Prepared in cooperation with the Massachusetts Department of Fish and Game, Division of Ecological Restoration, Riverways Program

Concentrations, Loads, and Sources of Polychlorinated Biphenyls, Neponset River and Neponset River Estuary, Eastern Massachusetts

Scientific Investigations Report 2011–5004
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Cover. Measurement of streamflow and collection of flow-proportional water samples at USGS streamgage (011055566) Neponset River at Milton Village, Milton, Massachusetts. Collection of fish tissue samples using gill nets strung across the river. Collection of dissolved PCBs from river water using Passive In-situ Chemical Extraction Samplers (PISCES) deployed in the river. Collection of sediment samples using a stainless steel dredge from the river's bottom.

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Contents

Acknowledgments iii
Abstract 1
Introduction 2
    Purpose and Scope 6
    Streamflow, Sediments, and Water Quality in the Neponset River Drainage Basin 6
    Sources of PCBs in the Neponset River Drainage Basin 8
PCB Chemistry, Use, and Environmental Presence 12
Study Design 13
Mathematical Analysis of PCB-Congener Data 18
Concentrations of PCBs and Other Constituents in Water, Sediment, and Fish 21
    PCBs in Sediment 21
    PCBs in Water 22
        Dissolved PCBs 22
        Particulate PCBs 26
    PCBs in Fish 26
Loads of PCBs from the Neponset River to the Neponset River Estuary 27
Loads of PCBs through the Braided-Channel Area 30
Sources of PCBs 31
    Relative Abundances, Concentrations, and Root-Mean-Square Difference 31
    Cluster Analysis 38
    History of PCB Contamination in the Neponset River 38
Summary 46
References Cited 47
Appendix 1. Sampling and Sample Processing Techniques 101
Appendix 2. Chemical Analysis of Water, Sediment, and Fish 105
Appendix 3. Quality Assurance and Quality Control 109
Appendix 4. Polychlorinated Biphenyl Masses Measured in Water Samples 125
Appendix 5. Polychlorinated Biphenyl Masses Measured in Commercially Available Aroclors 139

Figures

1. Map showing the Neponset River, Neponset River Estuary, Mother Brook, and Meadow Brook, Massachusetts....3
2. Map showing bottom-sediment sampling locations in Mother Brook and the Neponset River and Estuary, Massachusetts, 2002 and 2005....4
3. Map showing passive in situ chemical-extraction sampler locations in Mother Brook, the Neponset River, and the Neponset River Estuary, Massachusetts, 2002, 2004, and 2005....5
4. Photographs showing *(A)* Mother Brook, *(B)* Tileston and Hollingsworth Impoundment, *(C)* Walter Baker Impoundment, *(D)* Neponset River Estuary head of tide, *(E)* Neponset River Estuary, and *(F)* Dorchester Bay with the City of Boston in the background, Massachusetts....7
5. Photographs showing *(A)* USGS streamgage Neponset River at Milton Village (011055566) and *(B)* Walter Baker Dam....8
6. Graph showing summary statistics for streamflow measured at the USGS streamgage Neponset River at Milton Village (011055566)....9
7. Photograph showing breach of Walter Baker Dam, Neponset River, Massachusetts, in 2007....11
8. Photograph showing the Braided Channel reach in the Neponset River, Massachusetts....11
9. Schematic diagram of polychlorinated biphenyl isomers *(A)* 2,2′,3,3′,5,5′ hexachlorobiphenyl (PCB 133) and *(B)* 2,2′,3,3′,4,5′ hexachlorobiphenyl (PCB 130)....12
10. Photographs showing U.S. Geological Survey scientist collecting surficial (top 4 inches) sediment samples by means of *(A)* a stainless-steel dredge in water deeper than 3 feet and *(B)* a Teflon scoop in water shallower than 3 feet....14
11. Photographs showing *(A)* white sucker and *(B)* common mummichog collected from the Neponset River and Estuary, respectively, as well as the *(C)* collection and *(D)* processing of white sucker....16
12. Photographs showing *(A)* measurement of streamflow by means of an acoustic doppler current profiler, Blue Hill Parkway (Route 28), Mattapan and Milton, Massachusetts; and *(B)* U.S. Geological Survey staff collecting an isokinetic equal-width-integrated water sample with a DH-81 sampler suspended by a three-wheel base, Blue Hill Parkway, Mattapan and Milton, Massachusetts....18
13. Photographs showing passive in situ chemical-extraction samplers deployed in non-tidal parts of the Neponset River and Mother Brook in *(A)* deep water (deeper than about 2 feet), *(B)* shallow water (shallower than about 2 feet) and in tidal parts of the Neponset River Estuary suspended from *(C)* bridges, and *(D)* pilings....19
14. Graphs showing relative abundances of *(A)* dissolved and *(B)* particulate PCB congeners in a flow-proportional water sample collected during July 2005....25
15. Graphs showing relative abundances of polychlorinated biphenyls in white-sucker *(A)* fillets and *(B)* whole fish collected from the Tileston and Hollingsworth Impoundment and in *(C)* fillets and *(D)* whole fish collected from the Walter Baker Impoundment....28
16. Graphs showing relative abundances of polychlorinated biphenyl congeners in bottom-sediment grab samples collected from *(A)* Mother Brook near the Verizon Building (BGY–140), *(B)* Mother Brook near facility #2 (BGY–141), *(C)* the Neponset River near Fulton Street (BGY–104), and *(D)* the Neponset River at Fairmont Avenue (BGY–106)...32

17. Graphs showing total PCB concentrations and root mean square differences measured in *(A)* bottom-sediment grab samples and *(B)* passive in situ chemical-extraction samplers (PISCES)....35
18. Graphs showing relative abundances of polychlorinated biphenyls in passive in situ chemical-extraction samplers deployed in 2005 in *(A)* Mother Brook at Reservation Road, *(B)* Mother Brook at Hyde Park, *(C)* the Neponset River at Paul's Bridge, and *(D)* the Neponset River at Fairmont Avenue....36
19. Dendrograms of PCB-concentration data from *(A)* bottom-sediment grab samples and *(B)* passive in situ chemical-extraction samples....39
20. Graphs showing relative abundances of polychlorinated biphenyls measured in *(A)* Aroclor 1016, *(B)* Aroclor 1242, *(C)* Aroclor 1254, and *(D)* Aroclor 1260....42
21. Graphs showing relative abundances (expressed as decimal fractions) of *(A)* PCB 153 and PCB 138 + 163 + 164 in passive in situ chemical-extraction samplers and *(B)* PCB 153 and PCB 138 + 163 + 164 in bottom-sediment grab samples....44
22. Graphs showing daily mean discharges measured at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, during passive chemical-extraction sampler (PISCES) deployment in 2002, 2004, and 2005....45

Tables

1. Daily mean discharge measured at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), 2005 and 2006....10
2. Polychlorinated biphenyl names and numbers designated by the International Union of Pure and Applied Chemistry....52
3. Bottom-sediment grab-sampling and passive in situ chemical-extraction sampler sampling locations in Mother Brook and the Neponset River and Estuary, Massachusetts, 2002, 2004, and 2005....15
4. Characteristics of white sucker *(Catostomus commersoni)* and common mummichog *(Fundulus heteroclitus)* collected from the Neponset River and Estuary, Massachusetts....17
5. Collection data for water-quality samples, U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, May 2005 through April 2006....17
6. Deployment intervals and physical properties of water at locations sampled for polychlorinated biphenyls by passive in situ chemical-extraction samplers, 2004 and 2005....20
7. Polychlorinated biphenyl concentrations measured in bottom-sediment grab samples collected from Mother Brook and the Neponset River and Estuary, Massachusetts, in 2005....54
8. Element concentrations measured in surficial (top 4 inches) sediments collected from Mother Brook and the Neponset River and Estuary, Massachusetts, in 2005....23
9. Particulate, dissolved (less than one micron), and total polychlorinated biphenyl concentrations and loads, U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, May 2005 through April 2006....24
10. Concentrations of dissolved polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006....62

11. Concentrations of particulate polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006 66
12. Polychlorinated biphenyl concentrations in white sucker *(Catostomus commersoni)* collected from the Neponset River, Massachusetts, 2005 70
13. Polychlorinated biphenyl concentrations in the whole bodies of common mummichog *(Fundulus heteroclitus)* collected from the Neponset River Estuary, Massachusetts, 2005....75
14. Masses and concentrations of total polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, October and November 2005 78
15. Concentrations of particulate and dissolved polychlorinated biphenyls in water upstream (at Blue Hill Avenue) and downstream (at Central Avenue) of the Braided Channel, Neponset River, Massachusetts, October 15, 2005....82
16. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed in Mother Brook and the Neponset River and Estuary from July 25 through August 12, 2005....88
17. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed concurrently with the collection and analysis of white sucker tissue, Neponset River, Massachusetts, 2004....96

Conversion Factors and Abbreviations

Inch/Pound to SI

Multiply	By	To obtain
	Length	
inch (in.)	25,400	micrometer (µm)
inch (in.)	2.54	centimeter (cm)
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	4,047	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	3.785	liter (L)
gallon (gal)	0.003785	cubic meter (m^3)
million gallons (Mgal)	3,785	cubic meter (m^3)
cubic inch (in^3)	16.39	cubic centimeter (cm^3)
million cubic foot (Mft^3)	0.02832	million cubic meter (Mm^3)
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
gallon per day (gal/d)	0.003785	cubic meter per day (m^3/d)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
	Mass	
ounce, avoirdupois (oz)	28.35	gram (g)
pound, avoirdupois (lb)	0.4536	kilogram (kg)
ton, short (2,000 lb)	0.9072	megagram (Mg)
	Density	
pound per cubic foot (lb/ft^3)	0.01602	gram per cubic centimeter (g/cm^3)

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25°C).

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F=(1.8\times°C)+32$$

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

$$°C=(°F-32)/1.8$$

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (µg/L). Concentrations of PCBs and some elements are given in micrograms per liter (µg/L) or parts per million (ppm), nanograms per liter (ng/L) or parts per trillion (ppt), and pictograms per liter (pg/L) or parts per quadrillion (ppq) for water; nanograms per gram wet weight (ng/g wet wt) or parts per billion (ppb), and picograms per gram wet weight (pg/g wet wt) or parts per trillion (ppt) for fish tissue; ppb for blood; ppm and ppb for human milk and fat; and milligrams per kilogram (mg/kg) (ppm) and ng/g (ppb) for bottom sediment.

ABBREVIATIONS

ACOE	Army Corps of Engineers
ADCP	acoustic Doppler current profiler
AhR	aryl-hydrocarbon receptor
CCC	continuous chronic criterion
CSO	combined sewer overflows
DLC	dioxin-like compounds
DCM	dichloromethane
DIW	deionized water
DO	dissolved oxygen
ECD	electron-capture detection
EI	electron ionization
EWI	equal-width increment
GC	gas chromatograph
GC/ECD	gas chromatography with electron capture detector
GFF	glass-fiber filter
HRGC/LRMS	high-resolution gas chromatography/low-resolution mass spectrometry
HRGC/HRMS	high-resolution gas chromatography/high-resolution mass spectrometry
ICP-MS	inductively coupled plasma-mass spectrometry
IUPAC	International Union of Pure and Applied Chemistry
MassDEP	Massachusetts Department of Environmental Protection
MDWSC	Massachusetts Department of Waste Site Clean Up
MID	multiple ion detection
MS	quadruple mass spectrometer
MSD	mass selective detector
MWRA	Massachusetts Water Resources Authority
NepRWA	Neponset River Watershed Association
PAH	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCDD	polychlorinated dibenzodioxin compounds
PISCES	passive in situ chemical-extraction samplers
QA/QC	quality assurance/quality control
RMSD	root mean square difference
RPD	relative percent difference
SOP	standard operating procedure
TCDD	tetrachlorodibenzo-*p*-dioxin
TEF	toxic equivalency factors
TEQ	toxic equivalence
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WHO	World Health Organization

Concentrations, Loads, and Sources of Polychlorinated Biphenyls, Neponset River and Neponset River Estuary, Eastern Massachusetts

By Robert F. Breault

Abstract

Polychlorinated biphenyls (PCBs) are known to contaminate the Neponset River, which flows through parts of Boston, Massachusetts, and empties into the Neponset River Estuary, an important fish-spawning area. The river is dammed and impassable to fish. The U.S. Geological Survey, in cooperation with the Massachusetts Department of Fish and Game, Division of Ecological Restoration, Riverways Program, collected, analyzed, and interpreted PCB data from bottom-sediment, water, and (or) fish-tissue samples in 2002, 2004–2006. Samples from the Neponset River and Neponset River Estuary were analyzed for 209 PCB congeners, PCB homologs, and Aroclors. In order to better assess the overall health quality of river-bottom sediments, sediment samples were also tested for concentrations of 31 elements.

PCB concentrations measured in the top layers of bottom sediment ranged from 28 nanograms per gram (ng/g) just upstream of the Mother Brook confluence to 24,900 ng/g measured in Mother Brook. Concentrations of elements in bottom sediment were generally higher than background concentrations and higher than levels considered toxic to benthic organisms according to freshwater sediment-quality guidelines defined by the U.S. Environmental Protection Agency. Concentrations of dissolved PCBs in water samples collected from the Neponset River (May 13, 2005 to April 28, 2006) averaged about 9.2 nanograms per liter (ng/L) (annual average of monthly values); however, during the months of August (about 16.5 ng/L) and September (about 15.6 ng/L), dissolved PCB concentrations were greater than 14 ng/L, the U.S. Environmental Protection Agency's freshwater continuous chronic criterion for aquatic organisms. Concentrations of PCBs in white sucker (fillets and whole fish) were all greater than 2,000 ng/g wet wt), the U.S. Environmental Protection Agency's guideline for safe consumption of fish: PCB concentrations measured in fish-tissue samples collected from the Tileston and Hollingsworth and Walter Baker Impoundments were 3,490 and 2,450 ng/g wet wt (filleted) and 6,890 and 4,080 ng/g wet wt (whole fish). Total PCB-congener concentrations measured in the whole bodies of estuarine bait fish (common mummichog) averaged 708 ng/g wet wt.

PCBs that pass from the Neponset River to the Neponset River Estuary are either dissolved or associated with particulate matter (including living and nonliving material) suspended in the water column. A small proportion of PCBs may also be transported as part of the body burden of fish and wildlife. During the period May 13, 2005 to April 28, 2006, about 5,100 g (3.8 L or 1 gal) of PCBs were transported from the Neponset River to the Neponset River Estuary. Generally, about one-half of these PCBs were dissolved in the water column and the other half were associated with particulate matter; however, the proportion that was either dissolved or particulate varied seasonally. Most PCBs transported from the river to the estuary are composed of four or fewer chlorine atoms per biphenyl molecule.

The data suggest that widespread PCB contamination of the lower Neponset River originated from Mother Brook, a Neponset River tributary, starting sometime around the early 1950s or earlier. In 1955, catastrophic dam failure caused by flooding likely released PCB-contaminated sediment downstream and into the Neponset River Estuary. PCBs from this source area likely continued to be released after the flood and during subsequent rebuilding of downstream dams. Today (2007), PCBs are mostly trapped behind these dams; however, some PCBs either diffuse or are entrained back into the water column and are transported downstream by river water into the estuary or volatilize into the atmosphere. In addition to the continuing release of PCBs from historically contaminated bottom sediment, PCBs are still (2007) originating from source areas along Mother and Meadow Brook as well as other sources along the river and Boston Harbor. PCBs from the river (transported by river water) and from the harbor (transported by tidal action) appear to have contaminated parts of the Neponset River Estuary.

Introduction

The Neponset River, a tributary to Boston Harbor, has been dammed in some fashion for the past 350 years (fig. 1). Historically, the river supported abundant populations of American shad (*Alosa sapidissima*), river herring (alewife, *Alosa pseudoharengus*), and blueback herring (*Alosa aestivalis*). While the Neponset River Estuary continues to support an important fishery of rainbow smelt (*Osmerus mordax*), two dams in the lower Neponset River block passage for shad and herring. Following a habitat survey in 1995, the Massachusetts Division of Fisheries and Wildlife of the Massachusetts Department of Fish and Game within the Riverways Program, began to stock both shad and herring upstream of the two dams in anticipation of fish passage (U.S. Army Corps of Engineers, written commun., 2002).

Environmental managers and local advocates have proposed river-restoration efforts, such as channel restoration for habitat improvements and fish-passage alternatives, including the installation of engineered fishways, dam breaching, and removal of the two downstream dams on the lower Neponset River—the Walter Baker Dam (fig. 1) and the Tileston and Hollingsworth Dam (fig. 1; U.S. Army Corps of Engineers, written commun., 2002). Fish passage at these dams would open access to more than 17 mi of riverine habitat to migratory fish and facilitate increased recreational use of the lower Neponset River, the section of the river from Fowl Meadow to the Walter Baker Dam in Milton (U.S. Army Corps of Engineers, written commun., 2002).

Whether a river is restored through dam removal, other efforts, or a combination of dam removal and other efforts, data indicating the quality and quantity of bottom sediment are needed as the basis for informed sediment-management decisions. These data are especially important in the case of dam removal. Because the physical and chemical properties of most contaminants favor solid phase (or sediment) associations (Horowitz, 1991), accumulated fine-grained bottom sediment usually is associated with contaminants. These contaminants include elements and organic compounds, which can enter a river through waste disposal, urban runoff, sanitary sewers, atmospheric deposition, and inadvertent spills. As the contaminated sediments travel downstream, they commonly accumulate in the slack water behind dams.

In 2002, the U.S. Army Corps of Engineers (ACOE) completed a study on the environmental effects of dam removal that focused on fish passage and habitat restoration (U.S. Army Corps of Engineers, written commun., 2002). Although the ACOE study was not primarily focused on sediment quality, two bottom sediment cores were collected—one from the Walter Baker impoundment and one from the Tileston and Hollingsworth impoundment. These bottom-sediment cores were enriched in many contaminants, most notably polychlorinated biphenyls (PCBs).

Increased public dialogue about restoration of the Neponset River, combined with extensive dam construction, the long history of industrialization and urbanization along the river, and a preliminary knowledge of the occurrence and geographic distribution of sediment contaminants, including PCBs, in the lower Neponset River, led to a cooperative agreement between the Massachusetts Department of Fish and Game, Division of Ecological Restoration, Riverways Program (Riverways Program), and the U.S. Geological Survey (USGS). This partnership was formed with the intention of measuring the extent and magnitude of PCB contamination and, if possible, determining the source(s) of PCBs to the river.

The major goal of this partnership was the collection of bottom-sediment and water-quality data from the Neponset River in 2002 and 2003 (Breault and others, 2004b; figs. 2 and 3). Samples of sediment and water were collected at 63 sampling stations along the lower Neponset River (Paul's Bridge to the Walter Baker Dam) by sediment grab samplers (20 stations), sediment-core samplers (31 stations), and passive in situ chemical-extraction samplers (PISCES) (12 stations). Sediment samples were tested for concentrations of 31 elements, polycyclic aromatic hydrocarbons (PAHs), PCBs, and organochlorine pesticides, and also for grain-size distribution, to assess the overall health of river sediments. Selected bottom-sediment and PISCES samples were tested for 209 individual PCB congeners.

