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Final

Sediment Trap Study Report

Environmental Monitoring, Sampling, and Analysis

New Bedford Harbor Superfund Site

New Bedford Harbor, MA

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1.0 PROJECT DESCRIPTION AND OBJECTIVES

1.1 Purpose

Battelle has been contracted by U.S. Army Corps of Engineers (USACE) New England District (NAE) to perform environmental monitoring in support of the remedial activities at the New Bedford Harbor Superfund Site. This document presents the results from a sediment trap study designed to monitor resuspended sediments in the northern portion of the harbor that could impact restoration of the North of Wood Street (NWS) area. The data collection activities for the sediment trap study included:

- Deployment and collection of sediment traps at four locations north of dredging area MU-1 including traps north of the Wood Street Bridge (study locations are 'up-current' of dredging area MU-1 during ebb tide and 'down-current' of dredging area MU-1 during flood tide);
- *In-situ* water quality monitoring (e.g., temperature, salinity, and turbidity) at these locations;
- Collection of surface sediments at each sediment trap location; and
- Analysis of sediment trap samples and surface sediments for polychlorinated biphenyls (PCBs) congeners, grain size and total organic carbon (TOC).

1.2 Site Description

The New Bedford Harbor Superfund Site (hereafter referred to as the site), located in Bristol County, Massachusetts (MA), extends from the shallow northern reaches of the Acushnet River estuary south through the commercial harbor of New Bedford and into 17,000 adjacent acres of Buzzards Bay (Figure 1). Industrial and urban development surrounding the harbor has resulted in sediments becoming contaminated with high concentrations of many pollutants, most notably PCBs and heavy metals. Two manufacturers in the area used PCBs while producing electronic devices from the 1940s to the late 1970s, when the use of PCBs was banned by the U.S. Environmental Protection Agency (USEPA). Based on human health concerns and ecological risk assessments, USEPA added New Bedford Harbor to the National Priorities List in 1983 as a designated Superfund site. Through an Interagency Agreement between the USEPA and the USACE NAE, the USACE NAE is responsible for carrying out the design and implementation of the remedial measures at the site. The site has been divided into three areas – the upper, lower and outer harbors – consistent with geographical features of the area and gradients of contamination (Figure 2).

The shoreline Aerovox manufacturing facility located in New Bedford, MA (Figure 2) used PCBs in the manufacture of electrical capacitors from approximately 1940 to 1977. This facility is considered one of the major sources of historic PCB contamination to New Bedford Harbor. The highest concentrations of PCBs were found in sediments in a 5-acre area in the northern portion of the Acushnet River Estuary adjacent to the Aerovox facility. These 'hot spot' sediments, which contained PCBs upwards of 100,000 milligrams per kilogram (mg/kg), were removed between 1994 and 1995 as part of USEPA's 1990 "Hot Spot" Record of Decision

(ROD). Full scale remediation dredging per the 1998 Upper and Lower Harbor ROD was initiated in 2004 and has continued with annual funding every year since. Another known source of PCB contamination in New Bedford Harbor is related to activities at the Cornell-Dubilier mill on the western shore of the outer harbor (Figure 2). In 2005, a 15 acre underwater cap pilot project was implemented near Cornell-Dubilier to cap PCB contaminated sediments.

Located at the far northern end of the Upper Harbor are areas which were prioritized for restoration activities based on their proximity to shoreline residential and recreational land use areas. The NWS area includes in-river sediments and marsh soils on the eastern and western shores of the river. The NWS area ranges from approximately 250-ft south of the Wood Street Bridge to approximately 0.25 miles north of the bridge. Sediments and marsh soils in the NWS area previously had PCB concentrations as high as 46,000 mg/kg. The 1998 ROD established the following clean up criteria: 1 mg/kg for residential shoreline areas, 10 mg/kg for the sub-tidal sediments, 25 mg/kg for the top foot of recreational land use shoreline soils, and 50 mg/kg for shoreline soils deeper than the top foot in residential and recreational land use areas.

In the winter of 2002-2003, approximately 15,000 cubic yards of material was removed from the NWS area. The site was remediated using temporary dams and pumps to divert river water around the site. This allowed excavation activities to be conducted on dry sediments and soils, thus eliminating the potential for sediment resuspension and recontamination. Clean fill was used to restore the river banks, but sub-tidal areas were left at the depth of excavation (i.e., not backfilled). Marsh and upland vegetation was planted above the low water line to stabilize and restore the shoreline. In August of 2004 post-remediation sampling revealed elevated PCB concentrations on the eastern shoreline of the NWS area, and in certain sub-tidal locations. Elevated concentrations were found above the high tide line suggesting that incomplete remediation was a more likely cause than recontamination from in-river sources. Additional remediation and restoration efforts were conducted in December of 2005 to remove the remaining contamination. Samples collected before and after this effort showed an improvement in shoreline PCB concentrations (ENSR 2006). Additional sediment sampling in 2006 (Battelle 2007a) and 2007 (Battelle 2008) showed some variability in PCB concentrations but no substantial recontamination.

1.3 Objectives

The objective of this study was to collect data to assess trends in PCBs at the NWS area and to further evaluate the potential for recontamination of previously remediated areas north of the Wood Street Bridge, and to identify potential sources, if possible. Changes in PCBs observed in sediment stations at the NWS area could be associated with resuspension of dredged material related to remedial dredging activities, naturally occurring movement of resuspended sediments in the area, an upland source, or any combination of these factors. Data collected to support the study objectives included: physical characteristics (grain size and TOC), PCB chemistry on suspended sediment material and surface sediments, and *in-situ* water quality measurements (e.g., turbidity) during sediment trap deployment periods.

2.0 STUDY DESIGN AND METHODS

The study area and design and sampling and analytical methods used to deploy, collect and analyze sediment trap and surface (0-2 cm) sediment samples for physical characteristics and PCBs is summarized in this section and detailed in the project work plan (Battelle 2007b).

2.1 Study Area

The NWS area is a shallow water estuary located at the upstream reach of New Bedford Harbor and the Acushnet River. This area of the upper harbor also includes a narrow channel with steep marsh banks on both sides, with at least two combined sewer overflows that could provide additional inputs to the system. New Bedford Harbor is a highly dynamic system influenced by physical processes including precipitation, winds, severe weather conditions including coastal storms and hurricanes, and tides. Tides are semidiurnal, with two high waters and two low waters occurring each day. The tide, together with variability in freshwater flow, determines the current direction and its influence on the transport of suspended sediments. On ebb tides, "down-current" is always to the south. However, on flood tides flow is often, though not always, to the north. While all of these physical processes can influence resuspension and transport of bottom sediment in the area, tides and storm waves appear to be the dominating processes at the site (Battelle, 1991).

2.2 Study Design

Sediment trap samplers were deployed at four stations in the northern portion of New Bedford Harbor (Figure 3) to characterize sediment resuspension and associated PCBs and physical characteristics at the NWS area before, during, and after dredging. Pre and post-dredging deployments were performed to assess natural movement of sediments in the harbor.
The three northernmost deployment locations (ST-01, ST-02, and ST-03) were chosen to correspond to existing sediment sampling stations (033, 048, and 062, Figure 3). The southernmost station (ST-04) was located at the northern boundary of the 2007 and 2008 dredging activities (Areas G and H in 2007 and Aerovox and Pierce Mill Cove in 2008). Sediment traps were recovered once a sufficient quantity of suspended sediment material had accumulated to meet mass requirements for physical and chemical testing. Co-located surface sediments were collected during two events (post 2007 dredging and pre 2008 dredging) to represent an integrated measurement of actual surface sediment concentrations and PCB composition pre and post-dredging.

The sediment trap and surface sediment samples were analyzed for grain size, TOC, and PCB congeners (correlated to total PCBs using a site-specific correlation factor). Continuous *in-situ* water quality monitoring was also performed using moored instruments to collect temperature, salinity, dissolved oxygen (DO), and turbidity data. Other field data including sampling location, sample deployment and collection date, and sample depth were recorded on the field logs.

2.3 Field Methods

The sediment trap study was performed over a 12 month period, and encompassed both active dredging and non-dredging periods. A timeline showing when sediment trap samples and

surface (0-2 cm) sediment samples were collected relative to dredging and non-dredging activities is presented in Figure 4.

2.3.1 Sediment Trap Deployment and Retrieval

The sediment trap study was performed over a 12 month period, with individual deployments occurring during both active dredging and non- dredging periods. A minimum of two traps were deployed at each location to provide information on reproducibility with respect to sediment accumulation rates and to provide additional material for analysis. A third trap was also deployed at ST-01 to allow for sufficient replication to assess the precision of the field and laboratory measurements. All information pertaining to the deployment and retrieval of sediment traps was recorded on the Field Daily Log Forms (Appendix A). During sediment trap deployment, turbidity, temperature, and salinity measurements were obtained at the location of the deployment and recorded on the *In Situ* Log Form (Appendix A). In addition, a moored YSI data sonde was stationed at ST-03 to collect continuous turbidity, temperature, and salinity measurements over the duration of the deployments. A differential Global Positioning System (dGPS) was used to locate the stations. The dGPS was calibrated and the information recorded on the Calibration Form (Appendix A).

Figure 5 shows a picture of a sediment trap before and during deployment and after recovery. Each sediment trap sampler consisted of a 2-liter wide mouth plastic jar with a funnel affixed to the mouth. The inner diameter of the funnel was 8 inches. The jar/funnel assembly was secured inside a weighted 1-gallon bucket. This configuration placed the opening of the trap (mouth of the funnel) approximately 1-ft above the sediment water interface and approximately 3-inches above the rim of the bucket. A line from the bucket was attached to a surface buoy. During deployment clean sediment traps were lowered slowly through the water column and placed gently on the bottom. Every effort was made to minimize resuspension of sediments during deployment of the trap.

Sediment traps were retrieved once a sufficient quantity of material had accumulated (approximately 20 grams wet; based on visual observation of traps) to meet mass requirements for physical and chemical testing. The duration of the deployment period varied over the course of the study, and was dependent on the rate that suspended material accumulated in the traps. If sediment deposition rates were lower than expected, the deployment times were extended. To retrieve the samples, the traps were pulled up slowly and gently by the surface buoy line. Every effort was made to minimize disturbance of sediments within the trap. The traps were brought on board the boat, the funnel was gently removed, and a cap was placed on the 2-liter jar. Samples were kept cold (4°C) and transported under chain of custody to Battelle (Duxbury, MA) for processing (see Section 2.4.1).

2.3.2 Surface Sediment Sampling

Co-located surface sediments were collected at each of the four trap locations to represent an integrated measurement of actual surface sediment concentrations and PCB composition before and after dredging.

Surface sediment was collected using a Kynar coated 0.1-m^2 Van Veen grab sampler. Each grab sample was inspected for acceptability (Battelle, 2007b). The 0-2 cm was collected for physical

and chemical testing using pre-cleaned stainless steel scoops or spoons. Samples were homogenized by stirring in a clean, stainless steel container prior to subsampling into individual containers in the field. Samples were kept cold (4°C) and transported under chain of custody to Battelle (Duxbury, MA) for processing (see Section 2.4.1).

2.4 Laboratory Methods

2.4.1 Sample Processing

Upon receipt at the Battelle Duxbury Laboratory (BDL), sample custody was transferred to the laboratory. Sediment trap samples were allowed to rest undisturbed overnight in a cold room (4º ±2º C). This served two purposes. First, because many of the traps contained invertebrates such as shrimp or crabs, this chilling of the samples reduced movement of the organisms, thus reducing mixing of the sample. Secondly, the overnight storage allowed sediments in the sample to fully settle.

After the chilling and settling period, the sediment and water was transferred to a 500 mL Teflon jar, and centrifuged at approximately 1500 rpm to consolidate the trap samples and remove excess water. Before centrifugation, visible invertebrates in the sediment were removed with solvent-rinsed forceps. The centrifuged material for each sample was weighed using an electronic balance, and the weight recorded. Sediment deposition rates were calculated based on the mass of sediment accumulated in the trap, duration of the trap deployment, and the surface area of the sediment trap as follows:

$$\text{Deposition Rate (DR)} = (W_{ST} / D_{ST})/A_{ST}$$

where,

W_{ST} = mass of sediment trapped, grams dry weight
D_{ST} = duration of the sediment trap deployment, days
A_{ST} = area of the sediment trap, 0.0324 m^2 based on 8 inch diameter of funnel

Sediment material collected from the three trap samplers deployed at station ST-01 were split as follows: one trap sample was archived[1] frozen at the laboratory and two trap samples were used for grain size, TOC, and PCB analysis. Sample material split for grain size, TOC, and PCB analysis was sub-sampled from the same trap. Sediment material collected from the two trap samplers deployed at stations ST-02, ST-03, and ST04 were split as follows: one trap sample was used for grain size and TOC analysis and the second trap sample was used for PCB analysis.

All surface sediments were homogenized at the laboratory and split for grain size, TOC, and PCB analysis.

Sub-samples for grain size and TOC analysis were shipped overnight to Applied Marine Sciences (AMS) in League City, Texas (TX). Sub-samples for PCB analysis were frozen until analysis at BDL.

[1] For deployments #1 and #2, all three sediment trap samples from station ST-01 were analyzed for grain size, TOC, and PCBs.

2.4.2 Grain Size Analysis

The quantitative determination of the distribution of particle sizes in sediments was performed by AMS following ASTM D422 (AMS SOP 2103). The distribution of particle sizes larger than 74 microns (µm No. 200 sieve) was determined by sieving, while the distribution of particle sizes less than 74 µm was determined using a hydrometer. Initial preparation consisted of homogenizing samples thoroughly and removing any foreign debris (sticks, plastic, etc.). An aliquot of wet sediment was weighed and dispersed using a solution of RO/DI (reverse osmosis de-ionized) water and sodium hexameta-phosphate, then wet sieved over a No. 200 mesh sieve. The coarse fraction (>74 µm -gravels and sands) retained on the No. 200 sieve was transferred to a beaker and dried at 105ºC for 12 hours. After drying, the coarse fraction was passed through a series of nested sieves to determine the distribution of gravel and sand. The fine fraction (<74 µm silts and clays) passing the No. 200 sieve was collected in a calibrated 1 liter (L) cylinder. A hydrometer test was performed at predetermined intervals to determine the distribution of silt and clay-sized particles. All results were reported as percent on a dry weight basis.

2.4.3 Total Organic Carbon Analysis

TOC analyses were performed by AMS following EPA SW-846 Method 9060A (AMS SOP 2201). Sample preparation consisted of drying, homogenization, and acidification to remove carbonates and bicarbonates. The samples were combusted in a high-temperature furnace in a stream of oxygen to form CO_2, which was analyzed using a CO_2 Coulometer. Interfering gases, such as halogens, sulfur, nitrogen oxides, and water, were removed by chemical scrubbers prior to CO_2 measurement. All results were reported in percent carbon on a dry weight basis.

2.4.4 Polychlorinated Biphenyl (Congener) Analysis

Sediment (trap and surface) samples for PCB congener analysis were removed from frozen storage and allowed to thaw. Each sample was mixed in the container and a measured aliquot removed for percent moisture determination (Section 2.4.5). A second measured aliquot was removed and placed on a piece of aluminum foil for air drying in a hood overnight. The air-drying process was implemented to ensure percent solids in the samples were >50% to enhance extraction efficiency.

The air-dried sample was spiked with surrogates and extracted using Accelerated Solvent Extraction (ASE) following modified EPA SW846 Method 3545 (Battelle SOP 5-307). The extract was poured through a funnel containing sodium sulfate. The extract volume was then brought to 100 mL and 10 mL was removed for further processing. The 10 mL split was treated with activated copper for sulfur removal, solvent exchanged into hexane, and passed through a Florisil SPE cartridge. The post-Florisil extract was then diluted to 10 mL, out of which 1 mL was fortified with internal standards (IS) and submitted for analysis. The 100-fold pre dilution scheme (described here) was performed to prevent contamination of the analytical instruments that may occur from highly contaminated samples.

All sample extracts were analyzed for a set of 44 PCB congeners using gas chromatography/ mass spectrometry (GC/MS) in the selected ion monitoring mode (SIM) following key components of EPA Method 1668A and 8270D (Battelle SOP 5-315). Sample data were quantified by the method of internal standards, using the IS compounds. Many of the sample

extracts were diluted and re-analyzed because selected PCB congeners responded above the linear range of the instrument calibration. Congener concentrations resolved from post-analytical dilutions were qualified with a "D", while concentrations resolved from the 100-fold pre-analytical dilutions were not qualified with a "D". All results were reported in micrograms per kilogram (µg/kg) dry weight.

2.4.5 Percent Moisture

Percent moisture was determined by each laboratory (BDL and AMS) to determine the amount of water present in the sediment samples (trap and surface). At each laboratory, a well-homogenized aliquot of each sediment sample was dried overnight in an oven and the percent moisture was determined as the percent ratio of wet to dry weight for each analytical aliquot. All results were reported as percent on a wet weight basis.

