FOURTH FIVE-YEAR REVIEW REPORT FOR NEW BEDFORD HARBOR SUPERFUND SITE BRISTOL COUNTY, MASSACHUSETTS

Prepared by

U.S. Environmental Protection Agency
Region 1
BOSTON, MASSACHUSETTS

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

ACESD	EPA's Office of Research and Development, Atlantic Coastal Environmental Sciences Division Laboratory in Narragansett, Rhode Island
ADAF	Age Dependent Potency Adjustment Factors
ALM	Adult Lead Methodology
ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
AVX	AVX Corporation
BLL	Blood Lead Level
CAD	Confined Aquatic Disposal
CalEPA	State of California Environmental Protection Agency
CDE	Cornell Dubilier Electronics, Inc.
CDF	Confined Disposal Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R	Code of Federal Regulations
CIC	Community Involvement Coordinator
CIP	Community Involvement Plan
COC	Contaminants of Concern
CSO	Combined Sewer Overflow
cy	cubic yard(s)
DDA	Debris Disposal Area
DPA	Designated Port Area
EA	Early Action
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentrations
ESD	Explanation of Significant Difference
FDA	Food and Drug Administration
FS	Feasibility Study
FYR	Five-Year Review
IA	Inter-Agency Agreement
ICs	Institutional Controls
IEUBK	Integrated Exposure Uptake Biokinetic Model
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
LHCC	Lower Harbor Confined Aquatic Disposal Cell
LTM	Long-Term Monitoring
MA	Massachusetts
MassDEP	Massachusetts Department of Environmental Protection
MassDMF	Massachusetts Department of Marine Fisheries
MassDPH	Massachusetts Department of Public Health
mg/kg	milligrams per kilogram
NBH	New Bedford Harbor
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NHANES	National Health and Nutrition Examination Survey
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NTU	Nephelometric Turbidity Units
NWS	North of Wood Street
O&M	Operation and Maintenance
OLEM	EPA's Office of Land and Emergency Management (formerly OSWER)

OSWER	EPA's Office of Solid Waste and Emergency Response
OU	Operable Unit
PAHs	Polyaromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PECC	Pre-excavation Confirmatory Congener
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	Perfluorobutanesulfonic Acid
PFOS	Perfluorooctane Sulfonate
ppm	parts per million
PPRTV	Provisional Peer Reviewed Toxicity Value
RAO	Remedial Action Objectives
RfD	Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
RPF	Relative Potency Factors
ROD	Record of Decision
SER	State Enhanced Remedy
SL	Screening Levels
SFO	Oral Cancer Slope Factor
TBC	To Be Considered
TCL	Target Cleanup Level
TEF	Toxicity Equivalency Factor
TOC	Total Organic Carbon
TSCA	Toxic Substances Control Act
UCL	Upper Confidence Limit
µg/dl	micrograms per deciliter
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCG	U.S. Coast Guard
UU/UE	Unlimited Use/Unrestricted Exposure
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a Superfund remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, the FYR report identifies any issues discovered during the review, if any, and documents recommendations to address these issues.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code (U.S.C) § 9621, consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations (C.F.R) § Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the fourth FYR for the New Bedford Harbor Superfund Site (the Site), which borders the Massachusetts' cities and towns of New Bedford, Acushnet, Fairhaven, and Dartmouth. The triggering action for this statutory review was the completion of the third FYR on September 30, 2015. The current FYR was prepared because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site originally consisted of three operable units (OUs). OU1 included areas in the upper and lower harbor, OU2 included the hot spot areas in the upper harbor, and OU3 included the outer harbor south of the New Bedford Harbor hurricane barrier. Through various decision documents and actions, the Site now consists of one active OU, specifically OU1, which includes the upper, lower and outer harbors. This FYR evaluates all actions taken to date within OU1, OU2, and OU3.

The New Bedford Harbor Superfund Site fourth FYR was completed by David Lederer (EPA team leader), Natalie McClaine and David Dickerson (EPA remedial project managers), Courtney Carroll (EPA human health risk assessor), ZaNetta Purnell and Charlotte Gray (EPA community involvement coordinators aka CICs), Cindy Catri, Maximilian Boal and David Peterson (EPA legal counsel) and Paul Craffey and Diane Baxter (Massachusetts Department of Environmental Protection (MassDEP)). The review commenced on November 5, 2019.

Site Background

The Site, located in Bristol County, Massachusetts, extends from the shallow northern region of the Acushnet River estuary, south through the commercial harbor of New Bedford, and into 17,000 adjacent acres of Buzzards Bay. The Site is divided into three areas (upper, lower and outer harbor) characterized by unique geographical features and gradients of contamination. The upper harbor comprises approximately 200 acres. The boundary between the upper and lower harbor is the Coggeshall Street bridge where the width of the harbor narrows to approximately 100 feet. The lower harbor comprises approximately 750 acres. The boundary between the lower and outer harbor is the 150-foot-wide opening of the New Bedford hurricane barrier (constructed in the mid-1960s). The outer harbor's southern extent is formed by an imaginary line drawn from Rocky Point (the southern tip of West Island in Fairhaven), southwesterly to Negro Ledge, and then southwesterly to Mishaum Point in Dartmouth. The Site is also defined by three fishing closure areas, promulgated by the Massachusetts Department of Public Health (MassDPH) in 1979, extending approximately 6.8 miles north to south and encompassing approximately 18,000 acres in total. Please refer to Figure 1 and Figure 2 in Appendix B to view the Site Location Map and the Three New Bedford Harbor Fishing Closure Areas Map, respectively.

Historical industrial and urban development surrounding the harbor resulted in sediment contamination, notably polychlorinated biphenyls (PCBs) and heavy metals, with a contaminant gradient decreasing from north to south. From the 1940s into the 1970s, two capacitor manufacturing facilities, one located near the northern boundary of the site (Aerovox) and one located slightly south of the New Bedford Harbor hurricane barrier (Cornell Dubilier Electronics, Inc. aka CDE) discharged PCB-wastes either directly into the harbor or indirectly via discharges into the City of New Bedford's sewerage system.

The Site was proposed for the Superfund National Priorities List (NPL) in 1982 and finalized on the NPL in September 1983. Over time, land use changes have occurred along the upper harbor shoreline, specifically, shoreline mills were recently converted into residential dwellings. Pilot dredging and disposal studies began in the late 1980s, and "hot spot" dredging (OU2) occurred in 1994 and 1995. Subtidal dredging in OU1 was completed in 2020, and remaining intertidal cleanups are in progress. Sitewide long-term monitoring (LTM) activities have occurred since 1993 to assist in the evaluation of the remedies over time.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: New Bedford Harbor Superfund Site		
EPA ID: MAD980731335		
Region: 1	**State:** MA	**City/County:** New Bedford/Bristol County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): EPA: David Lederer, David Dickerson, Natalie McClaine, Courtney Carroll, ZaNetta Purnell, Charlotte Gray, Cindy Catri, Maximilian Boal and David Peterson MassDEP: Paul Craffey and Diane Baxter
Author affiliation: EPA Region 1 and MassDEP
Review period: 10/1/2015 - 9/30/2020
Date of site inspection: Not applicable
Type of review: Statutory
Review number: 4
Triggering action date: 9/30/2015
Due date *(five years after triggering action date)*: 9/30/2020

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Hazardous substances detected at the Site in various media are identified in Table 1 below. A more complete discussion is available in Section V of the *Record of Decision (ROD) for the Upper and Lower Harbor Operable Unit*, further referred to as the 1998 OU1 ROD (EPA, 1998).

Table 1
Hazardous Substances Detected at the Site by Media Type

Sediment	Surface Water	Biota	Air
PCBs	PCBs	PCBs	PCBs
Polyaromatic Hydrocarbons (PAHs)	Copper		
Cadmium			
Chromium			
Copper			
Lead			

A baseline public health risk assessment was performed in 1989 to estimate the probability and magnitude of potential adverse health effects, both carcinogenic and non-carcinogenic, from exposure to Site contaminants. In addition to PCBs, this evaluation also identified cadmium, copper and lead as contaminants that could potentially contribute to significant adverse health effects (Ebasco Services Incorporated, 1989). EPA recognizes that other contaminants, especially metals, contribute to sediment toxicity, and factored this information into the remedial action decision making process. The dredging-based remedy removes and sequesters the highest levels of metals along with the highest levels of PCBs (Nelson et al., 1996; Averett et al., 1989; and USACE, 1997). Additionally, the EPA National Remedy Review Board noted this feature in its assessment of the proposed remedy, warning that any relaxation of PCB cleanup levels should be examined for the effect on the degree of metals remediation (EPA, 1996). The exposure pathways for PCBs determined to be of highest concern were:

- ingestion of contaminated seafood;
- direct contact with contaminated shoreline sediment; and
- (for children ages 1-5) incidental ingestion of contaminated shoreline sediment.

Ecological risk studies have concluded that aquatic organisms are at significant risk due to exposure to PCBs in the New Bedford Harbor. A more complete discussion of the human health and ecological risks posed at the Site are available in Section VI of the 1998 OU1 ROD.

Response Actions

OU2

The *Record of Decision Summary New Bedford Harbor/Hot Spot Operable Unit*, further referred to as the 1990 OU2 ROD, was signed on April 6, 1990 (EPA, 1990). The respective remedial action objectives (RAOs) are as follows:

- Significantly reduce PCB migration from the hot spot area sediment, which acts as a PCB source to the water column and to the remainder of the sediment in the harbor;

- Significantly reduce the amount of remaining PCB contamination that would need to be remediated in order to achieve overall harbor cleanup;
- Protect public health by preventing direct contact with hot spot sediment; and
- Protect marine life by preventing direct contact with hot spot sediment.

The selected remedy for OU2, as identified in the 1990 OU2 ROD, consists of the following components:

- Dredging approximately 10,000 cubic yards (cy) of hot spot sediment (PCB concentrations ranging from a minimum of 4,000 parts per million (ppm) to over 100,000 ppm);
- Treatment of the large volume of water co-dredged along with the sediment;
- Passive dewatering of the dredged sediment;
- On-site incineration of the dewatered sediment;
- Stabilization of the incinerator ash (if determined to be necessary); and
- Temporary on-site disposal of the incinerator ash.

OU1

The 1998 OU1 ROD was signed on September 25, 1998 (EPA, 1998). The respective RAOs are as follows:

- To reduce risks to human health by reducing PCB concentrations in seafood, by lowering PCB concentrations in sediment and in the water column;
- To ensure that contact with shoreline sediment does not present excessive risks to human health as a result of dermal contact or accidental ingestion of PCB-contaminated sediment in areas prone to beach combing or in areas where residences abut the Harbor; and
- To improve the quality of the seriously degraded marine ecosystem by:
    - Reducing marine organisms' exposure to PCB-contaminated sediment while minimizing consequent harm to the environment; and
    - Reducing surface water PCB concentrations to comply with the chronic ambient water quality criteria (AWQC) by reducing PCB sediment concentrations.

The selected remedy for OU1, as identified in the 1998 OU1 ROD, consisted of the following components at that time:

- Construction of four shoreline confined disposal facilities (CDFs) and water treatment facilities;
- Removal of approximately 450,000 cy of sediment contaminated with PCBs (plus approximately 126,000 cy of additional PCB-contaminated sediment to be addressed by construction of the overlying CDFs);
- Operation of the CDFs and water treatment;
- Saltmarsh excavation, restoration and monitoring;
- Preliminary capping and sediment consolidation within the CDFs;
- Final capping, LTM, and maintenance, and beneficial reuse of the CDFs;
- Sitewide LTM;
- Seafood advisories and other institutional controls (ICs); and
- Review of the Site every five years to assure the remedy continues to protect human health and the environment.

OU3

OU3 was created in response to comments received from the first OU1 Proposed Plan issued in January of 1992 (EPA, 1992). The 1998 OU1 ROD included the remediation of two localized areas of PCB-contaminated sediment that exceeded OU1 cleanup standards located in the outer harbor just south of the New Bedford hurricane barrier. The two areas were capped as part of a pilot study in 2005, and a Remedial Investigation (RI) of the outer harbor was performed from 2009 through 2017 (Woods Hole Group, Inc., 2017). An Explanation of Significant Difference (ESD) issued in 2017, specifically ESD6, determined there was an unacceptable risk to human health based on potential consumption of PCB contaminated seafood in OU3; however, ESD6 also determined the PCBs in the seafood were primarily due to exposure to PCBs originating in surface water flowing from OU1. Based on this knowledge and through the determination in ESD6, EPA modified the OU1 remedy to expand the OU1 area to encompass the OU3 area, thus eliminating the outer harbor "OU3" designation.

Response Action Modifications

OU2 ESDs and ROD Amendment

EPA issued the first ESD to the 1990 OU2 ROD in April 1992 to modify the OU2 remedy component from the temporary on-site disposal of incinerator ash (generated by the OU2 remedial action) to permanent on-site disposal (EPA, 1992). In October 1995, EPA issued the second ESD to document the necessity for interim storage of the dredged hot spot sediment in the Sawyer Street CDF while treatment alternative studies excluding on-site incineration were conducted (EPA, 1995).

EPA issued the *EPA Superfund Record of Decision Amendment: New Bedford Harbor Site Hotspot OU* in April 1999, which replaced the incineration component of the OU2 remedy with dewatering and off-site landfill disposal as the final component for the hot spot sediment. Transportation of the hot spot sediment to an off-site Toxic Substances Control Act (TSCA) permitted landfill started in December 1999 and ended in May 2000, which completed the OU2 remedial action.

OU1 ESDs

As the 1998 OU1 ROD remedial actions took place, the discovery of new information prompted the refinement of the cleanup strategy. Since the issuance of the 1998 OU1 ROD, EPA has issued six ESDs modifying the OU1 remedy to address evolving conditions, as summarized below:

- ESD1 (2001):
    - Incorporate mechanical dewatering of dredged sediment (including construction of desanding and sediment dewatering facilities);
    - Construct a rail spur to the dewatering facility;
    - Revise the dike design at CDF D;
    - Document the creation and continuous use of a pilot CDF at EPA's Sawyer Street facility (Sawyer Street Pilot CDF);
    - Identify additional intertidal cleanup locations in residential zones; and
    - Refine the total volume of in-situ PCB-contaminated sediment to be addressed (EPA noted that based on post-OU1 ROD sampling, the total in-situ contaminated sediment requiring remediation for OU1 could be as high as approximately 800,000 cy).
- ESD2 (2002):
    - Eliminate CDF D; and
    - Modify the sediment disposal destination from CDF D to off-site disposal.

- ESD3 (2010):
    - Document the temporary storage of highly contaminated PCB and volatile organic compound (VOC) sediment (dredged near the Aerovox facility) in the former hot spot sediment disposal cell #1 at EPA's Sawyer Street facility.
- ESD4: (2011):
    - Modify the remedy to include the construction and use of a confined aquatic disposal (CAD) cell in the lower harbor for the disposal of approximately 300,000 cy of dredged sediment with PCB concentrations above the 1998 OU1 ROD action levels; and
    - Refine the total volume of in-situ PCB-contaminated sediment above the 1998 OU1 ROD cleanup levels (EPA noted that based on assessments of sediment volume performed in 2003 and refined in 2009/2010, and including an allowance for over-dredging, the total in-situ sediment volume above the 1998 OU1 ROD cleanup standards was estimated to be approximately 900,000 cy).
- ESD5 (2015):
    - Eliminate CDFs A, B and C in the upper harbor;
    - Modify the sediment disposal destination from CDF A, B and C to off-site disposal; and
    - Confirm the pilot shoreline CDF at the Sawyer Street facility is protective and designate the location as a permanent TSCA disposal facility.
- ESD6 (2017):
    - Modify the OU1 remedy to expand the OU1 area to include the OU3 area and eliminate the designation of "OU3".

The PCB sediment cleanup levels for protection of human health and ecological receptors are presented in Table 2 below. The selected remedies and cleanup levels are designed to be protective of human health and the environment through a combination of remedial actions and ICs. Numerous investigations have been completed at the Site to determine the nature and extent of PCB contamination, the location and functional values of the saltmarsh areas, the fate and transport of PCBs in the environment, and the ecological and human health risks resulting from Site contamination. For a detailed account of the baseline human health risk assessment, the reader is encouraged to review the *Draft Final Baseline Public Health Risk Assessment*; the *Draft Final Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay*; and the *Draft Final Supplemental Feasibility Study Evaluation for Upper Buzzards Bay* (Ebasco Services Incorporated, 1989, 1990, 1992).

Table 2

OU1 PCB Cleanup Levels in Sediment

Dredge Classification	Cleanup Level (mg/kg) [a]
Subtidal	
Upper harbor including mudflats	10
Lower harbor including mudflats [b]	50
Intertidal	
Residential	1
Recreational	25
Minimal and/or zero public access (includes remote saltmarshes)	50

Note.

[a] *milligrams per kilogram (mg/kg)*

[b] In contrast to the upper harbor, a majority of the lower harbor is a Designated Port Area (DPA).

Status of Implementation

In 2013, EPA entered into a Supplemental Consent Decree to the 1992 Consent Decree with AVX Corporation (AVX), whose corporate predecessor, Aerovox Corporation, owned and operated the former Aerovox facility and was the primary source of PCB contamination in the harbor (Supplemental Consent Decree with Defendant AVX Corporation, 2013). In September 2013, the U.S. District Court approved a landmark $366.25 million cash-out settlement. Due to prior limitations in Superfund funding, the project was expected to take approximately 40 additional years to complete. With this settlement, the harbor cleanup was accelerated substantially during the period between 2014 and 2020.

Consistent with the 1998 OU1 ROD and the respective six ESDs, the following remedial activities have occurred during this FYR period (2015 – 2020):

- Completion of the subtidal dredging in New Bedford Harbor: approximately 633,933 cy of contaminated sediment was dredged from the upper and lower harbor during this period, as illustrated in Figure 3 of Appendix B. Subsequently, the completion of dredging allows for operations to cease at the desanding building on Sawyer Street and the dewatering facility on Hervey Tichon Avenue;
- Completion of the construction and loading of the Lower Harbor CAD Cell (LHCC) with Superfund subtidal sediment;
- Completion of the intertidal remediation of approximately 23,149 cy from Parcel 265, Pierce Mill Cove, Marsh Island, North Street Saltmarsh, and Between the Bridges;
- Completion of the interim sediment cap abutting the Aerovox facility, as illustrated in Figure 4 of Appendix B. The three-acre multi-layer subaqueous interim cap was designed to contain potential releases from the adjacent former Aerovox Mill Site while it progresses through state-lead remediation;
- Completion of the interim Parcel 265 subaqueous cap, also illustrated in Figure 4 of Appendix B;
- Ongoing decontamination of the dewatering facility; demobilization completion is anticipated at the end of 2020;
- Ongoing decontamination and demobilization from the western portion of the Sawyer Street property, including the removal of the desanding building and site offices;
- Ongoing construction of seven interim sub-aqueous caps, as illustrated also in Figure 4 of Appendix B; construction completion is anticipated at the end of 2020;
- Ongoing remedial work in East Zone 1, as illustrated in Figure 3 of Appendix B (includes clearing parcels, excavation and transportation / off-site disposal of approximately 23,572 cy, restoration and replanting). The excavation and backfilling (but not all saltmarsh plantings) are expected to be completed by end of 2020;
- Ongoing remedial work in West Zone 1, as illustrated in Figure 3 of Appendix B (includes clearing parcels, excavation and transportation / off-site disposal of approximately 3,469 cy, restoration and replanting). The excavation and backfilling (but not saltmarsh plantings) are expected to be completed by end of 2020;
- Ongoing implementation of ICs, including fish advisories and coordination with the three municipalities (Acushnet, Fairhaven, and New Bedford) along the New Bedford Harbor to obtain notice of any shoreline development proposals that may be inconsistent with the remedy); and
- Sitewide LTM.

Consistent with CERCLA and its implementing regulations, the Commonwealth of Massachusetts requested that EPA include the State Enhanced Remedy (SER) actions in the remedy for OU1. The SER consists of navigational dredging and disposal activities within the lower and outer harbor, with MassDEP

designated as the lead agency for the Commonwealth. MassDEP is responsible for supervising and reviewing the conduct of the SER at the Site pursuant to § 300.515(f)(1)(ii)(A) and (B) of the NCP (EPA, 2015). After public review and comment, EPA integrated the SER into the 1998 OU1 ROD. The SER supplements the EPA remedy because the lower harbor EPA cleanup level is 50 ppm, and the SER navigational dredging removes PCB-contaminated sediment with concentrations less than 50 ppm that may not be addressed otherwise. The SER also contributes to attaining the EPA remedy's RAOs by further reducing overall PCB concentrations in seafood and the marine environment in the New Bedford Harbor beyond the PCB-contaminated sediment removal completed by the EPA Superfund remedy.

The SER work began in 2004, and through 2015 involved dredging of over 450,000 cy of PCB contaminated sediment in the lower harbor. The sediment was placed in four SER CAD cells (designated "Borrow Pit", "CAD1", "CAD2", and "CAD3") constructed under the SER. The most recent phase of the SER program began in May 2020 and resulted in an additional dredging of approximately 105,000 cy of contaminated sediment, which was disposed of in EPA's LHCC and the Commonwealth of Massachusetts SER's CAD2 and CAD3. The most recent work includes the construction of "CAD4", which is the next SER CAD cell in the sequence. Additional removal and disposal of contaminated sediment is anticipated to resume in 2021, once CAD4 construction is completed.

The complete chronology of major site investigations, remedy selection events, and major remedial actions from 1976 – 2020 are listed in Table A-1 and A-2 of Appendix A.

Table 3
Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Seafood	Yes	Yes	State Fishing Closure Areas 1, 2 and 3	Prevent consumption of PCB-contaminated seafood above risk-based levels	1979 MassDPH fishing restriction: *Completed*
					Site-specific seafood consumption advisories: *Completed with ongoing public education.*
					Signage: *Completed with ongoing maintenance.*
					Community Involvement Plan and Institutional Control Plan for Seafood Consumption (CIP): *Ongoing.*
Sediment (intertidal)	Yes	Yes	Will be identified once intertidal remediation is complete	Prevent dermal contact/incidental ingestion of PCB-contaminated sediment	Signage: *Completed with ongoing maintenance.*
					Land use controls: Towns of Fairhaven, New Bedford and Acushnet coordinate with EPA via the wetland coastal permitting process to identify proposed development that may conflict with the remedy. *Additional ICs may be established post-completion of intertidal/shoreline remediation.*
Sediment/Soil	Yes	Yes	93-120 (Sawyer Street)	Maintain the protectiveness of the Pilot CDF cap at the Debris Disposal Area (DDA)	Land use controls: *Scheduled for post-completion of West Zone intertidal remediation and construction of pilot CDF cap.*

Table 3, Continued
Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Pilot Cap Outside Hurricane Barrier, Sub-aqueous Cap	Yes	Yes	Outer Harbor Pilot Cap	Maintain the protectiveness of the Outer Harbor Pilot Cap	Regulated navigation: the U.S. Coast Guard (USCG) and National Oceanic and Atmospheric Administration (NOAA) established a regulated navigational area prohibiting activities that could disturb the seabed within the Outer Harbor cap area and delineating the Outer Harbor cap footprint on marine navigational charts for the New Bedford Harbor area. These charts note anchorage restrictions for mariners in the harbor: *Completed.*
LHCC Cap, Sub-aqueous Cap	Yes	Yes	LHCC	Maintain the protectiveness of the LHCC cap	Regulated navigation: Coordinate with the USCG and NOAA to establish a regulated navigational area prohibiting activities that could disturb the seabed within the LHCC cap area and delineating the LHCC cap footprint on marine navigational charts for the New Bedford Harbor area. These charts note anchorage restrictions for mariners in the harbor: *Scheduled for post-completion of the LHCC cap.*
			LHCC	Maintain the protectiveness of the LHCC cap	Coordinate with harbor stakeholders to develop guidelines for mooring and anchor designs that will ensure the integrity of the cap is not damaged; assist stakeholders in developing and implementing regulations requiring designs to be used within cap area: *Scheduled for post-completion of the LHCC cap.*[1]

[1] Currently, the LHCC is part of the SER construction zone and is surrounded by sheet piles and oil boom as an interim protective measure to prevent mooring and/or anchoring. The LHCC cap construction is anticipated after consolidation is achieved.

Table 3, Continued
Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Interim Upper Harbor Sub-Aqueous Caps	Yes	No: ICs, if needed, will be determined in a future decision-making document	Coggeshall East Cap; Coggeshall West Cap; Crib Cap; O-711 Cap; L-014 Cap; L-114 Cap; Pilot CDF Shoreline Cap	Maintain the protectiveness of the seven interim upper harbor caps	*The need for ICs will be determined in a future decision document.*

Systems Operations/Operation & Maintenance

The Site is currently in the remedial action phase, therefore, a final long-term operation and maintenance (O&M) plan is not enacted at this time. Below is a brief description of major remedial action monitoring activities that have been implemented at the Site to monitor various aspects of the remedy over time. For additional information on the major remedial action monitoring activities, please refer to historical decision documents (*e.g.* 1990 OU2 ROD, OU2 ESDs and ROD Amendment, 1998 OU1 ROD, OU1 ESDs 1- 6). A data review of the monitoring activities throughout this FYR is discussed in section IV of this document.

1. Long-term monitoring (LTM)
    a. Since 1993, EPA continues to collect LTM data approximately every five years to assess sediment conditions and quantify the long-term environmental effectiveness of remediation actions in the New Bedford Harbor.
2. North of Wood Street (NWS) monitoring
    a. Prioritized dredging of this area occurred in 2002 and 2003, and subsequently, EPA periodically collects data to assess any potential recontamination due to tidal sediment transport in the harbor from areas that are undergoing or awaiting remediation.
3. Pre-excavation confirmatory congener (PECC) sampling
    a. In 2018 and 2019, the pre-excavation pilot test was conducted in two intertidal remediation areas to demonstrate that the excavation achieved the horizontal and vertical design limits.
4. Outer harbor pilot cap monitoring
    a. After the construction of an approximately 19-acre cap was completed in 2005, EPA periodically collects data to monitor for any changes to the cap's spatial extent, thickness, PCB levels and total organic carbon (TOC). The most recent sampling event was conducted in 2017.
5. Sawyer Street groundwater monitoring
    a. Since 1992, EPA continues to collect groundwater data to evaluate the integrity of the Sawyer Street pilot CDF and monitor for any potential contamination migration pathways due to the sediment processing and storing at the Sawyer Street Site.
6. Ambient air monitoring
    a. Since 1989, EPA continues to collect air monitoring data to measure ambient air PCB concentrations nearby to any remedial operations and also throughout the New Bedford Harbor to determine cumulative exposures over time. In 2015, and again in 2018 and 2020, EPA updated the air monitoring plan to reflect any changing conditions (Jacobs Engineering, 2020).
7. Remedial dredging water quality monitoring
    a. During dredging operations, EPA and the U.S. Army Corps of Engineers (USACE) utilized a site-specific turbidity-based monitoring program to produce immediate sampling results.
8. Seafood monitoring
    a. The seafood monitoring program is augmented by the deployment of blue mussels (*Mytilus edulis*) as part of the comprehensive LTM program for the Site (Nelson and Bergen, 2012). Since 1993, EPA's Office of Research and Development Atlantic Coastal Environmental Sciences Division (ACESD) continues to collect data via mussel deployments bi-annually from three stations: NBH-2-Coggeshall St, NBH-4-Hurricane Barrier, and a control site NBH-5-West Island.
    b. Since 2003, based on an agreement between MassDEP and EPA, MassDEP manages the collection of annual seafood monitoring data used to evaluate the levels of PCBs in the edible seafood species in New Bedford Harbor and surrounding Buzzards Bay.

Consistent with the 1998 OU1 ROD, this seafood monitoring program will aid in the evaluation of the overall effectiveness of the harbor cleanup, as well as assist in the implementation of ICs (*i.e.,* seafood advisories).

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations.

Table 4
Protectiveness Determinations/Statements from the 2015 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Will be Protective	The remedy for OU1 is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks have been or are being controlled to the maximum extent practicable.
2	Short-term Protective	The remedy for OU2 currently protects human health and the environment because sediment with high concentrations of PCBs (greater than 4,000 ppm) was dredged from the upper harbor and safely transported to an off-site TSCA landfill. All remaining work, including ICs, are now within the scope of OU1.

The third FYR did not identify any issues or recommendations that could impact the protectiveness of the remedy; however, the following recommendations identified in Table 5 on the following page were stated to improve the effectiveness of the remedy, but do not affect the current protectiveness of the remedy.

Table 5
Status of Recommendations from the 2015 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description*	Completion Date
OU1	Minimize ingestion of local PCB-contaminated seafood and minimize dermal contact / incident ingestion risks	EPA must continue to implement the 2015 CIP.	Ongoing	The CIP was updated in 2020 and EPA continues to implement the actions within the plan (*e.g.,* signage, fencing, educational outreach, etc.).	Ongoing
OU1	Minimize ingestion of local PCB-contaminated seafood and minimize dermal contact / incident ingestion risks	Revise EPA's seafood consumption advisory brochure to reflect updated information.	Completed	The EPA seafood consumption advisory brochure was updated in 2016 to reflect the seafood consumption recommendation for Tautog in closure area 3.	2016
OU1	Address remaining dermal contact / incidental ingestion risks in intertidal zones	Review state laws concerning various types of land use restrictions to determine appropriate ICs for properties abutting the intertidal remediation areas once cleanup levels are achieved.	Ongoing	Intertidal zones are in the remediation phase. The City of New Bedford adopted an ordinance requiring notice of new shoreline projects to be made to EPA to ensure consistency with the remedy. The Town of Acushnet and Town of Fairhaven have agreed to voluntarily provide notice of new shoreline projects within their jurisdiction.	Once all intertidal zones are remediated, the need for additional forms of ICs can be determined.
OU1	Address remaining dermal contact / incidental ingestion risks in intertidal zones	Once adequate intertidal sampling data is available, EPA should assess the need for interim actions where PCB levels in intertidal sediment exceed applicable cleanup levels and prioritize intertidal cleanup efforts, considering potential human health risks and the overall remediation schedule, taking into consideration the potential for recontamination from subtidal sediment.	Completed	EPA completed an extensive design-level sampling program for intertidal zone delineation and remediation planning between 2014 and 2019. Design level work plans were developed for ten upper harbor intertidal remediation zones, which allows for prioritization based on land use, PCB levels and available funding.	2019

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

A public notice was made available by press release on March 13, 2020 announcing the 2020 commencement of the New Bedford Harbor FYR, which is available in Appendix E. The results of the review and the report will be available online on the New Bedford Harbor Superfund Site Profile Page.[2] In 2017, EPA transferred the local information repository to an online format, which allowed EPA to more efficiently and conveniently make information available to the public while minimizing the burden and holdings at the local information repository.[3] Excluding any restrictions on facility operations due to COVID-19, the EPA Region 1 Records Center (located at 5 Post Office Square in Boston, Massachusetts) and the New Bedford Free Public Library (located at 613 Pleasant Street in New Bedford, Massachusetts) remain as the required local repository.