The USGS, on the basis of results from the 2002 data collection, found that bottom sediment in part of the lower Neponset River was contaminated with concentrations of PCBs above levels considered safe for aquatic organisms by the U.S. Environmental Protection Agency (USEPA) (Breault and others, 2004b). Data collected in 2002 from PISCES, which were deployed in the river's water column, indicate that PCBs in the lower Neponset River were mostly from PCB-contaminated sediment just downstream of the confluence with Mother Brook (fig. 1). PISCES data also indicated that PCB contamination in river water likely was derived from several different sources; however, the exact locations of historical contamination could not be determined. Although inconclusive, these data did indicate that a major source of PCBs was likely on or near the confluence of the Neponset River with Mother Brook, a small tributary, and that PCBs in the river have been heavily chemically weathered (Breault and others, 2004a).

As a result of the USGS study (Breault and others, 2004a), it was determined that more information concerning concentrations, loads, and sources of PCBs would help environmental managers answer questions concerning the concentrations of PCBs in riverine and estuarine sediments, water, and fish; the quantity of PCBs transported to the estuary from the river; and the exact location(s) of PCB-source areas (or places where PCB contamination originated). To this end, the USGS, in cooperation with the Riverways Program, began this second study of the Neponset River with the objective of answering these remaining questions by sampling water, sediment, and fish tissue and analyzing each for PCB congeners by means of gas chromatography.

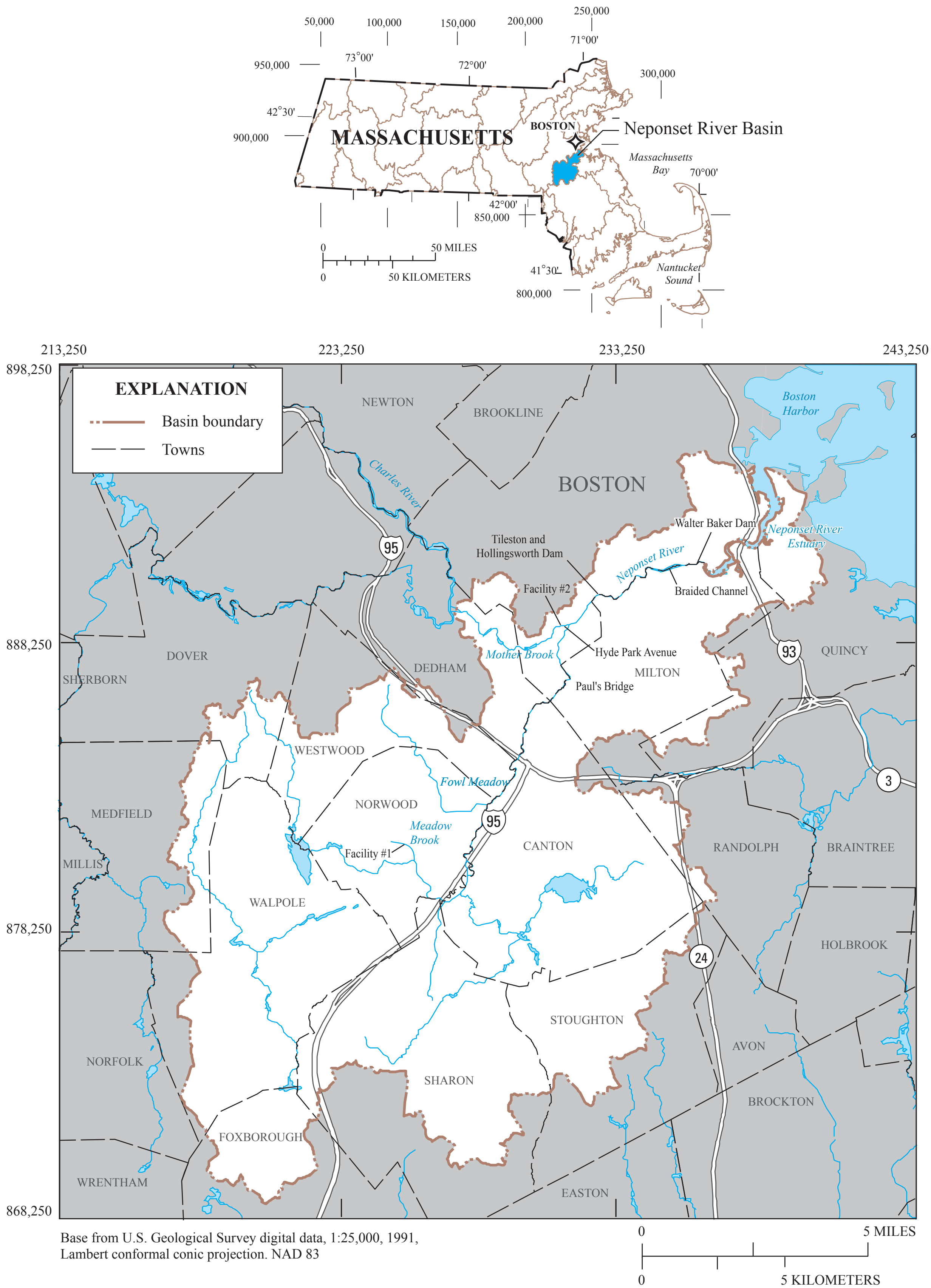

Figure 1. The Neponset River, Neponset River Estuary, Mother Brook, and Meadow Brook, Massachusetts. The Neponset River Drainage Basin is the unshaded area.

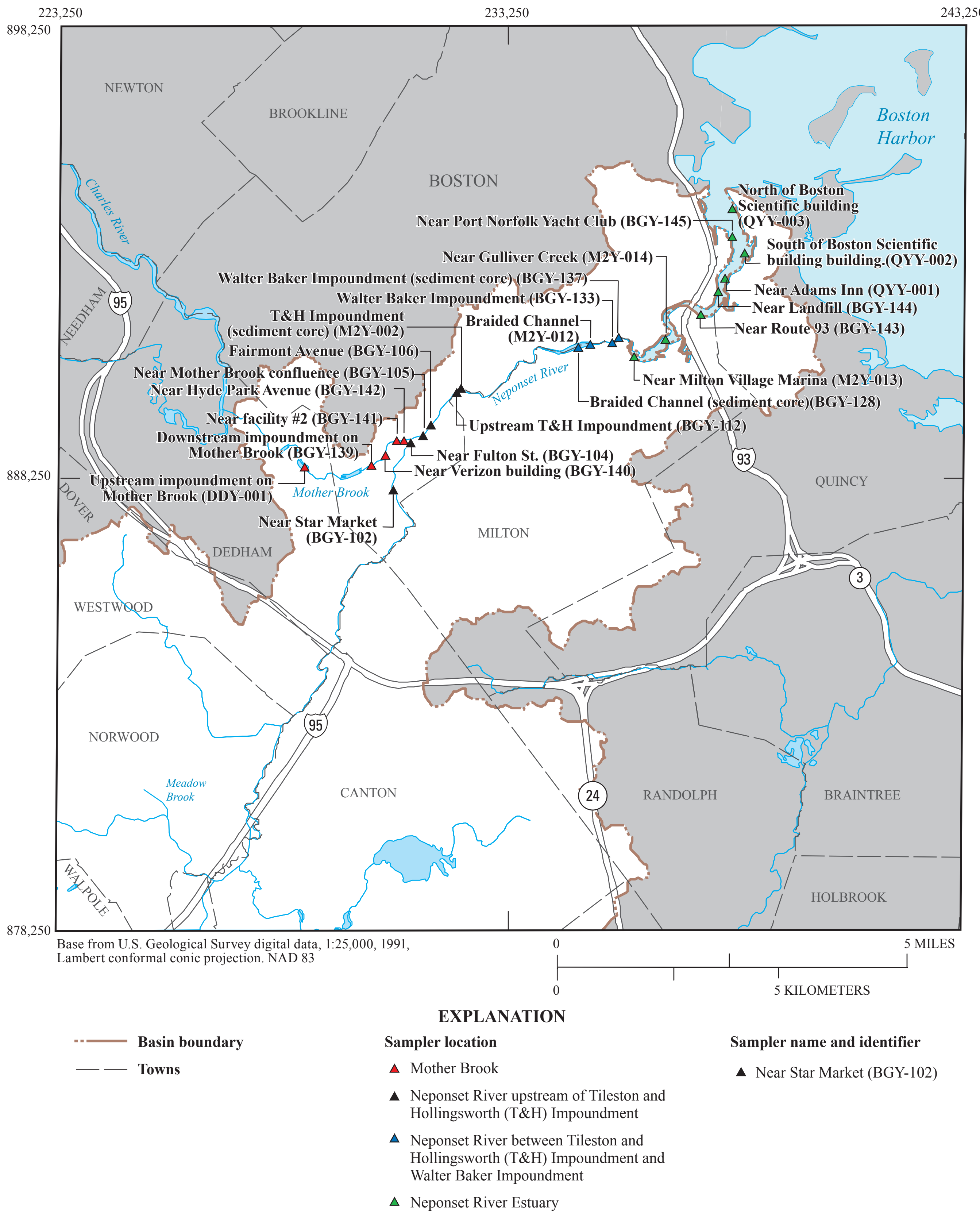

Figure 2. Bottom-sediment sampling locations in Mother Brook and the Neponset River and Estuary, Massachusetts, 2002 and 2005. The Neponset River Drainage Basin is the unshaded area. T&H is Tileston and Hollingsworth.

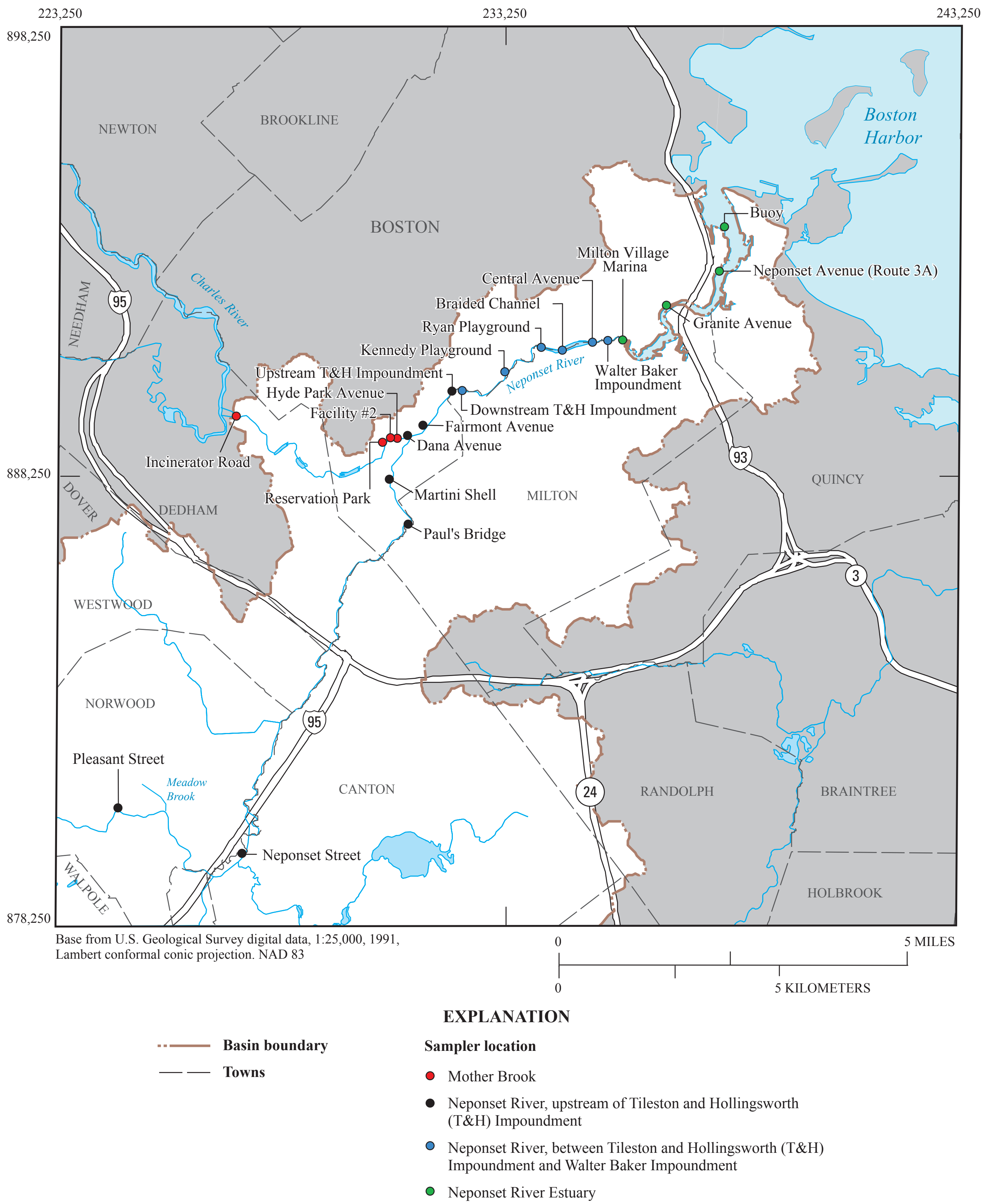

Figure 3. Passive in situ chemical-extraction sampler locations in Mother Brook, the Neponset River, and the Neponset River Estuary, Massachusetts, 2002, 2004, and 2005. The Neponset River Drainage Basin is the unshaded area. T&H is Tileston and Hollingsworth.

Purpose and Scope

This report describes the findings of the second USGS study, in which, concentrations, loads, and sources of PCBs were investigated by collecting, analyzing, and interpreting data from a number of sample types, including bottom-sediment grab samples, directly collected water samples, fish-tissue samples, and extracts from PISCES. PCB loading from the river to the estuary was quantified by chemical phase (dissolved, particulate, and total). The likelihood that PCBs would be transported from an area of the river contaminated with PCBs during large storms is also discussed. Finally, the report describes historical and present-day (2007) PCB-source areas. The report also presents data for 31 elements in samples of river-bottom sediments. These data, combined with the PCB results, provide an additional perspective on the overall quality of river-bottom sediment.

The data presented here will help environmental managers evaluate the advantages and limitations of fish-passage alternatives and sediment-management options. Possible options include dredging and removal of contaminated sediment, channel restoration with stabilization of contaminated sediment, breaching and removal of dams to allow redistribution of contaminated sediment downstream, and (or) leaving contaminated sediment in place. Knowledge of existing concentrations and distribution patterns of contaminants, as well as the location and persistence of PCB source areas in the river may guide the selection of the most cost-effective and environmentally beneficial river-restoration strategies.

Streamflow, Sediments, and Water Quality in the Neponset River Drainage Basin

The Neponset River is one of several major rivers that discharge to Boston Harbor. Flowing about 28 mi from its headwaters in Foxborough, MA, the Neponset River drains about 101 mi^2 of land—half of which can be classified as urban—as it passes through 14 Massachusetts cities and towns until it reaches the Neponset River Estuary (fig. 4E). Tidal for about another 3 mi (draining a total area of about 117 mi^2), the Neponset River ultimately discharges to Dorchester Bay (fig. 4F). The discharge of freshwater to the estuary has been measured by the USGS streamgage at Milton Village (station number 011055566; fig. 5A) since late 1996. On average, about 27 Mft^3/d or 202 Mgal/d (mean annual discharge for the period of record (water year[1] (WY) 1997–2005), equal to about 312 ft^3/s) of freshwater flows daily into Dorchester Bay. Most (80 percent) of the time, the daily mean discharge is between 39 and 777 ft^3/s (U.S. Geological Survey, 2010) (fig. 6, table 1).

[1] Water year in USGS reports dealing with surface-water supply is the 12-month period October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months.

The Neponset River also receives flow from the adjacent Charles River Basin through Mother Brook, a flood-diversion structure built in 1630. As much as one-third of flood flows in the Charles River, which are equivalent to the flow generated from about 60 mi^2 of drainage area of the Neponset River, are commonly diverted through Mother Brook to prevent flooding in downtown Boston (Boston Parks and Recreation Department, 2002). Historically, water diverted from the Charles River to the Neponset River through Mother Brook was used to flood fields or provide power to mills. The discharge in Mother Brook has been measured by the USGS (station number 01104000) since late 1931. On average, about 6.5 Mft^3/d or 49 Mgal/d (mean annual discharge for the period of record (WY 1932–2005), equal to about 75.7 ft^3/s) of water flows daily into the Neponset River. Most (80 percent) of the time, the daily mean discharge is between 1.4 and 201 ft^3/sec (U.S. Geological Survey, 2010).

Perhaps the most visible human alteration that has affected streamflow in the basin is the construction of dams, which has fragmented the river and changed low flows, high flows, and other hydrologic characteristics. Today (2007), 51 dams impound the waters of the Neponset River and its tributaries. These dams have also changed sediment regimes by trapping sediment in the impoundments behind the dams (Heinz Center, 2002). Whereas this is true for the Neponset River, it appears, at least with respect to the Tileston and Hollingsworth and Walter Baker Impoundments, that the river is at equilibrium with respect to siltation (Jim McBroom, McBroom and McBride, oral commun., 2006). In other words, the two most downstream impoundments are no longer accumulating sediment from year to year. At the time of this writing (2007), the lower dam has been breached (fig. 7); as a result, most of the sediment that was trapped behind this dam appears to have been transported downstream (Jim McBroom, McBroom and McBride, oral commun., 2006) along with associated contaminants.

Most bottom sediment in the lower Neponset River is just upstream of the dams or in an area that was impounded before 1955, locally known as the Braided Channel (fig. 8). This area was once impounded by the Jenkins Dam, which was destroyed by flooding caused by two successive hurricanes (Connie and Diane) that hit the Northeast on August 3–13 and August 10–19, 1955, respectively (Dunn and others, 1955). Other dams along the Neponset River were also destroyed by the floods. Although the Jenkins Dam was never rebuilt, some of the sediment deposits that accumulated behind the dam remain. Since 1955, the river has incised itself into these sediments, creating a landform called an anabranched channel that can be described as a meandering gravel-bed river with midchannel islands. Sediments trapped behind the remaining dams, for the most part, are composed of silts to fine sands in submerged, wedge-like deposits (Jim McBroom, McBroom and McBride, oral commun., 2006), whereas sediments in the anabranched channel are exposed and vegetated. The channel in free-flowing sections of the river is generally composed of

Figure 4. *(A)* Mother Brook, *(B)* Tileston and Hollingsworth Impoundment, *(C)* Walter Baker Impoundment, *(D)* Neponset River Estuary head of tide, *(E)* Neponset River Estuary, and *(F)* Dorchester Bay with the City of Boston in the background, Massachusetts.

Figure 5. *(A)* USGS streamgage Neponset River at Milton Village (011055566) and *(B)* Walter Baker Dam.

coarse-grained sediment overlain by a thin layer (less than 1 ft thick) of fine-grained sediment.

Like most urban rivers in the Northeast, the Neponset River has had a long industrial history. Industrialization and subsequent urbanization began in the Neponset River Basin as early as 1630. By the mid-1700s, the Neponset River was draining one of the most heavily industrialized basins in the Nation (U.S. Army Corps of Engineers, written commun., 2002). Perhaps the best known industry that operated in the Neponset River Drainage Basin was the chocolate industry; Baker Chocolate operated for 200 years along the banks of the Neponset River (1765–1965). The Massachusetts Department of Waste Site Clean Up (MDWSC) has documented several sites of PCB contamination throughout the basin, and many other contaminated sites likely remain undocumented (Chris Poytt, U.S. Environmental Protection Agency, oral commun., 2007).