At BDL, the percent moisture was determined before the samples were air-dried (Section 2.4.4) for PCB analysis. The percent moisture determination step was not repeated on the air-dried sample used for extraction.

2.4.6 Data Analyses

Microsoft® Excel 2003 and JMP (The Statistical Discovery Software, a business unit of SAS Institute, Inc.) were used to characterize the sediment chemistry data. Individual and station mean values were used in the data analyses for the following sediment parameters: sand+gravel, silt, and clay; percent fines, percent total sand, TOC, and total PCB, as follows:

- Percent fines – calculated as the sum of the silt and clay fractions
- Percent total sand – calculated as the sum of the coarse sand, medium sand, and fine sand fractions
- Total PCB – calculated as 2.6 times the sum of the 18 National Status and Trends (NS&T) congeners[2], as is routinely done for the New Bedford Harbor program. A value of zero was used in the summation for non-detects.

Total PCB concentrations used in the comparison of sediment trap and surface (0-2 cm) sediment data were also normalized to percent fines because normalization provides a more conservative means of evaluating the data for trends. Graphical representations of the sediment data were presented as ternary and histogram plots.

PCB flux, a measurement of PCB input to the bottom sediments based on both sediment deposition rate and PCB concentration, was calculated as follows:

$$\text{PCB Flux (mg/m}^2\text{/day)} = (\text{Total PCB}_{ST} \times \text{DR}_{ST})/1000$$

where,

[2] NS&T congeners include PCBs 8, 18, 28, 44, 52, 66, 101, 105, 118, 128, 138, 153, 170, 180, 187, 195, 206, and 209.

Total PCB_{ST} = concentration of total PCB in trapped sediment, mg/kg dry weight
DR_{ST} = deposition rate, $g/m^2/day$

2.5 Quality Assurance/Quality Control

2.5.1 Field Program

Replicate trap samplers were deployed and collected at each of the sediment trap stations (three samplers at station ST-01 and two samplers each at stations ST-02, ST-03, and ST-04) during each deployment to evaluate sampling reproducibility in terms of collected particulate mass. Replicate trap samplers deployed and collected at station ST-01 during each deployment were also used to evaluate sampling and analytical (i.e., grain size, TOC, and PCB) reproducibility. Replicate surface sediments were collected at station ST-01 during each sampling event to evaluate sampling and analytical reproducibility.

2.5.2 Laboratory Program

A routine set of laboratory-based quality control (QC) samples were prepared with each set of study samples to evaluate data quality in terms of accuracy and precision. QC samples for grain size consisted of one laboratory duplicate sample for each batch of 20 or fewer samples. QC samples for TOC consisted of one method blank, one continuing calibration verification, one independent continuing calibration verification, and one laboratory duplicate sample for each batch of 20 or fewer samples. QC samples for PCB analysis included one procedural blank, one laboratory control sample (LCS), one matrix spike (MS), and one matrix spike duplicate (MSD) for each batch of 20 or fewer samples.

2.6 Project Deviations

The project work plan (Battelle 2007b) indicated that a total of 12 sediment trap deployments would be conducted at each of the 4 stations. Upon evaluating the study objectives and consulting with USEPA and USACE NAE, it was determined that data provided by the 10 deployments performed over the 12-month period (beginning in October 2007 and ending in October 2008) were sufficient to meet the study objectives.

The surface sediment samples collected at the inter-tidal locations in July 2007 are not used in this report because these locations were not co-located with the trap locations, and PCB composition at these locations may not be representative of the sediment trap locations as a result.

In accordance with the study objectives, two sampling events were performed over the study period to collect co-located surface (0-2 cm) sediment samples at each of the four sediment trap locations. The co-located surface sediment samples were not collected within the same dredge season. Rather, these samples were collected following completion of dredge activities in 2007 (i.e., post 2007 dredge) and prior to the on-set of dredge activities in 2008 (i.e., pre 2008 dredge). While the surface sediment samples were not collected within the same dredge season, the samples do represent an integrated measurement of actual surface sediment concentrations and PCB composition over the study period.

3.0 RESULTS

This section summarizes results from the sediment trap study, including field and laboratory test results. Complete test results, along with results from the analysis of field- and laboratory-based QC samples, are provided as appendices to the report (Appendix A includes copies of all field logs; Appendix B includes grain size and TOC data; and Appendix C includes PCB data).

3.1 Field Sample Results

3.1.1 Sediment Sampling

Sediment trap and surface samples collected in support of this study are summarized in Table 1. The sediment trap study was performed over a 12-month period, beginning October 2007 and ending October 2008 (see Figure 4 for project timeline). Sediment trap samplers were not deployed between December 11, 2007 and March 13, 2008 due to icing conditions. A total of ten sediment trap deployments were performed at each of the four trap stations, with deployment duration ranging from 21 days to 38 days (Table 1).

Co-located surface (0-2 cm) sediment samples were collected at each of the four trap deployment locations during two events: November 12, 2007 (post 2007 dredge) and April 22, 2008 (pre 2008 dredge).

All sediment trap samples were processed to determine the particulate mass accumulated and sediment deposition rates. All sediment trap and co-located surface sediment samples received laboratory testing as described in Section 3.2.

3.1.2 In-situ Water Quality Monitoring

A moored YSI data sonde was stationed at ST-03 to collect continuous temperature, salinity, DO, and turbidity data over the duration of the sediment trap deployments. Continuous *in-situ* water quality data are not available between December 11, 2007 and March 13, 2008 because sediment traps were not deployed during this period due to icing conditions. Nor are data available between August 26 and September 15, 2008 because of a disruption in the power source (the unit was subsequently replaced).

Temperature and Salinity – Continuous *in-situ* temperature and salinity data collected during the sediment trap deployments are shown in Figure 6. Typical seasonal trends in temperature were observed throughout the study period. The highest recorded water temperatures occurred in July and August and the lowest recorded temperatures occurred in December (Figure 6). Salinity was variable within a narrow range between 20 PSU to 30 PSU throughout the study period, except for rainfall events. Salinity decreased by more than 20 PSU during major rain events (United States Geological Survey, 2009) that occurred in March, May, August, September and October 2008 (Figure 6).

Dissolved Oxygen (DO) – Continuous *in situ* DO data collected during the sediment trap deployments are shown in Figure 7. DO measurements showed patterns that were typical of estuarine environments. High DO levels were observed in the spring and fall, with lower levels

observed throughout the warmer summer months. On average DO levels from May through September 2008 were approximately 5 milligrams per liter (mg/L). However, spikes in the DO, which can be caused by large phytoplankton blooms, were also observed. A substantial increase in DO was recorded in mid July (Figure 7), which coincided with a particularly dry time period when the salinity data showed very little fluctuation (Figure 6).

Turbidity – Continuous *in-situ* turbidity data collected during the sediment trap deployments are shown in Figure 8. The raw turbidity data was variable day to day, but remained fairly consistent throughout the study period with values ranging from 0 NTU to less than 30 NTU. Filtered turbidity data showed that on average values ranged from close to 0 NTU to approximately 10 NTU. No seasonal trends were apparent in the turbidity data. However, several less significant rainfall events did coincide with increases in turbidity. For example, an increase in turbidity was observed in mid to late October 2007 and in late July 2008. Both events coincided with a small decrease in salinity (Figure 6). The larger decreases in salinity observed in mid March, early May, mid August, and late September through early October of 2008 did not appear to coincide with substantial turbidity changes, although turbidity readings did appear to be more variable than other periods.

3.2 Laboratory Testing

3.2.1 Sediment Accumulation

The mass of sediment accumulated in the sediment traps during deployment is summarized in Table 2. The wet mass of sediment accumulated in the traps ranged from 11 grams at station ST-01 during deployment #2 to approximately 190 grams at station ST-02 during deployment #9 (Table 2). The dry mass of sediment (calculated from wet mass using the percent moisture) accumulated in the traps ranged 2.5 grams at ST-04 (during deployment #4 to approximately 52 grams at ST-02 during deployment #9 (Table 2). Inter-location and inter-deployment differences were observed. Sediment mass data were used to evaluate sediment deposition rates and PCB flux (see Section 4.0).

3.2.2 Grain Size

Grain size results for the sediment trap and surface sediment samples are summarized in Table 3. The sediment trap samples from all deployments were dominated by fine-grained particles. Percent fines ranged from 86.5% to 99.8%, with 50 out of the 52 samples having >94% fines. Percent total sand ranged from 0.17% to 13.5%. Gravel was only present in 1 of the 52 samples (ST-03-103107-2) at 0.53%.

The co-located surface sediment samples were also generally fine-grained, with 7 out of 10 samples having >80% fines (Table 3). Surface sediment at station ST-01 had similar grain size composition between sampling events, while grain size composition was more variable between events at stations ST-02, ST03, and ST-04. The variability may reflect small-scale heterogeneity at these locations.

3.2.3 Total Organic Carbon

TOC results for the sediment trap and surface sediment samples are summarized in Table 3. All of the sediment trap samples had high concentrations of organic carbon (frequently >10%), consistent with the fine-grained composition of the sediments.

The co-located surface sediment samples generally had lower concentrations of organic carbon, ranging from 1.84% to 15.5%. Organic carbon content was higher in fine-grained (>90% fines) surface sediments and lower in coarse-grained (>45% total sand) sediments (Table 3). TOC levels in surface sediments were similar between events at stations ST-01 and ST-02 and more variable at stations ST-03 and ST-04.

3.2.4 Polychlorinated Biphenyls (Congener)

PCB results, presented as total PCB (2.6 times the sum of the 18 NS&T congeners), are summarized in Table 4. Concentrations of total PCB in the sediment trap samples ranged from 31.5 mg/kg at station ST-01 during deployment #2 to 345 mg/kg at station ST-04 during deployment #1 (Table 4). Concentrations of total PCB in the surface sediments ranged from 28.5 mg/kg at station ST-01 during the post 2007 dredge event (field duplicate) to 152 mg/kg at station ST-03 during the pre 2008 dredge event. Substantial variability in the total PCB data was observed, especially over time and across stations. The spatial and temporal trends in the PCB data are discussed in Section 4.0.

3.3 Quality Assurance/Quality Control

3.3.1 Field Program

Field replicate samples were collected throughout the study to evaluate sampling and analytical reproducibility with respect to sediment accumulation, grain size, TOC, and PCBs. For sediment accumulation, replicate sediment trap samplers were deployed and collected at each station and during each deployment (triplicate samplers at ST-01 and duplicate samplers at ST-02, ST-03, and ST-04). For grain size, TOC, and PCBs, replicate trap and surface sediment samples were collected at one station during each event (triplicate measurements at ST-01 during trap deployments 1 and 2 and duplicate measurements at ST-01 during trap deployments 3-10 and both surface sediment sampling events). The reproducibility among the replicate measurements is reported in terms of relative standard deviation (RSD), where the number of replicate measurements is three for a given station or relative percent difference (RPD), where the number of replicate measurements is two for a given station. Replicate results are reported with the sample data in Table 2 (sediment accumulation), Table 3 (grain size and TOC), and Table 4 (total PCB).

3.3.1.1 Sediment Accumulation

The precision between field replicates measurements in terms of the wet or dry mass of accumulated sediment was fair, with values ranging from 2% to 130% RSD/RPDs based on wet mass and from 1% to 155% based on dry mass (Table 2). The majority of the replicate samples (30 (wet) or 32 (dry) out of 39) had RSD/RPDs <50% (Table 2).

3.3.1.2 Grain Size

Field replicate measurements agreed well for silt and clay fractions (RSD/RPDs ranged from 0.2% to 9% for percent fines) and were more variable for sand and gravel fractions (RSD/RPDs ranged from 3% to 148% for total sand) (Table 3). The higher variability among replicate samples for the sand and gravel fractions is attributed to the very low percentages (frequently <5%) of these grain size fractions measured in the sediment samples.

3.3.1.3 Total Organic Carbon

Field replicate measurements agreed well for TOC, with values ranging from 0.3% to 27% RSD/RPDs (Table 3).

3.3.1.4 Polychlorinated Biphenyls (Congener)

Field replicate results for total PCB were generally comparable, with 9 out of the 12 replicates having RSD/RPDs <50% (Table 4). Concentrations of total PCB were more variable for 3 of the 12 replicate samples, with RSD/RPDs ranging from 57% to 71% (Table 4). The higher variability may be attributed to natural sample heterogeneity, sampling and/or laboratory analytical variability, or a combination of these factors.

3.3.2 Laboratory Program

Results from the laboratory-based QC samples are reported with the sample data as appendices to this report (Appendix B for grain size and TOC and Appendix C for PCB). Results from the analysis of laboratory-based QC samples for PCBs were evaluated against the project measurement quality objectives to evaluate data quality in terms of accuracy and precision. Results from this evaluation are summarized in the QA/QC narratives provided in Appendix C. Overall, results from the laboratory-based QC samples for all test parameters (grain size, TOC, and PCBs) indicate that the laboratory methods were in control and the data are useable.

4.0 SUMMARY AND CONCLUSIONS

This section describes the physical characteristics of suspended and settling sediment material at the NWS area, discusses trends in PCBs and evaluates if recontamination of the area is likely due to movement of sediment particles in the water column. Results discussed below are summarized in Table 5, and include sediment deposition rate and PCB flux to the bottom sediment based on amount of sediment collected, area of the trap, deployment durations, and PCB concentrations measured in the sediment trap samples.

4.1 Physical Characteristics

Sediment trap sediments were comprised of fine-grained (generally >90% fines), homogenous sediments with variable distributions of silt and clay fractions and high percentages of organic carbon (frequently >10%) (Figure 9). By comparison, surface (0-2 cm) sediments were more heterogeneous, comprised of both coarse-grained, low TOC and fine-grained, high TOC sediments (Figure 9).

Spatial and temporal trends in the physical characteristics and deposition rates of suspended and settling sediment material at the NWS study area were apparent in the study data. The distribution of fine-grained material (silt and clay fractions) at station ST-01 was variable throughout the monitoring period (Figure 10), during both dredging and non-dredging periods. By contrast, the distribution of fine-grained material was spatially more variable at stations ST-02, ST-03, and ST-04 during dredging activities compared to non-dredging periods (Figure 10). Moreover, the limited data showed a preferential increase in clay content during dredging periods at the southernmost stations ST-03 and ST-04 (Figure 10).

Sediment deposition rates were spatially variable at the NWS study area in the summer during remediation activities and were less spatially variable in the fall, winter and early spring during non-dredging periods (Figure 11). Excluding station ST-02, the time-series data suggest that sediment deposition rates appear to be seasonal, increasing from late spring to summer, reaching maximum rates in July/August and decreasing from late fall to winter, reaching minimum rates in March/April (Figure 11). The largest fluxuations in deposition rates were observed at station ST-02 (Figure 11), located immediately north of the Wood Street Bridge. Deposition rates at station ST-02 were also among the highest measured at the NWS study area in the summer of 2008 during the Aerovox and Pierce Mill Cove remediation periods (Figure 11). Interestingly, sedimentation rates at nearby stations (ST-01, ST-03) decreased during the Pierce Mill Cove dredge period (Figure 11), suggesting that the sustained, elevated sedimentation rates at ST-02 (25-30 $g/m^2/day$) could be associated with factors other than the remediation activity. Moreover, the observed decrease in sedimentation rates at stations ST-01, ST-03, and ST-04 during the Pierce Mill Cove dredging period (Figure 11) suggests that distance from the remediation activity may have influenced the sedimentation rates. That is, sedimentation rates increased during the Aerovox remediation period, located in close proximity (approximately 400 meters) to the study area, and decreased during the Pierce Mill Cove dredge period, located further away (approximately 2,000 meters) from the study area. However, the results for ST-02 (high deposition rate during Pierce Mill Cove dredging) confound the interpretation of the results, suggesting other unknown factors also may be contributors.

4.2 Polychlorinated Biphenyl Distribution and Flux

Spatial and temporal trends were observed in the PCB data from the sediment traps deployed at the NWS area in 2007 and 2008. In general, PCB concentrations were spatially somewhat more variable during non-dredging periods compared to dredging periods[3] (Figure 12). The spatial variability may reflect differences in physical characteristics, such as grain size (variable silt and clay fractions) (see Figure 10), the highly dynamic nature of the system, or a combination of these factors. The study data also suggests that PCB concentrations can change in response to human activities, such as remedial dredging which can result in the resuspension of dredged material. For example, PCB concentrations were among the highest measured in sediment traps deployed at stations ST-02, ST-03 and ST-04 during dredging in 2007 at Areas G and H (Figure 12), located south of the study area (Figure 3). In addition, total PCB concentrations at the NWS area increased above 'non-dredging levels' following the onset of shoreline excavation activities in 2008 at the Aerovox site (Figures 12 and 13), located approximately 400 meters south of the study area (southern boundary, Figure 3). PCB concentrations returned to near or below 'non-dredging levels' approximately two months after the cessation of excavation activities at the Aerovox site. During this period, active dredging was performed at the Pierce Mill Cove area located approximately 2,000 meters south the study area (southern boundary, Figure 3). The decreasing trend in total PCB concentrations during the Pierce Mill Cove dredge period (Figure 12) suggests that relatively 'clean' sediment material may have been transported to the NWS area during this period, and/or that Pierce Mill Cove suspended sediments were not being transported to the NWS area. As shown in Figure 14, PCB flux followed similar temporal and spatial trends as sediment deposition rate (Figure 11) and PCB concentrations (Figure 12), combining the results from both deposition and concentration.