During the FYR process, interviews were primarily conducted by ZaNetta Purnell, an EPA CIC, to document any perceived problems or successes with the remedy that have been implemented to date. The completed interview forms are included in Appendix F.

Data Review

Site Wide Long-Term Monitoring
LTM data was not collected during this FYR period. After the $366.25 million cash-out settlement at the end of 2013, and the commencement of additional SER navigational dredging, extensive dredging and intertidal cleanup operations took place throughout the harbor during this FYR time period. LTM sampling of the harbor was originally scheduled for September of 2019; however, EPA Superfund subtidal dredging was not completed until Spring of 2020. Therefore, the LTM data collection event was postponed until September of 2020 to more accurately demonstrate the harbor conditions after the dredging completion milestone was accomplished. Data from this event will be available on the New Bedford Harbor Superfund Site website and will also be included in the fifth FYR in 2025.

North of Wood Street Sediment Sampling
In 2015, sediment PCB data from the NWS area was collected to assess PCB concentration trends and to monitor potential recontamination (Battelle, 2016). A portion of this area (just south of the Wood Street bridge) was re-dredged in March of 2020, and EPA is awaiting additional data to be collected north of the Wood Street Bridge in September 2020 before determining if further remedial actions are necessary at NWS.

Pre-excavation Confirmatory Congener Sampling
After 2020, confirmation of compliance within the target cleanup levels (TCLs) is anticipated to be based on the PECC approach (i.e., using pre-excavation rather than post-excavation congener sampling) and the collection of post-excavation survey data to demonstrate that the excavation achieved the horizontal and vertical design limits. The PECC sample locations included excavation sidewall and floor locations. Design elevation compliance measurements at the PECC locations are made using real-time kinematic global positioning system with vertical and horizontal accuracies of less than 0.1 feet. The results of the

[2] www.epa.gov/nbh
[3] On March 18, 2013, the EPA promulgated a final rule to amend 40 C.F.R § 300.805(c) of the NCP "Location of the Administrative Record File" to acknowledge advancements in technologies used to manage and convey information to the public. This enabled the EPA to make available to the public Administrative Records via the internet. The New Bedford Free Public Library continues to serve as the required local information repository and is critical to providing the public with access to the online Site Profile Page and Administrative Records.

PECC approach pilot study, performed at the North Street Saltmarsh in 2018 (lower PCB levels) and at East Zone 1 in 2020 (higher PCB levels), are under review and are anticipated to be available at the end of 2020. If the PECC approach is proven to be ineffective at East Zone 1 parcel's 25-24 and 25-31, then post-excavation confirmatory samples will be collected and confirmed to be below the cleanup levels prior to backfilling the area.

Outer Harbor Pilot Cap Monitoring
In 2015-2016, additional material was placed near the Outer Harbor Pilot Cap for habitat restoration during the construction of the South Terminal. In 2017, sampling was conducted to characterize PCB concentrations in surficial sediment (0 – 0.25 foot) within and near the capped area and was compared with historical results from the same sampling locations. Sediment grab samples were collected at 15 locations, visually characterized to document sediment composition, and analyzed for NOAA 18 PCB congeners with a sub-set of samples analyzed for PCB homologues, as illustrated in Figure 5 of Appendix B. The PCB concentrations in the 2017 samples ranged from 0.0347 mg/kg dry weight to 1.19 mg/kg dry weight.

Box plots of the sum of NOAA 18 PCB congeners from 2005-2017 sediment monitoring (excluding 2012, which used a different sampling depth interval) were prepared to assess temporal trends in PCB concentrations at the Outer Harbor Pilot Cap area, as illustrated in Figure 12 of Appendix C. Average sum NOAA 18 PCB concentrations were highest in 2005, decreased in 2006, and do not appear to have changed substantially over the 2006-2017 monitoring period (Battelle, 2017).

Sawyer Street Groundwater and Stormwater Monitoring
The objective of the groundwater monitoring program is to provide data that can be used to evaluate the integrity of the Sawyer Street CDF, as well as assess trends in groundwater concentrations of PCBs as Aroclors, selected metals (cadmium, chromium, copper, and lead), VOCs, and total suspended solids (TSS) from site operations. Six groundwater wells are sampled each year, as illustrated in Figure 6 of Appendix B. Stormwater runoff from Cell #1 and the pilot CDF (aka the DDA) is stored in Cell #2 and is tested and treated if necessary, prior to being discharged into the City of New Bedford's sewerage system. Throughout this FYR period, concentrations of contaminants of concern (COCs) were either non-detect or were below state standards (EPA, 2016, 2017, 2018, 2019). Current and historical groundwater monitoring reports are available on the New Bedford Harbor Superfund Site website.

Ambient Air Monitoring
EPA performed air monitoring throughout the subtidal and intertidal dredging operations to confirm the dredging, de-sanding, de-watering and water treatment operations did not cause elevated levels of airborne PCBs that could pose an unacceptable risk to public health. Figures 7 and 8 of Appendix B illustrate the numerous ambient air sampling station locations utilized throughout the dredging operations. During this FYR period, land-based air monitoring results during the dredging and intertidal operations were below risk-based levels of concern. Air monitoring will continue to occur throughout intertidal operations in the upper harbor. To capture potential reductions in airborne PCBs due to completion of subtidal dredging in 2020, five stations (24, 25, 42, 43, and 46) were sampled in the lower harbor from June through September of 2020. Current and historical air monitoring data are also available on the New Bedford Harbor Superfund website. The post-dredging ambient air monitoring sample locations are illustrated in Figure 9 of Appendix B.

Remedial Dredging Water Quality Monitoring
Water quality in New Bedford Harbor was monitored one week before dredging activities commenced to determine existing conditions, and then was monitored during dredging operations. EPA evaluated the water quality data to assess for potential unintended impacts and to verify that the cleanup work did not create conditions that could cause toxicity to marine organisms, contaminant movement or interference

with seasonal bird and fish migrations within the Acushnet River and New Bedford harbor. A turbidity level greater than 50 nephelometric turbidity units (NTU) resulted in an action to stop work or slow down work and/or collect water samples. Throughout this FYR period, neither the up-current reference, debris removal / dredging (300 feet downstream from the dredge area boundary) or the disposal at EPA CAD cell (25 feet from silt curtain) surpassed the 50 NTU compliance level at any time (EPA, 2017, 2020). To view an example of sediment level and the turbidity data locations during dredging or CAD cell placement, please refer to Figure 10 and 11 in Appendix B, respectively.

EPA Blue Mussel Monitoring Program

The seafood monitoring program is augmented by the deployment of blue mussels (*Mytilus edulis*) as part of the comprehensive LTM program for the Site (Nelson and Bergen, 2012). The mussel deployments have been conducted twice annually (with some exceptions) since 1993 by ACESD at three stations: NBH-2-Coggeshall St, NBH-4-Hurricane Barrier, and a control site NBH-5-West Island. In addition, there were monthly deployments during the 1994-1995 hot spot remediation for a total thus far of fifty-seven 28-day deployments. The mean total PCBs (as the sum of 18 congeners) in the blue mussel tissue for the three stations (Coggeshall St, Hurricane Barrier, and West Island) are shown in Figures 13, 14, and 15 of Appendix D, respectively. As expected, there is a significant north to south spatial contamination gradient among stations.

Utilizing all 28 day deployments at each station, there is an approximate four-fold decrease in overall mean concentration between stations NBH-2-Coggeshall St (33 ppm) and NBH-4-Hurricane Barrier (8 ppm) and over an order of magnitude decrease between station NBH-4-Hurricane Barrier (8 ppm) and NBH-5-West Island (0.5 ppm). The PCB differences among stations are maintained over time; however, all stations exhibit seasonal variability due to the mussel reproductive cycle where lipid-rich gametes increase during the year (along with lipophilic organic contaminants such as PCBs), then decrease during spawning. This pattern has also been observed in the New Bedford Harbor indigenous ribbed mussel population (Bergen et al., 2001). Monthly deployments during the hot spot remediation demonstrated that increases in mussel bioaccumulation were more closely linked to storm events than any dredging activity (Bergen et al., 2005).

The data set indicates that within the time period of 1993 and 2018, no net change in PCB water column concentration and subsequent mussel bioaccumulation has occurred, primarily because the exposure to PCBs has not been altered dramatically along this gradient over time. In examining the data as an average over an approximate five-year period at NBH-2-Coggeshall St, there is an increase immediately following the hot spot removal, followed by a gradual decrease. The pattern is also seen at the NBH-4-Hurricane Barrier station. At NBH-5-West Island, the same pattern is evident, though not statistically significant. This demonstrates that while the overall mass of PCBs removed from the harbor has been substantial, especially during the hot spot removal, the average water column PCB concentrations increases near the mussel stations were transient. Bioaccumulation, as represented by the mussel deployments, has declined during the upper and harbor remedial operations that occurred after the hot spot removal. Indeed, there is evidence of a slow and steady decline, which indicates that the use of dredging/excavation has been an effective remedial method for this Site. It is reasonable to expect that with the upper harbor subtidal remediation completed this past year, the fifth FYR in 2-25 should show a measurable decrease in surface water PCB concentrations leading to a concomitant decrease in mussel PCB tissue concentrations.

MassDEP Annual Seafood Monitoring Program

The annual seafood monitoring program began in 2003 and is part of the ongoing PCB cleanup program for the Site. The program is a collaborative effort between Massachusetts Department of Marine Fisheries (MassDMF), MassDEP, and the EPA. Based on previous investigations and risk assessments performed at the Site, the variety of species selected for this monitoring program are considered locally caught

seafood, generally available for field collection, and bracket potential worst-case tissue levels **(**MassDEP, 2019**)**.

The data sets from 2016 – 2019 demonstrate a generally decreasing trend (north to south) of PCB levels in locally caught seafood. Tissue PCB levels decrease proportionally with the distance from the primary source of PCBs to the upper harbor (the Aerovox facility). Overall, the current data sets indicate continued levels of PCBs in the New Bedford Harbor area seafood above the 1998 ROD's site-specific, risk-based target level of 0.02 ppm as illustrated in Figures 16 through 35 of Appendix D (MassDEP and MassDMF, 2016, 2017, 2018, 2019).

Site Inspection

The formal FYR inspection of the Site was not conducted, as the USACE and designated contractors are on-site full time. EPA is also frequently on-site to conduct meetings and perform necessary oversight.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Yes. Review of available documents, evaluation of compiled data, and the results of frequent site inspections indicate that the remedy is functioning as intended in the 1998 OU1 ROD and subsequent OU1 ESDs. The hot spot remedy in the 1990 OU2 ROD, subsequent OU2 ESDs, and 1990 OU2 ROD amendment was successfully completed in 2001. As previously stated, OU1 is in the remedial action phase, and protectiveness is expected to increase as the Site reaches post-construction completion.

Subtidal dredging in the upper and lower harbor was completed in 2020 and complies with the TCLs. Approximately 75% of the sediment dredged was completed during this FYR period. Similarly, approximately 40% of the intertidal PCB-impacted sediment exceeding the ROD's TCLs has been remediated to date, a figure which is expected to increase to approximately 60% by the Spring of 2021. The vast majority of intertidal mudflats and sediment remediation has also occurred during this FYR period. The construction of the LHCC cap is anticipated during 2022 after material consolidation has occurred, which will permanently isolate the contents from the environment. The long-term remedial action for areas where interim sediment caps have been installed will be addressed in a future CERCLA decision document and is anticipated to be issued after this FYR period.

The implementation of ICs and other measures, specifically LTM, are in progress and are proving to be effective in preventing exposure.

In 2017, the City of New Bedford amended the Chapter 15, Licenses and Permits, Business Regulation ordinance in accordance with the provisions of Chapter 43 of General Laws to generally state the following:

> "Any work proposed to the north of the southern terminus of the hurricane barrier, and within one hundred (100) feet of a coastal wetland resource area protected under the Massachusetts Wetlands Protection Act and corresponding regulations, a copy of the notice shall also be sent to the United States Environmental Protection Agency, which is implementing the cleanup of the New Bedford Harbor Superfund Site" (The City of New Bedford, 2017).

Additionally, in 2020, the Town of Acushnet and Town of Fairhaven agreed to voluntarily notify the EPA if any requests are made to build along the shoreline within the New Bedford Harbor

Site boundaries. The Town of Fairhaven Conservation Commission voted to present an EPA-drafted proposed bylaw, incorporating EPA notice provisions similar to those incorporated into the New Bedford ordinance above, at the next scheduled Town meeting (tentatively scheduled to occur in the Spring of 2021).

Finally, the Outer Harbor Pilot Cap is protected by an IC in the form of a Regulated Navigation Area established by the USCG. The Outer Harbor Pilot Cap is identified on navigational charts and states the prohibited actions that have the potential to impact the integrity of the cap.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

No. There have been changes in exposure assumptions, toxicity factors, and risk methodologies since the time of remedy selection; however, the RAOs specified in the RODs are still valid. As explained in more detail in the third FYR, the sediment cleanup levels established at the time of remedy selection are still valid.

The short-term protectiveness risks from ongoing consumption of local PCB-contaminated seafood and potential access to un-remediated PCB-contaminated shorelines are in the process of being addressed. EPA continues to work to control these risks to the maximum extent practicable through educational and outreach efforts and with ICs such as fencing and signage. In 2015, EPA issued the CIP, which documents the actions EPA has and will continue to take to implement ICs to minimize ingestion of local PCB-contaminated seafood and dermal contact / incidental ingestion risk, as well as new actions EPA will take to augment existing controls. The CIP is a living document and is updated as conditions change, with the most recent update occurring in 2020. At this time, there are no known problems with the remedy that would affect its long-term protectiveness.

The following sections describe changes that have occurred since the 2015 FYR.

Changes in Applicable or Relevant and Appropriate Requirement (ARARs) and To-Be-Considered (TBC) Guidance

There have been no changes in ARARs or TBC guidance since the 2015 FYR.

Changes in Toxicity and Other Contaminant Characteristics

Since the original risk assessment, changes have occurred in the toxicity values for PCBs used for the fish consumption and inhalation exposure pathways, which are described below. Additionally, there have been toxicity changes in PAHs since the previous FYR; however, risks from PAHs are not being re-assessed because PCBs remain the primary risk driver for the Site and PAHs co-located with PCBs will be addressed by the remedy.

As explained in more detail in the third FYR on pages 30-32, EPA evaluated the impact of the exposure factor and oral toxicity value changes for PCBs on the risk-based fish tissue target level of 0.02 ppm. Recalculation of cancer and non-cancer risks resulted in confirmation that the 0.02 mg/kg total PCB seafood tissue target level remains protective for both cancer and non-cancer effects of total PCBs. Therefore, the updates in toxicity values as described below do not call into question the protectiveness of the remedy because impacted sediment remediation is in progress, and ICs are in place (including an updated seafood advisory that continues to minimize ingestion of local PCB-contaminated seafood). Also, the air monitoring program has demonstrated that the exposure from airborne PCBs to date remains below risk-based exposure levels and the controls in place are protective of human health.

The following summarizes changes in risk assessment toxicity factors that have occurred since the time of the 1989 risk assessment:

- ***2016 Lead in Soil Cleanups***

  EPA's 2016 OLEM memorandum "Updated Scientific Considerations for Lead in Soil Cleanups" (OLEM Directive 9200.2-167) indicates that adverse health effects are associated with blood lead levels (BLLs) at less than 10 micrograms per deciliter (µg/dl). The memo mentioned that several studies have observed "clear evidence of cognitive function decrements in young children with mean or group BLLs between 2 and 8 µg/dL" (EPA, 2016). Any soil screening, action or cleanup level developed based on the previous target BLL of 10 µg/dL may not be protective.

  EPA's approach to evaluate potential lead risks is to limit exposure to residential and commercial soil lead levels such that a typical (or hypothetical) child or group of similarly exposed children would have an estimated risk of no more than 5% of the population exceeding a 5 µg/dL BLL. This is based on evidence indicating cognitive impacts at BLLs below 10 µg/dL. Additionally, this approach aligns with the Lead Technical Review Workgroup's current support for using a BLL of 5 µg/dL as the level of concern in the Integrated Exposure Uptake Biokinetic Model (IEUBK) and Adult Lead Methodology (ALM). A target BLL of 5 µg/dL reflects current scientific literature on lead toxicology and epidemiology that provides evidence that the adverse health effects of lead exposure do not have a threshold.

  EPA's 2017 OLEM memorandum "Transmittal of Update to the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters" (OLEM Directive 9285.6-56) provides updates on the default baseline blood lead concentration and default geometric standard deviation input parameters for the ALM. These updates are based on the analysis of the National Health and Nutrition Examination Survey (NHANES) 2009-2014 data, with recommended updated values for baseline blood lead concentration being 0.6 µg/dL and geometric standard deviation being 1.8.

  Using updated default IEUBK and ALM parameters at a target BLL of 5 µg/dL, site-specific lead soil screening levels (SLs) of 200 ppm and 1,000 ppm are developed for residential and commercial/industrial exposures, respectively (EPA, 2017).

  As an urbanized watershed, the New Bedford Harbor sediment was historically contaminated with a variety of other pollutants, notably heavy metals, as well as PCBs. As with PCBs, feasibility studies illustrated the effect that specific discharge areas such as industrial outfalls, commercial areas and combined sewer overflows (CSOs) had on increasing contaminated sediment levels in localized areas. Metal levels also followed a decreasing north to south gradient, although the magnitude of the decline was lower than PCBs. The baseline long-term ecological monitoring report (Nelson, et al., 1996) illustrated that metals and PCBs are generally co-located, which was an important characteristic in terms of the overall environmental benefit of the selected remedy, as much of the metals-contaminated sediment was intended to be dredged simultaneously with the PCB-contaminated sediment (EPA, 1998). While lead was detected in sediment, lead in soil is not a primary COC for this Site.

- ***2017 Polycyclic Aromatic Hydrocarbons cancer and non-cancer toxicity values***

  On January 19, 2017, EPA issued revised (less carcinogenic) cancer toxicity values and new non-cancer toxicity values for benzo(a)pyrene. Benzo(a)pyrene did not have non-cancer toxicity values prior to January 19, 2017. Benzo(a)pyrene is now considered to be carcinogenic by a

mutagenic mode of action; therefore, cancer risks must be evaluated for different human developmental stages using age dependent potency adjustment factors (ADAFs) for different age groups. The cancer potency of other carcinogenic PAHs is adjusted using relative potency factors (RPFs), which are expressed relative to the potency of benzo(a)pyrene. The non-cancer effects of benzo(a)pyrene were not evaluated in the past due to the absence of non-cancer values.

PAHs were determined to be co-located with PCBs but were not assessed for risk because it was concluded that the PAHs resulted from non-point sources and would be effectively addressed with PCB remediation. Though toxicity values have changed since remedy selection, PAH risks are not being re-evaluated because PCBs continue to drive risk at the Site, and it is expected that the remedial actions will decrease or sequester PAHs to exposure levels consistent with anthropogenic background. Therefore, these changes related to PAHs do not impact the protectiveness of the remedy.

Changes in Risk Assessment Methods

Since the 2015 FYR the following changes have occurred in recommended risk assessment methods:

- ***2014 OSWER Directive Determining Groundwater Exposure Point Concentrations (EPCs), Supplemental Guidance[4]***

  In 2014, EPA finalized a directive to determine groundwater EPCs and provide recommendations to develop groundwater EPCs. The recommendations to calculate the 95% upper confidence limit (UCL) of the arithmetic mean concentration for each contaminant from wells within the core/center of the plume, using the statistical software ProUCL, could result in lower groundwater EPCs than the maximum concentrations routinely used for EPCs as past practice in risk assessment, leading to changes in groundwater risk screening and evaluation. In general, this approach could result in slightly lower risk or higher screening levels (EPA, 2014).

  Groundwater is not a direct media of concern at the Site. Groundwater monitoring, following the directive above, is conducted to assess the protectiveness of the Sawyer Street Pilot CDF.

Changes in Exposure Pathways

The environmental media that were considered in the 1998 OU1 ROD include surface water, harbor sediment, marine biota and ambient air throughout the Site. Direct contact with and incidental ingestion of shoreline sediment and ingestion of contaminated seafood were identified as the human health exposure pathways of primary concern.

The original human health risk assessment in 1989 evaluated the cancer and non-cancer risks of PCBs, in adults, young children (age 0-5 years), and older children (age 6-16 years) exposed via sediment contact, sediment ingestion, ingestion of aquatic biota, and inhalation of airborne contaminants. Screening results performed under conservative exposure conditions indicated that exposure to PCBs in surface water and air did not represent a significant exposure pathway; however, EPA established water quality and ambient air monitoring programs to ensure that the remediation efforts did not cause unacceptable impacts to

[4] In 2015, the Office of Solid Waste and Emergency Management (OSWER) was renamed as the Office of Land and Emergency Management (OLEM).

surface water and air and to confirm ambient air levels remained below levels protective of human health. The risk assessment scenarios and exposure assumptions remain valid.

EPA has observed an overall trend towards a more publicly accessible shoreline in the upper harbor (*e.g.* parks, walkways near the Acushnet river, boat houses, observation decks), and the conversion of historically industrial mills into residential dwellings. It is expected that as additional commercial and/or industrial shoreline properties are developed for residential and recreational uses before the final remediation is performed or completed, there will be a need to assess the implementation of more stringent shoreline cleanup levels. Currently, these risk assessment scenarios and exposure assumptions presently being used remain valid.

Since the 2015 FYR, the following changes have occurred in recommended exposure pathway considerations:

- ***2014 OSWER Directive on the Update of Standard Default Exposure Factors***

  In 2014, EPA finalized a directive to update standard default exposure factors and frequently asked questions associated with these updates. Many of these exposure factors differ from those used in the risk assessment supporting the RODs. These changes in general would result in a slight decrease of the risk estimates for most chemicals (EPA, 2014).

- ***2018 EPA Vapor Intrusion Screening Level (VISL) Calculator***

  In February 2018, EPA launched an online VISL calculator which can be used to obtain risk-based screening level concentrations for groundwater, sub-slab soil gas, and indoor air. The VISL calculator uses the same database as the Regional Screening Levels for toxicity values and physiochemical parameters and is automatically updated during the semi-annual regional screening level updates. Please see the User's Guide for further details on how to use the VISL calculator.

  These changes in exposure pathway considerations do not call into question the effectiveness of the remedy since there is no vapor pathway in the marine sediment being remediated. Site restrictions on the onshore Sawyer Street Pilot CDF prevent any potential vapor exposure from COCs in the CDF.

Expected Progress Towards Meeting the RAOs

The 1990 OU2 ROD RAOs to reduce PCB migration from the hot spot area sediment, reduce the amount of remaining PCB contamination, and protect public health and marine life by preventing direct contact with hot spot sediment were achieved in the year 2000 when approximately 14,000 cy of dredged hot spot sediment was permanently shipped off-site. The 1998 OU1 ROD RAOs to reduce risk to human health by reducing PCB concentrations in seafood, ensure contact with shoreline sediment does not present excessive risk via dermal contact or ingestion, and improve the quality of seriously degraded marine ecosystems are progressing as expected. The completion of the remaining intertidal zone remediation in the upper harbor is expected to increase the protectiveness of the remedy and satisfy the RAOs.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU1, OU2

OTHER FINDINGS

The following recommendations that were identified during the FYR may reduce costs, improve management of O&M, and/or accelerate site close out, but do not affect current and/or future protectiveness:

1. Implement the PECC program for the remaining intertidal cleanups based on the expected success of the PECC pilot at East Zone 1 and the North Street Salt Marsh (the draft PECC report is currently under review by EPA and USACE);
2. Collect additional reference area PCB seafood tissue and sediment samples in order to more accurately assess regional background levels in the absence of the New Bedford Harbor Superfund Site;
3. Increase fin fish sampling to obtain statistically significant data on PCB levels in fish; and
4. Evaluate the need for additional ICs for the Site post-completion of intertidal remediation.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination*: Will be Protective	*Planned Addendum Completion Date*: N/A
Protectiveness Statement: The remedy for OU1 is expected to be protective of human health and the environment upon completion, and in the interim, remedial actions completed to date have addressed exposure pathways that could result in unacceptable risks. These risks have been or are in the process of being controlled to the maximum extent practicable.		
Operable Unit: OU2	*Protectiveness Determination*: Protective	*Planned Addendum Completion Date*: N/A
Protectiveness Statement: The remedy for OU2 is protective of human health and the environment because the sediment with high concentrations of PCBs (greater than 4,000 ppm) was dredged from the upper harbor and safely transported to an off-site TSCA landfill. All future work in the area where the hot spot sediment was removed, including ICs, are within the scope of OU1.		

VIII. NEXT REVIEW

The next five-year review report for the New Bedford Harbor Superfund Site is required five years from the completion date of this review.

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APPENDIX A: SITE CHRONOLOGY

Table A-1

Chronology of Major Site Investigations and Remedy Selection Events

Date	Major Site Investigation and Remedy Selection Event
1976 - 1982	Discovery of widespread contamination of PCBs and heavy metals in sediment and marine life throughout New Bedford harbor
1983	Site added to the NPL
1988-89	EPA performed pilot dredging and disposal study (pilot CDF and pilot CAD)
1989	EPA issued the Proposed Plan for the hot spot OU2
April 1990	EPA issued the ROD for the hot spot OU2
August 1990	EPA issued a feasibility study (FS) and risk assessment for the entire harbor
January 1992	EPA issued the first Proposed Plan for the upper and lower harbor OU1
April 1992	EPA issued ESD1 for the 1990 OU2 ROD
May 1992	EPA issued an addendum proposed plan for OU1
1993	EPA suspended the incineration component of the hot spot remedy in response to community opposition. The New Bedford Harbor Community Forum was established to develop alternatives to on-site incineration
1995	EPA issued ESD2 for the 1990 hot spot ROD
1996	EPA issued a revised proposed plan for the upper and lower harbor OU1. The outer harbor was separated into OU3
1997	EPA issued an FS addendum report for the hot spot OU2
August 1998	EPA issued the proposed plan to amend the 1990 OU2 ROD
September 1998	EPA issued the 1998 OU1 ROD for the upper and lower harbor OU1
1999	EPA issued the amendment for the 1990 OU2 ROD
2001	EPA issued ESD1 for the 1998 OU1 ROD
2002	EPA issued ESD2 for the 1998 OU1 ROD
2005	EPA completed first FYR
2010	EPA issued ESD3 for the 1998 OU1 ROD and second FYR
2011	EPA issued ESD4 for the 1998 OU1 ROD
2012	EPA issued the final determination for the South Terminal Project, which was modified in 2013 and 2014
2013	Supplemental Consent Degree with AVX
2015	EPA issued ESD5 for the 1998 OU1 ROD and third FYR
2017	EPA issued ESD6 for the 1998 OU1 ROD

Table A-2
Chronology of Major Remedial Action Events

Date	Major Remedial Action Event
1988 – 99	Completed pilot dredging and disposal study.
1994-95	Dredged 14,000 cy of hot spot sediment (PCB concentrations up to 200,000 ppm) from the harbor.
2001	Completed the early action (EA) cleanup of highly contaminated residential properties (PCB concentrations up to 20,000 ppm), relocated the Sawyer Street combined sewer overflow (CSO), and constructed a clean corridor for the relocation of submerged power lines near the hot spot sediment.
2002	Eliminated CDF D in favor of shipping dredged material off-site (ESD2) and removed thirteen derelict commercial fishing vessels to allow for remedial dredging and commercial barge pier relocation.
2003	Completed the six-acre NWS cleanup (PCB concentrations up to 46,000 ppm), remedial dredging at the former Herman Melville shipyard, and the construction of the marine bulkhead for the Area D dewatering facility.
2004	Completed the first season of full-scale dredging, the construction of the dewatering facility, and the relocation of two CSOs at Area D.
2005	Completed the second season of full-scale dredging, construction of a relocated commercial barge pier and associated navigational channel, and the pilot underwater cap near the CDE mill.
2006 – 2012	Completed the third through ninth season of full-scale dredging.
2013	Completed the tenth season of full-scale dredging and began construction of the LHCC Phase I. Received the proceeds of the $366.25M settlement with AVX to allow for accelerated cleanup actions during subsequent years.
2014	Completed the eleventh season of full-scale dredging and the construction of the LHCC Phase I and began construction of the LHCC Phase II.
2015	Completed the twelfth season of full-scale dredging. The construction of the South Terminal under the SER was completed.
2016	Completed the thirteenth season of full-scale dredging: dredging was accomplished in the lower harbor, followed by disposal in the LHCC. Remediation in intertidal parcel 265 was completed.
2017	Completed the fourteenth season of full-scale dredging: final pass hybrid dredging commenced in the Upper Harbor with off-site disposal; mechanical dredging continued in the Lower Harbor, followed by LHCC disposal. Remediation of the Pierce Mill Cove (Riverside Park) intertidal area of New Bedford was completed.
2018	Completed the fifteenth season of full-scale dredging: Subtidal dredging in the Lower Harbor was completed. Final pass hybrid dredging continued in the Upper Harbor with off-site disposal. Remediation of the North Street Salt Marsh, Between the Bridges and Marsh Island intertidal areas in Fairhaven were completed.
2019	Completed the sixteenth season of full-scale dredging: Final pass dredging continued with both hybrid (off-site disposal) dredging and mechanical dredging followed by LHCC disposal.
2020	Completed all Superfund sub-tidal dredging of New Bedford Harbor and began the intertidal excavation in two intertidal zones (EZ1 and WZ1): Excavation of these areas and off-site disposal of contaminated material is expected to be complete by the end of CY 2020; restoration and replanting of these areas is expected to be complete during CY 2021.