The quality of the river has also been investigated with respect to constituents other than PCBs, most notably fecal coliform bacteria. This bacterial contamination has been attributed to leaking sewer pipes, illicit connections of sanitary sewers to storm drains, failing septic systems, stormwater runoff, and combined sewer overflows (CSOs) in the basin (Massachusetts Department of Environmental Protection (MassDEP), 2002). Since 1994, citizen groups and State, local, and Federal agencies have been collecting water-quality samples from the Neponset River. Recently (1995–2007), this work has been spearheaded by members of the Neponset River Watershed Association (NepRWA). Other water-quality problems in the river include excessive nutrients and plant growth, low dissolved oxygen (DO), siltation, trash and debris, color, odor, toxic metals, and oil and grease (Neponset River Watershed Association and University of Massachusetts Urban Harbors Institute, 2004).

Sources of PCBs in the Neponset River Drainage Basin

Soil, sediment, and water in some parts of the Neponset River Drainage Basin are known to have been contaminated with PCBs. For example, in 1983, the Massachusetts Department of Environmental Protection (MassDEP) and the U.S. Environmental Protection Agency (USEPA) found that soil and groundwater collected from a 26-acre property in Norwood, MA (facility #1; fig. 1), and bottom sediment collected from Meadow Brook, which flows along this property before its confluence with the Neponset River, were contaminated with PCBs at concentrations as high as 26,000 mg/kg (U.S. Environmental Protection Agency, 2005). The source of these PCBs is likely the disposal of waste from electronics research, electrical-equipment manufacturing, or both, between 1947 and 1979 (U.S. Environmental Protection Agency, 2004). Long-term remediation at this site included the removal of more than 500 tons of contaminated soil (1983); capping and fencing (1986); groundwater treatment (1996–2000); and river restoration of Meadow Brook (1997). Groundwater PCB concentrations measured in 2002 ranged from 0.05 to 12 μg/L (U.S. Environmental Protection Agency, 2004).

In 1986, Briggs Associates found that soil and groundwater collected from a 4-acre property in the Hyde Park neighborhood of Boston, MA (facility #2; fig. 1), was contaminated with PCBs and other contaminants (Shaw Environmental, 2004). In subsequent studies, bottom sediment collected from Mother Brook, which also runs along this property, was also found to be contaminated with PCBs at concentrations as high as 104 mg/kg (Shaw Environmental, 2004). The sources of these PCBs are likely the disposal of waste from aluminum and zinc die casting, machining, and painting, and the

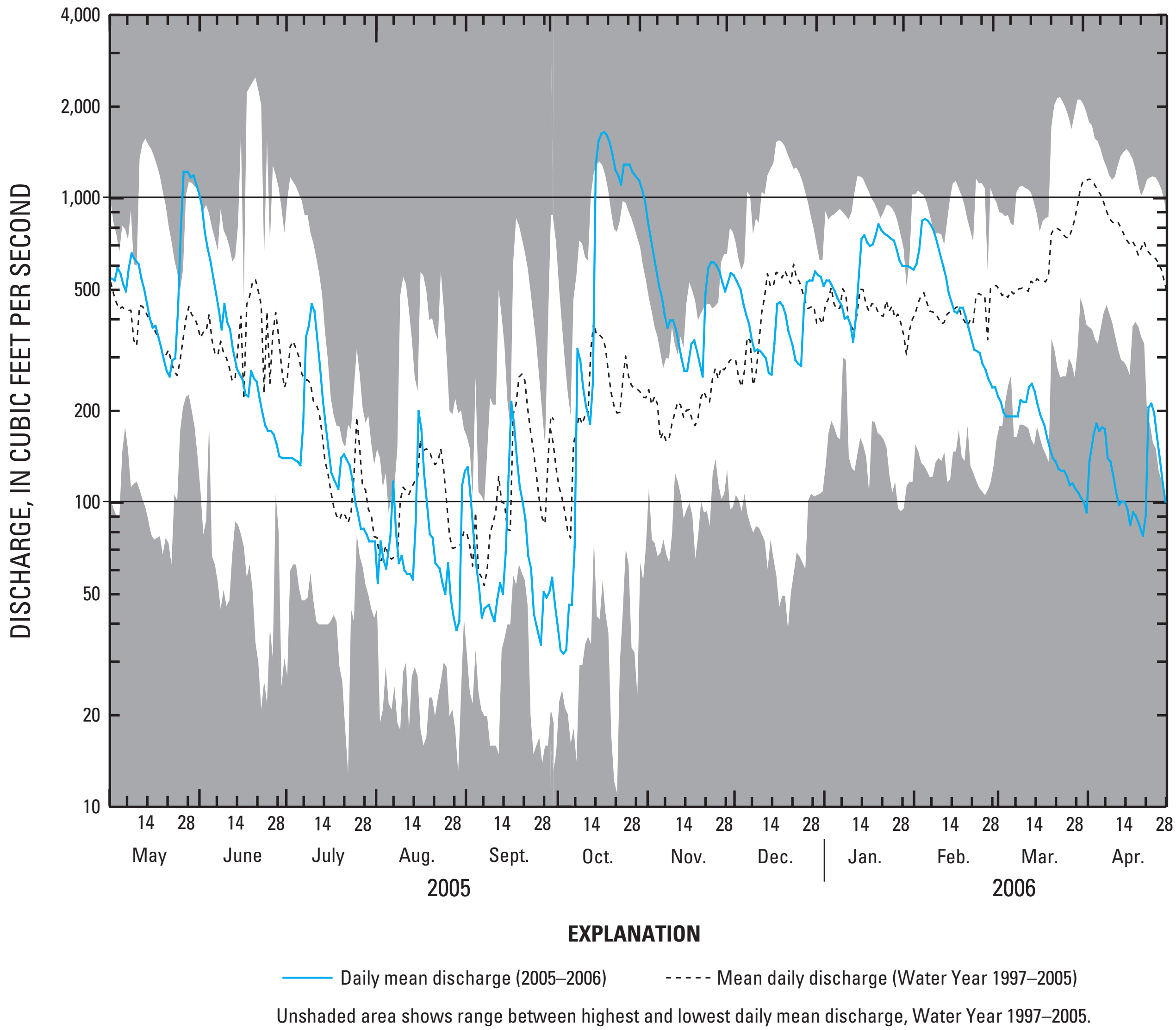

Figure 6. Summary statistics for streamflow measured at the USGS streamgage Neponset River at Milton Village (011055566).

packaging of electrical hardware at facility #2 beginning in the 1940s (Shaw Environmental, 2004). A storm drain in the vicinity of facility #2 has also been implicated as a potential PCB source. Street dirt collected from an upstream catch basin was contaminated with PCBs (0.36 mg/kg); as a result, Shaw Environmental concluded that data from this storm drain …"indicates a possible upstream source of PCBs; however, no specific upstream sources have been identified to date (Shaw Environmental, 2004, p. 3-3)." Remediation efforts at this site have included the removal of contaminated soil; groundwater treatment; the restoration of Mother Brook, which included the removal of about 2,500 tons of contaminated sediment and the construction of a barrier wall; an ecological risk assessment for Mother Brook downstream of the property (Shaw Environmental, 2004); and restoration of the downstream part of Mother Brook.

Additional sources of PCBs in the Neponset River Basin are likely given the history of industrialization in the basin. For example, Allis Chalmers produced oil circuit breakers along the banks of Mother Brook beginning in the 1920s. Oil-filled circuit breakers manufactured before 1989 might contain PCBs. Other documented sources of PCBs in this area include a former salvage yard (MassDEP, 2012a) and a tool-and-machine facility (MassDEP, 2012b, 2102c). As remediation efforts in the Neponset River Basin continue, new information about the industrial history of the area becomes available.

Table 1. Daily mean discharge measured at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), 2005 and 2006.

[Daily mean discharge, mean, maximum, and minimum discharge are given in cubic feet per second; --, not applicable; MAX, maximum; MIN, minimum]

Day	May-05	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06
1	539	928	139	54	130	46	967	558	544	586	239	103
2	534	772	139	74	104	39	832	555	513	576	236	101
3	587	677	137	65	80	33	737	530	534	602	222	93
4	562	615	135	61	62	32	655	493	528	674	214	136
5	519	548	132	77	53	33	575	444	510	834	197	167
6	491	484	180	116	42	46	511	409	488	846	192	181
7	587	426	347	80	45	46	471	383	462	836	192	171
8	654	369	378	63	46	71	411	339	436	808	192	176
9	625	443	443	67	43	318	370	313	399	775	191	174
10	598	390	420	60	41	292	392	317	406	726	190	140
11	542	365	345	58	48	239	391	312	384	667	215	136
12	496	318	275	58	54	207	367	302	334	593	214	121
13	443	273	215	56	50	181	328	294	405	544	212	108
14	400	260	178	87	69	247	296	265	545	485	236	98
15	372	251	150	199	122	1,280	268	262	732	451	245	101
16	377	225	125	173	213	1,510	267	331	749	424	230	101
17	350	221	119	124	178	1,600	330	447	704	417	211	95
18	320	269	110	99	138	1,630	339	453	691	434	194	84
19	293	254	140	79	112	1,590	311	439	702	434	178	93
20	270	246	144	76	101	1,490	284	412	752	407	161	90
21	257	220	137	63	88	1,360	259	364	813	373	149	85
22	291	197	132	61	67	1,220	481	325	783	344	139	78
23	297	178	118	54	61	1,170	584	292	759	317	135	90
24	429	170	100	50	43	1,090	607	283	747	312	129	204
25	776	170	91	63	39	1,270	610	280	732	307	127	211
26	1,200	167	82	48	34	1,280	591	432	719	283	127	197
27	1,200	156	82	42	51	1,270	567	523	671	271	121	164
28	1,160	141	79	38	49	1,210	527	531	621	253	114	139
29	1,180	139	74	41	51	1,170	490	532	592	--	115	116
30	1,100	139	74	113	57	1,120	522	568	596	--	110	100
31	1,030	--	74	127	--	1,050	--	553	592	--	107	--
TOTAL	18,479	10,011	5,294	2,426	2,271	24,140	14,340	12,541	18,443	14,579	5,534	3,853
MEAN	596	334	171	78.3	75.7	779	478	405	595	521	179	128
MAX	1,200	928	443	199	213	1,630	967	568	813	846	245	211
MIN	257	139	74	38	34	32	259	262	334	253	107	78

Figure 7. Breach of Walter Baker Dam, Neponset River, Massachusetts, in 2007.

Figure 8. The Braided Channel reach in the Neponset River, Massachusetts.

PCB Chemistry, Use, and Environmental Presence

PCBs are a group of organic compounds consisting of a biphenyl ring structure with 1 to 10 attached hydrogen or substituted chlorine atoms that theoretically form 209 distinctly different chemical compounds known as congeners (fig. 9). Congeners are identified by IUPAC (International Union of Pure and Applied Chemistry) numbers ranging from 1 to 209 (also known as a PCB number), with 1 indicating the lowest number of attached chlorine atoms (and the highest number of hydrogen atoms) and 209 indicating the highest number of attached chlorine atoms (and the lowest number of hydrogen atoms). Each congener is also referred to by a chemical name based on the number of attached chlorine atoms[2] and the position of the chlorine atoms on the biphenyl molecule defined below (table 2, in back of report). Positions are referred to by name, with four ortho positions, four meta positions, and two para positions (fig. 9). There are no known sources of PCBs in the natural environment.

Congeners that are composed of the same number of attached chlorine atoms (1 to 10) but differ stereochemically (that is, in the position occupied by the chlorine atoms) are called isomers (fig. 9) and are members of the same homolog group. These groups (with the number of isomers in parentheses) include monochlorobiphenyl (3), dichlorobiphenyl (12), trichlorobiphenyl (24), tetrachlorobiphenyl (42), pentachlorobiphenyl (46), hexachlorobiphenyl (42), heptachlorobiphenyl (24), octachlorobiphenyl (12), nonachlorobiphenyl (3), and decachlorobiphenyl (1) (table 2, in back of report). The degree of chlorine substitution and the stereochemistry affect the persistence, bioaccumulation, and toxic potential of each PCB congener (Safe, 1994).

PCBs were commercially manufactured and sold as specific mixtures of congeners. In the United States, most PCB mixtures were produced by Monsanto in Anniston, AL, and Sauget, IL, and sold under the trade name Aroclor. PCB mixtures were also manufactured in other countries by several different companies and sold under many different names (Morrison, 2000). Aroclors are identified by four digits (for example, 1232, 1242, and 1254), which indicate the number of carbon atoms per molecule (the first two digits) and the percentage of chlorine substituted for hydrogen by weight (the second two numbers). For example, Aroclor 1254 contains 12 carbon atoms, and chlorine was substituted for 54 percent of the hydrogen by weight. One exception to this naming convention is Aroclor 1016, which also contains 12 carbon atoms, but about 41 percent chlorine by weight. The composition of each Aroclor was determined on the basis of the intended commercial use, but generally consisted of 60 to 90 congeners. Commercial uses of Aroclors included dielectric fluids in capacitors and transformers, printing inks, paints, dedusting agents, pesticides, carbonless copy paper, and others. Some 700,000 tons (or 1.4 billion pounds) of PCBs were sold in North America between the 1930s and the late 1970s, when their general use was banned in the United States.

The production and commercial use of Aroclors have resulted in releases of specific mixtures of PCB congeners into the environment. Consequently, PCB concentrations commonly are reported in environmental studies in terms of Aroclors. Aroclor quantification is done by analyzing what are called “characteristic congeners” and then using a mathematical algorithm to estimate the concentrations of other congeners. These algorithms are based on well known congener patterns in commercially produced Aroclors and the assumption that congener patterns in environmental samples remain unchanged. It has become increasingly evident, however, that once released into the environment, PCB congeners can be transformed by volatilization, solubilization, photodegradation, biological uptake or metabolization (Morrison, 2000), preferentially transported (Pierad and others, 1996), or both, thereby muddling characteristic PCB-congener patterns. For these reasons, congener-specific analysis, which is now routine, is the preferred method of quantifying PCBs, although it is more costly. Statistical techniques are available to determine whether or not PCB-congener patterns in environmental samples differ from commercial mixtures of PCBs (Karcher and others, 2004).

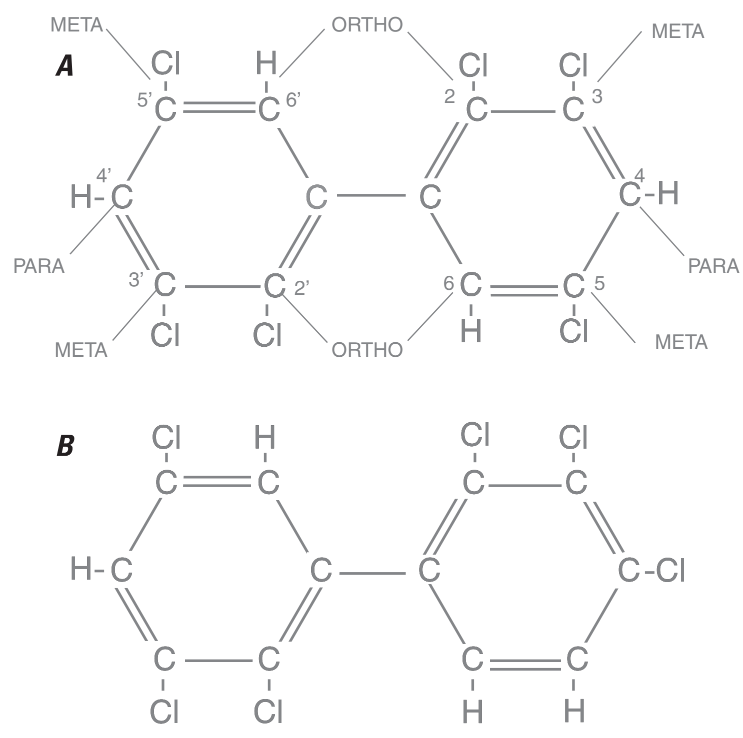

Figure 9. Schematic diagram of polychlorinated biphenyl isomers *(A)* 2,2′,3,3′,5,5′ hexachlorobiphenyl (PCB 133) and *(B)* 2,2′,3,3′,4,5′ hexachlorobiphenyl (PCB 130).

[2] Mono-, di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona,-, and decachlorobiphenyl have one, two, three, four, five, six, seven, eight, nine, or ten chlorine atoms per biphenyl molecule, respectively.

PCB congeners released into the environment are partitioned differently among air, water, sediment, vegetation, and biota (Beyer and Biziuk, 2009). Partitioning results from differences among congeners in the number of attached chlorine atoms (or level of chlorination), stereochemistry, or both, which determines each congener's solubility in water, vapor pressure, sorption characteristics, miscibility (for example, lipophilicy), and other properties and affects biologically mediated processes such as biotransformation, uptake, and accumulation (Schweitzer and others, 1997). For example, an inverse relation between the number of chlorine atoms and the solubility of PCBs in water and air has been demonstrated. On the other hand, the tendency for PCBs to sorb to soil, sediment, and seston (living and nonliving floating particles) appears to increase with the number of chlorine atoms, the concentration of total organic carbon, and the ratio of surface area to weight. Thus, it is expected that the more chlorinated congeners would tend to sorb onto fine-grained sediment and be preferentially transported in high-energy environments compared to the less chlorinated congeners (Pierard and others, 1996), which might be more likely to be transported in dissolved form. Some individual congeners can also be transformed through anaerobic dechlorination, that is, removal of attached chlorines by microbial action (Dingyi and others, 1995; Yadav and others, 1995; Williams and May, 1997; Qingzhong and others, 1997); destroyed through aerobic degradation (Manzano and others, 2003); or metabolized (Tanabe and others, 1988).

PCBs appear to be ubiquitous in the environment. They have been detected in water, sediment, fish, and wildlife in areas as remote as the Arctic Circle and in reservoirs as unlikely as polar-bear blubber (Norris and others, 2002). Closer to home, PCBs have been shown to be one of the preeminent classes of toxic chemicals in the bottom sediments of the Nation's lakes and rivers at concentrations exceeding those considered safe for aquatic life (U.S. Environmental Protection Agency, 2003). Samples of fish flesh collected from the Nation's waters have also been found to be contaminated with PCBs. In fact, as many as 91 percent of the sites surveyed (n=375) by the USEPA were contaminated by PCBs. Concentrations of PCBs in fish flesh (1.9 mg/kg, on average) were responsible, at least in part, for some 679 fish-consumption advisories issued nationwide (U.S. Environmental Protection Agency, 1999).