With few exceptions, concentrations of total PCB were among the lowest measured during the study period at station ST-01, located at the northern boundary of the study area (Figure 12). PCB concentrations were generally among the highest measured during the study period at station ST-04 (Figure 12), located at the southern boundary of the study area and in closest proximity (relative to other trap locations) to the remediation activities. While there was some variability in the PCB concentrations across space and time, the detailed congener patterns were generally similar among all the sediment samples (surface and sediment traps) indicating a common source of contamination (congener patterns for representative station ST-04 shown in Figure 15).

Overall, the study data suggest that the physical characteristics of the sediment, natural transport of sediment material in the water column, and proximity to remediation activities can influence PCB concentrations and composition in surface sediments. Moreover, PCBs in the surface sediments in the study area appear to be mostly from downstream sources (i.e., harbor areas to the south of the study area; considered down-current during ebb tide or up-current during flood tide).

[3] PCB data from the first deployment did not fit this generalization possibly because the deployment encompassed both active dredging and non-dredging periods which can confound the data interpretation.

4.3 Comparison of PCBs in Sediment Trap and Surface Sediments

Contamination in surface sediment typically represents long-term accumulation measured in terms of years, whereas contamination measured in sediment traps represents a snap shot in time (e.g., days and weeks) and reflects current deposits to the sediment bottom. While there was some variability in PCBs over space and time at the NWS area, concentrations of total PCB measured in the sediment traps at a given location were comparable to or slightly higher[4] than levels measured in the co-located surface (0-2 cm) sediments (normalized data are shown in Figure 16; non-normalized data are shown in Figures 17-19). Sediment trap samples with PCB concentrations above surface sediment levels coincided with remedial dredging activities at Area H in 2007 and shoreline excavation activities at the Aerovox site in 2008 (Figures 16-19). PCB concentrations in sediment trap samples decreased following the cessation of these remediation activities (see Section 4.2).

Sediment trap and surface sediment data were also comparable in terms of the congener distribution patterns (representative station ST-04 shown in Figure 15), indicating that the PCB-contaminated material depositing in the traps is representative of the material accumulating on the sediment bottom. Overall, the study data indicate that sediment trap and surface sediments at the NWS area are fairly comparable, both in terms of concentration levels and composition.

4.4 Potential Sediment Recontamination

Long-term monitoring of PCBs in surface sediments has been conducted at the NWS area to assess the efficacy of the remediation activities conducted in 2002-2003 and again in December 2005. Three of the long-term monitoring locations correspond to locations sampled under the sediment trap study (i.e., ST-01, ST-02, and ST-03). While the types of sediment sampled varied between the studies[5], the PCB data are informative with respect to assessing potential sediment recontamination at the NWS area. Total PCB concentrations measured in sediment cores, surface sediment, and sediment trap samples at stations ST-01, ST-02, and ST-03 are shown in Figures 17 through 19.

The sediment trap study showed that PCB-contaminated sediment material has deposited at the NWS study area, contributing to short-term changes to the PCB levels in the uppermost sediment material. While the long-term monitoring data did not reveal any substantial recontamination (Battelle, 2007a and 2008), a small increase in PCB concentrations has been observed since 2005 in sediment cores sampled at the co-located trap stations (Figures 17-19). Post-depositional processes such as bioturbation and resuspension continue to mix surface and subsurface sediment which probably explains why the post-remediation PCB increase is relatively small in the sediment cores and more evident in the sediment trap samples.

Overall, the sediment trap study showed that sediment deposition rates and PCB concentrations in the depositing sediment material varied over space and time at the NWS area, likely reflecting

[4] Depending on the location, total PCB concentrations in the sediment traps were as much as 4× higher compared to levels in co-located surface sediments.
[5] The long-term monitoring program sampled sediment cores and analyzed the surface 6 inches or 0-15 cm for PCBs. The sediment trap study sampled surface (0-2 cm) sediment and sediment traps (<1 cm) for PCB testing.

the natural variability of a highly dynamic system and influence from human activities such as remedial dredging activities. Resuspension and transport of sediments to the NWS area from other parts of New Bedford Harbor is a concern because the resuspended sediment material could be a source of PCB contamination to the NWS area. PCB data from the long-term monitoring and sediment trap studies, however, suggest that substantial recontamination has not occurred (in the surface 15 cm) at the NWS area. The small post-remediation increase in PCBs observed at some locations within the greater NWS area suggests that continued monitoring would be valuable to assess site conditions and better understand potential impacts ongoing remediation activities at New Bedford Harbor may have on the NWS area.

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Tables

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Table 1. Summary of Sediment Trap and Surface Sediment Samples Collected for Physical and Chemical Testing

Deployment Period	Deployment Duration (day)	Activity	Sample ID	Station ID	Test Parameter
SEDIMENT TRAP SAMPLES					
Deployment 1					
10/2/07-10/31/07	29	Dredging & debris removal at Area H started 8/6/2007, ended 10/9/2007	ST-01-103107-1	ST-01	PCB, Grain Size, TOC
			ST-01-103107-2		
			ST-01-103107-3		
			ST-02-103107-1	ST-02	PCB
			ST-02-103107-2		Grain Size, TOC
			ST-03-103107-1	ST-03	PCB
			ST-03-103107-2		Grain Size, TOC
			ST-04-103107-1	ST-04	PCB
			ST-04-103107-2		Grain Size, TOC
Deployment 2					
11/7/07-12/10/07	33	No dredging	ST-01-121007-1	ST-01	PCB; Grain Size, TOC
			ST-01-121007-2		
			ST-01-121007-3		
			ST-02-121007-1	ST-02	PCB
			ST-02-121007-2		Grain Size, TOC
			ST-03-121007-1	ST-03	PCB
			ST-03-121007-2		Grain Size, TOC
			ST-04-121007-1	ST-04	PCB
			ST-04-121007-2		Grain Size, TOC
Deployment 3					
3/14/08-4/15/08	32	No dredging	ST-01-041508-A	ST-01	Archive
			ST-01-041508-B		PCB, Grain Size. TOC
			ST-01-041508-C		PCB, Grain Size, TOC
			ST-02-041508-A	ST-02	PCB
			ST-02-041508-B		Grain Size, TOC
			ST-03-041508-A	ST-03	PCB
			ST-03-041508-B		Grain Size, TOC
			ST-04-041508-A	ST-04	PCB
			ST-04-041508-B		Grain Size, TOC
Deployment 4					
4/15/08-5/15/08	30	No dredging	ST-01-051508-A	ST-01	Archive
			ST-01-051508-B		PCB, Grain Size, TOC
			ST-01-051508-C		PCB, Grain Size, TOC
			ST-02-051508-A	ST-02	PCB
			ST-02-051508-B		Grain Size, TOC
			ST-03-051508-A	ST-03	PCB
			ST-03-051508-B		Grain Size, TOC
			ST-04-051508-A	ST-04	PCB
			ST-04-051508-B		Grain Size, TOC
			SS01-042208DUP		PCB, Grain Size, TOC
			SS02-042208	ST-02	PCB, Grain Size, TOC
			SS03-042208	ST-03	PCB, Grain Size, TOC
			SS04-042208	ST-04	PCB, Grain Size, TOC

Table 1. (cont)

Deployment Period	Deployment Duration (day)	Activity	Sample ID	Station ID	Test Parameter
Deployment 5					
5/15/08-6/11/08	27	Aerovox shoreline excavation started 6/2/08, ended 7/23/08	ST-01-061108-A	ST-01	Archive
			ST-01-061108-B		PCB, Grain Size, TOC
			ST-01-061108-C		PCB, Grain Size, TOC
			ST-02-061108-A	ST-02	PCB
			ST-02-061108-B		Grain Size, TOC
			ST-03-061108-A	ST-03	PCB
			ST-03-061108-B		Grain Size, TOC
			ST-04-061108-A	ST-04	PCB
			ST-04-061108-B		Grain Size, TOC
Deployment 6					
6/11/08-7/10/08	29	Aerovox shoreline excavation started 6/2/08, ended 7/23/08	ST-01-071008-A	ST-01	Archive
			ST-01-071008-B		PCB, Grain Size, TOC
			ST-01-071008-C		PCB, Grain Size, TOC
			ST-02-071008-A	ST-02	PCB
			ST-02-071008-B		Grain Size, TOC
			ST-03-071008-A	ST-03	PCB
			ST-03-071008-B		Grain Size, TOC
			ST-04-071008-A	ST-04	PCB
			ST-04-071008-B		Grain Size, TOC
Deployment 7					
7/10/08-7/31/08	21	Aerovox shoreline excavation started 6/2/08, ended 7/23/08	ST-01-073108-A	ST-01	Archive
			ST-01-073108-B		PCB, Grain Size, TOC
			ST-01-073108-C		PCB, Grain Size, TOC
			ST-02-073108-A	ST-02	PCB
			ST-02-073108-B		Grain Size, TOC
			ST-03-073108-A	ST-03	PCB
			ST-03-073108-B		Grain Size, TOC
			ST-04-073108-A	ST-04	PCB
			ST-04-073108-B		Grain Size, TOC
Deployment 8					
7/31/2008-8/25/08	25	Pierce Mill Cove dredging started 8/18/08, ended 10/21/08	ST-01-082508-A	ST-01	Archive
			ST-01-082508-B		PCB, Grain Size, TOC
			ST-01-082508-C		PCB, Grain Size, TOC
			ST-02-082508-A	ST-02	PCB
			ST-02-082508-B		Grain Size, TOC
			ST-03-082508-A	ST-03	PCB
			ST-03-082508-B		Grain Size, TOC
			ST-04-082508-A	ST-04	PCB
			ST-04-082508-B		Grain Size, TOC
Deployment 9					
8/25/08-10/2/08	38	Pierce Mill Cove dredging started	ST-01-100208-A	ST-01	Archive
			ST-01-100208-B		PCB, Grain Size, TOC
			ST-01-100208-C		PCB, Grain Size, TOC
			ST-02-100208-A	ST-02	PCB

Table 1. (cont)

Deployment Period	Deployment Duration (day)	Activity	Sample ID	Station ID	Test Parameter
		8/18/08, ended 10/21/08	ST-02-100208-B		Grain Size, TOC
			ST-03-100208-A	ST-03	PCB
			ST-03-100208-B		Grain Size, TOC
			ST-04-100208-A	ST-04	PCB, Grain Size, TOC
			ST-04-100208-B		Not used; insufficient mass for analysis
Deployment 10					
10/2/08 - 10/30/08	28	Pierce Mill Cove dredging started 8/18/08, ended 10/21/08	ST-01-103008-A	ST-01	Archive
			ST-01-103008-B		PCB, Grain Size, TOC
			ST-01-103008-C		PCB, Grain Size, TOC
			ST-02-103008-A	ST-02	PCB
			ST-02-103008-B		Grain Size, TOC
			ST-03-103008-A	ST-03	PCB
			ST-03-103008-B		Grain Size, TOC
			ST-04-103008-A	ST-04	PCB
			ST-04-103008-B		Grain Size, TOC
SURFACE (0-2 CM) SEDIMENT SAMPLES					
Event 1 (post 2007 dredge)					
11/12/07	NA	No dredging	SS-ST01-111207	ST-01	PCB, Grain Size, TOC
			SS-ST01-111207-DUP		PCB, Grain Size, TOC
			SS-ST02-111207	ST-02	PCB, Grain Size, TOC
			SS-ST03-111207	ST-03	PCB, Grain Size, TOC
			SS-ST04-111207	ST-04	PCB, Grain Size, TOC
Event 2 (pre 2008 dredge)					
4/22/08	NA	No dredging	SS01-042208	ST-01	PCB, Grain Size, TOC
			SS01-042208DUP		PCB, Grain Size, TOC
			SS02-042208	ST-02	PCB, Grain Size, TOC
			SS03-042208	ST-03	PCB, Grain Size, TOC
			SS04-042208	ST-04	PCB, Grain Size, TOC

[1] PCB testing conducted by BDL; Grain size and TOC testing conducted by AMS.

Table 2. Summary of Sediment Mass Collected During Sediment Trap Deployments

Sample ID	Sediment Trap Wet Weight (g)	Replicate Precision RSD/RPD[1] (%)	Percent Moisture[2] (%)	Sediment Trap Dry Weight[3] (g)	Replicate Precision RSD/RPD[4] (%)
Deployment 1 (10/2/07 to 10/31/07)					
ST-01-103107-1	29.55	18	42 (74)	12.5	19
ST-01-103107-2	28.69		44 (75)	11.6	
ST-01-103107-3	20.84		44 (75)	8.5	
ST-02-103107-1	23.6	52	49	11.9	6
ST-02-103107-2	40.04		(72)	11.2	
ST-03-103107-1	33.93	15	53	15.8	43
ST-03-103107-2	39.41		(74)	10.2	
ST-04-103107-1	26.45	79	53	12.3	42
ST-04-103107-2	61.08		(69)	18.9	
Deployment 2 (11/7/07 to 12/10/07)					
ST-01-121007-1	18.2	23	52 (81)	6.1	26
ST-01-121007-2	11.4		65 (73)	3.5	
ST-01-121007-3	15.7		59 (78)	5.0	
ST-02-121007-1	22.2	54	55	9.9	21
ST-02-121007-2	38.5		(79)	8.1	
ST-03-121007-1	38.5	66	58	16.3	97
ST-03-121007-2	19.5		(71)	5.7	
ST-04-121007-1	29.5	22	62	11.3	2
ST-04-121007-2	36.7		(70)	11.0	
Deployment 3 (3/14/08 to 4/15/08)					
ST-01-041508-A	12.83	17	NM	NM	NM
ST-01-041508-B	15.34		75 (76)	3.7	23
ST-01-041508-C	18.22		74 (75)	4.7	
ST-02-041508-A	16.36	11	75	4.1	7
ST-02-041508-B	18.32		(76)	4.4	
ST-03-041508-A	16.09	4	74	4.2	8
ST-03-041508-B	16.81		(73)	4.5	
ST-04-041508-A	21.54	2	76	5.2	6
ST-04-041508-B	21.16		(74)	5.5	
Deployment 4 (4/15/08 to 5/15/08)					
ST-01-051508-A	61.98	29	NM	NM	NM
ST-01-051508-B	38.17		84 (85)	5.9	6
ST-01-051508-C	39.21		84 (84)	6.3	
ST-02-051508-A	21.17	28	76	5.0	44
ST-02-051508-B	16.04		(80)	3.2	
ST-03-051508-A	16.1	26	80	3.2	49
ST-03-051508-B	21.01		(75)	5.3	
ST-04-051508-A	11.74	11	79	2.5	11
ST-04-051508-B	13.14		(79)	2.8	
Deployment 5 (5/15/08 to 6/11/08)					
ST-01-061108-A	48.62	8	NM	NM	NM
ST-01-061108-B	48.08		79 (71)	12.0	18
ST-01-061108-C	41.74		76 (76)	10.0	

Table 2. (cont)

Sample ID	Sediment Trap Wet Weight (g)	Replicate Precision RSD/RPD[1] (%)	Percent Moisture[2] (%)	Sediment Trap Dry Weight[3] (g)	Replicate Precision RSD/RPD[4] (%)
Deployment 5 (5/15/08 to 6/11/08)					
ST-02-061108-A	108.75	72	68	34.9	72
ST-02-061108-B	51.38		(68)	16.4	
ST-03-061108-A	30.49	26	77	7.1	28
ST-03-061108-B	23.42		(77)	5.4	
ST-04-061108-A	21.84	3	73	5.9	34
ST-04-061108-B	21.16		(80)	4.2	
Deployment 6 (6/11/08 to 7/10/08)					
ST-01-071008-A	52.07	27	NM	NM	NM
ST-01-071008-B	30.57		78 (80)	6.3	63
ST-01-071008-C	51.22		76 (76)	12.2	
ST-02-071008-A	43.96	6	73	11.8	14
ST-02-071008-B	41.26		(75)	10.3	
ST-03-071008-A	37.56	32	76	9.0	27
ST-03-071008-B	27.27		(75)	6.8	
ST-04-071008-A	42.95	11	75	10.7	7
ST-04-071008-B	38.34		(74)	10.0	
Deployment 7 (7/10/08 to 7/31/08)					
ST-01-073108-A	26.06	56	NM	NM	NM
ST-01-073108-B	57.05		73 (68)	17.0	104
ST-01-073108-C	21.13		78 (71)	5.4	
ST-02-073108-A	98.85	88	69	30.3	92
ST-02-073108-B	38.51		(71)	11.2	
ST-03-073108-A	41.5	19	74	10.7	19
ST-03-073108-B	50.05		(74)	13.0	
ST-04-073108-A	62.45	18	72	17.8	27
ST-04-073108-B	52.25		(74)	13.6	
Deployment 8 (7/31/08 to 8/25/08)					
ST-01-082508-A	73.14	30	NM	NM	NM
ST-01-082508-B	39.79		70 (70)	11.8	34
ST-01-082508-C	55.56		70 (70)	16.6	
ST-02-082508-A	76.94	8	68	24.4	11
ST-02-082508-B	70.76		(69)	21.9	
ST-03-082508-A	61.57	31	71	17.8	38
ST-03-082508-B	83.93		(69)	26.0	
ST-04-082508-A	15.31	130	80	3.1	155
ST-04-082508-B	71.77		(66)	24.4	
Deployment 9 (8/25/08 to 10/2/08)					
ST-01-100208-A	76.52	27	NM	NM	NM
ST-01-100208-B	59.01		73 (72)	16.2	28
ST-01-100208-C	43.91		73 (72)	12.2	
ST-02-100208-A	189.25	108	73	51.7	117
ST-02-100208-B	56.42		(76)	13.5	