APPENDIX B: MAPS

Figure 1
Site Location Map

Figure 2
Three New Bedford Harbor Fishing Closure Areas Map

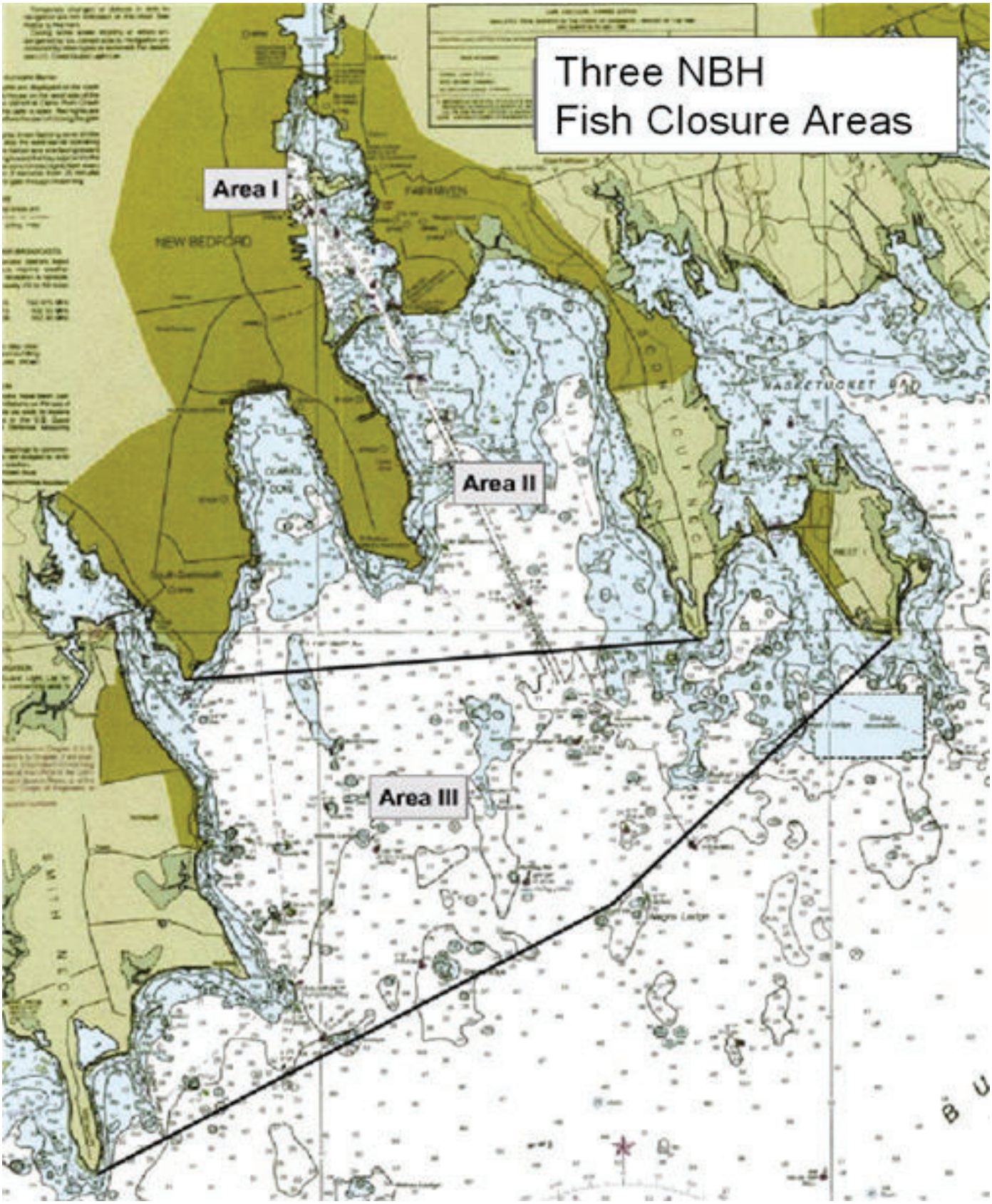
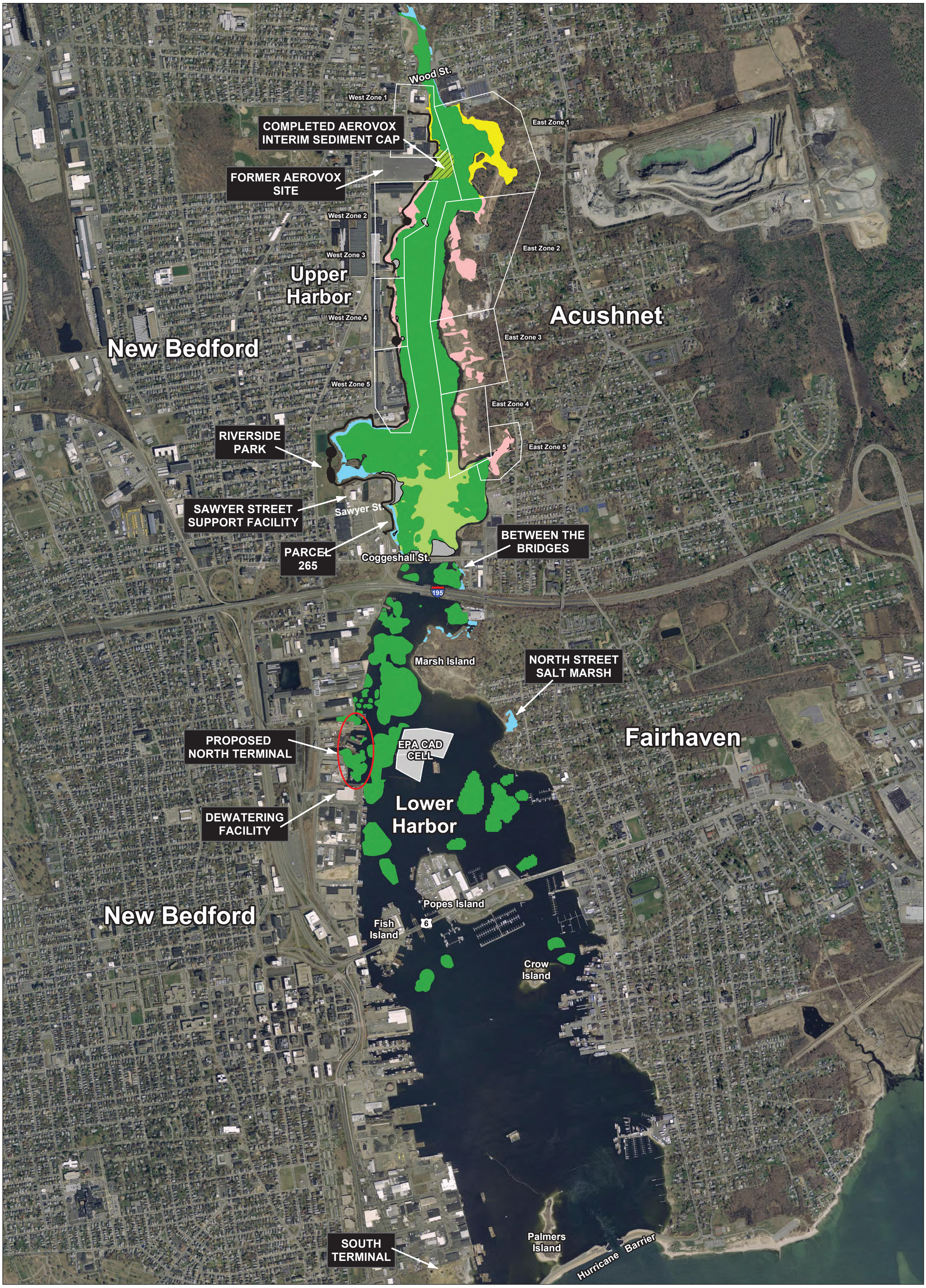


Figure 3
Remediation Progress Map



Legend

- Dredging Complete
- No Remediation Required
- Currently Proposed Sediment Cover/Capping Areas
- EPA CAD Cell
- Riverwalk (Proposed)
- Completed Aerovox Interim Sediment Cap
- Intertidal Remediation Completed
- Intertidal Remediation to be Completed
- Intertidal Remediation in Progress

0 0.25 0.5 Miles

N

Aerial Photography MASSGIS 2014

Status September 2020

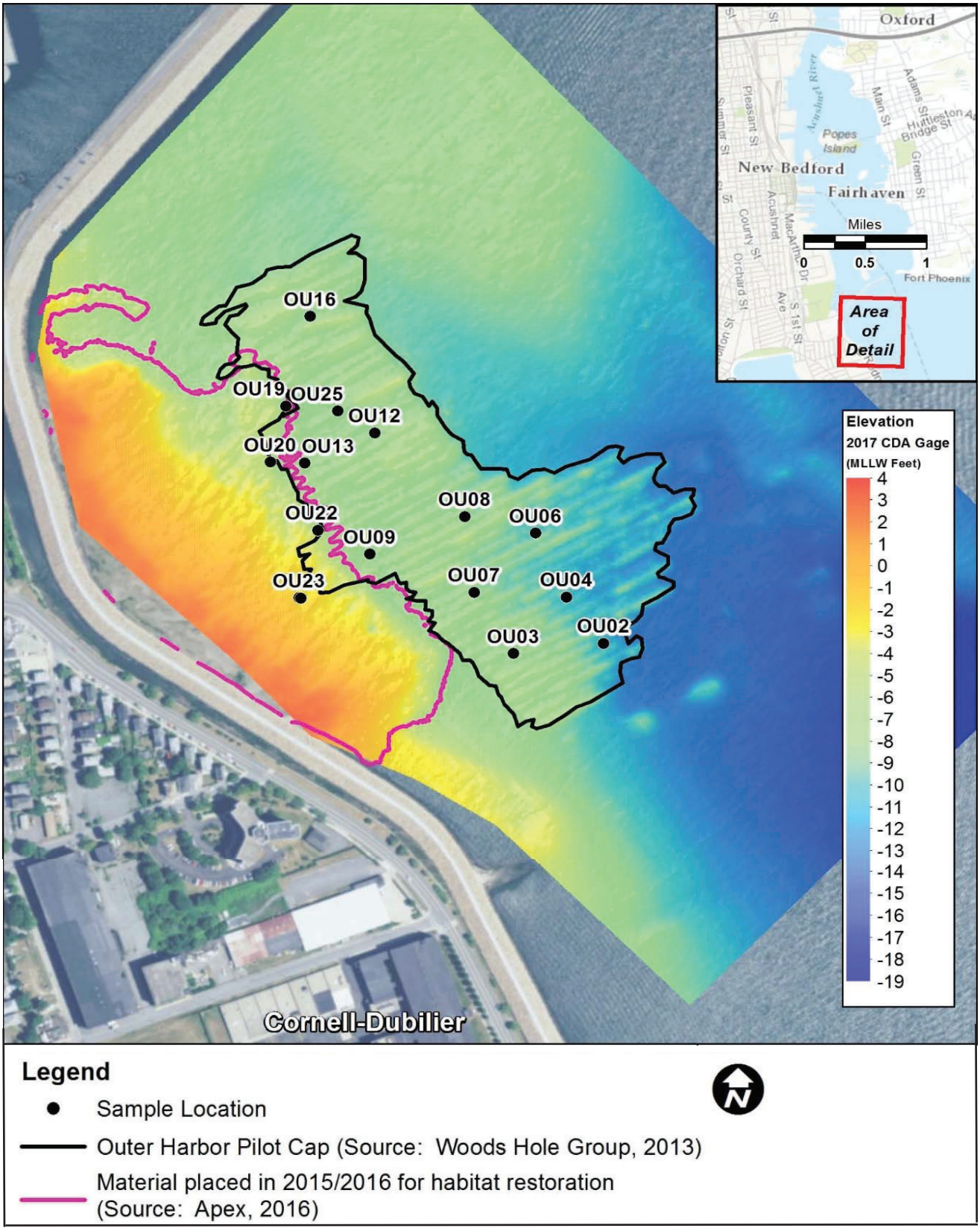
Figure 4

Upper Harbor Interim Capping Locations

Note. The figure above was copied from the 2020 *Draft Final Upper Harbor Interim Caps Long Term Monitoring Plan.*

Figure 5

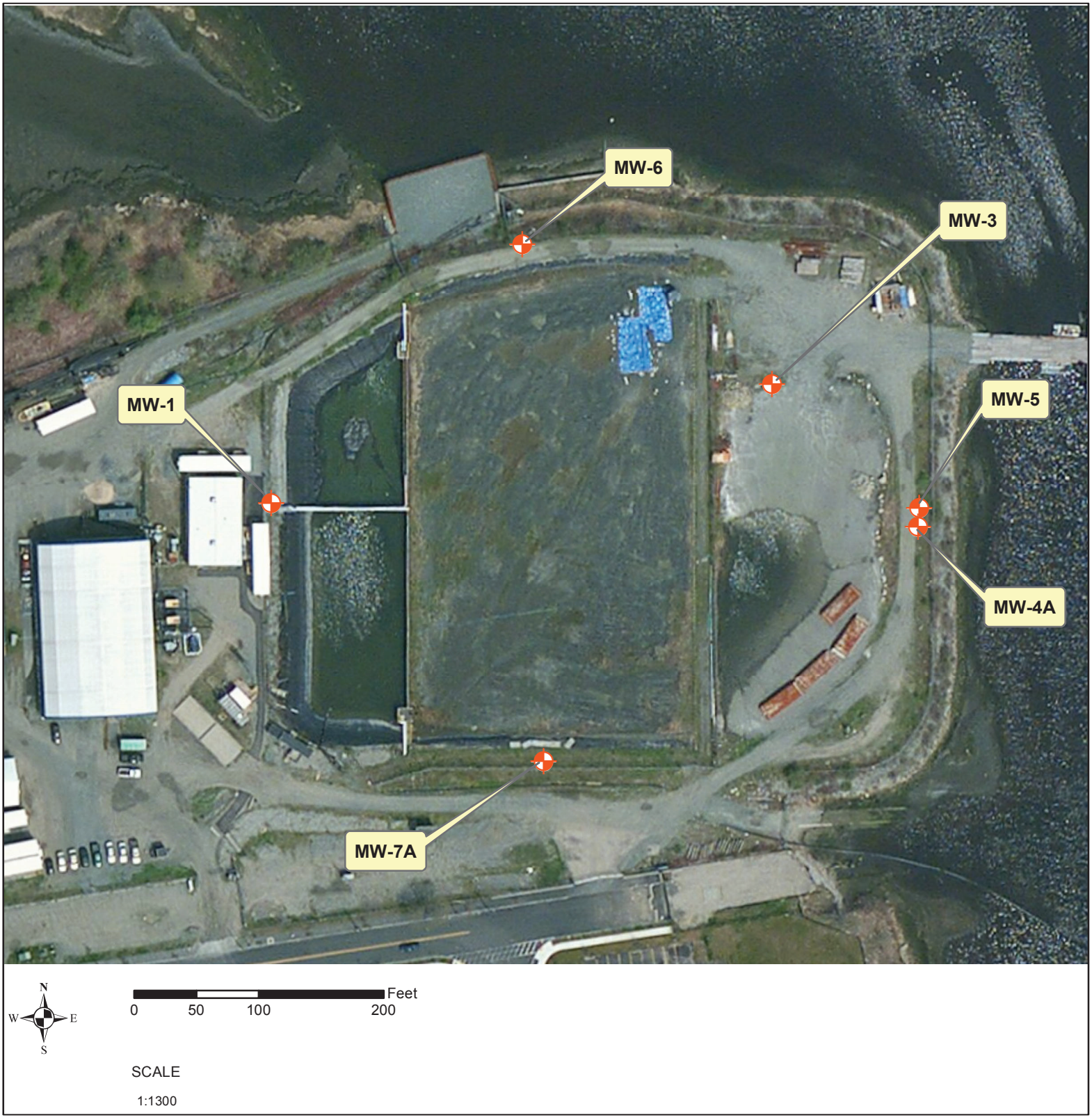
Outer Harbor Pilot Cap Sample Location Map



Note. The figure above was copied from the *2017 Outer Harbor Pilot Cap Sediment Monitoring Summary Report.*

Figure 6

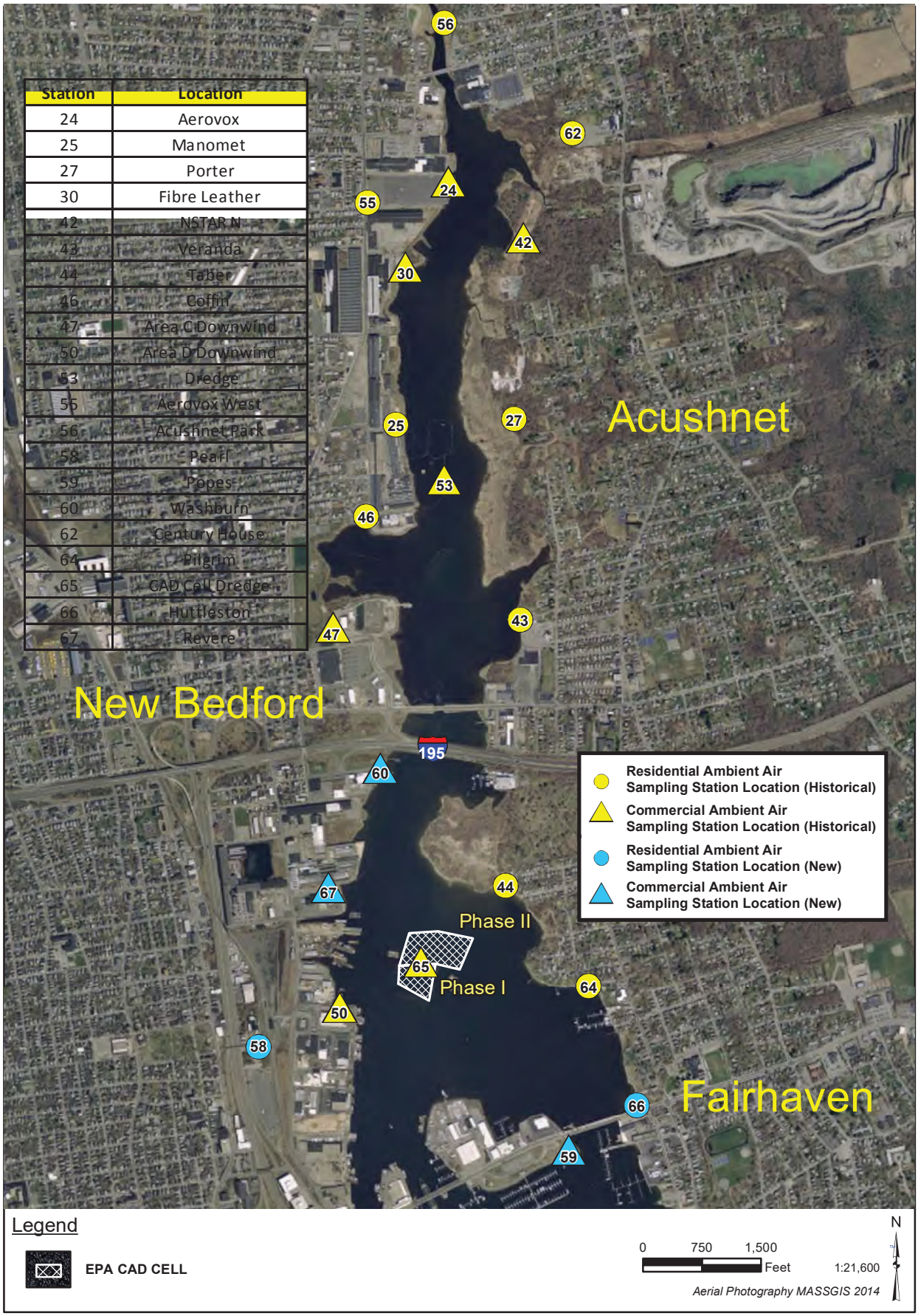
Sawyer Street CDF Groundwater Well Locations Map



Note. The figure above was copied from the 2019 *Draft Final Groundwater Monitoring Field Sampling Plan.*

Figure 7

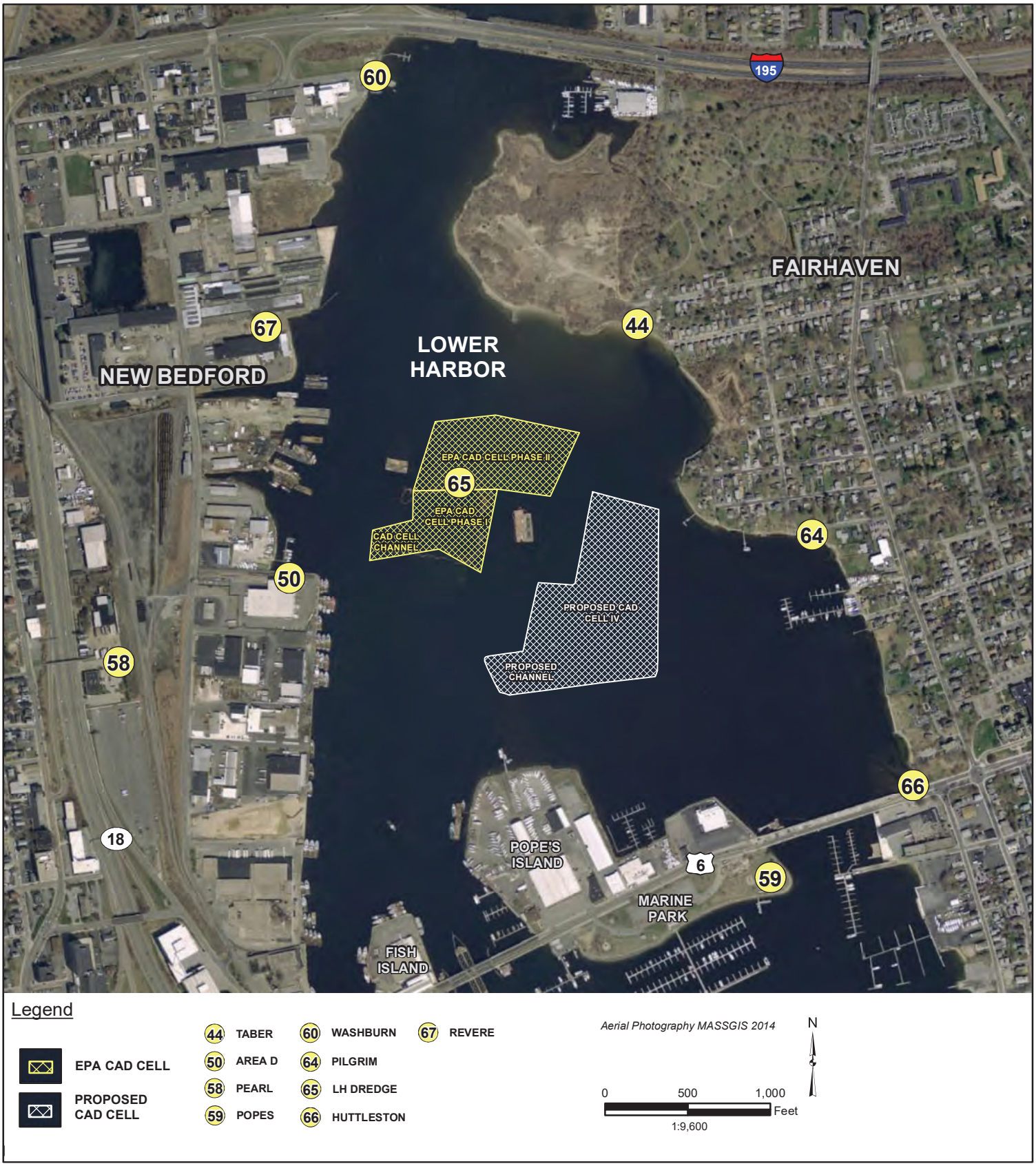
Ambient Air Sampling Station Locations Map



Note. The figure above was copied from the 2020 *Draft Final Ambient Air Monitoring Plan for Remediation Activities*.

Figure 8

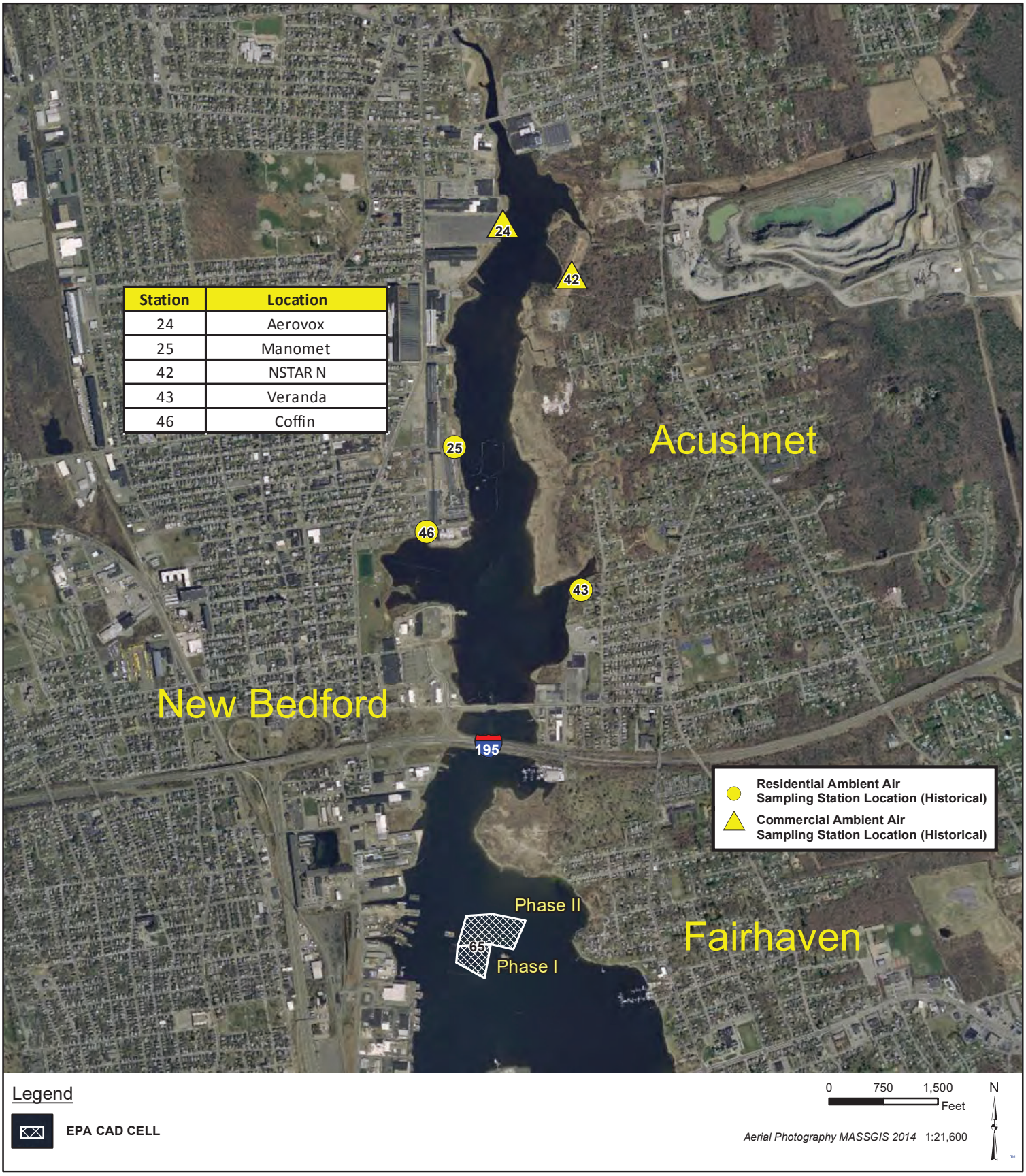
Lower Harbor Ambient Air Sampling Station Locations Map



Note. The figure above was copied from the 2020 *Draft Final Ambient Air Monitoring Plan for Remediation Activities*.

Figure 9

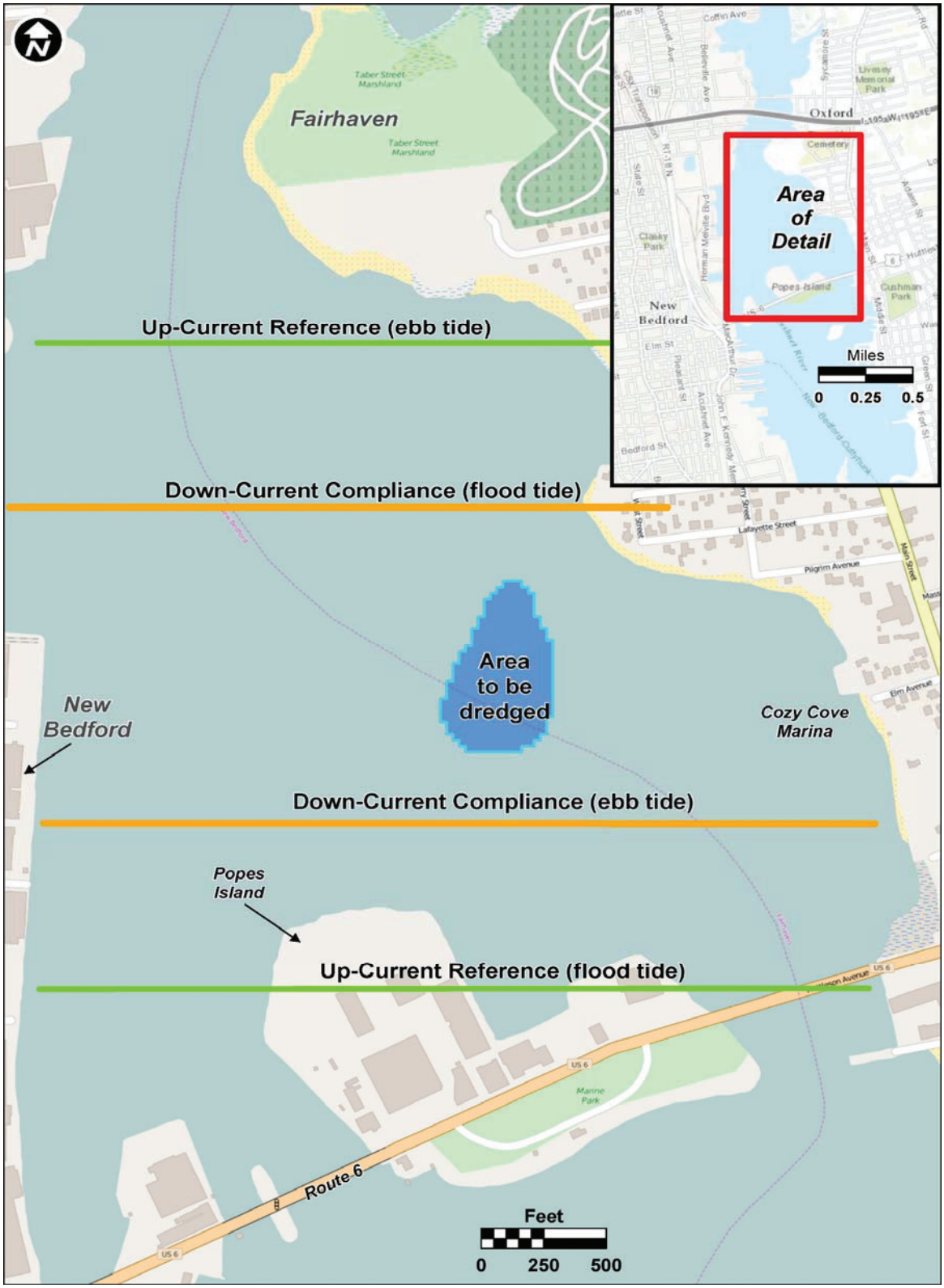
Ambient Air Sampling Locations for Post-Dredging Monitoring Map



Note. The figure above was copied from the 2020 *Draft Final Ambient Air Monitoring Plan for Remediation Activities*.

