received:	NA	QC Lot:	LC0821M
Lab ID:	8944-MB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	ND	1.0	
PCB-18	ND	1.0	
PCB-28	ND	1.0	
PCB-44	ND	1.0	
PCB-52	ND	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	ND	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	ND	1.0	
Total diCB	ND	1.0	
Total triCB	ND	1.0	
Total tetraCB	ND	1.0	
Total pentaCB	ND	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C34

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Method Blank
Lab ID: 8944-MB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	51	
^{13}C-PCB-9	69	
^{13}C-PCB-28	87	
^{13}C-PCB-37	85	
^{13}C-PCB-77	82	
^{13}C-PCB-101	81	
^{13}C-PCB-118	107	
^{13}C-PCB-105	107	
^{13}C-PCB-126	94	
^{13}C-PCB-138	84	
^{13}C-PCB-156	81	
^{13}C-PCB-157	81	
^{13}C-PCB-169	68	
^{13}C-PCB-180	88	
^{13}C-PCB-202	98	
^{13}C-PCB-194	130	
^{13}C-PCB-208	106	
^{13}C-PCB-209	97	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	NA	
^{13}C-PCB-178	NA	

Dates Analyzed:

DB-1: 8/24/00

Analyst: BS

Reviewer:

L-C35

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

LCS1/LCS2 RESULTS
Lab ID: 8944-LCS1/LCS2
Matrix: MM5

Date Received: NA
Date Extracted: 8/21/00
Sample Amount: Sample

ICAL ID: I1668
QC Lot: LC0821M
Units: NA

Compound	LCS1 %R	LCS2 %R	RPD %
PCB-8	110	113	2.7
PCB-18	81	84	3.6
PCB-28	118	120	1.7
PCB-44	103	98	5.0
PCB-52	105	95	10
PCB-66	116	107	8.1
PCB-77	104	98	5.9
PCB-81	103	97	6.0
PCB-90/101	99	101	2.0
PCB-118	123	121	1.6
PCB-123	116	115	0.87
PCB-105	116	116	0.0
PCB-114	120	123	2.6
PCB-126	112	108	3.6
PCB-151	128	115	11
PCB-128	110	106	3.7
PCB-138	108	108	0.0
PCB-153	113	110	2.7
PCB-167	108	106	1.9
PCB-156	111	114	2.7
PCB-157	113	113	0
PCB-169	107	107	0
PCB-170	109	108	0.92
PCB-180	103	104	0.97
PCB-187	114	114	0.0
PCB-189	103	101	3.8
PCB-195	127	126	0.79
PCB-206	114	112	1.8
PCB-209	105	105	0.0

Analyst: BS

Reviewer: SM

L-C36

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

LCS1/LCS2 RESULTS
Lab ID: 8944-LCS1/LCS2

Internal Standard:	Isotopic Recovery Results LCS1 %R	LCS2 %R
^{13}C-PCB-3	48	41
^{13}C-PCB-9	63	53
^{13}C-PCB-28	63	49
^{13}C-PCB-37	70	53
^{13}C-PCB-77	73	62
^{13}C-PCB-101	71	57
^{13}C-PCB-118	78	67
^{13}C-PCB-105	82	68
^{13}C-PCB-126	74	60
^{13}C-PCB-138	67	57
^{13}C-PCB-156	67	53
^{13}C-PCB-157	65	54
^{13}C-PCB-169	57	46
^{13}C-PCB-180	77	61
^{13}C-PCB-202	92	72
^{13}C-PCB-194	102	84
^{13}C-PCB-208	87	72
^{13}C-PCB-209	81	67

Dates Analyzed:

DB-1: 8/24/00

Analyst: BS

Reviewer:

L-C37

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-1	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0001-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	15	1.0	
PCB-18	160	1.0	
PCB-28	280	1.0	
PCB-44	370	1.0	
PCB-52	640	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	50	1.0	
PCB-118	1.5	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	3.2	1.0	
PCB-128	ND	1.0	
PCB-138	1.4	1.0	
PCB-153	1.4	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	ND	1.0	
Total diCB	170	1.0	
Total triCB	1600	1.0	
Total tetraCB	2800	1.0	
Total pentaCB	320	1.0	
Total hexaCB	27	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: MS

Reviewer: [illegible]

L-C38

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0001-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	40	
^{13}C-PCB-9	58	
^{13}C-PCB-28	74	
^{13}C-PCB-37	65	
^{13}C-PCB-77	69	
^{13}C-PCB-101	68	
^{13}C-PCB-118	95	
^{13}C-PCB-105	93	
^{13}C-PCB-126	85	
^{13}C-PCB-138	73	
^{13}C-PCB-156	71	
^{13}C-PCB-157	69	
^{13}C-PCB-169	61	
^{13}C-PCB-180	71	
^{13}C-PCB-202	80	
^{13}C-PCB-194	112	
^{13}C-PCB-208	92	
^{13}C-PCB-209	80	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	102	
^{13}C-PCB-178	106	

Dates Analyzed:

DB-1: 8/25/00

Analyst: MS

Reviewer:

L-C39

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-2	Date Received:	8/16/00	QC Lot:	LC0821M
Lab ID:	8944-0002-PCB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	84	1.0	
PCB-18	140	1.0	
PCB-28	71	1.0	
PCB-44	22	1.0	
PCB-52	93	1.0	
PCB-66	2.5	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	3.6	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	7.7	1.0	
Total diCB	350	1.0	
Total triCB	580	1.0	
Total tetraCB	310	1.0	
Total pentaCB	23	1.0	
Total hexaCB	1.6	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: MS

Reviewer:

L-C40

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0002-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	46	
^{13}C-PCB-9	68	
^{13}C-PCB-28	83	
^{13}C-PCB-37	71	
^{13}C-PCB-77	77	
^{13}C-PCB-101	78	
^{13}C-PCB-118	107	
^{13}C-PCB-105	104	
^{13}C-PCB-126	97	
^{13}C-PCB-138	82	
^{13}C-PCB-156	79	
^{13}C-PCB-157	79	
^{13}C-PCB-169	68	
^{13}C-PCB-180	85	
^{13}C-PCB-202	94	
^{13}C-PCB-194	134	
^{13}C-PCB-208	108	
^{13}C-PCB-209	94	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	110	
^{13}C-PCB-178	110	

Dates Analyzed:

DB-1: 8/25/00

Analyst: MS

Reviewer: [signature]

L-C41

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-3	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0003-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	25	1.0	
PCB-18	66	1.0	
PCB-28	32	1.0	
PCB-44	13	1.0	
PCB-52	51	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	2.1	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	ND	1.0	
Total diCB	120	1.0	
Total triCB	270	1.0	
Total tetraCB	170	1.0	
Total pentaCB	14	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: MS

Reviewer: [illegible]

L-C42

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0003-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	41	
^{13}C-PCB-9	56	
^{13}C-PCB-28	68	
^{13}C-PCB-37	54	
^{13}C-PCB-77	56	
^{13}C-PCB-101	59	
^{13}C-PCB-118	82	
^{13}C-PCB-105	83	
^{13}C-PCB-126	75	
^{13}C-PCB-138	63	
^{13}C-PCB-156	63	
^{13}C-PCB-157	60	
^{13}C-PCB-169	53	
^{13}C-PCB-180	60	
^{13}C-PCB-202	65	
^{13}C-PCB-194	97	
^{13}C-PCB-208	78	
^{13}C-PCB-209	66	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	114	
^{13}C-PCB-178	110	

Dates Analyzed:

DB-1: 8/25/00

Analyst: MS

Reviewer:

L-C43

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-B-1	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0004-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	ND	1.0	
PCB-18	ND	1.0	
PCB-28	ND	1.0	
PCB-44	ND	1.0	
PCB-52	ND	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	ND	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	ND	1.0	
Total diCB	1.4	1.0	
Total triCB	ND	1.0	
Total tetraCB	ND	1.0	
Total pentaCB	ND	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: MS

Reviewer: BM

L-C44

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0004-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	39	
^{13}C-PCB-9	57	
^{13}C-PCB-28	58	
^{13}C-PCB-37	59	
^{13}C-PCB-77	58	
^{13}C-PCB-101	62	
^{13}C-PCB-118	88	
^{13}C-PCB-105	87	
^{13}C-PCB-126	80	
^{13}C-PCB-138	67	
^{13}C-PCB-156	66	
^{13}C-PCB-157	64	
^{13}C-PCB-169	58	
^{13}C-PCB-180	62	
^{13}C-PCB-202	69	
^{13}C-PCB-194	98	
^{13}C-PCB-208	79	
^{13}C-PCB-209	67	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	106	
^{13}C-PCB-178	106	

Dates Analyzed:

DB-1: 8/25/00

Analyst: MS

Reviewer:

L-C45

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-4	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0005-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	57	1.0	
PCB-18	57	1.0	
PCB-28	2.7	1.0	
PCB-44	3.2	1.0	
PCB-52	9.4	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	ND	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	8.4	1.0	
Total diCB	210	1.0	
Total triCB	130	1.0	
Total tetraCB	33	1.0	
Total pentaCB	1.2	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: MS

Reviewer:

L-C46

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0005-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	40	
^{13}C-PCB-9	59	
^{13}C-PCB-28	61	
^{13}C-PCB-37	60	
^{13}C-PCB-77	65	
^{13}C-PCB-101	69	
^{13}C-PCB-118	91	
^{13}C-PCB-105	92	
^{13}C-PCB-126	86	
^{13}C-PCB-138	70	
^{13}C-PCB-156	70	
^{13}C-PCB-157	66	
^{13}C-PCB-169	62	
^{13}C-PCB-180	68	
^{13}C-PCB-202	74	
^{13}C-PCB-194	106	
^{13}C-PCB-208	85	
^{13}C-PCB-209	73	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	104	
^{13}C-PCB-178	106	

Dates Analyzed:

DB-1: 8/25/00

Analyst: MS

Reviewer: [illegible]

L-C47

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-5	Date Received:	8/16/00	QC Lot:	LC0821M
Lab ID:	8944-0006-PCB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	120	1.0	
PCB-18	160	1.0	
PCB-28	5.0	1.0	
PCB-44	11	1.0	
PCB-52	29	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	ND	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	22	1.0	
Total diCB	420	1.0	
Total triCB	320	1.0	
Total tetraCB	100	1.0	
Total pentaCB	3.4	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: MS

Reviewer: [illegible]

L-C48

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0006-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	46	
^{13}C-PCB-9	53	
^{13}C-PCB-28	63	
^{13}C-PCB-37	56	
^{13}C-PCB-77	48	
^{13}C-PCB-101	55	
^{13}C-PCB-118	65	
^{13}C-PCB-105	64	
^{13}C-PCB-126	65	
^{13}C-PCB-138	56	
^{13}C-PCB-156	63	
^{13}C-PCB-157	58	
^{13}C-PCB-169	60	
^{13}C-PCB-180	46	
^{13}C-PCB-202	47	
^{13}C-PCB-194	589	
^{13}C-PCB-208	54	
^{13}C-PCB-209	50	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	114	
^{13}C-PCB-178	102	

Dates Analyzed:

DB-1: 8/25/00

Analyst: MS

Reviewer:

L-C49

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-6	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0007-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	120	1.0	
PCB-18	150	1.0	
PCB-28	11	1.0	
PCB-44	19	1.0	
PCB-52	46	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	ND	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	16	1.0	
Total diCB	370	1.0	
Total triCB	360	1.0	
Total tetraCB	160	1.0	
Total pentaCB	10	1.0	
Total hexaCB	ND	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: MS

Reviewer: [illegible]

L-C50

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0007-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	53	
^{13}C-PCB-9	62	
^{13}C-PCB-28	72	
^{13}C-PCB-37	62	
^{13}C-PCB-77	60	
^{13}C-PCB-101	65	
^{13}C-PCB-118	76	
^{13}C-PCB-105	76	
^{13}C-PCB-126	73	
^{13}C-PCB-138	68	
^{13}C-PCB-156	73	
^{13}C-PCB-157	66	
^{13}C-PCB-169	66	
^{13}C-PCB-180	54	
^{13}C-PCB-202	55	
^{13}C-PCB-194	64	
^{13}C-PCB-208	65	
^{13}C-PCB-209	59	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	102	
^{13}C-PCB-178	104	

Dates Analyzed:

DB-1: 8/25/00

Analyst: MS

Reviewer:

L-C51

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-7	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0008-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	41	1.0	
PCB-18	68	1.0	
PCB-28	27	1.0	
PCB-44	20	1.0	
PCB-52	49	1.0	
PCB-66	5.7	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	5.9	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	2.3	1.0	
Total diCB	80	1.0	
Total triCB	230	1.0	
Total tetraCB	200	1.0	
Total pentaCB	27	1.0	
Total hexaCB	2.2	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: RS

Reviewer: [illegible]

L-C52

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0008-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	33	
^{13}C-PCB-9	57	
^{13}C-PCB-28	73	
^{13}C-PCB-37	67	
^{13}C-PCB-77	54	
^{13}C-PCB-101	59	
^{13}C-PCB-118	68	
^{13}C-PCB-105	68	
^{13}C-PCB-126	66	
^{13}C-PCB-138	64	
^{13}C-PCB-156	68	
^{13}C-PCB-157	66	
^{13}C-PCB-169	65	
^{13}C-PCB-180	52	
^{13}C-PCB-202	53	
^{13}C-PCB-194	58	
^{13}C-PCB-208	60	
^{13}C-PCB-209	55	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	108	
^{13}C-PCB-178	104	

Dates Analyzed:

DB-1: 8/25/00

Analyst: RS

Reviewer:

L-C53

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-8	Date Received:	8/16/00	QC Lot:	LC0821M
Lab ID:	8944-0009-PCB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	31	1.0	
PCB-18	42	1.0	
PCB-28	14	1.0	
PCB-44	9.8	1.0	
PCB-52	28	1.0	
PCB-66	1.9	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	3.3	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	ND	1.0	
Total diCB	64	1.0	
Total triCB	140	1.0	
Total tetraCB	110	1.0	
Total pentaCB	16	1.0	
Total hexaCB	1.5	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: RS

Reviewer: [illegible]

L-C 54

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0009-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	38	
^{13}C-PCB-9	44	
^{13}C-PCB-28	66	
^{13}C-PCB-37	45	
^{13}C-PCB-77	48	
^{13}C-PCB-101	48	
^{13}C-PCB-118	53	
^{13}C-PCB-105	53	
^{13}C-PCB-126	49	
^{13}C-PCB-138	51	
^{13}C-PCB-156	52	
^{13}C-PCB-157	48	
^{13}C-PCB-169	46	
^{13}C-PCB-180	43	
^{13}C-PCB-202	46	
^{13}C-PCB-194	49	
^{13}C-PCB-208	54	
^{13}C-PCB-209	49	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	104	
^{13}C-PCB-178	112	

Dates Analyzed:

DB-1: 8/25/00

Analyst: RS

Reviewer:

L-C55

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-9	Date Received:	8/16/00	QC Lot:	LC0821M
Lab ID:	8944-0010-PCB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	120	1.0	
PCB-18	140	1.0	
PCB-28	62	1.0	
PCB-44	36	1.0	
PCB-52	78	1.0	
PCB-66	9.7	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	17	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	1.2	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	4.3	1.0	
Total diCB	290	1.0	
Total triCB	520	1.0	
Total tetraCB	340	1.0	
Total pentaCB	76	1.0	
Total hexaCB	8.3	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: RS

Reviewer: [illegible]

L-C56

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0010-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	48	
^{13}C-PCB-9	69	
^{13}C-PCB-28	101	
^{13}C-PCB-37	80	
^{13}C-PCB-77	73	
^{13}C-PCB-101	72	
^{13}C-PCB-118	97	
^{13}C-PCB-105	98	
^{13}C-PCB-126	100	
^{13}C-PCB-138	83	
^{13}C-PCB-156	96	
^{13}C-PCB-157	88	
^{13}C-PCB-169	99	
^{13}C-PCB-180	61	
^{13}C-PCB-202	57	
^{13}C-PCB-194	69	
^{13}C-PCB-208	70	
^{13}C-PCB-209	63	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	88	
^{13}C-PCB-178	98	

Dates Analyzed:

DB-1: 8/26/00

Analyst: RS

Reviewer: [illegible]

L-C57

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-10	Date Received:	8/16/00	QC Lot:	LC0821M
Lab ID:	8944-0011-PCB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	2800	1.0	
PCB-18	2000	1.0	
PCB-28	360	1.0	
PCB-44	150	1.0	
PCB-52	290	1.0	
PCB-66	6.8	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	8.5	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	620	1.0	
Total diCB	9700	1.0	
Total triCB	5500	1.0	
Total tetraCB	1300	1.0	
Total pentaCB	59	1.0	
Total hexaCB	2.7	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: RS

Reviewer:

L-C58

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0011-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	52	
^{13}C-PCB-9	75	
^{13}C-PCB-28	92	
^{13}C-PCB-37	76	
^{13}C-PCB-77	69	
^{13}C-PCB-101	74	
^{13}C-PCB-118	92	
^{13}C-PCB-105	91	
^{13}C-PCB-126	86	
^{13}C-PCB-138	82	
^{13}C-PCB-156	87	
^{13}C-PCB-157	82	
^{13}C-PCB-169	84	
^{13}C-PCB-180	64	
^{13}C-PCB-202	65	
^{13}C-PCB-194	73	
^{13}C-PCB-208	77	
^{13}C-PCB-209	72	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	112	
^{13}C-PCB-178	100	

Dates Analyzed:

DB-1: 8/26/00

Analyst: RS

Reviewer:

L-C59

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-11	Date Received:	8/16/00	QC Lot:	LC0821M
Lab ID:	8944-0012-PCB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	1800	1.0	
PCB-18	1100	1.0	
PCB-28	160	1.0	
PCB-44	75	1.0	
PCB-52	120	1.0	
PCB-66	3.7	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	ND	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	460	1.0	
Total diCB	6400	1.0	
Total triCB	2900	1.0	
Total tetraCB	580	1.0	
Total pentaCB	28	1.0	
Total hexaCB	1.5	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: RS

Reviewer: [signature]

L-C60

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0012-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	46	
^{13}C-PCB-9	64	
^{13}C-PCB-28	85	
^{13}C-PCB-37	67	
^{13}C-PCB-77	67	
^{13}C-PCB-101	65	
^{13}C-PCB-118	80	
^{13}C-PCB-105	78	
^{13}C-PCB-126	75	
^{13}C-PCB-138	71	
^{13}C-PCB-156	76	
^{13}C-PCB-157	72	
^{13}C-PCB-169	76	
^{13}C-PCB-180	52	
^{13}C-PCB-202	53	
^{13}C-PCB-194	56	
^{13}C-PCB-208	61	
^{13}C-PCB-209	60	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	90	
^{13}C-PCB-178	98	

Dates Analyzed:

DB-1: 8/26/00

Analyst: RS

Reviewer:

L-C61

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-12	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0013-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	3900	1.0	
PCB-18	2600	1.0	
PCB-28	650	1.0	
PCB-44	240	1.0	
PCB-52	420	1.0	
PCB-66	14	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	17	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	670	1.0	
Total diCB	13000	1.0	
Total triCB	8000	1.0	
Total tetraCB	2000	1.0	
Total pentaCB	110	1.0	
Total hexaCB	5.1	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: RS

Reviewer: [illegible]

L-C62

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0013-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	45	
^{13}C-PCB-9	64	
^{13}C-PCB-28	81	
^{13}C-PCB-37	59	
^{13}C-PCB-77	62	
^{13}C-PCB-101	58	
^{13}C-PCB-118	73	
^{13}C-PCB-105	71	
^{13}C-PCB-126	67	
^{13}C-PCB-138	66	
^{13}C-PCB-156	69	
^{13}C-PCB-157	65	
^{13}C-PCB-169	63	
^{13}C-PCB-180	53	
^{13}C-PCB-202	54	
^{13}C-PCB-194	56	
^{13}C-PCB-208	66	
^{13}C-PCB-209	61	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	96	
^{13}C-PCB-178	102	

Dates Analyzed:

DB-1: 8/26/00

Analyst: RS

Reviewer: [illegible]

L-C63

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-13	Date Received:	8/16/00	QC Lot:	LC0821M
Lab ID:	8944-0014-PCB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	2000	1.0	
PCB-18	1600	1.0	
PCB-28	320	1.0	
PCB-44	140	1.0	
PCB-52	250	1.0	
PCB-66	7.9	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	9.2	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	380	1.0	
Total diCB	6600	1.0	
Total triCB	4400	1.0	
Total tetraCB	1200	1.0	
Total pentaCB	64	1.0	
Total hexaCB	2.4	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: RS

Reviewer: BM

L-C64

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0014-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	49	
^{13}C-PCB-9	67	
^{13}C-PCB-28	85	
^{13}C-PCB-37	69	
^{13}C-PCB-77	64	
^{13}C-PCB-101	67	
^{13}C-PCB-118	76	
^{13}C-PCB-105	75	
^{13}C-PCB-126	70	
^{13}C-PCB-138	72	
^{13}C-PCB-156	77	
^{13}C-PCB-157	70	
^{13}C-PCB-169	71	
^{13}C-PCB-180	52	
^{13}C-PCB-202	52	
^{13}C-PCB-194	54	
^{13}C-PCB-208	62	
^{13}C-PCB-209	60	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	110	
^{13}C-PCB-178	104	

Dates Analyzed:

DB-1: 8/26/00

Analyst: RS

Reviewer: BM

L-C65

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-14	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0015-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	440	1.0	
PCB-18	460	1.0	
PCB-28	230	1.0	
PCB-44	140	1.0	
PCB-52	230	1.0	
PCB-66	11	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	16	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	29	1.0	
Total diCB	1400	1.0	
Total triCB	2000	1.0	
Total tetraCB	1000	1.0	
Total pentaCB	100	1.0	
Total hexaCB	5.9	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: RS

Reviewer: [illegible]

L-C66

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0015-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	52	
^{13}C-PCB-9	70	
^{13}C-PCB-28	88	
^{13}C-PCB-37	72	
^{13}C-PCB-77	68	
^{13}C-PCB-101	72	
^{13}C-PCB-118	85	
^{13}C-PCB-105	84	
^{13}C-PCB-126	81	
^{13}C-PCB-138	78	
^{13}C-PCB-156	87	
^{13}C-PCB-157	77	
^{13}C-PCB-169	80	
^{13}C-PCB-180	54	
^{13}C-PCB-202	57	
^{13}C-PCB-194	55	
^{13}C-PCB-208	64	
^{13}C-PCB-209	64	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	103	
^{13}C-PCB-178	105	

Dates Analyzed:

DB-1: 8/26/00

Analyst: RS

Reviewer: [illegible]

L-C67

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-15	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0016-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	360	1.0	
PCB-18	470	1.0	
PCB-28	130	1.0	
PCB-44	91	1.0	
PCB-52	160	1.0	
PCB-66	2.7	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	5.8	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	17	1.0	
Total diCB	1100	1.0	
Total triCB	1600	1.0	
Total tetraCB	690	1.0	
Total pentaCB	47	1.0	
Total hexaCB	1.6	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer: BM

L-C68

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0016-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	57	
^{13}C-PCB-9	80	
^{13}C-PCB-28	102	
^{13}C-PCB-37	83	
^{13}C-PCB-77	83	
^{13}C-PCB-101	79	
^{13}C-PCB-118	94	
^{13}C-PCB-105	90	
^{13}C-PCB-126	84	
^{13}C-PCB-138	86	
^{13}C-PCB-156	87	
^{13}C-PCB-157	83	
^{13}C-PCB-169	82	
^{13}C-PCB-180	70	
^{13}C-PCB-202	72	
^{13}C-PCB-194	70	
^{13}C-PCB-208	78	
^{13}C-PCB-209	80	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	101	
^{13}C-PCB-178	109	

Dates Analyzed:

DB-1: 8/26/00

Analyst: BS

Reviewer:

L-69

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-16	Date Received:	8/16/00	QC Lot:	LC0821M
Lab ID:	8944-0017-PCB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	450	1.0	
PCB-18	470	1.0	
PCB-28	130	1.0	
PCB-44	88	1.0	
PCB-52	160	1.0	
PCB-66	3.9	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	9.4	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	37	1.0	
Total diCB	1400	1.0	
Total triCB	1600	1.0	
Total tetraCB	700	1.0	
Total pentaCB	66	1.0	
Total hexaCB	3.7	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer: SM

L-C70

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0017-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	59	
^{13}C-PCB-9	82	
^{13}C-PCB-28	114	
^{13}C-PCB-37	74	
^{13}C-PCB-77	85	
^{13}C-PCB-101	89	
^{13}C-PCB-118	105	
^{13}C-PCB-105	100	
^{13}C-PCB-126	96	
^{13}C-PCB-138	98	
^{13}C-PCB-156	100	
^{13}C-PCB-157	94	
^{13}C-PCB-169	92	
^{13}C-PCB-180	73	
^{13}C-PCB-202	75	
^{13}C-PCB-194	73	
^{13}C-PCB-208	86	
^{13}C-PCB-209	85	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	105	
^{13}C-PCB-178	105	

Dates Analyzed:

DB-1: 8/26/00

Analyst: BS

Reviewer:

L-C71

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-17	Date Received:	8/16/00	QC Lot:	LC0821M
Lab ID:	8944-0018-PCB	Date Extracted:	8/21/00	Units:	ng/sample
Matrix:	MM5 Train	Sample Amount:	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	1800	1.0	
PCB-18	1600	1.0	
PCB-28	380	1.0	
PCB-44	190	1.0	
PCB-52	370	1.0	
PCB-66	9.4	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	21	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	1.0	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	250	1.0	
Total diCB	5900	1.0	
Total triCB	4900	1.0	
Total tetraCB	1600	1.0	
Total pentaCB	120	1.0	
Total hexaCB	7.7	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer: [illegible]

L-C72

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0018-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	61	
^{13}C-PCB-9	85	
^{13}C-PCB-28	118	
^{13}C-PCB-37	97	
^{13}C-PCB-77	88	
^{13}C-PCB-101	91	
^{13}C-PCB-118	115	
^{13}C-PCB-105	112	
^{13}C-PCB-126	109	
^{13}C-PCB-138	103	
^{13}C-PCB-156	107	
^{13}C-PCB-157	102	
^{13}C-PCB-169	100	
^{13}C-PCB-180	81	
^{13}C-PCB-202	79	
^{13}C-PCB-194	85	
^{13}C-PCB-208	94	
^{13}C-PCB-209	91	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	105	
^{13}C-PCB-178	104	

Dates Analyzed:

DB-1: 8/26/00

Analyst: BS

Reviewer:

L-C73

ALTA

EPA METHOD 1668
POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-18	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0019-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	2400	1.0	
PCB-18	2900	1.0	
PCB-28	610	1.0	
PCB-44	260	1.0	
PCB-52	520	1.0	
PCB-66	ND	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	22	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	1.2	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	200	1.0	
Total diCB	7400	1.0	
Total triCB	8900	1.0	
Total tetraCB	2200	1.0	
Total pentaCB	160	1.0	
Total hexaCB	9.2	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C74

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0019-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	55	
^{13}C-PCB-9	78	
^{13}C-PCB-28	73	
^{13}C-PCB-37	66	
^{13}C-PCB-77	80	
^{13}C-PCB-101	76	
^{13}C-PCB-118	94	
^{13}C-PCB-105	90	
^{13}C-PCB-126	88	
^{13}C-PCB-138	85	
^{13}C-PCB-156	87	
^{13}C-PCB-157	83	
^{13}C-PCB-169	81	
^{13}C-PCB-180	68	
^{13}C-PCB-202	69	
^{13}C-PCB-194	72	
^{13}C-PCB-208	88	
^{13}C-PCB-209	81	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	101	
^{13}C-PCB-178	102	

Dates Analyzed:

DB-1: 8/26/00

Analyst: BS

Reviewer: [illegible]

L-C75

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID:	URS-A-19	**Date Received:**	8/16/00	**QC Lot:**	LC0821M
Lab ID:	8944-0020-PCB	**Date Extracted:**	8/21/00	**Units:**	ng/sample
Matrix:	MM5 Train	**Sample Amount:**	Sample		

Compound	Conc.	R.L.	Qualifier
PCB-8	230	1.0	
PCB-18	240	1.0	
PCB-28	110	1.0	
PCB-44	88	1.0	
PCB-52	140	1.0	
PCB-66	7.2	1.0	
PCB-77	ND	1.0	
PCB-81	ND	1.0	
PCB-90/101	14	1.0	
PCB-118	ND	1.0	
PCB-123	ND	1.0	
PCB-105	ND	1.0	
PCB-114	ND	1.0	
PCB-126	ND	1.0	
PCB-151	ND	1.0	
PCB-128	ND	1.0	
PCB-138	ND	1.0	
PCB-153	ND	1.0	
PCB-167	ND	1.0	
PCB-156	ND	1.0	
PCB-157	ND	1.0	
PCB-169	ND	1.0	
PCB-170	ND	1.0	
PCB-180	ND	1.0	
PCB-187	ND	1.0	
PCB-189	ND	1.0	
PCB-195	ND	1.0	
PCB-206	ND	1.0	
PCB-209	ND	1.0	
Totals			
Total monoCB	12	1.0	
Total diCB	700	1.0	
Total triCB	1100	1.0	
Total tetraCB	660	1.0	
Total pentaCB	79	1.0	
Total hexaCB	6.4	1.0	
Total heptaCB	ND	1.0	
Total octaCB	ND	1.0	
Total nonaCB	ND	1.0	

Analyst: BS

Reviewer:

L-C76

ALTA

EPA METHOD 1668

POLYCHLORINATED BIPHENYLS

Sample ID: URS-A-20
Lab ID: 8944-0020-PCB

Isotopic Recovery Results

Internal Standard:	% R	Qualifier
^{13}C-PCB-3	45	
^{13}C-PCB-9	60	
^{13}C-PCB-28	86	
^{13}C-PCB-37	55	
^{13}C-PCB-77	61	
^{13}C-PCB-101	60	
^{13}C-PCB-118	75	
^{13}C-PCB-105	72	
^{13}C-PCB-126	65	
^{13}C-PCB-138	66	
^{13}C-PCB-156	62	
^{13}C-PCB-157	62	
^{13}C-PCB-169	54	
^{13}C-PCB-180	55	
^{13}C-PCB-202	57	
^{13}C-PCB-194	60	
^{13}C-PCB-208	68	
^{13}C-PCB-209	65	

Prespike Standard:	% Rec.	Qualifier
^{13}C-PCB-52	105	
^{13}C-PCB-178	109	

Dates Analyzed:

DB-1: 8/27/00

Analyst: BS

Reviewer:

L-077

DATA QUALIFIERS & ABBREVIATIONS

A	The amount detected is below the Method Calibration Limit.
B	This compound was also detected in the blank.
C	The amount detected is less than five times the Method Quantitation Limit.
D	The amount reported is the maximum possible concentration.
E	The detection limit was raised above the Method Quantitation Limit due to chemical interference's.
F	This result has been confirmed on a DB-225 column.
G	This result has been confirmed on a SP-2331 column.
H	The signal-to-noise ratio is greater than 10:1.
I	Chemical Interference

Conc.	Concentration
D.L.	Detection Limit
NA	Not applicable
S/N	Signal-to-noise
*	See Cover Letter
ND	Not Detected
MPC	Maximum Possible Concentration

CURRENT CERTIFICATIONS

ALTA

Bureau of Reclamation-Mid-Pacific Region---(MP-470, Res-1.10)

Commonwealth of Kentucky---(Certificate No. 90063)

Commonwealth of Virginia---(Certificate No. 00013)

State of Alaska, Department of Environmental Conservation---(Certificate No. OS-00197)

State of Arkansas, Department of Health---(Approval granted through CA certification)

State of Arkansas, Department of Environmental Quality---

State of California---(Certificate No. 1640)

State of Connecticut---(Certificate No. PH-0182)

State of Florida---(Certificate No. 87456)

State of Louisiana---(Certificate No. 98-33)

State of Mississippi---(Approval granted through CA certification)

State of Nevada---(Certificate No. CA413)

State of New York, Department of Health---(Certificate No. 11411)

State of North Carolina---(Certificate No. 06700)

State of North Dakota, Department of Health---(Certificate No. R-078)

State of Oregon---

State of Pennsylvania---(Certificate No. 68-490)

State of South Carolina---(Certificate No. 87002001)

State of Texas — (Certificate No. TX247-2000A)

State of Tennessee---(Certificate No. 02996)

State of Utah---(Certificate No. E-201)

State of Washington, Department of Ecology---(Certification No. C091)

State of Wisconsin---(Certificate No. 998036160)

State of Wyoming---(Ref: 8ES-LB)

U.S. Army Corps of Engineers

U.S. 5 EPA Region

May 2000

L-C79

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

Chain of Custody Record

Page ____ of ____

PROJECT: Foster-Wheeler

SITE: New Bedford Harbor

PREPARED BY (Signature):

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	PCBs										REMARKS
URS-A-1	XAD	8/8 0858-1058		1	X										Test I-1
URS-A-2	↓	8/8 0908-1108			X										Test I-2
URS-A-3	↓	8/8 0908-1108			X										Test I-3
URS-B-1	↓	8/8			X										Blank
URS-A-4	↓	8/10 1529-1729			X										Test H-1
URS-A5	↓	8/11 1425-1630			X										Test H2
URS-A6	↓	8/11 1639-1722			X										Test H3
URS-A7	↓	8/11 1724-1824			X										Test G1
URS-A8	↓	8/11 1809-1909			X										Test F1
URS-A9	↓	8/11 1851-1951													Test F2

REMARKS

RELINQUISHED BY:	DATE	TIME
[signature]	8/15	1200

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
[signature] ALTA	8-16-93	1200							

REMARKS:

IEG-4VFH13-96-30337coc.FH8

L-C80

RADIAN INTERNATIONAL
A DAMES & MOORE GROUP COMPANY

Chain of Custody Record

Page ____ of ____

PROJECT: Foster Wheeler

SITE: New Bedford Harbor

PREPARED BY (Signature):

FIELD SAMPLE I.D.	SAMPLE MATRIX	DATE/TIME	MS/MSD	NO. OF CONTAINERS	PCBs											REMARKS
URS-A10	XAD	8-14/1005-1105		1	X											Test C1
URS-A11		8-14/0956-1056			X											Test C2
URS-A12		8-14/1108-1208			X											Test E1
URS-A13		8-14/1102-1202			X											Test E2
URS-A14		8-14/1605-1705			X											Test F3
URS-A15		8-14/1605-1705			X											Test F4
URS-A16		8/15/0936-1042			X											Test A-1
URS-A17		8/15/0939-1044			X											Test A-2
URS-A18		8/15/0940-1044			X											Test A-3
URS-A19		8/15/1127-1227			X											Test B-1

REMARKS

RELINQUISHED BY: [signature] DATE 8/15 TIME 1200

RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	DATE	TIME	RELINQUISHED BY:	DATE	TIME

LAB USE ONLY

RECEIVED FOR LABORATORY BY:	DATE	TIME	AIRBILL NO.	OPENED BY:	DATE	TIME	TEMP°C	SEAL #	CONDITION
[signature]	8/16	1000							

REMARKS:

IEG-4VFH3-96-30337/coc.FH8

L-C81

Ken Flatt

From: eric_p_anderson@urscorp.com
Sent: Wednesday, August 16, 2000 5:34 PM
To: Ken Flatt
Subject: Re: XAD Sample problem

Ken,

The sample that has no label, is an unused resin trap that inadverntly got
left in the sample pile (do not analyze this sample). The one labeled Sheenl should be URS-A-10. I think it got mislabeled during the rain storms that occurred during our sampling.