Humans are not exempt from PCB contamination. Humans are most commonly exposed to PCBs through the consumption of contaminated foodstuffs and environmental and occupational exposure; however, other types of exposures are possible. It has been shown that PCBs tend to accumulate in human blood, milk, and fat. Background PCB concentrations are typically less than 20 parts per billion (ppb) in human blood serum and range from 40 to 100 ppb and 1 to 2 parts per million (ppm) in human milk and fat, respectively (Safe, 1994). Two of the worst episodes of human PCB contamination occurred in Japan (Yusho incident, 1968) and Taiwan (Yu-Cheng incident, 1979) after PCB-contaminated rice oil was consumed by several thousand people. PCB blood-serum concentrations in Japanese and Taiwanese victims ranged from 1 to 30 ppb and 3 to 1,156 ppb, respectively (Masuda, 1985). PCB blood-serum concentrations in adults living within half a mile of the PCB-manufacturing plant in Alabama were 14 ppb, on average (Division of Health Assessment and Consultation, 2000). Occupational exposure has resulted in some of the highest body burdens of PCBs (Safe, 1994). PCBs have been shown to cause cancer, as well as a wide range of adverse effects on the immune, reproductive, nervous, and endocrine systems of animals and most likely humans (U.S. Environmental Protection Agency, 2006).

Study Design

Bottom-sediment samples were collected from the river and farther downstream in the estuary to supplement bottom-sediment data collected as part of the earlier USGS study (Breault and others, 2004a; fig. 10 and table 3). Specifically, riverine bottom-sediment samples were collected in and around areas near assumed sources of PCB contamination (fig. 2). The rationale for sampling estuarine bottom sediments was twofold: to examine PCB-congener patterns in estuarine mud and compare them with those in riverine mud, and to identify other PCB sources to the estuary, if present.

The results of the previous study demonstrated the potential for the overlying water to be contaminated with PCBs above levels considered safe for aquatic organisms, but did not provide information concerning the concentrations of PCBs in the water column. In this study, concentrations of dissolved and particulate PCBs were measured in flow-proportional water samples collected monthly at the mouth of the river just upstream of the Walter Baker Dam (fig. 5B). These samples were collected for one year starting in May 2005. In the laboratory, particulate and dissolved portions of water samples collected during October and November 2005 were inadvertently combined. As a result, no information concerning partitioning between phases is available for these two months.

PCBs have been shown to bioaccumulate, thereby resulting in PCB concentrations in organisms like fish that are thousands to millions of times more concentrated than concentrations in water from the same PCB-contaminated system. The magnitude of bioaccumulation depends on river characteristics and trophic level, as well as feeding strategy, metabolism, and exposure duration, and the specific toxic chemical ingested, as well as other factors. Consequently, PCB concentrations were measured in *Catostomus commersoni* (known as white sucker) and *Fundulus heteroclitus* (known as common mummichog) to ascertain the likelihood that riverine and estuarine fish exposed to PCB-contaminated water and bottom sediment are bioaccumulating PCBs. White sucker are medium-sized fish (12 to 20 in. in length) that feed mostly on larval insects and other bottom-dwelling organisms (fig. 11A and table 4). White sucker are commonly used as bait, but on occasion are fished

Figure 10. U.S. Geological Survey scientist collecting surficial (top 4 inches) sediment samples by means of *(A)* a stainless-steel dredge in water deeper than 3 feet and *(B)* a Teflon scoop in water shallower than 3 feet.

for food. Common mummichog are small fish (5 to 6 in. in length) that live within about 100 ft of the shoreline and feed primarily on phytoplankton, mollusks, crustaceans, mosquito larvae, and detritus. Common mummichog are of some commercial value as bait (Bigelow and Schroeder, 1953; fig. 11B).

The transport of PCBs from the Neponset River to the Neponset River Estuary may not only threaten the ecological health of the estuary, but may also threaten the health of downstream salt marshes, wetlands, flood plains, tributary streams, and embayments, including Boston Harbor. During the late 1990s Boston Harbor was the focus of a cleanup effort that was considered "….one of America's greatest environmental success stories," by John DeVillars, then regional administrator of the USEPA (Allen, 2000). Prior to this study, no information was available concerning the loading of PCBs from the river to the estuary. Concentrations measured in flow-proportional water samples were used together with daily mean streamflow[3] data measured by the streamgage at Milton Village (station number 011055566) to estimate PCB loads from the river to the estuary. This streamgage is on the upstream face of the Walter Baker dam (fig. 5B and table 5), which physically separates the Neponset River from the Neponset River Estuary.

High flows, such as flows during rain storms, may be able to resuspend and transport PCB-contaminated bottom sediment. Prior to this study, no information was available concerning the potential to remobilize PCB-contaminated bottom sediment in the lower Neponset River. This information is needed to assess potential restoration alternatives—in particular, the alternative of not taking action. In other words, it may be possible to leave PCB-contaminated bottom sediment in place safely if it can be demonstrated that those sediments are stable and will not move significantly. The Braided Channel may be a good reach in which to test the no-action alternative because, at first glance, sediments in this part of the river appear stable; PCBs are trapped in heavily vegetated islands in this part of the river. To test this hypothesis, stormwater flows were measured while stormwater samples were collected upstream and downstream of the Braided Channel (fig. 12).

PISCES have been used in the past to identify PCB sources (Colman, 2000; Breault and others, 2004a). As part of the previous study by the USGS, PISCES were deployed in the Neponset River from Paul's Bridge to the Walter Baker Dam with the objective of identifying the areas where PCB contamination first originated (Breault and others, 2004a). This was done by deploying PISCES at strategic locations; retrieving PISCES after about two weeks; processing and analyzing hexane collected from each sampler; and interpreting PCB-congener masses or congener patterns in the samples. The results of this first study indicated that a substantial PCB source likely was between Fairmont Avenue and either Martini Shell on the Neponset River or Reservation Park on Mother Brook (fig. 3) (Breault and others, 2004a); however, the exact location could not be determined. For this reason, a second round of sampling was conducted that included deploying PISCES along Mother Brook, as well as in the Neponset River upstream and downstream of the confluence with Meadow Brook, another well-known PCB-contaminated tributary stream. PISCES were also deployed downstream of the Walter Baker Dam in the Neponset River Estuary to provide data on PCB-congener patterns in estuarine water for comparison to those in riverine water and to allow identification of other PCB sources to the estuary, if present (figs. 1, 13, table 6). Bottom-sediment samples were also collected along Mother Brook and in the estuary. PCBs and PCB-congener patterns measured in PISCES and bottom-sediment samples were mathematically analyzed to determine likely PCB source areas and degradation processes.

[3] Daily mean streamflow in cubic feet per second is calculated by dividing the volume of total streamflow measured in cubic feet during each day by the number of seconds in each 24-hour period (86,400).

Table 3. Bottom-sediment grab-sampling and passive in situ chemical-extraction sampler sampling locations in Mother Brook and the Neponset River and Estuary, Massachusetts, 2002, 2004, and 2005.

[Bottom-sediment sampling locations are shown in figure 2, and passive in situ chemical-extraction sampler (PISCES) locations are shown in figure 3. ID, identifier; T&H, Tileston and Hollingsworth; do, ditto]

Station name	Station ID	Location	Massachusetts State Plane coordinates (meters)	
Bottom sediment				
Upstream impoundment on Mother Brook	DDY-001	Mother Brook	228,750	888,484
Downstream impoundment on Mother Brook	BGY-139	......do...........	230,215	888,518
Near Verizon Building	BGY-140	......do...........	230,533	888,732
Near facility #2	BGY-141	......do...........	230,775	889,056
Near Hyde Park Avenue	BGY-142	......do...........	230,933	889,064
Near Star Market	BGY-102	Neponset River	230,706	887,979
Near Fulton Street	BGY-104	......do...........	231,078	889,013
Near Mother Brook confluence	BGY-105	......do...........	231,355	889,173
Fairmont Avenue	BGY-106	......do...........	231,531	889,403
Upstream T&H Impoundment	BGY-112	......do...........	232,094	890,115
T&H Impoundment (sediment core)	M2Y-002	......do...........	232,130	890,118
Braided Channel (sediment core)	BGY-128	......do...........	234,800	891,151
Braided Channel	M2Y-012	......do...........	235,025	891,177
Walter Baker Impoundment	BGY-133	......do...........	235,501	891,209
Walter Baker Impoundment (sediment core)	BGY-137	......do...........	235,562	891,240
Near Milton Village Marina	M2Y-013	Neponset Estuary	235,993	890,912
Near Gulliver Creek	M2Y-014	......do...........	236,673	891,289
Near Route 93	BGY-143	......do...........	237,450	891,830
Near landfill	BGY-144	......do...........	237,840	892,331
Near Adams Inn	QYY-001	......do...........	237,982	892,626
South of Boston Scientific Building	QYY-002	......do...........	238,421	893,183
Near Port Norfolk Yatch Club	BGY-145	......do...........	238,149	893,547
North of Boston Scientific Building	QYY-003	......do...........	238,146	894,164

Station name	Location	Massachusetts State Plane coordinates (meters)	
PISCES			
Pleasant Street	Neponset River	224,719	880,867
Neponset Street	......do...........	227,466	879,864
Paul’s Bridge	......do...........	231,137	887,152
Martini Shell	......do...........	230,732	888,142
Incinerator Road	Mother Brook	227,337	889,542
Reservation Park	......do...........	230,570	888,965
Facility #2	......do...........	230,747	889,062
Hyde Park Avenue	......do...........	230,900	889,047
Dana Avenue	Neponset River	231,128	889,113
Fairmont Avenue	......do...........	231,474	889,340
T&H Impoundment (upstream)	......do...........	232,116	890,102
T&H Impoundment (downstream)	......do...........	232,343	890,111
Kennedy Playground	......do...........	233,282	890,519
Ryan Playground	......do...........	234,090	891,067
Braided Channel	......do...........	234,556	891,006
Central Avenue	......do...........	235,217	891,177
Walter Baker Impoundment	......do...........	235,565	891,213
Milton Village Marina	Neponset Estuary	235,882	891,226
Granite Avenue	......do...........	236,856	892,002
Neponset Avenue (Route 3A)	......do...........	238,023	892,753
Buoy	......do...........	238,138	893,734

Figure 11. *(A)* White sucker and *(B)* common mummichog collected from the Neponset River and Estuary, respectively, as well as the *(C)* collection and *(D)* processing of white sucker.

Dissolved PCB congeners were collected in hexane-filled PISCES to provide data on PCB-congener patterns. The advantages of PISCES over other types of samplers for the collection of whole-water samples include the collection of PCBs over a period of time without the added expense of constructing, maintaining, and operating streamgaging and water-quality monitoring stations outfitted with automated, flow-proportional sampling equipment; the concentration of PCBs in hexane (the solubility of PCBs is much greater in hexane compared to river water) and, in turn, the increased likelihood of detecting individual PCB congeners that could otherwise be undetectable in whole-water samples; better analytical recovery compared to recoveries typical for whole-water samples; and closer resemblance of concentration patterns to those detected in fish collected from similar settings. More detailed information about field methods can be found in appendix 1.

Two techniques can be used to analyze PCB data: Aroclor or congener analysis. Aroclors are analyzed by testing for characteristic congeners, and then using a mathematical algorithm to estimate the concentrations of other congeners. These data are reported in terms of Aroclor concentrations. Measuring PCBs by testing for Aroclors however, can generate errors when congener patterns deviate from those of the original Aroclor. For example, once an Aroclor enters the environment, individual congeners can be preferentially degraded by microbial action, chemically weathered, or physically changed in such a way that the original congener pattern for that Aroclor is lost (Butcher and others, 1997). In contrast, a congener analysis, which was used in the original study and this study, tests for the presence of individual congeners. More detailed information about laboratory methods and QA/QC procedures can be found in appendixes 2 and 3, respectively.

Table 4. Characteristics of white sucker *(Catostomus commersoni)* and common mummichog *(Fundulus heteroclitus)* collected from the Neponset River and Estuary, Massachusetts.

[ID, identifier; mm, millimeter; g, grams; T&H, Tileston and Hollingsworth; WB, Walter Baker]

Fish ID	Length (mm)	Weight (g)	Fish ID	Length (mm)	Weight (g)
Whole white sucker (T&H) (August 2003)			Filleted white sucker (WB) (September 2005)		
1	430	1,020	9	445	985
2	460	1,260	10	439	835
3	405	850	11	463	1,038
4	410	945	12	391	685
5	425	955	13	415	829
6	400	805	14	430	911
7	410	865	15	412	810
8	460	1,250	16	465	1,128
Filleted white sucker (T&H) (September 2005)			Common mummichog (Estuary) (July 2006)		
9	425	906	1	77	5.20
10	413	784	2	67	3.04
11	444	943	3	68	3.52
12	428	892	4	70	3.81
13	475	1,138	5	66	3.00
14	420	862	6	54	1.64
15	453	943	7	60	2.18
16	414	781	8	62	2.78
Whole white sucker (WB) (August 2003)			9	69	3.69
			10	63	2.61
1	460	1,300	11	65	2.86
2	425	1,150	12	65	2.91
3	470	1,450	13	60	2.14
4	435	1,250	14	55	1.72
5	430	950	15	61	2.65
6	380	790	16	62	2.62
7	450	1,310	17	56	1.69
8	425	1,090	18	59	2.28
			19	63	2.37
			20	62	2.57
			21	65	2.73

Table 5. Collection data for water-quality samples, U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, May 2005 through April 2006.

[No., number; Mft^3, million cubic feet; L, liters; --, not applicable]

No.	Start date	End date	Sample flow threshold (Mft^3)	No. of samples	Sample volume (L)
1	05/13/05	05/31/05	6.4	173	13.5
2	06/01/05	07/01/05	6.4	120	10.7
3	07/01/05	07/31/05	3.2	140	10.5
4	07/31/05	08/31/05	3.2	132	8.9
5	08/31/05	09/30/05	1.6	126	8.1
6	09/30/05	10/30/05	[1]1.6 (6.4)	617	19.9
7	10/30/05	12/01/05	6.4	253	11.6
8	12/01/05	01/01/06	6.4	175	10.9
9	01/01/06	02/02/06	3.2	491	22.4
10	02/02/06	03/02/06	6.4	221	11.0
11	03/02/06	04/28/06	3.2	208	5.7
Total	05/13/05	04/28/06	--	2,656	133

[1] 30 L of the October sample collected at a 1.6-Mft^3 sample threshold was split with a Teflon cone splitter. One-fourth of the split sample was added to the sample collected at the 6.4-Mft^3 sample threshold.

Figure 12. *(A)* Measurement of streamflow by means of an acoustic doppler current profiler, Blue Hill Parkway (Route 28), Mattapan and Milton, Massachusetts; and *(B)* U.S. Geological Survey staff collecting an isokinetic equal-width-integrated water sample with a DH-81 sampler suspended by a three-wheel base, Blue Hill Parkway, Mattapan and Milton, Massachusetts.

Mathematical Analysis of PCB-Congener Data

The statistic root mean square difference (*RMSD)*, was used to compare differences in PCB-congener patterns (referred to as “fingerprints”) among environmental samples and duplicates. Mathematically, *RMSD* is defined as the square root of the average of the sum of squared differences of relative abundances of a set of specific congeners in two different samples. To calculate *RMSD*, each individual congener concentration measured in each sample was first divided by the total PCB concentration in the sample to yield the relative abundance of that congener. PCB congeners for which analytical results were censored or estimated were excluded.

For a pair of samples *A* and *B*,

$$RMSD = 100 \times \sqrt{\frac{\sum_{i=1}^{n}\left(A-B\right)^2}{n}}, \qquad (1)$$

where

RMSD is the root mean square difference;
A and *B* are the relative abundances of the same congener in two samples; and
n is the number of congener pairs compared.

Differences in congener patterns between two environmental samples were considered statistically significant if the *RMSD* value for these samples was greater than the average of the *RMSD* values for duplicate samples. It is important to note that *RMSD*s greater than these for duplicate samples (the average *RMSDs* for duplicate bottom-sediment grab and PISCES samples as part of this study were about 0.18 and 0.17, respectively) do not unequivocally indicate a new or different source of PCBs. For example, transformation or preferential transport can alter the relative abundance of PCB congeners in a sample and substantially affect *RMSD* values. If changes in the concentrations of PCB congeners are not interpreted with caution, they may be incorrectly attributed to the addition of a new source. *RMSD* was used to compare congener patterns in samples collected from spatially adjacent stations along the river for historical-source identification and from month to month to track changes in possible transport pathways.

Whereas the *RMSD* statistic is useful for comparing individual sample-to-sample differences, cluster analysis, a multivariate statistical technique, is well suited for grouping samples together on the basis of some measure of similarity (or, alternatively, the distance or difference) so that differences are minimized within groups and maximized between groups. As part of this project, PISCES and bottom-sediment samples were organized into similar groups called “clusters” by means of the cluster-analysis function in Minitab, a commercially available statistical software package.

The cluster-analysis function in Minitab uses an agglomerative hierarchical method that begins with each sample

Figure 13. Passive in situ chemical-extraction samplers deployed in nontidal parts of the Neponset River and Mother Brook in *(A)* deep water (deeper than about 2 feet), *(B)* shallow water (shallower than about 2 feet) and in tidal parts of the Neponset River Estuary suspended from *(C)* bridges, and *(D)* pilings.

forming its own cluster. Next, pairs of clusters are successively agglomerated, or merged, on the basis of similarity of measurement and a linkage model until all of the clusters are joined together. In this analysis, similarity was computed by the Euclidean distance between samples. The Euclidean distance is the straight-line distance between two points in *c*-dimensional space defined by *c* variables. Here, *c* is 47, representing the number of PCB congeners that were detected in more than 90 percent of the PISCES or bottom-sediment grab samples. Points representing similar values for all 47 PCB congeners in their corresponding samples would lie close to each other if plotted in 47-dimensional space; pairs of these points would be separated by a small Euclidean distance, and the points as a whole would form a cluster. The average-linkage strategy was used to merge clusters. That is, "when two clusters agglomerate, their dissimilarity is equal to the mean of the distances between each [point] in one cluster and each [point] in the other cluster" (McGarigal and others, 2000). Finally, the results of hierarchical cluster analysis are displayed graphically in the form of a dendrogram or a tree-like plot depicting the agglomeration sequence, in which the points are plotted on one axis and the similarity levels at which the points merge are plotted on the other. The lengths of the branches being merged together indicate the degree of dissimilarity (or similarity) between members of the newly formed clusters.

Before being analyzed, PCB-congener concentrations were first divided by total congener concentrations to

Table 6. Deployment intervals and physical properties of water at locations sampled for polychlorinated biphenyls by passive in situ chemical-extraction samplers, 2004 and 2005.