Figure 10

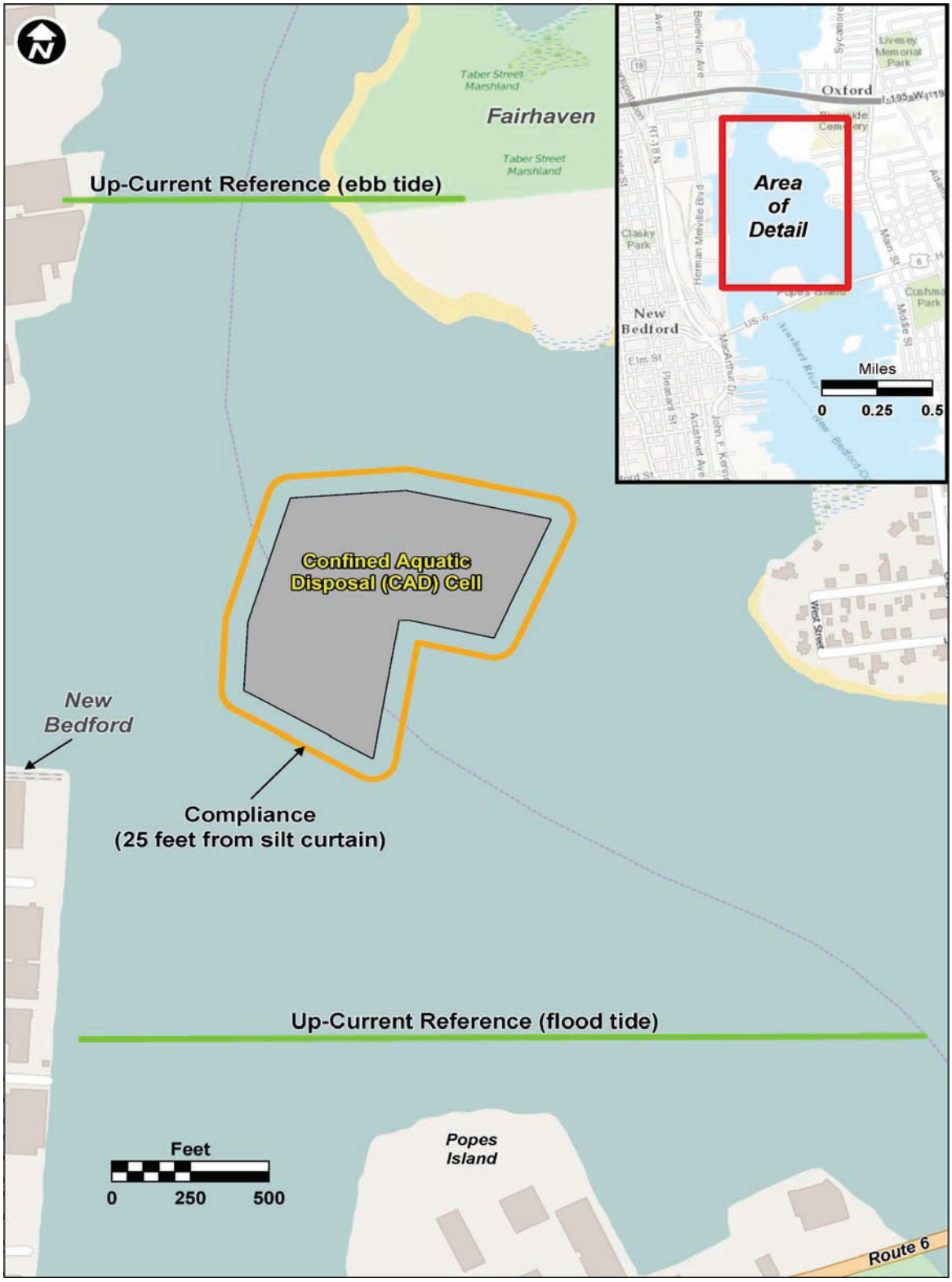
Turbidity Monitoring Near the Dredging Area Map



Note. The figure above was copied from the *Water Quality Monitoring Program - Historical Turbidity Data for the Lower Harbor* document.

Figure 11

Turbidity Monitoring Near the CAD Cell Map

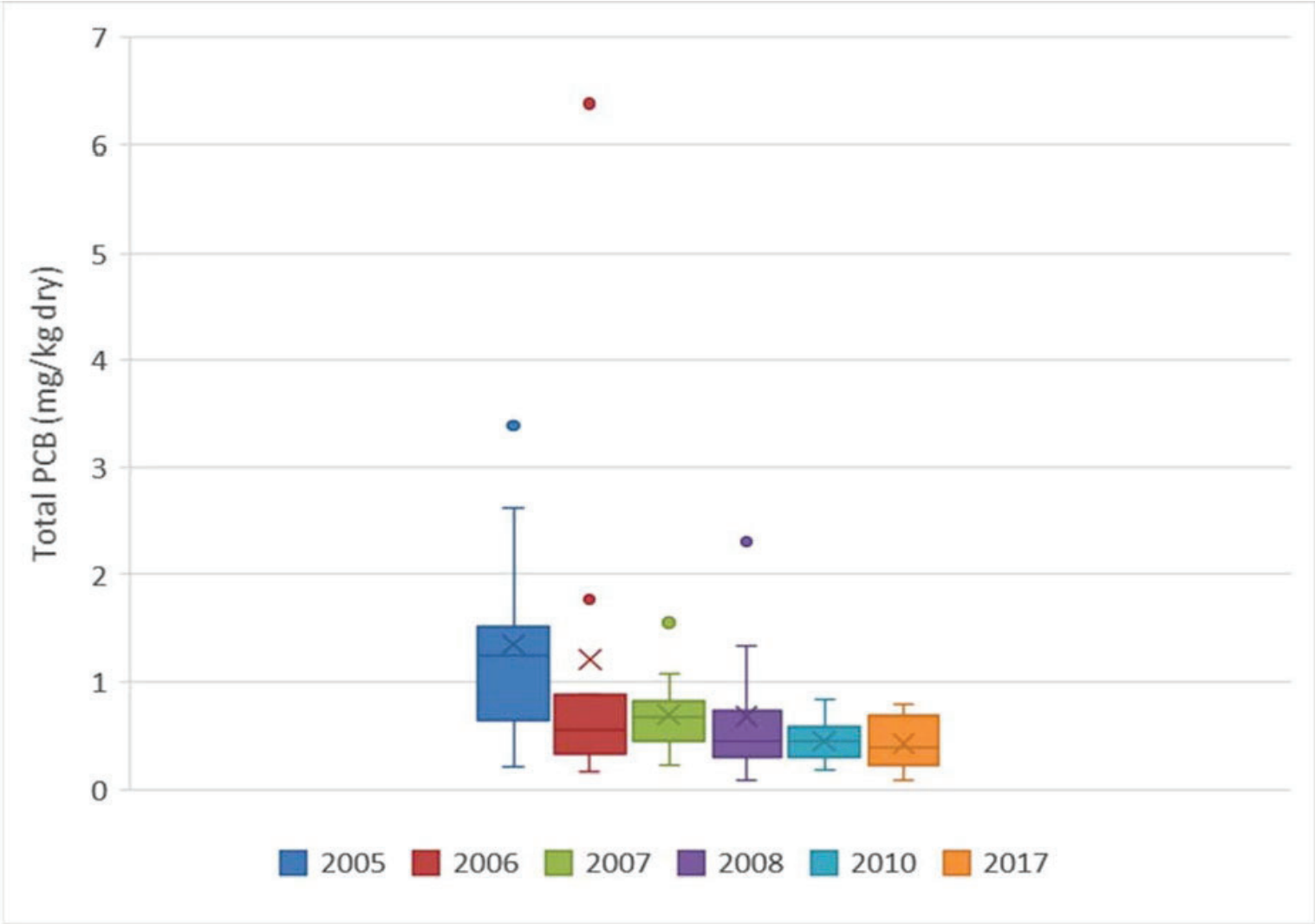


Note. The figure above was copied from the *Water Quality Monitoring Program - Historical Turbidity Data for the Lower Harbor* document.

APPENDIX C: OUTER HARBOR CAP MONITORING DATA

Figure 12

Box Plot of Temporal Trends in NOAA 18 PCB Concentration at Outer Harbor Cap



Note. Top and bottom of the box show the 75th and 25th percentiles; midline of the box shows the 50th percentile; whiskers show the minimum and maximum values (excluding outliers); the circles are possible outliers; the "x" illustrates the mean.

APPENDIX D: SEAFOOD MONITORING PROGRAM

Figure 13
Mussel Deployments at Coggeshall Street

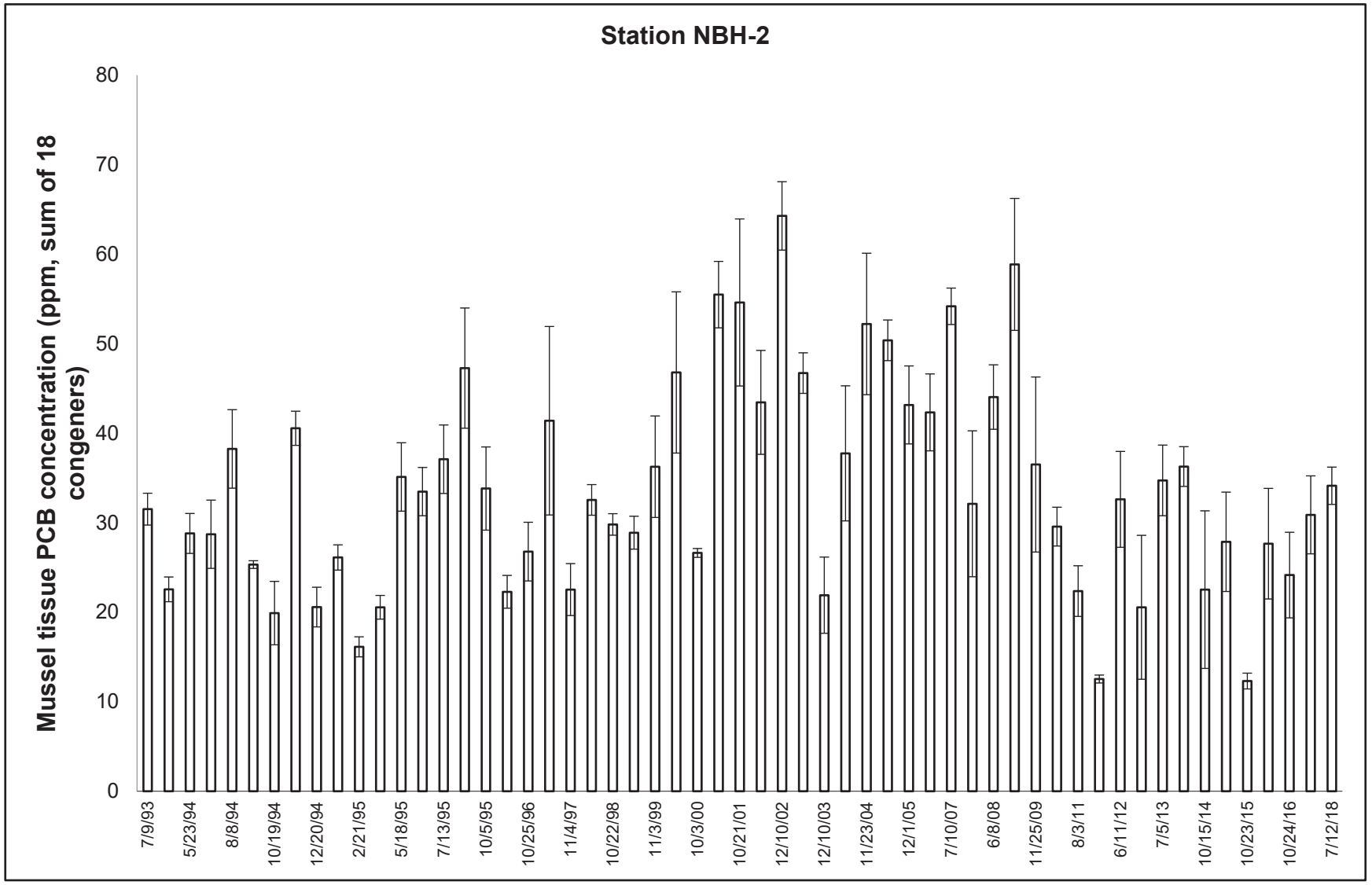


Figure 14
Mussel Deployment at the Hurricane Barrier

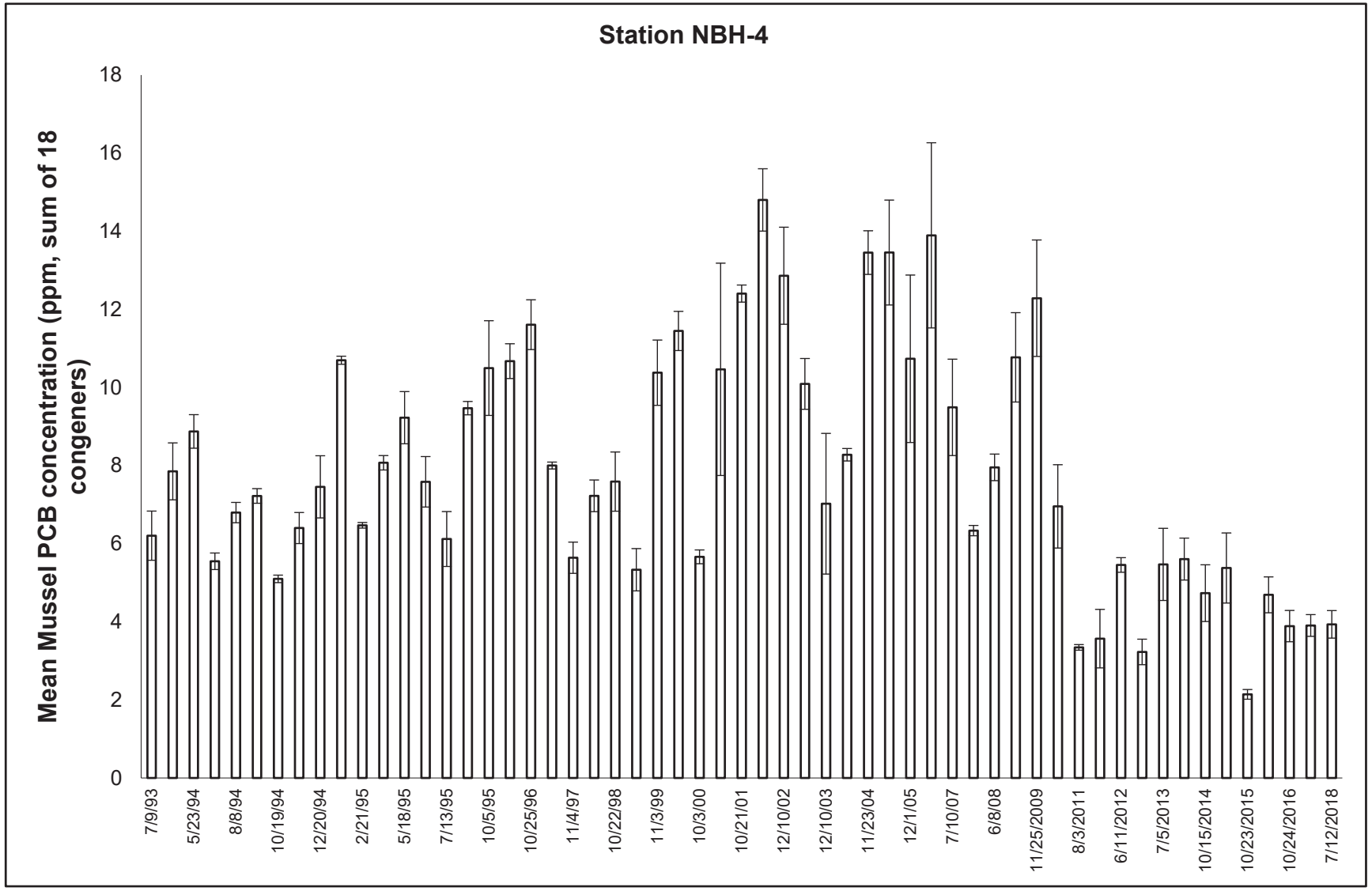


Figure 15
Mussel Deployment at the Control Site on West Island

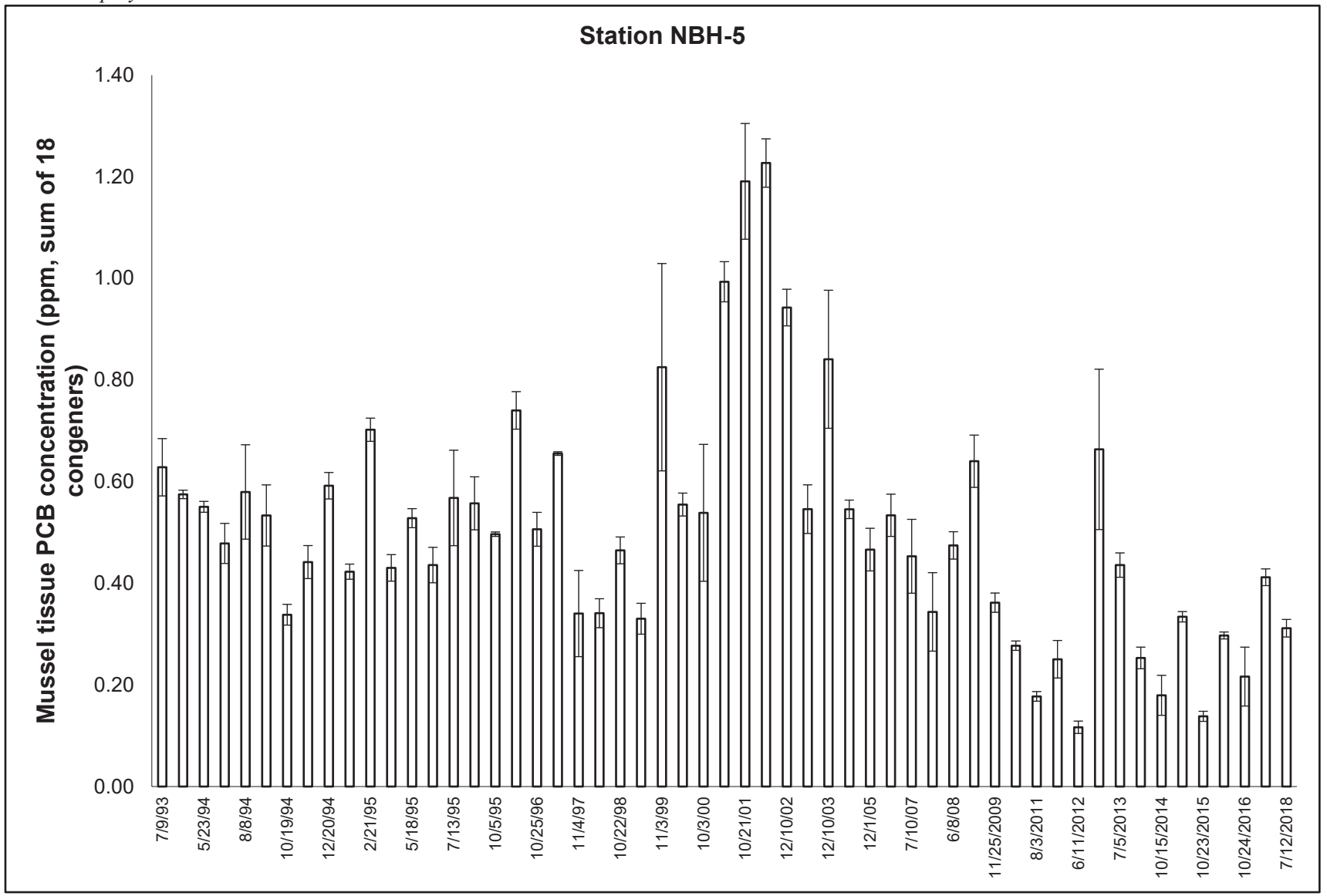
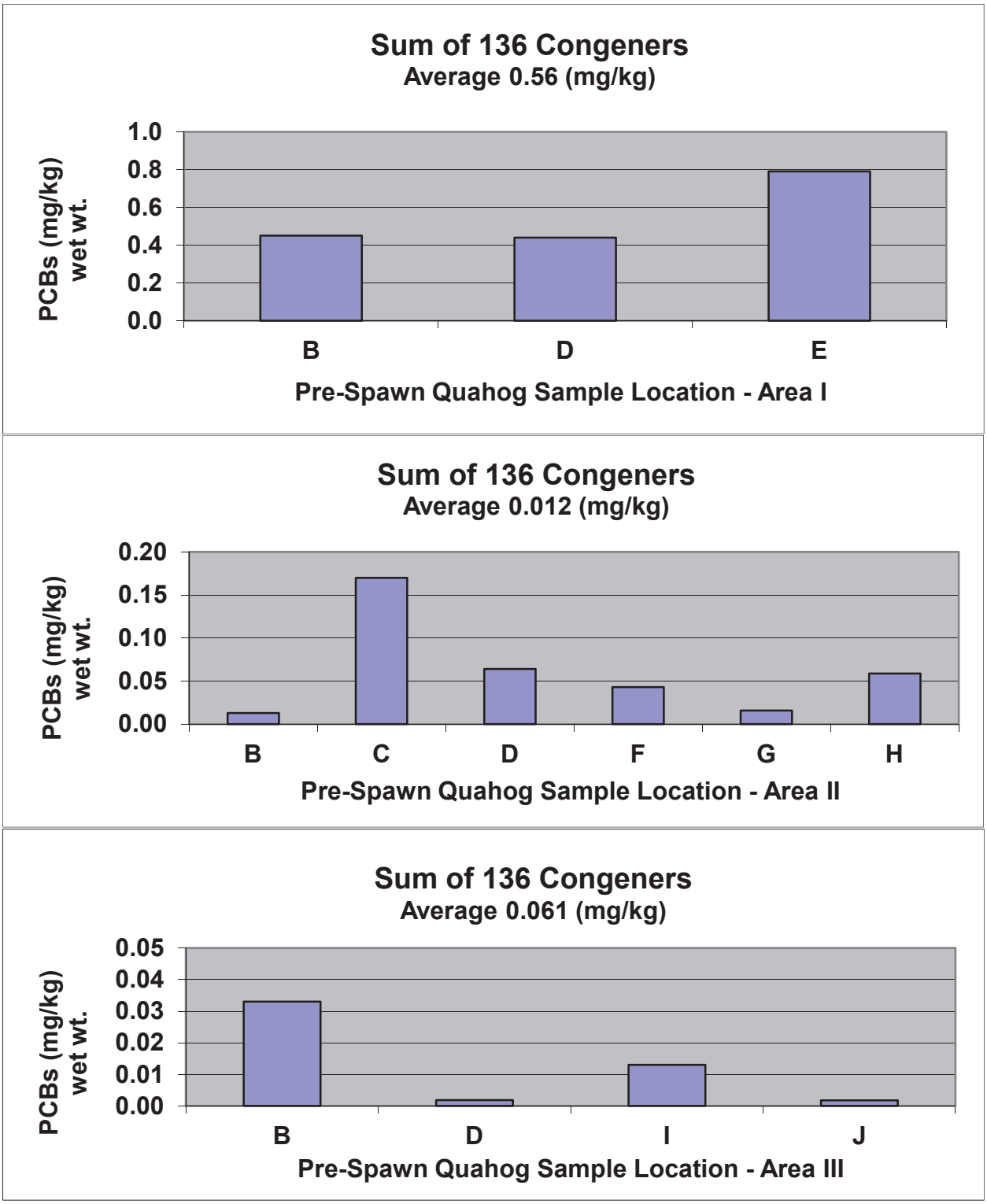


Figure 16

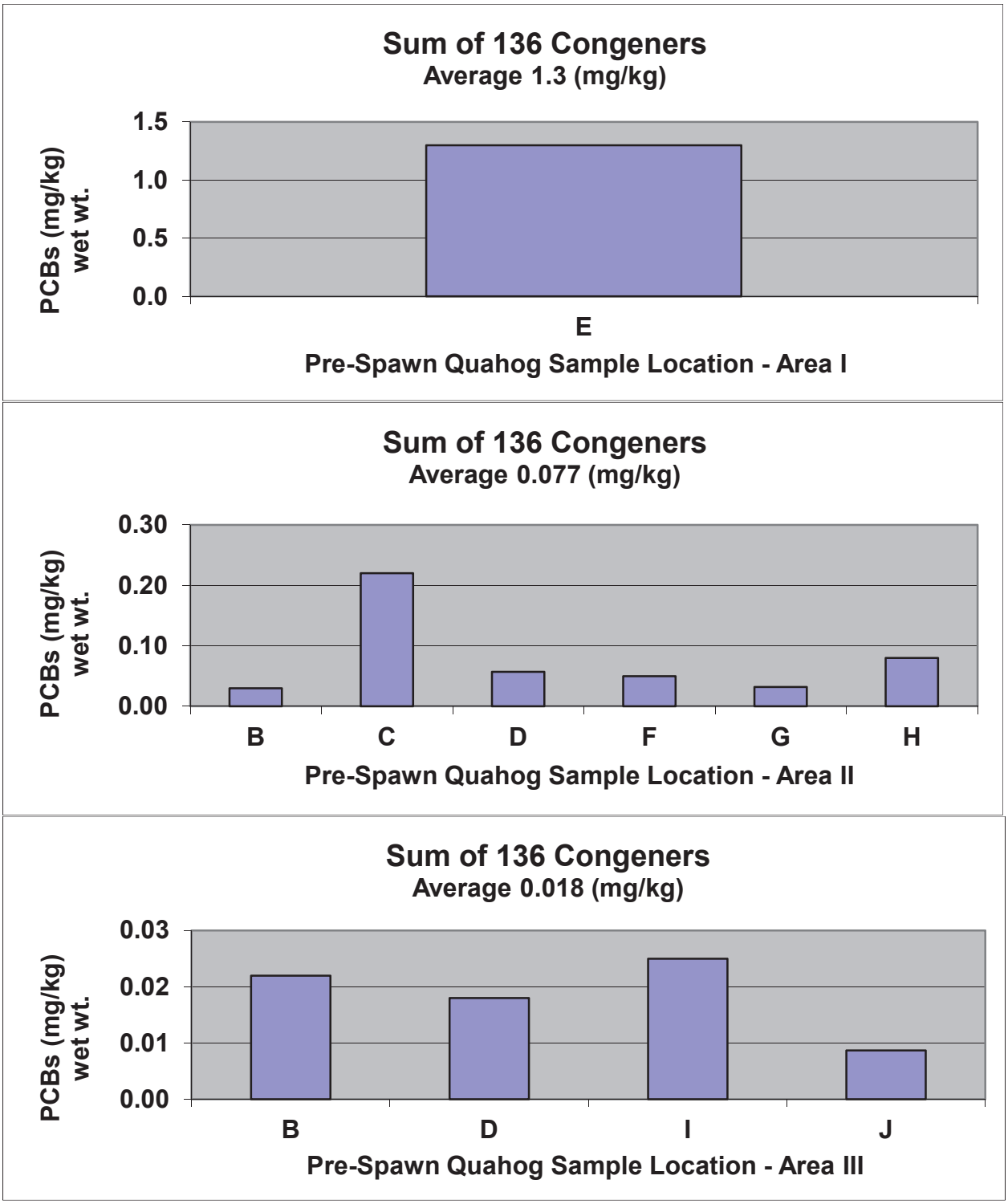
PCB Concentrations in Pre-Spawn Quahog Areas I to III - 2015



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2015 from the New Bedford Harbor Superfund Site.*

Figure 17

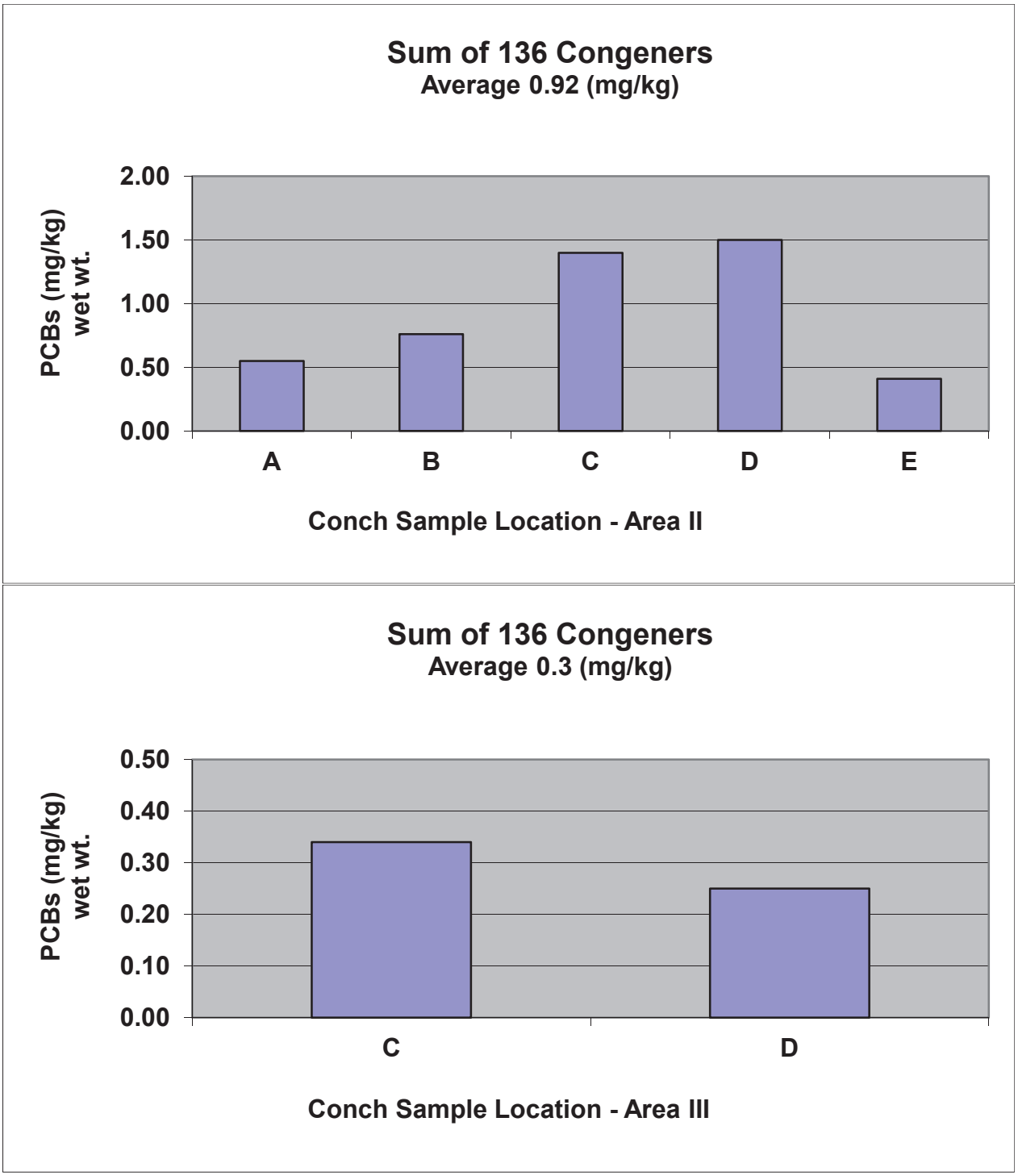
PCB Concentrations in Pre-Spawn Quahog Areas I to III - 2016