You will get another shipment tomorrow. One chest is samples, the other is
unused traps. Do not analyze these traps.

Let me know it there are any other discrepancies.

Eric P. Anderson
Senior Scientist
URS
(512) 419-5437
(512) 454-8807 (fax)
eric_p_anderson@urscorp.com

Please note change of email. Radian is now a URS company.

Ken Flatt <kflatt@ALTALAB.com>

To: "'eric_p_anderson@urscorp.com'" <eric_p_anderson@urscorp.com>
cc:
Subject: XAD Sample problem

08/16/00
02:06 PM

Eric, I received the Xad's this morning.

The only problem I have is with sample # URS-A-10
I have (2) Xad traps left, one has on the label what looks like " sheenl
062 " on the Packing/Spike label
The other one has nothing other than the Xad Packing/Spike label.

L-C82

Attachment D

Spreadsheet of Emission Flux Test Results

Client: Foster Wheeler
Project: New Bedford Harbor Superfund Site
Last Update: 30-Aug

Date	Test #	Sample ID	Start Time	End Time	Run Time (min)	Ave. Roto Setting	Sample Roto #	Ave. Flow Rate (mL/min)	Total Flow (m3)	Comments
8-Aug	I -1	URS -A1	8:50	10:58	128	76	7063-004	2,462	0.315	Mud Flat (657)
8-Aug	I -2	URS -A2	9:08	11:08	120	95	7063-001	3,087	0.370	Mud Flat (602)
8-Aug	I -3	URS -A3	9:08	11:08	120	91	7063-002	2,935	0.352	Mud Flat (650)
10-Aug	H -1	URS -A4	15:29	17:29	53	105	7063-004	3,495	0.185	Dredge/Hopper (sample on/off)
11-Aug	H -2	URS -A5	14:25	16:30	58	105	7063-004	3,495	0.203	Dredge/Hopper (sample on/off)
11-Aug	H -3	URS -A6	16:39	17:22	43	105	7063-004	3,495	0.150	Dredge/Hopper (sample on/off)
11-Aug	G -1	URS -A7	17:24	18:24	60	85	7063-002	2,724	0.163	Outside silt fence
11-Aug	F -1	URS -A8	18:09	19:09	60	76	7063-004	2,462	0.148	Moon Pool
11-Aug	F -2	URS -A9	18:51	19:51	60	82	7063-002	2,618	0.157	Moon Pool
14-Aug	C -1	URS -A10	10:05	11:05	60	100	7063-004	3,317	0.199	CDF Sheen-1
14-Aug	C -2	URS -A11	9:56	10:56	60	75	7063-002	2,372	0.142	CDF Sheen-2
14-Aug	E -1	URS -A12	11:08	12:08	60	98	7063-004	3,246	0.195	CDF Dawn Surfactant
14-Aug	E -2	URS -A13	11:02	12:02	60	75	7063-002	2,372	0.142	CDF Biosolve Surfactant
14-Aug	F -3	URS -A14	16:05	17:05	60	98	7063-004	3,246	0.195	Moon Pool
14-Aug	F -4	URS -A15	16:05	17:05	60	75	7063-002	2,372	0.142	Moon Pool
15-Aug	A -1	URS -A16	9:36	10:42	66	76	7063-004	2,462	0.162	CDF Fresh Sediment-1
15-Aug	A -2	URS -A17	9:39	10:44	65	95.5	7063-002	3,094	0.201	CDF Fresh Sediment-2
15-Aug	A -3	URS -A18	9:40	10:44	64	86	7063-001	2,771	0.177	CDF Fresh Sediment-3
15-Aug	B -1	URS -A19	11:27	12:27	60	76	7063-004	2,462	0.148	CDF Sediment + Water-1
15-Aug	B -2	URS -A20	11:28	12:28	60	96	7063-002	3,111	0.187	CDF Sediment + Water-2
15-Aug	B -3	URS -A21	11:30	12:30	60	87.5	7063-001	2,823	0.169	CDF Sediment + Water-3
15-Aug	D -1	URS -A22	15:08	16:11	63	92	7063-002	2,970	0.187	CDF Water near Sheen-1
15-Aug	C -3	URS -A23	15:13	16:15	62	78	7063-001	2,489	0.154	CDF Sheen
15-Aug	E -3	URS -A24	16:22	17:22	60	78	7063-001	2,489	0.149	CDF Simple Green
15-Aug	D -2	URS -A25	16:40	17:40	60	92	7063-002	2,970	0.178	Water near sheen
16-Aug	G -2	URS -A26	14:09	15:09	60	85	7063-001	2,735	0.164	~ 40 feet from Silt fence
16-Aug	G -3	URS -A27	14:10	15:10	60	98	7063-002	3,182	0.191	~ 47 feet from Silt fence

Emission Flux Calculations

Date	Test #	Sample ID	Total Flow (m3)	PCB (ng)	PCB (ng/m3)	Sweep Air (L/min)	Surface Area (m2)	Emission Flux (ng/min-m2)	Comments
8-Aug	I -1	URS -A1	0.315	1	3.17	0.005	0.13	0.122	Mud Flat (657)
8-Aug	I -2	URS -A2	0.370	1	2.70	0.005	0.13	0.104	Mud Flat (602)
8-Aug	I -3	URS -A3	0.352	1	2.84	0.005	0.13	0.109	Mud Flat (650)
10-Aug	H -1	URS -A4	0.185	1	5.40	0.005	0.13	0.208	Dredge/Hopper (sample on/off)
11-Aug	H -2	URS -A5	0.203	1	4.93	0.005	0.13	0.190	Dredge/Hopper (sample on/off)
11-Aug	H -3	URS -A6	0.150	1	6.65	0.005	0.13	0.256	Dredge/Hopper (sample on/off)
11-Aug	G -1	URS -A7	0.163	1	6.12	0.005	0.13	0.235	Outside silt fence
11-Aug	F -1	URS -A8	0.148	1	6.77	0.005	0.13	0.260	Moon Pool
11-Aug	F -2	URS -A9	0.157	1	6.37	0.005	0.13	0.245	Moon Pool
14-Aug	C -1	URS -A10	0.199	1	5.02	0.005	0.13	0.193	CDF Sheen-1
14-Aug	C -2	URS -A11	0.142	1	7.03	0.005	0.13	0.270	CDF Sheen-2
14-Aug	E -1	URS -A12	0.195	1	5.14	0.005	0.13	0.198	CDF Dawn Surfactant
14-Aug	E -2	URS -A13	0.142	1	7.03	0.005	0.13	0.270	CDF Biosolve Surfactant
14-Aug	F -3	URS -A14	0.195	1	5.14	0.005	0.13	0.198	Moon Pool
14-Aug	F -4	URS -A15	0.142	1	7.03	0.005	0.13	0.270	Moon Pool
15-Aug	A -1	URS -A16	0.162	1	6.15	0.005	0.13	0.237	CDF Fresh Sediment-1
15-Aug	A -2	URS -A17	0.201	1	4.97	0.005	0.13	0.191	CDF Fresh Sediment-2
15-Aug	A -3	URS -A18	0.177	1	5.64	0.005	0.13	0.217	CDF Fresh Sediment-3
15-Aug	B -1	URS -A19	0.148	1	6.77	0.005	0.13	0.260	CDF Sediment + Water-1
15-Aug	B -2	URS -A20	0.187	1	5.36	0.005	0.13	0.206	CDF Sediment + Water-2
15-Aug	B -3	URS -A21	0.169	1	5.90	0.005	0.13	0.227	CDF Sediment + Water-3
15-Aug	D -1	URS -A22	0.187	1	5.34	0.005	0.13	0.206	CDF Water near Sheen-1
15-Aug	C -3	URS -A23	0.154	1	6.48	0.005	0.13	0.249	CDF Sheen
15-Aug	E -3	URS -A24	0.149	1	6.69	0.005	0.13	0.257	CDF Simple Green
15-Aug	D -2	URS -A25	0.178	1	5.61	0.005	0.13	0.216	Water near sheen
16-Aug	G -2	URS -A26	0.164	1	6.09	0.005	0.13	0.234	~ 40 feet from Silt fence
16-Aug	G -3	URS -A27	0.191	1	5.24	0.005	0.13	0.201	~ 47 feet from Silt fence

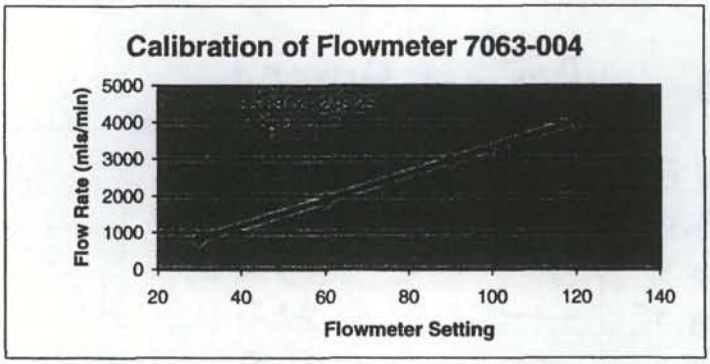
L-D3

Attachment E

Calibration Data

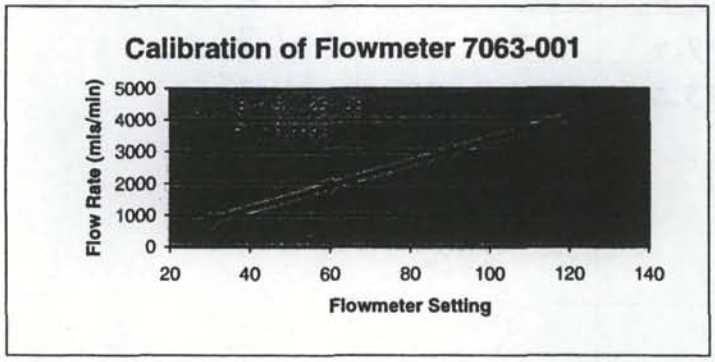
Flowmeter 7063-004

Meter Setting	Trial #1	Trial #2	Trial #3	Trial #4	Average
30	823	823	823		823
60	1927	1892	1888	1883	1898
90	2932	2950	2961		2948
120	4029	4033	4046		4036



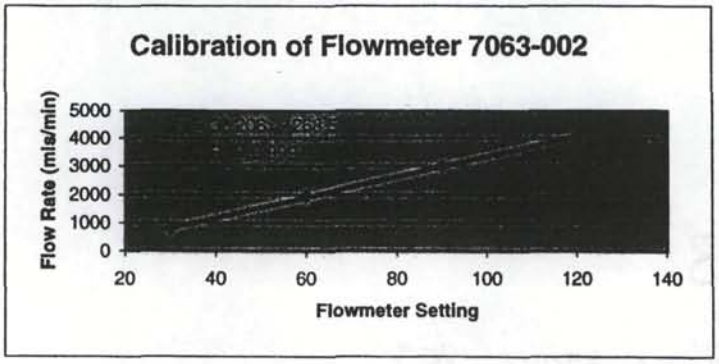
Flowmeter 7063-001

Meter Setting	Trial #1	Trial #2	Trial #3	Trial #4	Average
30	822	809	804	807	811
60	1977	1949	1957	1950	1958
90	2945	3000	2997	2995	2984
120	4108	4083	4071	4070	4083



Flowmeter 7063-002

Meter Setting	Trial #1	Trial #2	Trial #3	Trial #4	Average
30	789	791	783	785	787
60	1927	1951	1959	1967	1951
90	2971	2994	2991	2997	2988
120	4060	4078	4058	4052	4062



TITLE New Bedford Instr. Co. Project No. Book No. 34424

From Page No.

Thermocouple / Digital Meter ①

Thermocouple Color	Letter	Meter #	Temp (°C) Hg	Dig ②	Omega
Black	C	1	98.5	—	99.9
	S		98.5	—	100.3
	C	2	98.5	—	99.7
	S		98.5	—	99.7
Red	C	1	99.0	—	101.9
	S		99.2	—	101.2
	C	2	99.2	—	101.3
	S		99.2	—	100.7
Green	C	1	99.2	—	102.1
	S		99.2	—	101.8
	C	2	99.2	—	101.3
	S		99.2	—	101.2

L-E3

① See p. 76

② Did not use - Not recommended for use above 90°C.

To Page No.

Witnessed & Understood by me, | Date | Invented by | Date

TITLE New Bedford Inst. Cal. Project No. Book No. 34424

From Page No.

Thermocouples / Omega Dig. Readout Meters.

Color	Letter	Meter #	Temp-Dig ①	Temp.-Hg ②	Meter Readout
Red	C	1	-0.7	-0.5	0.9
"	S	"	-0.8	-0.8	1.4
Green	C	"	-0.8	-0.7	0.4
"	S	"	-0.8		-1.7
Black/Red	C	"	-0.7		0.3
"	S	"	-0.7		
Red	C	2	-0.5		0.6
"	S	"	-0.6		0.9
Green	C	"	-0.5		0.5
"	S	"	-0.6		0.5
Black/Red	C	"	-0.5		0.6

Gus Taylor

L-E4

① Orion Comp. Meter - Model #140

To Page No

Witnessed & Understood by me,	Date	Invented by	Date
			6/2/00

om Page No.___

Thermocouple / Digital Meter ①

Thermocouple Color	Letter	Meter #	Temp (°C) Hg	Dig.	Omega
BLACK	C	1	-0.8	-0.9	0.3
	S		-0.8	-0.9	0.2
	C	2	-0.8	-0.9	0.2
	S		-0.8	-0.9	0.0
ROD	C	1	-0.8	-0.9	0.6
	S		-0.8	-0.9	0.8
	C	2	-0.8	-0.9	0.3
	S		-0.8	-0.9	0.3
REEN	C	1	-0.8	-0.9	0.5
	S		-0.8	-0.9	0.4
	C	2	-0.8	-0.9	-0.3
	S		-0.8	-0.9	-0.2
LACK	C	1	21.8	21.9	22.5
	S		21.8	21.9	22.7
	C	2	21.8	21.7	22.2
	S		21.8	21.7	22.2
ED	C	1	21.6	21.7	22.5
	S		21.6	21.7	22.3
	C	2	21.6	21.7	21.9
	S		21.6	21.7	21.8
REEN	C	1	21.6	21.7	~~20.5~~ 22.1
	S		21.6	21.7	22.2
	C	2	21.6	21.7	21.7
	S		21.6	21.7	21.7

L-E5

Thermoc. - Type K / Dig. Meters - Omega HH11

To Page No.___

nessed & Understood by me,	Date	Invented by	Date
		Recorded by Sus Ten L	8/3/00

Attachment F

Analytical Results

For Source Samples

Qualifier Definitions:

V – Value
Q – Qualifier
U – Compound was analyzed for, but not detected in the sample.
P – The percent difference for results between the two analytical columns. is greater than 25%. The lower of the two values is reported.
E – Compound exceeded the instrument range, results may be estimated.
D – Compound result is from a diluted sample.

Final Flux Chamber Source Sample Data

Matrix/Units of Measure (wet weight)		slurry / mg/kg		slurry / mg/kg		slurry / mg/kg		slurry / mg/kg		slurry / mg/kg		slurry / mg/kg		slurry / mg/kg	
Station Number		CDF Sheen		CDF Sediment		CDF Sediment		Sediment w/harbor H2O cover		CDF Sheen		Sheen w/ Dawn		Sheen w/ Biosolve	
Sample Number		FC1011		FC161718		FC161718REP		FC192021		FC2225		URS-W12		URS-W13	
Flux Chamber Test Designation		C		A		A		B		D		E		E	
Sample Date		17-Aug-00		17-Aug-00		17-Aug-00		17-Aug-00		17-Aug-00		14-Aug-00		14-Aug-00	
Analyte	BZ#	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V	Q
2,4'-DiCB	8 *	72.0	D	.69		.81		.92		2.0		3.4		2.3	
2,5,2'-TriCB	18 *	95.0	D	.9		1.0		1.2		2.5		4.2		3.0	
2,4,4'-TriCB	28 *	120.0	D	1.1		1.2		1.4		3.2		5.4		3.9	
2,3,6,2'-TetraCB	44 *	55.0	D	.54		.63		.74		1.5		2.6		1.8	
2,5,2',5'-TetraCB	52 *	86.0	D	.77		.9		1.0		2.2		3.5		2.5	
2,4,3',4'-TetraCB	66 *	57.0	D	.57		.65		.76		1.4		2.4		1.8	
3,4,3',4'-TetraCB	77	.59	U	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
3,4,5,4'-TetraCB	81	1.8	P	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,4,5,2',5'-PentaCB	101 *	35.0	DP	.36	P	.42	P	.5	P	.96	P	1.5	P	1.2	P
2,3,4,3',4'-PentaCB	105 *	1.2	P	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,3,4,5,4'-PentaCB	114	.59	U	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,4,5,3',4'-PentaCB	118 *	15.0		.16		.18		.22		.38		.62		.52	
3,4,5,2',4'-PentaCB	123	19.0		.24		.28		.33		.67		.98		.73	
3,4,5,3',4'-PentaCB	126	.59	U	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,3,4,2',3',4'-HexaCB	128 *	.87	P	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,3,4,2',4',5'-HexaCB	138 *	5.0	P	.067	P	.073	P	.084	P	.18	P	.3	U	.21	P
2,4,5,2',4',5'-HexaCB	153 *	17.0		.18		.21		.26		.49		.72		.58	
2,3,4,5,3',4'-HexaCB	156	1.1	P	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,3,4,3',4',5'-HexaCB	157	.59	U	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,4,5,3',4',5'-HexaCB	167	1.0	P	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
3,4,5,3',4',5'-HexaCB	169	.59	U	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,3,4,5,2',3',4'-HeptaCB	170 *	1.1	P	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,3,4,5,2',4',5'-HeptaCB	180 *	2.0		.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,3,5,6,2',4',5'-HeptaCB	187 *	2.6		.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,3,4,5,3',4',5'-HeptaCB	189	.59	U	.06		.059	U	.058	U	.14	U	.3	U	.14	U
2,3,4,5,6,2',3',4'-OctaCB	195 *	.59	U	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
2,3,4,5,6,2',3',4',5'-NonaCB	206 *	.59	U	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
Deca-CB	209 *	.59	U	.06	U	.059	U	.058	U	.14	U	.3	U	.14	U
NOAA Congeners Total		560		5.3		6.1		7.1		15		24		18	
Total X	2.5	1400		13		15		18		38		60		45	

L-F2

Final Flux Chamber Source Sample Data

Sample Matrix/Units of Measure (dryweight)		Sediment/mg/kg		Sediment/mg/kg		Sediment/mg/kg	
Station Number		@657		@602		@650	
Sample Number		URS-W1		URS-W2		URS-W3	
Flux Chamber Test Designation		I		I		I	
Sample Date		08-Aug-00		08-Aug-00		08-Aug-00	
Analyte	BZ#	V	Q	V	Q	V	Q
2,4'-DiCB	8 *	14.0		1.0		.81	U
2,5,2'-TriCB	18 *	65.0	P	3.2		3.5	P
2,4,4'-TriCB	28 *	680.0	D	7.2		17.0	
2,3,6,2'-TetraCB	44 *	540.0	D	3.4		9.7	
2,5,2',5'-TetraCB	52 *	600.0	D	6.9		13.0	
2,4,3',4'-TetraCB	66 *	970.0	D	6.6		17.0	
3,4,3',4'-TetraCB	77	76.0	EP	.39	U	.81	U
3,4,5,4'-TetraCB	81	1.6	U	.39	U	.81	U
2,4,5,2',5'-PentaCB	101 *	400.0	DP	3.5	P	6.8	P
2,3,4,3',4'-PentaCB	105 *	190.0	DP	.66	P	2.8	
2,3,4,5,4'-PentaCB	114	14.0	P	.39	U	.81	U
2,4,5,3',4'-PentaCB	118 *	340.0	DP	2.8		5.4	
3,4,5,2',4'-PentaCB	123	200.0	D	3.2		4.0	
3,4,5,3',4'-PentaCB	126	1.6	U	.39	U	.81	U
2,3,4,2',3',4'-HexaCB	128 *	62.0	P	.4		.97	
2,3,4,2',4',5'-HexaCB	138 *	240.0	D	1.3	P	3.4	
2,4,5,2',4',5'-HexaCB	153 *	180.0	D	2.6		3.4	
2,3,4,5,3',4'-HexaCB	156	32.0	P	.39	U	.81	U
2,3,4,3',4',5'-HexaCB	157	7.5		.39	U	.81	U
2,4,5,3',4',5'-HexaCB	167	18.0	P	.39	U	.81	U
3,4,5,3',4',5'-HexaCB	169	1.6	U	.39	U	.81	U
2,3,4,5,2',3',4'-HeptaCB	170 *	26.0		.39	U	.81	U
2,3,4,5,2',4',5'-HeptaCB	180 *	41.0		.39	U	.81	U
2,3,5,6,2',4',5'-HeptaCB	187 *	25.0	P	.39	U	.81	U
2,3,4,5,3',4',5'-HeptaCB	189	1.6	U	.39	U	.81	U
2,3,4,5,6,2',3',4'-OctaCB	195 *	2.0		.39	U	.81	U
2,3,4,5,6,2',3',4',5'-NonaCB	206 *	2.6		.39	U	.81	U
Deca-CB	209 *	1.6	U	.39	U	.81	U
NOAA Congeners Total		4400		40		83	
Total X	**2.5**	10K+		100		210	

Final Flux Chamber Source Sample Data

Sample Matrix/Units of Measure		Aqueous/ug/l		Aqueous/ug/l		Aqueous/ug/l	
Station Number		Moon Pool		Harbor outside silt fence		Moon Pool	
Sample Number		FC1415		FC72627		FC89	
Flux Chamber Test Designation		F		G		F	
Sample Date		17-Aug-00		17-Aug-00		17-Aug-00	
Analyte	BZ#	V	Q	V	Q	V	Q
2,4'-DiCB	8 *	.98		.16		.16	
2,5,2'-TriCB	18 *	1.5		.35		.32	
2,4,4'-TriCB	28 *	2.0		.31		.32	
2,3,6,2'-TetraCB	44 *	.92		.12		.15	
2,5,2',5'-TetraCB	52 *	1.6		.33		.34	
2,4,3',4'-TetraCB	66 *	1.0		.15		.28	
3,4,3',4'-TetraCB	77	.095	U	.02	U	.019	U
3,4,5,4'-TetraCB	81	.095	U	.02	U	.029	
2,4,5,2',5'-PentaCB	101 *	.62	P	.074	P	.16	P
2,3,4,3',4'-PentaCB	105 *	.095	U	.02	U	.019	U
2,3,4,5,4'-PentaCB	114	.095	U	.02	U	.019	U
2,4,5,3',4'-PentaCB	118 *	.31		.043		.11	
3,4,5,2',4'-PentaCB	123	.49		.072		.12	
3,4,5,3',4'-PentaCB	126	.095	U	.02	U	.019	U
2,3,4,2',3',4'-HexaCB	128 *	.095	U	.02	U	.019	U
2,3,4,2',4',5'-HexaCB	138 *	.15	P	.022	P	.032	P
2,4,5,2',4',5'-HexaCB	153 *	.36		.049		.099	
2,3,4,5,3',4'-HexaCB	156	.095	U	.02	U	.019	U
2,3,4,3',4',5'-HexaCB	157	.095	U	.02	U	.019	U
2,4,5,3',4',5'-HexaCB	167	.095	U	.02	U	.019	U
3,4,5,3',4',5'-HexaCB	169	.095	U	.02	U	.019	U
2,3,4,5,2',3',4'-HeptaCB	170 *	.095	U	.02	U	.019	U
2,3,4,5,2',4',5'-HeptaCB	180 *	.095	U	.02	U	.019	U
2,3,5,6,2',4',5'-HeptaCB	187 *	.095	U	.02	U	.019	U
2,3,4,5,3',4',5'-HeptaCB	189	.095	U	.02	U	.019	U
2,3,4,5,6,2',3',4'-OctaCB	195 *	.095	U	.02	U	.019	U
2,3,4,5,6,2',3',4',5'-NonaCB	206 *	.095	U	.02	U	.019	U
Deca-CB	209 *	.095	U	.02	U	.019	U
NOAA Congeners Total		9.4		1.6		2.0	
Total X	**2.5**	24		4.0		5.0	

L-F4

Ambient Air Data

USACE CONTRACT NO. DACW33-94-D-0002
TASK ORDER NO. 0017
TOTAL ENVIRONMENTAL RESTORATION CONTRACT

FINAL DATA REPORTS
FOR

Pre-Design Dredge Test Sampling: 15 August 2000 – 17 August 2000

OPERABLE UNIT #1
NEW BEDFORD HARBOR SUPERFUND SITE
NEW BEDFORD, MASSACHUSETTS

May 2001

Prepared by
The KEVRIC Company, Incorporated and
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New England District
Concord, Massachusetts

L-2-1

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ATTACHMENTS

Final Sample Event Summary for Pre-Design Dredge Test Sampling – 15, 16, and 17 August 2000

1.0 SAMPLE DATA

The information contained in this report includes detailed tables for each sample event date. The report details the polychlorinated biphenyl (PCB) congener and homologue results, quality flags, detection limits, Estimated Maximum Potential Concentration (EMPC) values, and sampling information. The meteorological data contained in this section are based on the start and end times for each individual sample.

The meteorological station takes readings every 5 minutes and averages these 5-minute readings at the end of every hour. For example, the sample at station 28 on 14 March 2001 started at 07:47 a.m. and ended at 07:52 a.m. on 15 March 2001. Therefore, the average temperature, average solar radiation, and total precipitation are calculated based on the 14 March 2001 08:00 a.m. data through 15 March 2001 8:00 a.m. data.

2.0 SAMPLING SCHEDULE

The sample event schedule is presented in Table 1. Samples in the area surrounding the confined disposal facility were collected for 3 days in August 2000 during the pre-design dredge testing. Samples were collected at stations 02, 03, 03D, 06, 09, 17, and 27. Samples were collected at station 03D on an alternating basis. A designated U.S. Army Corps of Engineers laboratory analyzed these quality assurance samples.

Table 1: Sample Event Schedule

Sampling Effort	Sample Event Date	Sampling Stations							
		02	03	03D	06	09	17	27	Blank Station
Pre-Design Dredge Test	08/15/00	X	X	X	X	X	X	X	02
	08/16/00	X	X	†	X	X	X	X	06
	08/17/00	X	X	X	X	X	X	X	27

X Sample collected at station

† Alternate duplicate samples analyzed by the U.S. Army Corps of Engineers designated laboratory

3.0 IMPORTANT TERMS

3.1. Summary Report Definitions

Air sample summary reports have been developed for each sample collected. The data is presented in the tables that follow. The following information is provided to help the reader interpret the data reports.

Table 2: Column Headings

Heading	Definition
Sample Event Date	Start date. Date in which the sample was installed in the sampler
Lab Sample ID	Identification number designed by the analytical laboratory
Station ID/Name	Site identification number and corresponding name
Sample Type	Designates whether the sample is a field blank, normal sample, or duplicate sample
Sample Number	Field identification number formatted as month, day, year, station. For example, sample number 09190028 represents a sample collected on 19 September 2000 at station 28. A letter "B" following the sample number (09190028B) indicates a field blank, a letter "D" (09190028D) indicates a duplicate sample
Preliminary Flow	For this data report the flow is assumed to be 225 standard liters per minute (slpm)
Run Time	Sample duration in hours
Sample Volume	Total volume of air sampled, cubic meters
Prevailing Wind Direction	Predominant direction that the wind was blowing from
Average Temperature	Average temperature for the sampling event date at 2 meters, degrees Fahrenheit
Average Solar Radiation	Average solar radiation for the sampling event date, watt meter squared
Total Precipitation	Total Precipitation for the sampling event date, inches of water
Analyte	The name of the PCB congener, homologue or total homologues
Detsym	Detection symbol; < denotes not detected, = denotes detected, M denotes EMPC
Mass	Mass of analyte detected in the sample, nanograms
EMPC	Estimated Maximum Potential Concentration (denoted as M in the Detsym column). An EMPC value indicates there were interferences in the sample that may cause an underestimation of the result. In this case, the EMPC value is used to calculate the estimated concentration
Qflag	Quality flag designated by either the laboratory or the data validator
Concentration	Average concentration of analyte over the sampling period, nanograms per cubic meter
TEF	Toxic Equivalency Factor, not applicable to homologue groups
TEQ	Toxic Equivalent Concentration, not applicable to homologue groups The TEF is multiplied by the concentration to calculate the TEQ

3.2. Data Qualifier Flags

In order to assist with data interpretation, data qualifier flags are used on the final reports. The most commonly used flags are:

C: Coeluting congener
NDR: Peak detected, but did not meet quantification criteria
R: Rejected
U: Not detected. Result is within five times the concentration detected in associated blanks and considered not detected at the reported value.