[Similar data for PISCES samples collected during 2002 can be found in Breault and others (2004b); µS/cm, microsiemens per centimeter at 25 degrees Celsius; deg. C, degrees Celsius; do, ditto; T&H, Tileston and Hollingsworth]

Station name	Location	Date deployed	Date retrieved	Number of days in river	Specific conductance (µS/cm) at retrieval time	Temperature (deg. C) at retrieval time
Pleasant Street	Neponset River	7/27/2005	8/12/2005	16.1	431	27.0
Neponset Street	......do..............	7/27/2005	8/12/2005	16.1	444	27.2
Paul's Bridge	......do..............	7/27/2005	8/12/2005	16.1	500	25.2
Incinerator Road	Mother Brook	7/27/2005	8/12/2005	16.1	481	28.6
Reservation Park	......do..............	7/27/2005	8/12/2005	16.1	497	27.9
Facility #2	......do..............	7/27/2005	8/12/2005	16.1	497	27.9
Hyde Park Avenue	......do..............	7/27/2005	8/12/2005	16.2	496	27.6
Dana Avenue	Neponset River	7/27/2005	8/12/2005	16.2	513	27.2
Fairmont Avenue	......do..............	7/27/2005	8/12/2005	16.2	601	27.4
T&H Impoundment (upstream)	......do..............	8/18/2004	8/30/2004	12.1	337	20.8
Walter Baker Impoundment	......do..............	8/18/2004	8/30/2004	12.0	332	20.6
Milton Village Marina	Neponset Estuary	7/28/2005	8/12/2005	15.0	2,650	25.1
Granite Avenue	......do..............	7/28/2005	8/12/2005	14.9	3,250	25.0
Neponset Avenue (Route 3A)	......do..............	7/28/2005	8/12/2005	14.9	41,000	23.6
Buoy	......do..............	7/28/2005	8/12/2005	14.9	46,100	22.2

minimize the effects associated with order-of-magnitude differences in concentrations. Data scaled in this way add up to one (or 100 percent) and are commonly described as "compositional." Unfortunately, "the inappropriateness of correlation coefficients and standard multivariate techniques [like cluster analysis], for compositional data has been known for many years" (Pearson, 1897). "Standard covariance and correlation coefficients from sets of compositions are affected by closure. This leads to problems with the interpretation of simple summary statistics, but also more complex multivariate analyses" (Howel, 2007). Fortunately, log-ratio transformation of compositional data has proven to be a simple solution to the problem of closure (Aitchison, 1986). Consequently, PCB-congener data were center-log-ratio (clr) transformed prior to analysis. That is, PCB-congener relative abundances were divided by the geometric mean by station and log-transformed (base-10) (Howel, 2007). Despite solving the problem of closure, this approach is very sensitive to the issue of values below detection limits or censored values. To solve this problem, censored values are commonly replaced by means of imputation[4]; however, the large number of variables (congeners) and the small number of observations (samples) in this study makes imputation impractical. In cases like this, a simple replacement strategy proposed by Martín-Fernández and others (2003) has been shown to have little effect on the structure of the data set as long as fewer than 10 percent of the values are censored. By means of this replacement strategy, censored PCB concentrations of congeners detected in at least 90 percent of the samples were replaced by concentration values equal to 65 percent of the detection limit. PCB congeners detected in fewer than 90 percent of the samples were not included in the cluster analysis (estimated PCB-congener concentrations were included in the cluster analysis).

A statistical method was used to distinguish between PCB congeners affected by processes like transformation or preferential transport and congeners unaffected by these factors. This method is based on the fact that some PCB congeners combine to form tracker pairs that maintain a constant concentration ratio in commercial PCB mixtures (Karcher and others, 2004). Tracker pairs were determined from Aroclor data supplied by AXYS Analytical Services Ltd., and PCB congeners composing tracker pairs were tested by separate methods described by Karcher and others (2004) for PISCES and bottom-sediment samples. If the ratios for tracker pairs in environmental samples differ statistically (α= 0.05) from the

[4] Missing or censored (in this case) values are predicted by using existing values from other variables.

ratios measured in Aroclor samples, the PCB congeners are considered to be not Aroclor like. In contrast, if the ratios for the tracker pairs in environmental samples are similar to ratios measured in Aroclor samples, the congeners are considered Aroclor like. Although possible, it is unlikely that tracker-paired PCB congeners are affected in exactly the same way by environmental processes as unpaired congeners and, for this reason maintain the ratio measured in commercial PCB mixtures. As a result, the relative abundance of Aroclor-like congeners in environmental samples may be used to infer characteristics of the original source material (for example, the Aroclor(s) most responsible for PCB contamination). In addition, differences in the relative abundances of Aroclor-like congeners among environmental samples can be used with other information (for example, grain-size distribution and (or) congener solubility) to determine whether differences in relative abundance among samples are the result of the addition of a new PCB source or an environmental process.

Although guidelines for specific PCB congeners do not exist, some PCB congeners are structurally similar to a group of polychlorinated dibenzodioxin compounds (PCDD) that act by a similar cellular mechanism to cause comparable biological and toxic effects (U.S. Environmental Protection Agency, 2001). The compound 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (often referred to as 2,3,7,8-TCDD, TCDD, or dioxin) is generally considered the most toxic PCDD (Murphy, 1986). Human exposure to high levels of TCDD causes a variety of ailments, including chloracne, porphyria (skin and nerve damage), liver damage, and psychiatric disturbances (International Agency for Research on Cancer, 1997). Of the 209 PCB congeners, 12 are considered dioxin-like compounds (DLC); that is, they cause toxic effects similar to TCDD (U.S. Environmental Protection Agency, 2006). Because of this similarity, the USEPA has developed an algorithm for estimating PCB toxicity relative to TCDD toxicity to generate a metric called the TCDD "toxic equivalency" (*TEQ*). The algorithm is based on toxic equivalency factors (*TEF*) developed by the World Health Organization (WHO) in 1997 (updated in 2005) for the different congeners; these factors indicate the degree of toxicity compared to TCDD, which is given a value of 1 (Van den Berg and others, 1998; Van den Berg and others, 2006). Equation 2 was used to calculate the *TEQ*.

$$TEQ = \sum_{i=1}^{n} C_i \times TEF_i \, , \qquad (2)$$

where

TEQ is the TCDD toxic equivalency, in picograms per liter (pg/L);

C_i is the concentration of dioxin-like compound i in water, in pg/L;

TEF_i is the toxic equivalency factor for dioxin-like compound i; and

n is the number of dioxin-like compounds.

Concentrations of PCBs and Other Constituents in Water, Sediment, and Fish

The collection, analysis, and interpretation of PCB data can be used to answer the question "What methods could be used to restore the river?" but also yield information about how PCB contamination is affecting the ecosystem; thus, this information can be used to answer the question, "What would be the consequences of doing nothing?" For example, PCB-contaminated sediment, if left in place, will continue to supply PCBs through resuspension of particulates in the water column and through diffusion and advection of dissolved PCBs that can redeposit downstream, volatilize into the air, or accumulate in fish, wildlife, or humans. PCBs enter the food chain through phytoplankton and benthic organisms, which in turn are eaten by zooplankton, fish, and wildlife. Fish can also accumulate PCBs directly from the water column by means of transfer across the gill surface.

PCBs in Sediment

Total PCB concentrations[5] measured (as part of both studies) in the top layers (4 in.) of Neponset River bottom sediment varied by about a factor of about 1,000: a minimum concentration of 28 ng/g was measured in the Neponset River (behind Star Market) upstream of the Mother Brook confluence (table 7, in back of report), and a maximum concentration of 24,900 ng/g was measured near facility #2 in Mother Brook. Concentrations in sediment grabs in Mother Brook averaged about 60 times less (270 ng/g) upstream of facility #2 than downstream of this location (15,400 ng/g). PCB concentrations in Neponset River sediments downstream of Mother Brook averaged about 11,400 ng/g, almost six times the safe limit (U.S. Environmental Protection Agency, 1999), and about 900 ng/g in estuarine mud samples. PCB concentrations generally declined with distance away from the river mouth into the estuary. PCB concentrations in some sediment grab samples collected from the Neponset River were also greater than the maximum PCB concentration (2,000 ng/g) allowed in capping material to be disposed in lined landfills (MassDEP, 1997), and some sediment could be classified as moderately regulated waste (50 to 499 mg/kg) defined by the Toxic Substances Control Act. Sediment with contaminant concentrations greater than these values usually requires special disposal, but sediment with concentrations below these values may not.

[5] If duplicate sediment grab samples were collected at the same location, the masses of PCBs measured in both were averaged. Censored data (or individual PCB congeners reported as less than method detection limits) nor estimated data were included in the calculation of totals.

Because urban rivers like the Neponset are commonly contaminated with anthropogenic organic compounds, trace metals, and other elements, information regarding all of these categories of constituents is needed for planning river-restoration efforts. A limited study of anthropogenic organic compounds (other than PCBs) and elements in the Neponset River was done by Breault and others (2004a). Bottom-sediment samples collected in that study were enriched in PAHs and several elements compared to background levels. To enlarge this data set, bottom-sediment grab samples collected as part of the present study were analyzed for 31 elements (table 8). These concentrations were compared to background concentrations measured in New England rivers and streams (Breault and others, 2002) and estuarine environments (Bowen, 1979). In the river and estuary, element concentrations were generally higher than background concentrations and higher than levels considered toxic to benthic organisms, or bottom-dwelling insects and worms, which form the base of the food chain (Ingersoll and others, 2000).

PCBs in Water

Total PCB concentrations (sum of dissolved and particulate PCB concentrations[6] measured in the same sample (appendix 4) in water samples collected from the Neponset River at the USGS streamgage at Milton Village ranged from about 2.2 ng/L (December) to 34.2 ng/L (September) (table 9) and were on average 4.5 times higher in the spring/summer months (May to October; about 29.0 ng/L) than in the fall/winter months (November to March–April; about 6.5 ng/L; table 9). Seasonal variability, however, may better illustrated by comparing dissolved and particulate PCB concentrations measured in July 2005 (11.7 and 15.6 ng/L) and March–April 2006 (2.6 and 0.3 ng/L), which differ greatly even though streamflow was about the same for both months (171 and 154 ft^3/s, respectively).

Dissolved PCBs

Dissolved PCBs comprised mostly dichlorobiphenyls, trichlorobiphenyls, and tetrachlorobiphenyls, which accounted for about 34, 26, and 35 percent of the total dissolved PCB concentrations, on average. The proportions of these homologs however, did change seasonally. For example, dichlorobiphenyls accounted for largest proportion of the dissolved PCBs (about 47 percent) during the spring/summer months (May to September), whereas samples collected during the winter months (December to March–April) comprised less than 18 percent dissolved dichlorobiphenyls. Conversely, samples collected during the spring/summer contained less than 21 percent dissolved tetrachlorobiphenyls, which accounted for largest proportion of dissolved PCBs in the winter (about 53 percent). Dissolved PCBs consisting of more than six chlorine atoms per biphenyl molecule were not detected in whole-water samples collected at the streamgage station Neponset River at Milton Village.

Of all the dissolved PCBs detected in samples collected at the streamgage, PCB 4 + 10 was most often detected in the highest concentration (3.74 ng/L, on average) and accounted for the largest proportion (about 33 percent, on average) of concentrations of dissolved PCBs (fig. 14A; table 10, in back of report). Concentrations of PCB 4 + 10, on average, were 14.5 times higher in the spring/summer (May to September; 6.37 ng/L) than in winter (December to March–April; 0.44 ng/L). Other dissolved PCB congeners with relatively high concentrations include PCB 16 + 32 (average dissolved concentration 0.40 ng/L), PCB 19 (0.87 ng/L), PCB 41 + 64 + 68 + 71 (0.36 ng/L), and PCB 47 + 48 + 75 (1.2 ng/L). On average, these accounted for 5, 10, 5, and 17 percent, respectively, of the concentrations of dissolved PCBs.

Seasonal variability of dissolved PCBs may have substantial implications pertaining to the fate, transport, and toxicity of PCBs in the Neponset River and Neponset River Estuary. That is, although the USEPA publishes numerical standards that relate chronic toxicity to concentrations of PCBs, these standards apply only to concentrations of dissolved PCBs in the water column. Presently (2007), the freshwater continuous chronic criterion (CCC) for aquatic organisms is 14.0 ng/L (U.S. Environmental Protection Agency, 2003). The USEPA defines the CCC as the highest constituent concentration to which an aquatic organism can be exposed indefinitely without causing adverse biological effects. Aquatic organisms exposed for any length of time to PCB levels greater than the CCC may develop impaired reproductive-, endocrine-, and immune-system function, resulting in increased lesions and tumors, or they may die (U.S. Environmental Protection Agency, 1999).

Concentrations of dissolved PCBs in water samples collected from the Neponset River averaged about 9.2 ng/L (annual average of monthly values; table 10, in back of report). Monthly concentrations were generally less than 14 ng/L, with two exceptions: dissolved PCB concentrations measured during the months of August and September were about 16.5 and 15.5 ng/L, respectively. That is, average monthly concentrations measured in August and September were at or above concentration levels considered safe for aquatic organisms. It is important to note that the process of compositing samples results in concentrations that are averaged over the time of sampling (in this case, one month). Therefore, a concentration greater than 14 ng/L in a composite sample could be the result of concentrations greater than 14 ng/L in all days of the month or concentrations lower than 14 ng/L for many days of the month but much higher concentrations during some days, high enough to increase the average monthly concentration to 14 ng/L or more. Similarly, average monthly concentrations less than 14 ng/L do not unequivocally indicate that concentrations were not greater

[6] Total dissolved and total particulate PCB concentrations were calculated by dividing the mass of all PCB congeners in ng/sample by the volume of water filtered in liters. Neither censored data (or individual PCB congeners reported as less than method detection limits) nor estimated data were included in the calculation of total monthly PCB concentrations.

Table 8. Element concentrations measured in surficial (top 4 inches) sediments collected from Mother Brook and the Neponset River and Estuary, Massachusetts, in 2005.

[Analyzed by SGS Laboratory, Ontario, Canada; No., number; ppm, parts per million; <, less than value shown; -D, duplicate; -LD, laboratory duplicate; SRM, National Institute of Standards and Technology, Standard Reference Material 2711, Montana Soil, Moderately Elevated Trace Element Concentrations, Leachable Concentrations Using U.E. EPA Method 3050 Using Flame Atomic Absorption spectrometry and Inductively Coupled Plasma Atomic Emission Spectrometry; SRM range is noncertified acceptable range; --, not applicable]

Sample No.	Station name	Sample location	Calcium (percent)	Magnesium (percent)	Sodium (percent)	Potassium (percent)	Phosphorus (percent)	Aluminum (percent)	Antimony (ppm)	Arsenic (ppm)	Barium (ppm)	Beryllium (ppm)	Bismuth (ppm)
1	M2Y-013	Mother Brook	0.58	0.87	0.56	0.51	0.22	2.22	<5	20	109	1.3	<5
2	M2Y-014	do…..	0.75	0.58	0.28	0.33	0.1	1.53	<5	11	68	0.7	<5
3	BGY-143	do…..	2.31	0.61	0.52	0.38	0.11	1.58	<5	13	70	0.8	<5
4	BGY-144	do…..	0.6	0.77	0.82	0.49	0.14	1.94	<5	16	90	1	<5
5	QYY-001	do…..	0.61	0.58	0.42	0.37	0.1	1.56	<5	13	75	0.8	<5
6	QYY-002	Neponset Estuary	2.76	0.73	0.76	0.48	0.11	1.83	<5	13	78	0.9	<5
7	BGY-145	do…..	0.93	0.82	1.06	0.55	0.14	2.06	<5	15	89	1.1	<5
8	QYY-003	do…..	1.49	0.47	0.35	0.3	0.07	1.25	<5	7	50	0.8	<5
9	BGY-142	do…..	0.29	0.22	0.04	0.08	0.05	0.73	<5	5	85	<0.5	<5
10	BGY-141	do…..	0.36	0.24	0.06	0.12	0.07	1.05	<5	7	138	0.6	<5
11	BGY-140	do…..	0.62	0.61	0.09	0.21	0.08	1.3	<5	<3	94	0.7	<5
12	BGY-139	do…..	0.64	0.4	0.07	0.18	0.13	1.58	<5	7	170	0.9	<5
13	DDY-001	do…..	0.61	0.41	0.07	0.15	0.15	1.46	<5	6	178	0.9	<5
1	M2Y-013-D	Mother Brook	0.59	0.88	0.68	0.55	0.2	2.28	<5	18	108	1.2	<5
10	BGY-141-D	Neponset Estuary	0.35	0.24	0.05	0.12	0.07	0.93	<5	6	126	0.6	<5
5	DDY-001-LD	Mother Brook	0.66	0.42	0.07	0.17	0.15	1.57	<5	6	188	0.9	<5
8	QYY-003-LD	Neponset Estuary	1.45	0.46	0.34	0.29	0.07	1.2	<5	6	46	0.5	<5
						Quality-control samples							
--	SRM	--	2.23	0.83	0.05	0.58	0.08	2.48	<5	100	224	1.2	<5
--	SRM range	--	2.0–2.5	0.72–0.89	0.020–0.029	0.26–0.53	0.06–0.09	1.2–2.3	--	88–110	170–260	--	--

Sample No.	Station name	Sample location	Cadmium (ppm)	[1]Chromium (ppm)	Cobalt (ppm)	Copper (ppm)	Iron (percent)	Lead (ppm)	Lanthanum (ppm)	Lithium (ppm)	Manganese (ppm)	Molybdenum (ppm)	[1]Nickel (ppm)
1	M2Y-013	Mother Brook	2	217	11	132.8	4.1	219	29.1	35	505	6	34
2	M2Y-014	do…..	1	128	6	78.3	2.4	114	22.2	24	295	5	23
3	BGY-143	do…..	<1	200	6	71.5	2.54	109	22.3	26	306	6	23
4	BGY-144	do…..	1	183	8	100	3.22	152	25.1	31	398	6	27
5	QYY-001	do…..	1	214	7	85.1	2.54	111	21.4	25	292	6	28
6	QYY-002	Neponset Estuary	<1	156	7	80.3	2.71	106	22.5	31	343	5	25
7	BGY-145	do…..	1	160	8	89.9	3.13	123	23.8	33	364	4	28
8	QYY-003	do…..	<1	153	5	38.3	1.87	48	18.5	19	253	5	17
9	BGY-142	do…..	1	109	6	108.8	1.92	168	11.1	7	336	4	24
10	BGY-141	do…..	<1	216	6	156	3.02	241	12.9	9	326	8	26
11	BGY-140	do…..	<1	180	8	74.8	2.43	80	20	14	499	5	26
12	BGY-139	do…..	3	268	10	99.7	2.12	244	22.2	15	588	5	31
13	DDY-001	do…..	2	197	9	92.7	2.11	281	21.4	13	529	6	26
1	M2Y-013-D	Mother Brook	2	279	10	129	3.93	206	27.3	35	506	7	33
10	BGY-141-D	Neponset Estuary	<1	204	5	120.3	2.86	242	12.4	8	303	5	27
5	DDY-001-LD	Mother Brook	2	201	10	95.7	2.21	285	23.2	15	550	6	27
8	QYY-003-LD	Neponset Estuary	<1	151	5	37	1.83	48	18.1	18	253	5	17
						Quality-control samples							
--	SRM	--	44	28	8	115.9	2.52	1,170	28.6	19	545	3	20
--	SRM range	--	32–46	15–25	7–12	91–110	1.7–2.6	930–1,500	--	--	400–620	--	14–20

Table 8. Element concentrations measured in surficial (top 4 inches) sediments collected from Mother Brook and the Neponset River and Estuary, Massachusetts, in 2005.—Continued

[Analyzed by SGS Laboratory, Ontario, Canada; No., number; ppm, parts per million; <, less than value shown; -D, duplicate; -LD, laboratory duplicate; SRM, National Institute of Standards and Technology, Standard Reference Material 2711, Montana Soil, Moderately Elevated Trace Element Concentrations, Leachable Concentrations Using U.E. EPA Method 3050 Using Flame Atomic Absorption spectrometry and Inductively Coupled Plasma Atomic Emission Spectrometry; SRM range is noncertified acceptable range; --, not applicable]

Sample No.	Station name	Sample location	Scandium (ppm)	Silver (ppm)	Strontium (ppm)	Tin (ppm)	Titanium (percent)	Tungsten (ppm)	Vanadium (ppm)	Yttrium (ppm)	Zinc (ppm)	Zirconium (ppm)
1	M2Y-013	Mother Brook	6.1	2.3	76.1	27	0.14	<10	73	18.7	333.2	11.9
2	M2Y-014	do…..	4.2	1.4	56.1	20	0.13	<10	47	14.6	186.5	13
3	BGY-143	do…..	4.4	1.5	127.5	20	0.12	<10	48	14.1	157.2	12.1
4	BGY-144	do…..	5.3	1.8	60.5	23	0.13	<10	61	15.9	239.7	13.5
5	QYY-001	do…..	4.6	1.7	48.2	20	0.13	<10	51	14.2	183	14
6	QYY-002	Neponset Estuary	5	2.1	109	20	0.13	<10	56	14.7	171.9	13
7	BGY-145	do…..	5.7	2	69.6	21	0.13	<10	62	15.4	199.6	14.7
8	QYY-003	do…..	4.4	0.8	87.6	14	0.1	<10	40	12.2	85.7	9.9
9	BGY-142	do…..	1.8	0.2	35.7	39	0.06	<10	26	6.7	272.9	4.2
10	BGY-141	do…..	2.3	0.5	51.6	35	0.07	<10	31	7.9	581.9	8
11	BGY-140	do…..	3.7	0.2	52.9	19	0.09	<10	40	12.6	141.3	12.2
12	BGY-139	do…..	3.9	0.2	50.6	25	0.1	<10	41	14.7	396.5	4.2
13	DDY-001	do…..	3.4	0.6	48.1	26	0.09	<10	42	14.2	386.2	3
1	M2Y-013-D	Mother Brook	5.9	2.1	77.5	25	0.14	<10	69	17.5	308.1	12.3
10	BGY-141-D	Neponset Estuary	2.2	0.2	50	36	0.07	<10	29	7.7	442.5	7
5	DDY-001-LD	Mother Brook	3.9	0.4	54	27	0.09	<10	45	15.5	394.9	3.4
8	QYY-003-LD	Neponset Estuary	3.6	0.9	82.6	14	0.11	<10	38	11.6	84	9
					Quality-control samples analyzed by SGS							
--	SRM	--	5.2	4.1	54.3	12	0.08	<10	58	19.8	351.7	20.1
--	SRM range	--	--	2.5–5.5	48–55	--	0.039–0.048	--	34–50	--	290–340	--

[1] Milling of bottom-sediment samples may expose to the digestive acids elements that otherwise would be locked in mineral grains. Therefore, elements exposed to digestive acids by milling are likely to be detected at greater concentrations than elements in unmilled samples. Milling may bias samples by increasing measured concentrations of chromium and nickel.