Table 2. (cont)

Sample ID	Sediment Trap Wet Weight (g)	Replicate Precision RSD/RPD[1] (%)	Percent Moisture[2] (%)	Sediment Trap Dry Weight[3] (g)	Replicate Precision RSD/RPD[4] (%)
ST-03-100208-A	94.12	40	71	27.6	44
ST-03-100208-B	62.81		(72)	17.6	
ST-04-100208-A	31.6	NA	75 (69)	8.8	NA
ST-04-100208-B	Limited material collected. No weight measurement performed.				
Deployment 10 (10/2/08 to 10/30/08)					
ST-01-103008-A	30.4	11	NM	NM	1
ST-01-103008-B	26.2		74 (69)	7.5	
ST-01-103008-C	32.8		78 (76)	7.5	
ST-02-103008-A	97.6	23	69	30.6	34
ST-02-103008-B	77.7		(72)	21.8	
ST-03-103008-A	45.7	23	72	12.8	34
ST-03-103008-B	36.3		(75)	9.1	
ST-04-103008-A	28.1	29	75	7.1	24
ST-04-103008-B	37.6		(76)	9.0	

Notes:
NM = not measured; RSD = relative standard deviation; RPD = relative percent difference.
[1]Precision results determined using wet weight data.
[2]Percent Moisture measured by BDL and AMS; results reported as BDL value (AMS value).
[3]Sediment Trap Dry Weight = Sediment Trap Wet Weight*(100 - % Moisture)/100. When % Moisture results from both labs were available, average of the two values was used.
[4]Precision results determined using dry weight data.

Table 3. Grain Size and TOC in Sediment Trap and Surface Sediment Samples

Sample ID	TOC (%)	Gravel (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Total Sand[1] (%)	Percent Fines[2] (%)
SEDIMENT TRAP SAMPLES									
Deployment 1 (10/2/07 to 10/31/07)									
ST-01-103107-1	12.41	0.00	0.00	0.12	1.01	40.61	58.26	1.13	98.87
ST-02-103107-2	11.36	0.00	0.00	0.11	0.68	53.38	45.83	0.79	99.21
ST-03-103107-2	10.14	0.53	0.08	0.29	1.14	47.07	50.89	1.51	97.96
ST-04-103107-2	10.10	0.00	0.13	0.29	1.39	60.04	38.15	1.81	98.19
Deployment 2 (11/7/07 to 12/10/07)									
ST-01-121007-1	11.85	0.00	0.00	0.24	1.60	53.17	44.99	1.84	98.16
ST-02-121007-2	10.44	0.00	0.00	0.06	1.34	46.77	51.83	1.40	98.60
ST-03-121007-2	9.72	0.00	0.00	0.02	1.58	48.02	50.38	1.60	98.40
ST-04-121007-2	10.53	0.00	0.00	0.88	2.36	59.23	37.53	3.24	96.76
Deployment 3 (3/14/08 to 4/15/08)									
ST-01-041508-B	13.05	0.00	0.00	0.83	4.37	29.64	65.16	5.20	94.80
ST-02-041508-B	12.61	0.00	0.00	0.75	4.41	47.00	47.84	5.16	94.84
ST-03-041508-B	9.18	0.00	0.00	0.90	2.41	57.96	38.73	3.31	96.69
ST-04-041508-B	10.57	0.00	0.00	0.28	2.02	39.58	58.12	2.30	97.70
Deployment 4 (4/15/08 to 5/15/08)									
ST-01-051508-B	16.36	0.00	0.00	0.00	0.67	39.25	60.08	0.67	99.33
ST-02-051508-B	11.77	0.00	0.00	0.00	0.17	40.20	59.63	0.17	99.83
ST-03-051508-B	11.72	0.00	0.00	0.00	1.35	39.60	59.05	1.35	98.65
ST-04-051508-B	9.89	0.00	0.00	0.00	0.87	39.71	59.42	0.87	99.13
Deployment 5 (5/15/08 to 6/11/08)									
ST-01-061108-B	15.45	0.00	0.00	0.24	0.75	25.56	73.45	0.99	99.01
ST-02-061108-B	11.20	0.00	0.00	0.01	1.01	39.02	59.96	1.02	98.98
ST-03-061108-B	10.79	0.00	0.00	0.20	0.99	35.88	62.93	1.19	98.81
ST-04-061108-B	11.44	0.00	0.00	0.13	0.27	29.62	69.98	0.40	99.60
Deployment 6 (6/11/08 to 7/10/08)									
ST-01-071008-B	12.89	0.00	0.00	0.12	0.32	44.28	55.28	0.44	99.56
ST-02-071008-B	15.01	0.00	0.10	0.36	0.27	36.49	62.78	0.73	99.27
ST-03-071008-B	12.10	0.00	0.00	0.21	0.49	24.93	74.37	0.70	99.30
ST-04-071008-B	10.62	0.00	0.00	0.37	0.77	32.80	66.06	1.14	98.86
Deployment 7 (7/10/08 to 7/31/08)									
ST-01-073108-B	16.25	0.00	0.00	0.12	5.24	18.45	76.19	5.36	94.64
ST-02-073108-B	13.70	0.00	0.00	0.21	0.49	15.14	84.16	0.70	99.30
ST-03-073108-B	11.29	0.00	0.00	0.05	0.50	27.95	71.50	0.55	99.45
ST-04-073108-B	11.71	0.00	0.00	0.06	0.43	23.49	76.02	0.49	99.51
Deployment 8 (7/31/08 to 8/25/08)									
ST-01-082508-B	12.68	0.00	0.00	0.00	2.70	20.45	76.85	2.70	97.30
ST-02-082508-B	13.88	0.00	0.00	0.00	1.84	26.53	71.63	1.84	98.16
ST-03-082508-B	11.83	0.00	0.05	0.36	2.22	32.37	65.00	2.63	97.37
ST-04-082508-B	12.59	0.00	0.00	0.08	1.81	15.46	82.65	1.89	98.11
Deployment 9 (8/25/08 to 10/2/08)									
ST-01-100208-B	15.41	0.00	0.00	0.14	4.99	43.15	51.72	5.13	94.87
ST-02-100208-B	23.83	0.00	0.00	2.07	1.35	57.83	38.75	3.42	96.58
ST-03-100208-B	12.39	0.00	0.00	0.06	2.72	45.59	51.63	2.78	97.22
ST-04-100208-A	13.58	0.00	0.00	0.76	1.65	10.89	86.70	2.41	97.59

Table 3. (cont)

Sample ID	TOC (%)	Gravel (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Total Sand[1] (%)	Percent Fines[2] (%)
SEDIMENT TRAP SAMPLES									
Deployment 10 (10/2/08 to 10/30/08)									
ST-01-103008-B	13.38	0.00	5.13	2.69	5.69	35.27	51.22	13.51	86.49
ST-02-103008-B	16.97	0.00	6.08	4.56	2.69	54.36	32.31	13.33	86.67
ST-03-103008-B	13.05	0.00	0.00	0.20	1.35	33.62	64.83	1.55	98.45
ST-04-103008-B	12.21	0.00	0.00	0.25	1.69	30.28	67.78	1.94	98.06
SURFACE (0-2 CM) SEDIMENT SAMPLES									
Event 1 (post 2007 Dredge)									
SS-ST01-111207	15.47	0.00	0.00	0.12	3.58	49.86	46.44	3.70	96.30
SS-ST02-111207	7.91	6.30	1.72	6.06	26.36	36.41	23.15	34.14	59.56
SS-ST03-111207	1.84	5.35	4.30	18.70	36.80	21.95	12.90	59.80	34.85
SS-ST04-111207	7.77	2.45	4.11	6.14	6.02	53.06	28.22	16.27	81.28
Event 2 (pre 2008 Dredge)									
SS01-042208	12.16	0.00	0.00	0.68	6.67	61.27	31.38	7.35	92.65
SS02-042208	9.31	0.00	0.57	2.15	13.91	44.07	39.30	16.63	83.37
SS03-042208	8.07	0.00	0.00	2.09	12.78	56.13	29.00	14.87	85.13
SS04-042208	3.33	19.38	11.40	20.92	12.87	23.92	11.51	45.19	35.43
FIELD REPLICATE DATA									
SEDIMENT TRAP SAMPLES									
Deployment 1 (10/2/07 to 10/31/07)									
ST-01-103107-1	12.41	0.00	0.00	0.12	1.01	40.61	58.26	1.13	98.87
ST-01-103107-2	14.40	0.00	0.00	0.06	0.20	45.16	54.58	0.26	99.74
ST-01-103107-3	13.75	0.00	0.00	0.05	0.43	49.37	50.15	0.48	99.52
RSD	**7.5%**	**NA**	**NA**	**49.4%**	**76.4%**	**9.7%**	**7.5%**	**72.6%**	**0.5%**
Deployment 2 (11/7/07 to 12/10/07)									
ST-01-121007-1	11.85	0.00	0.00	0.24	1.60	53.17	44.99	1.84	98.16
ST-01-121007-2	11.14	0.00	0.00	1.53	1.32	48.27	48.88	2.85	97.15
ST-01-121007-3	12.50	0.00	0.00	2.26	1.52	33.58	62.64	3.78	96.22
RSD	**5.7%**	**NA**	**NA**	**76.1%**	**9.7%**	**22.7%**	**17.8%**	**34.4%**	**1.0%**
Deployment 3 (3/14/08 to 4/15/08)									
ST-01-041508-B	13.05	0.00	0.00	0.83	4.37	29.64	65.16	5.20	94.80
ST-01-041508-C	12.66	0.00	0.00	1.88	4.02	21.73	72.37	5.90	94.10
RPD	**3.0%**	**NA**	**NA**	**77.5%**	**8.3%**	**30.8%**	**10.5%**	**12.6%**	**0.7%**
Deployment 4 (4/15/08 to 5/15/08)									
ST-01-051508-B	16.36	0.00	0.00	0.00	0.67	39.25	60.08	0.67	99.33
ST-01-051508-C	17.19	0.00	0.00	0.00	0.52	54.12	45.36	0.52	99.48
RPD	**4.9%**	**NA**	**NA**	**NA**	**25.2%**	**31.9%**	**27.9%**	**25.2%**	**0.2%**
Deployment 5 (5/15/08 to 6/11/08)									
ST-01-061108-B	15.45	0.00	0.00	0.24	0.75	25.56	73.45	0.99	99.01
ST-01-061108-C	15.54	0.00	0.34	0.16	0.70	20.34	78.46	1.20	98.80
RPD	**0.6%**	**NA**	**200%**	**40.0%**	**6.9%**	**22.7%**	**6.6%**	**19.2%**	**0.2%**

Table 3. (cont)

Sample ID	TOC (%)	Gravel (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Total Sand[1] (%)	Percent Fines[2] (%)
Deployment 6 (6/11/08 to 7/10/08)									
ST-01-071008-B	12.89	0.00	0.00	0.12	0.32	44.28	55.28	0.44	99.56
ST-01-071008-C	14.02	0.00	0.00	0.62	2.34	47.10	49.94	2.96	97.04
RPD	**8.4%**	**NA**	**NA**	**135%**	**152%**	**6.2%**	**10.2%**	**148%**	**2.6%**
Deployment 7 (7/10/08 to 7/31/08)									
ST-01-073108-B	16.25	0.00	0.00	0.12	5.24	18.45	76.19	5.36	94.64
ST-01-073108-C	12.40	0.00	0.00	0.60	2.19	25.62	71.59	2.79	97.21
RPD	**26.9%**	**NA**	**NA**	**133%**	**82.1%**	**32.5%**	**6.2%**	**63.1%**	**2.7%**
Deployment 8 (7/31/08 to 8/25/08)									
ST-01-082508-B	12.68	0.00	0.00	0.00	2.70	20.45	76.85	2.70	97.30
ST-01-082508-C	13.06	0.00	0.00	0.04	3.15	31.69	65.12	3.19	96.81
RPD	**3.0%**	**NA**	**NA**	**200%**	**15.4%**	**43.1%**	**16.5%**	**16.6%**	**0.5%**
Deployment 9 (8/25/08 to 10/2/08)									
ST-01-100208-B	15.41	0.00	0.00	0.14	4.99	43.15	51.72	5.13	94.87
ST-01-100208-C	15.37	0.00	0.00	0.40	3.41	31.35	64.84	3.81	96.19
RPD	**0.3%**	**NA**	**NA**	**96.3%**	**37.6%**	**31.7%**	**22.5%**	**29.5%**	**1.4%**
Deployment 10 (10/2/08 to 10/30/08)									
ST-01-103008-B	13.38	0.00	5.13	2.69	5.69	35.27	51.22	13.51	86.49
ST-01-103008-C	13.21	0.00	0.05	1.43	4.18	36.20	58.14	5.66	94.34
RPD	**1.3%**	**NA**	**196%**	**61.2%**	**30.6%**	**2.6%**	**12.7%**	**81.9%**	**8.7%**
SURFACE SEDIMENTS									
Event 1 (post 2007 Dredge)									
SS-ST01-111207	15.47	0.00	0.00	0.12	3.58	49.86	46.44	3.70	96.30
SS-ST01-111207-DUP	12.25	0.00	0.00	0.16	1.64	49.17	49.03	1.80	98.20
RPD	**23.2%**	**NA**	**NA**	**28.6%**	**74.3%**	**1.4%**	**5.4%**	**69.1%**	**2.0%**
Event 2 (pre 2008 Dredge)									
SS01-042208	12.16	0.00	0.00	0.68	6.67	61.27	31.38	7.35	92.65
SS01-042208DUP	12.92	0.00	0.24	1.05	6.30	63.96	28.45	7.59	92.41
RPD	**6.1%**	**NA**	**200%**	**42.8%**	**5.7%**	**4.3%**	**9.8%**	**3.2%**	**0.3%**

Notes:
RSD = relative standard deviation; RPD = relative percent difference.
[1]Total Sand (%) = Coarse Sand (%) + Medium Sand (%) + Fine Sand (%)
[2] Percent Fines (%) = Silt (%) + Clay (%)

Table 4. Total PCB in Sediment Trap and Surface Sediment Samples

Station	Sample ID	Total PCB[1] (mg/kg dry weight)		Precision (RPD/RSD)
		Original Sample	Field Replicate Sample(s)	
SEDIMENT TRAP SAMPLES				
Deployment 1 (10/2/07 to 10/31/07)				
ST-01	ST-01-103107-1	127.95	47.51, 45.17	64%
ST-02	ST-02-103107-1	287.65	—	—
ST-03	ST-03-103107-1	250.45	—	—
ST-04	ST-04-103107-1	344.61	—	—
Deployment 2 (11/7/07 to 12/10/07)				
ST-01	ST-01-121007-1	31.53	70.83, 56.35	38%
ST-02	ST-02-121007-1	215.31	—	—
ST-03	ST-03-121007-1	104.51	—	—
ST-04	ST-04-121007-1	168.38	—	—
Deployment 3 (3/14/08 to 4/15/08)				
ST-01	ST-01-041508-B	56.66	64.58	13%
ST-02	ST-02-041508-A	120.27	—	—
ST-03	ST-03-041508-A	113.48	—	—
ST-04	ST-04-041508-A	207.52	—	—
Deployment 4 (4/15/08 to 5/15/08)				
ST-01	ST-01-051508-B	71.50	77.63	8%
ST-02	ST-02-051508-A	149.17	—	—
ST-03	ST-03-051508-A	113.21	—	—
ST-04	ST-04-051508-A	135.17	—	—
Deployment 5 (5/15/08 to 6/11/08)				
ST-01	ST-01-061108-B	177.12	180.49	2%
ST-02	ST-02-061108-A	203.87	—	—
ST-03	ST-03-061108-A	220.05	—	—
ST-04	ST-04-061108-A	236.82	—	—
Deployment 6 (6/11/08 to 7/10/08)				
ST-01	ST-01-071008-B	223.92	288.96	25%
ST-02	ST-02-071008-A	231.46	—	—
ST-03	ST-03-071008-A	215.26	—	—
ST-04	ST-04-071008-A	286.86	—	—
Deployment 7 (7/10/08 to 7/31/08)				
ST-01	ST-01-073108-B	121.75	121.06	1%
ST-02	ST-02-073108-A	220.58	—	—
ST-03	ST-03-073108-A	208.02	—	—
ST-04	ST-04-073108-A	245.49	—	—
Deployment 8 (7/31/08 to 8/25/08)				
ST-01	ST-01-082508-B	71.93	128.77	57%
ST-02	ST-02-082508-A	70.57	—	—
ST-03	ST-03-082508-A	113.83	—	—
ST-04	ST-04-082508-A	156.08	—	—

Table 4. (cont)

Station	Sample ID	Total PCB[1] (mg/kg dry weight)		Precision (RPD/RSD)
		Original Sample	Field Replicate Sample(s)	
SEDIMENT TRAP SAMPLES				
Deployment 9 (8/25/08 to 10/2/08)				
ST-01	ST01-100208-B	76.02	69.17	9%
ST-02	ST02-100208-A	71.22	—	—
ST-03	ST03-100208-A	73.05	—	—
ST-04	ST04-100208-A	78.88	—	—
Deployment 10 (10/2/08 to 10/30/08)				
ST-01	ST-01-103008-B	92.83	78.99	16%
ST-02	ST-02-103008-A	79.72	—	—
ST-03	ST-03-103008-A	80.24	—	—
ST-04	ST-04-103008-A	83.17	—	—
SURFACE (0-2 CM) SAMPLES				
Event 1 (post 2007 Dredge)				
ST-01	SS-ST01-111207	60.25	28.52	71%
ST-02	SS-ST02-111207	86.78	—	—
ST-03	SS-ST03-111207	33.22	—	—
ST-04	SS-ST04-111207	142.96	—	—
Event 2 (pre 2008 Dredge)				
ST-01	SS01-042208	117.37	131.27	11%
ST-02	SS02-042208	128.95	—	—
ST-03	SS03-042208	151.71	—	—
ST-04	SS04-042208	42.95	—	—

Note:
RSD = relative standard deviation; RPD = relative percent difference.
[1]Total PCB = 2.6 times the sum of the 18 NS&T PCB congener concentrations; a value of zero used in summation for non-detects.