4.0 REPORTING CONVENTIONS

In order to calculate homologue group concentrations, several data validation conventions are applied. The concentration values for non-detects are calculated at half the detection limit, based on the assumption that the actual concentration is likely to be somewhere between zero and the detection limit. The exception to this data validation convention is homologue #209 (DecaCB), which if detected, was detected intermittently and at relatively low concentrations such that their actual presence is questionable. Including non-detects with elevated detection limits at half the detection limit results in relatively high values; in turn, skewing the resulting averages higher. Consequently, when calculating concentrations for homologue #209, non-detect values were disregarded (i.e., not included as a result). For analytes qualified as U due to blank contamination, the analyte concentrations are calculated at half the reported mass value. In all cases where an EMPC value was reported, this value is used in calculating analyte concentrations in lieu of the reported value.

Individual sample results reported in this data package include the mass of each analyte as reported by the laboratory, the volume of air sampled, the resulting sample concentration, and the data qualifiers (described in Section 3.2). Total PCBs are reported (in nanograms) as the sum of the homologue group detected mass values, EMPC (where reported), or half of the detection limit values, with the exception of DecaCB, which was rejected. An example of Total PCB calculation is shown in Table 3.

Table 3: Example Total PCB Calculation

Homologue Group	Detsym	Detection Limit (ng)	Mass (ng)	EMPC (ng)
Total MonoCB	=	0.08	**105**	
Total DiCB	=	0.1	**5640**	
Total TriCB	M	0.06	7710	**7750**
Total TetraCB	M	0.1	5220	**5230**
Total PentaCB	=	0.3	**1490**	
Total HexaCB	M	0.2	202	**212**
Total HeptaCB	M	0.4	35.1	**37.6**
Total OctaCB	=	0.5	**3.8**	
Total NonaCB	<	**0.6**		
Total DecaCB	<	0.7		
Homologue Group Sum = 20468.7 nanograms*				

* Obtained by the summation of table values highlighted in bold print.

5.0 PROBLEMS AND CORRECTIVE ACTION

There were no problems for these sampling events.

6.0 SAMPLE EVENT SUMMARY REPORTS

The attached sample summary reports are for the Pre-Design Dredge Test 15, 16, and 17 August 2000 sampling efforts.

Sample Event Date	8/15/2000	**Sample Number**	08150002	**Prevailing Wind Direction**	NNE
Lab Sample ID	L2694-1	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	68.6
Station ID/Name	02/E Side of CDF	**Run Time (hours)**	24.15	**Average Solar Radiation (w •m²)**	70.3
Sample Type	Normal Sample	**Sample Volume (m³)**	326.025	**Total Precipitation (inches H_2O)**	0.32

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.395	3.87	—		0.0119	0.0001	0.000001
3,4,5,4'-TetraCB (#81)	<	0.376	—	—	U	0.0006	0.0001	0.00000006
2,3,3',4,4'-PentaCB (#105)	=	0.0551	5.42	—		0.0166	0.0001	0.000002
2,3,4,4',5-PentaCB (#114)	=	0.0519	0.67	—		0.0021	0.0005	0.000001
2,3',4,4',5-PentaCB (#118)	=	0.051	40.4	—		0.124	0.0001	0.00001
2',3,4,4',5-PentaCB (#123)	=	0.0548	0.971	—		0.00298	0.0001	0.0000003
3,3',4,4',5-PentaCB (#126)	M	0.0564	0.0906	0.0906	NDR	0.000278	0.1	0.00003
2,3,3',4,4',5-HexaCB (#156)	=	0.0414	0.905	—	C	0.00278	0.0005	0.000001
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	*C156*	—	*0.0005*	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0314	0.635	—		0.00195	0.00001	0.00000002
3,3',4,4',5,5'-HexaCB (#169)	<	0.0341	—	—	U	0.00005	0.01	0.0000005
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0112	0.362	—		0.00111	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.00988	0.903	—	C	0.00277	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	<	0.00536	0.024	—	U	0.000037	0.0001	0.000000004
DecaCB (#209)	=	0.0127	0.0284	—	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0388	500	—		1.5		
2,2',5-TriCB (#18)	=	0.019	1290	—	C	3.96		
2,3,3',-TriCB (#20)	=	0.234	1130	—	C	3.47		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0145	602	—	C	1.85		
2,2',5,5'-TetraCB (#52)	=	0.0135	1110	—		3.4		
2,3',4,4'-TetraCB (#66)	=	0.303	85.9	—		0.263		
2,2',3,4',5-PentaCB (#90)	=	0.0362	116	—	C	0.356		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.0389	1.67	—	C	0.00512		
2,2',3,3',4,5-HexaCB (#129)	=	0.0364	13.8	—	C	0.0423		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.0333	21.6	—	C	0.0663		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.00908	1.31	—		0.00402		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.00706	0.0323	—		0.0000991		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	M	0.0341	0.0572	0.0572	NDR	0.000175		
PCB Homologue Groups								
Total MonoCB	=	0.0527	32.6	—		0.100		
Total DiCB	=	0.0776	2180	—		6.69		
Total TriCB	=	0.308	7050	—		21.6		
Total TetraCB	=	0.395	3890	—		11.9		
Total PentaCB	=	0.0564	831	—		2.55		
Total HexaCB	=	0.0483	121	—		0.371		
Total HeptaCB	=	0.0147	5.15	—		0.0158		
Total OctaCB	=	0.0153	0.139	—		0.000426		
Total NonaCB	<	0.0341	—	—	U	0.00005		
DecaCB (#209)	=	0.0127	0.0284	—	R	—		
Homologue Groups Sum			**14100**			**43**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

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Sample Event Date	8/15/2000	**Sample Number**	08150002B	**Prevailing Wind Direction**	—
Lab Sample ID	L2694-8	**Preliminary Flow (slpm)**	0	**Average Temperature (°F)**	—
Station ID/Name	02/E Side of CDF	**Run Time (hours)**	0	**Average Solar Radiation (w ·m²)**	—
Sample Type	Field Blank	**Sample Volume (m³)**	0	**Total Precipitation (inches H_2O)**	—

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration ng	TEF	TEQ† ng
PCB Congeners								
3,3',4,4'-TetraCB (#77)	<	0.015	—	—	U	—		
3,4,5,4'-TetraCB (#81)	<	0.0143	—	—	U	—		
2,3,3',4,4'-PentaCB (#105)	<	0.0127	—	—	U	—		
2,3,4,4',5-PentaCB (#114)	<	0.0116	—	—	U	—		
2,3',4,4',5-PentaCB (#118)	=	0.0121	0.0435	—		—		
2',3,4,4',5-PentaCB (#123)	<	0.0123	—	—	U	—		
3,3',4,4',5-PentaCB (#126)	<	0.0126	—	—	ND	—		
2,3,3',4,4',5-HexaCB (#156)	M	0.00595	0.0104	0.0104	C NDR	—		
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—		
2,3',4,4',5,5'-HexaCB (#167)	<	0.00452	—	—	U	—		
3,3',4,4',5,5'-HexaCB (#169)	<	0.00481	—	—	U	—		
2,2',3,3',4,4',5-HeptaCB (#170)	<	0.00879	—	—	U	—		
2,2',3,4,4',5,5'-HeptaCB (#180)	M	0.00806	0.0104	0.0104	C NDR	—		
2,3,3',4,4',5,5'-HeptaCB (#189)	<	0.0033	—	—	U	—		
DecaCB (#209)	M	0.00825	0.0122	0.0122	R	—		
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0687	0.215	—		—		
2,2',5-TriCB (#18)	=	0.0478	0.334	—	C	—		
2,3,3',-TriCB (#20)	=	0.0248	0.168	—	C	—		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0166	0.142	—	C	—		
2,2',5,5'-TetraCB (#52)	=	0.0153	0.153	—		—		
2,3',4,4'-TetraCB (#66)	=	0.0113	0.0301	—		—		
2,2',3,4',5-PentaCB (#90)	=	0.0144	0.0805	—	C	—		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	<	0.00558	—	—	U	—		
2,2',3,3',4,5-HexaCB (#129)	=	0.00531	0.0351	—	C	—		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.00472	0.0415	—	C	—		
2,2',3,4',5,5',6-HeptaCB (#187)	<	0.0074	—	—	U	—		
2,2',3,3',4,4',5,6-OctaCB (#195)	<	0.00526	—	—	U	—		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	<	0.0183	—	—	U	—		
PCB Homologue Groups								
Total MonoCB	<	0.0222	—	—	U	—		
Total DiCB	=	0.0991	0.387	—		—		
Total TriCB	=	0.0633	1.14	—		—		
Total TetraCB	=	0.0206	0.583	—		—		
Total PentaCB	=	0.0224	0.428	—		—		
Total HexaCB	=	0.0097	0.117	—		—		
Total HeptaCB	<	0.0119	—	—	U	—		
Total OctaCB	<	0.0147	—	—	U	—		
Total NonaCB	<	0.0183	—	—	U	—		
DecaCB (#209)	M	0.00825	0.0122	0.0122	R	—		
Homologue Groups Sum			**2.69**					

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/15/2000	**Sample Number**	08150003	**Prevailing Wind Direction**	NNE
Lab Sample ID	L2694-2	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	68.6
Station ID/Name	03/N Side of CDF	**Run Time (hours)**	24.19	**Average Solar Radiation (w·m²)**	71.7
Sample Type	Normal Sample	**Sample Volume (m³)**	326.565	**Total Precipitation (inches H_2O)**	0.32

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.862	13.4	—		0.0410	0.0001	0.000004
3,4,5,4'-TetraCB (#81)	<	0.802	—	—	U	0.001	0.0001	0.0000001
2,3,3',4,4'-PentaCB (#105)	=	0.221	18.8	—		0.0576	0.0001	0.000006
2,3,4,4',5-PentaCB (#114)	=	0.214	2.15	—		0.00658	0.0005	0.000003
2,3',4,4',5-PentaCB (#118)	=	0.202	128	—		0.392	0.0001	0.00004
2',3,4,4',5-PentaCB (#123)	=	0.224	3.07	—		0.00940	0.0001	0.0000009
3,3',4,4',5-PentaCB (#126)	M	0.227	0.333	0.333	NDR	0.00102	0.1	0.0001
2,3,3',4,4',5-HexaCB (#156)	=	0.14	3.43	—	C	0.0105	0.0005	0.000005
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.103	2.13	—		0.00652	0.00001	0.00000007
3,3',4,4',5,5'-HexaCB (#169)	<	0.119	—	—	U	0.0002	0.01	0.000002
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0102	1.31	—		0.00401	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.00899	3.24	—	C	0.00992	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	=	0.00416	0.0768	—		0.000235	0.0001	0.00000002
DecaCB (#209)	M	0.0137	0.072	0.072	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.164	1960	—		6		
2,2',5-TriCB (#18)	=	0.0213	2900	—	C	8.9		
2,3,3',-TriCB (#20)	=	0.961	3240	—	C	9.92		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0184	1440	—	C	4.41		
2,2',5,5'-TetraCB (#52)	=	0.0171	2490	—		7.62		
2,3',4,4'-TetraCB (#66)	=	0.68	213	—		0.652		
2,2',3,4',5-PentaCB (#90)	=	0.116	292	—	C	0.894		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.129	6.11	—	C	0.0187		
2,2',3,3',4,5-HexaCB (#129)	=	0.121	50.6	—	C	0.155		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.111	77.5	—	C	0.237		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.00827	4.44	—		0.0136		
2,2',3,3',4,4',5,6-OctaCB (#195)	M	0.00898	0.135	0.135	NDR	0.000413		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	M	0.0304	0.161	0.161	NDR	0.000493		
PCB Homologue Groups								
Total MonoCB	=	0.0288	182	—		0.557		
Total DiCB	=	0.116	7110	—		21.8		
Total TriCB	=	0.36	18000	—		55		
Total TetraCB	=	0.862	9060	—		27.7		
Total PentaCB	=	0.227	2110	—		6.46		
Total HexaCB	=	0.161	408	—		1.25		
Total HeptaCB	=	0.0133	21	—		0.064		
Total OctaCB	=	0.0179	1.34	—		0.00410		
Total NonaCB	=	0.0304	0.135	—		0.000413		
DecaCB (#209)	M	0.0137	0.072	0.072	R	—		
Homologue Groups Sum			**36900**			**110**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/15/2000	**Sample Number**	08150003D	**Prevailing Wind Direction**	NNE
Lab Sample ID	L2694-3	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	68.6
Station ID/Name	03D/N Side of CDF Dup	**Run Time (hours)**	24.17	**Average Solar Radiation (w •m²)**	71.7
Sample Type	Field Duplicate	**Sample Volume (m³)**	326.295	**Total Precipitation (inches H_2O)**	0.32

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.439	8.75	—		0.0268	0.0001	0.000003
3,4,5,4'-TetraCB (#81)	M	0.404	0.42	0.42	NDR	0.0013	0.0001	0.0000001
2,3,3',4,4'-PentaCB (#105)	=	0.327	15.2	—		0.0466	0.0001	0.000005
2,3,4,4',5-PentaCB (#114)	=	0.301	1.35	—		0.00414	0.0005	0.000002
2,3',4,4',5-PentaCB (#118)	=	0.293	94.2	—		0.289	0.0001	0.00003
2',3,4,4',5-PentaCB (#123)	=	0.324	2.16	—		0.00662	0.0001	0.0000007
3,3',4,4',5-PentaCB (#126)	<	0.332	—	—	U	0.0005	0.1	0.00005
2,3,3',4,4',5-HexaCB (#156)	=	0.134	2.61	—	C	0.00800	0.0005	0.000004
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0945	1.58	—		0.00484	0.00001	0.00000005
3,3',4,4',5,5'-HexaCB (#169)	<	0.111	—	—	U	0.0002	0.01	0.000002
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.014	0.967	—		0.00296	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0124	2.32	—	C	0.00711	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	=	0.00467	0.0439	—		0.000135	0.0001	0.00000001
DecaCB (#209)	M	0.013	0.0337	0.0337	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0539	1090	—		3.34		
2,2',5-TriCB (#18)	=	0.0325	2120	—	C	6.5		
2,3,3',-TriCB (#20)	=	0.478	2400	—	C	7.4		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0271	1070	—	C	3.28		
2,2',5,5'-TetraCB (#52)	=	0.0252	1830	—		5.61		
2,3',4,4'-TetraCB (#66)	=	0.339	153	—		0.469		
2,2',3,4',5-PentaCB (#90)	=	0.0888	213	—	C	0.653		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.122	5.05	—	C	0.0155		
2,2',3,3',4,5-HexaCB (#129)	=	0.114	40.8	—	C	0.125		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.104	57	—	C	0.17		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0114	3.3	—		0.010		
2,2',3,3',4,4',5,6-OctaCB (#195)	M	0.00679	0.0874	0.0874	NDR	0.000268		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.0352	0.0919	—		0.000282		
PCB Homologue Groups								
Total MonoCB	=	0.0739	112	—		0.343		
Total DiCB	=	0.103	4400	—		13		
Total TriCB	=	0.279	13000	—		40		
Total TetraCB	=	0.439	6700	—		21		
Total PentaCB	=	0.332	1230	—		3.77		
Total HexaCB	=	0.152	305	—		0.935		
Total HeptaCB	=	0.0184	16.7	—		0.0512		
Total OctaCB	=	0.026	0.962	—		0.00295		
Total NonaCB	=	0.0352	0.0919	—		0.000282		
DecaCB (#209)	M	0.013	0.0337	0.0337	R	—		
Homologue Groups Sum			**25800**			**79**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/15/2000	**Sample Number**	08150006	**Prevailing Wind Direction**	NNE
Lab Sample ID	L2694-4	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	68.6
Station ID/Name	06/W Side of CDF	**Run Time (hours)**	24.15	**Average Solar Radiation (w·m²)**	71.7
Sample Type	Normal Sample	**Sample Volume (m³)**	326.025	**Total Precipitation (inches H_2O)**	0.32

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.925	31.4	—		0.0963	0.0001	0.00001
3,4,5,4'-TetraCB (#81)	=	0.859	1.03	—		0.00316	0.0001	0.0000003
2,3,3',4,4'-PentaCB (#105)	=	0.193	26.2	—		0.0804	0.0001	0.000008
2,3,4,4',5-PentaCB (#114)	=	0.174	2.54	—		0.00779	0.0005	0.000004
2,3',4,4',5-PentaCB (#118)	=	0.169	152	—		0.466	0.0001	0.00005
2',3,4,4',5-PentaCB (#123)	=	0.189	4.28	—		0.0131	0.0001	0.000001
3,3',4,4',5-PentaCB (#126)	=	0.193	0.665	—		0.00204	0.1	0.0002
2,3,3',4,4',5-HexaCB (#156)	=	0.152	3.96	—	C	0.0121	0.0005	0.000006
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.11	2.4	—		0.0074	0.00001	0.00000007
3,3',4,4',5,5'-HexaCB (#169)	<	0.122	—	—	U	0.0002	0.01	0.000002
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0135	1.42	—		0.00436	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0119	3.49	—	C	0.0107	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	<	0.00395	0.059	—	U	0.000090	0.0001	0.000000009
DecaCB (#209)	M	0.0117	0.0293	0.0293	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.204	1830	—		5.61		
2,2',5-TriCB (#18)	=	0.0262	2360	—	C	7.24		
2,3,3',-TriCB (#20)	=	0.324	2650	—	C	8.13		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.027	1660	—	C	5.09		
2,2',5,5'-TetraCB (#52)	=	0.0251	2350	—		7.21		
2,3',4,4'-TetraCB (#66)	=	0.716	306	—		0.939		
2,2',3,4',5-PentaCB (#90)	=	0.0771	372	—	C	1.14		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.138	7.81	—	C	0.0240		
2,2',3,3',4,5-HexaCB (#129)	=	0.13	61	—	C	0.19		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.118	87.5	—	C	0.268		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0109	4.56	—		0.0140		
2,2',3,3',4,4',5,6-OctaCB (#195)	M	0.00626	0.133	0.133	NDR	0.000408		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	M	0.0359	0.101	0.101	NDR	0.000310		
PCB Homologue Groups								
Total MonoCB	=	0.0695	205	—		0.629		
Total DiCB	=	0.0931	6620	—		20.3		
Total TriCB	=	0.285	15400	—		47.2		
Total TetraCB	=	0.925	9950	—		30.5		
Total PentaCB	=	0.193	2730	—		8.37		
Total HexaCB	=	0.172	491	—		1.51		
Total HeptaCB	=	0.0177	23.8	—		0.0730		
Total OctaCB	=	0.0213	0.724	—		0.00222		
Total NonaCB	<	0.0359	—	—	U	0.00006		
DecaCB (#209)	M	0.0117	0.0293	0.0293	R	—		
Homologue Groups Sum			**35400**			**110**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/15/2000	**Sample Number**	08150009	**Prevailing Wind Direction**	NNE
Lab Sample ID	L2694-6	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	68.6
Station ID/Name	09/Coffin Avenue	**Run Time (hours)**	24.14	**Average Solar Radiation (w ·m²)**	71.7
Sample Type	Normal Sample	**Sample Volume (m³)**	325.89	**Total Precipitation (inches H_2O)**	0.32

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.467	4.5	—		0.014	0.0001	0.000001
3,4,5,4'-TetraCB (#81)	<	0.438	—	—	U	0.0007	0.0001	0.00000007
2,3,3',4,4'-PentaCB (#105)	=	0.153	7.36	—		0.0226	0.0001	0.000002
2,3,4,4',5-PentaCB (#114)	=	0.155	0.76	—		0.0023	0.0005	0.000001
2,3',4,4',5-PentaCB (#118)	=	0.143	45.7	—		0.140	0.0001	0.00001
2',3,4,4',5-PentaCB (#123)	=	0.16	1.2	—		0.0037	0.0001	0.0000004
3,3',4,4',5-PentaCB (#126)	<	0.171	—	—	U	0.0003	0.1	0.00003
2,3,3',4,4',5-HexaCB (#156)	=	0.133	1.38	—	C	0.00423	0.0005	0.000002
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0973	0.851	—		0.00261	0.00001	0.00000003
3,3',4,4',5,5'-HexaCB (#169)	<	0.116	—	—	U	0.0002	0.01	0.000002
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0367	1.02	—		0.00313	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0291	2.42	—	C	0.00743	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	M	0.0204	0.0775	0.0775	NDR	0.000238	0.0001	0.00000002
DecaCB (#209)	M	0.0225	0.0547	0.0547	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0994	497	—		1.53		
2,2',5-TriCB (#18)	=	0.068	1130	—	C	3.47		
2,3,3',-TriCB (#20)	=	0.382	1190	—	C	3.65		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0315	436	—	C	1.34		
2,2',5,5'-TetraCB (#52)	=	0.0329	837	—		2.57		
2,3',4,4'-TetraCB (#66)	=	0.401	96.1	—		0.295		
2,2',3,4',5-PentaCB (#90)	=	0.0853	141	—	C	0.433		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.121	2.22	—	C	0.00681		
2,2',3,3',4,5-HexaCB (#129)	=	0.12	19	—	C	0.058		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.11	28.8	—	C	0.0884		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0308	3.47	—		0.0106		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.0265	0.0698	—		0.000214		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.0716	0.179	—		0.000549		
PCB Homologue Groups								
Total MonoCB	=	0.0468	40.1	—		0.123		
Total DiCB	=	0.15	1870	—		5.74		
Total TriCB	=	0.474	6950	—		21.3		
Total TetraCB	=	0.467	3200	—		9.8		
Total PentaCB	=	0.171	939	—		2.88		
Total HexaCB	=	0.16	167	—		0.512		
Total HeptaCB	=	0.0383	14.2	—		0.0436		
Total OctaCB	=	0.0384	1.43	—		0.00439		
Total NonaCB	=	0.0716	0.273	—		0.000838		
DecaCB (#209)	M	0.0225	0.0547	0.0547	R	—		
Homologue Groups Sum			**13200**			**40**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/15/2000	**Sample Number**	08150017	**Prevailing Wind Direction**	NNE
Lab Sample ID	L2694-5	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	68.5
Station ID/Name	17/S Side of CDF	**Run Time (hours)**	24.13	**Average Solar Radiation (w •m²)**	67.4
Sample Type	Normal Sample	**Sample Volume (m³)**	325.755	**Total Precipitation (inches H_2O)**	0.32

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	3.86	24.1	—		0.0740	0.0001	0.000007
3,4,5,4'-TetraCB (#81)	<	3.46	—	—	U	0.005	0.0001	0.0000005
2,3,3',4,4'-PentaCB (#105)	=	0.431	27.8	—		0.0853	0.0001	0.000009
2,3,4,4',5-PentaCB (#114)	=	0.416	4.5	—		0.014	0.0005	0.000007
2,3',4,4',5-PentaCB (#118)	=	0.39	237	—		0.728	0.0001	0.00007
2',3,4,4',5-PentaCB (#123)	=	0.436	6.18	—		0.0190	0.0001	0.000002
3,3',4,4',5-PentaCB (#126)	=	0.466	0.595	—		0.00183	0.1	0.0002
2,3,3',4,4',5-HexaCB (#156)	=	0.231	7.24	—	C	0.0222	0.0005	0.00001
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.172	4.09	—		0.0126	0.00001	0.0000001
3,3',4,4',5,5'-HexaCB (#169)	<	0.191	—	—	U	0.0003	0.01	0.000003
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.00988	3.43	—		0.0105	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.00872	7.17	—	C	0.0220	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	=	0.004	0.158	—		0.000485	0.0001	0.00000005
DecaCB (#209)	=	0.0129	0.0409	—	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.343	10500	—		32.2		
2,2',5-TriCB (#18)	=	0.348	27800	—	C	85.3		
2,3,3',-TriCB (#20)	=	1.91	18800	—	C	57.7		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.13	5400	—	C	17		
2,2',5,5'-TetraCB (#52)	=	0.12	8310	—		25.5		
2,3',4,4'-TetraCB (#66)	=	2.97	642	—		1.97		
2,2',3,4',5-PentaCB (#90)	=	0.341	903	—	C	2.77		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.214	10.8	—	C	0.0332		
2,2',3,3',4,5-HexaCB (#129)	=	0.201	89	—	C	0.27		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.183	157	—	C	0.482		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.00801	9.72	—		0.0298		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.00805	0.251	—		0.000771		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.027	0.22	—		0.00068		
PCB Homologue Groups								
Total MonoCB	=	0.0808	940	—		2.9		
Total DiCB	=	0.564	37600	—		115		
Total TriCB	=	2.31	118000	—		362		
Total TetraCB	=	3.86	33500	—		103		
Total PentaCB	=	0.494	6680	—		20.5		
Total HexaCB	=	0.266	926	—		2.84		
Total HeptaCB	=	0.0129	48.4	—		0.149		
Total OctaCB	=	0.0158	2.34	—		0.00718		
Total NonaCB	=	0.027	0.485	—		0.00149		
DecaCB (#209)	=	0.0129	0.0409	—	R	—		
Homologue Groups Sum			**198000**			**610**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/15/2000	**Sample Number**	08150027	**Prevailing Wind Direction**	NNE
Lab Sample ID	L2694-7	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	68.6
Station ID/Name	27/Francis Street	**Run Time (hours)**	24.17	**Average Solar Radiation (w·m²)**	71.7
Sample Type	Normal Sample	**Sample Volume (m³)**	326.295	**Total Precipitation (inches H_2O)**	0.32

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.0908	1.99	—		0.00610	0.0001	0.0000006
3,4,5,4'-TetraCB (#81)	<	0.0858	—	—	U	0.0001	0.0001	0.00000001
2,3,3',4,4'-PentaCB (#105)	=	0.0313	3.47	—		0.0106	0.0001	0.000001
2,3,4,4',5-PentaCB (#114)	=	0.0318	0.30	—		0.00092	0.0005	0.0000005
2,3',4,4',5-PentaCB (#118)	=	0.0292	16.9	—		0.0518	0.0001	0.000005
2',3,4,4',5-PentaCB (#123)	=	0.0314	0.408	—		0.00125	0.0001	0.0000001
3,3',4,4',5-PentaCB (#126)	=	0.0376	0.0661	—		0.000203	0.1	0.00002
2,3,3',4,4',5-HexaCB (#156)	=	0.0298	0.616	—	C	0.00189	0.0005	0.0000009
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0227	0.334	—		0.00102	0.00001	0.00000001
3,3',4,4',5,5'-HexaCB (#169)	<	0.0262	—	—	U	0.00004	0.01	0.0000004
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.00816	0.369	—		0.00113	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.00647	1.01	—	C	0.00310	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	M	0.00342	0.0149	0.0149	NDR	0.0000457	0.0001	0.000000005
DecaCB (#209)	=	0.00535	0.0188	—	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0134	161	—		0.493		
2,2',5-TriCB (#18)	=	0.0098	293	—	C	0.898		
2,3,3',-TriCB (#20)	=	0.0587	352	—	CE	1.08		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.00728	148	—	C	0.454		
2,2',5,5'-TetraCB (#52)	=	0.00759	284	—		0.870		
2,3',4,4'-TetraCB (#66)	=	0.0807	36.2	—		0.111		
2,2',3,4',5-PentaCB (#90)	=	0.0203	45.4	—	C	0.139		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.0271	1.1	—	C	0.0034		
2,2',3,3',4,5-HexaCB (#129)	=	0.0269	8.72	—	C	0.0267		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.0247	11.8	—	C	0.0362		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.00685	1.51	—		0.00463		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.00516	0.0496	—		0.000152		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.0119	0.112	—		0.000343		
PCB Homologue Groups								
Total MonoCB	=	0.00888	9.36	—		0.0287		
Total DiCB	=	0.0231	599	—		1.84		
Total TriCB	=	0.0687	1950	—		5.98		
Total TetraCB	=	0.0908	1090	—		3.34		
Total PentaCB	=	0.0376	304	—		0.932		
Total HexaCB	=	0.0359	70.2	—		0.215		
Total HeptaCB	=	0.00852	5.96	—		0.0183		
Total OctaCB	=	0.00678	1.49	—		0.00457		
Total NonaCB	=	0.0119	0.286	—		0.000877		
DecaCB (#209)	=	0.00535	0.0188	—	R	—		
Homologue Groups Sum			**4030**			**12**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/16/2000	**Sample Number**	08160002	**Prevailing Wind Direction**	NW
Lab Sample ID	L2699-1	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	70.3
Station ID/Name	02/E Side of CDF	**Run Time (hours)**	23.35	**Average Solar Radiation (w •m²)**	134
Sample Type	Normal Sample	**Sample Volume (m³)**	315.225	**Total Precipitation (inches H_2O)**	0.040

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.49	8.75	—		0.0278	0.0001	0.000003
3,4,5,4'-TetraCB (#81)	<	0.459	—	—	U	0.0007	0.0001	0.00000007
2,3,3',4,4'-PentaCB (#105)	=	0.246	16.1	—		0.0511	0.0001	0.000005
2,3,4,4',5-PentaCB (#114)	=	0.228	1.46	—		0.00463	0.0005	0.000002
2,3',4,4',5-PentaCB (#118)	=	0.225	103	—		0.327	0.0001	0.00003
2',3,4,4',5-PentaCB (#123)	=	0.243	2.53	—		0.00803	0.0001	0.0000008
3,3',4,4',5-PentaCB (#126)	=	0.257	0.389	—		0.00123	0.1	0.0001
2,3,3',4,4',5-HexaCB (#156)	=	0.166	3.53	—	C	0.0112	0.0005	0.000006
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.125	2.2	—		0.0070	0.00001	0.00000007
3,3',4,4',5,5'-HexaCB (#169)	<	0.136	—	—	U	0.0002	0.01	0.000002
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.00838	1.15	—		0.00365	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.00739	3.1	—	C	0.0098	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	<	0.00527	0.0468	—	U	0.0000742	0.0001	0.000000007
DecaCB (#209)	M	0.0129	0.093	0.093	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.064	1490	—		4.73		
2,2',5-TriCB (#18)	=	0.0214	2160	—	C	6.85		
2,3,3',-TriCB (#20)	=	0.784	2280	—	C	7.23		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0115	1100	—	C	3.5		
2,2',5,5'-TetraCB (#52)	=	0.0107	1760	—		5.58		
2,3',4,4'-TetraCB (#66)	=	0.382	164	—		0.520		
2,2',3,4',5-PentaCB (#90)	=	0.0814	249	—	C	0.790		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.154	6.04	—	C	0.0192		
2,2',3,3',4,5-HexaCB (#129)	=	0.144	47.5	—	C	0.151		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.131	68.8	—	C	0.218		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.00679	4.45	—		0.0141		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.00716	0.0783	—		0.000248		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.0349	0.322	—		0.00102		
PCB Homologue Groups								
Total MonoCB	=	0.0553	140	—		0.44		
Total DiCB	=	0.123	5630	—		17.9		
Total TriCB	=	0.23	12400	—		39.3		
Total TetraCB	=	0.49	6650	—		21.1		
Total PentaCB	=	0.257	1810	—		5.74		
Total HexaCB	=	0.191	362	—		1.15		
Total HeptaCB	=	0.011	22.1	—		0.0701		
Total OctaCB	=	0.0173	1.33	—		0.00422		
Total NonaCB	=	0.0349	0.527	—		0.00167		
DecaCB (#209)	M	0.0129	0.093	0.093	R	—		
Homologue Groups Sum			**27000**			**86**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/16/2000	**Sample Number**	08160003	**Prevailing Wind Direction**	NW
Lab Sample ID	L2699-2	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	70.3
Station ID/Name	03/N Side of CDF	**Run Time (hours)**	23.34	**Average Solar Radiation (w •m²)**	134
Sample Type	Normal Sample	**Sample Volume (m³)**	315.09	**Total Precipitation (inches H_2O)**	0.040