Table 9. Particulate, dissolved (less than one micron), and total polychlorinated biphenyl concentrations and loads, U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, May 2005 through April 2006.

[Because sampling began on May 13, 2005, the May monthly load is only a partial load. ft^3/s, cubic feet per second; PCBs, polychlorinated biphenyls; ng/L, nanograms per liter; g, gram; --, not done]

Month	Mean daily discharge (ft^3/s)	Concentrations			Loads		
		Dissolved PCBs (ng/L)	Particulate PCBs (ng/L)	Total PCBs (ng/L)	Dissolved PCBs (g)	Particulate PCBs (g)	Total PCBs (g)
May-05	618	12.3	13.3	25.6	352	382	736
June-05	334	12.7	11.3	24.0	315	280	595
July-05	171	11.7	15.6	27.3	152	202	354
August-05	78	16.5	16.9	33.4	100	103	205
September-05	76	15.6	18.6	34.2	92	109	200
October-05	779	--	--	29.6	--	--	1,712
November-05	478	--	--	11.2	--	--	467
December-05	405	1.2	1.0	2.2	38	31	69
January-06	595	1.6	3.7	5.3	77	179	257
February-06	499	8.5	2.5	11.0	300	89	389
March–April 06	154	2.6	0.3	2.9	56	6.4	62
	Average				Total		
	381	9.2	9.2	18.8	1,482	1,381	5,047

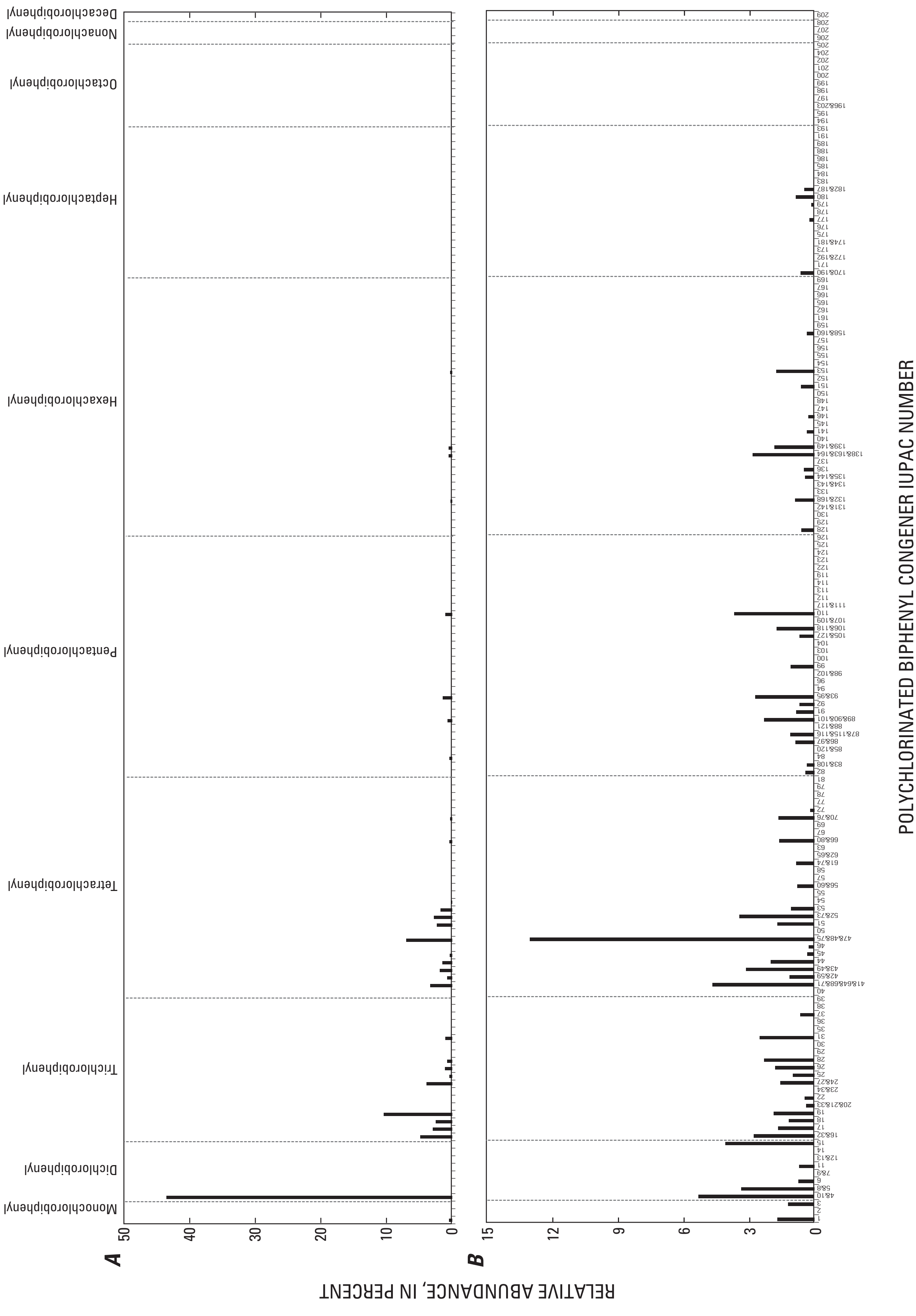

Figure 14. Relative abundances of *(A)* dissolved and *(B)* particulate PCB congeners in a flow-proportional water sample collected during July 2005.

than 14 ng/L at some time during the month. A more detailed sampling strategy would be required to determine PCB concentrations during smaller time intervals (for example, a few days).

Particulate PCBs

PCB congeners generally have a high affinity for particulate matter. More specifically, PCB congeners of higher molecular weight tend to sorb to particulate matter more preferentially than PCB congeners of lighter molecular weight. Thus, it was expected that PCB congeners, especially those of higher molecular weight, would be associated with both living and nonliving particles suspended in the water column. In fact, only half of the PCB congeners detected in samples collected from the Neponset River at Milton Village streamgage were associated with suspended particles; particulate-associated PCB concentrations averaged about 9.3 ng/L and ranged from 0.30 ng/L (March–April 2006) to 18.6 ng/L (September 2005) (table 11, in back of report). These low concentrations are likely a result of the relatively low concentration (less than about 10 mg/L, on average) of suspended particles commonly measured in the river (K.P. Smith, U.S. Geological Survey, unpub. data, 2002).

As expected, PCBs associated with particulates were enriched in PCB congeners of molecular weights higher than those in dissolved PCBs. For example, tetrachlorobiphenyls accounted for the largest proportion (34 percent[7], on average) of concentrations of particulate-associated PCBs, whereas dichlorobiphenyls, in contrast, accounted for the largest proportion (34 percent) of concentrations of dissolved PCBs (table 10, in back of report). Tetrachlorobiphenyls also accounted for the largest proportion of particulate PCBs in both the spring/summer (May to September; 34 percent) and in the winter months (December to March–April; 35 percent). In addition, at least one congener from each homolog group was detected in the particulate fraction, with one exception: none of the three nonachlorobiphenyl congeners associated with particulates were detected in whole-water samples collected at the streamgage station Neponset River at Milton Village.

Of the tetachlorobiphenyls associated with particulates, the unresolved congener group PCB 47 + 48 + 75 was most often detected in the highest concentration (1.18 ng/L) and accounted for the largest proportion (about 14 percent) of the concentrations of particulate PCBs, on average (fig. 14B). Concentrations of PCB 47 + 48 + 75, on average, were 5 times higher in the spring/summer (May to September; 1.83 ng/L) than in winter (December to February; 0.36 ng/L). Eighty other PCB congeners or unresolved congener groups compose the remainder of the detected particulate-associated PCB congeners. Each of these PCB congeners and congener groups generally accounts for less than 5 percent of the total concentration of particulate-associated PCBs, with two notable exceptions: PCB 5 + 8 (8 percent) and PCB 15 (10 percent), on average.

Similar differences between summer and winter water-column PCB concentrations measured in the Lower Fox River in Wisconsin were attributed to algal dynamics (growth, predation, sinking, and other factors) in summer months (Fitzgerald and Steuer, 1996). Seasonal variability also was related to total PCB concentrations, streamflow, and air temperature. It is likely that the PCB congeners of lower molecular weight (lower PCB numbers) are more soluble at higher (summertime) water temperatures, which thereby increases their water-column concentrations during summer months. For the same reason, colder water temperatures may result in the predominance of PCB congeners of higher molecular weight (higher PCB numbers) in the water column during the winter. Higher wintertime water levels and streamflows may also scour the riverbed, which may release sediment contaminated with PCB congeners of different patterns into the water column. Whatever the causes, these differences may have substantial implications for the transport, fate, and toxicity of PCBs in the system. Similar differences in relative PCB-congener abundances were also observed in the Millers River, MA, by Colman (2000).

PCBs in Fish

Total PCB-congener concentrations measured in fillets and whole bodies of white sucker collected from the Tileston and Hollingsworth and Walter Baker Impoundments were all greater than 2,000 ng/g wet wt (or ppb), the USEPA's guideline for safe consumption of fish (table 12, in back of report). Moreover, PCB-congener concentrations measured in whole fish collected from the Tileston and Hollingsworth Impoundment (about 6,890 ng/g wet wt) were more than three times this value, and concentrations in whole fish collected from the Walter Baker Impoundment (about 4,080 ng/g wet wt) were more than double the guideline value. This level of PCB contamination in whole fish can be lethal for predators that consume these fish. As was expected, fish fillets contained lower concentrations of PCBs than their whole-body counterparts (about 3,490 and 2,450 ng/g wet wt, respectively); however, these concentrations are still above safe levels and are particularly troublesome for subsistence fishermen who typically eat only the fillets of caught fish. Total PCB-congener concentrations measured in the whole bodies of common mummichog, which are estuarine bait fish, were lower (about 708 ng/g wet wt) than in the whole bodies of white sucker (table 13, in back of report).

Concentrations of lipophilic (or fat-loving) contaminants like PCBs, commonly reported as concentrations per unit lipid (total PCB concentration divided by fraction of lipid), were measured in each tissue sample. Concentrations in whole fish collected from the Tileston and Hollingsworth and Walter Baker Impoundments were about 90,400 ng/g lipid wet wt (90.4 mg/kg lipid wet wt) and 65,600 ng/g lipid wet

[7] Values less than the detection limit were set to zero.

wt (65.6 mg/kg lipid wet wt), respectively. Lipid-normalized concentrations in fillets collected from the two impoundments were about 119,500 ng/g lipid wet wt (119.5 mg/kg lipid wet wt) and 85,100 ng/g lipid wet wt (85.1 mg/kg lipid wet wt), respectively. By comparison, whole fish collected from the Housatonic River, a PCB-contaminated river in western Massachusetts during two separate sampling rounds in 1994 and 1995 averaged 76 mg/kg wet wt (3,378 mg/kg lipid wet wt) and 112 mg/kg wet wt (5,258 mg/kg lipid wet wt), respectively (U.S. Environmental Protection Agency, 2007). Lipid-normalized PCB concentrations measured in carp collected from the Lower Fox River downstream of Depere Dam, Wisconsin, in 1989 (about 75,000 ng/g lipid; Steuer and others, 1995) were similar to lipid-normalized PCB concentrations measured as part of this study. Unresolved PCB congeners measured at relatively high concentrations in fish-tissue samples included PCB 43 + 49, PCB 41 + 64 + 68 + 71, and PCB 47 + 48 + 75. Most fish-tissue samples were enriched in one or all of these congeners compared to other congeners tested (fig. 15).

Three nonorthosubstituted, coplanar[8] PCBs—PCB 77, PCB 126, and PCB 169—structurally resemble TCDD and, of all the PCB congeners, are the most dioxin-like with respect to their ability to interact with the aryl-hydrocarbon receptor (AhR), an intercellular protein (Denison and others, 1988). Concentrations of these congeners ranged from 0.0027 to 3.8 ng/g wet wt in fillets and less than 0.0086 to 11 ng/g wet wt in whole fish. The highest concentration of all the coplanar congeners, 11 ng/g wet wt, was measured in whole fish caught in the Tileston and Hollingsworth Impoundment (table 12, in back of report). For comparison, maximum concentrations of PCB 77 measured in white sucker (fillets and whole) collected from the Connecticut River Basin were 1.0 and 2.1 ng/g wet wt, respectively (Hellyer, 2006).

Dioxin like PCB-congener concentrations measured in white-sucker fillets were converted to 2,3,7,8-TCDD equivalents by means of equation 2, excluding and including unresolved congener groups PCB 105 + 127 and PCB 106 + 118. *TEQ* calculated for fish fillets collected from the Tileston and Hollingsworth and Walter Baker Impoundments were 18–23 pg WHO_{2005}-*TEQ*/g (620–780 pg WHO_{2005}-*TEQ*/g lipid) and 17–20 pg WHO_{2005}-*TEQ*/g (590–700 pg WHO_{2005}-*TEQ*/g lipid), respectively. These values are as much as several orders of magnitude greater than the USEPA's human health carcinogenic screening values for recreational fishers (0.256 pg *TEQ*/g) and for subsistence fishers (0.0315 pg *TEQ*/g) (Hellyer, 2006). *TEQ* calculated for white sucker collected from the Tileston and Hollingsworth and Walter Baker Impoundments and common mummichog collected from the estuary were about 59–67 WHO_{2005}-*TEQ*/g (770–880 pg WHO_{2005}-*TEQ*/g lipid) , 38–43 WHO_{2005}-*TEQ*/g (620–690 pg WHO_{2005}-*TEQ*/g lipid), and 7–8 pg WHO_{2005}-*TEQ*/g (460–540 pg WHO_{2005}-*TEQ*/g lipid), respectively. *TEQ* calculated for whole fish are about equal to or greater than the values designated by the USEPA as "High Eco-Risk" for fish-eating mammals (7 pg WHO_{2005}-*TEQ*/g; U.S. Environmental Protection Agency, 1998). It is important to note that *TEQ* values may underestimate the risk associated with PCB-contaminated fish because they do not include concentrations of actual dioxins as compared to dioxin-like compounds. For example, Hellyer (2006) suggested that "when dioxin *TEQ*s are excluded from the risk calculation, [they] may underestimate the risk from consumption of Connecticut River fish."

[8] Structurally, PCBs generally resemble propeller blades because the large chlorine atoms sterically interfere with coplanarity of the benzene rings; however, as long as the chlorine atoms are far enough apart, the benzene rings can be considered coplanar. In nonorthosubstituted PCB congeners, hydrogen atoms are not substituted by chlorine atoms at the ortho positions or the positions adjacent to the other ring, and therefore, the benzene rings are coplanar.

Loads of PCBs from the Neponset River to the Neponset River Estuary

About 5,100 g or 1 gal (with an assumed a density of 1.4 g/mL) of PCBs was transported in May 2005–2006 by the Neponset River to the Neponset River Estuary and most likely farther downstream (table 9). The mean monthly discharge for the Neponset River for the study period was about 357 ft^3/s at the USGS streamgage Neponset River at Milton Village (011055566). By comparison, about 210 kg of PCBs was transported by the Fox River into Green Bay, WI, in 1995 (Steuer and others, 1995). The mean daily discharge for the Fox River for 1989 was about 3,588 ft^3/s at USGS streamgage Fox River at oil tank depot at Green Bay, WI (040851385) (Steuer and others, 1995). At first glance, 1 gal of PCBs does not appear to be much; however, this volume of PCBs is sufficient to contaminate about 94 billion gal of water (about 143,000 Olympic-size swimming pools) above levels considered safe (14 ng/L) or about 33,000 ft^3 of bottom sediment of density 2.65 g/cm^3 (enough to fill about 150 dump trucks) above levels considered safe (2,000 ng/g) for aquatic organisms.

Monthly PCB loads measured at the Milton Village streamgage (011055566) ranged from 62 g (March–April 2006) to 1,712 g (October 2005) (table 9). About half of the total PCB load was dissolved (about 1,500 g), and half was associated with particulates (about 1,400 g) (excluding October and November, for which no information was available; table 9; table 14, at back of report). The largest monthly PCB load, which accounted for about 34 percent of the total annual (May 2005 to April 2006) load, was calculated for October. This relatively large load was likely the result of large rainstorms that dropped over 14.7 in. of rain on the watershed; otherwise PCB loads varied from month to month in an irregular manner. Typically, 3.85 in. of rain falls in the month of October at the nearby Blue Hill Observatory in Milton, MA (averaged for the period of record, 1891–2000), and October 2005 was the wettest October on record (Iancono, 2010).