Table 5. Sediment Deposition Rates and Estimated PCB Flux

Deployment Period, Duration, Activity	Sample ID	Sediment Trap Dry Weight (g)	Sediment Deposition Rate[1] ($g/m^2/day$)	Total PCB Congeners (mg/kg)	Total PCB Congener Flux[2] ($mg/m^2/day$)
Deployment 1					
10/2/07-10/31/07, 29 days, Dredging & debris removal in Area H started 8/6/2007, ended 10/9/2007.	ST-01-103107-1	12.5	13.3	127.95	1.70
	ST-01-103107-2	11.6	12.3	47.51	0.58
	ST-01-103107-3	8.5	9.0	45.17	0.41
	ST-02-103107-1	11.9	12.7	287.65	3.66
	ST-02-103107-2	11.2	11.9	—	—
	ST-03-103107-1	15.8	16.8	250.45	4.21
	ST-03-103107-2	10.2	10.9	—	—
	ST-04-103107-1	12.3	13.1	344.61	4.52
	ST-04-103107-2	18.9	20.2	—	—
Deployment 2					
11/7/07-12/10/07, 33 days, No dredging.	ST-01-121007-1	6.1	5.7	31.53	0.18
	ST-01-121007-2	3.5	3.3	70.83	0.23
	ST-01-121007-3	5.0	4.6	56.35	0.26
	ST-02-121007-1	9.9	9.3	215.31	2.00
	ST-02-121007-2	8.1	7.6	—	—
	ST-03-121007-1	16.3	15.3	104.51	1.60
	ST-03-121007-2	5.7	5.3	—	—
	ST-04-121007-1	11.3	10.6	168.38	1.78
	ST-04-121007-2	11.0	10.3	—	—
Deployment 3					
3/14/08-4/15/08, 32 days, No dredging.	ST-01-041508-B	3.7	3.6	56.66	0.20
	ST-01-041508-C	4.7	4.5	64.58	0.29
	ST-02-041508-A	4.1	4.0	120.27	0.48
	ST-02-041508-B	4.4	4.2	—	—
	ST-03-041508-A	4.2	4.0	113.48	0.46
	ST-03-041508-B	4.5	4.4	—	—
	ST-04-041508-A	5.2	5.0	207.52	1.04
	ST-04-041508-B	5.5	5.3	—	—
Deployment 4					
4/15/08-5/15/08, 30 days, No dredging.	ST-01-051508-B	5.9	6.1	71.50	0.44
	ST-01-051508-C	6.3	6.5	77.63	0.51
	ST-02-051508-A	5.0	5.2	149.17	0.77
	ST-02-051508-B	3.2	3.3	—	—
	ST-03-051508-A	3.2	3.3	113.21	0.37
	ST-03-051508-B	5.3	5.4	—	—
	ST-04-051508-A	2.5	2.5	135.17	0.34
	ST-04-051508-B	2.8	2.8	—	—
Deployment 5					
5/15/08-6/11/08, 27 days, Aerovox dredging started 6/2/08, ended 7/23/08.	ST-01-061108-B	12.0	13.7	177.12	2.43
	ST-01-061108-C	10.0	11.5	180.49	2.07
	ST-02-061108-A	34.9	39.9	203.87	8.14
	ST-02-061108-B	16.4	18.8	—	—
	ST-03-061108-A	7.1	8.1	220.05	1.79
	ST-03-061108-B	5.4	6.2	—	—
	ST-04-061108-A	5.9	6.8	236.82	1.61
	ST-04-061108-B	4.2	4.8	—	—

Table 5. (cont)

Deployment Period, Duration, Activity	Sample ID	Sediment Trap Dry Weight (g)	Sediment Deposition Rate[1] ($g/m^2/day$)	Total PCB Congeners (mg/kg)	Total PCB Congener Flux[2] ($mg/m^2/day$)
Deployment 6					
6/11/08-7/10/08, 29 days, Aerovox dredging started 6/2/08, ended 7/23/08	ST-01-071008-B	6.3	6.8	223.92	1.51
	ST-01-071008-C	12.2	13.0	288.96	3.75
	ST-02-071008-A	11.8	12.6	231.46	2.91
	ST-02-071008-B	10.3	11.0	—	—
	ST-03-071008-A	9.0	9.6	215.26	2.06
	ST-03-071008-B	6.8	7.3	—	—
	ST-04-071008-A	10.7	11.3	286.86	3.25
	ST-04-071008-B	10.0	10.6	—	—
Deployment 7					
7/10/08-7/31/08, 21 days, Aerovox dredging started 6/2/08, ended 7/23/08.	ST-01-073108-B	17.0	24.9	121.75	3.03
	ST-01-073108-C	5.4	7.9	121.06	0.96
	ST-02-073108-A	30.3	44.6	220.58	9.84
	ST-02-073108-B	11.2	16.4	—	—
	ST-03-073108-A	10.7	15.8	208.02	3.28
	ST-03-073108-B	13.0	19.1	—	—
	ST-04-073108-A	17.8	26.1	245.49	6.42
	ST-04-073108-B	13.6	20.0	—	—
Deployment 8					
7/31/2008-8/25/08, 25 days, Pierce Mill Cove dredging started 8/18/08, ended 10/21/08.	ST-01-082508-B	11.8	14.6	71.93	1.05
	ST-01-082508-C	16.6	20.5	128.77	2.65
	ST-02-082508-A	24.4	30.1	70.57	2.13
	ST-02-082508-B	21.9	27.1	—	—
	ST-03-082508-A	17.8	21.9	113.83	2.49
	ST-03-082508-B	26.0	32.1	—	—
	ST-04-082508-A	3.1	3.8	156.09	0.59
	ST-04-082508-B	24.4	30.1	—	—
Deployment 9					
8/25/08-10/2/08, 38 days, Pierce Mill Cove dredging started 8/18/08, ended 10/21/08.	ST-01-100208-B	16.2	13.1	76.02	1.00
	ST-01-100208-C	12.2	9.9	69.17	0.68
	ST-02-100208-A	51.7	42.0	71.22	2.99
	ST-02-100208-B	13.5	11.0	—	—
	ST-03-100208-A	27.6	22.4	73.05	1.64
	ST-03-100208-B	17.6	14.3	—	—
	ST-04-100208-A	8.8	7.2	78.88	0.57
Deployment 10					
10/2/08 - 10/30/08, 28 days, Pierce Mill Cove dredging started 8/18/08, ended 10/21/08.	ST-01-103008-B	7.5	8.2	92.83	0.76
	ST-01-103008-C	7.5	8.3	78.99	0.66
	ST-02-103008-A	30.6	33.8	79.72	2.69
	ST-02-103008-B	21.8	24.0	—	—
	ST-03-103008-A	12.8	14.1	80.24	1.13
	ST-03-103008-B	9.1	10.0	—	—
	ST-04-103008-A	7.1	7.8	83.17	0.65
	ST-04-103008-B	9.0	9.9	—	—

Notes:
[1] Sediment Deposition Rate = Sediment Trap Dry Weight / Deployment Duration / Area of Sediment Trap (0.0324 m^2)
[2] Total PCB Flux = (Total PCB × Deposition Rate)/1000

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Figures

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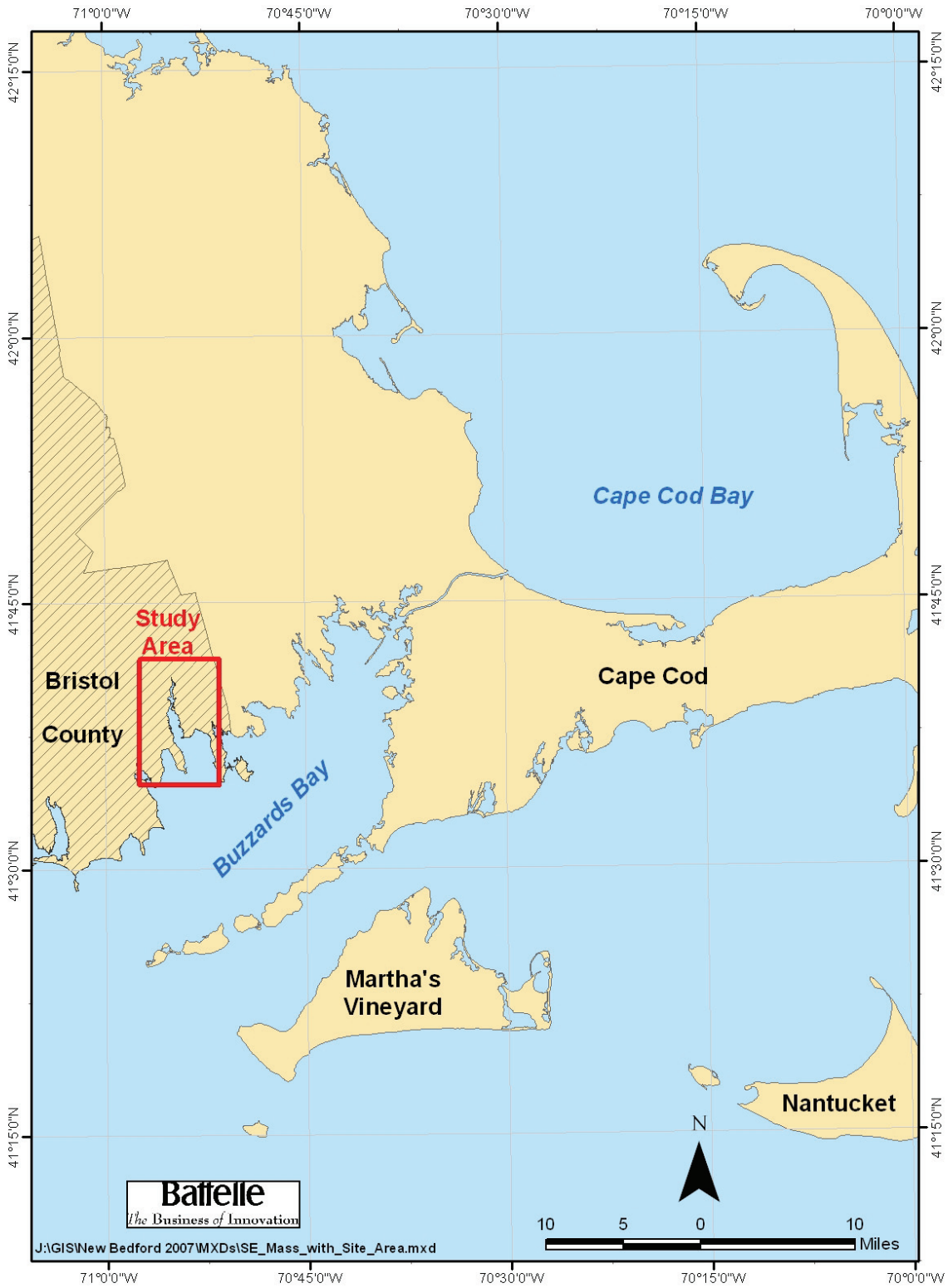

Figure 1. Location of the New Bedford Harbor Site in Southeastern, MA.

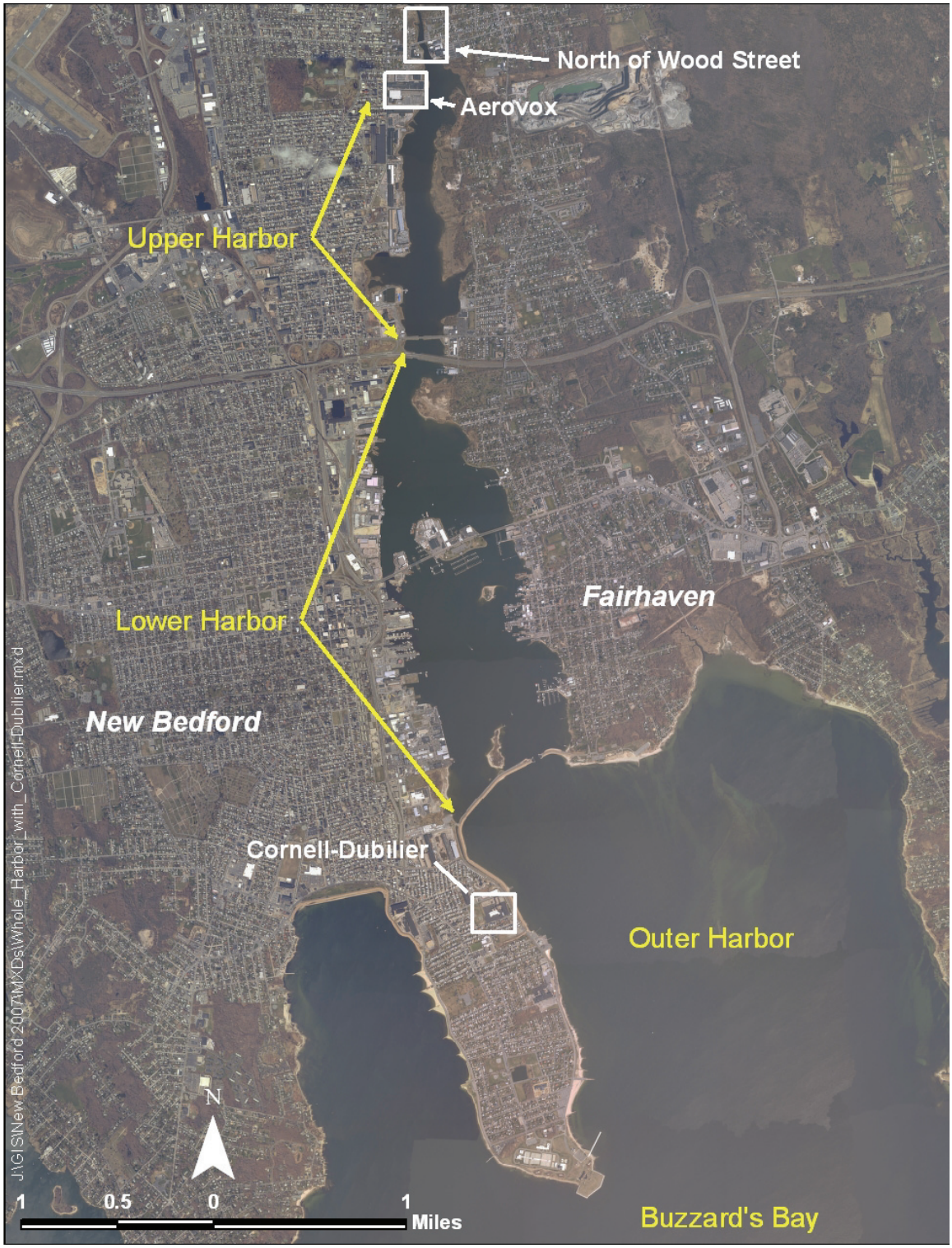

Figure 2. Overview of New Bedford Harbor Site.