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.931	11.1	—		0.0352	0.0001	0.000004
3,4,5,4'-TetraCB (#81)	<	0.894	—	—	U	0.001	0.0001	0.0000001
2,3,3',4,4'-PentaCB (#105)	=	0.328	17.4	—		0.0552	0.0001	0.000006
2,3,4,4',5-PentaCB (#114)	=	0.308	1.72	—		0.00546	0.0005	0.000003
2,3',4,4',5-PentaCB (#118)	=	0.305	107	—		0.340	0.0001	0.00003
2',3,4,4',5-PentaCB (#123)	=	0.326	2.51	—		0.00797	0.0001	0.0000008
3,3',4,4',5-PentaCB (#126)	<	0.346	—	—	U	0.0005	0.1	0.00005
2,3,3',4,4',5-HexaCB (#156)	=	0.187	3.9	—	C	0.012	0.0005	0.000006
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.132	2.18	—		0.00692	0.00001	0.00000007
3,3',4,4',5,5'-HexaCB (#169)	<	0.149	—	—	U	0.0002	0.01	0.000002
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.00967	1.58	—		0.00501	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.00853	3.63	—	C	0.0115	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	M	0.00467	0.0752	0.0752	NDR	0.000239	0.0001	0.00000002
DecaCB (#209)	M	0.0107	0.0374	0.0374	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.17	2550	—		8.09		
2,2',5-TriCB (#18)	=	0.0258	2560	—	C	8.12		
2,3,3',-TriCB (#20)	=	0.895	3160	—	C	10		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.023	1290	—	C	4.09		
2,2',5,5'-TetraCB (#52)	=	0.0214	1760	—		5.59		
2,3',4,4'-TetraCB (#66)	=	0.74	199	—		0.632		
2,2',3,4',5-PentaCB (#90)	=	0.119	254	—	C	0.806		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.167	6.04	—	C	0.0192		
2,2',3,3',4,5-HexaCB (#129)	=	0.157	47.5	—	C	0.151		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.143	65.9	—	C	0.209		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.00784	4.35	—		0.0138		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.00421	0.128	—		0.000406		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.0256	0.127	—		0.000403		
PCB Homologue Groups								
Total MonoCB	=	0.0507	254	—		0.806		
Total DiCB	=	0.138	7190	—		22.8		
Total TriCB	=	0.291	16000	—		51		
Total TetraCB	=	0.931	7300	—		23		
Total PentaCB	=	0.346	1810	—		5.74		
Total HexaCB	=	0.208	342	—		1.09		
Total HeptaCB	=	0.0127	22.9	—		0.0727		
Total OctaCB	=	0.0161	1.44	—		0.00457		
Total NonaCB	=	0.0256	0.269	—		0.000854		
DecaCB (#209)	M	0.0107	0.0374	0.0374	R	—		
Homologue Groups Sum			**32900**			**100**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/16/2000	**Sample Number**	08160006	**Prevailing Wind Direction**	NW
Lab Sample ID	L2699-3	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	70.3
Station ID/Name	06/W Side of CDF	**Run Time (hours)**	23.43	**Average Solar Radiation (w •m²)**	134
Sample Type	Normal Sample	**Sample Volume (m³)**	316.305	**Total Precipitation (inches H_2O)**	0.040

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.401	6.72	—		0.0212	0.0001	0.000002
3,4,5,4'-TetraCB (#81)	<	0.378	—	—	U	0.0006	0.0001	0.00000006
2,3,3',4,4'-PentaCB (#105)	=	0.125	13.2	—		0.0417	0.0001	0.000004
2,3,4,4',5-PentaCB (#114)	=	0.118	1.27	—		0.00402	0.0005	0.000002
2,3',4,4',5-PentaCB (#118)	=	0.118	70.1	—		0.222	0.0001	0.00002
2',3,4,4',5-PentaCB (#123)	=	0.125	1.63	—		0.00515	0.0001	0.0000005
3,3',4,4',5-PentaCB (#126)	=	0.13	0.234	—		0.000740	0.1	0.00007
2,3,3',4,4',5-HexaCB (#156)	=	0.102	3.01	—	C	0.00952	0.0005	0.000005
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0724	1.44	—		0.00455	0.00001	0.00000005
3,3',4,4',5,5'-HexaCB (#169)	<	0.0869	—	—	U	0.0001	0.01	0.000001
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0109	1.03	—		0.00326	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.00999	2.89	—	C	0.00914	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	<	0.00323	0.0536	0.0536	U	0.0000847	0.0001	0.000000008
DecaCB (#209)	=	0.00897	0.0296	—	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0335	157	—		0.496		
2,2',5-TriCB (#18)	=	0.0194	263	—	C	0.831		
2,3,3',-TriCB (#20)	=	0.0471	228	—	C	0.721		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.00703	186	—	C	0.588		
2,2',5,5'-TetraCB (#52)	=	0.00651	229	—		0.724		
2,3',4,4'-TetraCB (#66)	=	0.309	66.9	—		0.212		
2,2',3,4',5-PentaCB (#90)	=	0.0451	118	—	C	0.373		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.0944	4.94	—	C	0.0156		
2,2',3,3',4,5-HexaCB (#129)	=	0.0898	37.3	—	C	0.118		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.08	46.7	—	C	0.148		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.00917	3.15	—		0.00996		
2,2',3,3',4,4',5,6-OctaCB (#195)	M	0.00698	0.0838	0.0838	NDR	0.000265		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.0268	0.0795	—		0.000251		
PCB Homologue Groups								
Total MonoCB	=	0.0475	20.4	—		0.0645		
Total DiCB	=	0.0616	499	—		1.58		
Total TriCB	=	0.0685	1400	—		4.4		
Total TetraCB	=	0.401	1150	—		3.64		
Total PentaCB	=	0.13	784	—		2.48		
Total HexaCB	=	0.118	230	—		0.73		
Total HeptaCB	=	0.0147	17.4	—		0.0550		
Total OctaCB	=	0.0187	1.35	—		0.00427		
Total NonaCB	=	0.0268	0.192	—		0.000607		
DecaCB (#209)	=	0.00897	0.0296	—	R	—		
Homologue Groups Sum			**4100**			**13**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/16/2000	**Sample Number**	08160006B	**Prevailing Wind Direction**	—
Lab Sample ID	L2699-7	**Preliminary Flow (slpm)**	0	**Average Temperature (°F)**	—
Station ID/Name	06/W Side of CDF	**Run Time (hours)**	0	**Average Solar Radiation (w •m²)**	—
Sample Type	Field Blank	**Sample Volume (m³)**	0	**Total Precipitation (inches H_2O)**	—

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration ng	TEF	TEQ† ng
PCB Congeners								
3,3',4,4'-TetraCB (#77)	<	0.0165	—	—	U	—		
3,4,5,4'-TetraCB (#81)	<	0.0152	—	—	U	—		
2,3,3',4,4'-PentaCB (#105)	<	0.0166	—	—	U	—		
2,3,4,4',5-PentaCB (#114)	<	0.0156	—	—	U	—		
2,3',4,4',5-PentaCB (#118)	<	0.0156	—	—	U	—		
2',3,4,4',5-PentaCB (#123)	<	0.0164	—	—	U	—		
3,3',4,4',5-PentaCB (#126)	<	0.0165	—	—	U	—		
2,3,3',4,4',5-HexaCB (#156)	M	0.00678	0.0101	0.0101	C NDR	—		
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—		
2,3',4,4',5,5'-HexaCB (#167)	<	0.00501	—	—	U	—		
3,3',4,4',5,5'-HexaCB (#169)	<	0.0059	—	—	U	—		
2,2',3,3',4,4',5-HeptaCB (#170)	<	0.0084	—	—	U	—		
2,2',3,4,4',5,5'-HeptaCB (#180)	<	0.00743	—	—	U	—		
2,3,3',4,4',5,5'-HeptaCB (#189)	<	0.00376	—	—	U	—		
DecaCB (#209)	<	0.00638	—	—	R	—		
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0805	0.0957	—		—		
2,2',5-TriCB (#18)	=	0.0414	0.0812	—	C	—		
2,3,3',-TriCB (#20)	=	0.0298	0.0946	—	C	—		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	M	0.0128	0.0644	0.0644	C NDR	—		
2,2',5,5'-TetraCB (#52)	=	0.0112	0.0712	—		—		
2,3',4,4'-TetraCB (#66)	<	0.0129	—	—	U	—		
2,2',3,4',5-PentaCB (#90)	<	0.0202	—	—	U	—		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	<	0.00646	—	—	U	—		
2,2',3,3',4,5-HexaCB (#129)	M	0.00615	0.0137	0.0137	C NDR	—		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	M	0.00555	0.0164	0.0164	C NDR	—		
2,2',3,4',5,5',6-HeptaCB (#187)	<	0.00672	—	—	U	—		
2,2',3,3',4,4',5,6-OctaCB (#195)	<	0.00337	—	—	U	—		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	<	0.017	—	—	U	—		
PCB Homologue Groups								
Total MonoCB	<	0.0282	—	—	U	—		
Total DiCB	=	0.139	0.0957	—		—		
Total TriCB	=	0.0667	0.32	—		—		
Total TetraCB	=	0.0165	0.225	—		—		
Total PentaCB	<	0.0269	—	—	U	—		
Total HexaCB	<	0.00796	—	—	U	—		
Total HeptaCB	<	0.0107	—	—	U	—		
Total OctaCB	<	0.0126	—	—	U	—		
Total NonaCB	<	0.017	—	—	U	—		
DecaCB (#209)	<	0.00638	—	—	R	—		
Homologue Groups Sum			**0.692**					

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

L-2-18

Sample Event Date	8/16/2000	**Sample Number**	08160009	**Prevailing Wind Direction**	NW
Lab Sample ID	L2699-5	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	70.3
Station ID/Name	09/Coffin Avenue	**Run Time (hours)**	23.42	**Average Solar Radiation (w ·m²)**	134
Sample Type	Normal Sample	**Sample Volume (m³)**	316.17	**Total Precipitation (inches H_2O)**	0.040

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.373	5.17	—		0.0164	0.0001	0.000002
3,4,5,4'-TetraCB (#81)	<	0.347	—	—	U	0.0005	0.0001	0.00000005
2,3,3',4,4'-PentaCB (#105)	=	0.171	9.46	—		0.0299	0.0001	0.000003
2,3,4,4',5-PentaCB (#114)	=	0.152	0.684	—		0.00216	0.0005	0.000001
2,3',4,4',5-PentaCB (#118)	=	0.158	54.1	—		0.171	0.0001	0.00002
2',3,4,4',5-PentaCB (#123)	=	0.162	1.32	—		0.00417	0.0001	0.0000004
3,3',4,4',5-PentaCB (#126)	=	0.174	0.186	—		0.000588	0.1	0.00006
2,3,3',4,4',5-HexaCB (#156)	=	0.0982	2.51	—	C	0.00794	0.0005	0.000004
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0724	1.15	—		0.00364	0.00001	0.00000004
3,3',4,4',5,5'-HexaCB (#169)	<	0.0945	—	—	U	0.0001	0.01	0.000001
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0164	1.08	—		0.00342	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0145	2.07	—	C	0.00655	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	M	0.00597	0.0529	0.0529	NDR	0.000167	0.0001	0.00000002
DecaCB (#209)	M	0.0127	0.0418	0.0418	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0509	200	—		0.63		
2,2',5-TriCB (#18)	=	0.0461	566	—	C	1.79		
2,3,3',-TriCB (#20)	=	0.228	759	—	C	2.4		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0226	401	—	C	1.27		
2,2',5,5'-TetraCB (#52)	=	0.0198	648	—		2.05		
2,3',4,4'-TetraCB (#66)	=	0.269	77.9	—		0.246		
2,2',3,4',5-PentaCB (#90)	=	0.0795	105	—	C	0.332		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.0957	4.02	—	C	0.0127		
2,2',3,3',4,5-HexaCB (#129)	=	0.091	27.6	—	C	0.0873		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.0822	34.3	—	C	0.108		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0131	2.24	—		0.00708		
2,2',3,3',4,4',5,6-OctaCB (#195)	M	0.00828	0.087	0.087	NDR	0.00028		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	M	0.0489	0.116	0.116	NDR	0.000367		
PCB Homologue Groups								
Total MonoCB	=	0.0442	15.3	—		0.0484		
Total DiCB	=	0.103	877	—		2.77		
Total TriCB	=	0.338	3970	—		12.6		
Total TetraCB	=	0.373	2460	—		7.78		
Total PentaCB	=	0.174	753	—		2.38		
Total HexaCB	=	0.118	179	—		0.566		
Total HeptaCB	=	0.0209	12.1	—		0.0383		
Total OctaCB	=	0.0244	0.624	—		0.00197		
Total NonaCB	<	0.0489	—	—	U	0.00008		
DecaCB (#209)	M	0.0127	0.0418	0.0418	R	—		
Homologue Groups Sum			**8270**			**26**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/16/2000	**Sample Number**	08160017	**Prevailing Wind Direction**	NW
Lab Sample ID	L2699-4	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	70.3
Station ID/Name	17/S Side of CDF	**Run Time (hours)**	23.35	**Average Solar Radiation (w •m²)**	134
Sample Type	Normal Sample	**Sample Volume (m³)**	315.225	**Total Precipitation (inches H_2O)**	0.040

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.222	3.58	—		0.0114	0.0001	0.000001
3,4,5,4'-TetraCB (#81)	<	0.2	—	—	U	0.0003	0.0001	0.00000003
2,3,3',4,4'-PentaCB (#105)	=	0.0935	8.55	—		0.0271	0.0001	0.000003
2,3,4,4',5-PentaCB (#114)	=	0.086	0.737	—		0.00234	0.0005	0.000001
2,3',4,4',5-PentaCB (#118)	=	0.0818	40.5	—		0.128	0.0001	0.00001
2',3,4,4',5-PentaCB (#123)	=	0.0899	0.905	—		0.00287	0.0001	0.0000003
3,3',4,4',5-PentaCB (#126)	=	0.0952	0.333	—		0.00106	0.1	0.0001
2,3,3',4,4',5-HexaCB (#156)	=	0.0995	3.59	—	C	0.0114	0.0005	0.000006
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0717	1.33	—		0.00422	0.00001	0.00000004
3,3',4,4',5,5'-HexaCB (#169)	<	0.0816	—	—	U	0.0001	0.01	0.000001
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.00862	1.89	—		0.00600	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0076	3.39	—	C	0.0108	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	M	0.00364	0.0876	0.0876	NDR	0.000278	0.0001	0.00000003
DecaCB (#209)	=	0.00963	0.0336	—	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0314	253	—		0.803		
2,2',5-TriCB (#18)	=	0.0213	342	—	C	1.08		
2,3,3',-TriCB (#20)	=	0.0699	354	—	C	1.12		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0131	250	—	C	0.79		
2,2',5,5'-TetraCB (#52)	=	0.0122	311	—		0.987		
2,3',4,4'-TetraCB (#66)	=	0.176	49.2	—		0.156		
2,2',3,4',5-PentaCB (#90)	=	0.0319	85.5	—	C	0.271		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.0904	4.43	—	C	0.0141		
2,2',3,3',4,5-HexaCB (#129)	=	0.0847	26.6	—	C	0.0844		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.0773	28.1	—	C	0.0891		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.00699	2.14	—		0.00679		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.00629	0.126	—		0.000400		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	M	0.0374	0.123	0.123	NDR	0.000390		
PCB Homologue Groups								
Total MonoCB	=	0.0488	26.9	—		0.0853		
Total DiCB	=	0.0601	991	—		3.14		
Total TriCB	=	0.0906	2060	—		6.54		
Total TetraCB	=	0.222	1400	—		4.4		
Total PentaCB	=	0.0952	581	—		1.84		
Total HexaCB	=	0.112	157	—		0.498		
Total HeptaCB	=	0.0113	16.4	—		0.0520		
Total OctaCB	=	0.0141	0.867	—		0.00275		
Total NonaCB	=	0.0374	0.0356	—		0.000113		
DecaCB (#209)	=	0.00963	0.0336	—	R	—		
Homologue Groups Sum			**5230**			**17**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/16/2000	**Sample Number**	08160027	**Prevailing Wind Direction**	NW
Lab Sample ID	L2699-6	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	70.1
Station ID/Name	27/Francis Street	**Run Time (hours)**	23.34	**Average Solar Radiation (w •m²)**	136
Sample Type	Normal Sample	**Sample Volume (m³)**	315.09	**Total Precipitation (inches H_2O)**	0.040

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.408	4.71	—		0.0149	0.0001	0.000001
3,4,5,4'-TetraCB (#81)	<	0.403	—	—	U	0.0006	0.0001	0.00000006
2,3,3',4,4'-PentaCB (#105)	=	0.156	10.5	—		0.0333	0.0001	0.000003
2,3,4,4',5-PentaCB (#114)	=	0.14	0.924	—		0.00293	0.0005	0.000001
2,3',4,4',5-PentaCB (#118)	=	0.144	51.5	—		0.163	0.0001	0.00002
2',3,4,4',5-PentaCB (#123)	=	0.156	1.11	—		0.00352	0.0001	0.0000004
3,3',4,4',5-PentaCB (#126)	=	0.168	0.225	—		0.000714	0.1	0.00007
2,3,3',4,4',5-HexaCB (#156)	=	0.1	2.73	—	C	0.00866	0.0005	0.000004
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0767	1.12	—		0.00355	0.00001	0.00000004
3,3',4,4',5,5'-HexaCB (#169)	<	0.079	—	—	U	0.0001	0.01	0.000001
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0193	1.06	—		0.00336	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0177	2.2	—	C	0.0070	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	M	0.00795	0.0647	0.0647	NDR	0.000205	0.0001	0.00000002
DecaCB (#209)	M	0.0209	0.0301	0.0301	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0625	529	—		1.68		
2,2',5-TriCB (#18)	=	0.0491	1600	—	C	5.1		
2,3,3',-TriCB (#20)	=	0.441	1090	—	C	3.46		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0256	445	—	C	1.41		
2,2',5,5'-TetraCB (#52)	=	0.0237	802	—		2.55		
2,3',4,4'-TetraCB (#66)	=	0.305	96.7	—		0.307		
2,2',3,4',5-PentaCB (#90)	=	0.053	95.8	—	C	0.304		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.0961	4.3	—	C	0.014		
2,2',3,3',4,5-HexaCB (#129)	=	0.0911	27.4	—	C	0.0870		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.0814	32.1	—	C	0.102		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0162	1.94	—		0.00616		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.0142	0.094	—		0.00030		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	<	0.069	—	—	U	0.0001		
PCB Homologue Groups								
Total MonoCB	=	0.069	28.3	—		0.0898		
Total DiCB	=	0.102	1820	—		5.78		
Total TriCB	=	0.732	7460	—		23.7		
Total TetraCB	=	0.408	3020	—		9.58		
Total PentaCB	=	0.168	700	—		2.2		
Total HexaCB	=	0.12	173	—		0.549		
Total HeptaCB	=	0.0261	11.1	—		0.0352		
Total OctaCB	=	0.0398	0.674	—		0.00214		
Total NonaCB	<	0.069	—	—	U	0.0001		
DecaCB (#209)	M	0.0209	0.0301	0.0301	R	—		
Homologue Groups Sum			**13200**			**42**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/17/2000	**Sample Number**	08170002	**Prevailing Wind Direction**	WNW
Lab Sample ID	L2699-8	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	66.2
Station ID/Name	02/E Side of CDF	**Run Time (hours)**	24.09	**Average Solar Radiation (w·m²)**	272
Sample Type	Normal Sample	**Sample Volume (m³)**	325.215	**Total Precipitation (inches H_2O)**	0.00

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.689	10.5	—		0.0323	0.0001	0.000003
3,4,5,4'-TetraCB (#81)	<	0.65	—	—	U	0.001	0.0001	0.0000001
2,3,3',4,4'-PentaCB (#105)	=	0.394	12.2	—		0.0375	0.0001	0.000004
2,3,4,4',5-PentaCB (#114)	=	0.368	1.54	—		0.00474	0.0005	0.000002
2,3',4,4',5-PentaCB (#118)	=	0.373	107	—		0.329	0.0001	0.00003
2',3,4,4',5-PentaCB (#123)	=	0.401	2.83	—		0.00870	0.0001	0.0000009
3,3',4,4',5-PentaCB (#126)	<	0.392	—	—	U	0.0006	0.1	0.00006
2,3,3',4,4',5-HexaCB (#156)	=	0.0904	2.04	—	C	0.00627	0.0005	0.000003
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0659	1.45	—		0.00446	0.00001	0.00000004
3,3',4,4',5,5'-HexaCB (#169)	<	0.0733	—	—	U	0.0001	0.01	0.000001
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0194	0.682	—		0.00210	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0178	1.94	—	C	0.00597	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	<	0.00817	0.0214	0.0214	U	0.0000329	0.0001	0.000000003
DecaCB (#209)	<	0.0208	—	—	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0848	2630	—		8.09		
2,2',5-TriCB (#18)	=	0.0488	6600	—	C	20		
2,3,3',-TriCB (#20)	=	1.6	4440	—	C	13.7		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0234	1610	—	C	4.95		
2,2',5,5'-TetraCB (#52)	=	0.0217	2690	—		8.27		
2,3',4,4'-TetraCB (#66)	=	0.506	281	—		0.864		
2,2',3,4',5-PentaCB (#90)	=	0.113	330	—	C	1		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.0852	3.73	—	C	0.0115		
2,2',3,3',4,5-HexaCB (#129)	=	0.0808	35	—	C	0.11		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.0722	60.6	—	C	0.186		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0163	3.34	—		0.0103		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.0145	0.0508	—		0.000156		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	M	0.0511	0.0913	0.0913	NDR	0.000281		
PCB Homologue Groups								
Total MonoCB	=	0.0794	164	—		0.504		
Total DiCB	=	0.14	9040	—		27.8		
Total TriCB	=	1.73	29300	—		90.1		
Total TetraCB	=	0.689	10300	—		31.7		
Total PentaCB	=	0.401	2220	—		6.83		
Total HexaCB	=	0.106	329	—		1.01		
Total HeptaCB	=	0.0263	14	—		0.043		
Total OctaCB	=	0.0323	0.204	—		0.000627		
Total NonaCB	<	0.0511	—	—	U	0.00008		
DecaCB (#209)	<	0.0208	—	—	R	—		
Homologue Groups Sum			**51400**			**160**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/17/2000	**Sample Number**	08170003	**Prevailing Wind Direction**	WNW
Lab Sample ID	L2699-9	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	66.2
Station ID/Name	03/N Side of CDF	**Run Time (hours)**	23.95	**Average Solar Radiation (w ·m²)**	272
Sample Type	Normal Sample	**Sample Volume (m³)**	323.325	**Total Precipitation (inches H_2O)**	0.00

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.361	5.51	—		0.0170	0.0001	0.000002
3,4,5,4'-TetraCB (#81)	<	0.335	—	—	U	0.0005	0.0001	0.00000005
2,3,3',4,4'-PentaCB (#105)	=	0.192	6.82	—		0.0211	0.0001	0.000002
2,3,4,4',5-PentaCB (#114)	=	0.175	0.738	—		0.00228	0.0005	0.000001
2,3',4,4',5-PentaCB (#118)	=	0.179	49.4	—		0.153	0.0001	0.00002
2',3,4,4',5-PentaCB (#123)	=	0.192	1.17	—		0.00362	0.0001	0.0000004
3,3',4,4',5-PentaCB (#126)	<	0.194	—	—	U	0.0003	0.1	0.00003
2,3,3',4,4',5-HexaCB (#156)	=	0.0916	1.34	—	C	0.00414	0.0005	0.000002
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0697	0.917	—		0.00284	0.00001	0.00000003
3,3',4,4',5,5'-HexaCB (#169)	<	0.0747	—	—	U	0.0001	0.01	0.000001
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0213	0.621	—		0.00192	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0188	1.37	—	C	0.00424	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	M	0.0063	0.0501	0.0501	NDR	0.000155	0.0001	0.00000002
DecaCB (#209)	M	0.0205	0.0304	0.0304	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.124	894	—		2.77		
2,2',5-TriCB (#18)	=	0.067	1410	—	C	4.36		
2,3,3',-TriCB (#20)	=	0.35	1230	—	C	3.8		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0344	565	—	C	1.75		
2,2',5,5'-TetraCB (#52)	=	0.0301	900	—		2.8		
2,3',4,4'-TetraCB (#66)	=	0.275	103	—		0.319		
2,2',3,4',5-PentaCB (#90)	=	0.0926	121	—	C	0.374		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.0865	2.36	—	C	0.00730		
2,2',3,3',4,5-HexaCB (#129)	=	0.0823	19.1	—	C	0.0591		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.0743	30.3	—	C	0.0937		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.017	1.92	—		0.00594		
2,2',3,3',4,4',5,6-OctaCB (#195)	M	0.0111	0.0542	0.0542	NDR	0.000168		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	M	0.0617	0.126	0.126	NDR	0.000390		
PCB Homologue Groups								
Total MonoCB	=	0.0765	77.5	—		0.240		
Total DiCB	=	0.202	3320	—		10.3		
Total TriCB	=	0.525	7690	—		23.8		
Total TetraCB	=	0.361	3500	—		11		
Total PentaCB	=	0.194	837	—		2.59		
Total HexaCB	=	0.107	158	—		0.489		
Total HeptaCB	=	0.0271	8.78	—		0.0272		
Total OctaCB	=	0.0314	0.65	—		0.0020		
Total NonaCB	=	0.0617	0.0705	—		0.000218		
DecaCB (#209)	M	0.0205	0.0304	0.0304	R	—		
Homologue Groups Sum			**15600**			**48**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/17/2000	**Sample Number**	08170003D	**Prevailing Wind Direction**	WNW
Lab Sample ID	L2699-10	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	66.2
Station ID/Name	03D/N Side of CDF Dup	**Run Time (hours)**	23.99	**Average Solar Radiation (w·m²)**	272
Sample Type	Field Duplicate	**Sample Volume (m³)**	323.865	**Total Precipitation (inches H_2O)**	0.00

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.534	8.5	—		0.026	0.0001	0.000003
3,4,5,4'-TetraCB (#81)	<	0.49	—	—	U	0.0008	0.0001	0.00000008
2,3,3',4,4'-PentaCB (#105)	=	0.235	11.8	—		0.0364	0.0001	0.000004
2,3,4,4',5-PentaCB (#114)	=	0.22	1.12	—		0.00346	0.0005	0.000002
2,3',4,4',5-PentaCB (#118)	=	0.214	85.5	—		0.264	0.0001	0.00003
2',3,4,4',5-PentaCB (#123)	=	0.238	2.38	—		0.00735	0.0001	0.0000007
3,3',4,4',5-PentaCB (#126)	<	0.239	—	—	U	0.0004	0.1	0.00004
2,3,3',4,4',5-HexaCB (#156)	=	0.173	2.02	—	C	0.00624	0.0005	0.000003
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.125	1.36	—		0.00420	0.00001	0.00000004
3,3',4,4',5,5'-HexaCB (#169)	<	0.143	—	—	U	0.0002	0.01	0.000002
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0163	0.831	—		0.00257	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0144	2.24	—	C	0.00692	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	=	0.00572	0.0538	—		0.000166	0.0001	0.00000002
DecaCB (#209)	M	0.0162	0.0326	0.0326	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.121	1350	—		4.17		
2,2',5-TriCB (#18)	=	0.0687	2590	—	C	8		
2,3,3',-TriCB (#20)	=	0.435	2120	—	C	6.55		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0328	923	—	C	2.85		
2,2',5,5'-TetraCB (#52)	=	0.0287	1550	—		4.79		
2,3',4,4'-TetraCB (#66)	=	0.409	170	—		0.52		
2,2',3,4',5-PentaCB (#90)	=	0.12	213	—	C	0.658		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.162	4.05	—	C	0.0125		
2,2',3,3',4,5-HexaCB (#129)	=	0.154	32.7	—	C	0.101		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.139	52.5	—	C	0.162		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0131	3.44	—		0.0106		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.0101	0.102	—		0.000315		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	M	0.0524	0.141	0.141	NDR	0.000435		
PCB Homologue Groups								
Total MonoCB	=	0.0868	116	—		0.358		
Total DiCB	=	0.214	5270	—		16.3		
Total TriCB	=	0.634	13500	—		41.7		
Total TetraCB	=	0.534	5970	—		18.4		
Total PentaCB	=	0.239	1480	—		4.57		
Total HexaCB	=	0.199	273	—		0.843		
Total HeptaCB	=	0.0208	15.4	—		0.0476		
Total OctaCB	=	0.0258	0.669	—		0.00207		
Total NonaCB	<	0.0524	—	—	U	0.00008		
DecaCB (#209)	M	0.0162	0.0326	0.0326	R	—		
Homologue Groups Sum			**26600**			**82**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/17/2000	**Sample Number**	08170006	**Prevailing Wind Direction**	WNW
Lab Sample ID	L2699-11	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	66.2
Station ID/Name	06/W Side of CDF	**Run Time (hours)**	23.89	**Average Solar Radiation (w •m²)**	272
Sample Type	Normal Sample	**Sample Volume (m³)**	322.515	**Total Precipitation (inches H_2O)**	0.00

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.592	11.2	—		0.0347	0.0001	0.000003
3,4,5,4'-TetraCB (#81)	<	0.549	—	—	U	0.0009	0.0001	0.00000009
2,3,3',4,4'-PentaCB (#105)	=	0.31	13.4	—		0.0415	0.0001	0.000004
2,3,4,4',5-PentaCB (#114)	=	0.289	1.54	—		0.00477	0.0005	0.000002
2,3',4,4',5-PentaCB (#118)	=	0.276	91.5	—		0.284	0.0001	0.00003
2',3,4,4',5-PentaCB (#123)	=	0.303	2.24	—		0.00695	0.0001	0.0000007
3,3',4,4',5-PentaCB (#126)	<	0.324	—	—	U	0.0005	0.1	0.00005
2,3,3',4,4',5-HexaCB (#156)	=	0.18	2.04	—	C	0.00633	0.0005	0.000003
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.131	1.28	—		0.00397	0.00001	0.00000004
3,3',4,4',5,5'-HexaCB (#169)	<	0.147	—	—	U	0.0002	0.01	0.000002
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0198	0.849	—		0.00263	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0175	2.06	—	C	0.00639	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	M	0.00838	0.0501	0.0501	NDR	0.000155	0.0001	0.00000002
DecaCB (#209)	<	0.0183	—	—	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.148	1530	—		4.74		
2,2',5-TriCB (#18)	=	0.0573	2840	—	C	8.81		
2,3,3',-TriCB (#20)	=	0.24	2310	—	C	7.16		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0281	1010	—	C	3.13		
2,2',5,5'-TetraCB (#52)	=	0.0246	1420	—		4.4		
2,3',4,4'-TetraCB (#66)	=	0.439	206	—		0.639		
2,2',3,4',5-PentaCB (#90)	=	0.207	284	—	C	0.881		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.168	3.71	—	C	0.0115		
2,2',3,3',4,5-HexaCB (#129)	=	0.159	33.7	—	C	0.104		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.144	53.2	—	C	0.165		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0159	2.97	—		0.00921		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.0103	0.061	—		0.00019		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.0645	0.104	—		0.000322		
PCB Homologue Groups								
Total MonoCB	=	0.0758	154	—		0.477		
Total DiCB	=	0.262	6090	—		18.9		
Total TriCB	=	0.36	14700	—		45.6		
Total TetraCB	=	0.592	6080	—		18.9		
Total PentaCB	=	0.324	1760	—		5.46		
Total HexaCB	=	0.206	301	—		0.933		
Total HeptaCB	=	0.0252	14.5	—		0.0450		
Total OctaCB	=	0.029	1.1	—		0.0034		
Total NonaCB	=	0.0645	0.104	—		0.000322		
DecaCB (#209)	<	0.0183	—	—	R	—		
Homologue Groups Sum			**29100**			**90**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/17/2000	**Sample Number**	08170009	**Prevailing Wind Direction**	WNW
Lab Sample ID	L2699-15	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	66.2
Station ID/Name	09/Coffin Avenue	**Run Time (hours)**	24.03	**Average Solar Radiation (w ·m²)**	272
Sample Type	Normal Sample	**Sample Volume (m³)**	324.405	**Total Precipitation (inches H_2O)**	0.00