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2016 from the New Bedford Harbor Superfund Site.*

Figure 18

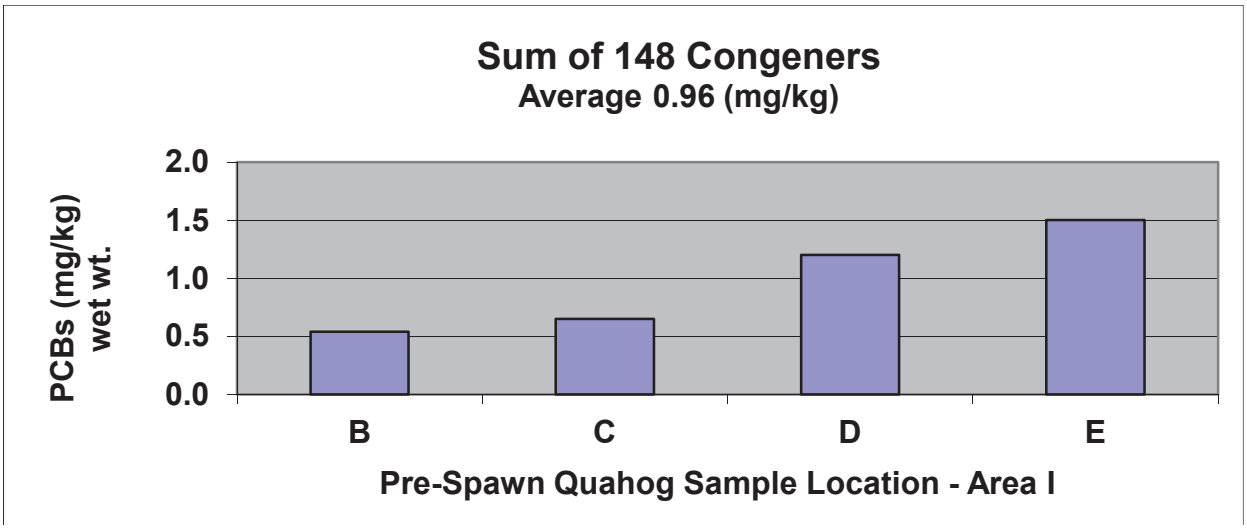
PCB Concentrations in Conch Areas II and III - 2016

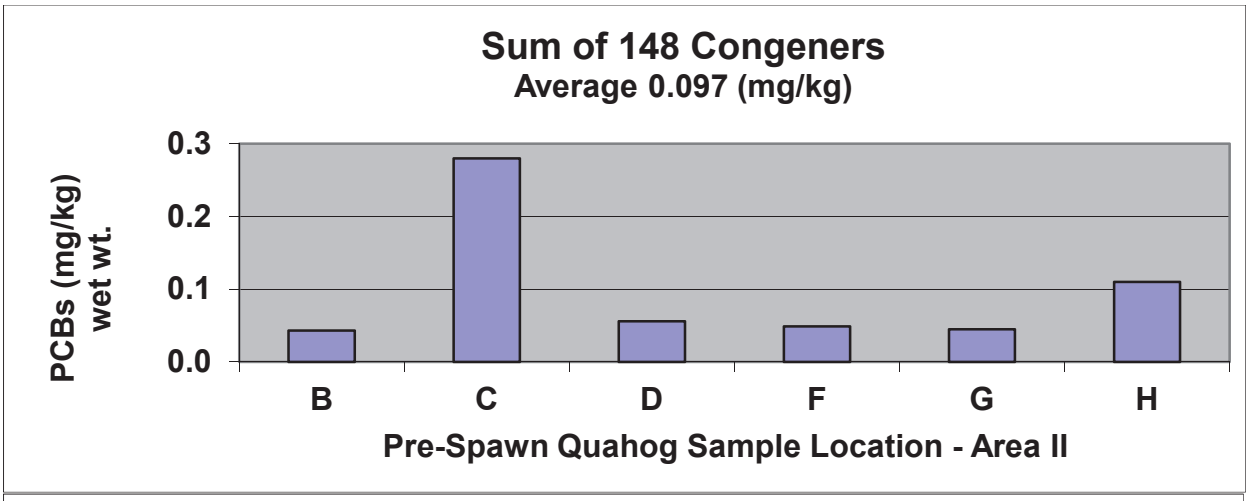


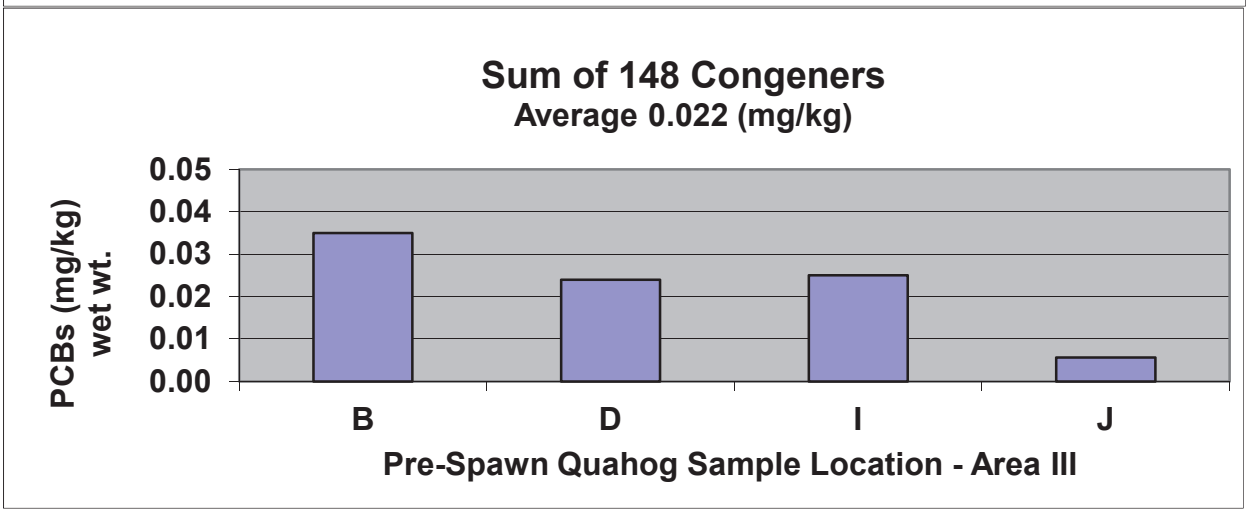
Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2016 from the New Bedford Harbor Superfund Site*.

Figure 19

PCB Concentrations in Pre-Spawn Quahog Areas I to III - 2017



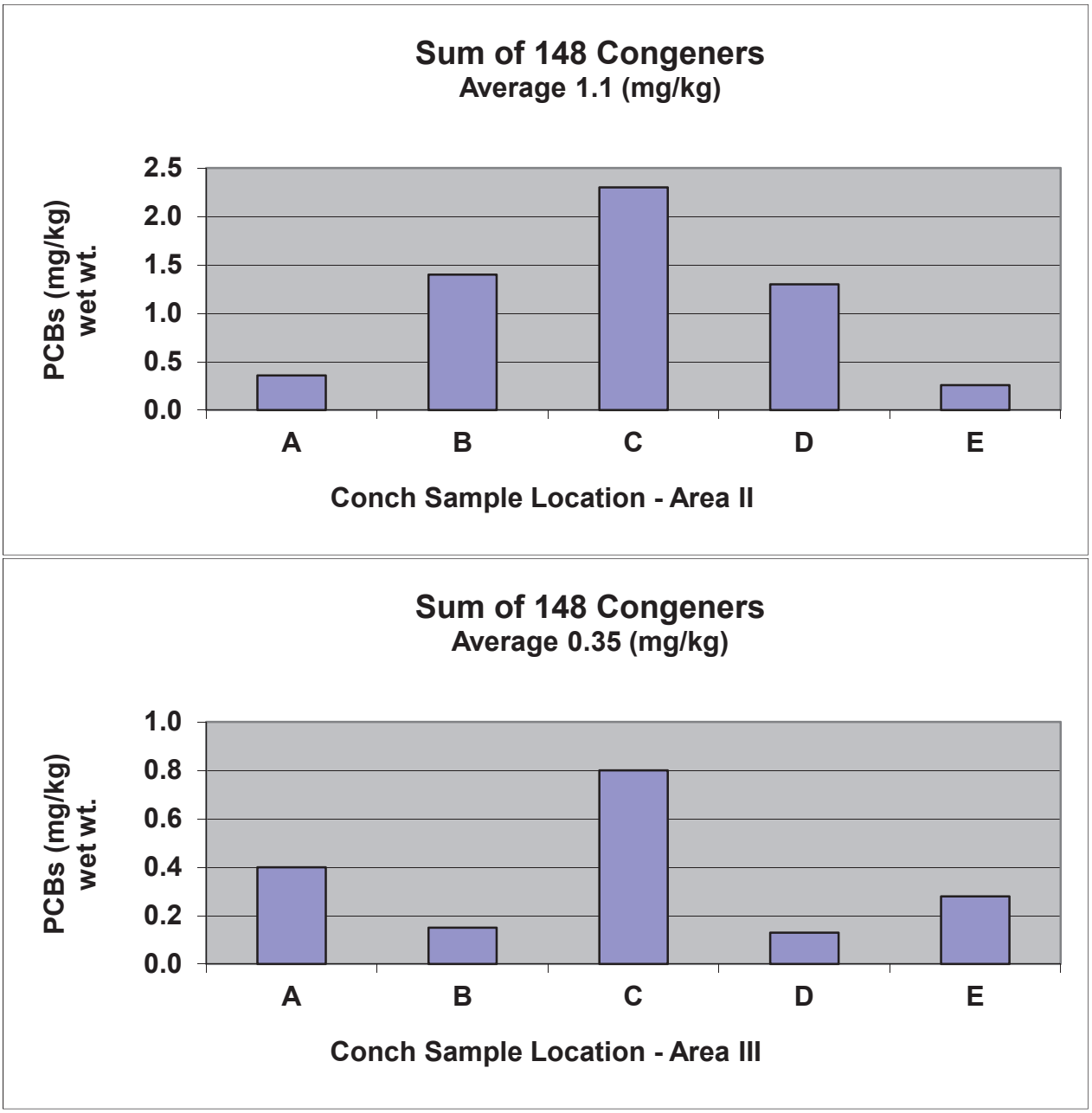




Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2017 from the New Bedford Harbor Superfund Site*.

Figure 20

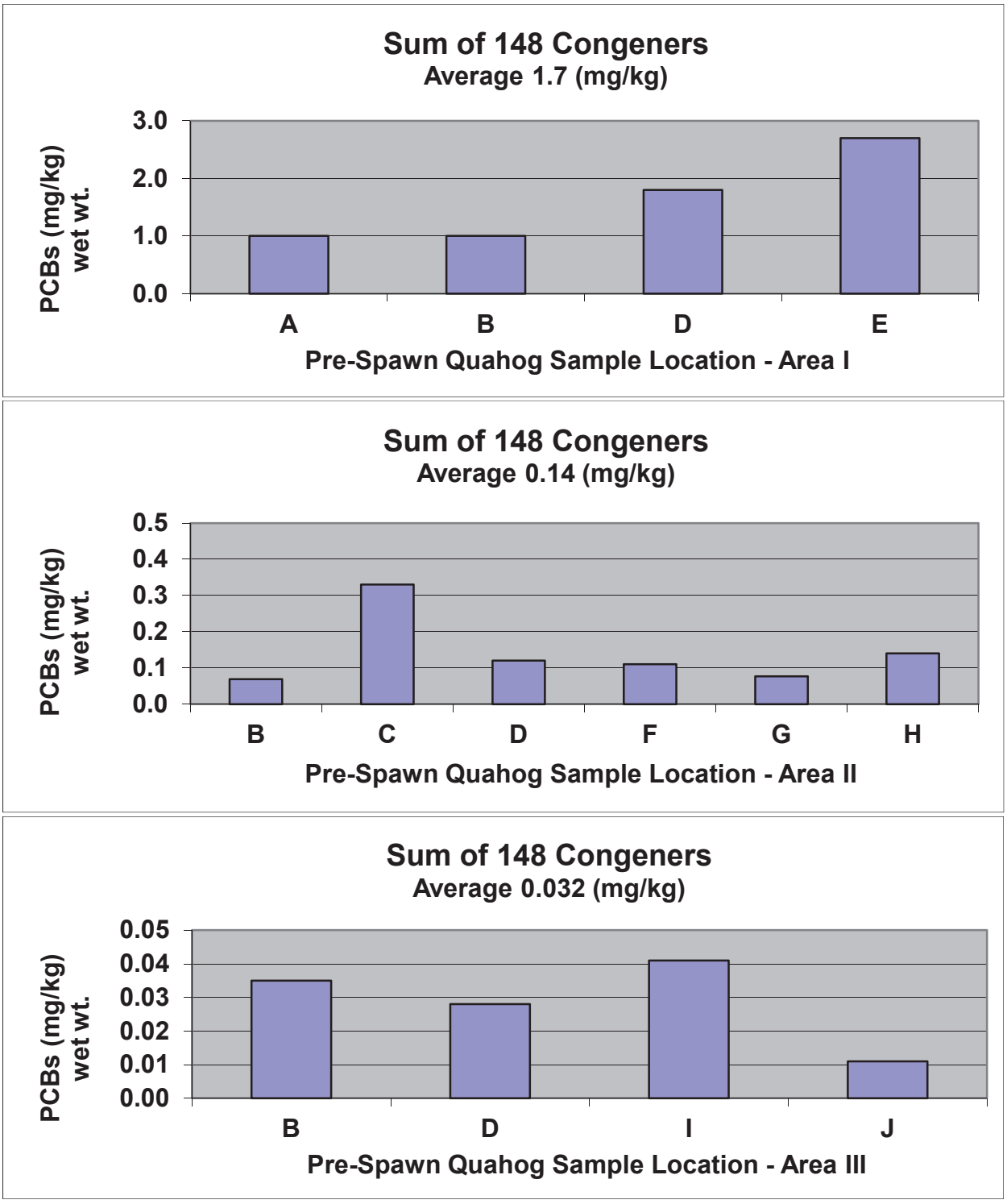
PCBs Concentrations in Conch Areas II & III - 2017



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2017 from the New Bedford Harbor Superfund Site*.

Figure 21

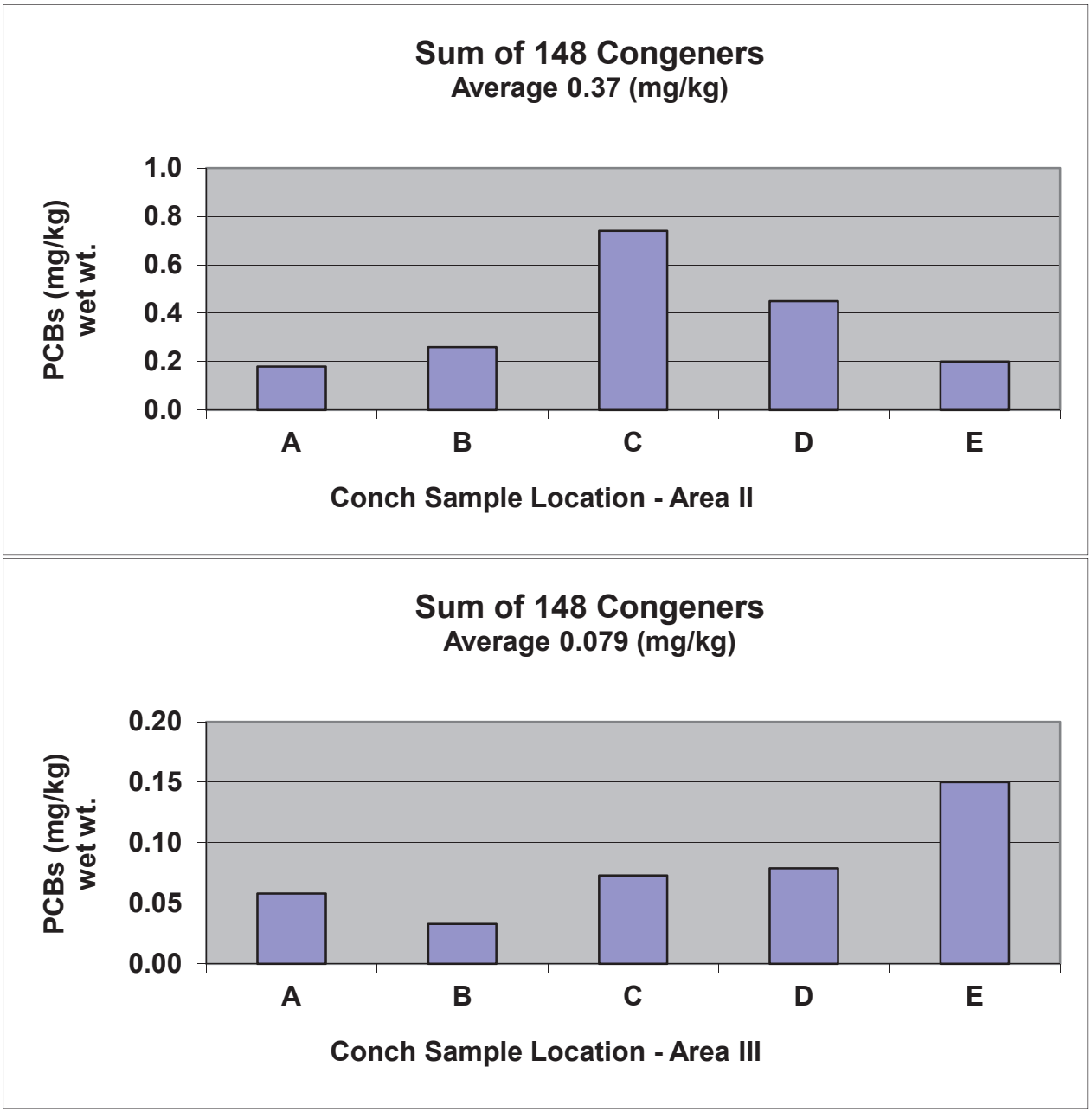
PCB Concentrations in Pre-Spawn Quahog Areas I to III - 2018



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2018 from the New Bedford Harbor Superfund Site.*

Figure 22

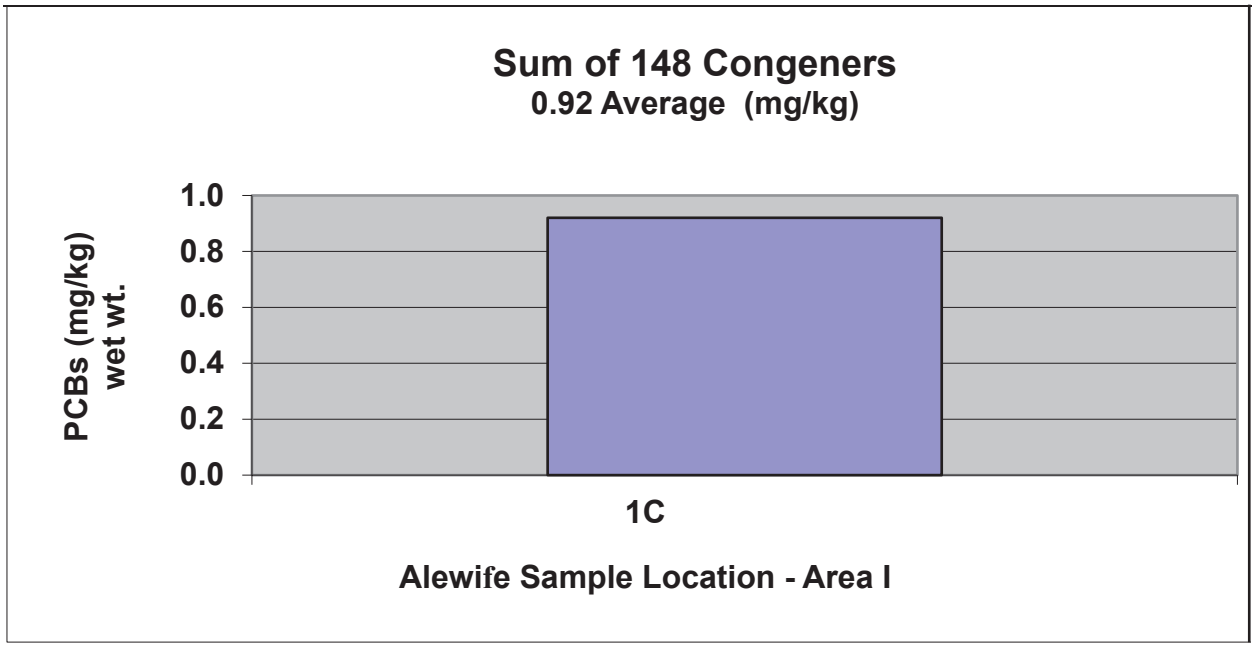
PCB Concentrations in Conch Areas II & III - 2018



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2017 from the New Bedford Harbor Superfund Site*.

Figure 23

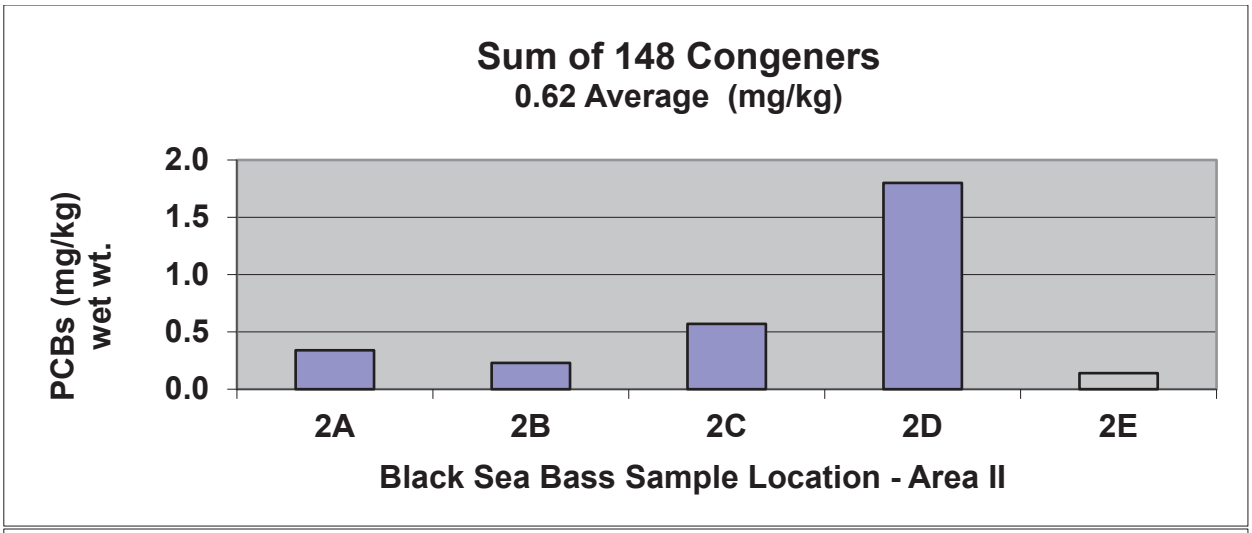
PCB Concentrations in Alewife Area I - 2019

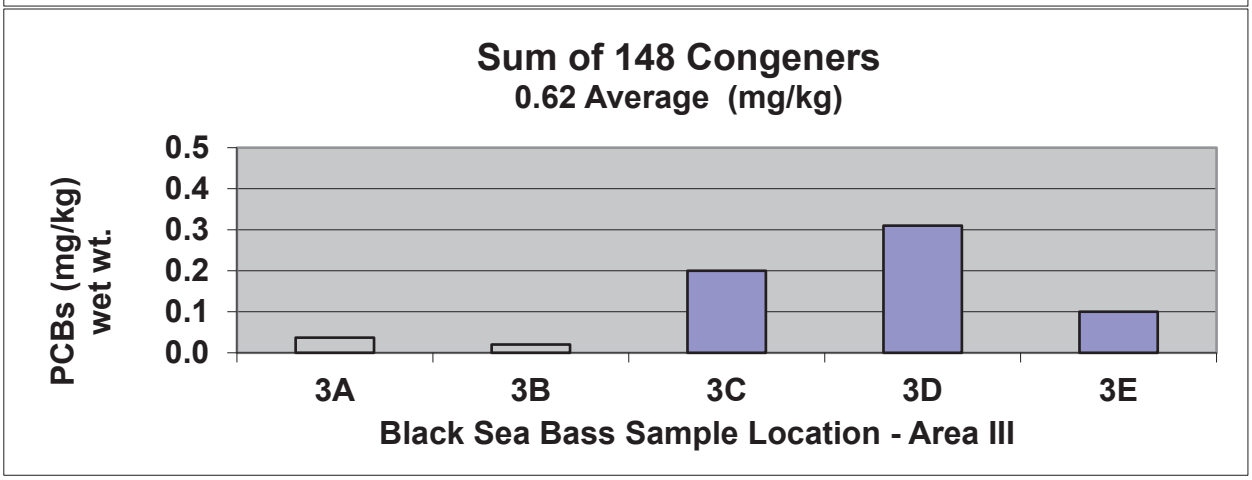


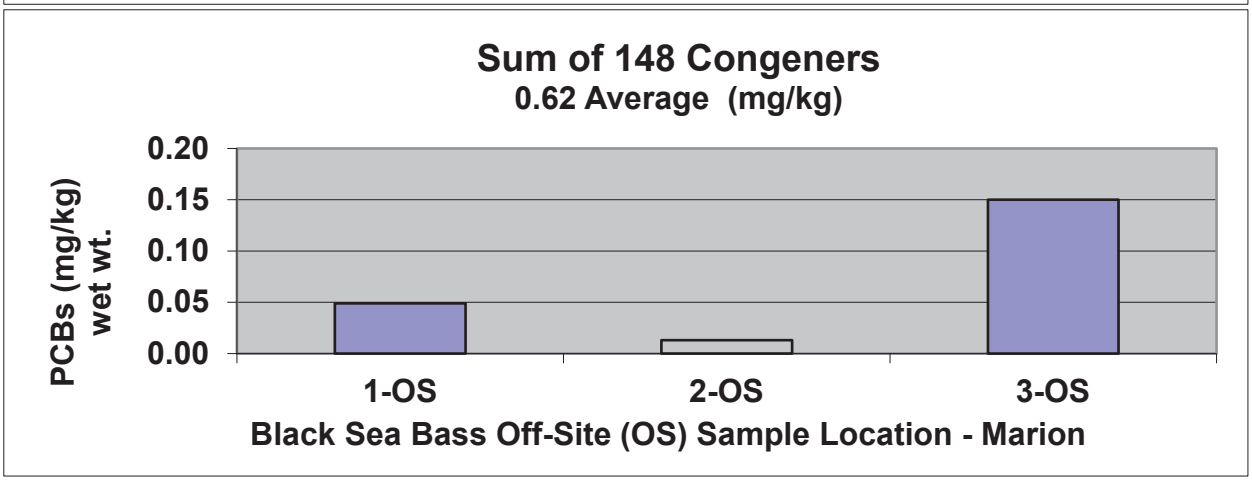
Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graph above was copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

Figure 24

PCB Concentrations in Black Sea Bass Areas II, III & Off-Site - 2019



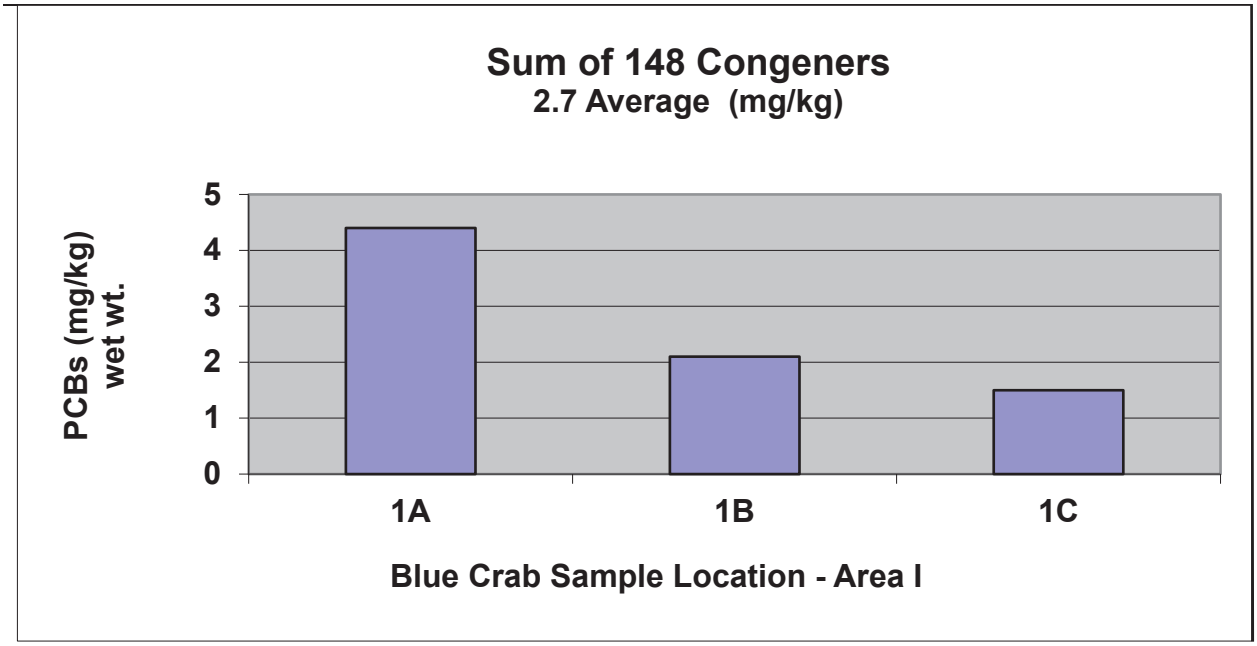




Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

Figure 25

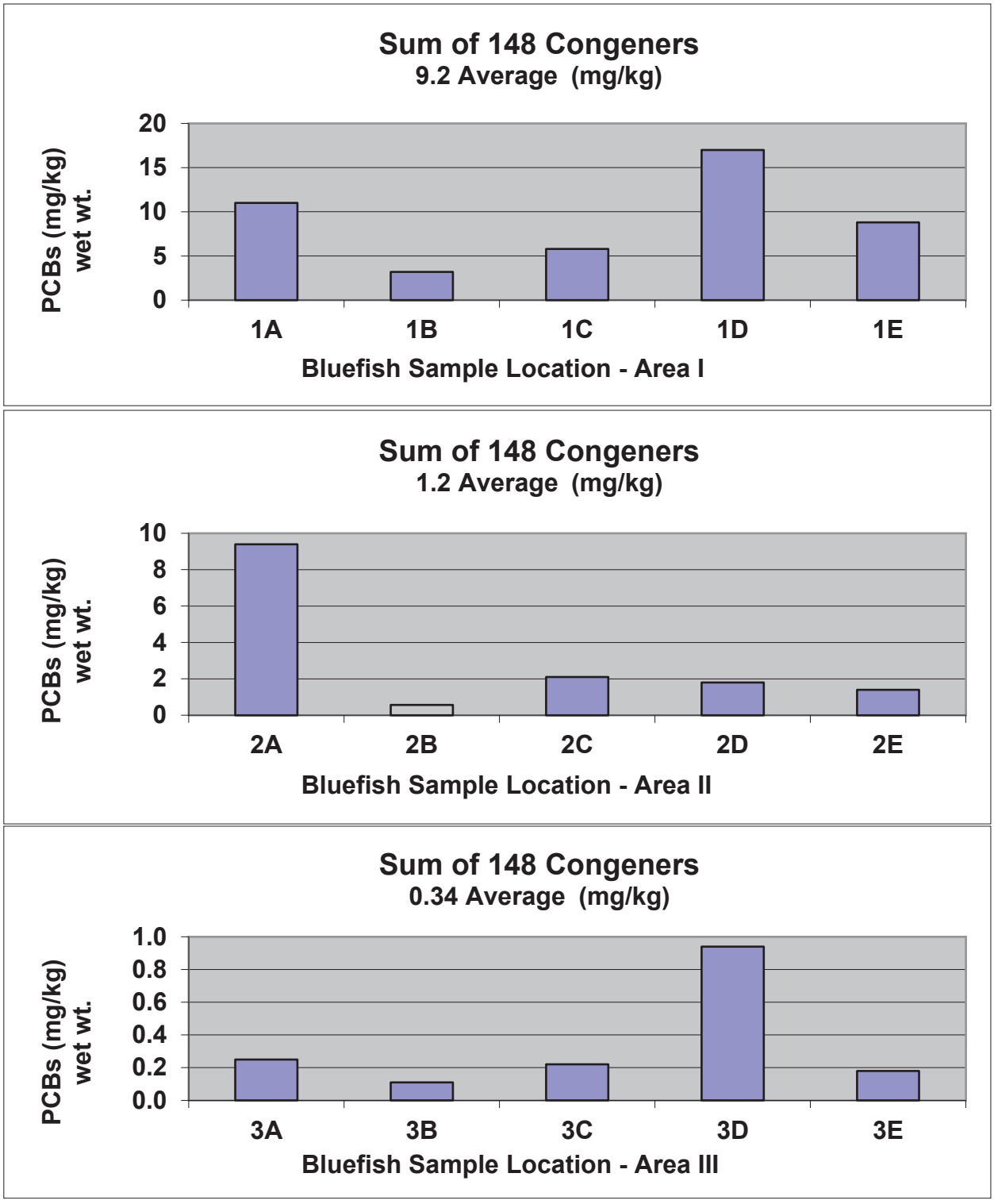
PCB Concentrations in Blue Crab Area I - 2019



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graph above was copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site*.