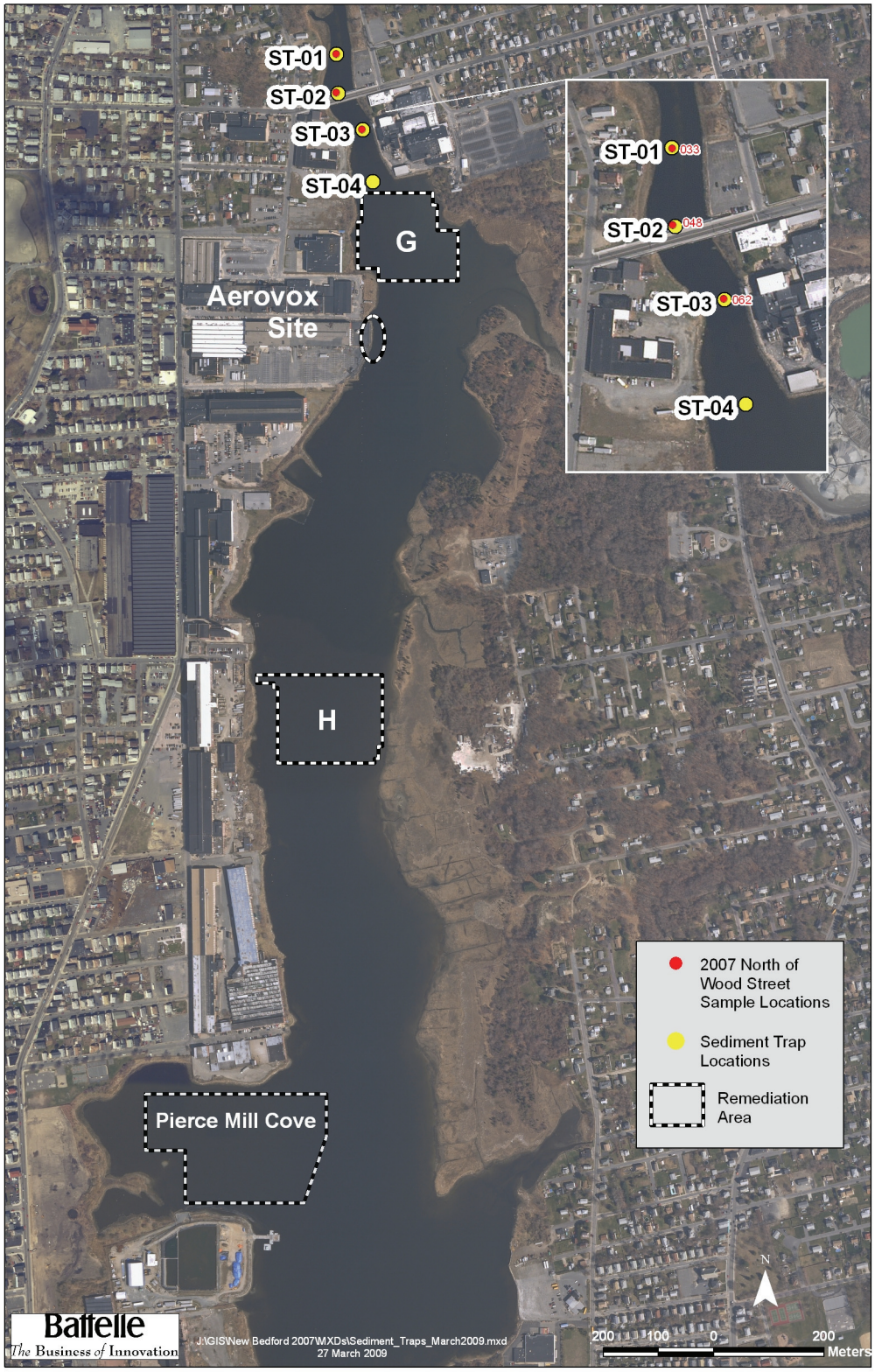

Figure 3. Sediment Trap Study Locations and 2007 and 2008 Remediation Areas.

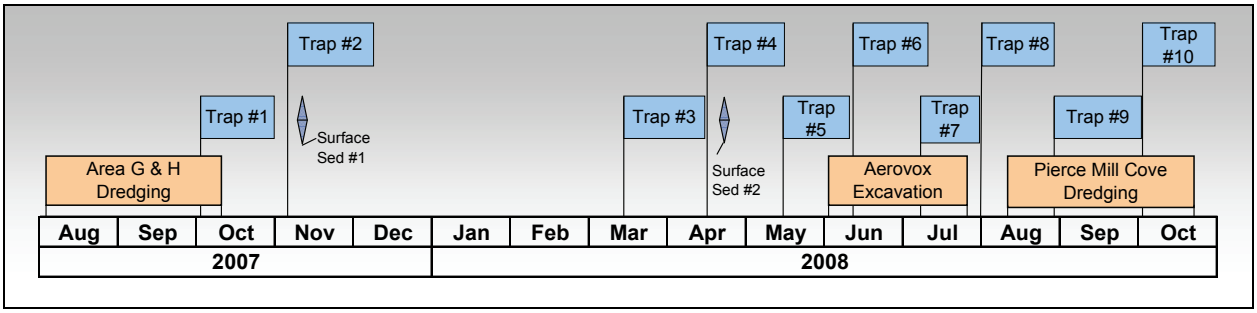

Figure 4. Sediment Trap Study Timeline. See Table 1 for Specific Collection Dates.

Figure 5. Pictures of Sediment Traps before Deployment (Top), During Deployment (Bottom), and Recovery (Bottom).

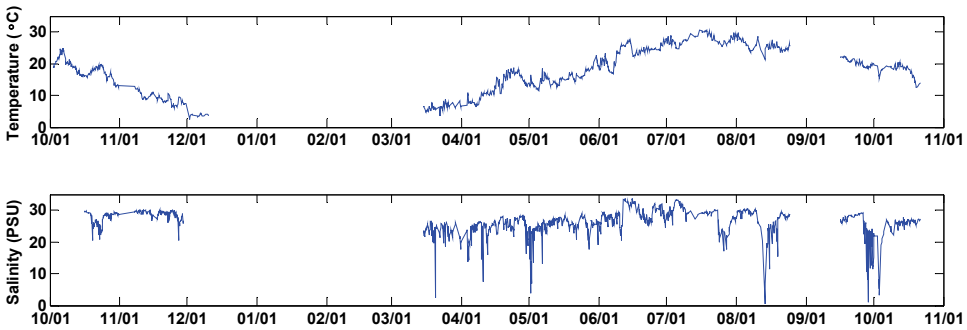

Figure 6. *In situ* Temperature and Salinity Data at ST-03 from October 2007 to October 2008. (showing all data when sensor depth >1m; mooring not deployed between December 11, 2007 and March 13, 2008 due to icing conditions)

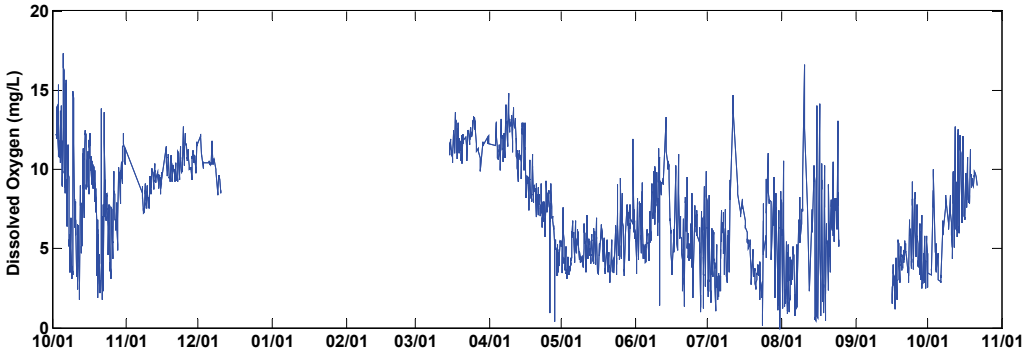

Figure 7. *In situ* Dissolved Oxygen Data at ST-03 from October 2007 to October 2008. (mooring not deployed between December 11, 2007 and March 13, 2008 due to icing conditions)

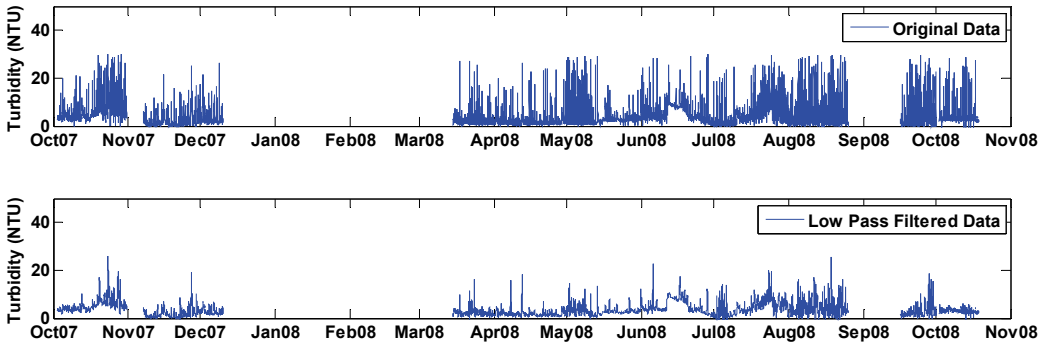

Figure 8. *In situ* Turbidity Data at ST-03 from October 2007 to October 2008. (mooring not deployed between December 11, 2007 and March 13, 2008 due to icing conditions)

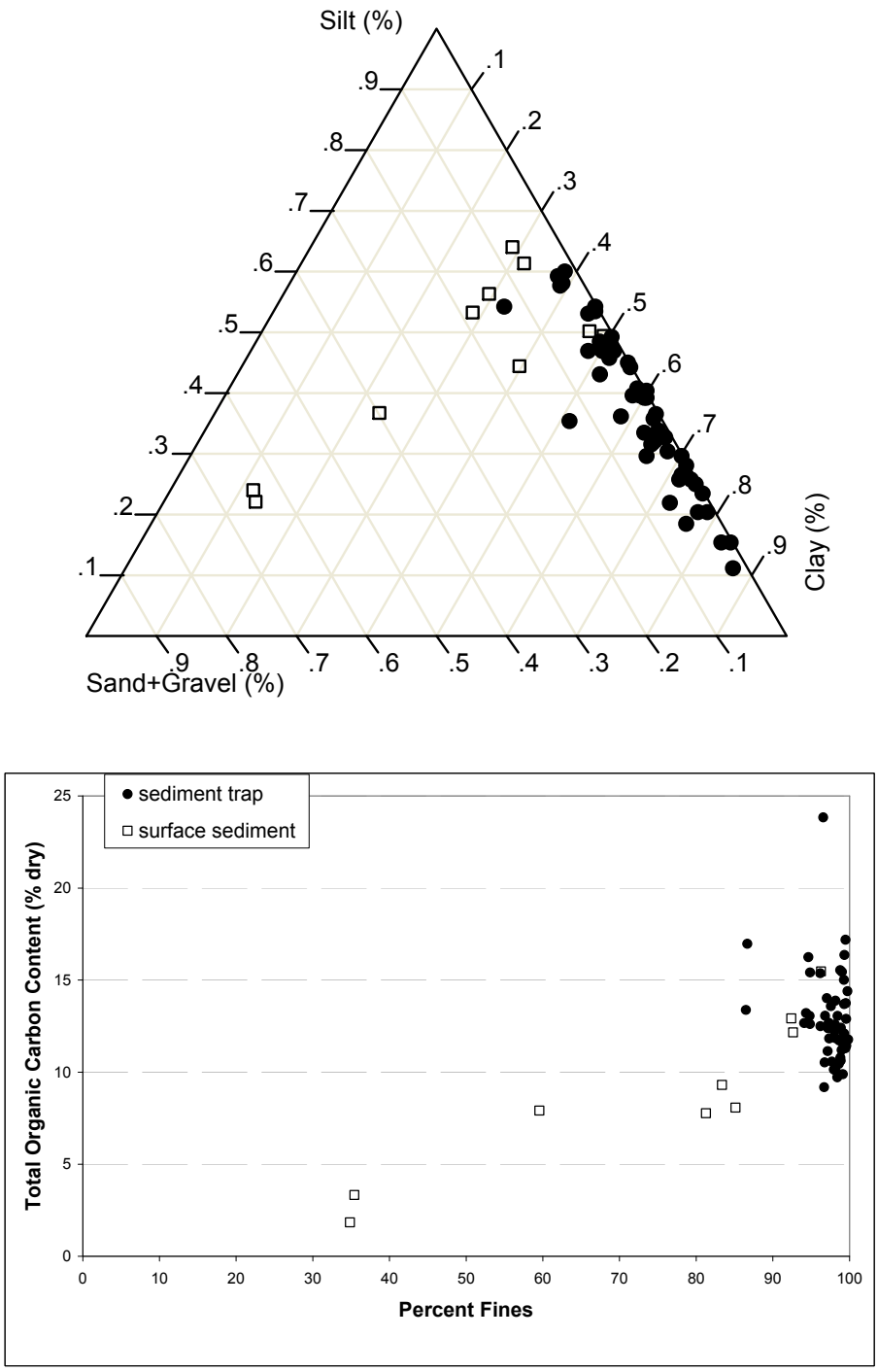

Figure 9. Grain Size Distributions (Top) and the Correspondence between Percent Fines and TOC (Bottom) in Sediment Trap (●) and Surface (□) Sediment Samples at the North of Wood Street Area, Data from October 2007 to October 2008.

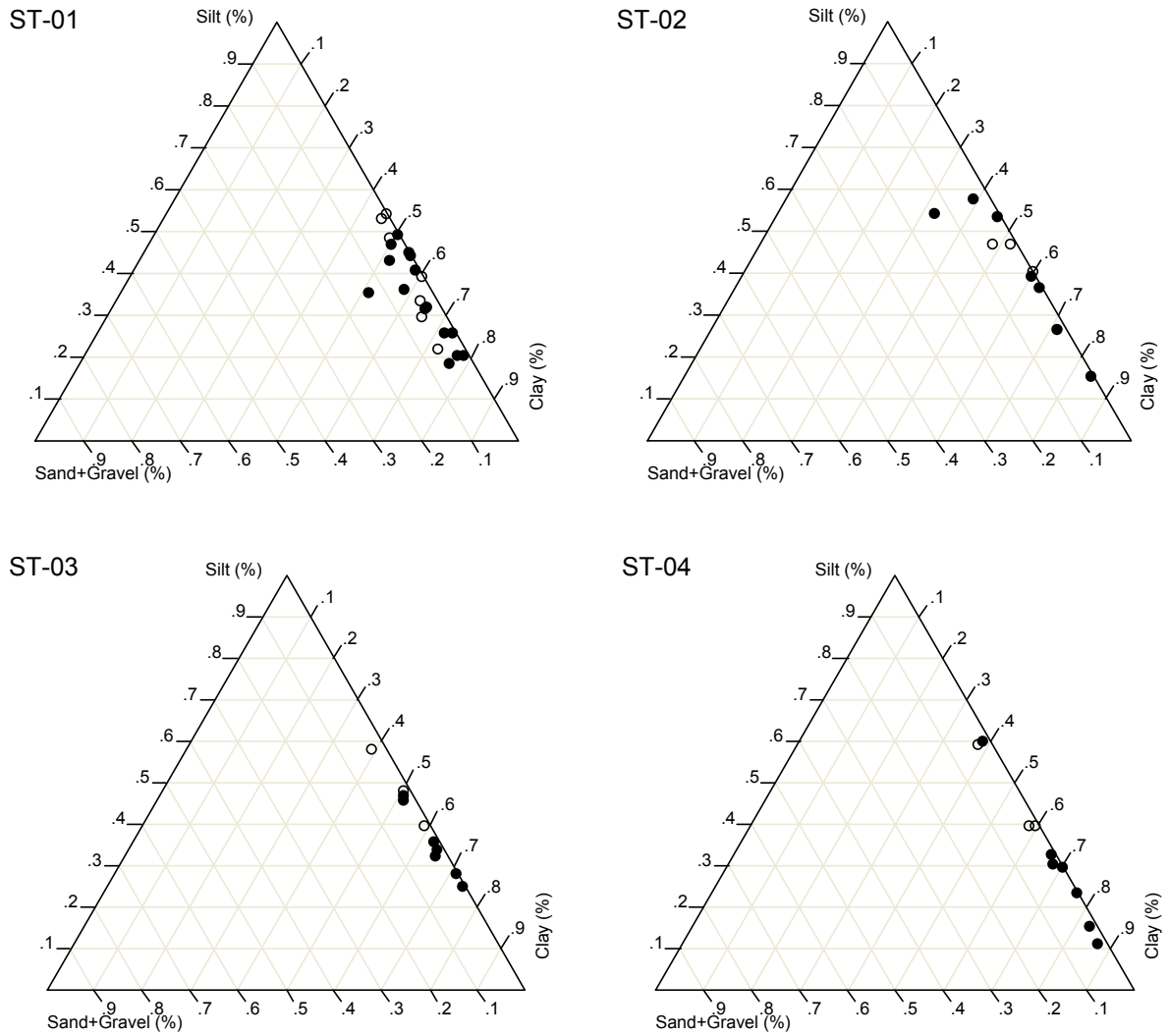

Figure 10. Grain Size Distributions in Suspended Sediment Material at Sediment Trap Locations during Non-dredging (○) and Dredging (●) Periods, Data from October 2007 to October 2008.