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.286	3.31	—		0.0102	0.0001	0.000001
3,4,5,4'-TetraCB (#81)	<	0.264	—	—	U	0.0004	0.0001	0.00000004
2,3,3',4,4'-PentaCB (#105)	=	0.187	4.71	—		0.0145	0.0001	0.000001
2,3,4,4',5-PentaCB (#114)	=	0.172	0.556	—		0.00171	0.0005	0.0000009
2,3',4,4',5-PentaCB (#118)	=	0.171	35.5	—		0.109	0.0001	0.00001
2',3,4,4',5-PentaCB (#123)	=	0.18	0.832	—		0.00256	0.0001	0.0000003
3,3',4,4',5-PentaCB (#126)	<	0.177	—	—	U	0.0003	0.1	0.00003
2,3,3',4,4',5-HexaCB (#156)	=	0.079	0.822	—	C	0.00253	0.0005	0.000001
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0574	0.594	—		0.00183	0.00001	0.00000002
3,3',4,4',5,5'-HexaCB (#169)	<	0.0608	—	—	U	0.00009	0.01	0.0000009
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0139	0.326	—		0.00100	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0123	1.31	—	C	0.00404	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	<	0.0056	0.0369	—	U	0.0000569	0.0001	0.000000006
DecaCB (#209)	M	0.0176	0.0388	0.0388	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0752	545	—		1.68		
2,2',5-TriCB (#18)	=	0.055	1280	—	C	3.95		
2,3,3',-TriCB (#20)	=	0.311	951	—	C	2.93		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0185	351	—	C	1.08		
2,2',5,5'-TetraCB (#52)	=	0.0162	612	—		1.89		
2,3',4,4'-TetraCB (#66)	=	0.214	68.8	—		0.212		
2,2',3,4',5-PentaCB (#90)	=	0.112	87.2	—	C	0.269		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.0738	1.59	—	C	0.00490		
2,2',3,3',4,5-HexaCB (#129)	=	0.0702	13.6	—	C	0.0419		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.0634	22.6	—	C	0.0697		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0112	1.86	—		0.00573		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.0104	0.0573	—		0.000177		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.0534	0.214	—		0.000660		
PCB Homologue Groups								
Total MonoCB	=	0.0662	41.5	—		0.128		
Total DiCB	=	0.137	2250	—		6.94		
Total TriCB	=	0.473	6430	—		19.8		
Total TetraCB	=	0.286	2320	—		7.15		
Total PentaCB	=	0.187	605	—		1.86		
Total HexaCB	=	0.0909	118	—		0.364		
Total HeptaCB	=	0.0177	8.05	—		0.0248		
Total OctaCB	=	0.0209	0.734	—		0.00226		
Total NonaCB	=	0.0534	0.259	—		0.000798		
DecaCB (#209)	M	0.0176	0.0388	0.0388	R	—		
Homologue Groups Sum			**11800**			**36**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/17/2000	**Sample Number**	08170017	**Prevailing Wind Direction**	WNW
Lab Sample ID	L2699-12	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	66.2
Station ID/Name	17/S Side of CDF	**Run Time (hours)**	24.12	**Average Solar Radiation (w ·m²)**	272
Sample Type	Normal Sample	**Sample Volume (m³)**	325.62	**Total Precipitation (inches H_2O)**	0.00

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.738	10.7	—		0.0329	0.0001	0.000003
3,4,5,4'-TetraCB (#81)	<	0.704	—	—	U	0.001	0.0001	0.0000001
2,3,3',4,4'-PentaCB (#105)	=	0.394	12.7	—		0.0390	0.0001	0.000004
2,3,4,4',5-PentaCB (#114)	=	0.378	1.56	—		0.00479	0.0005	0.000002
2,3',4,4',5-PentaCB (#118)	=	0.359	107	—		0.329	0.0001	0.00003
2',3,4,4',5-PentaCB (#123)	=	0.395	2.67	—		0.00820	0.0001	0.0000008
3,3',4,4',5-PentaCB (#126)	<	0.406	—	—	U	0.0006	0.1	0.00006
2,3,3',4,4',5-HexaCB (#156)	=	0.246	2.3	—	C	0.0071	0.0005	0.000004
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.178	1.63	—		0.00501	0.00001	0.00000005
3,3',4,4',5,5'-HexaCB (#169)	<	0.193	—	—	U	0.0003	0.01	0.000003
2,2',3,3',4,4',5-HeptaCB (#170)	=	0.0181	0.80	—		0.0025	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.016	2.55	—	C	0.00783	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	<	0.00659	0.0368	0.0368	U	0.0000565	0.0001	0.000000006
DecaCB (#209)	M	0.0153	0.0324	0.0324	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0877	2060	—		6.33		
2,2',5-TriCB (#18)	=	0.0706	3550	—	C	10.9		
2,3,3',-TriCB (#20)	=	0.65	2940	—	C	9.03		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0345	1250	—	C	3.84		
2,2',5,5'-TetraCB (#52)	=	0.0303	1710	—		5.25		
2,3',4,4'-TetraCB (#66)	=	0.57	248	—		0.762		
2,2',3,4',5-PentaCB (#90)	=	0.185	310	—	C	0.95		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.224	4.14	—	C	0.0127		
2,2',3,3',4,5-HexaCB (#129)	=	0.214	38.2	—	C	0.117		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.193	65.2	—	C	0.200		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0145	3.77	—		0.0116		
2,2',3,3',4,4',5,6-OctaCB (#195)	=	0.0118	0.081	—		0.00025		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	=	0.0563	0.0976	—		0.000300		
PCB Homologue Groups								
Total MonoCB	=	0.0945	174	—		0.534		
Total DiCB	=	0.159	7760	—		23.8		
Total TriCB	=	0.96	18300	—		56.2		
Total TetraCB	=	0.738	7440	—		22.8		
Total PentaCB	=	0.406	2030	—		6.23		
Total HexaCB	=	0.277	361	—		1.11		
Total HeptaCB	=	0.023	17.8	—		0.0547		
Total OctaCB	=	0.0285	1.36	—		0.00418		
Total NonaCB	=	0.0563	0.188	—		0.000577		
DecaCB (#209)	M	0.0153	0.0324	0.0324	R	—		
Homologue Groups Sum			**36100**			**110**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

Sample Event Date	8/17/2000	**Sample Number**	08170027	**Prevailing Wind Direction**	WNW
Lab Sample ID	L2699-13	**Preliminary Flow (slpm)**	225	**Average Temperature (°F)**	66.2
Station ID/Name	27/Francis Street	**Run Time (hours)**	24.03	**Average Solar Radiation (w ·m²)**	278
Sample Type	Normal Sample	**Sample Volume (m³)**	324.405	**Total Precipitation (inches H_2O)**	0.00

Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration (ng/m³)	TEF	TEQ† (ng/m³)
PCB Congeners								
3,3',4,4'-TetraCB (#77)	=	0.577	3.55	—		0.0109	0.0001	0.000001
3,4,5,4'-TetraCB (#81)	<	0.535	—	—	U	0.0008	0.0001	0.00000008
2,3,3',4,4'-PentaCB (#105)	=	0.209	7.39	—		0.0228	0.0001	0.000002
2,3,4,4',5-PentaCB (#114)	=	0.192	0.642	—		0.00198	0.0005	0.000001
2,3',4,4',5-PentaCB (#118)	=	0.188	36.7	—		0.113	0.0001	0.00001
2',3,4,4',5-PentaCB (#123)	=	0.205	0.803	—		0.00248	0.0001	0.0000002
3,3',4,4',5-PentaCB (#126)	<	0.213	—	—	U	0.0003	0.1	0.00003
2,3,3',4,4',5-HexaCB (#156)	=	0.114	2.08	—	C	0.00641	0.0005	0.000003
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—	0.0005	
2,3',4,4',5,5'-HexaCB (#167)	=	0.0827	0.845	—		0.00260	0.00001	0.00000003
3,3',4,4',5,5'-HexaCB (#169)	<	0.0853	—	—	U	0.0001	0.01	0.000001
2,2',3,3',4,4',5-HeptaCB (#170)	M	0.019	1.03	1.03	NDR	0.00318	—	
2,2',3,4,4',5,5'-HeptaCB (#180)	=	0.0168	1.98	—	C	0.00610	—	
2,3,3',4,4',5,5'-HeptaCB (#189)	=	0.00875	0.0478	—		0.000147	0.0001	0.00000001
DecaCB (#209)	M	0.0174	0.0343	0.0343	R	—	—	
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0732	386	—		1.19		
2,2',5-TriCB (#18)	=	0.0666	754	—	C	2.32		
2,3,3',-TriCB (#20)	=	0.27	607	—	C	1.87		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0274	308	—	C	0.949		
2,2',5,5'-TetraCB (#52)	=	0.024	459	—		1.41		
2,3',4,4'-TetraCB (#66)	=	0.429	63.3	—		0.195		
2,2',3,4',5-PentaCB (#90)	=	0.0966	83.8	—	C	0.258		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	=	0.104	2.97	—	C	0.00916		
2,2',3,3',4,5-HexaCB (#129)	=	0.0989	19.8	—	C	0.0610		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	=	0.0892	23.7	—	C	0.0731		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.0152	1.61	—		0.00496		
2,2',3,3',4,4',5,6-OctaCB (#195)	M	0.0104	0.0766	0.0766	NDR	0.000236		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	M	0.0793	0.0962	0.0962	NDR	0.000297		
PCB Homologue Groups								
Total MonoCB	=	0.0779	30.7	—		0.0946		
Total DiCB	=	0.13	1390	—		4.28		
Total TriCB	=	0.4	3890	—		12		
Total TetraCB	=	0.577	1880	—		5.8		
Total PentaCB	=	0.213	550	—		1.7		
Total HexaCB	=	0.128	130	—		0.40		
Total HeptaCB	=	0.0242	7.91	—		0.0244		
Total OctaCB	=	0.0305	0.507	—		0.00156		
Total NonaCB	<	0.0793	—	—	U	0.0001		
DecaCB (#209)	M	0.0174	0.0343	0.0343	R	—		
Homologue Groups Sum			**7880**			**24**		

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

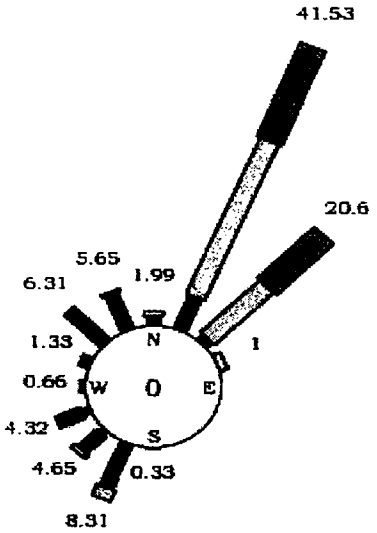
Sample Event Date	8/17/2000	**Sample Number**	08170027B	**Prevailing Wind Direction**	—
Lab Sample ID	L2699-14 i	**Preliminary Flow (slpm)**	0	**Average Temperature (°F)**	—
Station ID/Name	27/Francis Street	**Run Time (hours)**	0	**Average Solar Radiation (w •m²)**	—
Sample Type	Field Blank	**Sample Volume (m³)**	0	**Total Precipitation (inches H_2O)**	—

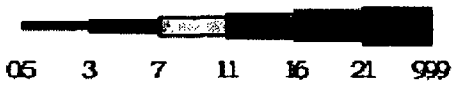
Analyte	Detsym	Detection Limit (ng)	Mass (ng)	EMPC*	QFlag	Concentration ng	TEF	TEQ† ng
PCB Congeners								
3,3',4,4'-TetraCB (#77)	M	0.0113	0.0192	0.0192	NDR	—		
3,4,5,4'-TetraCB (#81)	<	0.0104	—	—	U	—		
2,3,3',4,4'-PentaCB (#105)	<	0.022	—	—	U	—		
2,3,4,4',5-PentaCB (#114)	<	0.0201	—	—	U	—		
2,3',4,4',5-PentaCB (#118)	=	0.021	0.0805	—		—		
2',3,4,4',5-PentaCB (#123)	<	0.0219	—	—	U	—		
3,3',4,4',5-PentaCB (#126)	<	0.0201	—	—	U	—		
2,3,3',4,4',5-HexaCB (#156)	M	0.00664	0.0147	0.0147	C NDR	—		
2,3,3',4,4',5'-HexaCB (#157)		—	—	—	C156	—		
2,3',4,4',5,5'-HexaCB (#167)	<	0.00517	—	—	U	—		
3,3',4,4',5,5'-HexaCB (#169)	<	0.00484	—	—	U	—		
2,2',3,3',4,4',5-HeptaCB (#170)	<	0.0095	—	—	U	—		
2,2',3,4,4',5,5'-HeptaCB (#180)	M	0.0084	0.0124	0.0124	C NDR	—		
2,3,3',4,4',5,5'-HeptaCB (#189)	=	0.00352	0.00752	—		—		
DecaCB (#209)	M	0.0091	0.0137	0.0137	R	—		
Additional PCB Congeners								
2,4'-DiCB (#8)	=	0.0343	0.307	—		—		
2,2',5-TriCB (#18)	=	0.0357	0.395	—	C	—		
2,3,3',-TriCB (#20)	=	0.0343	0.297	—	C	—		
2,4,4'-TriCB (#28)		—	—	—	C20	—		
2,2',3,5'-TetraCB (#44)	=	0.0108	0.145	—	C	—		
2,2',5,5'-TetraCB (#52)	=	0.0095	0.189	—		—		
2,3',4,4'-TetraCB (#66)	=	0.00836	0.0382	—		—		
2,2',3,4',5-PentaCB (#90)	=	0.0151	0.105	—	C	—		
2,2',4,5,5'-PentaCB (#101)		—	—	—	C90	—		
2,2',3,3',4,4'-HexaCB (#128)	<	0.00619	—	—	U	—		
2,2',3,3',4,5-HexaCB (#129)	M	0.00589	0.0484	0.0484	C NDR	—		
2,2',3,4,4',5'-HexaCB (#138)		—	—	—	C129	—		
2,2',4,4',5,5'-HexaCB (#153)	M	0.00532	0.0364	0.0364	C NDR	—		
2,2',3,4',5,5',6-HeptaCB (#187)	=	0.00761	0.0109	—		—		
2,2',3,3',4,4',5,6-OctaCB (#195)	<	0.00538	—	—	U	—		
2,2',3,3',4,4',5,5',6-NonaCB (#206)	<	0.0305	—	—	U	—		
PCB Homologue Groups								
Total MonoCB	=	0.0262	0.0346	—		—		
Total DiCB	=	0.0629	0.933	—		—		
Total TriCB	=	0.0562	1.83	—		—		
Total TetraCB	=	0.012	0.715	—		—		
Total PentaCB	=	0.022	0.518	—		—		
Total HexaCB	=	0.0111	0.0731	—		—		
Total HeptaCB	=	0.0121	0.0184	—		—		
Total OctaCB	=	0.0185	0.00699	—		—		
Total NonaCB	<	0.0305	—	—	U	—		
DecaCB (#209)	M	0.0091	0.0137	0.0137	R	—		
Homologue Groups Sum			**4.14**					

* M indicates all or a portion of the result has a calculated EMPC value.
† TEQ is the product of the concentration and its TEF value.

New Bedford Harbor

15 Aug - 16 Aug, 2000 (0700 EST - 0800 EST)





Scale (mph)

Wind Speed (mph) Percent Occurance

	0.5-3	3-7	7-11	11-16	16-21	>21
N	0	1.33	0.66	0	0	0
NNE	0	4.98	22.92	13.62	0	0
NE	0	1	9.97	9.63	0	0
ENE	0	0	1	0	0	0
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0

Wind Speed (mph) Percent Occurance

	0.5-3	3-7	7-11	11-16	16-21	>21
S	0	0.33	0	0	0	0
SSW	0.33	6.31	1.66	0	0	0
SW	0.66	3.32	0.66	0	0	0
WSW	1	3.32	0	0	0	0
W	0	0.66	0	0	0	0
WNW	0	1.33	0	0	0	0
NW	0	6.31	0	0	0	0
NNW	0	5.32	0.33	0	0	0

New Bedford Harbor

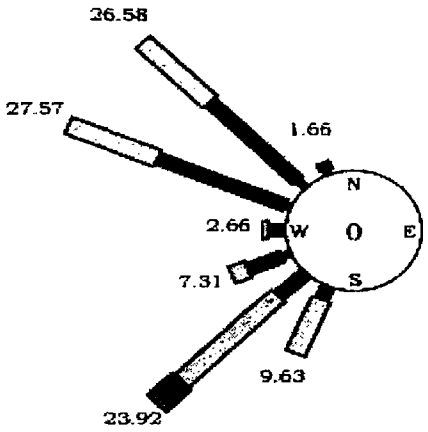
Meteorological Data

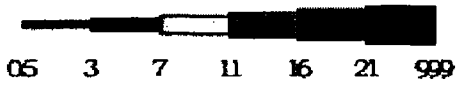
Hourly Summary
15 Aug - 16 Aug, 2000 (0700 EST - 0800 EST)

Date	Time	Wind Speed	Wind Direction		STD	Temp. (10m)	Temp. (2m)	Delta Temp	Solar Radiation	Batt.	Barr. Press.	Relative Humidity	Precip.
Mo. Day	EST	mph	deg	compass	deg	°F	°F	°F	w•m^2	vdc	in. Hg	%RH	in. H_2O
08/15	700	9.27	19.52	NNE	8.45	67.44	67.13	0.31	34.94	13.42	29.96	93.04	0
08/15	800	9.37	34.57	NE	7.32	68.23	68.03	0.2	52.68	13.46	29.97	91.64	0
08/15	900	9.07	26.84	NNE	9.5	68.99	68.65	0.33	82.44	13.46	29.98	90.95	0
08/15	1000	10.66	18.98	NNE	8.83	69.48	69.2	0.28	137.73	13.44	29.98	90.07	0
08/15	1100	10.21	27.21	NNE	7.66	69.59	69.43	0.16	228.19	13.44	29.98	91.64	0.01
08/15	1200	11	27.51	NNE	8.25	72.6	72.38	0.22	341.83	13.41	29.97	86.91	0
08/15	1300	12.5	32.17	NNE	7.54	71.78	71.63	0.15	162.61	13.4	29.96	84.94	0
08/15	1400	11	40.88	NE	8.73	68.2	68.24	-0.04	70.36	13.42	29.95	90.79	0.17
08/15	1500	8.91	28.9	NNE	9.7	68.84	68.47	0.37	126.29	13.43	29.94	93.77	0.04
08/15	1600	11.94	30.25	NNE	8.71	69.66	69.44	0.22	181.42	13.44	29.92	90.92	0.01
08/15	1700	12.6	31.19	NNE	7.87	68.89	68.75	0.14	122.28	13.43	29.92	92.04	0.09
08/15	1800	12.12	37.96	NE	7.27	69.69	69.49	0.2	88.76	13.44	29.91	90.23	0
08/15	1900	10.83	36.22	NE	6.87	69.3	69.1	0.19	33.26	13.44	29.91	89.93	0
08/15	2000	9.12	33.34	NNE	8.72	68.26	68.05	0.21	2.77	13.44	29.91	91.15	0
08/15	2100	7.83	27.44	NNE	8.86	67.7	67.34	0.36	0.11	13.46	29.91	93.02	0
08/15	2200	7.16	24.47	NNE	8.74	68.32	67.82	0.49	0.08	13.46	29.91	92.25	0
08/15	2300	5.6	19.12	NNE	11.85	68.51	67.96	0.56	0.06	13.46	29.91	92.07	0
08/16	2400	6.31	353.52	N	14.48	68.47	67.82	0.65	0.06	13.46	29.9	92.38	0
08/16	100	5.76	343.17	NNW	13.93	68.41	67.68	0.73	0.05	13.47	29.89	91.97	0
08/16	200	5.55	325.76	NW	11.15	67.95	67.27	0.68	0.05	13.47	29.87	92.11	0
08/16	300	5.06	320.02	NW	9.48	67.67	67	0.67	0.05	13.47	29.85	92.67	0
08/16	400	4.12	270.3	W	13.81	67.75	67.11	0.64	0.04	13.47	29.84	91.97	0
08/16	500	3.69	243.37	WSW	19.45	68.36	67.75	0.61	0.04	13.48	29.83	90.91	0
08/16	600	5.11	197.66	SSW	14.22	68.77	68.25	0.52	0.55	13.47	29.82	90.71	0
08/16	700	6.5	202.31	SSW	17.93	69.27	68.73	0.54	19.04	13.43	29.82	90.49	0
08/16	800	6.31	218	SW	21.59	70.95	70.38	0.57	142.29	13.44	29.83	89.25	0
Average		8.37			10.8	68.96	68.58	0.38	70.31	13.45	29.91	91.07	0.01
Minimum		3.69			6.87	67.44	67	-0.04	0.04	13.4	29.82	84.94	0
Maximum		12.6			21.59	72.6	72.38	0.73	341.83	13.48	29.98	93.77	0.17
Total													0.32

New Bedford Harbor

16 Aug - 17 Aug, 2000 (0700 EST - 0800 EST)





Scale (mph)

Wind Speed (mph) Percent Occurance

	0.5-3	3-7	7-11	11-16	16-21	>21
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	0	0	0	0	0
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0

Wind Speed (mph) Percent Occurance

	0.5-3	3-7	7-11	11-16	16-21	>21
S	0	0	0	0	0	0
SSW	0	1.99	7.64	0	0	0
SW	0.33	3.99	15.61	3.99	0	0
WSW	1	4.32	1.99	0	0	0
W	0.33	1.66	0.66	0	0	0
WNW	0.66	15.95	10.96	0	0	0
NW	1.33	14.29	10.96	0	0	0
NNW	0.66	1	0	0	0	0

New Bedford Harbor

Meteorological Data

Hourly Summary
16 Aug - 17 Aug, 2000 (0700 EST - 0800 EST)

Date	Time	Wind Speed	Wind Direction		STD	Temp. (10m)	Temp. (2m)	Delta Temp	Solar Radiation	Batt.	Barr. Press.	Relative Humidity	Precip.
Mo. Day	EST	mph	deg	compass	deg	°F	°F	°F	w•m^2	vdc	in. Hg	%RH	in. H_2O
08/16	700	6.5	202.31	SSW	17.93	69.27	68.73	0.54	19.04	13.43	29.82	90.49	0
08/16	800	6.31	218	SW	21.59	70.95	70.38	0.57	142.29	13.44	29.83	89.25	0
08/16	900	9.7	222.53	SW	20.72	74.17	73.72	0.45	333.87	13.39	29.82	83.93	0
08/16	1000	8.85	222.8	SW	20.8	73.04	72.31	0.72	142.66	13.37	29.81	84.61	0.02
08/16	1100	8.47	207.39	SSW	16.24	70.66	69.83	0.83	123.89	13.4	29.8	90.3	0.01
08/16	1200	8.82	208.44	SSW	22.12	73.27	72.68	0.59	174.24	13.4	29.78	87.44	0
08/16	1300	9.7	222.77	SW	21.52	74.47	74.18	0.29	252.67	13.37	29.76	85.83	0
08/16	1400	10.92	229.83	SW	17.14	74.71	74.48	0.22	269	13.35	29.74	85.09	0
08/16	1500	8.49	236.55	WSW	18.37	77.83	77.89	-0.06	500.91	13.32	29.73	81.47	0
08/16	1600	6.74	246.66	WSW	22.55	81.79	81.99	-0.21	592.03	13.27	29.72	75.24	0
08/16	1700	7.53	229.25	SW	19.88	80.24	80.02	0.22	224.69	13.25	29.72	75.23	0.01
08/16	1800	8.48	290.86	WNW	14.29	75.97	75.2	0.77	239.28	13.3	29.73	81.75	0
08/16	1900	8.11	300.29	WNW	11.78	77.26	76.54	0.72	163	13.3	29.74	74.49	0
08/16	2000	5.88	307.9	NW	10.21	75.03	73.78	1.25	24.63	13.33	29.76	67.19	0
08/16	2100	5.56	303.91	NW	10.1	71.64	70.36	1.28	0.21	13.39	29.78	70.33	0
08/16	2200	4.73	301.3	WNW	12.61	69.81	68.59	1.21	0.16	13.44	29.79	72.8	0
08/16	2300	6.96	303.86	NW	11.55	69.24	68.08	1.16	0.12	13.46	29.8	70.23	0
08/17	2400	6.91	302.9	WNW	11.78	68.12	66.99	1.14	0.11	13.48	29.81	69.53	0
08/17	100	8.83	302.42	WNW	9.98	66.72	65.72	1	0.1	13.5	29.81	70.89	0
08/17	200	8.53	307.91	NW	10	65.49	64.51	0.99	0.1	13.51	29.8	72.69	0
08/17	300	6.64	308.46	NW	8.76	64.66	63.63	1.04	0.09	13.53	29.79	74.54	0
08/17	400	3.99	323.16	NW	9.86	63.29	62.23	1.06	0.08	13.55	29.79	77.18	0
08/17	500	3.07	313.94	NW	12.9	62.42	61.36	1.05	0.06	13.59	29.82	79.62	0
08/17	600	6.22	304.53	NW	9.1	61.83	60.82	1.01	0.84	13.6	29.84	80.42	0
08/17	700	4.92	289.38	WNW	11.79	62.5	61.64	0.86	36.73	13.52	29.87	79.83	0
08/17	800	3.92	273.22	W	20.89	66.04	64.96	1.08	169.67	13.51	29.89	76.62	0
Average		7.11			15.17	70.79	70.02	0.76	131.17	13.42	29.79	78.73	0
Minimum		3.07			8.76	61.83	60.82	-0.21	0.06	13.25	29.72	67.19	0
Maximum		10.92			22.55	81.79	81.99	1.28	592.03	13.6	29.89	90.49	0.02
Total													0.04

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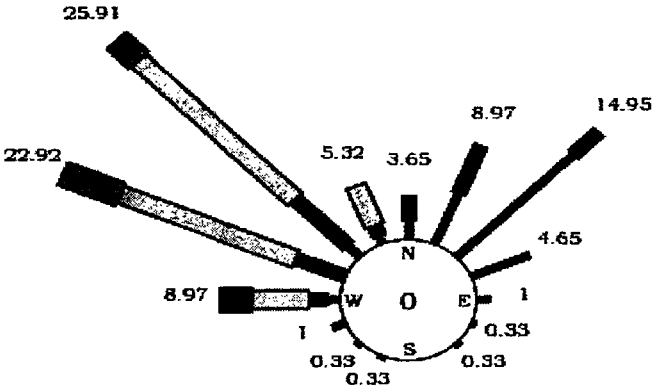
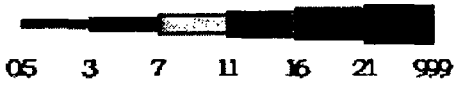
New Bedford Harbor

17 Aug - 18 Aug, 2000 (0700 EST - 0800 EST)





Scale (mph)

Wind Speed (mph) Percent Occurance

	0.5-3	3-7	7-11	11-16	16-21	>21
N	1.66	1.99	0	0	0	0
NNE	4.65	4.32	0	0	0	0
NE	12.29	2.66	0	0	0	0
ENE	4.65	0	0	0	0	0
E	1	0	0	0	0	0
ESE	0.33	0	0	0	0	0
SE	0.33	0	0	0	0	0
SSE	0	0	0	0	0	0

Wind Speed (mph) Percent Occurance

	0.5-3	3-7	7-11	11-16	16-21	>21
S	0	0	0	0	0	0
SSW	0.33	0	0	0	0	0
SW	0.33	0	0	0	0	0
WSW	1	0	0	0	0	0
W	1	1.33	4.32	2.33	0	0
WNW	0	3.99	14.29	4.65	0	0
NW	1.33	5.65	16.61	2.33	0	0
NNW	0.66	1	3.65	0	0	0

New Bedford Harbor

Meteorological Data

Hourly Summary
17 Aug - 18 Aug, 2000 (0700 EST - 0800 EST)

Date	Time	Wind Speed	Wind Direction		STD	Temp. (10m)	Temp. (2m)	Delta Temp	Solar Radiation	Batt.	Barr. Press.	Relative Humidity	Precip.
Mo. Day	EST	mph	deg	compass	deg	°F	°F	°F	w•m^2	vdc	in. Hg	%RH	in. H_2O
08/17	700	4.92	289.38	WNW	11.79	62.5	61.64	0.86	36.73	13.52	29.87	79.83	0
08/17	800	3.92	273.22	W	20.89	66.04	64.96	1.08	169.67	13.51	29.89	76.62	0
08/17	900	8.69	301.62	WNW	13.67	68.31	67.52	0.79	398.72	13.46	29.9	72.85	0
08/17	1000	10.26	312.02	NW	12.47	70.35	69.41	0.94	593.8	13.41	29.9	69.01	0
08/17	1100	10.37	298.08	WNW	15.7	72.43	71.65	0.78	709.53	13.36	29.9	65.61	0
08/17	1200	9.91	297.03	WNW	15.88	73.86	73.22	0.64	790.03	13.34	29.9	63.47	0
08/17	1300	11.17	284.57	WNW	16.42	74.35	74.61	-0.27	904.71	13.35	29.88	60.49	0
08/17	1400	10.84	292.23	WNW	16.61	75.21	75.92	-0.71	923.59	13.35	29.89	58.75	0
08/17	1500	10.35	285.18	WNW	19.12	75.66	76.21	-0.55	756.16	13.35	29.89	58.07	0
08/17	1600	9.43	287.26	WNW	17.42	76.46	76.75	-0.29	622.97	13.33	29.88	57.05	0
08/17	1700	9.29	309.04	NW	14.18	75.89	75.5	0.39	375.75	13.32	29.88	58.14	0
08/17	1800	9.61	308.57	NW	13.23	75.5	74.93	0.57	297.68	13.33	29.89	57.77	0
08/17	1900	8.44	321.96	NW	11.02	74.05	73.15	0.89	135.18	13.35	29.9	59.31	0
08/17	2000	8.57	330.65	NNW	12.3	70.89	69.78	1.11	20.77	13.39	29.91	63.19	0
08/17	2100	6.4	314.57	NW	10.32	66.82	65.83	0.99	0.2	13.45	29.93	69.37	0
08/17	2200	6.43	316.48	NW	9.2	65.39	64.32	1.07	0.14	13.5	29.94	71.92	0
08/17	2300	2.2	337.52	NNW	25.21	64.2	63.04	1.16	0.12	13.54	29.94	73.51	0
08/18	2400	1.94	26.63	NNE	27.37	62.24	60.69	1.55	0.09	13.59	29.94	80.98	0
08/18	100	2.49	44.38	NE	12.4	60.11	58.84	1.27	0.07	13.62	29.93	84.49	0
08/18	200	2	36.33	NE	16.95	58.92	57.91	1.01	0.04	13.64	29.93	86.1	0
08/18	300	2.44	41.49	NE	11.04	57.9	57.07	0.83	0.02	13.66	29.93	86.85	0
08/18	400	2.22	51.11	NE	11.07	57.17	56.4	0.77	0.04	13.67	29.92	87.01	0
08/18	500	2.3	42.87	NE	8.19	56.43	55.68	0.75	0.01	13.69	29.92	88.08	0
08/18	600	2.94	36.04	NE	7.88	55.49	54.77	0.72	1.01	13.7	29.92	89.04	0
08/18	700	4.34	3.34	N	11.78	57.01	55.95	1.06	59.94	13.69	29.95	87.62	0
08/18	800	3.2	32.93	NNE	10.15	62.02	60.78	1.24	188.66	13.64	29.97	83.22	0
Average		6.33			14.32	66.74	66.02	0.72	268.68	13.49	29.91	72.63	0
Minimum		1.94			7.88	55.49	54.77	-0.71	0.01	13.32	29.87	57.05	0
Maximum		11.17			27.37	76.46	76.75	1.55	923.59	13.7	29.97	89.04	0
Total													0

Appendix M
Wastewater Treatment Results and Calculations

Table M1
Pilot - Scale Activated Carbon Treatment Analytical Results

September 14, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	29	5.21	NA	NA	NA	NA	NA	NA	21	ND: <5.0
Clarifier Effluent	SP2	20	5.08	NA	NA	NA	NA	NA	NA	16	ND: <5.0
Vortisand Filter Influent	SP3	35	1.14	NA	NA	NA	NA	NA	NA	8.4	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	36	1.11	NA	NA	NA	NA	NA	NA	17	ND: <5.0
GAC Midpoint	SP6A	25	ND: <0.05	NA	NA	NA	NA	NA	NA	11	ND: <5.0
GAC Effluent	SP7	11	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0
GAC Effluent	SP7 Dup	22	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0

September 15, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	42	6.3	NA	NA	NA	NA	NA	NA	18	ND: <5.0
Clarifier Effluent	SP2	71	5.21	NA	NA	NA	NA	NA	NA	6.4	ND: <5.0
Vortisand Filter Influent	SP3	30	1.12	NA	NA	NA	NA	NA	NA	8.5	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	25	1.14	NA	NA	NA	NA	NA	NA	12	7.4
GAC Midpoint	SP6A	46	ND: <0.05	NA	NA	NA	NA	NA	NA	3.4	ND: <5.0
GAC Effluent	SP7	58	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0