Figure 26

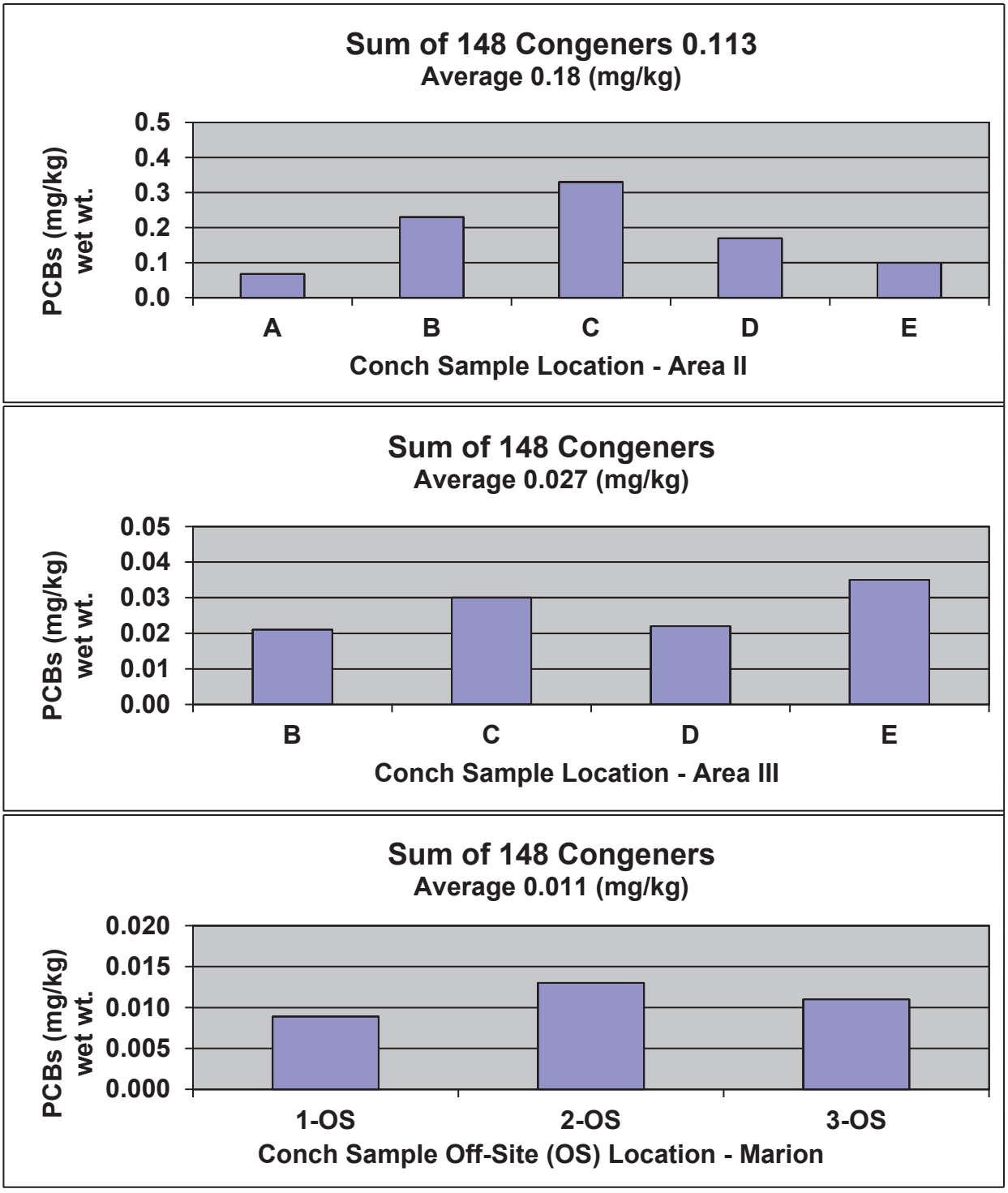
PCB Concentrations in Bluefish Areas I to III - 2019



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

Figure 27

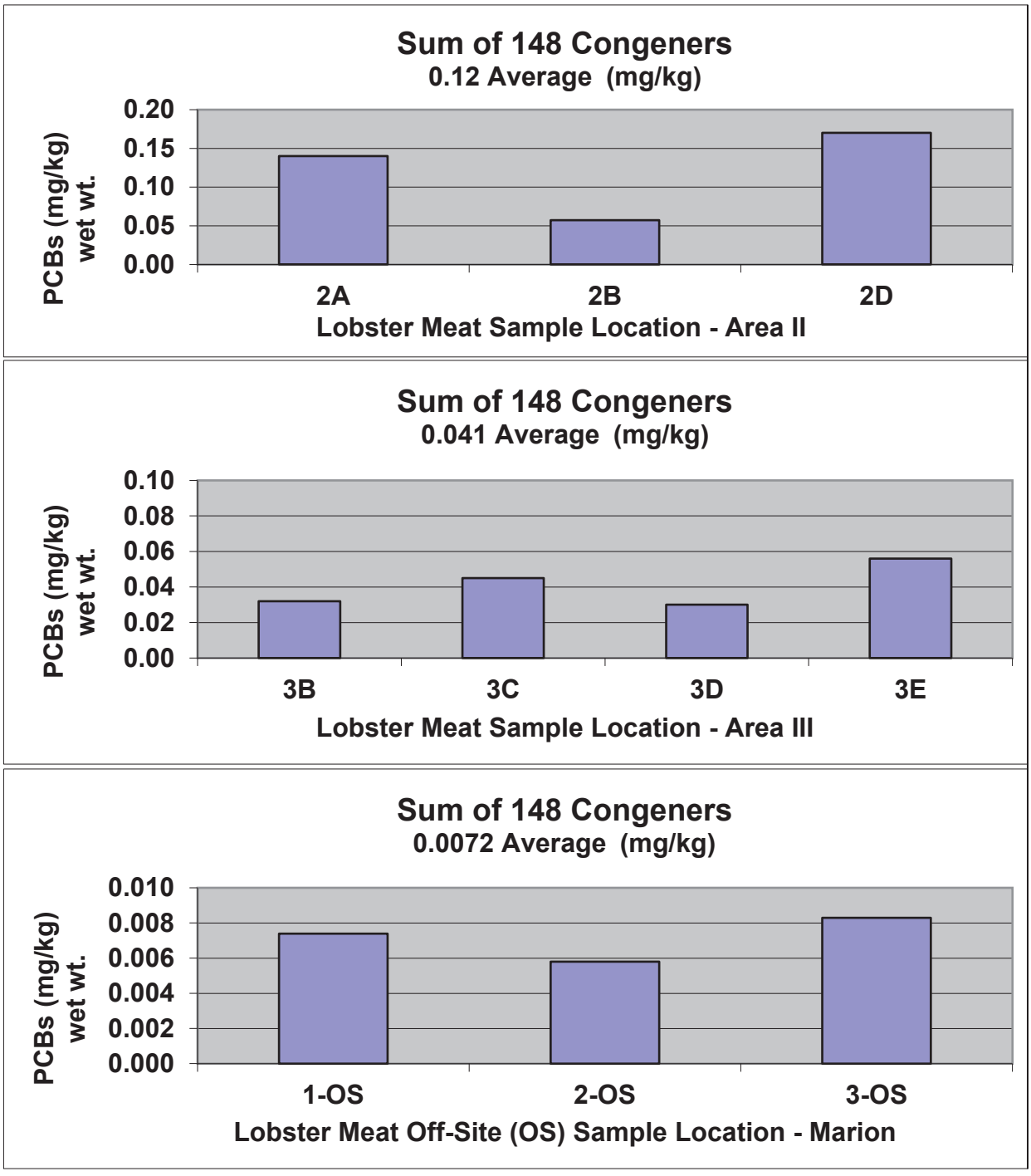
PCB Concentrations in Conch Areas II, III & Off-Site - 2019



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

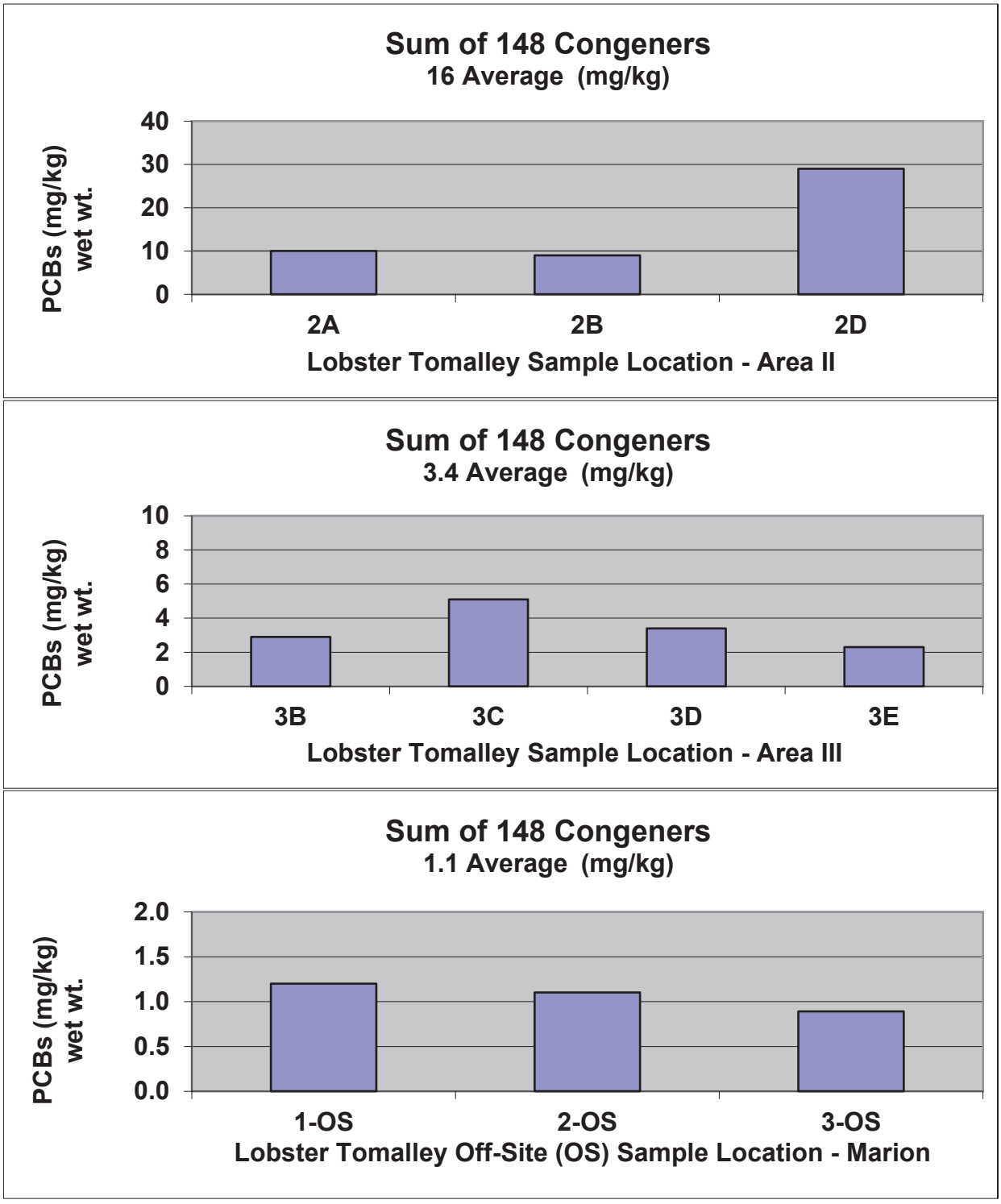
Figure 28

PCB Concentrations in Lobster Areas II, III & Off-Site - 2019



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

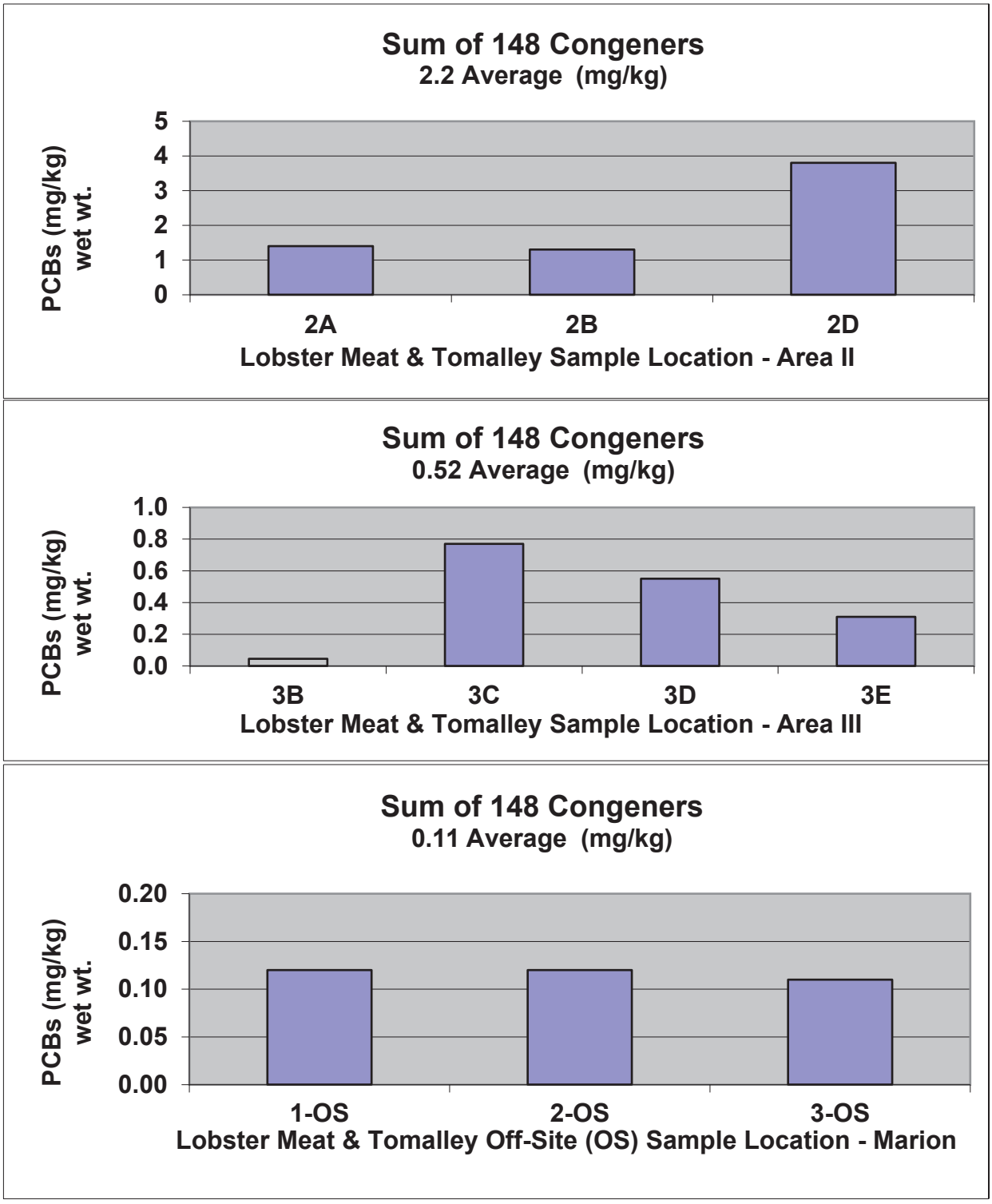
Figure 29
PCB Concentrations in Lobster Tomalley Areas II, III & Off-Site - 2019



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

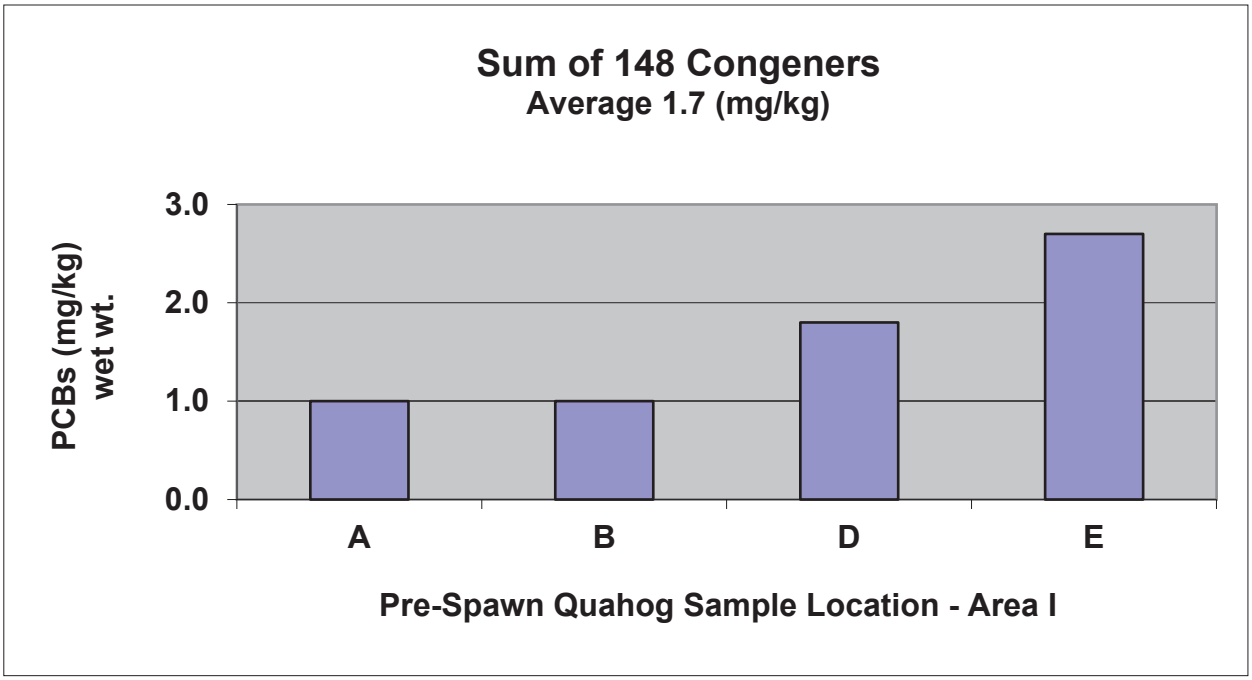
Figure 30

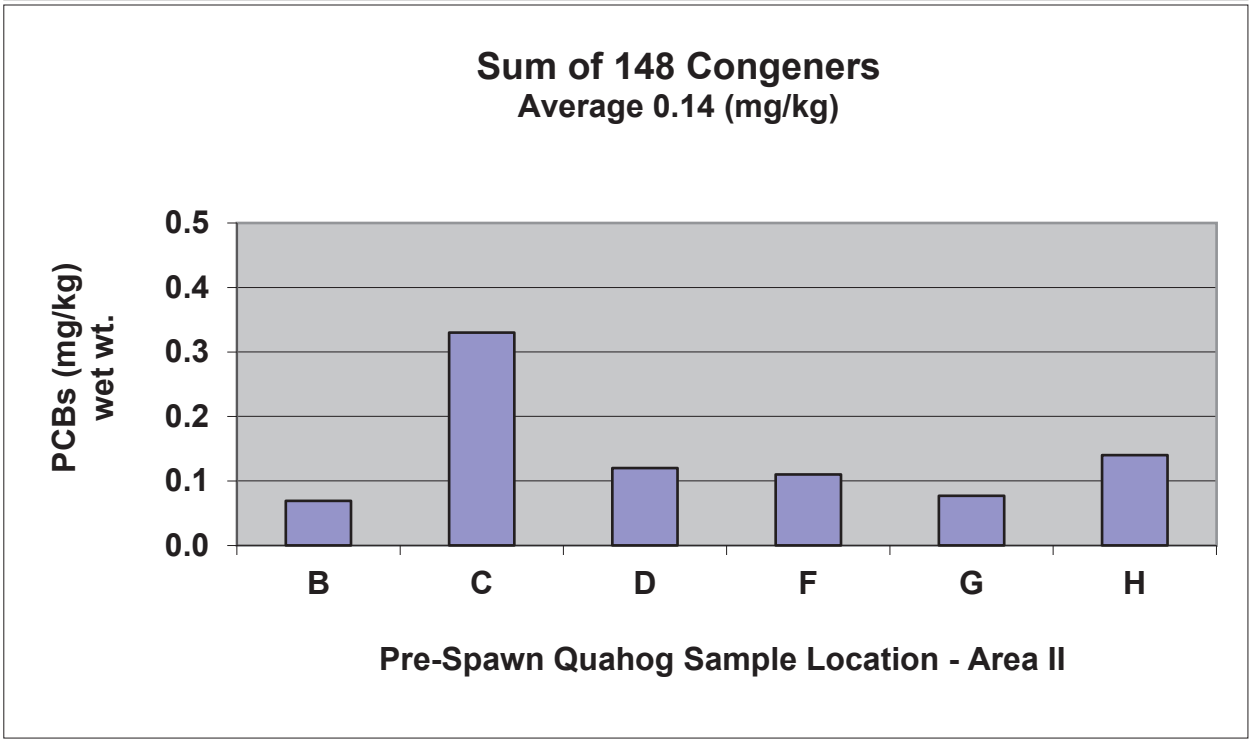
PCB Concentrations in Lobster Meat & Tomalley Areas II, III & Off-Site - 2019



Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

Figure 31
PCB Concentrations in Pre-Spawn Quahog Areas I & II - 2019

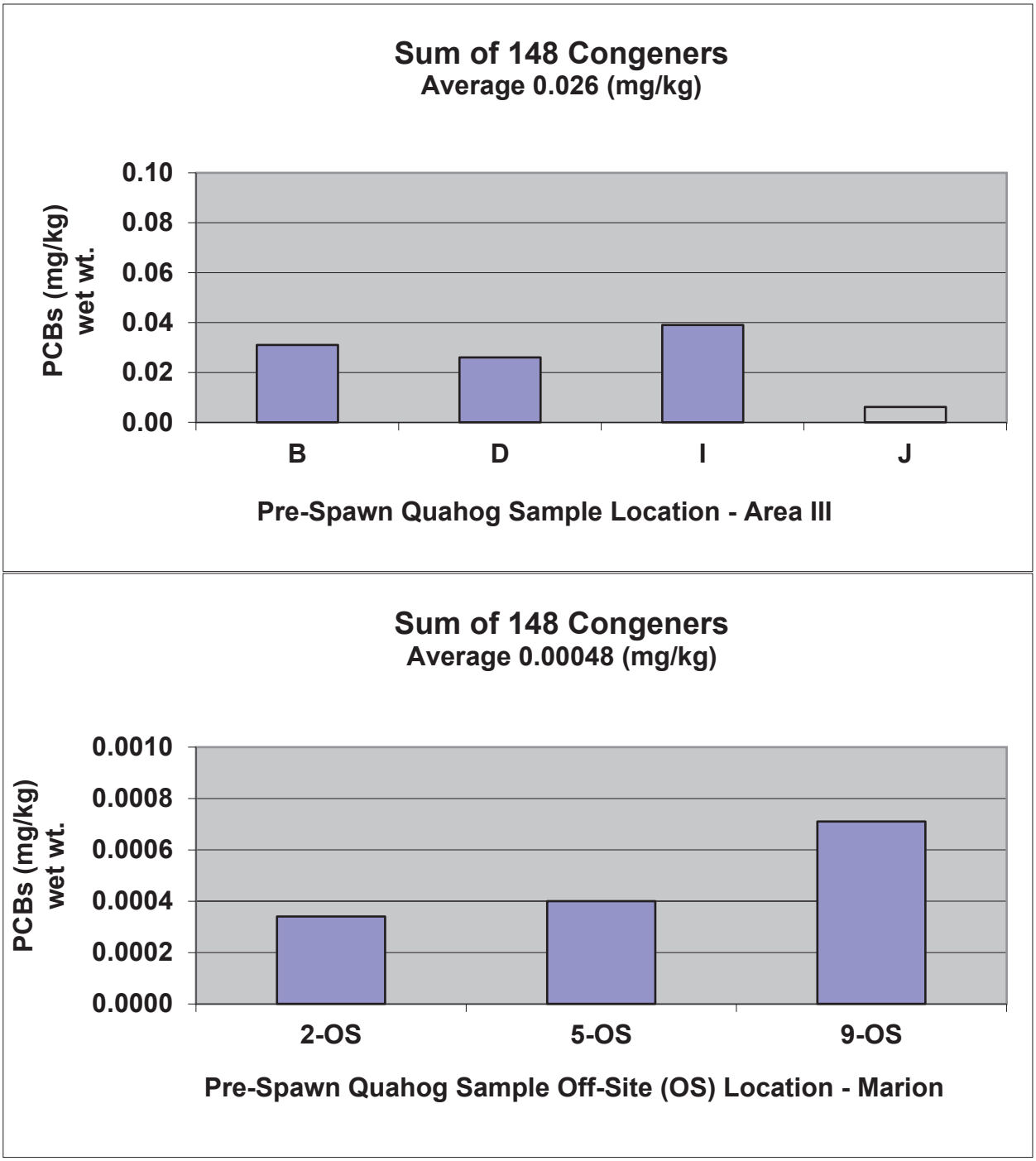




Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

Figure 32

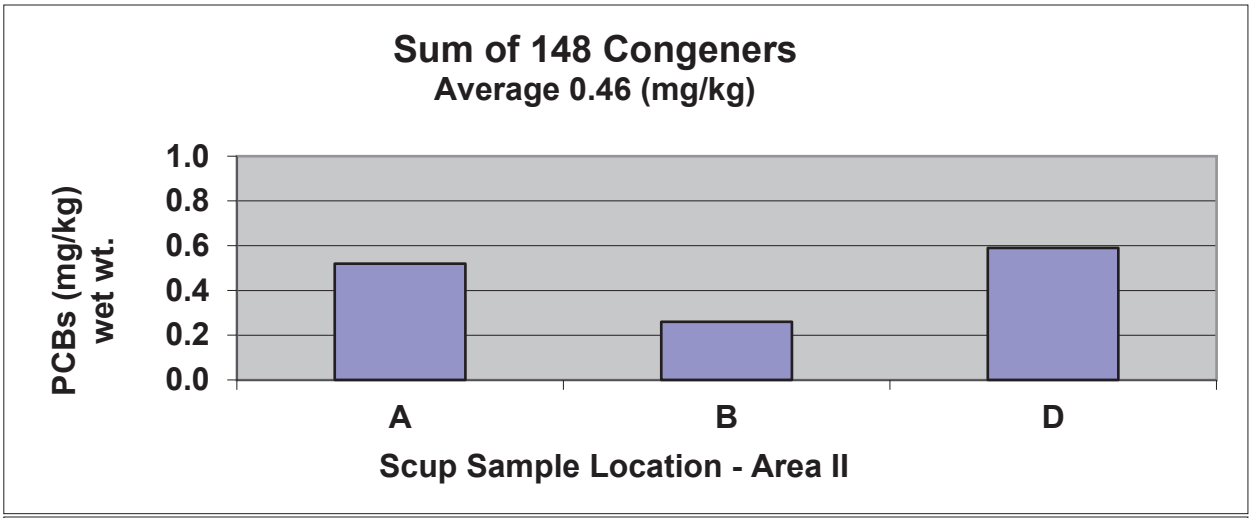
PCB Concentrations in Pre-Spawn Quahog Areas III & Off-Site - 2019