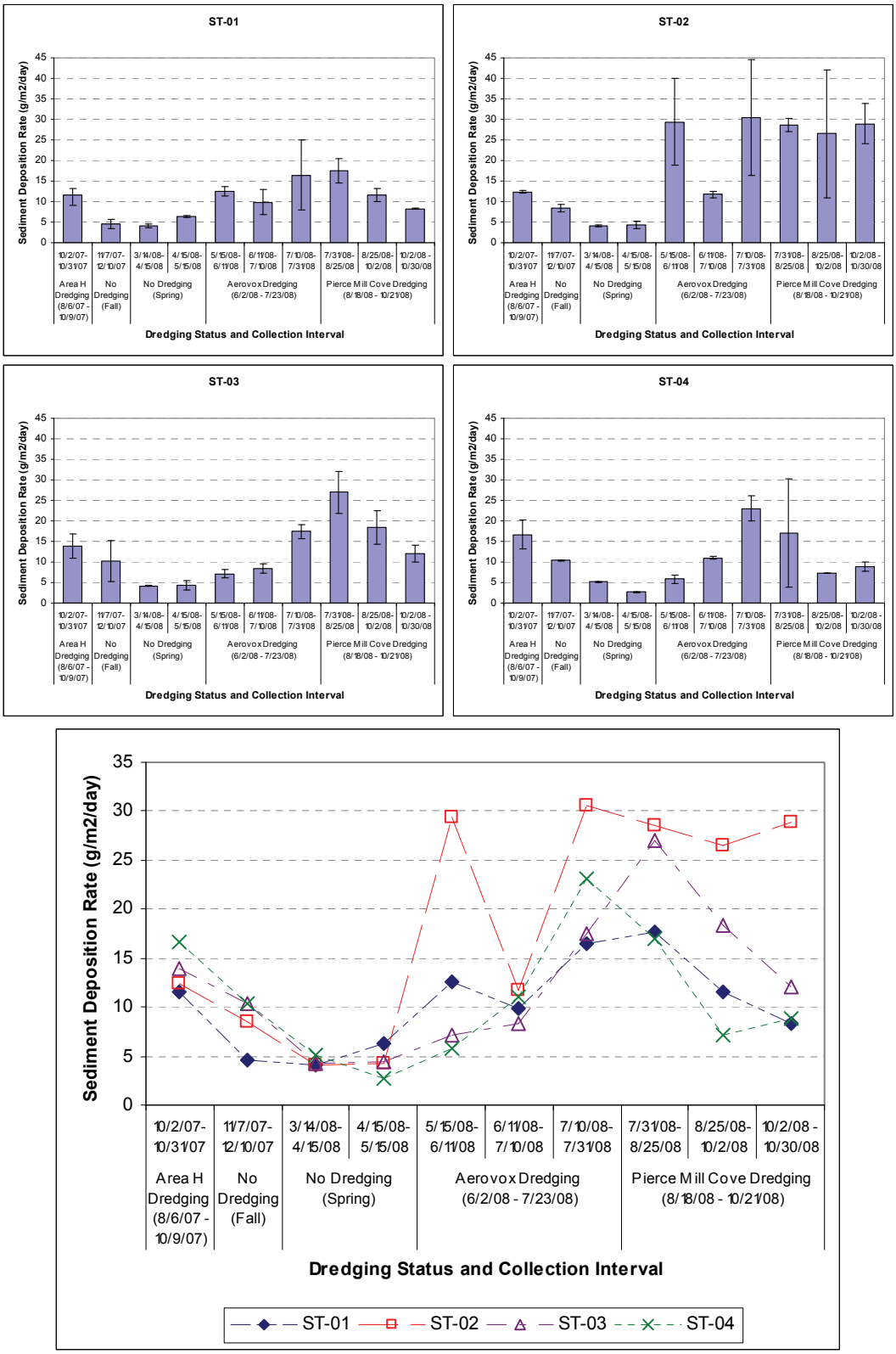

Figure 11. Sediment Deposition Rate at Sediment Trap Stations. Bars and symbols represent average values and vertical bars represent the range of values. (Deployment #1 10/2/07 to 10/31/07 occurred largely during a non-dredging period)

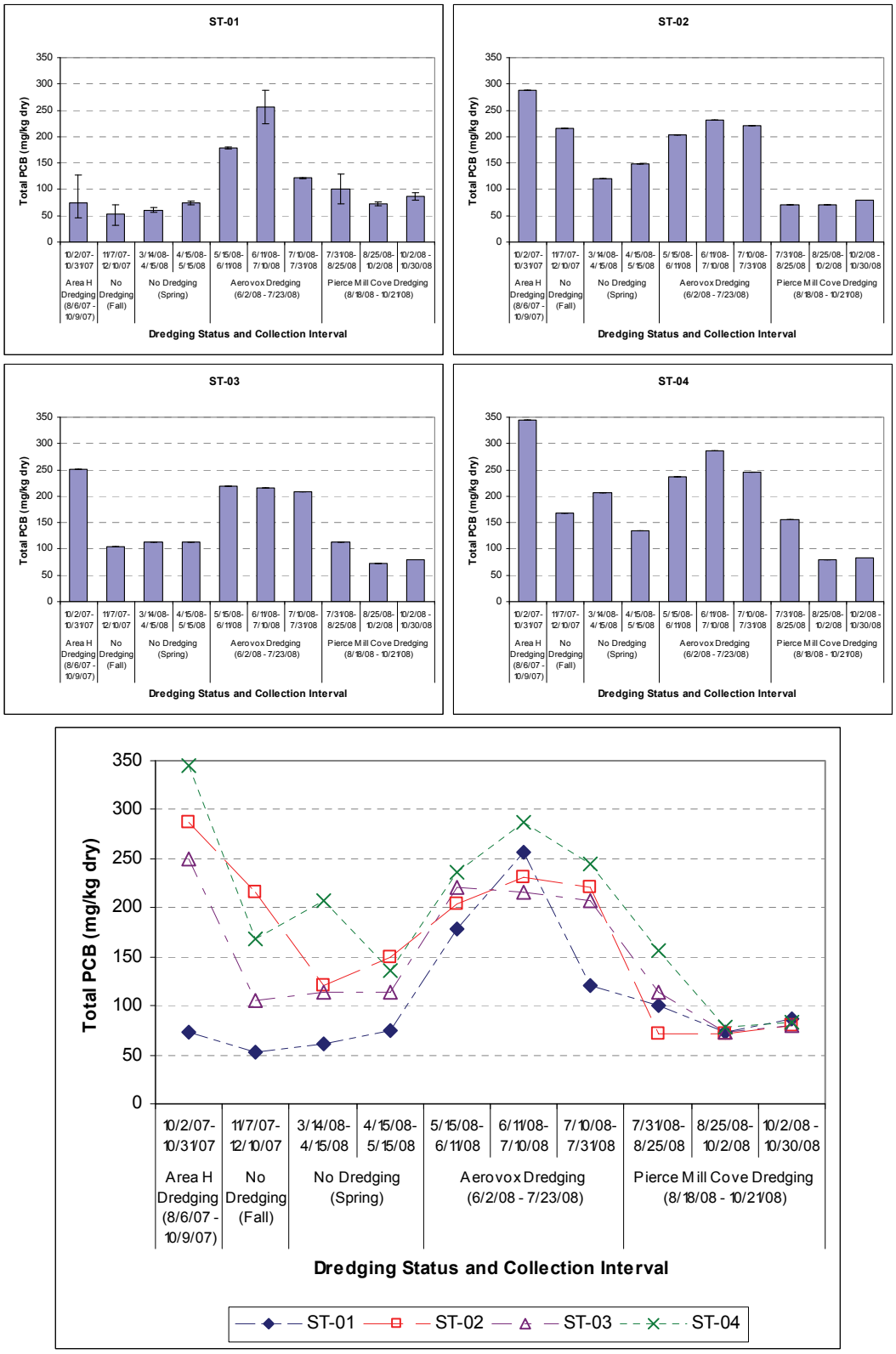

Figure 12. Total PCB Concentrations at Sediment Trap Stations. Bars and symbols represent average values and vertical bars represent the range of values. (Deployment #1 10/2/07 to 10/31/07 occurred largely during a non-dredging period)

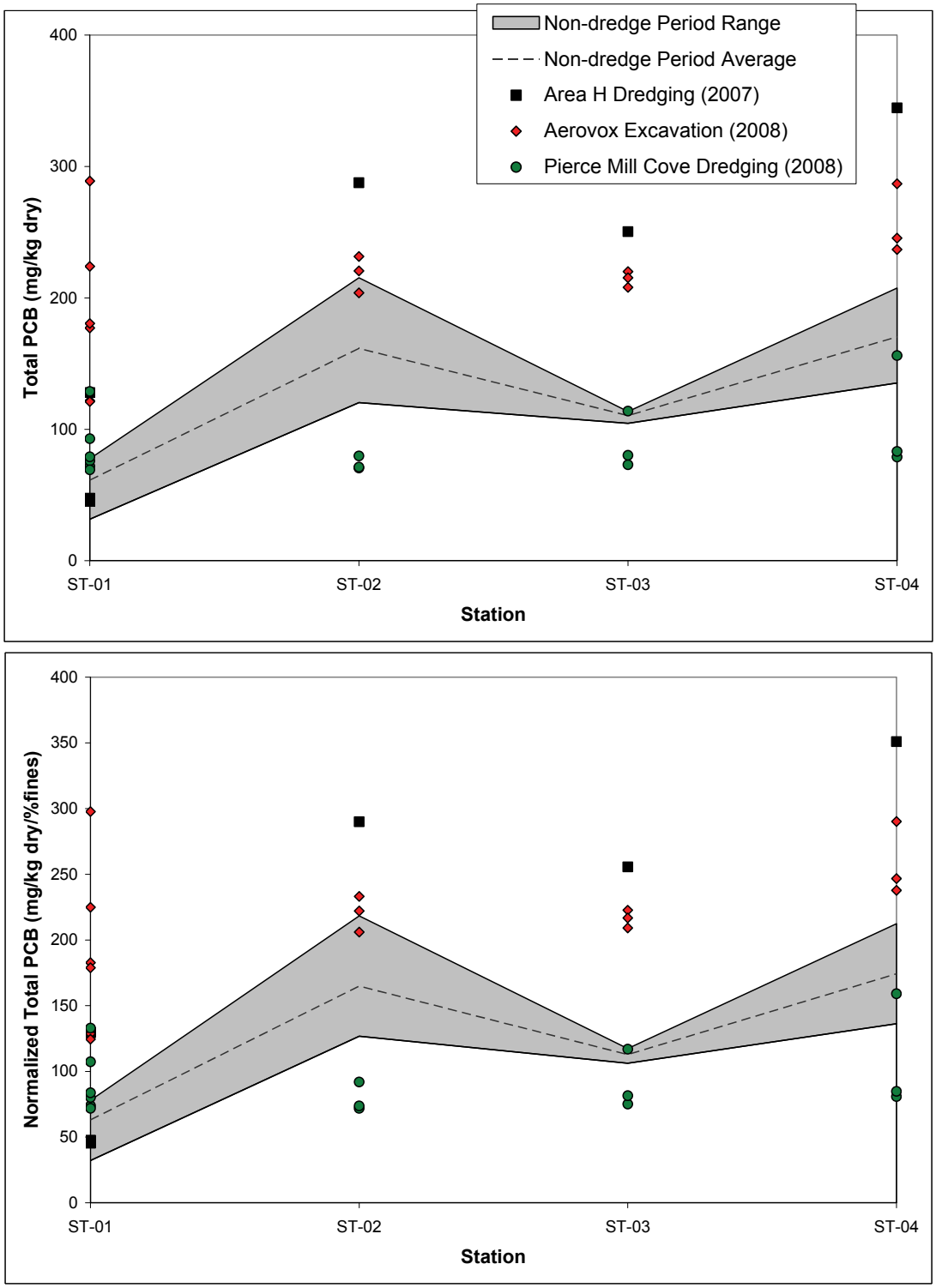

Figure 13. Total PCB Concentrations, Non-normalized (Top) and Normalized to Percent Fines (Bottom), in Sediment Trap Samples Deployed During Non-dredge (grey band) and Dredge (symbols) Periods. The grey band represents the range of values during the non-dredge period and the dashed line represents the average values during the non-dredge period. The symbols represent total PCB concentrations during remediation activities.

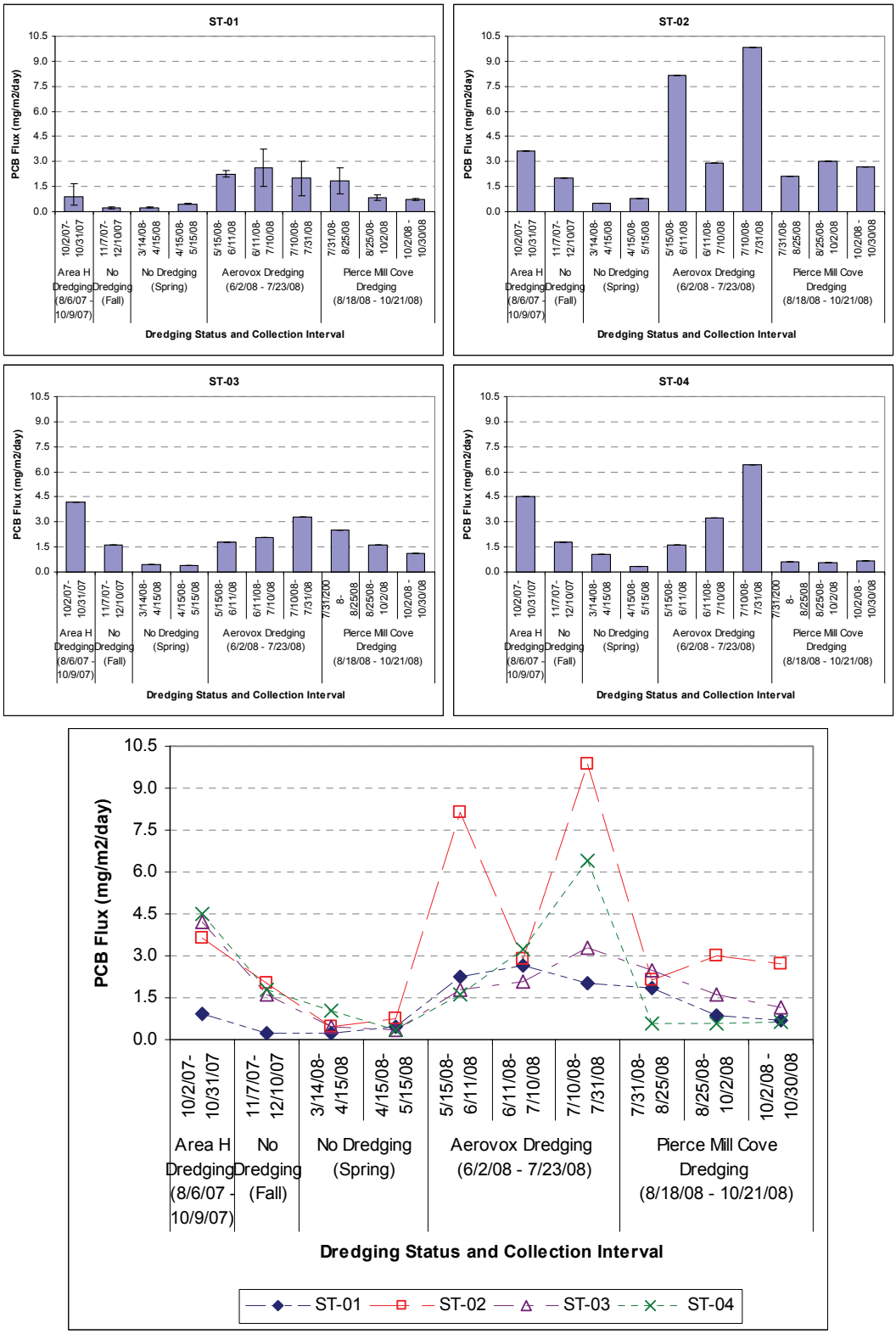

Figure 14. PCB Flux at Sediment Trap Stations. Bars and symbols represent average values and vertical bars represent the range of values. (Deployment #1 10/2/07 to 10/31/07 occurred largely during a non-dredging period)