September 16, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	69	3.93	NA	NA	19	ND: <5.0	NA	NA	14	ND: <5.0
Clarifier Effluent	SP2	71	3.05	NA	NA	7.4	ND: <5.0	NA	NA	6.2	ND: <5.0
Vortisand Filter Influent	SP3	57	1.29	NA	NA	7.5	ND: <5.0	NA	NA	7.2	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	49	1.28	NA	NA	12	ND: <5.0	NA	NA	12	ND: <5.0
GAC Midpoint	SP6A	39	ND: <0.05	NA	NA	ND: <3.0	ND: <5.0	NA	NA	ND: <3.0	92
GAC Effluent	SP7	34	ND: <0.05	NA	NA	ND: <3.0	ND: <5.0	NA	NA	ND: <3.0	ND: <5.0

NA = Not Analyzed
ND = Not Detected

Table M1 (Cont.)
Pilot - Scale Activated Carbon Treatment Analytical Results

September 17, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	74	4.22	NA	NA	14	ND: <5.0	NA	NA	17	ND: <5.0
Clarifier Effluent	SP2	71	3.53	NA	NA	12	ND: <5.0	NA	NA	13	ND: <5.0
Vortisand Filter Influent	SP3	44	1.04	NA	NA	11	ND: <5.0	NA	NA	12	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	32	1.06	NA	NA	15	ND: <5.0	NA	NA	15	ND: <5.0
GAC Midpoint	SP6A	52	ND: <0.05	NA	NA	ND: <3.0	ND: <5.0	NA	NA	ND: <3.0	ND: <5.0
GAC Effluent	SP7	27	ND: <0.05	NA	NA	ND: <3.0	ND: <5.0	NA	NA	ND: <3.0	ND: <5.0

September 18, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	76	3.68	NA	NA	NA	NA	NA	NA	16	ND: <5.0
Clarifier Effluent	SP2	89	2.57	NA	NA	NA	NA	NA	NA	12	ND: <5.0
Vortisand Filter Influent	SP3	72	0.98	NA	NA	NA	NA	NA	NA	12	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	55	1.05	NA	NA	NA	NA	NA	NA	15	ND: <5.0
GAC Midpoint	SP6A	53	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0
GAC Effluent	SP7	52	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0

September 19, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	79	8.27	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	18	ND: <5.0
Clarifier Effluent	SP2	72	3.25	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	7.9	ND: <5.0
Vortisand Filter Influent	SP3	58	1.11	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	12	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	45	0.73	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	18	ND: <5.0
GAC Midpoint	SP6A	44	ND: <0.05	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	34	ND: <0.05	ND: <5.0	ND: <20.0	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

NA = Not Analyzed
ND = Not Detected

Table M2
Pilot - Scale UV/OX Treatment Analytical Results

September 25, 2000

Sample		TSS	PCBs	Dissolved				Total			
Location	ID #	(mg/L)	(ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	89	11.2	ND: <5.0	ND: <20.0	5.6	ND: <5.0	ND: <5.0	ND: <22.0	22	6.6
Clarifier Effluent	SP2	74	10.8	ND: <5.0	ND: <20.0	4.1	ND: <5.0	ND: <5.0	ND: <22.0	5.0	ND: <5.0
Vortisand Filter Influent	SP3	67	1.26	ND: <5.0	ND: <20.0	7.2	ND: <5.0	ND: <5.0	ND: <22.0	6.9	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	61	ND: <0.05	ND: <5.0	ND: <20.0	9	ND: <5.0	ND: <5.0	ND: <22.0	11	ND: <5.0
UV/Oxidation Effluent	SP5	57	0.06	ND: <5.0	ND: <20.0	14	ND: <5.0	ND: <5.0	ND: <22.0	14	ND: <5.0
GAC Midpoint	SP6A	57	ND: <0.05	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	3.3	17
GAC Effluent	SP7	62	ND: <0.05	NA	NA	NA	NA	NA	NA	ND: <3.0	ND: <5.0
Blank		-	-	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	< 3	ND: <5.0

September 26, 2000

Sample		TSS	PCBs	Dissolved				Total			
Location	ID #	(mg/L)	(ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	86	8.72	ND: <5.0	ND: <20.0	7.8	ND: <5.0	ND: <5.0	ND: <22.0	22	6.9
Clarifier Effluent	SP2	81	8.18	ND: <5.0	ND: <20.0	6.7	ND: <5.0	ND: <5.0	ND: <22.0	7.2	ND: <5.0
Vortisand Filter Influent	SP3	56	1.5	ND: <5.0	ND: <20.0	6.3	ND: <5.0	ND: <5.0	ND: <22.0	6.4	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	63	ND: <0.05	ND: <5.0	ND: <20.0	9.6	ND: <5.0	ND: <5.0	ND: <22.0	9.8	ND: <5.0
UV/Oxidation Effluent	SP5	61	ND: <0.05	ND: <5.0	ND: <20.0	16	ND: <5.0	ND: <5.0	ND: <22.0	12	ND: <5.0
UV/Oxidation Effluent	SP5 Dup	-	-	ND: <5.0	ND: <20.0	15	ND: <5.0	NA	NA	NA	NA
GAC Midpoint	SP6A	61	ND: <0.05	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	57	ND: <0.05	NA	NA	18	ND: <5.0	NA	NA	ND: <3.0	ND: <5.0
GAC Effluent	SP7DUP	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7DUP	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
Blank		ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

NA = Not Analyzed
ND = Not Detected

Table M2 (Cont.)
Pilot - Scale UV/OX Treatment Analytical Results

September 27, 2000

Sample		TSS	PCBs	Dissolved				Total			
Location	ID #	(mg/L)	(ug/L)	Cadmium	Chromium	Copper	Lead	Cadmium	Chromium	Copper	Lead
Clarifier Influent	SP1	14	8.01	NA	NA	NA	NA	ND: <5.0	ND: <22.0	15	6.1
Clarifier Effluent	SP2	20	6.86	NA	NA	NA	NA	ND: <5.0	ND: <22.0	6.4	ND: <5.0
Vortisand Filter Influent	SP3	8	1.51	NA	NA	NA	NA	ND: <5.0	ND: <22.0	5.6	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	ND: <5.0	1.19	NA	NA	NA	NA	ND: <5.0	ND: <22.0	12	ND: <5.0
UV/Oxidation Effluent	SP5	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	11	ND: <5.0
GAC Midpoint	SP6A	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7DUP	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7DUP	ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
Blank		ND: <5.0	ND: <0.05	NA	NA	NA	NA	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

September 28, 2000

Sample		TSS	PCBs	Dissolved				Total			
Location	ID #	(mg/L)	(ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	10	5.8	ND: <0.05	ND: <20.0	9.8	ND: <5.0	ND: <5.0	ND: <22.0	22	ND: <5.0
Clarifier Effluent	SP2	20	4.63	ND: <0.05	ND: <20.0	8.3	ND: <5.0	6.1	ND: <22.0	16	ND: <5.0
Vortisand Filter Influent	SP3	ND: <5.0	1.39	ND: <0.05	ND: <20.0	6.7	ND: <5.0	ND: <5.0	ND: <22.0	7.2	ND: <5.0
Vortisand Filter Info. 0.45 um filtration	SP3F	ND: <5.0	0.58	NA	NA	NA	NA	NA	NA	NA	NA
Vortisand Filter Effluent/ GAC Influent	SP4	6	1.24	ND: <0.05	ND: <20.0	14	ND: <5.0	ND: <5.0	ND: <22.0	28	5.2
Vortisand Filter Info. 0.45 um filtration	SP4F	ND: <5.0	0.42	NA	NA	NA	NA	NA	NA	NA	NA
UV/Oxidation Effluent	SP5	6	ND: <0.05	ND: <0.05	ND: <20.0	19	ND: <5.0	ND: <5.0	ND: <22.0	33	8.3
GAC Midpoint	SP6A	ND: <5.0	ND: <0.05	ND: <0.05	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	ND: <5.0	ND: <0.05	ND: <0.05	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

NA[illegible] [illegible]ot Analyzed

Table M2 (Cont.)
Pilot - Scale UV/OX Treatment Analytical Results

September 29, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Clarifier Influent	SP1	34	12	ND: <5.0	ND: <20.0	6.7	ND: <5.0	ND: <5.0	ND: <22.0	20	5.6
Clarifier Effluent	SP2	47	13.2	ND: <5.0	ND: <20.0	5.7	ND: <5.0	ND: <5.0	ND: <22.0	7.3	ND: <5.0
Vortisand Filter Influent	SP3	30	1.54	ND: <5.0	ND: <20.0	8.5	ND: <5.0	ND: <5.0	ND: <22.0	8.9	ND: <5.0
Vortisand Filter Effluent/ GAC Influent	SP4	33	1.42	ND: <5.0	ND: <20.0	39	ND: <5.0	ND: <5.0	ND: <22.0	15	ND: <5.0
UV/Oxidation Effluent	SP5	23	ND: <0.05	ND: <5.0	ND: <20.0	11	ND: <5.0	ND: <5.0	ND: <22.0	17	ND: <5.0
GAC Midpoint	SP6A	35	ND: <0.05	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0
GAC Effluent	SP7	27	ND: <0.05	ND: <5.0	ND: <20.0	ND: <3.0	ND: <5.0	ND: <5.0	ND: <22.0	ND: <3.0	ND: <5.0

NA = Not Analyzed
ND = Not Detected

Table M3
Pilot - Scale Treatment - Filter Press Analytical Results

September 14, 2000

Sample		TSS (mg/L)	PCBs (ug/L)	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
Settled Sludge	SP8	7800	13 (ug/L)	NA	NA	NA	NA	NA	NA	NA	NA

September 28, 2000

Sample		TSS (mg/L)	PCBs	Dissolved				Total			
Location	ID #			Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Cadmium	Chromium	Copper	Lead
Settled Sludge	SP8	4620	39.8 (ug/L)	NA	NA	NA	NA	NA	NA	NA	NA
Filtrate	SP9	NA	22.8 (ug/L)	ND: <5.0	ND: <20.0	ND: <19.0	ND: <5.0	ND: <5.0 (ug/L)	ND: <22.0 (ug/L)	27 (ug/L)	ND: <5.0 (ug/L)
Filter Cake	SP10	NA	35000 (mg/kg dry)	NA	NA	NA	NA	0.74 (mg/kg dry)	200 (mg/kg dry)	200 (mg/kg dry)	74 (mg/kg dry)

NA = Not Analyzed
ND = Not Detected

Table M-4
Flow Totals by Date

DATE	Flow (gallons)						
	Cell 1 Transfer to Cell 2	Clarifier Effluent to Cell 2	Clarifier Effluent to Cell 3	Vortisand Effluent	UV/OX Influent	UV/OX Effluent	GAC Effluent/ Final Discharge
9/5/2000	17,587	22,627	0	0	0	0	0
9/6/2000	28,913	32,485	13,610	0	0	0	0
9/7/2000	125,000	0	34,403	0	0	0	0
9/8/2000	78,143	12,275	34,555	0	0	0	0
9/9/2000	0	0	33,186	0	0	0	0
9/10/2000	0	0	0	0	0	0	0
9/11/2000	0	8,300	50,371	0	0	0	0
9/12/2000	0	6,600	39,030	0	0	0	0
9/13/2000	0	7,336	48,999	0	0	0	0
9/14/2000	106,870	4,800	70,109	89,800	0	0	102,569
9/15/2000	54,974	54,570	61,928	81,300	0	0	88,847
9/16/2000	81,682	70,488	63,217	84,400	0	0	85,800
9/17/2000	0	13,459	95,705	86,350	0	0	80,849
9/18/2000	134,636	9,594	27,578	88,900	0	0	78,747
9/19/2000	103,558	37,260	24,515	70,900	0	0	59,302
9/20/2000	23,948	8,900	42,637	0	0	0	0
9/21/2000	NM	9,300	58,212	0	0	0	0
9/22/2000	NM	9,100	45,732	0	0	0	0
9/23/2000	0	0	0	0	0	0	0
9/24/2000	0	0	0	0	0	0	0
9/25/2000	NM	9,697	49,043	99,500	84,895	83,210	86,299
9/26/2000	NM	11,207	53,735	69,500	60,653	57,170	47,902
9/27/2000	0	14,001	49,264	115,300	92,769	89,450	79,412
9/28/2000	0	11,862	55,264	53,200	43,545	42,140	36,602
9/29/2000	NM	11,500	41,419	109,750	84,525	81,640	87,568
9/30/2000	0	0	0	0	0	0	0
10/1/2000	0	0	0	0	0	0	0
10/2/2000	0	0	0	0	0	0	0
10/3/2000	0	0	0	0	0	0	0
10/4/2000	0	0	0	0	0	0	54,964
10/5/2000	0	0	0	NM	0	0	62,536
10/6/2000	0	0	0	NM	0	0	0
10/7/2000	0	0	0	0	0	0	0
10/8/2000	0	0	0	0	0	0	0
10/9/2000	0	0	0	0	0	0	0
10/10/2000	0	0	0	0	0	0	0
10/11/2000	0	0	0	50,800	0	0	46,742
10/12/2000	0	0	0	0	0	0	0
10/13/2000	0	0	0	77,900	0	0	69,780
Totals	755,311	365,361	992,512	1,077,600	366,387	353,610	1,067,919

Table M-5
Turbidity Measurements Activated Carbon Pilot Scale Treatment

DATE	DAILY AVERAGE TURBIDITY MEASUREMENTS (NTU)				
	Clarifier Influent SP1	Clarifier Effluent SP2	Vortisand Influent	Vortisand Effluent/ GAC Influent	GAC Effluent
9/5/2000	NM	NM	NM	NM	NM
9/6/2000	8.75	4.00	NM	NM	NM
9/7/2000	7.29	6.75	NM	NM	NM
9/8/2000	7.53	4.84	NM	NM	NM
9/9/2000	NM	NM	NM	NM	NM
9/10/2000	NM	NM	NM	NM	NM
9/11/2000	10.31	3.50	NM	NM	NM
9/12/2000	7.46	3.71	NM	NM	NM
9/13/2000	6.70	2.89	NM	NM	NM
9/14/2000	6.18	2.41	1.15	0.89	0.58
9/15/2000	6.87	4.04	1.09	0.68	0.32
9/16/2000	6.58	2.76	1.52	0.65	0.50
9/17/2000	5.60	3.24	0.64	0.27	0.29
9/18/2000	7.12	6.90	0.78	0.54	0.30
9/19/2000	8.46	5.26	NM	NM	NM
9/20/2000	10.13	3.59	NM	NM	NM
9/21/2000	16.0	3.90	NM	NM	NM
9/22/2000	17.25	4.8	NM	NM	NM
9/23/2000	NM	NM	NM	NM	NM
9/24/2000	NM	NM	NM	NM	NM
Average	8.81	4.17	1.04	0.61	0.40

NM = Not Measured

Table M-6
Turbidity Measurements UV/Oxidation Pilot Scale Treatment

DATE	DAILY AVERAGE TURBIDITY MEASUREMENTS (NTU)					
	Clarifier Influent SP1	Clarifier Effluent SP2	Vortisand Influent	Vortisand Effluent/ UV/OX Influent	UV/OX Effluent/ GAC Influent	GAC Effluent
9/25/2000	15.85	5.54	1.24	0.55	0.56	NM
9/26/2000	14.37	5.78	1.26	0.52	0.43	0.03
9/27/2000	11.12	4.79	0.59	0.63	0.78	0.03
9/28/2000	7.25	4.42	0.83	0.71	0.63	0.03
9/29/2000	19.93	4.31	0.85	0.48	0.37	0.11
Average	13.70	4.97	0.95	0.58	0.55	0.05

NM = Not Measured

Table M-7
Vortisand Filtration Performance
Turbidity Measurements

DATE	Vortisand Turbiduty (NTU)		
	Vortisand Effluent/ UV/OX Influent	UV/OX Effluent/ GAC Influent	GAC Effluent
10/4/2000	2.96	2.49	NM
10/4/2000	2.92	2.41	NM
10/4/2000	30 - 32	NM	NM
10/5/2000	7.9 - 8.1	5.3 - 5.5	NM
10/5/2000	4.8	7.6 - 7.2	NM
10/6/2000	NM	NM	NM
10/7/2000	NM	NM	NM
10/8/2000	NM	NM	NM
10/9/2000	NM	NM	NM
10/10/2000	NM	NM	NM
10/11/2000	2.7 - 2.8	2.9 - 3.0	0.90
10/11/2000	37 - 39	6.1 - 6.2	1.4 - 1.5
10/11/2000	5.5	NM	NM
10/11/2000	16 - 18	6.3 - 6.5	1.5 - 1.6
10/12/2000	NM	NM	NM
10/13/2000	NM	NM	NM
10/13/2000	9.1	6.0	1.99
10/13/2000	9.5	5.3 - 5.6	NM
10/13/2000	9.3	5.9 - 6.0	NM
10/13/2000	9.4 - 9.5	8.0 - 8.3	0.2
10/13/2000	9.3	7.1 - 7.3	NM
10/13/2000	8.5 - 8.6	3.6 - 3.8	NM
10/13/2000	8.8 - 9.0	3.3 - 3.7	NM
10/13/2000	9.00	3.1 - 3.2	1.0 - 1.2
10/14/2000	NM	NM	NM
10/15/2000	NM	NM	NM
10/16/2000	NM	NM	NM

NM = Not Measured

TABLE M-8
UV/OXIDATION SYSTEM SIZING

Influent Concentration (ppb)	Flow Rate (gpm)	UV Dose (kWH)	System (kW)	No. of 270 (kW units)	No. of 360 (kW units)
1	1200	23.71	1706.84	1	4
2	1200	29.72	2139.67	1	5
3	1200	33.23	2392.86	1	6
4	1200	35.73	2572.51	1	6
5	1200	37.66	2711.85	1	7
6	1200	39.25	2825.70	1	7
7	1200	40.58	2921.96	1	7
8	1200	41.74	3005.34	1	8
9	1200	42.76	3078.89	1	8
10	1200	43.68	3144.68	1	8
11	1200	44.50	3204.20	1	8
12	1200	45.26	3258.53	1	8
13	1200	45.95	3308.51	1	8
14	1200	46.59	3354.79	1	9
15	1200	47.19	3397.87	1	9
16	1200	47.75	3438.17	1	9
17	1200	48.28	3476.03	1	9
18	1200	48.77	3511.72	1	9
19	1200	49.24	3545.48	1	9
20	1200	49.69	3577.51	1	9
21	1200	50.11	3607.98	1	9
22	1200	50.51	3637.03	1	9
23	1200	50.90	3664.79	1	9
24	1200	51.27	3691.36	1	10
25	1200	51.62	3716.85	1	10
1	1400	23.71	1991.31	1	5
2	1400	29.72	2496.29	1	6
3	1400	33.23	2791.68	1	7
4	1400	35.73	3001.26	1	8
5	1400	37.66	3163.82	1	8
6	1400	39.25	3296.65	1	8
7	1400	40.58	3408.95	1	9
8	1400	41.74	3506.23	1	9
9	1400	42.76	3592.04	1	9
10	1400	43.68	3668.79	1	9
11	1400	44.50	3738.27	1	10
12	1400	45.26	3801.62	1	10
13	1400	45.95	3859.93	1	10
14	1400	46.59	3913.92	1	10
15	1400	47.19	3964.18	1	10
16	1400	47.75	4011.20	1	10
17	1400	48.28	4055.37	1	11
18	1400	48.77	4097.01	1	11
19	1400	49.24	4136.40	1	11
20	1400	49.69	4173.77	1	11
21	1400	50.11	4209.31	1	11
22	1400	50.51	4243.20	1	11
23	1400	50.90	4275.59	1	11
24	1400	51.27	4306.59	1	11
25	1400	51.62	4336.33	1	11

TABLE M-8
CONTINUATION OF UV/OXIDATION SYSTEM SIZING

Influent Concentration (ppb)	Flow Rate (gpm)	UV Dose (kWH)	System (kW)	No. of 270 (kW units)	No. of 360 (kW units)
1	1000	23.71	1422.37	1	3
2	1000	29.72	1783.06	1	4
3	1000	33.23	1994.05	1	5
4	1000	35.73	2143.76	1	5
5	1000	37.66	2259.87	1	6
6	1000	39.25	2354.7	1	6
7	1000	40.58	2434.96	1	6
8	1000	41.74	2504.45	1	6
9	1000	42.76	2565.74	1	6
10	1000	43.68	2620.57	1	7
11	1000	44.50	2670.16	1	7
12	1000	45.26	2715.44	1	7
13	1000	45.95	2757.09	1	7
14	1000	46.59	2795.66	1	7
15	1000	47.19	2831.56	1	7
16	1000	47.75	2865.14	1	7
17	1000	48.28	2896.69	1	7
18	1000	48.77	2926.4	1	7
19	1000	49.24	2954.57	1	7
20	1000	49.69	2981.26	1	8
21	1000	50.11	3006.65	1	8
22	1000	50.51	3030.86	1	8
23	1000	50.90	3053.99	1	8
24	1000	51.27	3076.14	1	8
25	1000	51.62	3097.38	1	8
1	800	23.71	1138.89	1	3
2	800	29.72	1426.45	1	3
3	800	33.23	1595.24	1	4
4	800	35.73	1715.00	1	4
5	800	37.66	1807.90	1	4
6	800	39.25	1883.80	1	4
7	800	40.58	1947.97	1	5
8	800	41.74	2003.56	1	5
9	800	42.76	2055.59	1	5
10	800	43.68	2096.45	1	5
11	800	44.50	2136.13	1	5
12	800	45.26	2172.35	1	5
13	800	45.95	2205.68	1	5
14	800	46.59	2236.53	1	5
15	800	47.19	2265.25	1	5
16	800	47.75	2292.12	1	6
17	800	48.28	2317.55	1	6
18	800	48.77	2341.15	1	6
19	800	49.24	2363.66	1	6
20	800	49.69	2385.01	1	6
21	800	50.11	2405.32	1	6
22	800	50.51	2424.69	1	6
23	800	50.90	2443.19	1	6
24	800	51.27	2460.91	1	6
25	800	51.62	2477.90	1	6

TABLE M-8
CONTINUATION OF UV/OXIDATION SYSTEM SIZING

Influent Concentration (ppb)	Flow Rate (gpm)	UV Dose (kWH)	System (kW)	No. of 270 (kW units)	No. of 360 (kW units)
1	600	23.71	853.42	1	2
2	600	29.72	1069.84	1	2
3	600	33.23	1196.43	1	3
4	600	35.73	1286.25	1	3
5	600	37.66	1355.92	1	3
6	600	39.25	1412.85	1	3
7	600	40.58	1460.98	1	3
8	600	41.74	1502.67	1	3
9	600	42.76	1539.44	1	4
10	600	43.68	1572.34	1	4
11	600	44.50	1602.10	1	4
12	600	45.26	1629.27	1	4
13	600	45.95	1654.26	1	4
14	600	46.59	1677.39	1	4
15	600	47.19	1698.94	1	4
16	600	47.75	1719.09	1	4
17	600	48.28	1738.01	1	4
18	600	48.77	1755.86	1	4
19	600	49.24	1772.74	1	4
20	600	49.69	1788.76	1	4
21	600	50.11	1803.99	1	4
22	600	50.51	1818.51	1	4
23	600	50.90	1832.39	1	4
24	600	51.27	1845.68	1	4
25	600	51.62	1858.43	1	4
1	400	23.71	568.95	1	1
2	400	29.72	713.22	1	1
3	400	33.23	797.62	1	1
4	400	35.73	857.50	1	2
5	400	37.66	903.95	1	2
6	400	39.25	941.90	1	2
7	400	40.58	973.99	1	2
8	400	41.74	1001.78	1	2
9	400	42.76	1026.30	1	2
10	400	43.68	1048.23	1	2
11	400	44.50	1068.07	1	2
12	400	45.26	1086.18	1	2
13	400	45.95	1102.81	1	2
14	400	46.59	1118.26	1	2
15	400	47.193	1132.62	1	2
16	400	47.75	1146.06	1	2
17	400	48.28	1158.68	1	2
18	400	48.77	1170.57	1	3
19	400	49.24	1181.83	1	3
20	400	49.69	1192.50	1	3
21	400	50.11	1202.66	1	3
22	400	50.51	1212.34	1	3
23	400	50.90	1221.60	1	3
24	400	51.27	1230.45	1	3
25	400	51.62	1238.95	1	3

FOSTER WHEELER ENVIRONMENTAL CORPORATION

BY Martita Mullen DATE 1-5-01 SHEET 1 OF

CHKD. BY _____ DATE _____ OFS NO. _____ DEPT. NO. _____

CLIENT USACE

PROJECT NBH- WTP Pilot Scale Test

SUBJECT UV/OX System Sizing Calculations

A - Calculations for Pilot Scale Data

① UV Dose Calculation:

UV dose is a measure of the total lamp electrical energy applied to a fixed volume of water.

$$\text{UV Dose} = \frac{1000 \times \text{lamp power (KW)}}{\text{flow (gpm)} \times 60}$$

Variables:

flowrate = 160 gpm

lamp power = 30 kw/lamp x 9 lamps = 270 KW

$$\text{UV Dose} = \frac{1000 \times 270\,KW}{160\,gpm \times 60\,\frac{min}{hr}} = 28.125\,\frac{KWH}{1000\,gal}$$

② Electrical Energy per Order (EE/O):

EE/O is a measure of the treatment obtained in a fixed volume of water as a function of exposure to light.

$$EE/O = \frac{\text{UV Dose}}{\log (C_i / C_f)}$$

where C_i = initial concentration
C_f = discharge concentration

Variables:

UV Dose = 28.125 KWh /1000 gal

C_i = 1.28 ppb (average influent concentration at SP4 measured 9/27/00 - 9/29/00)

C_f = < 0.05 ppb (average effluent concentration at SP5 measured 9/27/00 - 9/29/00)

$$EE/O = \frac{28.125\,KWH}{\log (1.28\,ppb / 0.05\,ppb)} = 19.972\,\frac{KWH/1000\,gal}{order}$$

③ Calculation of the UV dose required based upon anticipated: influent concentrations and effluent discharge limits.

$C_i = 1\,ppb$

$C_f = 0.065\,ppb$

$EE/O = 19.97 \frac{KWH/1000gal}{order}$

UV dose = ?

$$\text{UV dose} = EE/O \times \log\left(C_i/C_f\right) = 19.97 \frac{KWH/1000gal}{order} \times \log\left(1ppb/0.065ppb\right)$$

$$= 23.708 \frac{KWH}{1000\,gal}$$

④ Calculation of the number of KWH required to treat 1ppb at 1200gpm

$$\text{Lamp Power} = \frac{\text{UV Dose} \times \text{flow (gpm)} \times 60\,min/hr}{1000\,gal/1000\,gal}$$

$$= \frac{23.708\,KWH/1000gal \times 1200\,gpm \times 60\,min/hr}{1000\,(gal/1000\,gal)}$$

$$= 1707\,KW$$

⑤ Number of Individual units required to provide a lamp power of 1707 KW:

1 - 270 KW unit and 4 - 360 KW units - total power = 1710 KW

FOSTER WHEELER ENVIRONMENTAL CORPORATION

BY MARTITA MULEN DATE 1/5/01 SHEET 3 OF

CHKD. BY DATE OFS NO. DEPT. NO.

CLIENT USACE

PROJECT NBH - WTP PILOT SCALE TEST

SUBJECT UV/OX SYSTEM SIZING CALCULATIONS

B - CALCULATIONS FOR BENCH SCALE DATA

① Flowrate = Batch
UV Dose Tested = 24 KWH/1000gal
C_i = 0.75 ppb
C_f = 0.060 ppb

② Calculation of Electrical Energy per Order (EE/O):

$$EE/O = \frac{\text{UV Dose}}{\log(C_i/C_f)} = \frac{24\ KWH/1000gal}{\log(.75ppb/0.060ppb)} = 21.88\ \frac{KWH/1000gal}{order}$$

③ Calculation of UV Dose Required for anticipated influent concentration and effluent discharge limits. (C_i = 1 ppb and C_f = 0.065 ppb)

$$\text{UV Dose} = EE/O * \log(C_i/C_f) = 21.88\ \frac{KWH/1000gal}{order}\left(\log\frac{1ppb}{0.065ppb}\right)$$

UV Dose = 26 KWH/1000gal

④ Calculation of the number of KWH required to treat 1 ppb at 1200 gpm:

$$\text{Lamp Power} = \frac{\text{UV dose} \times \text{flow (gpm)} \times 60\ min/hr}{1000\ (gal/1000\ gal)}$$

$$= \frac{(26\ KWH/1000\ gal)(1200\ gpm)(60\ min/hr)}{1000\ (gal/1000\ gal)}$$

$$= 1870\ KW$$

⑤ Number of Individual Units required to provide a lamp power of 1870 KW:

1 - 270 KW unit and 5-360 KW units - total power = 2070 KW

N

Appendix N
Health & Safety

Note: The New Bedford Harbor Project Health and Safety Plan was distributed to USACE-NAE EPA Region I and Massachusetts DEP prior to the start of the PDFT. Also, a copy has been filed in the Foster Wheeler project file.