Monthly dissolved PCB loads measured at the Milton Village streamgage (011055566) ranged from 38 g (December

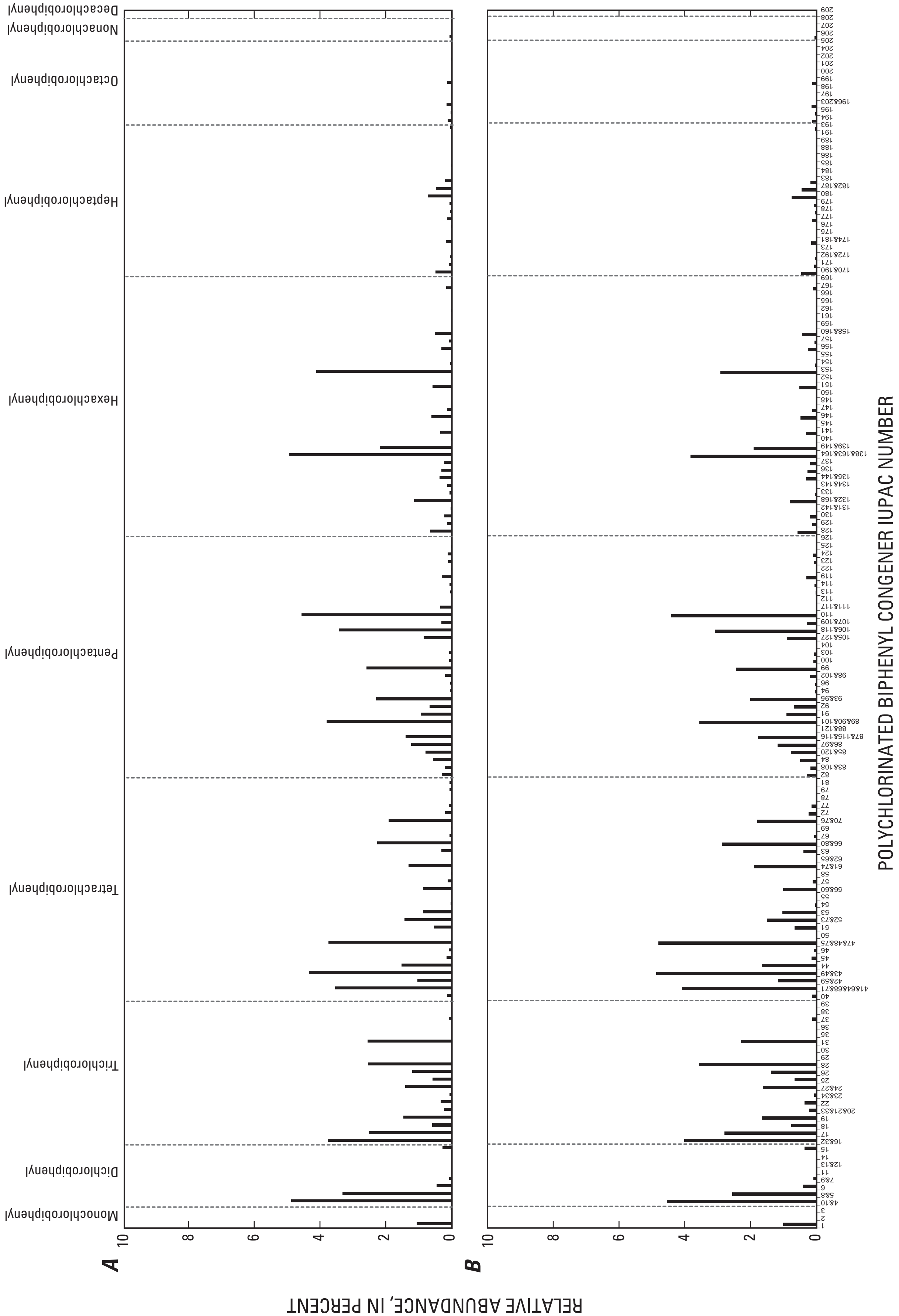

Figure 15. Relative abundances of polychlorinated biphenyls in white-sucker *(A)* fillets and *(B)* whole fish collected from the Tileston and Hollingsworth Impoundment and in *(C)* fillets and *(D)* whole fish collected from the Walter Baker Impoundment.

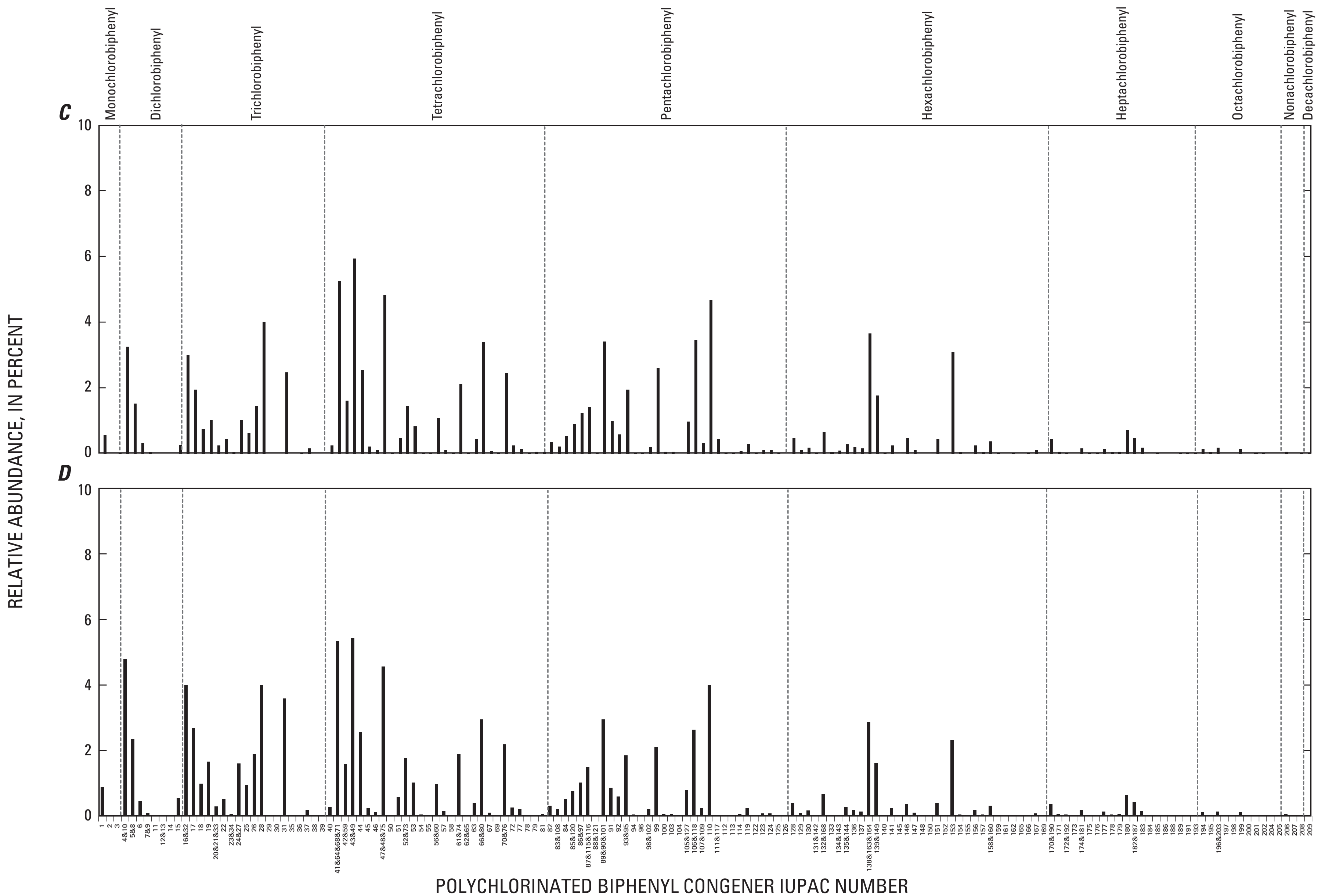

Figure 15. Relative abundances of polychlorinated biphenyls in white-sucker *(A)* fillets and *(B)* whole fish collected from the Tileston and Hollingsworth Impoundment and in *(C)* fillets and *(D)* whole fish collected from the Walter Baker Impoundment.—Continued

2005) to 352 g (May 2005) (table 9). The largest monthly dissolved PCB load, which accounted for about 24 percent of the total annual (May 2005 to April 2006) dissolved load, was calculated for May 2005 (excluding October and November, for which no information was available). The largest percentage (90 percent) of the total load that was dissolved was measured in March–April 2006. Not surprisingly, the monthly mean discharge for this time period was relatively low (153 ft^3/s). In fact, March 2006 was the second driest March on record (1891–2000) measured at the Blue Hill Observatory, and rainfall totals for March and April 2006 were 4.11 and 1.84 in. below normal, respectively. Dissolved loads are most likely a result of diffusion and nonscour resuspension/desorption from sediment (Butcher and Garvey, 2004). The lack of storms, which may resuspend and transport contaminated bottom sediment downstream, may be the reason why the percentage of particulate PCB loading for March–April 2006 (10 percent) is relatively low and the percentage of dissolved PCB loading for the same two months is relatively high.

Monthly particulate PCB loads measured at the Milton Village streamgage (011055566) ranged from 6.4 g (March–April 2006) to 382 g (May 2005) (table 9). The largest monthly particulate PCB load, which accounted for about 70 percent of the total annual (May 2005 to April 2006) load, was calculated for January 2006 (excluding October and November, for which no information was available). The mean daily discharge measured in January 2006 was about 596 ft^3/s, which is about double the period-of-record (WY 1997–2005) mean daily discharge for January (382 ft^3/s). It is likely that the October particulate load, if measured separately, would have been the largest. The mean daily discharge measured in October 2005 was about 779 ft^3/s, which is almost six times the period-of-record (WY 1997–2005) mean-daily discharge for October (132 ft^3/s). Resuspension of PCB-contaminated bottom sediment by flood waters most likely resulted in a large particulate load.

Although water-quality samples were collected for a time period of only one year, the relation between PCB loads and streamflow was used to test whether or not the PCB loads measured in this study were representative of long-term loads (WY 1997–2005). An analysis based on linear regression (Minitab, v. 14.12) indicated that the log (base 10) of monthly mean streamflow could explain 98 percent of the observed variation in PCB loads in spring/summer (May to October; adjusted r^2=0.98; p value=0.001) and 75 percent of fall/winter total PCB loads (November to March–April, excluding December, which was an outlier; adjusted r^2=0.75; p value=0.088). Thus, it was possible to estimate long-term average PCB loads based on the 11-year record of average mean monthly streamflows under the assumption that the relation between PCB loads and streamflow in the Neponset River has remained constant over time.

Based on this approach, the long-term average annual PCB load was estimated as about 4.0 kg, or about 1 kg less than the PCB load measured between May 2005 and April 2006. Although similar in magnitude, the timing of these loads is very different. An inordinately large PCB load was measured in water samples collected during October; the combined October 2005 and January 2006 loads were about six times as large as the estimated long-term average loads. In contrast, very low streamflows in March and April 2006, compared to long-term average streamflows for these months, resulted in PCB loads that were possibly about 7 percent of the average March and April loads during a normal year.

The mass of PCBs transported out of the river (estimated above) does not include the mass of PCBs lost by volatilization. Volatilization (or the transfer of PCBs across the air-water interface as the result of a concentration gradient) can be an important mechanism for transporting PCBs from the water column to the atmosphere. For example, numerical modeling of PCBs in Green Bay, WI, showed that the mass of PCBs transported out of the river by volatilization (158 kg) exceeded that transported by the water column (122 kg; Stratus Consulting, Inc., 1999). Volatilization may play an important role in the lower Neponset River, because PCB-contaminated water spills over two dams and flows through a series of riffles. For example, Colman (2000) observed a four-fold decrease in total PCB concentrations from a PISCES sample collected upstream of a steep-gradient reach of the Millers River in central Massachusetts and New Hampshire to a sample collected downstream of the reach. Once in the atmosphere, PCBs can be transported away from the area by means of prevailing winds. Inhalation of PCBs volatilized from contaminated river water and sediment is one pathway through which humans can be exposed to PCBs (Vorhees and others, 1997). PCBs may also be transported from the river to the estuary in the body burden of fish or other wildlife.

Loads of PCBs through the Braided-Channel Area

The special handling and disposal of PCB-contaminated bottom sediment, the large volume of bottom sediment, the logistics of restoring an urban river, and historical considerations all contribute to the difficulty of restoring the Neponset River. The consequences of leaving PCB-contaminated sediment in place can ultimately be more problematic than the consequences of removing the sediment unless the sediment can be shown, with some degree of certainty, to be stable (or able to be stabilized)—that is, not an active source of PCBs and inaccessible to people in the local area.

The reach known locally as the Braided Channel, although heavily contaminated with PCBs (Breault and others, 2004a), is likely to be stable under normal hydrologic conditions[9]. That is, PCBs in the Braided Channel are likely trapped in semipermanent stable islands around which the river flows. These morphological features likely formed as a result of the large flood that breached the Jenkins Dam after two successive hurricanes in 1955; the Jenkins Dam historically impounded this part of the river. Presumably, sediments that were trapped behind dam but not transported downstream by flooding were incised by the river. Currently (50 years later), these subaerial islands are mostly vegetated and consequently very stable.

To test this hypothesis, water samples were collected upstream and downstream of the Braided Channel during a large storm on October 15, 2005, and analyzed for particulate and dissolved PCB congeners (table 15, in back of report). Upstream and downstream streamflows measured concurrently with sampling were 1,500 and 1,350 ft^3/s, respectively. Flows at the upstream site, the Blue Hill Avenue bridge, were greater than downstream flows because of flow conditions at the bridge, which rests on large pillars that cause water to circulate unpredictably. Swirling water interferes with flow measurements, and the degree of interference is noted by the technician making the measurement as good, average, or poor. In this case, the upstream measurement was rated poor (within 10 percent of the actual streamflow), whereas the downstream measurement was rated good (within 5 percent of the actual streamflow). Similar upstream and downstream flows indicate that no substantial inputs of water entered the river between these stations, which were only about 1.25 mi apart. Differences in PCB loads measured upstream and downstream of the Braided Channel, therefore, can be attributed only to processes in that part of the river.

Dissolved and particulate PCB concentrations measured upstream of the Braided Channel were 20.0 and 21.2 ng/L, respectively; downstream concentrations were 19.5 and 24.1 ng/L, respectively. The products of these concentrations and streamflows give an instantaneous upstream PCB load of about 1.8 mg/s and an instantaneous downstream load of about 1.7 mg/s. Additionally, dissolved PCB-congener patterns determined in the upstream and downstream samples were similar (*RMSD* equal to 1.29), as were particulate PCB-congener patterns (*RMSD* equal to 0.34). Thus, the Braided Channel apparently is neither a source nor a sink of PCBs under the flow conditions at the time of sampling; however, this result does not indicate that PCBs in this part of the river will not be transported under any circumstances.

[9] Because PCBs are trapped in semipermanent stable islands, the diffusion and advection of dissolved PCBs into the water column is not a concern during normal hydrologic conditions.

Sources of PCBs

Sources of PCBs in the environment commonly include the release of PCB-contaminated oil-like substances into rivers, streams, soils, or groundwater. Once released into the environment, PCBs partition themselves among air, water, sediment, vegetation, and biota. With time, PCBs can be preferentially transported, transformed through anaerobic dechlorination, destroyed through aerobic degradation, or metabolized. PCBs that are not destroyed by either aerobic degradation or metabolization mostly end up dissolved in water, sorbed onto suspended particles (living and nonliving), volatilized into the atmosphere, buried with bottom sediments, taken up by vegetation, or stored in the tissues of wildlife, fish, and humans. After partitioning, many of the characteristics of the original source materials may be changed forever. For these reasons, identifying places where PCB contamination first originated or determining the ultimate fate of PCBs can be challenging.

Relative Abundances, Concentrations, and Root-Mean-Square Difference

Fortunately, combinations of sampling, analytical, and statistical techniques can be used to identify sources and transport pathways of PCBs released into the environment. For example, the relative abundances and concentrations of some congeners or unresolved congener groups measured in bottom-sediment grab samples differed from sample to sample in such a way that inferences could be made concerning source areas. For example, the average relative abundances of the unresolved congeners PCB-138 + 163 + 164 in bottom-sediment grab samples collected upstream of facility #2 (on Mother Brook; average relative abundance equal to 7.2 percent) and upstream of the Mother Brook confluence with the Neponset River (8.4 percent) were greater than the average relative abundances of the same congeners measured in samples collected downstream of facility #2 on the brook (0.81 percent) and the river (1.2 percent). An example of this congener pattern for four specific sampling stations is shown in figure 16. Meanwhile, the average concentrations of PCB-138 + 163 + 164 in samples collected upstream of facility #2 (on Mother Brook; 18.7 ng/g) and upstream of the Mother Brook confluence (on the Neponset River; 38.7 ng/g) were much lower than the average concentrations of the same congeners measured downstream of facility #2 on the brook (95.3 ng/g) and the river (132 ng/g). These results suggest the addition of the unresolved congener group PCB-138 + 163 + 164 as well as other PCB congeners downstream of facility #2. This change in the relative concentration of PCB-138 + 163 + 164 and changes in other PCB-congener or unresolved congener-group patterns can be quantified by means of *RMSD*.

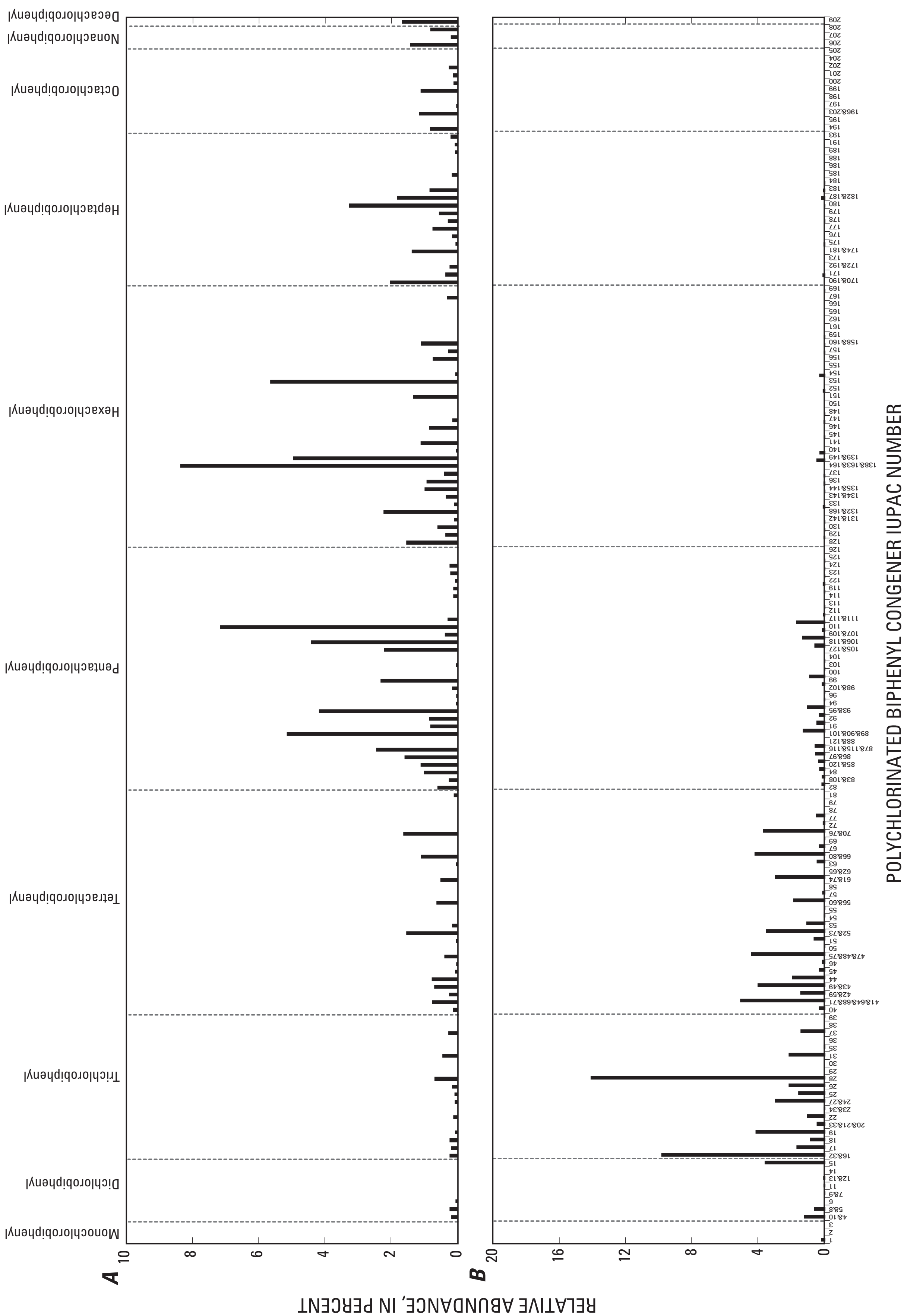

Figure 16. Relative abundances of polychlorinated biphenyl congeners in bottom-sediment grab samples collected from *(A)* Mother Brook near the Verizon Building (BGY–140), *(B)* Mother Brook near facility #2 (BGY–141), *(C)* the Neponset River near Fulton Street (BGY–104), and *(D)* the Neponset River at Fairmont Avenue (BGY–106). Sampling stations are shown in figure 2.