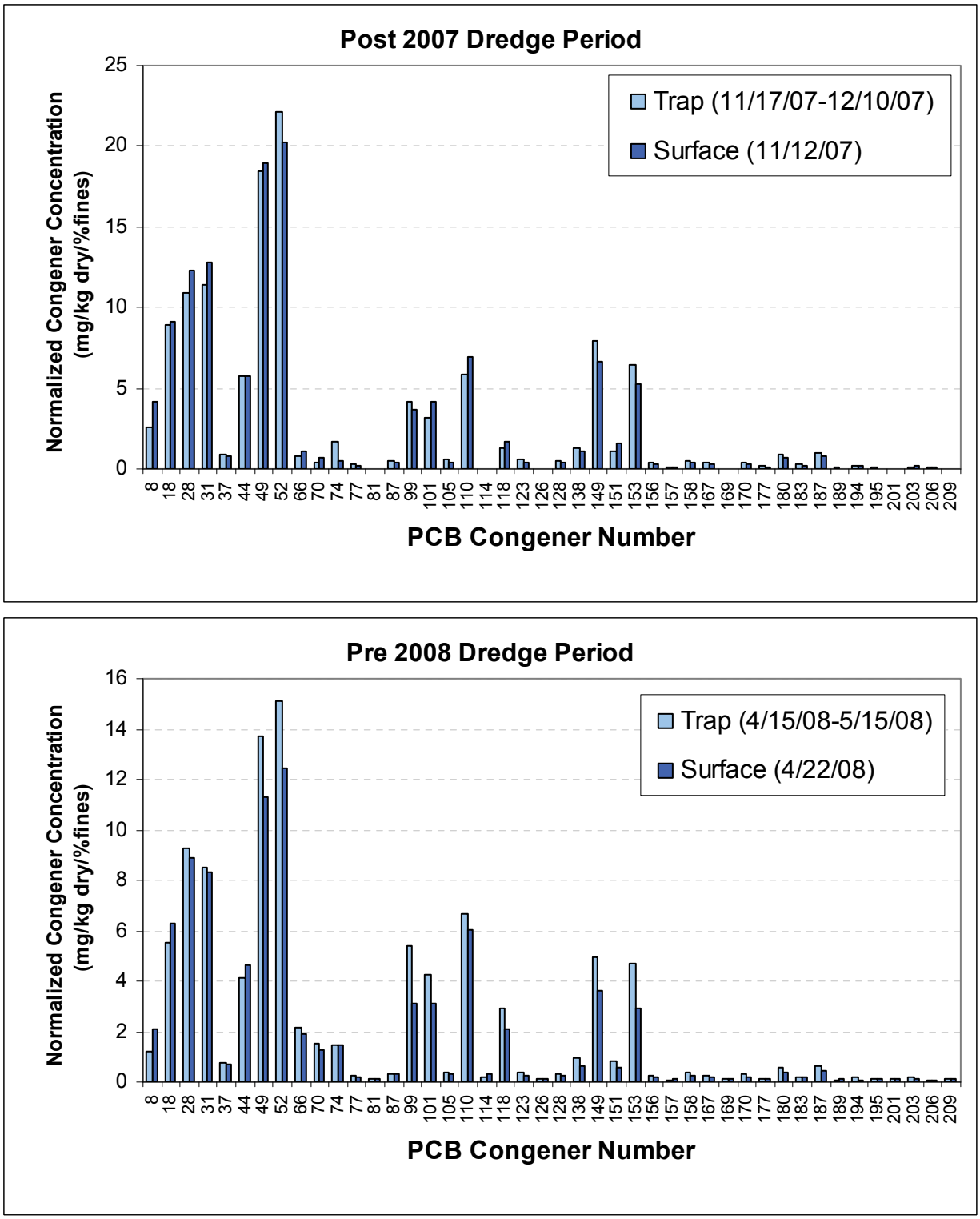

Figure 15. Comparison of PCB Distribution Patterns in Surface Sediment and Sediment Trap Samples at Station ST-04 During Post 2007 (top) and Pre 2008 (bottom) Dredge Periods.

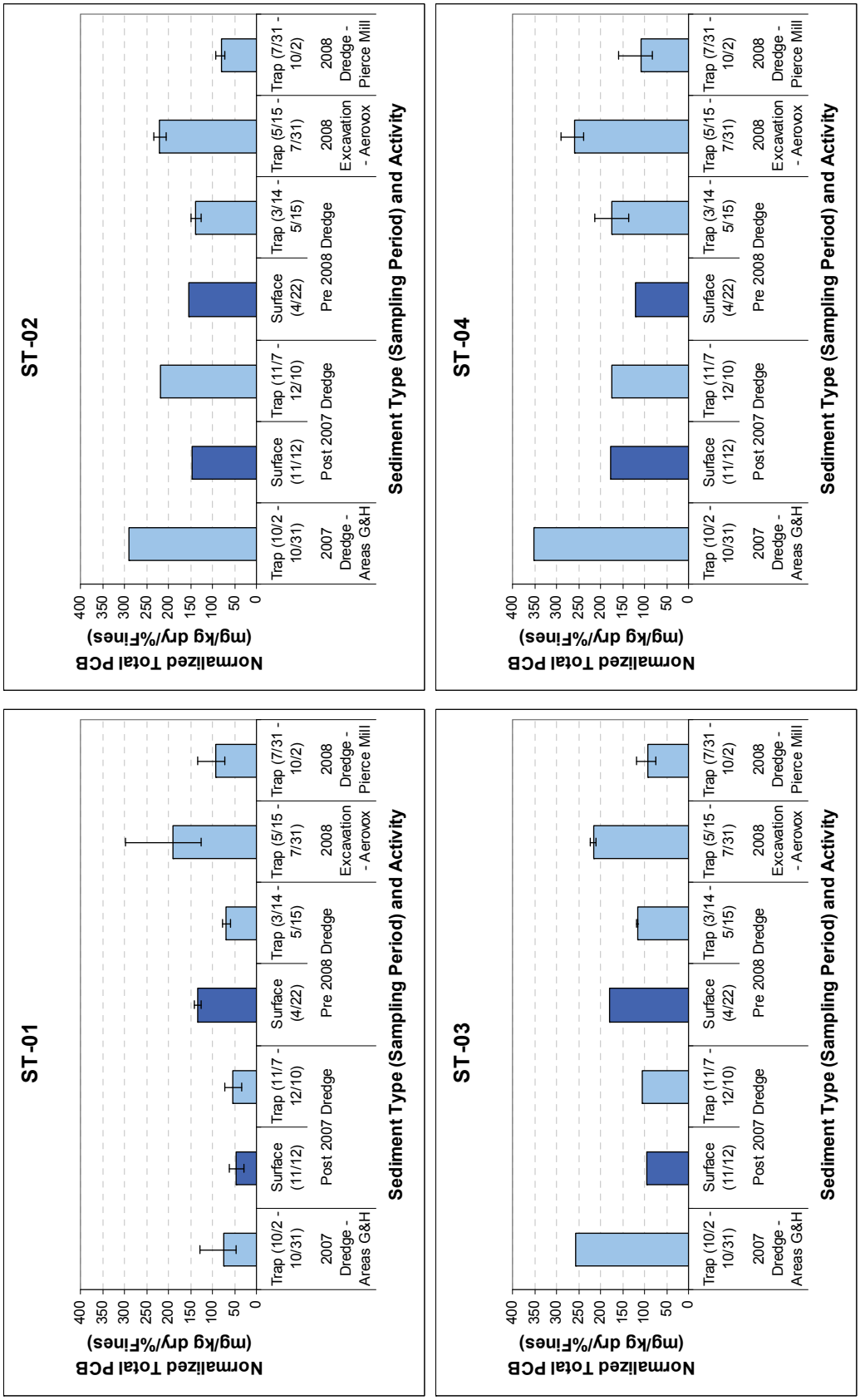

Figure 16. Total PCB Concentrations (Normalized to Percent Fines) in Surface (0-2 cm) Sediment (dark blue bars) and Sediment Trap (light blue bars) Samples at the North of Wood Street Area, October 2007 to October 2008. Bars represent average values and vertical bars represent the range of values during the activity periods.

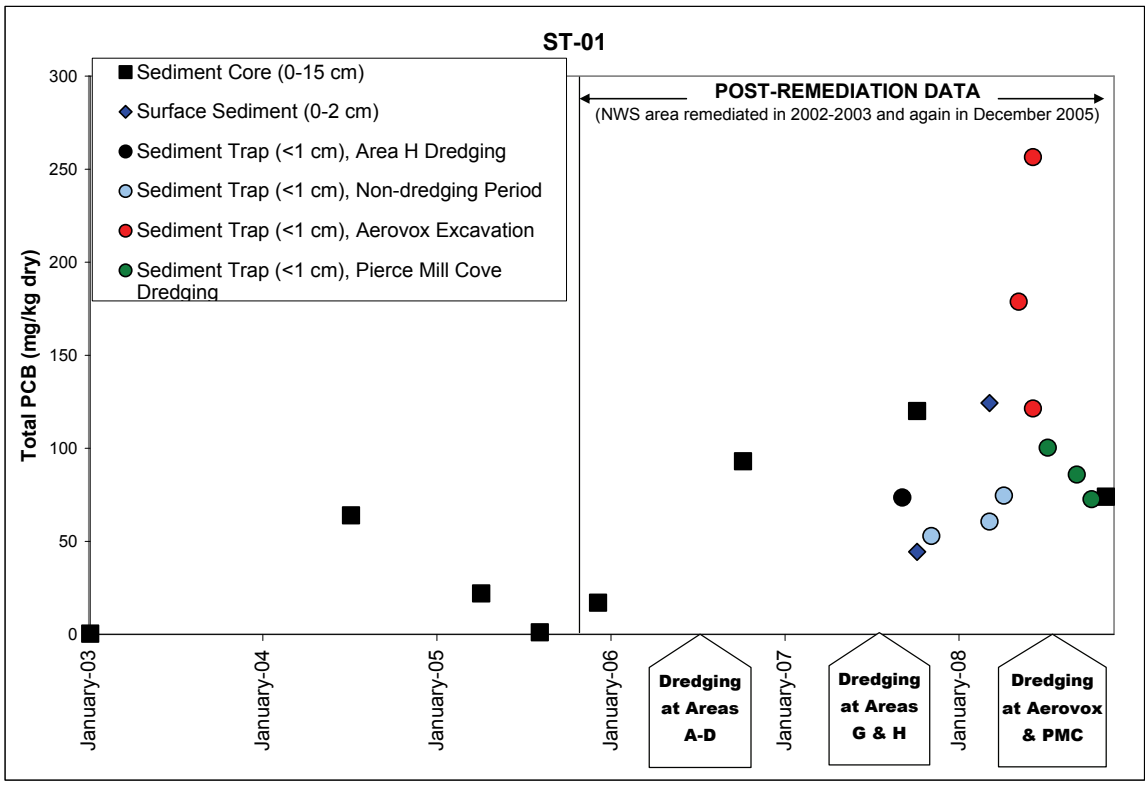

Figure 17. Total PCB in Sediment at Station ST-01 from 2003 to 2008.

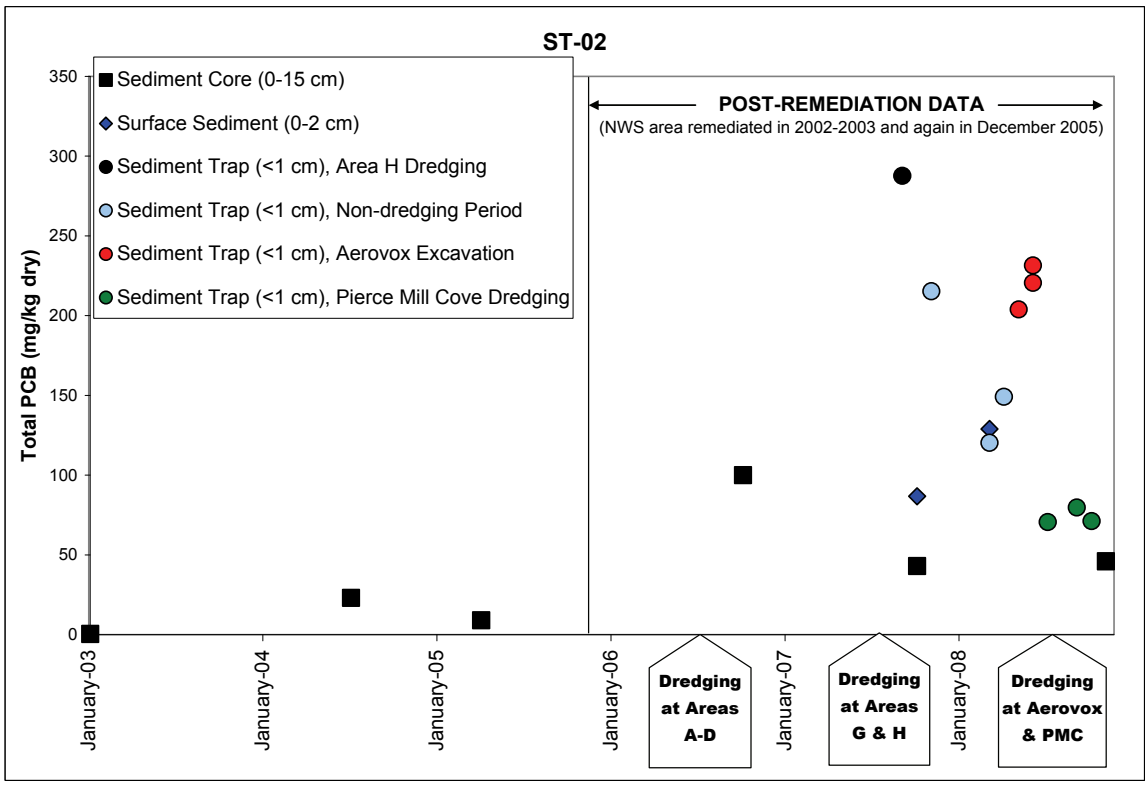

Figure 18. Total PCB in Sediment at Station ST-02 from 2003 to 2008.

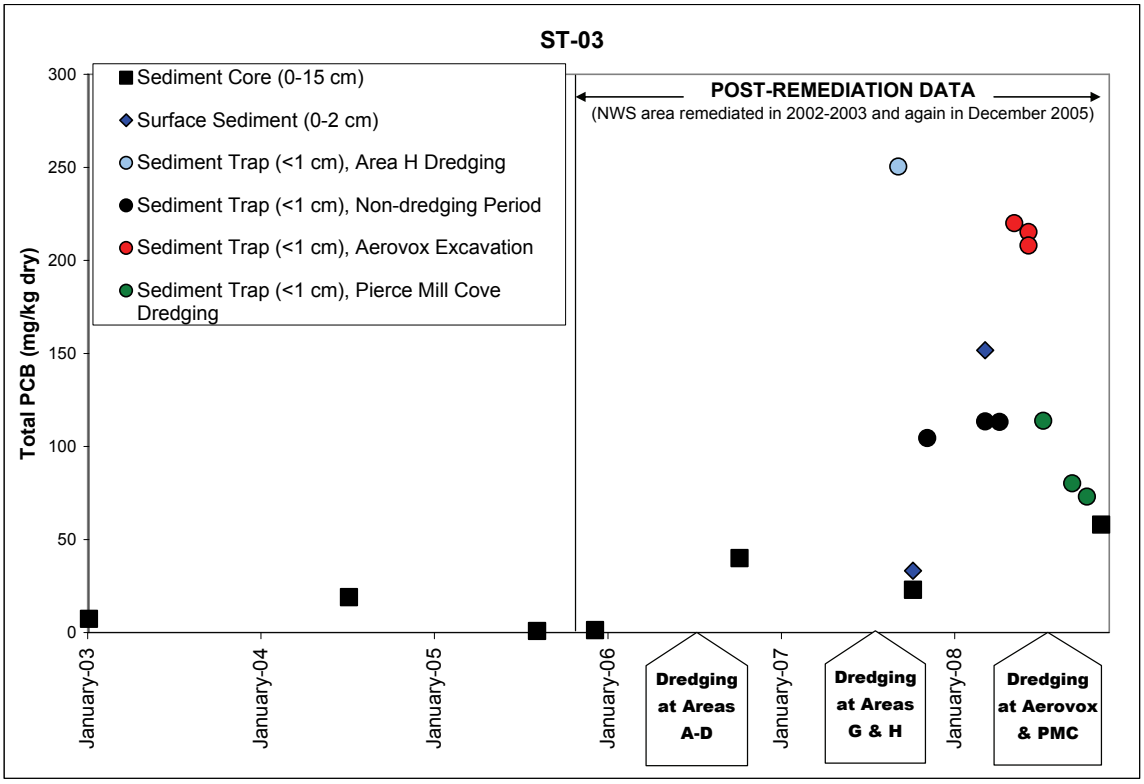

Figure 19. Total PCB in Sediment at Station ST-03 from 2003 to 2008.