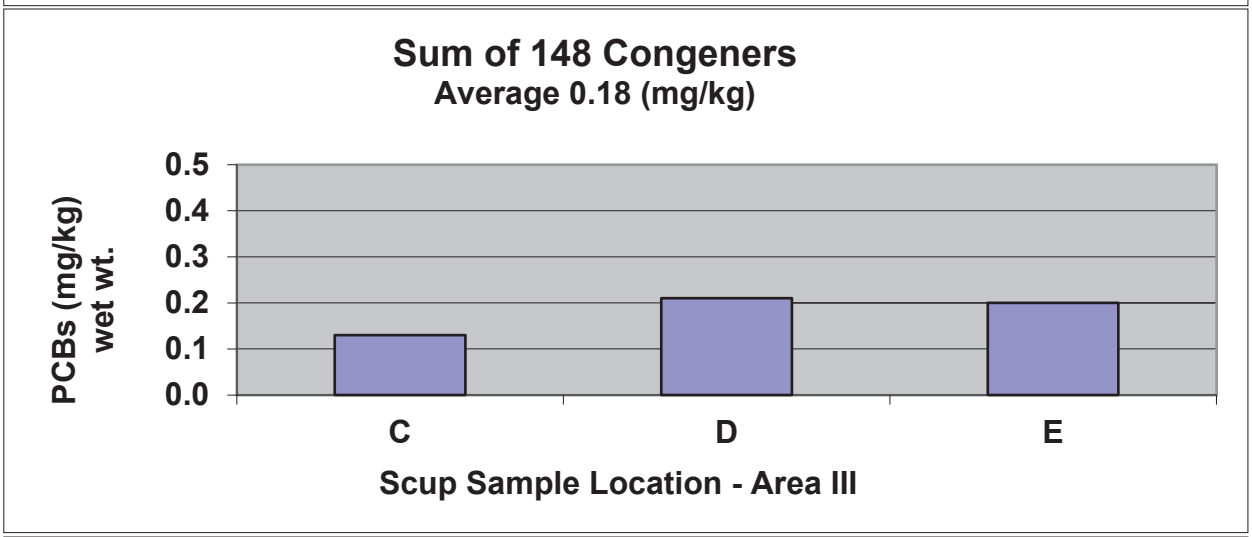


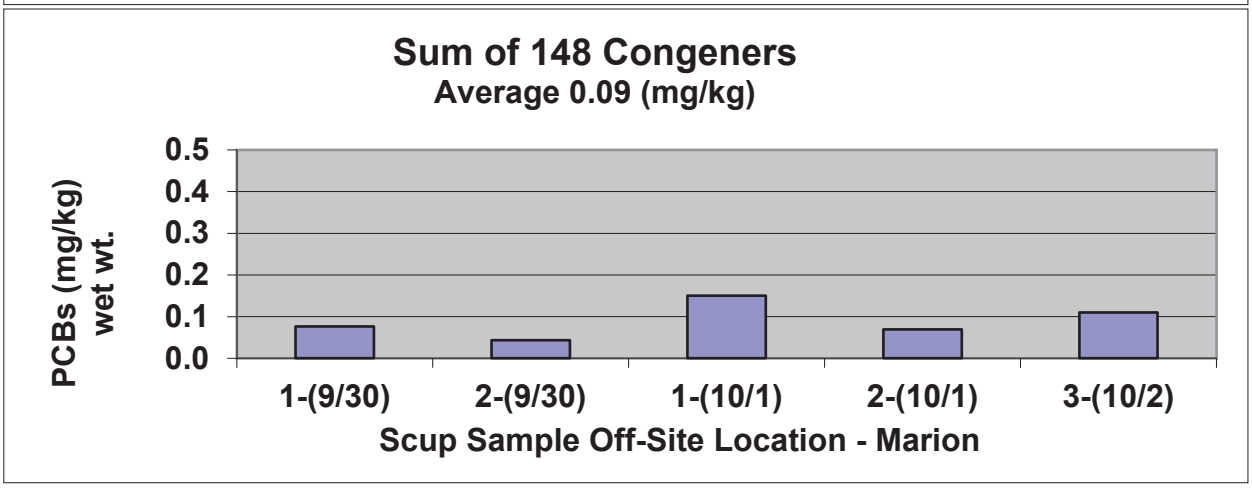
Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

Figure 33

PCB Concentrations in Scup Areas II, III & Off-Site - 2019



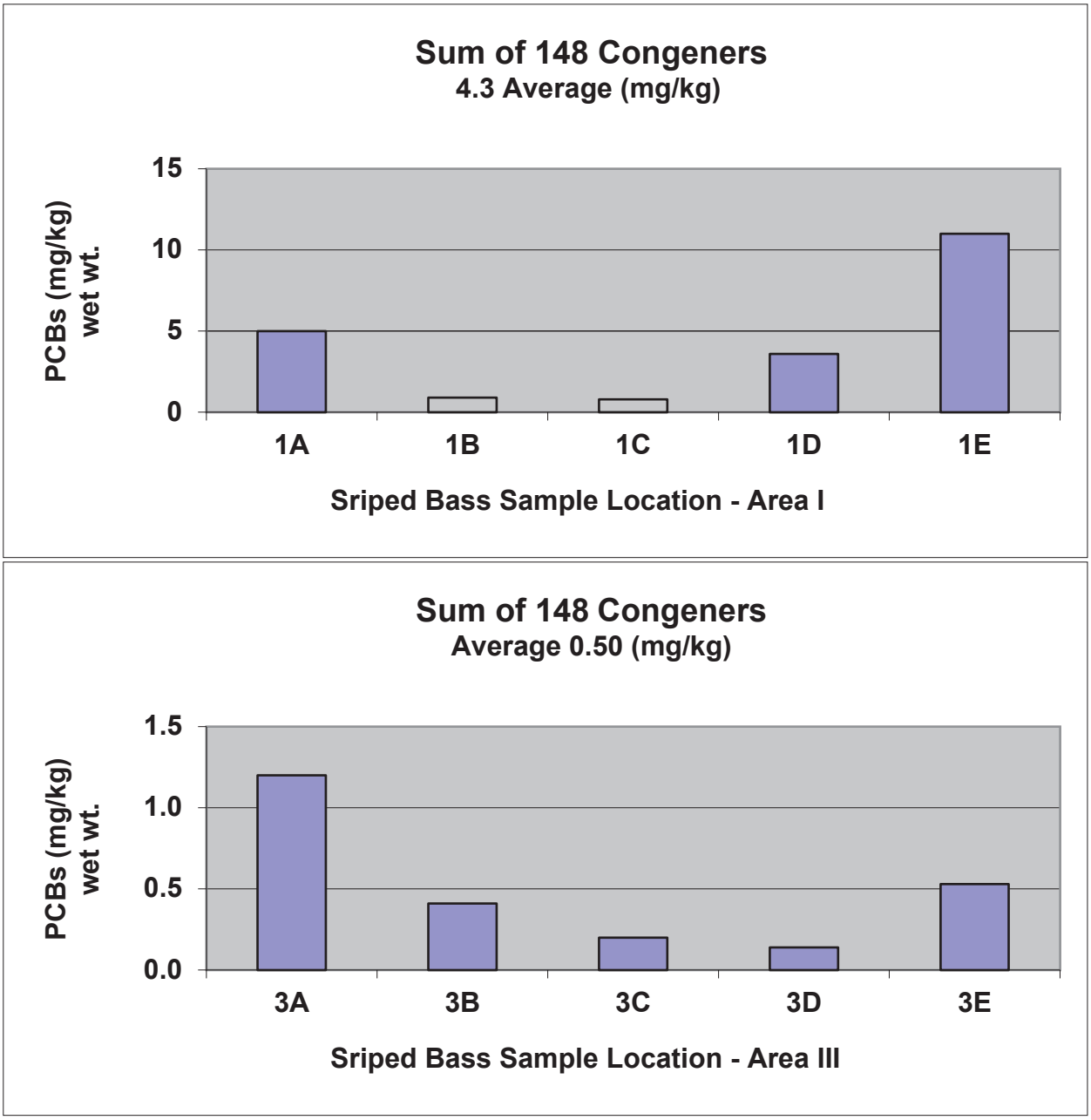




Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

Figure 34

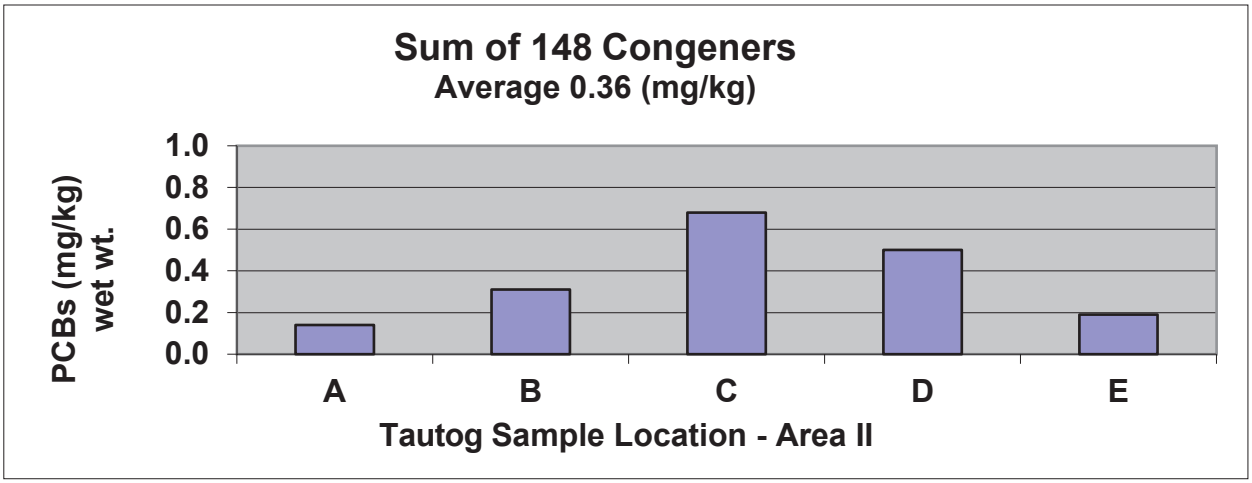
PCB Concentrations in Striped Bass Areas I & III - 2019

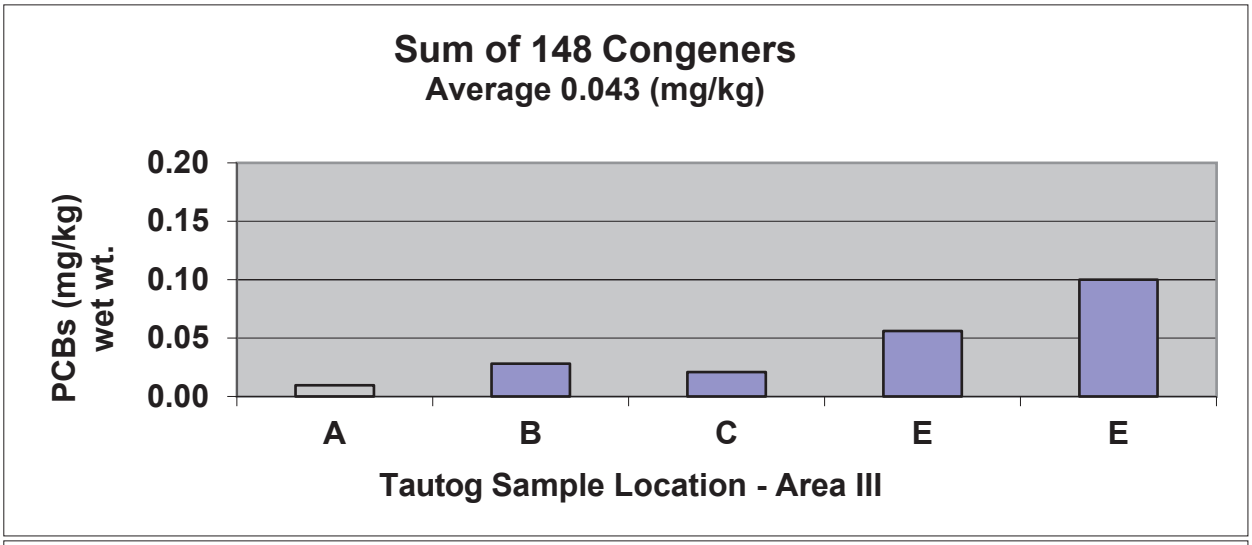


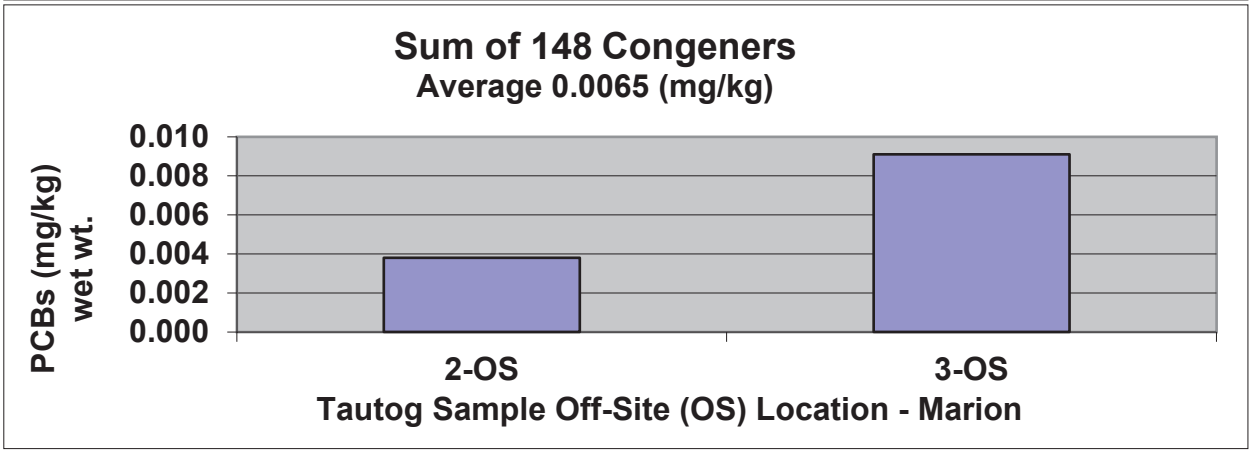
Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

Figure 35

PCB Concentrations in Tautog Areas II, III & Off-Site - 2019







Note. The PCB concentrations are the detected values and do not included the ½ detection limits. The graphs above were copied from the *Monitoring Report for Seafood Harvested in 2019 from the New Bedford Harbor Superfund Site.*

APPENDIX E: PRESS RELEASE

EPA United States Environmental Protection Agency

News Releases from Region 01

EPA Begins Reviews of Nine Massachusetts Superfund Site Cleanups This Year

03/13/2020

Contact Information:
David Deegan (deegan.dave@epa.gov)
617-918-1017

BOSTON – The U.S. Environmental Protection Agency (EPA) will conduct comprehensive reviews of previously-completed cleanup work at nine National Priorities List (NPL) Superfund sites in Massachusetts this year. The sites, including one federal facility that is also listed as a NPL Superfund site, will undergo a legally-required Five-Year Review to ensure that previous remediation efforts at the site continue to protect public health and the environment.

"It is a major EPA priority to make continued progress cleaning up Superfund sites across New England. Once cleanup work at all or a portion of a site is completed, EPA conducts regular periodic reviews of our previous work to ensure that it is continuing to protect human health and the environment," **said EPA New England Regional Administrator Dennis Deziel.**

"EPA's Five-Year Reviews help to ensure that the cleanup at Superfund sites continue to meet the Commonwealth's requirements, protecting public health and the environment," **said Massachusetts Department of Environmental Protection Commissioner Martin Suuberg.**

Background

The Superfund program, a federal program established by Congress in 1980, investigates and cleans up the most complex, uncontrolled or abandoned hazardous waste sites in the country and works to facilitate activities to return them to productive use. Under the Trump Administration, the Superfund program has reemerged as a priority to fulfill EPA's core mission of protecting human health and the environment.

EPA is actively involved in Superfund studies and cleanups at 40 sites in Massachusetts, including eight federal facilities. There are many phases of the Superfund cleanup process including considering future use and redevelopment and conducting post-cleanup monitoring of sites. EPA must ensure completed remedies continue to be protective of public health and the environment. The NPL Superfund sites where EPA will begin work on Five-Year Reviews in 2020 are listed below, and the web links provide detailed information on site status and past assessment and cleanup activity. Once the Five-Year Review is complete, its findings will be posted to the website in a final report.

Five-Year Reviews of Superfund sites in Massachusetts to be completed in 2020

Blackburn & Union Privileges, Walpole, Mass. www.epa.gov/superfund/blackburn
Norwood PCBS, Norwood, Mass. www.epa.gov/superfund/norwood
Atlas Tack, Fairhaven, Mass. www.epa.gov/superfund/atlas
Cannon Engineering, Bridgewater, Mass. www.epa.gov/superfund/cannon
Charles George Reclamation Trust Landfill, Tyngsborough, Mass. www.epa.gov/superfund/charlesgeorge
Groveland Wells, Groveland, Mass. www.epa.gov/superfund/groveland
New Bedford, New Bedford, Mass. www.epa.gov/superfund/newbedford
PSC Resources, Palmer, Mass. www.epa.gov/superfund/psc

Federal Facility
Fort Devens, Ayer, Shirley, Lancaster and Harvard., Mass. www.epa.gov/superfund/devens

More information on Superfund and other cleanup sites in New England: https://www.epa.gov/cleanups/cleaning-new-england

LAST UPDATED ON MAY 18, 2020

APPENDIX F: INTERVIEW FORMS

INTERVIEW RECORD												
Site Name:	New Bedford Harbor Superfund Site							**EPA ID No.:**		MAD980731335		
Subject:	2020 FYR					**Date:**	1/21/2020			**Time:**	2:00 PM	
Type:	☐	Telephone	☒	E-mail	☐	Other		☐	Incoming	☒	Outgoing	
	☐	Visit	**Location of Visit:**		N/A							
Contact Made By:												
Name:	ZaNetta Purnell			**Title:**	CIC			**Organization:**		EPA		
Individual Contacted:												
Name:	Paul Craffey			**Title:**	Project Manager			**Organization:**		MassDEP		
Telephone No:	(617) 292 - 5591				**Street Address:**			1 Winter Street				
Fax No:	N/A				**City, State, Zip:**			Boston, MA 02108				
E-Mail Address:	paul.craffey@mass.gov											

1. **Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.**

   There have been ongoing communications between the MassDEP, EPA, and USACE including review of Remedial Actions work plans and monitoring reports. See EPA files for purpose and results. The only activities that MassDEP currently performs for EPA is the Annual Fish Monitoring sampling program, annual sampling plans and reports are reviewed by EPA.

2. **Are you aware of any community concerns or effects that site operations and administration have on the surrounding community?**

   I do not know of any additional concerns that EPA does not know.

3. **Do you feel well informed about site activities and progress?**

   Yes.

4. **Have there been any planned changes that you know of in projected land use/zoning at or near the site?**

   Given that the New Bedford Site is a significant area, it would be difficult for anyone to know of all changes to land use or zoning near the site. MassDEP is not aware of any land use or zoning changes that have impacted the Remedial Action at the Site.

5. **Have any interested parties approached your office about the site's future reuse (if different from current uses)? If so, what is the schedule for future development?**

   No. I am not aware of any future development that EPA is not aware of.

6. Have any problems been encountered or changes in the site conditions that affect the current institutional controls at the site? Not that I am aware of.
7. Have there been any complaints, violations, or other incidents such as vandalism, trespassing, or emergency responses related to the site requiring a response by your office? If so, please give details of the events and results of the response. Not that I am aware of.
8. Do you have any comments, suggestions, or recommendations regarding site management, or operation? EPA should continue to keep MassDEP of the ongoing Remedial Action and O&M obligation for the State.
9. Is there any other information that you wish to share that might be of use? No.

INTERVIEW RECORD												
Site Name:	New Bedford Harbor Superfund Site							**EPA ID No.:**		MAD980731335		
Subject:	2020 FYR				**Date:**	1/25/2020			**Time:**	10:00 PM		
Type:	☐	Telephone	☒	E-mail	☐	Other		☐	Incoming	☒	Outgoing	
	☐	Visit	**Location of Visit:**		N/A							
Contact Made By:												
Name:	ZaNetta Purnell			**Title:**	CIC			**Organization:**		EPA		
Individual Contacted:												
Name:	Karen Vilandry			**Title:**	President			**Organization:**		Hands Across the River Coalition Inc.		
Telephone No:	(508) 951 - 1184				**Street Address:**	34 Huttleston Avenue						
Fax No:	N/A				**City, State, Zip:**	Fairhaven, MA 02719						
E-Mail Address:	harcgnb@gmail.com											

1. **What effects have the site operations has on the surrounding community?**

   The oldest and most historical, residential part of the Town of Fairhaven, MA has been degraded through the creation of a major PCB dump site just yards from a key residential area that contains the Fairhaven High School. Boston University released a study on non-cancer health risks from airborne PCBs. The target organ for these PCBs is the thyroid.

2. **Are you aware of any community concerns or articles regarding the site or its operations and administration? If so, please give details.**

   Boston University and other highly qualified supporting research organizations have demonstrated that the PCBs being dumped in the Fairhaven harbor in direct proximity to the town's high school are a significant long-term threat to the community. The airborne threat is in addition and separate from the highly questionable and poorly thought-out process whereby the EPA Region 1, Boston, has moved PCB toxic wastes from factory sites in New Bedford and dumped them into an unlined, virtually un-capped hole in the harbor floor where they will be forever in the harbor and forever immediately adjacent to the oldest historic and residential site of the Town of Fairhaven, MA. The community is very concerned about airborne PCBs and the very limited air monitoring that the EPA has done just 24 hours per day periodically, not continuously.

3. **Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.**

   The EPA has refused to investigate why the EPA used a blatantly fraudulent Environmental Impact Study to support their harbor project. Any oil spills into the harbor need to be discussed with the local harbormaster and other authorities in charge of the harbor.

4. Are you concerned about the site's future reuse? If so, please give details.

The site will forever present a threat to the Town of Fairhaven. The EPA Region 1 Boston has not and is not cleaning up the PCB sediments to a level of 1 ppm of PCBs as is done in other areas throughout the country. We feel that EPA Region 1 Boston has squandered a $366 million settlement from the AVX corporation. Rather that moving the PCB wastes in the New Bedford Harbor Superfund Site to a TSCA approved landfill, the funds have been used to concentrate the existing PCB wastes in the harbor and placed adjacent to the key historic monuments, its oldest and most historic area, and the Fairhaven High School. Since there are HIGHLY contaminated areas on the north side of the Coggeshall Street bridge in the upper harbor accumulated from the hot spots there, with levels of PCBs in the thousands, this is not safe for our community to leave it there. EPA Region 1 Boston needs to partner with the City of New Bedford to provide support for the foundation of that bridge and rebuild it if necessary, in order to remove these dangerously high levels of PCBs. It should not be just covered over. That is NOT a cleanup and is NOT safe long term. Because of so much PCBs being left behind, it is NOT safe for swimming and it NOT safe at all for recreational fishing. It is not safe for people to consume fish or sell it to a local market or restaurant.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

PCB sediments should have NEVER been buried in the harbor near a residential area of Fairhaven, MA and its high school. This is NOT a "cleanup". It is simply relocating PCBs to another area of the harbor. Heavy marine activity and severe weather disturbances could mobilize those buried PCBs over time. The EPA Region 1, Boston, has demonstrated that they have an agenda other than protecting the residents of Fairhaven. They have used their positions to hide the location of the PCB dumpsite, to short-circuit the oversight function of the Town of Fairhaven, and to attack personally local individuals who objected to their arrogant and poorly thought out plans. This is no way to treat very concerned citizens! Management of the New Bedford Harbor should be transferred out of the EPA Region 1, Boston, and be given to another impartial unity that does not have the clear prospect for conflict of interest.

6. General comments:

All PCB sediments need to be removed offsite to a TSCA approved landfill not buried in the harbor. That is NOT a cleanup and it's NOT safe! The operation of mechanically dredging up deadly PCB sediments, dumping it on an open top scow, towing the scow to the dumpsite called a "CAD cell" and then dumping the deadly material into an unlined burial hold in the riverbed causes some of the PCBs to become airborne. It is this type of activity in addition to the volatilization of PCBs that contaminate our air and has now been proven to cause ill health. EPA Region 1 Boston then has the audacity to say to news reporters that there is NO health risk. Well now there is, and it's proven! There is a serious problem within the EPA Region 1, Boston network. The region's management has systematically failed to properly disclose the dumpsite's location and has used US$366 million dollars merely to move existing PCBs around the New Bedford Harbor. They have refused to investigate improprieties in the Environmental Assessment that is the basis of the project and have used their positions to threaten individuals who question their project. No one at EPA has addressed the extraordinary adverse long-term impact of keeping the PCB wastes directly adjacent to the Fairhaven High School. A multitude of issues indicate the probability of significant level of corruption within the EPA's Region 1, Boston office.

INTERVIEW RECORD												
Site Name:	New Bedford Harbor Superfund Site							**EPA ID No.:**		MAD980731335		
Subject:	2020 FYR					**Date:**	2/4/2020			**Time:**	2	
Type:	☐	Telephone	☒	E-mail	☐	Other		☐	Incoming	☒	Outgoing	
	☐	Visit	**Location of Visit:**		N/A							
Contact Made By:												
Name:	ZaNetta Purnell			**Title:**	CIC			**Organization:**		EPA		
Individual Contacted:												
Name:	Mark Rasmussen			**Title:**	President			**Organization:**		Buzzards Bay Coalition		
Telephone No:	(508) 999 – 6363 ext. 201				**Street Address:**			114 Front Street				
Fax No:	N/A				**City, State, Zip:**			New Bedford, MA 02740				
E-Mail Address:	rasmussen@savebuzzardsbay.org											

1. **What effects have site operations had on the surrounding community?**

   The overall reduction in volume and concentration of PCBs due to cleanup operations has reduced the background ambient concentrations of PCBs in the surrounding community. This is clearly a positive result and the Coalition supports all efforts to adequately remove and fund a full PCB cleanup as quickly as possible. However, the multi-generational timeframe this cleanup continues to take has had adverse impacts. First and foremost, so long as the Harbor continues to be contaminated with PCBs above a concentration of 1 ppm, consumption of fish continues to be a health risk. To date, under the current cleanup standards, the EPA has yet to provide the community with a timeframe where the Harbor will be fishable.

2. Are you aware of any community concerns or articles regarding the site or its operation and administration? If so, please give details.

The Coalition is aware of several community concerns regarding the site and its operation and administration.

a. Inadequate Funding to Complete the Cleanup.

This site has long suffered from inadequate funding. Money from the federal government and the responsible parties, collectively, have been insufficient to deliver a safe, usable, and clean Harbor. EPA has consistently underestimated the remedial costs at this site, prolonging the cleanup timeframe and increasing the risk of PCB exposure throughout the community.

The Coalition has persistently argued for increased funding for nearly a decade. In 2012 and 2013 the Coalition opposed a settlement between AVX and the EPA, arguing in large part that the settlement would not provide sufficient funds to complete the cleanup. The Coalition argued that any settlement must have a "re-opener " clause to allow governmental enforcement action against AVX, the responsible party, in the event that the Harbor's remedial costs ultimately exceed EPA's current estimate. Not surprisingly, the 2013 funds from the AVX Settlement have now been expended and the Harbor cleanup remains incomplete. Moreover, EPA's failure to insist on a reopener clause in the settlement has now relegated the site to beg for annual federal appropriations in order to continue the cleanup.

b. Inadequate Cleanup Levels.

The 1998 Record of Decision ("ROD") stated that, "[f]or seafood to meet both the FDA and site specific levels at the end of 10 years, EPA believes that a TCL [standard] for sediment dredging of 1 ppm would be necessary."[6] Instead of establishing cleanup levels at 1 ppm, the EPA established far less protective standards including: 50 ppm for sediments in the Lower harbor and in salt marshes; 25 ppm for sediments in certain shoreline areas used for beach combing; 10 ppm for the Upper harbor sediments, and 1 ppm in areas where homes abut the Harbor or otherwise where human contact with sediment is expected.[7] Even if EPA possessed sufficient funds to meet the ROD cleanup targets, the Harbor would not be safe for fish consumption.

c. Use of CAD Cells for Disposal.

In an effort to cut costs and expedite the cleanup timeframe, the EPA sought alternative disposal options for PCB contaminated material. In March 2011, EPA proposed that, in lieu of disposing of sediment off-site as previously planned, it would place 300,000 cy of contaminated sediment in a CAD cell to be dug in the bottom of the Lower harbor. This new plan called for excavating a 47-foot pit deep into the Harbor floor; mechanically dredging contaminated sediment; placing it on a barge; de-watering it in the open air; and then dumping it into the cell. The long-term suitability for this disposal alternative remains uncertain.

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[6] Record of Decision for the Upper and Lower harbor Operable Unit New Bedford Harbor Superfund Site New Bedford, Massachusetts, September 1998 ("1998 ROD") at 35.

[7] Declaration for the Record of Decision New Bedford Harbor Superfund Site Upper and Lower harbor Operable Unit New Bedford, Massachusetts, ("Declaration for the Record of Decision") Administrative Record No. 38206 at i-ii.

3. **Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.**

A persistent challenge facing the site is that of subsistence fishing. While it is true that EPA has posted no fishing signs in various locations around the Harbor, subsistence fishing still takes place. Consumption of fish containing PCBs provides the most significant health risk to the community.

4. Are you concerned about the site's future reuse? If so, please give details.

The Coalition has several concerns about the site's future reuse considering the lack of a full cleanup plan and adequate funding noted above.

a. Cleanup Levels are Insufficient to Maximize Future Harbor Reuse.

The level of cleanup established by the ROD significantly restricts the future reuse of the Harbor. The Coalition and its members have long advocated that the clean-up levels established 22 years ago, which are as high as 50 ppm, will prove to be insufficient to reduce PCB concentrations to a level that permits fishing in the Harbor. As stated above, the ROD itself found that, "[f]or seafood to meet both the FDA and site-specific levels at the end of 10 years, EPA believes that a TCL [standard] for sediment dredging of 1 ppm would be necessary."

The 1998 ROD prescribed a plan to address sediments there that exceeded specified cleanup performance standards tied to PCB sediment concentrations in the Upper and Lower harbor. Those standards were, and currently remain, as follows: 50 parts per million ("ppm") for sediments in the Lower harbor and in salt marshes; 25 ppm for sediments in certain shoreline areas used for beach combing; 10 ppm for the Upper harbor sediments, and 1 ppm in areas where homes abut the Harbor or otherwise where human contact with sediment is expected. The Coalition has repeatedly urged EPA to establish cleanup levels for New Bedford Harbor equal to other similar aquatic PCB cleanups. A Coalition analysis of similar sites completed in 2012 concluded that the PCB standard at most sites is l ppm including the Fox River in Wisconsin and at six sites supervised by the EPA's Region 1 office in Boston, including the Housatonic River cleanup in Pittsfield. Nevertheless, EPA ultimately decided to use cleanup standards less stringent than 1 ppm for most of the Harbor and set a 1 ppm standard only for areas where homes directly abutted the Harbor or where EPA expected human contact with contaminated shoreline sediment. This narrow application of an appropriate cleanup standard will inevitably limit future reuse of the Harbor.

b. Significant Harbor-Wide Investments Will Not be Fully Realized in the Future Due to Inadequate Cleanup.