Appendix O
Project Photos

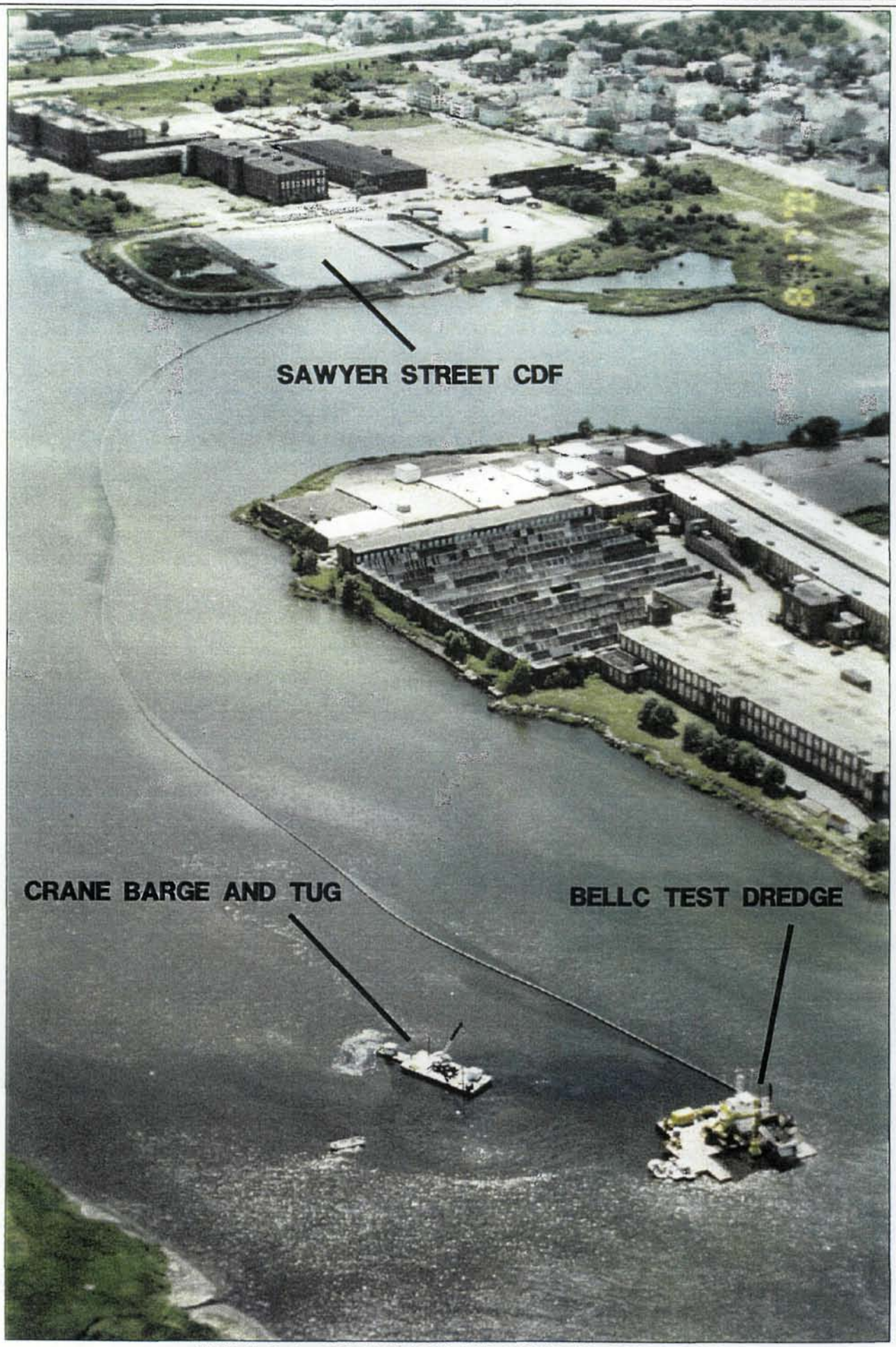


FIGURE O-1. PDFT DREDGE AND DISPOSAL OPERATIONS

CAD FILE:NBH_PHOTO_01.DWG

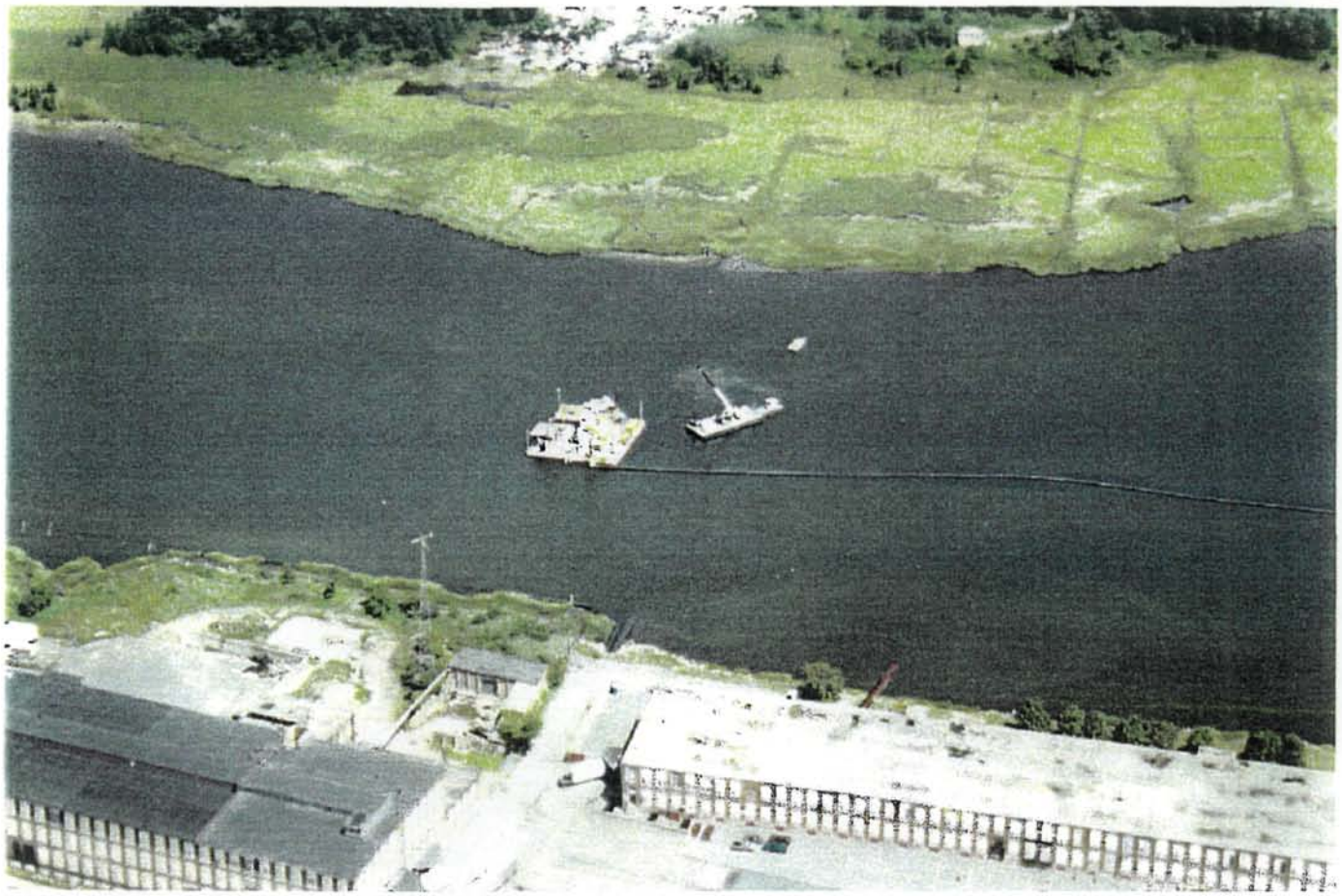


FIGURE O-2. PDFT DREDGE AREA

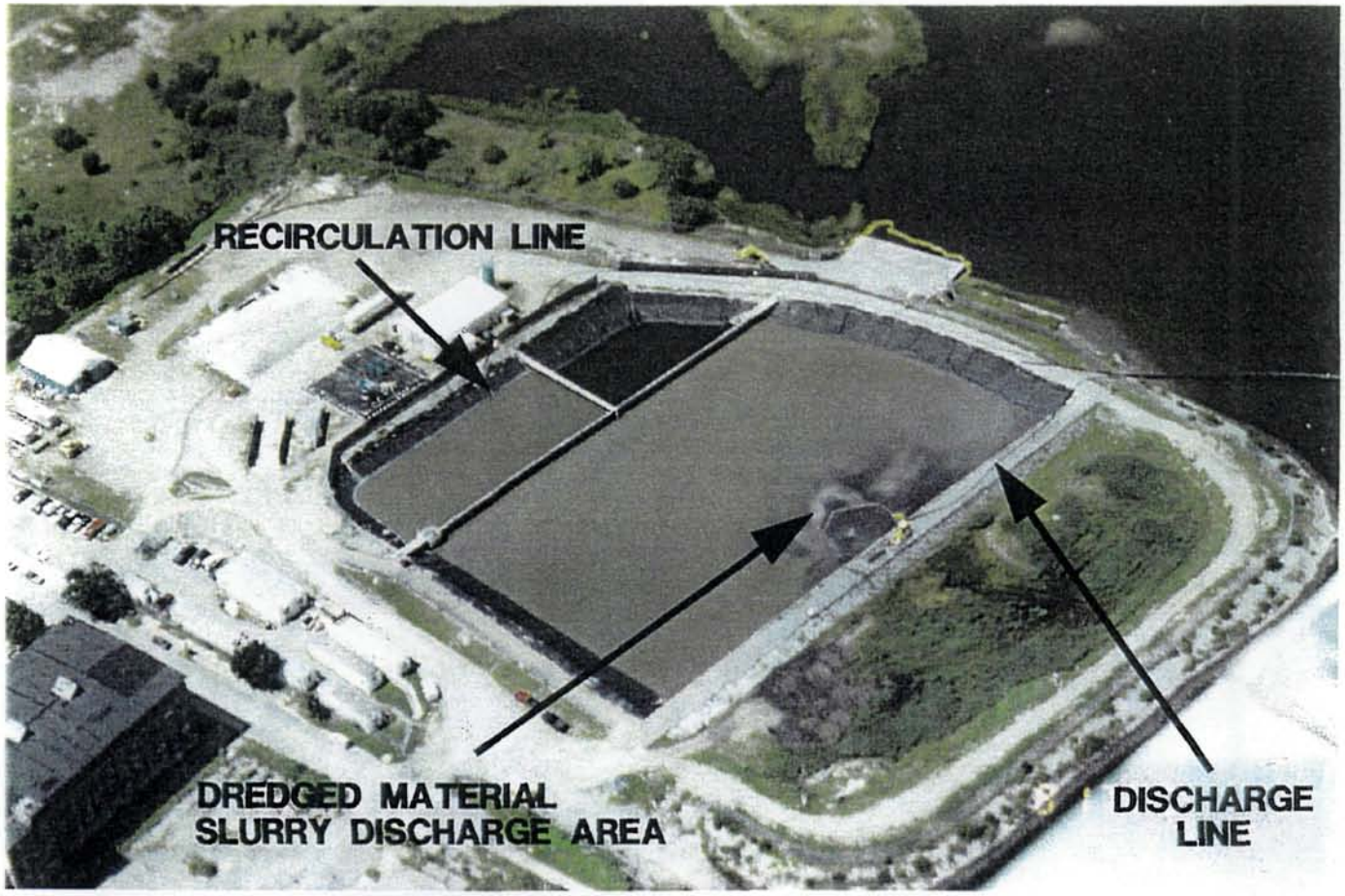


FIGURE O-3. SAWYER STREET CDF

CAD FILE:NBH_PHOTO_01.DWG

FIGURE O-4. TEST DREDGE AND SUPPORT EQUIPMENT (OPERATING)

FIGURE O-5. TEST DREDGE AND SUPPORT EQUIPMENT (NOT OPERATING)

CAD FILE:NBH_PHOTO_01.DWG

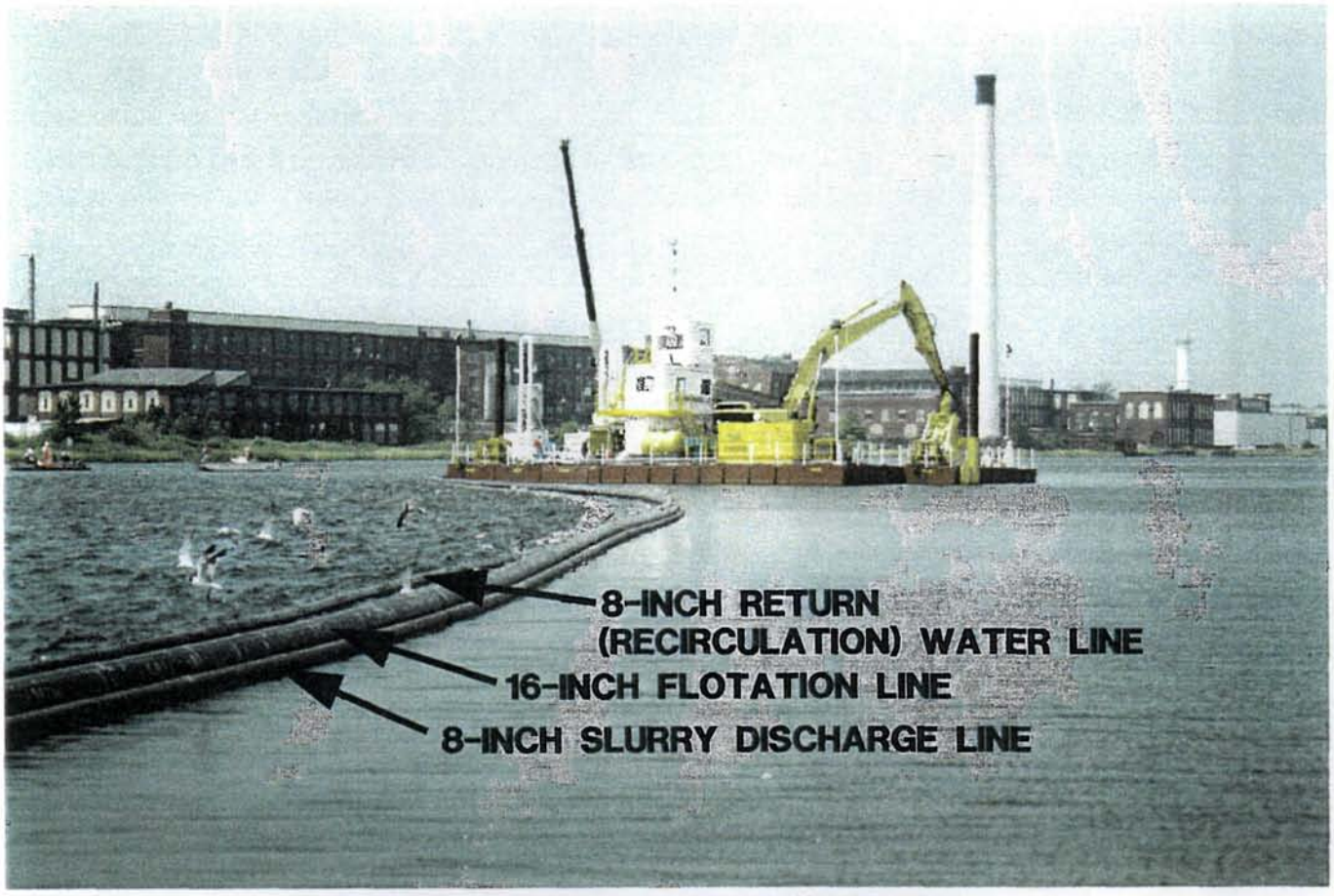


FIGURE O-6. TEST DREDGE WITH DISCHARGE AND RETURN WATER LINE

FIGURE O-7. TEST DREDGE

CAD FILE:NDH_PHOTO_01.DWG

FIGURE O-8. CATERPILLAR 375LC HYDRAULIC EXCAVATOR WITH 4.5 cy HORIZONTAL PROFILING GRAB BUCKET

FIGURE O-9. CRANE MONITORING SYSTEM SCREEN IN ENGINEERS ROOM

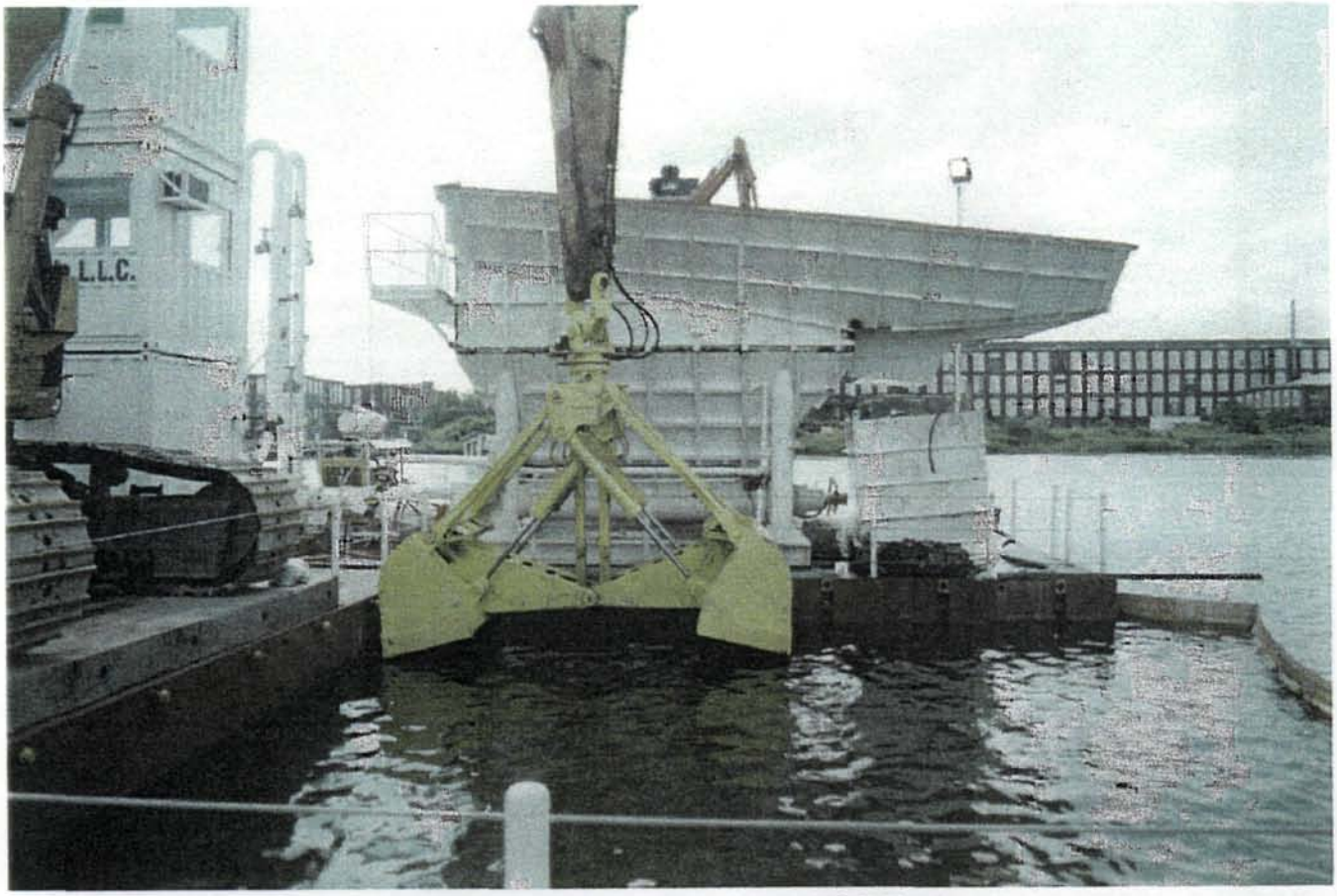


FIGURE O-10. HORIZONTAL PROFILING GRAB BUCKET OVER MOONPOOL

FIGURE O-11. HORIZONTAL PROFILING GRAB BUCKET OVER MOONPOOL

CAD FILE:NBH_PHOTO_01.DWG

FIGURE O-12. MATERIAL HOPPER

FIGURE O-13. BEAN PATENTED SLURRY PROCESSING UNIT

CAD FILE:NBH_PHOTO_01.DWG

FIGURE O-14. REMOVING ROCK BOX COVER TO CLEAR ROCKS AND DEBRIS FROM SUCTION LINE

FIGURE O-15. DEBRIS IN ROCK BOX

CAD FILE:NBH_PHOTO_01.DWG

FIGURE O-16. COBBLES, QUAHOGS, AND DEBRIS REMOVED FROM ROCK BOX

FIGURE O-17. SHALLOW DRAFT TUG

CAD FILE:NBH_PHOTO_01.DWG

FIGURE O-18. WATER QUALITY MONITORING VESSEL WITH TEST DREDGE IN BACKGROUND

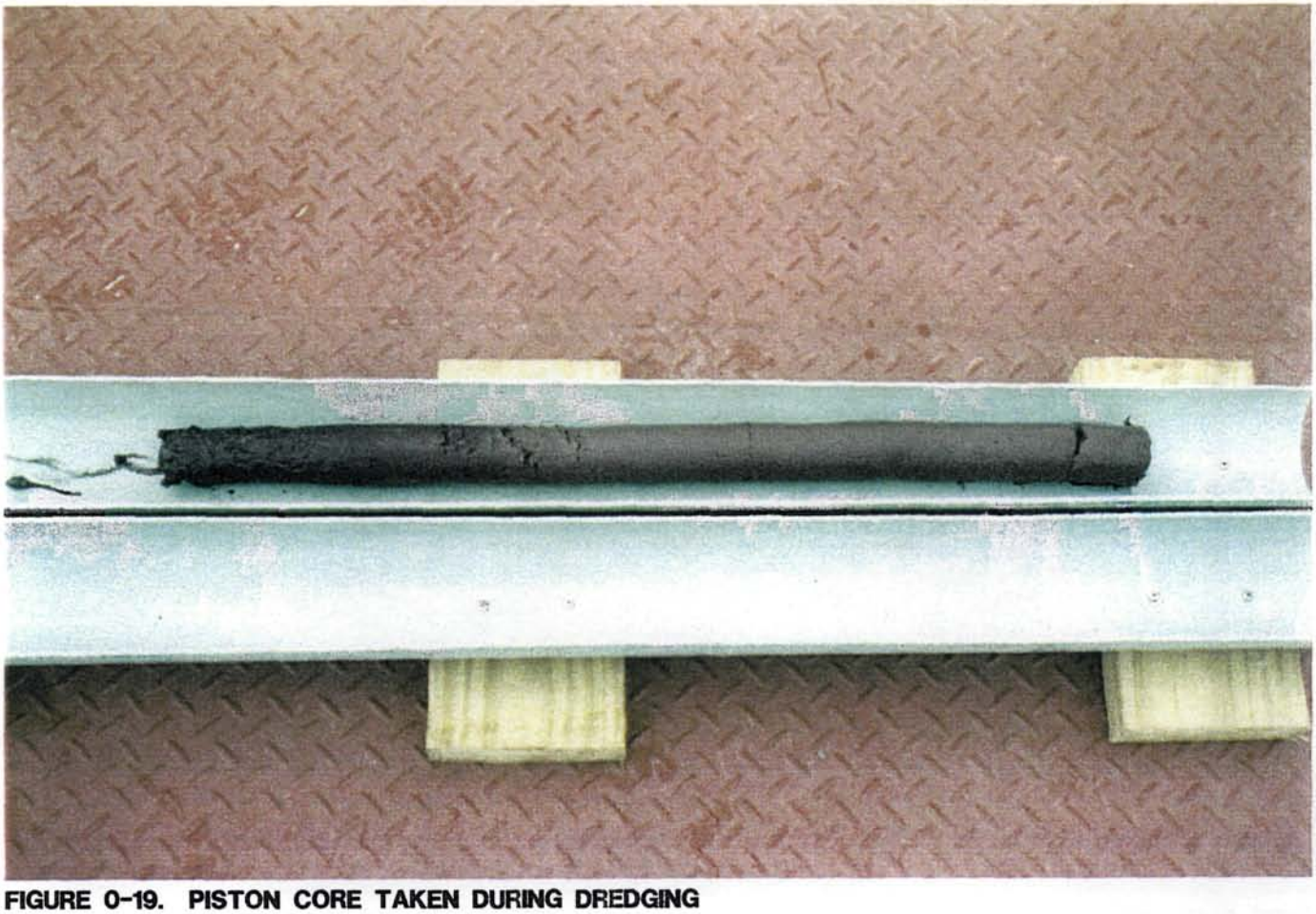


FIGURE O-19. PISTON CORE TAKEN DURING DREDGING

CAD FILE:NBK_PHOTO_01.DWG

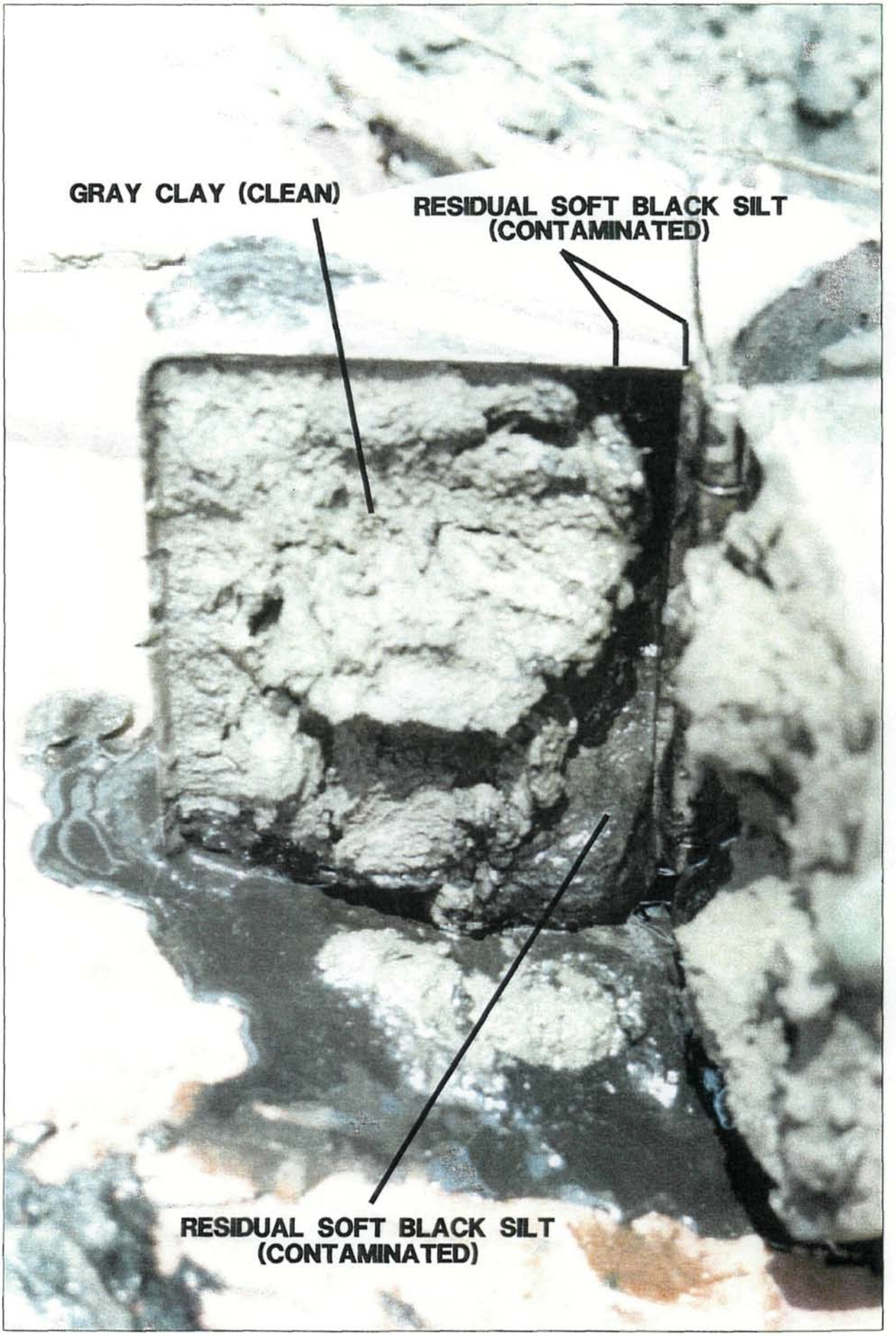


FIGURE O-20. PONAR GRAB SAMPLE TAKEN IN PDFT AREA (POST-DREDGE AREA)

CAD FILE:NDH_PHOTO_01.DWG

P

Appendix P
Other Screened Dredging Technologies

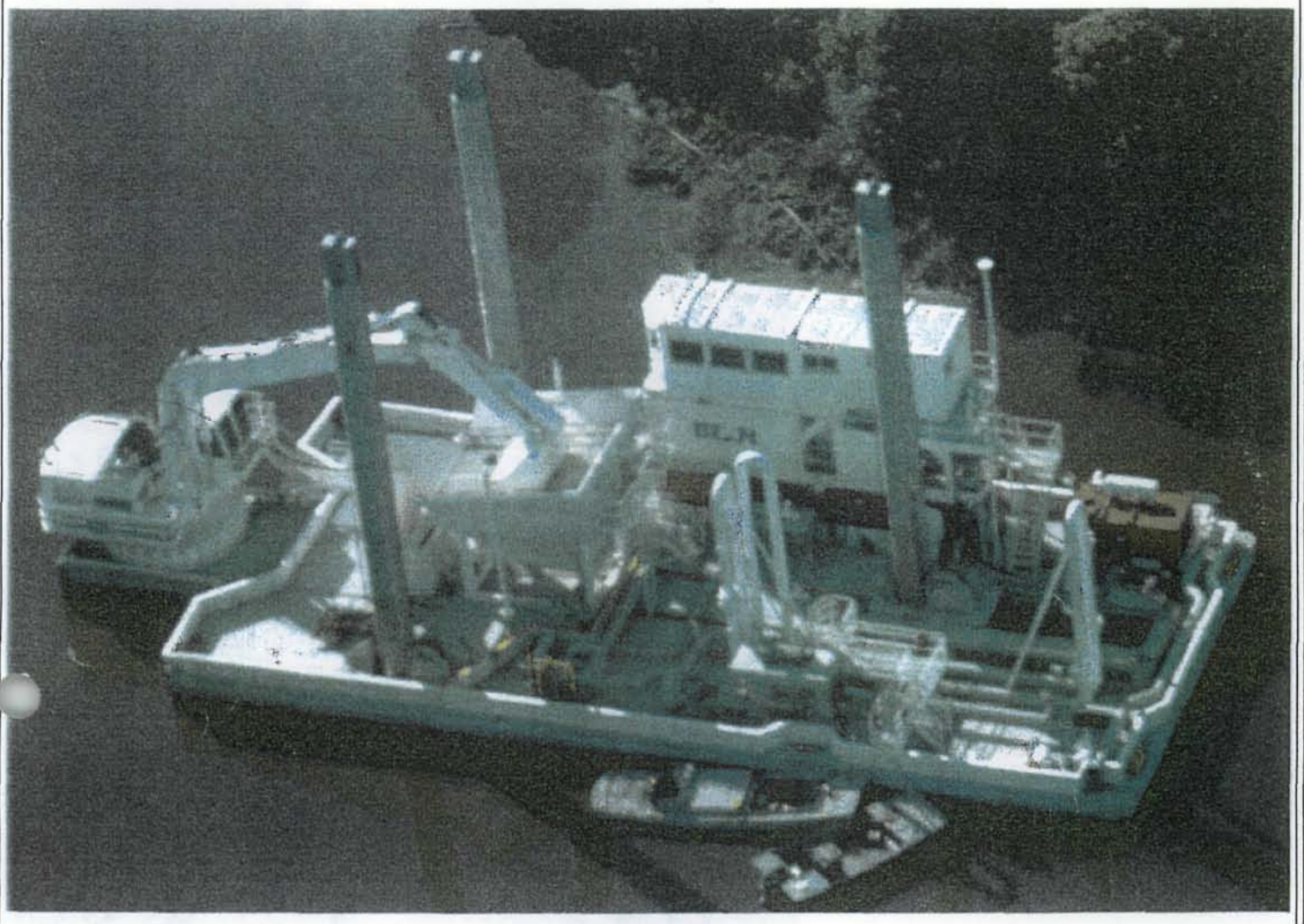


FIGURE P-1. BELLC BONACAVOR. BAYOU BONFOUCA, SLIDELL, LOUISIANA

CAD FILE:NBH_PHOTO_02.DWG

PROFILING GRAB

Efficient dredging of polluted bed material

The **profiling grab,** which has a horizontal closing action, is an efficient dredging tool developed by Boskalis for the removal of polluted bed material in ports and waterways. Great accuracy is required for this type of selective dredging. If dumping or processing costs are to be contained, only polluted spoil must be removed and not the uncontaminat material which should be left in space.
The profiling grab is designed to dredge in layers (the thinnest layers if necessary) and without spillage or muddying of the water. The volume to be recovered or processed is consequently kept to a minimum.

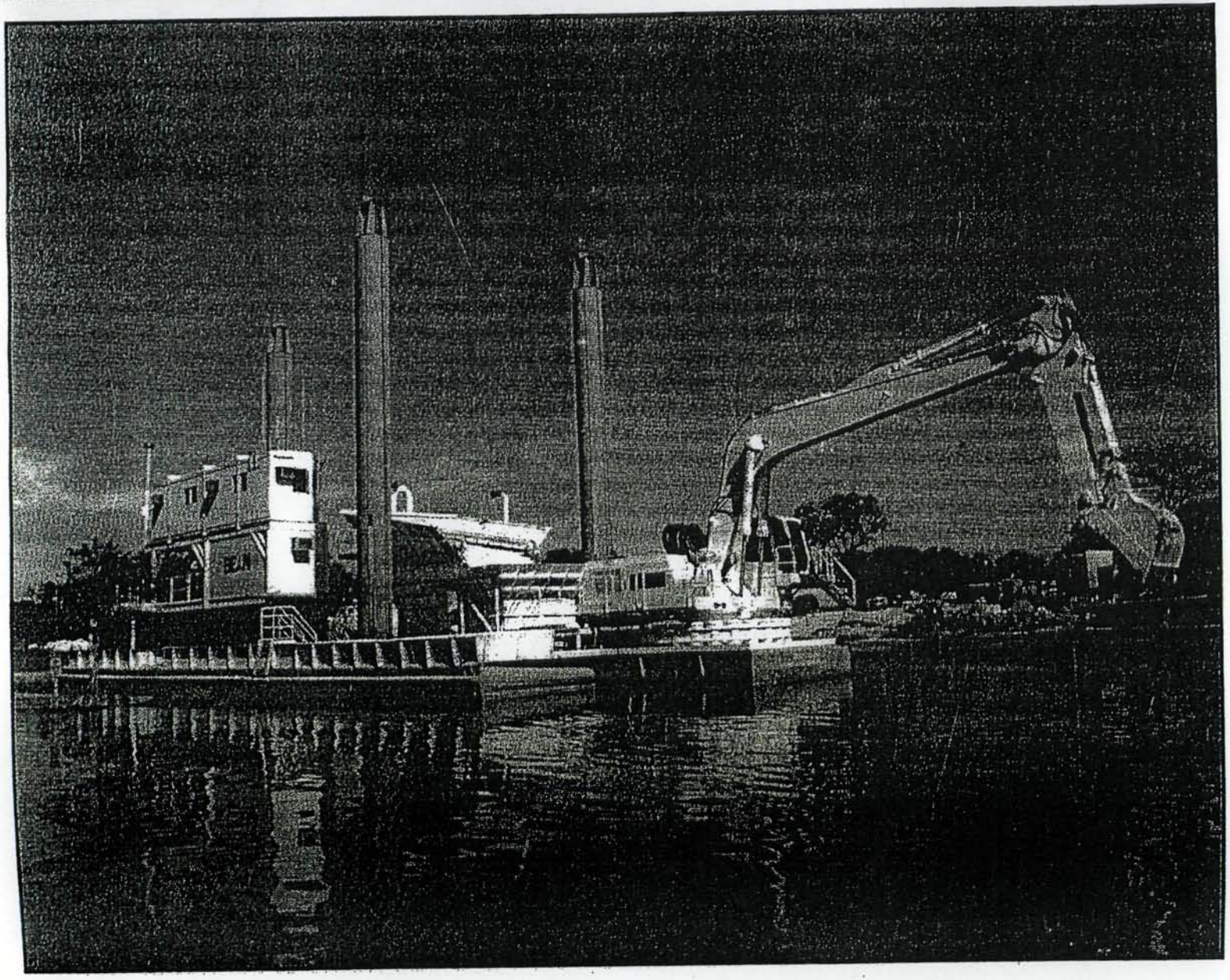
Polluted bed material often contains substantial quantities of large items of rubbish. Fitted an hydraulic crane, the profiling grab has no difficulty in handling this kind of waste.