New Bedford Harbor is located in southeast Massachusetts where the Acushnet River flows into Buzzards Bay. The western shore of the Harbor is in the City of New Bedford (population c. 100,000); the eastern shore is located in the Towns of Fairhaven (pop. c. 16,000) and Acushnet (pop. c. 10,000), which are primarily residential communities. The City of New Bedford, the largest city on Buzzards Bay, is the home port of the top revenue generating commercial fishing fleet in America.[8] The Harbor is also used for recreational fishing, boating, beach combing and swimming, but the PCB contamination has lowered the value of the Harbor as a recreational resource.

In addition to the significant state investment made in South Terminal, the numerous harbor dredging projects managed by the Port of New Bedford to support the local maritime economy, and the City's substantial investment in reducing the discharge of raw sewage from combined sewage overflows seeking to protect human health and the environment, the town of Fairhaven is now investing in a substantial upgrade of their wastewater treatment facility in order to reduce the amount of pollution discharged to the Harbor. Furthermore, the Coalition, Acushnet River Reserve and the City continue to make substantial investment in restoration projects to encourage public use of its natural resources.

Specifically, the Coalition owns and manages various properties around the Harbor in order to protect coastal and marine resources, while providing a location for native habitat rest oration , as well as allowing public access, shoreline access and the enjoyment of open space by reconnecting the community and its membership with the Harbor as a natural resource.

In 2009, the Coalition purchased 7.5 acres of Marsh Island located in the Lower harbor and has rights to the remainder of Marsh Island under a conservation restriction from the Fairhaven Acushnet Land Preservation Trust. The New Bedford Harbor Trustees Council funded the Coalition's purchase and restoration of this property using proceeds from the 1991 and 1992 settlements discussed above. A primary purpose of the Coalition's investment in Marsh Island is to allow public access, shoreline access and enjoyment of coastal and marine resources, wildlife and open space. The Coalition's conservation restriction states that permitted acts and uses shall include but not be limited to "hiking, canoeing, fishing, wildlife observation and that the general public shall have the right to enter the Premises ...for passive recreation such as hiking, boating, bird watching, etc." The Coalition plans to use this property to promote a heightened community conservation ethic by creating a large publicly accessible natural riverfront reserve containing walking trails, in an area where access opportunities are now limited or non-existent. Marsh Island is also the largest salt marsh restoration project in the Harbor and its completion will, following cleanup of the Site, greatly improve the community's access to the Harbor's natural resources. However, public access is limited because of the on-going PCB contamination and the failure of the cleanup to meet the public's needs.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

The Coalition urges the EPA to seek Congressional appropriation of money in addition to the annual Superfund allocation in order to procure sufficient funds to complete a full cleanup.

6. General Comments

The Coalition appreciates the opportunity to provide comments on the Five-Year Review of the New Bedford Harbor Superfund Site.

[8] https://portofnewbedford.org/ Last visited January 23, 2020.

INTERVIEW RECORD												
Site Name:	New Bedford Harbor Superfund Site							**EPA ID No.:**		MAD980731335		
Subject:	2020 FYR					**Date:**	2/25/2020			**Time:**	1:30 PM	
Type:	☐	Telephone	☒	E-mail	☐	Other		☒	Incoming	☒	Outgoing	
	☐	Visit	**Location of Visit:**		N/A							
Contact Made By:												
Name:	ZaNetta Purnell			**Title:**	CIC			**Organization:**		EPA		
Individual Contacted:												
Name:	Michele Paul			**Title:**	Director, Office of Environmental Stewardship			**Organization:**		City of New Bedford		
Telephone No:	(508) 979 - 1487				**Street Address:**	133 William Street						
Fax No:	N/A				**City, State, Zip:**	New Bedford, MA 02740						
E-Mail Address:	Michele.paul@newbedford-ma.gov											

1. **Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.**

   This office has been meeting with the EPA project leadership staff monthly for coordination and information sharing.

2. **Have any problems been encountered or changes in the site conditions that affect the current institutional controls at the site?**

   No.

3. **Have there been any planned changes that you know of in projected land use/zoning at or near the site?**

   Nashaweena Mills has been purchased by the abutter to the north with intention to redevelop for mixed use although the project is in the early planning stages. It has been vacant for over 5 years.

4. **Have any interested parties approached the City's about the site's future reuse (if different from current uses)? If so, what is the schedule for future development?**

   There are plans by private parties and the Port Authority to improve land along the waterfront, but it will remain industrial in accordance with the DPA.

5. **Do you have any recommendations for reducing or increasing activities at the site?**

   No.

6. **Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If yes, how often and what type of activities did they engage in?**

   No, other than response by Coast Guard and MassDEP relative to occasional sheens reported along the working docks.

7. **Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the response.**

   No.

8. **Do you have any comments, suggestions, or recommendations regarding site management, or operation?**

   No.

9. **Is there any other information that you wish to share that might be of use?**

   The EPA management team is professional and responsive to city inquiries and requests.

APPENDIX G: EPA RISK ASSESSMENT TECHNICAL MEMORANDUM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region 1
5 Post Office Square, Suite 100
BOSTON, MA 02109-3912

TECHNICAL MEMORANDUM
To: David Lederer, Natalie McClaine
From: Courtney Carroll
Date: August 11, 2020
RE: PCB concentrations in fish/shellfish collected near the New Bedford Harbor Superfund Site in New Bedford, MA and human health risks for recreational fishers

Background:

The purpose of this technical memorandum is to assess polychlorinated biphenyl (PCB) concentrations in fish and shellfish collected near the New Bedford Harbor (NBH) Superfund Site, located in Bristol County, MA, and to evaluate the potential human health risks due to ingestion by recreational fishers. The data for PCB concentrations in fish collected by Massachusetts Department of Marine Fisheries (MassDMF) and analyzed for PCB congeners by Massachusetts Department of Environmental Protection (MassDEP) were obtained from an Access Database maintained by the MassDEP contractor, which contains all of the available fish tissue data from 2003 to 2019.

Due to historic PCB contamination in NBH, currently there is a regulation per the Massachusetts Department of Public Health (MassDPH) prohibiting the taking and/or selling of certain fish, lobster, or shellfish in certain areas of NBH. The regulation identified three Fishing Closure Areas (1, 2 and 3) in NBH and surrounding Buzzards Bay. In 2009 and 2010, EPA Region 1 published Fish Consumption Recommendations for Recreational Fishermen/Shell fishermen (and/or their families/friends who consume their take) with respect to the Outer Harbor (the 17,000 acres outside the Hurricane Barrier). Institutional controls in the form of seafood consumption recommendations are necessary since it is expected to take many years, even after the sediment remediation efforts are completed, before PCB levels in seafood species reach safe levels for consumption for all species in all areas. These recommendations were last updated during the 2015 FYR.

Between 1994 and 2020, 600,000 cubic yards of PCB-contaminated sediment were dredged from the Upper Harbor and disposed of off-site. An additional 388,000 cubic yards of sediment were removed from the Lower Harbor and lower portion of the Upper Harbor and disposed of in the Lower Harbor CAD Cell. About 75% of that cleanup activity was achieved between 2014 and the present by the EPA Superfund program. Subtidal Dredging is now complete at the Site, and the cleanup of intertidal shoreline areas will be about 60% complete by the end of 2020. PCB levels in seafood tissue collected in and near the New Bedford Harbor Superfund Site will continue to be monitored going forward to measure progress towards lowering risks due to seafood ingestion.

This memorandum will evaluate whether the aforementioned recommendations remain protective, can be relaxed, or whether further updates are appropriate. The memorandum also will make recommendations regarding the collection of more data to further inform future decision makers with regard to the existing seafood consumption recommendations.

Methodology:

Fish species collected from NBH and surrounding areas include the following: alewife, eel, flounder, black sea bass, blue crab, bluefish, conch, lobster, quahog, scup, striped bass and tautog. Available data were used to calculate the Exposure Point Concentrations (EPCs) for those species which had sufficient data to calculate a 95% Upper Confidence Limit (UCL) of the arithmetic mean. These included: black sea bass (Area 2, Area 3), bluefish (Area 2, Area 3), conch (Area 2, Clark's Cove, Area 3), lobster (Area 2, Area 3), quahog (Area 2, Clark's Cove, Area 3), scup (Area 2, Area 3), striped bass (Area 2, Area 3), and tautog (Area 2, Area 3). UCLs were calculated for EPA by AECOM under contract to the US Army Corps of Engineers by using EPA's ProUCL software. The software selects the most statistically appropriate UCL type based on the sample size and distribution of the data.
Tables 1 and 2 below are provided for reference and define the terms and formulas used for the human health risk calculations. The EPCs are summarized in Table 3.

Table 1. Definitions

Acronym	Definition	Units
IR	Ingestion Rate	kg/meal
FI	Fraction ingested	unitless
EF	Exposure Frequency	meals/year
ED	Exposure Duration	years
BW	Body Weight	kg
AT- C	Averaging Time - cancer	days
AT- NC	Averaging Time - non-cancer	days
CF	Concentration in Fish	mg/kg
ADD	Average Daily Dose	mg/kg/day
LADD	Lifetime Average Daily Dose	mg/kg/day
RfD	Reference Dose	mg/kg/day
SF	Oral Slope Factor	per mg/kg/day
HQ	Hazard Quotient	unitless
ELCR	Elevated Lifetime Cancer Risk	unitless
RME	Reasonable Maximum Exposure (4 meals/month)	
CTE	Central Tendency Exposure (1 meal/month)	
EPC	Exposure Point Concentration	mg/kg
UCL	Upper Confidence Level	

Table 2. Formulas

Term	Formula
ADD	CF*IR*FI*ED*EF*1/BW*1/AT-nc
LADD	CF*IR*FI*ED*EF*1/BW*1/AT-c
HQ	ADD/RfD
ELCR	LADD*SF

Table 3. Seafood Exposure Point Concentrations - New Bedford Harbor

Seafood Type	Area 2	Area 3	Clark's Cove
Black sea bass	0.932	0.183	NA
Bluefish	6.268	0.589	NA
Conch	0.425	0.088	1.167
Quahog	0.155	0.0356	0.0506
Lobster meat	0.182	0.0691	NA
Lobster tomalley	17.19	4.783	NA
Scup	0.599	0.241	NA
Striped bass	NC	0.847	NA
Tautog	0.59	0.0658	NA

1. EPCs calculated for total PCB congeners using ProUCL Version 5.1.002
2. Units are in mg/kg
3. NA = not applicable
4. NC = not calculated due to insufficient data

Risk calculations for seafood consumption were performed for Areas 2 and 3. Area 1 was not further evaluated because the current recommendation is to not eat any seafood from Area 1, and the available data indicate that PCB concentrations in seafood from this area remain above acceptable risk levels for all receptors. There were insufficient data to calculate a UCL for eel and flounder. Additionally, alewife and blue crab tissue samples were only collected from Area 1, therefore risk calculations could not be performed for Areas 2 and 3 for these species.

The methodology used to calculate the health risks of PCB concentrations in fish in this memorandum is the same methodology that was used for the Remedial Investigation for OU3 (the Outer Harbor) of the New Bedford Harbor Superfund Site (Woods Hole Group, 2017). Cancer and non-cancer risks were calculated for adult, older child, and young child receptors. Elevated Lifetime Cancer Risks (ELCR) are quantified as a probability (e.g. 1 in 1 million, or 1E-06) of getting cancer over a lifetime due to exposure related to the Site. An ELCR of 1E-04 (1 in 10,000) is the upper EPA cancer risk limit at Superfund sites. Non-cancer risk is quantified as a Hazard Quotient (HQ) which is the ratio of the exposure dose divided by the EPA no-effect dose, called the oral Reference Dose (RfD). An HQ greater than one indicates a potential adverse risk of non-cancer effects and is the EPA upper limit for non-cancer risk at Superfund sites.

The exposure and toxicity assumptions used in the risk calculations are presented in Table 4 below. The fraction ingested (FI) was conservatively assumed to be 1, meaning that 100% of the total seafood consumption of the specified seafood species was assumed to be from the specified area of New Bedford Harbor. The Exposure Frequency (EF) was assumed to be either 12 events per year (i.e. once per month) or 52 events/year (once per week, or about 4 times per month). The EF of 12 events/year was designated as the Central Tendency Exposure (CTE), and the EF of 52 events/year was designated as the Reasonable Maximum Exposure (RME). The exposure duration (ED) was assumed to be 55 years for the adult (age 16 to 70 years), 10 years for the older child (age 6 to 15 years), and 5 years for the young child (age 1-6 years). The body weight (BW) was assumed to be 80 kg for the adult, 40 kg for the older child, and 15 kg for the young child. The averaging time for cancer risk was 25,550 days (70 years x 365 days/year) for each receptor. The averaging time for non-cancer risk was 20,075 days (55 years x 365 days/year) for the adult, 3,650 days (10 years x 365 days/year) for the older child, and 1,825 days (5 years x 365 days/year) for the young child. Meal size was assumed to be 0.227 kg for the adult and older child, and half of that

(0.114 kg) for the young child. The larger meal size was designated as the CTE and RME for adults and older child. The smaller meal size was designated as the CTE and RME for the young child.

The toxicity factors for total PCBs were those for "high-risk" PCBs as designated in EPA's Integrated Risk Information System (IRIS). These toxicity factors are the same as those recommended for Aroclor 1254. The oral cancer slope factor (SF) was 2.0 per mg/kg/day. The oral Reference Dose (RfD) was 2.0 x 10^{-5} mg/kg/day for chronic exposure (adults and older child) and 5.0 x 10^{-5} mg/kg/day for sub-chronic exposure (young child). These values are current as of 2020.

Table 4. Exposure and Toxicity Assumptions

Receptor	Exp.	IR	FI	EF	ED	BW	AT-C	AT-NC	RfD	SF
Adult	CTE	0.227	1	12	55	80	25,550	20,075	2.0E-05	2.0E+00
	RME	0.227	1	52	55	80	25,550	20,075	2.0E-05	2.0E+00
Older Child	CTE	0.227	1	12	10	40	25,550	3,650	2.0E-05	2.0E+00
	RME	0.227	1	52	10	40	25,550	3,650	2.0E-05	2.0E+00
Young Child	CTE	0.114	1	12	5	15	25,550	1,825	2.0E-05	2.0E+00
	RME	0.114	1	52	5	15	25,550	1,825	5.0E-05	2.0E+00

Results:

Human health risk results for seafood consumption are presented in Tables 5 through 13 below. Based on uncertainty inherent in the risk assessment process, HQ and ELCR values should be rounded to the nearest whole number. For example, HQ values of 1.2 should be rounded to 1, and an HQ of 1.6 would be rounded to 2. Values highlighted in green are within EPA human health risk criteria while those in red exceed the risk criteria.

Table 5. Young Child Risk Summary – Area 2

Young Child Risk Summary Area 2					
Seafood type	EPC (mg/kg)	HQ CTE	HQ RME	ELCR CTE	ELCR RME
Black sea bass	0.932	12	20	3.0E-05	1.0E-04
Bluefish	6.268	78	136	2.0E-04	1.0E-03
Conch	0.425	5	9	2.0E-05	7.0E-05
Lobster meat	0.182	2	4	6.0E-06	3.0E-05
Lobster tomalley	17.19	215	372	6.0E-04	3.0E-03
Quahog	0.155	2	3	6.0E-06	2.0E-05
Scup	0.599	7	13	2.0E-05	9.0E-05
Striped Bass	NC				
Tautog	0.59	7	13	2.0E-05	9.0E-05

1. EPC is based on the 95% UCL for total PCB congeners
2. NC = not calculated due to insufficient data

Table 6. Young Child Risk Summary – Area 3

Young Child Risk Summary Area 3					
Seafood type	EPC (mg/kg)	HQ CTE	HQ RME	ELCR CTE	ELCR RME
Black sea bass	0.183	2	4	7.0E-06	3.0E-05
Bluefish	0.589	7	13	2.0E-05	9.0E-05
Conch	0.088	1	2	3.0E-06	1.0E-05
Lobster meat	0.0691	1	1	2.0E-06	1.0E-05
Lobster tomalley	4.783	60	104	2.0E-04	7.0E-04
Quahog	0.0356	0.4	1	1.0E-06	6.0E-06
Scup	0.241	3	5	9.0E-06	4.0E-05
Striped Bass	0.847	11	18	3.0E-05	1.0E-04
Tautog	0.0658	1	1	2.0E-06	1.0E-05

1. EPC is based on the 95% UCL for total PCB congeners

Table 7. Young Child Risk Summary – Clark's Cove

Young Child Risk Summary Clark's Cove					
Seafood type	EPC (mg/kg)	HQ CTE	HQ RME	ELCR CTE	ELCR RME
Quahog	0.0506	1	1	2.0E-06	8.0E-06
Conch	1.167	15	25	4.0E-05	2.0E-04

1. EPC is based on the 95% UCL for total PCB congeners

Table 8. Older Child Risk Summary – Area 2

Older Child Risk Summary Area 2					
Seafood type	EPC (mg/kg)	HQ CTE	HQ RME	ELCR CTE	ELCR RME
Black sea bass	0.932	9	38	5.0E-05	2.0E-04
Bluefish	6.268	58	253	3.0E-04	1.0E-03
Conch	0.425	4	17	2.0E-05	1.0E-04
Lobster meat	0.182	2	7	1.0E-05	4.0E-05
Lobster tomalley	17.19	160	695	9.0E-04	4.0E-03
Quahog	0.155	1	6	8.0E-06	4.0E-05
Scup	0.599	6	24	3.0E-05	1.0E-04
Striped Bass	NC				
Tautog	0.59	6	24	3.0E-05	1.0E-04

1. EPC is based on the 95% UCL for total PCB congeners
2. NC = not calculated due to insufficient data

Table 9. Older Child Risk Summary – Area 3

Older Child Risk Summary Area 3					
Seafood type	EPC (mg/kg)	HQ CTE	HQ RME	ELCR CTE	ELCR RME
Black sea bass	0.183	2	7	1.0E-05	4.0E-05
Bluefish	0.589	5	24	3.0E-05	1.0E-04
Conch	0.088	1	4	5.0E-06	2.0E-05
Lobster meat	0.0691	1	3	4.0E-06	2.0E-05
Lobster tomalley	4.783	45	193	3.0E-04	1.0E-03
Quahog	0.0356	0.3	1	2.0E-06	8.0E-06
Scup	0.241	2	10	1.0E-05	6.0E-05
Striped Bass	0.847	8	34	5.0E-05	2.0E-04
Tautog	0.0658	1	3	4.0E-06	2.0E-05

1. EPC is based on the 95% UCL for total PCB congeners

Table 10. Older Child Risk Summary – Clark's Cove

Older Child Risk Summary Clark's Cove					
Seafood type	EPC (mg/kg)	HQ CTE	HQ RME	ELCR CTE	ELCR RME
Quahog	0.0506	1	2	3.0E-06	1.0E-05
Conch	1.167	11	47	6.0E-05	3.0E-04

1. EPC is based on the 95% UCL for total PCB congeners

Table 11. Adult Risk Summary – Area 2

Adult Risk Summary Area 2					
Seafood type	EPC (mg/kg)	HQ CTE	HQ RME	ELCR CTE	ELCR RME
Black sea bass	0.932	4	19	1.0E-04	6.0E-04
Bluefish	6.268	29	127	9.0E-04	4.0E-03
Conch	0.425	2	10	7.0E-05	3.0E-04
Lobster meat	0.182	1	4	3.0E-05	1.0E-04
Lobster tomalley	17.19	80	347	3.0E-03	1.0E-02
Quahog	0.155	1	3	2.0E-05	1.0E-04
Scup	0.599	3	12	9.0E-05	4.0E-04
Striped Bass	NC				
Tautog	0.59	3	12	9.0E-05	4.0E-04

1. EPC is based on the 95% UCL for total PCB congeners
2. NC = not calculated due to insufficient data

Table 12. Adult Risk Summary – Area 3

Adult Risk Summary Area 3					
Seafood type	EPC (mg/kg)	HQ CTE	HQ RME	ELCR CTE	ELCR RME
Black sea bass	0.183	1	4	3.0E-05	1.0E-04
Bluefish	0.589	3	12	9.0E-05	4.0E-04
Conch	0.088	0.4	2	1.0E-05	6.0E-05
Lobster meat	0.0691	0.3	1	1.0E-05	4.0E-05
Lobster tomalley	4.783	22	97	7.0E-04	3.0E-03
Quahog	0.0356	0.2	1	5.0E-06	2.0E-05
Scup	0.241	1	5	4.0E-05	2.0E-04
Striped Bass	0.847	4	17	1.0E-04	5.0E-04
Tautog	0.0658	0.3	1	1.0E-05	4.0E-05

1. EPC is based on the 95% UCL for total PCB congeners

Table 13. Adult Risk Summary – Clark's Cove

Adult Risk Summary Clark's Cove					
Seafood type	EPC (mg/kg)	HQ CTE	HQ RME	ELCR CTE	ELCR RME
Quahog	0.0506	0.2	1	7.0E-06	3.0E-05
Conch	1.167	5	24	2.0E-04	7.0E-04

1. EPC is based on the 95% UCL for total PCB congeners

Discussion:

Updates Under Review for 2020 Fish Consumption Recommendations

The EPA Fish Consumption Recommendations categorize receptors as either "sensitive receptors" or "other" receptors. Sensitive receptors include pregnant women, nursing mothers, children under age 12, and women who may become pregnant. Since both the young child receptor (age 1-6 years) and older child receptor (age 6-15 years) include ages below 12 years, both types of child receptors are considered "sensitive" receptors for comparison of risks with recommendations. The "other" receptor category therefore includes adults but not children. For this set of recommendations, shellfish are considered to be "clams, quahogs, mussels, etc." but not lobster.

Risks for the young child, older child and adult were compared to the 2015 EPA Fish Consumption Recommendations to determine if changes may be appropriate. Based on the risk results, updates are being considered for certain areas. The following section discusses potential updates for Area 2, Area 3 and Clark's Cove for sensitive and other receptors.

EPA is identifying "potential future changes" to its 2015 seafood consumption recommendations based on the currently available seafood tissue database but is not affecting a change in the recommendations at this time. EPA intends to first consult with state agencies on a number of issues relating to the potential revised seafood consumption advisories:

1) Evaluation of the need for collection and review of additional seafood data from the Outer Harbor and/or additional reference locations prior to further consideration of the proposed changes;

2) Evaluating what is known about the levels of PCBs found in certain species at other areas unaffected by the New Bedford Harbor Site along the eastern seaboard;
3) Consultation regarding the status of current state regulatory restrictions placed by the MassDPH on consumption of Outer Harbor seafood species in light of the data collected in the Outer Harbor.

Area 2:

Sensitive receptors:

- No recommended changes. Risks at both the RME (4 meals/month) and CTE (1 meal/month) are still unacceptable for young and older children for each species; therefore, the recommendation of no consumption of any fish species in Area 2 (excluding shellfish caught in Clark's Cove) for sensitive receptors ensures protectiveness for children.

Other receptors:

- Black sea bass:
  2015 Seafood Consumption Recommendation: Eat no more than one meal per month.

  Potential Revised Future Seafood Consumption Recommendation: do not eat. Risks at both the RME and CTE are unacceptable for an adult consuming black sea bass from Area 2; therefore, recommendations may be updated to do not eat for black sea bass from Area 2 to ensure protectiveness for all receptors.

- Lobster meat:
  2015 Seafood Consumption Recommendation: Do not eat.

  Potential Revised Future Seafood Consumption Recommendation: eat no more than one meal per month; do not consume lobster tomalley. Risks for consuming lobster meat (excluding tomalley) are acceptable at CTE for the adult; however, current MassDPH regulations prohibit the taking of lobster from Area 2.

- Bluefish:
  2015 Seafood Consumption Recommendation: not addressed.

  Potential Revised Future Seafood Consumption Recommendation: do not eat. Risks for consuming bluefish were unacceptable at both CTE and RME for all receptors in Area 2; however, bluefish is not currently included in the seafood recommendations.

Clark's Cove:

Sensitive receptors:

- 2015 Seafood Consumption Recommendation: sensitive receptors can eat one, and only one, meal per month of shellfish caught in Clark's Cove. For this set of recommendations, shellfish are considered to be "clams, quahogs, mussels, etc." but not lobster.
- Potential Revised Future Seafood Consumption Recommendation: No recommended changes. Although both the CTE and RME risk for the young child are acceptable, the RME risk for the older child is unacceptable. The CTE risk for the older child is acceptable; therefore, the current recommendation of no more than one meal per month of shellfish from Clark's Cove remains protective for sensitive receptors.

Other receptors:

- 2015 Seafood Consumption Recommendation: eat no more than one meal per week of shellfish caught in Clark's Cove. For this set of recommendations, shellfish are considered to be "clams, quahogs, mussels, etc." but not lobster.

- Potential Revised Future Seafood Consumption Recommendation: No recommended changes. Risk is acceptable at CTE and RME for quahogs for the adult; therefore, a recommendation of one meal per week (4 meals/month) remains protective for non-sensitive receptors.

Area 3:

Sensitive receptors:

- Shellfish:
  2015 Seafood Consumption Recommendation: eat no more than one meal per month.

  Potential Revised Future Seafood Consumption Recommendation: eat no more than one meal per week. Risks for the young child and older child are acceptable at CTE and RME for quahogs caught in Area 3. Therefore, a recommendation of one meal per week or 4 meals per month would be protective for sensitive receptors.

- Lobster meat:
  2015 Seafood Consumption Recommendation: do not eat.

  Potential Revised Future Seafood Consumption Recommendation: eat no more than one meal per month; do not consume lobster tomalley. Risks for the young child and older child are acceptable at CTE for lobster meat (excluding tomalley); however, current MassDPH regulations prohibit the taking of lobster from Area 3.

Other receptors:

- Scup:
  2015 Seafood Consumption Recommendation: Do not eat.

  Potential Revised Future Seafood Consumption Recommendation: eat no more than one meal per month. Risks for the adult are acceptable at CTE for scup. Therefore, a recommendation to eat no more than one meal per month would be protective for non-sensitive receptors.

- Tautog:
  2015 Seafood Consumption Recommendation: Eat no more than one meal per month.

  Potential Revised Future Seafood Consumption Recommendation: eat no more than one meal per week. Risks for the adult are acceptable at both CTE and RME for tautog; therefore, a recommendation of one meal per week (4 meals/month) would be protective for non-sensitive receptors.

- Lobster meat:
  2015 Seafood Consumption Recommendation: Do not eat.

Potential Revised Future Seafood Consumption Recommendation: eat no more than one meal per week. Risks for the adult are acceptable at both CTE and RME for lobster meat (excluding tomalley); however, current MassDPH regulations prohibit the taking of lobster from Area 3.

- Bluefish:
  2015 Seafood Consumption Recommendation: Not addressed.

  Potential Revised Future Seafood Consumption Recommendation: do not eat. Risks for consuming bluefish were unacceptable at both CTE and RME for all receptors in Area 3; however, bluefish is not currently included in the seafood recommendations.

- Striped bass:
  2015 Seafood Consumption Recommendation: Not addressed.

  Potential Revised Future Seafood Consumption Recommendation: do not eat. Risks for consuming striped bass were unacceptable at both CTE and RME for all receptors in Area 3; however, striped bass is not currently included in the seafood recommendations.

Migratory Species and Issue of Background:

There are a number of species found near NBH that migrate along the northeast coast. For example, striped bass is a migratory species that generally migrates south along the Atlantic seaboard from New England in the fall and returns to New England in the spring and summer; however, there are subpopulations that forage in the same area for several months, enough time to accumulate PCBs from the local prey. As a lipid rich top predator, striped bass are known to bioaccumulate relatively high concentrations of PCBs through their entire range along the Atlantic seaboard. It is uncertain how much of the PCB load in striped bass caught in NBH is derived from the PCBs in NBH or from other known PCBs sources such as the Hudson River, Housatonic River, and Boston Harbor where striped bass are known to occur.

As part of the MassDEP sampling program, filet muscle and stomach contents from the same individual fish have been analyzed for PCB congeners in a subset of striped bass from NBH and reference areas. EPA may evaluate whether the PCB congener patterns between muscle and stomach contents are more similar in NBH fish than in reference fish. Since stomach contents are digested over a period of days, a greater similarity in PCB congeners between muscle and prey in NBH-caught fish may indicate that the fish from NBH are bioaccumulating a significant proportion of their total PCB load during short-term (days to weeks) residence at NBH.

In addition, Woods Hole Group (2018) under contract to US Army Corps of Engineers through funding provided by EPA conducted a literature search covering 2005 to 2018 for data on PCB concentrations in seafood species from Long Island Sound to Maine. The available information for Striped Bass from this report is presented in Table 5. This table shows that the average concentrations (0.133 to 0.368 mg/kg) in striped bass from Maine, Rhode Island and Long Island Sound are somewhat higher than the average concentrations (0.17, 0.18 mg/kg) in Striped Bass from NBH Areas 2 and 3, but much lower than the average concentration (6.0 mg/kg) in Area 1 of NBH.

The original remedial goal for PCBs in seafood from the 1998 Record of Decision for the New Bedford Harbor Superfund Site is 0.02 mg/kg, which is a risk-based concentration that is associated with a HQ of 1 and an ILCR of 1E-05. The Woods Hole Group (2018) literature review also presents PCB

concentration data for seafood species in addition to Striped Bass, which generally show that seafood tissue in many reference areas from Long Island Sound to Maine contain PCBs at concentrations higher than this risk-based goal, suggesting that further data gathering and study may be required. The issue of reference area concentrations in species other than Striped Bass is beyond the scope of this technical memorandum, however, EPA intends to do more research on this issue in the coming years.

Conclusions

Superfund subtidal dredging is now complete at the Site, and the cleanup of intertidal shoreline areas will be about 60% complete by the end of 2020.Navigational dredging by others will continue. Available seafood data through 2019 indicate that PCB tissue levels in sampled species continue to be above the site-specific goal of 0.02 ppm for PCB concentrations in seafood, though some species have shown downward trends. More data, including fish tissue background data and sediment data, will be required to better assess remedy progress and feasibility of cleanup goals. EPA is developing plans to resume annual collection of fish tissue data from NBH as well as expand collection of fish tissue data from reference locations to improve understanding of the Site's impact on seafood in comparison to background levels of PCBs in fish in the New England area. Numerous species-specific changes in the EPA Fish Consumption Recommendations are currently being reviewed. EPA will be discussing these potential changes in the near future with MassDEP, MassDPH and MassDMF before any changes are formally proposed to EPA's seafood consumption recommendations.

References

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