Boskalis has successfully used the profiling grab on numerous clean-up projects in the Netherlands, at Elburg, Wemeldinge, Terneuzen and Tiel, and on the Zuid-Willemsvaart canal.

Boskalis Dolman bv

's-Gravenweg 399-405
P.O. Box 4466, 3006 AL Rotterdam
The Netherlands
Telephone +31 (0)10 288 28 00
Telefax +31 (0)10 288 28 10

THE UNIQUE BONACAVOR



What once was a bea[illegible] southeastern Louisiana, turned into a[illegible] environmental disaster. A creosote plant operating on the banks of Bayou Bonfouca since 1892, burned down in 1970 - spilling large amounts of toxic creosote into the bayou. By the 1980's, the spill had contaminated over 55 acres of bottom material. The site was subsequently placed on the EPA's Superfund priorities list, and has since become the largest Superfund Project ever awarded.

The specifications for the "Bayou Bonfouca Superfund Remediation Project" required an extremely narrow excavation tolerance. Such extreme tolerances were necessary in order to reduce or eliminate overdredging, and hold the quantity and cost of sediment treatment to the project estimates. Another challenge presented was protecting personnel and property from exposure to the contaminated sediments during excavation and transportation to the treatment facility. In addition, the sediment treatment process required the removal of contaminated sediments in as close to in *situ* state as possible.

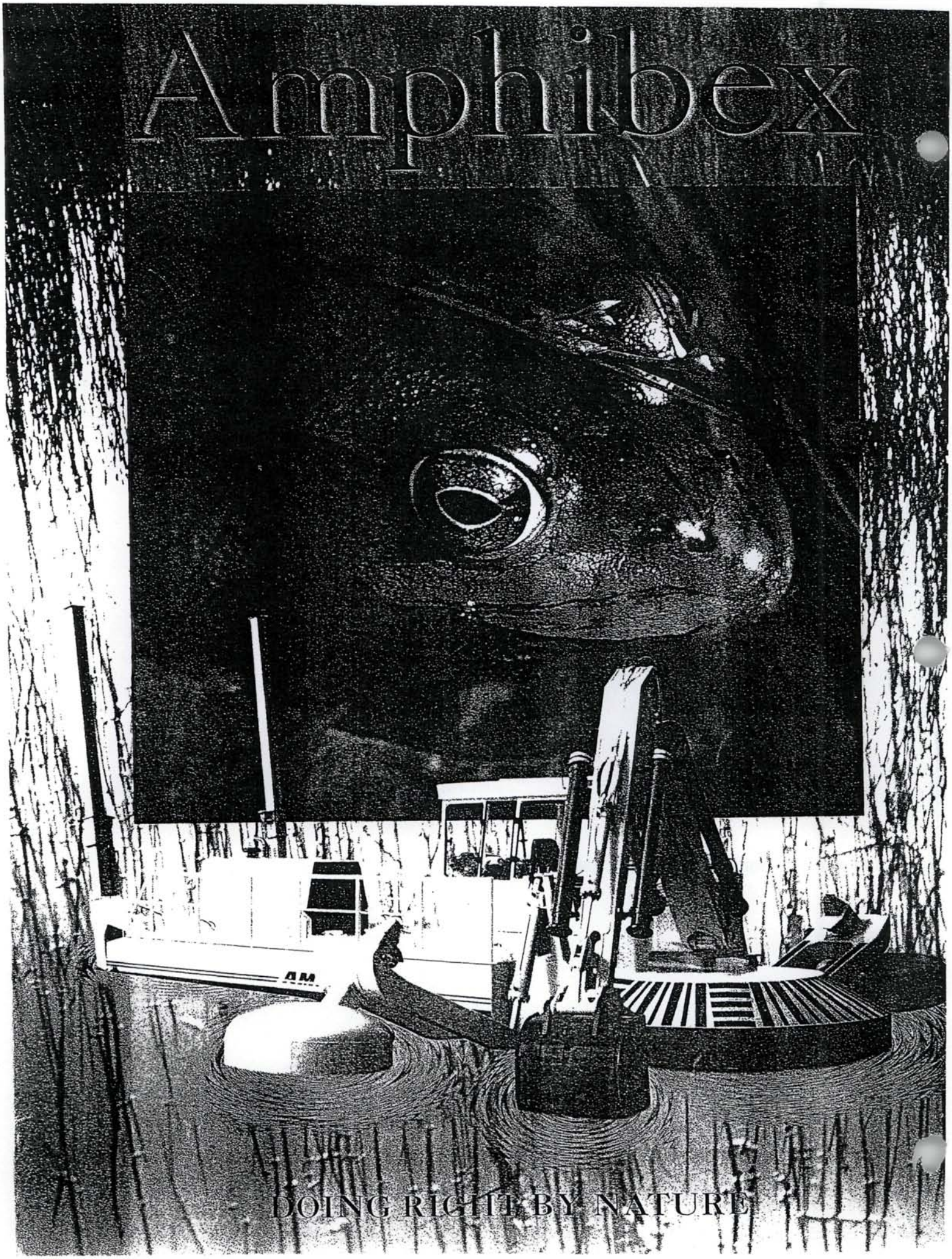
Bean responded to these challenges by designing and building the Bonacavor. With innovations in cutter location, dredge positioning, sediment processing and transportation, the Bonacavor and Bean successfully conquered the challenges presented at Bayou Bonfouca.

BEAN

FIGURE P-2. NORMROCK INDUSTRIES AMPHIBEX

CAD FILE:NBH_PHOTO_02.DWG

Amphibex



DOING RIGHT BY NATURE

Working with Nature

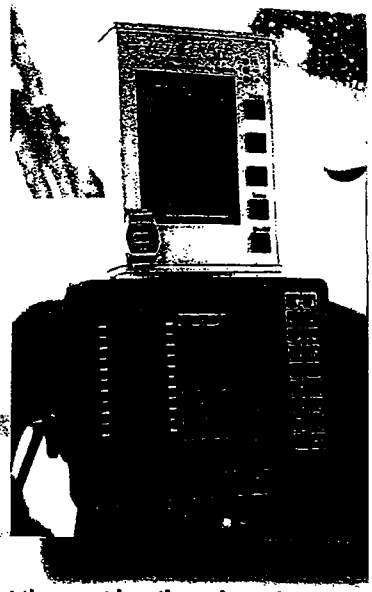
From time immemorial, humankind has used its ingenuity to exploit the planet's resources. But in these enlightened times, we also know that we must treat those resources with respect. The **Amphibex** from Normrock Industries is an amphibious excavator designed to meet both needs, wedding state-of-the-art performance with environmentally sound operation.

The culmination of many years of research and innovation, the **Amphibex** is an amphibious excavator specially designed to operate in an aquatic environment. What makes it different? Its versatility, power, ruggedness, mobility, sophisticated positioning equipment, and very low capital and operational costs.

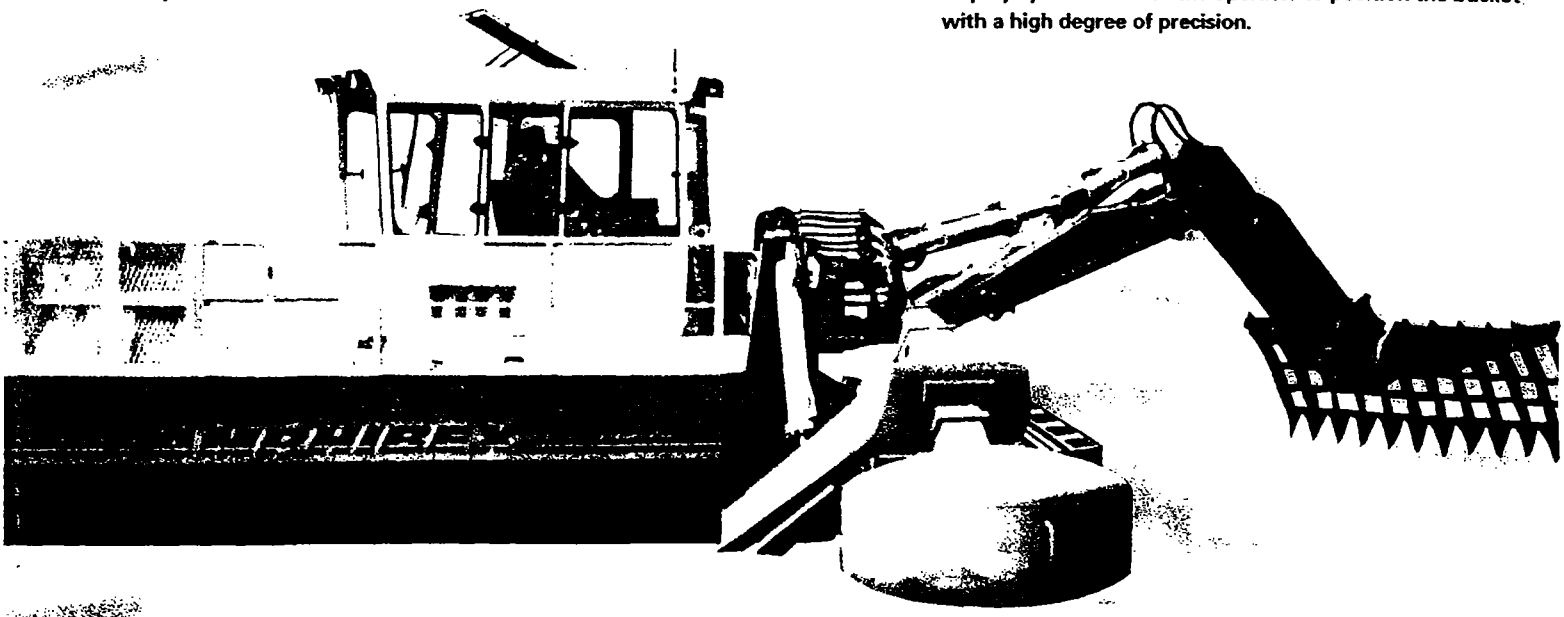
The Quebec-designed and built **Amphibex** is suitable for a wide range of uses in all types of water:

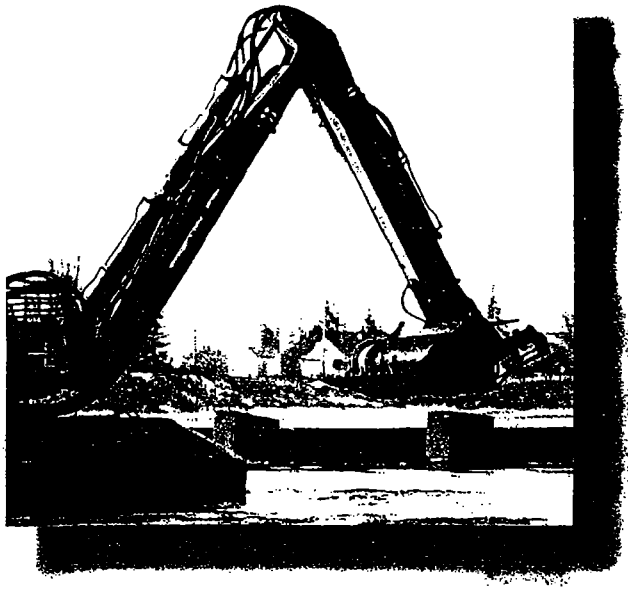
- cleaning and restoring contaminated waterways
- installing water pipes, pipelines and submarine cables
- cleaning wastewater treatment ponds
- preventing and breaking up ice jams
- controlling vegetation
- developing peat lands
- creating wildlife habitats

The Amphibex's cab meets the highest standards of comfort and visibility. It is equipped with two deluxe seats, easy-to-reach controls, side windows that can be opened, and a range of standard and optional accessories.



The Amphibex's optional sophisticated positioning system, developed by Normrock Industries, is particularly useful for clean-up operations. It can pinpoint the exact location where the machine is to set to work, by night or day. A graphical display system enables the operator to position the bucket with a high degree of precision.

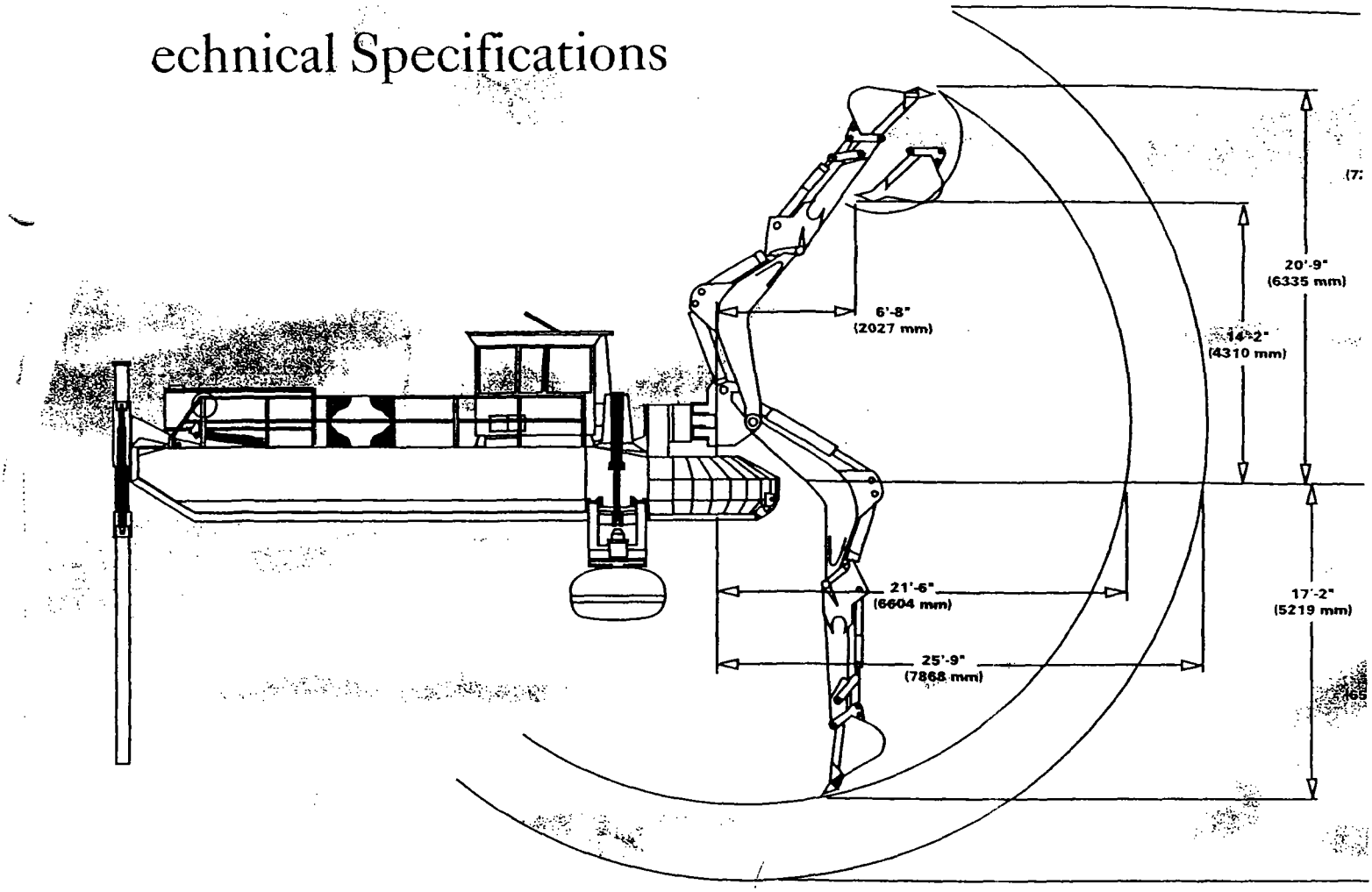




The Amphibex's powerful hydraulic pumping system can propel highly concentrated solid residues over distances of more than one kilometre.

The Amphibex can be equipped with an array of accessories (bucket, cutterhead-equipped pump bucket, rake, etc.) to enable it to perform the job at hand.

echnical Specifications



General Description

Maximum length	35' 7" (10.85 m)
Working weight	appr. 24.25 tons) (22 metric tons
Transport length	42' 2" (12.85 m)
Transport width	11' 6" (3.5 m)
Transport height	10' 6" (3.2 m)
Sailing speed	appr. 8 knots
Stabilizers (rear) Draught	2' (60 cm)

Engine

	Detroit diesel, Series 40
Model	see options
Cylinders	6
Maximum HP	170 to 300
Maximum torque	170 [illegible] NM) at 1700 rpm 300 [illegible] NM) at 1300 rpm
Air compressor	[illegible] 43 c. i. m.
Electrical	12 volts y/c Delco or 24 volts
Starter	Delco/Remy 12 volts
Alternator	Delco/Remy 100 amp
Batteries (2)	Delco/Remy 225 amps/hr.

Fuel Tank Capacity 317 Gal. (1200 L)

*American gallon

Hydraulics

2 Gear pump	90 gal (340 L)/min.
Maximum working pressure	240 bar
Variable displacement pump	
Maximum working pressure	450 bar
Hydraulic system capacity	132.09 gal (500 L)
Hydraulic oil vegetable base or mineral	

Standard Equipment

- Corrosion resistant one-piece body divided into nine watertight compartments
- Two rear stabilizers, equipped with hydraulical tilting cylinders. Depth control by means of hydraulic cylinder/ mechanical control
- Two front stabilizers with detachable floats and removable spuds
- Propulsion system hydraulically height controlled
- Powder fire extinguisher [illegible]
- Excavator equipped with hydraulic mounting bucket and discharge line [illegible]
- Output connection SAE200 - max. discharge 2 X 33 gal/s (2 X 125 L/s) - bucket with horizontal cutter
- Quick coupling for working attachment
- Life saving equipment

Excavator

Maximum bucket reach	21'6" (6.6 m) to 25' 9" (7. through 180°
Maximum depth with telescopic arm	21' 5" (6.528
Breakout force (from bucket cyl.)	depends on selec option
Digging force (from bucket cyl.)	depends on selec option

Optional Equipment

- Backoe buckets, 0.5 yd³ (400 L) and 1 yd³ (800 L)
- Discharge spout for side casting
- Rake -width 9' 11" (3 m)
- Discharge pipe - 8" (200 mm) X 20' (6 m) with aluminum mounting flanges (SAE200) connected float pipes
- Air compressor, hydraulically driven for accesso
- Navigation and dredging lights, telescopic and fo mast
- Winch
- Crane
- Tools
- Heating system
- Air conditioning

For customized equipment for your special needs, please consult manufacturer.

NORMROCK INDUSTRIES INC.
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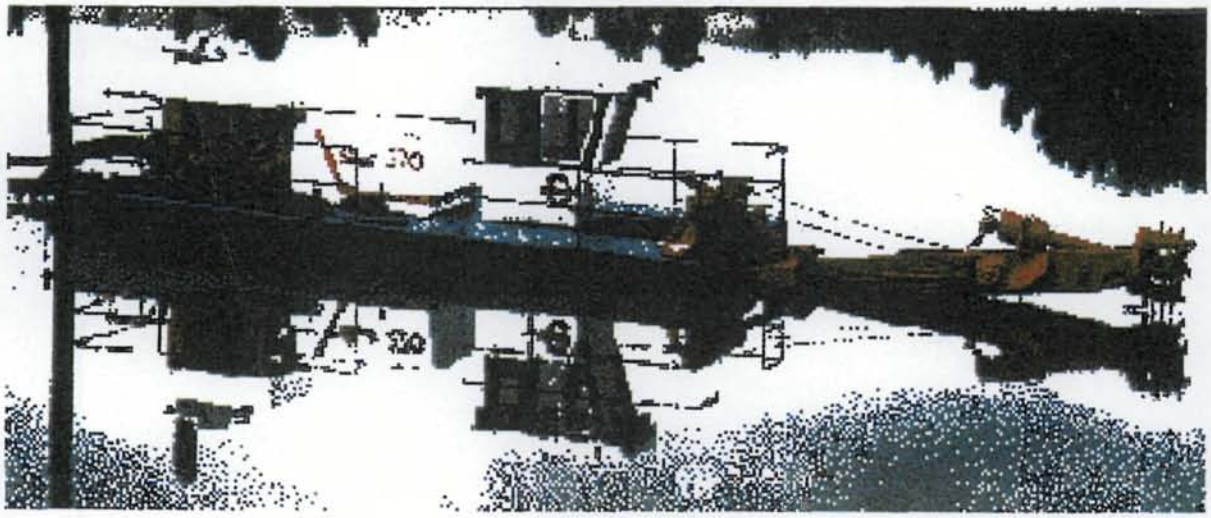
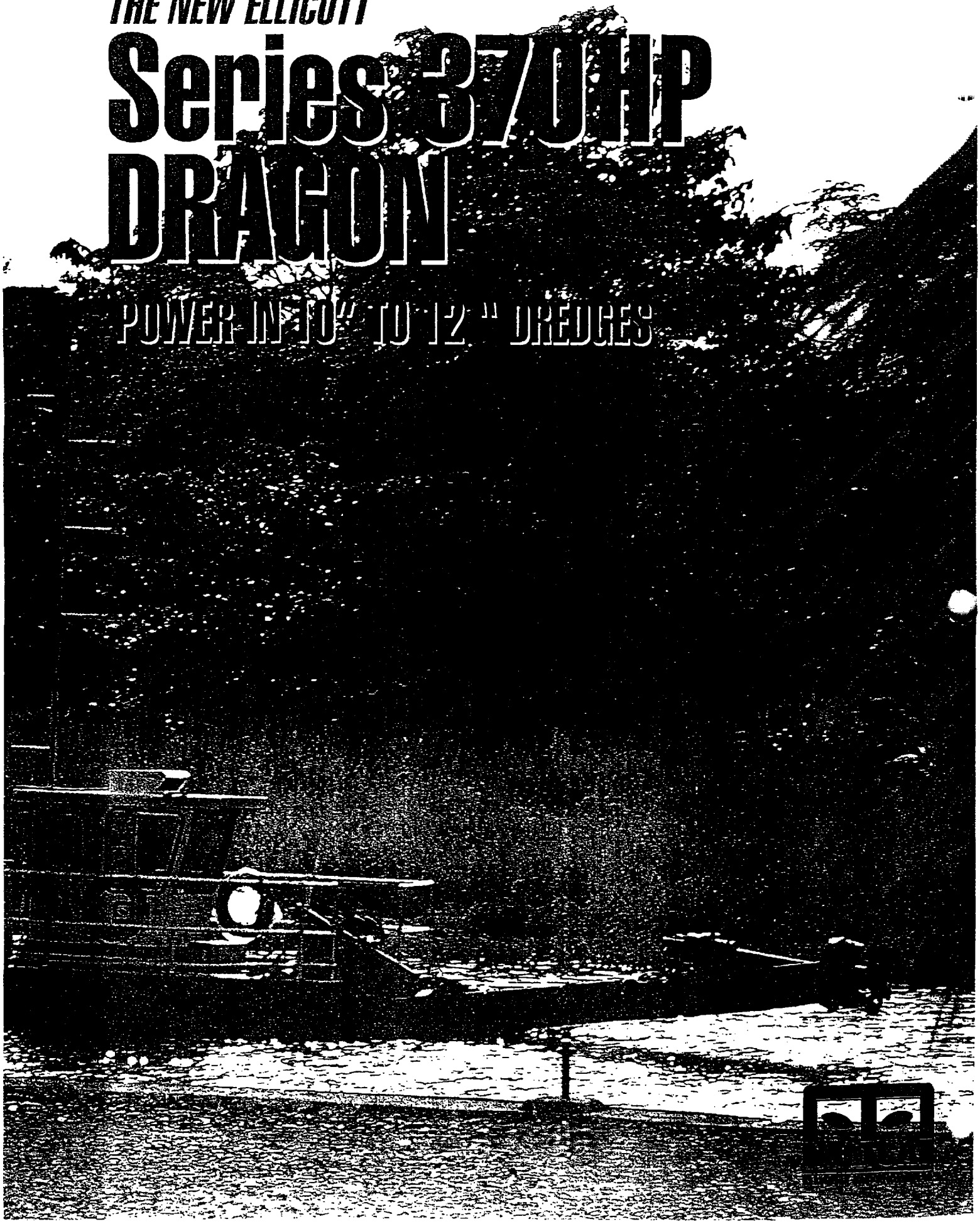


FIGURE P-3. ELLICOTT INTERNATIONAL SERIES 370 HP

THE NEW ELLICOTT
Series 370 HP DRAGON

POWER IN 10" TO 12" DREDGES



POWERFUL!

MUD CAT
ELLICOTT INTERNATIONAL

STANDARD SPECIFICATIONS SERIES 37/0HP

GENERAL		
Overall Length (with ladder)	17.5 m	57.5 feet
Overall Width	3.7 m	12.0 feet
Hull Depth	1.2 m	4.0 feet
Mean Draft (with fuel)	0.81 m	2.67 feet
Spud Length	8.9 m	29.1 feet
Spud Weight (each)	816 kg	1800 lb.
Total Dredge Dry Weight	25400 kg	56000 lb.
Suction Pipe Diameter	305 mm	12 in.
Discharge Pipe Diameter	254 mm	10 in.
OPERATING CONDITIONS		
Digging Depth		
Minimum	0.9 m	3.0 feet
Maximum	6.1 m	20.0 feet
Maximum Channel Cut of Dredge		
@Minimum Digging Depth	22.2 m	73.0 feet
@Maximum Digging Depth	18.3 m	60.0 feet
PRIME MOVER		
Diesel Engine (radiator cooled)	Caterpillar	Caterpillar
Model	3406 B	3406 B
Maximum Operating RPM	1800	1800
Continuous Power (flywheel)	306 kW	410 SHP
SWING WINCHES		
Line Pull (1st layer)	3629 kg	8000 lb.
Line Speed (1st layer)	22.9 m/min.	75 FPM
Wire Size	12.7 mm	1/2 in.
Drum Capacity (maximum)	91 m	300 feet
Drum Capacity (standard)	61 m	200 feet

CUTTER MODULE		
Cutter Force	1787 kg	3940 lb.
Cutting Force (per unit length of blade)	34.3 kg/cm	192 lb./in.
Cutter Diameter	800 mm	31.5 in.
Cutter Rating	30 kW	40.0 SHP
Cutter Speed	0-39 RPM	0-39 RPM
Number of Blades	6	6
SLURRY PUMP		
Impeller Diameter	686 mm	27 in.
Particle Clearance	152 mm	6 in. dia.
Maximum RPM	845	845
LADDER HOIST CYLINDER		
Extending Force	4452 kg	9815 lb.
Retracting Force	18700 kg	41225 lb.
Lowering Speed at Cutter	24.7 m/min	81 FPM
Hoisting Speed at Cutter	29.6 m/min	97 FPM
SPUD HOIST	CYLINDER	CYLINDER
Lifting Force (at spud)	3266 kg	7200 lb.
Lowering Speed	Free Fall	Free Fall
ELECTRICAL SYSTEM		
Battery	24 V	24 V
CAPACITIES		
Fuel	3028 Liters	800 gal.
Hydraulic Oil	871 Liters	230 gal.

Complete dredge outfitting equipment available including polyethylene pipeline and booster pumps.

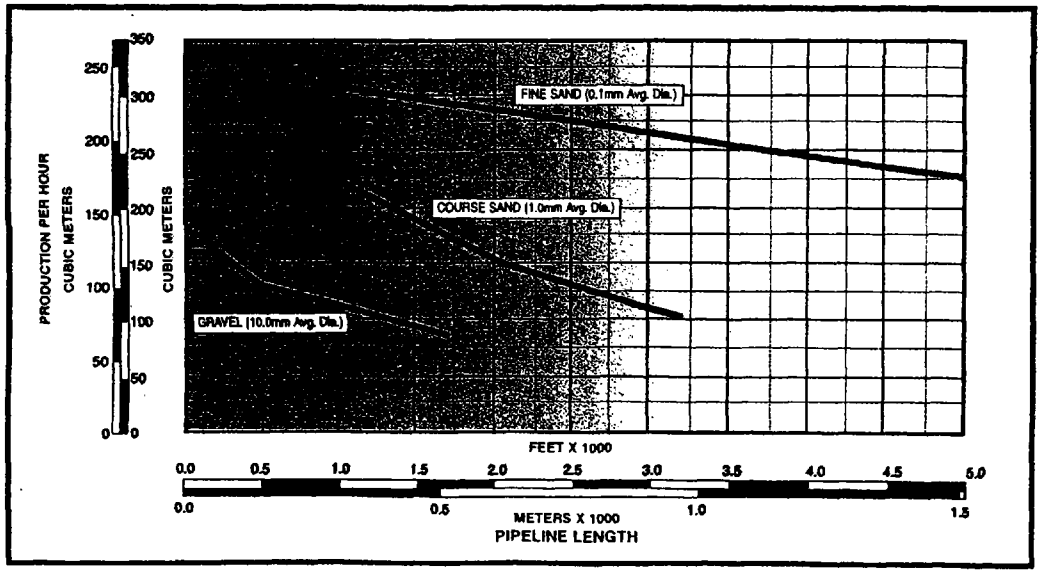
CONVERSION FOR VARIOUS IN-SITU S.G.	
DENSITY	MULTIPLIER
2.10	1.000
2.00	1.100
1.95	1.158
1.90	1.222
1.85	1.294
1.80	1.375

SERIES 370HP CALCULATED OUTPUT CURVES

Material In-situ Density = 2.1
For material in-situ values other than 2.1, see conversion chart at left.

CALCULATED OUTPUT CURVES BASED ON 12-INCH (305 mm) PIPELINE:

- 12" (305mm) Diameter Suction
- 12" (305mm) Diameter Discharge
- 20' (6.09m) Digging Depth
- 10' (3.05m) Terminal Elevation
- 27" (685.8mm) Diameter Impeller
- Maximum RPM = 845 SHP = 320



Output curves for all applications are computer generated on a program specifically designed for this purpose. The calculated output curves represent our best engineering knowledge and reflect the output pumping capability of the dredge under the conditions stated. In actual practice, the material varies from free-flowing, easily excavated material, to compacted and/or difficult excavations. The nature of the material and job conditions must be considered when estimating actual outputs. The outputs are indicated for your reference and are not guaranteed.

WARRANTY

Ellicott warrants its equipment only in accordance with its printed warranty conditions, the latest copy of which will be forwarded to you promptly upon written request. No other warranties are provided.

The specifications shown in this brochure are subject to change due to improvements or design modifications required during construction, or the addition of equipment not described in the specifications.

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