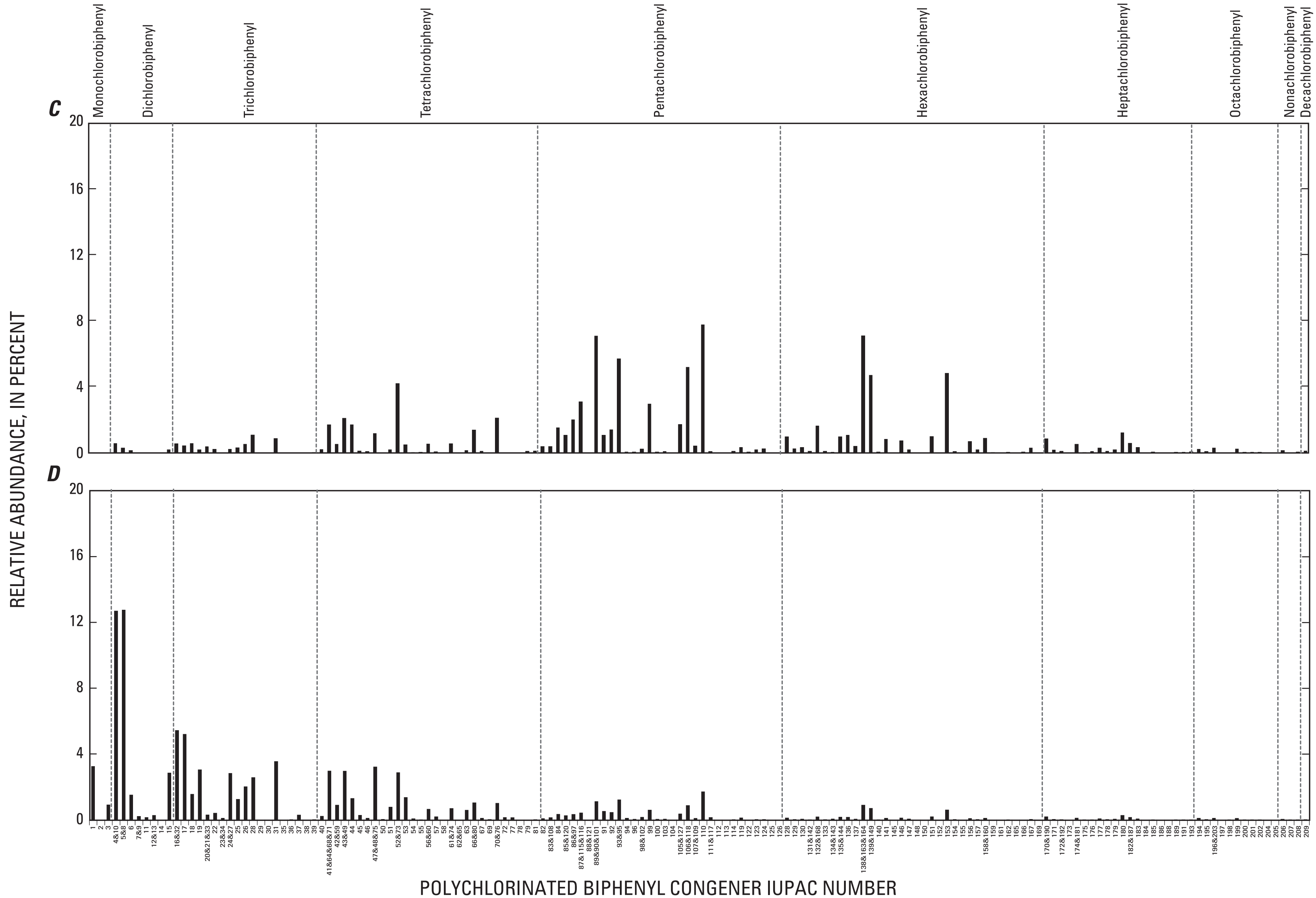

Figure 16. Relative abundances of polychlorinated biphenyl congeners in bottom-sediment grab samples collected from *(A)* Mother Brook near the Verizon Building (BGY–140), *(B)* Mother Brook near facility #2 (BGY–141), *(C)* the Neponset River near Fulton Street (BGY–104), and *(D)* the Neponset River at Fairmont Avenue (BGY–106). Sampling stations are shown in figure 2.—Continued

*RMSD*s for adjacent bottom-sediment grab samples collected in 2002 and 2005 from the Neponset River and Mother Brook are shown in figure 17. Substantial PCB-congener-pattern changes observed in the vicinity of facility #2 (3.0; *RMSD*s for upstream adjacent sample site shown in parentheses) and Hyde Park Avenue (1.3) suggest the location of a major source(s) of PCBs to Mother Brook. Transport of PCBs from this source area on Mother Brook followed by deposition of PCBs in river sediments can be inferred from the low *RMSD* value calculated for the sample collected in Mother Brook near Hyde Park Avenue and the sample collected in the river just downstream of the confluence (0.5). *RMSD* values calculated for samples collected upstream and downstream of the Mother Brook confluence (1.8) suggest that the set of PCBs coming from upstream is different from the set of PCBs coming from Mother Brook. Samples collected downstream of the confluence suggest that other PCB sources were along the river near Fairmont Avenue, the Tileston and Hollingsworth Impoundment, and the Braided Channel. Environmental conditions downstream may favor anaerobic dechlorination; this process could result in high *RMSD* values between sampling locations, and these high values could be misinterpreted as evidence of another source. More sophisticated sampling and (or) statistical analysis could be done to determine whether or not anaerobic dechlorination is happening in river bottom sediments of the Neponset River (for example, Karcher and others, 2004). *RMSD* values calculated for bottom-sediment samples collected from adjacent sampling stations in the estuary suggest that PCBs from an additional source may be mixing with PCBs from the Neponset River in the estuary.

The total masses[10] of PCBs and the masses of specific PCB congeners measured in PISCES may also provide important information concerning the locations of source areas and transportation pathways (fig. 17; tables 16 and 17, in back of report). For example, the average of the total masses of PCBs measured in PISCES deployed in 2005 near the river's headwaters was relatively low (273 ng/sample); peaked just downstream of the confluence with Mother Brook near Fairmont Avenue (5,190 ng/sample); remained relatively constant all the way downstream to the Milton Village Marina (5,240 ng/sample, the maximum total mass measured in 2005); and declined farther into the estuary. PCB concentrations in Mother Brook were relatively low at Incinerator Road near the confluence with the Charles River (64 ng/sample, the minimum mass measured in 2005) and gradually increased to a maximum (1,940 ng/sample) at Hyde Park Avenue near the confluence with the Neponset River. Although the masses of PCBs measured in PISCES deployed in 2005 were, on average, about three times higher than those measured in 2002 at similar locations, the spatial trends were similar (Breault and others, 2004a).

More specifically, the average relative abundances of the unresolved congeners PCB 4 + 10 in PISCES samples deployed in 2002 and 2005 collected upstream of facility #2 (on Mother Brook; 6.5 percent) and upstream of the Mother Brook confluence (on the Neponset River; 8.4 percent) were less than the average relative abundance of these same congeners measured in samples collected downstream of facility #2 on the brook (17 percent) and the river (30 percent). An example of this congener pattern for four specific stations is shown in figure 18. Meanwhile, the average concentrations of PCB 4 + 10 in samples collected upstream of facility #2 (on Mother Brook; 9.5 ng/sample) and upstream of the Mother Brook confluence (on the Neponset River; 57.1 ng/sample) were much lower than the average concentrations of this unresolved congener group measured downstream of facility #2 on the brook (280 ng/sample) and the river (960 ng/sample). These results can be explained by the addition of the unresolved congener group PCB-4 + 10, the anaerobic dechlorination of PCB congeners downstream of facility #2, or both. Preferential transport is less likely because the abundance of fine-grained sediments downstream of facility #2 is much greater than upstream: these fine-grained sediments are likely to be enriched in higher molecular weight PCB congeners.

*RMSD*s for adjacent PISCES samples collected in 2002 and 2005 from the Neponset River and Mother Brook are shown in figure 17B[11]. Substantial PCB-congener-pattern changes observed just downstream of the confluence with Meadow Brook at Neponset Street (3.1; *RMSD* for upstream adjacent sample site shown in parentheses) suggests that facility #1 is a source of PCBs to the Neponset River. Similarly, the substantial PCB-congener-pattern change observed just downstream of the confluence with Mother Brook at Dana Avenue (2.3) suggests that Mother Brook is also a substantial source of PCBs to the Neponset River. The location of PCB source(s) on Mother Brook is likely somewhere in the vicinity of Reservation Park (1.6 measured in 2005 and 2.7 measured in 2002), facility #2 (1.6), and Hyde Park (1.8). PCB concentrations in PISCES deployed near Fairmont Avenue suggest three possibilities—a new source, the anaerobic dechlorination of PCBs coming from Mother and Meadow Brooks, or both. More sophisticated statistical analysis may allow determination of whether or not PCBs are being anaerobically degraded in bottom sediments of the Neponset River (for example, Karcher and others, 2004). *RMSD* values calculated for PISCES samples deployed in the estuary suggests that PCBs from the Neponset River may be mixing with PCBs in the estuary.

[10] If two PISCES were deployed at a location, the masses of PCBs measured in the two samples were averaged.

[11] *RMSD*s were calculated for samples collected at adjacent locations in the same year.

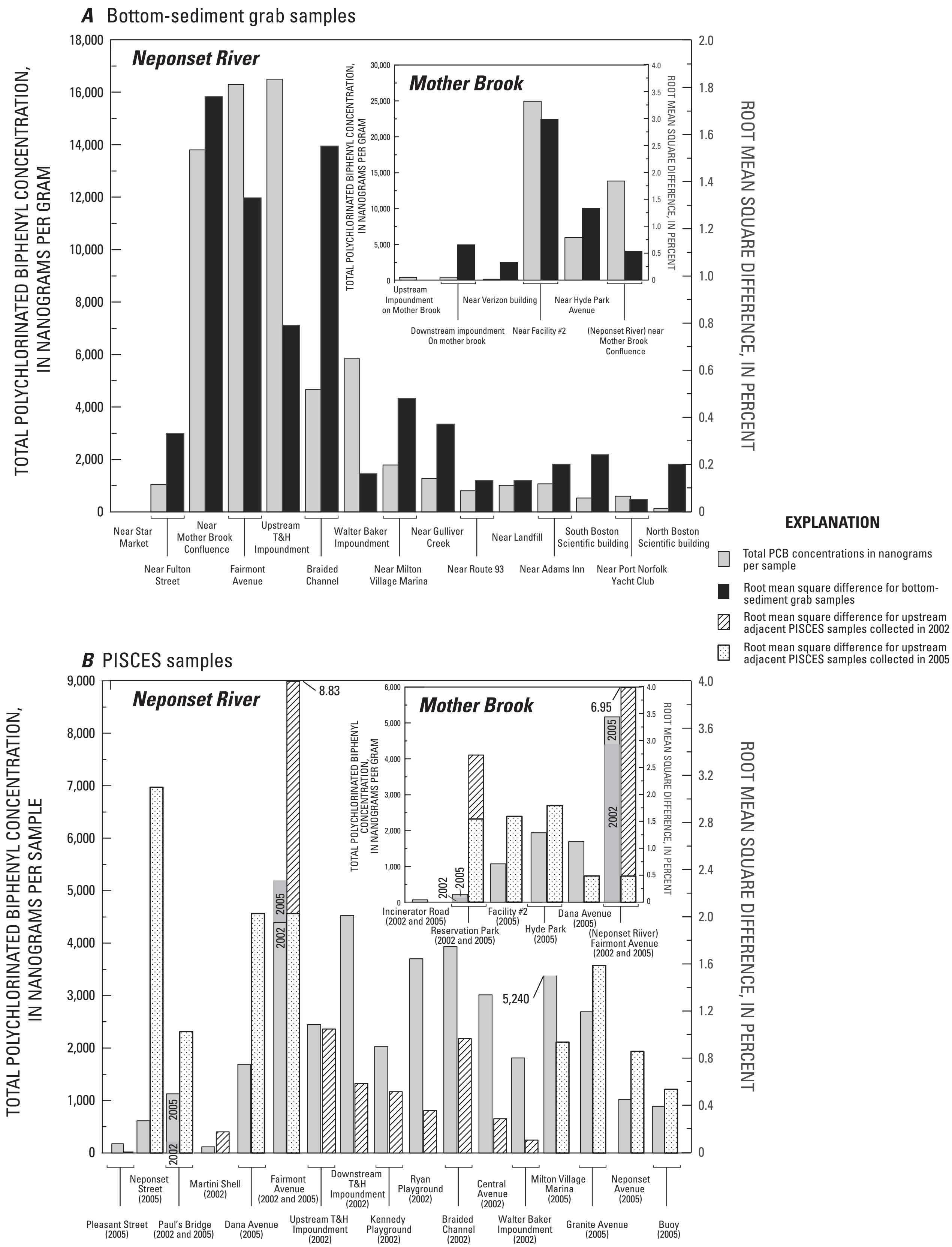

Figure 17. Total PCB concentrations and root mean square differences measured in *(A)* bottom-sediment grab samples and *(B)* passive in situ chemical-extraction samplers (PISCES).

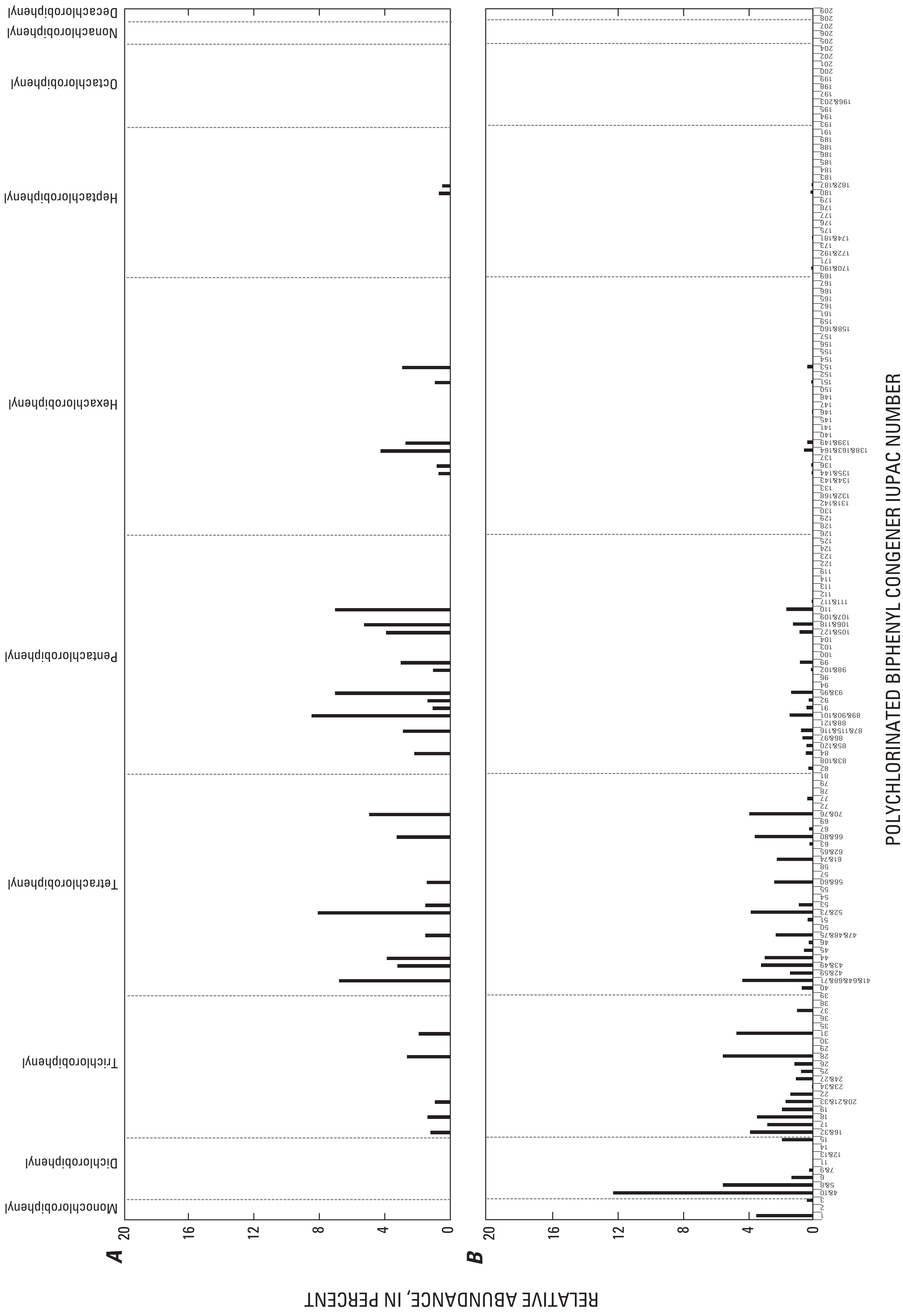

Figure 18. Relative abundances of polychlorinated biphenyls in passive in situ chemical-extraction samplers deployed in 2005 in *(A)* Mother Brook at Reservation Road, *(B)* Mother Brook at Hyde Park, *(C)* the Neponset River at Paul's Bridge, and *(D)* the Neponset River at Fairmont Avenue.

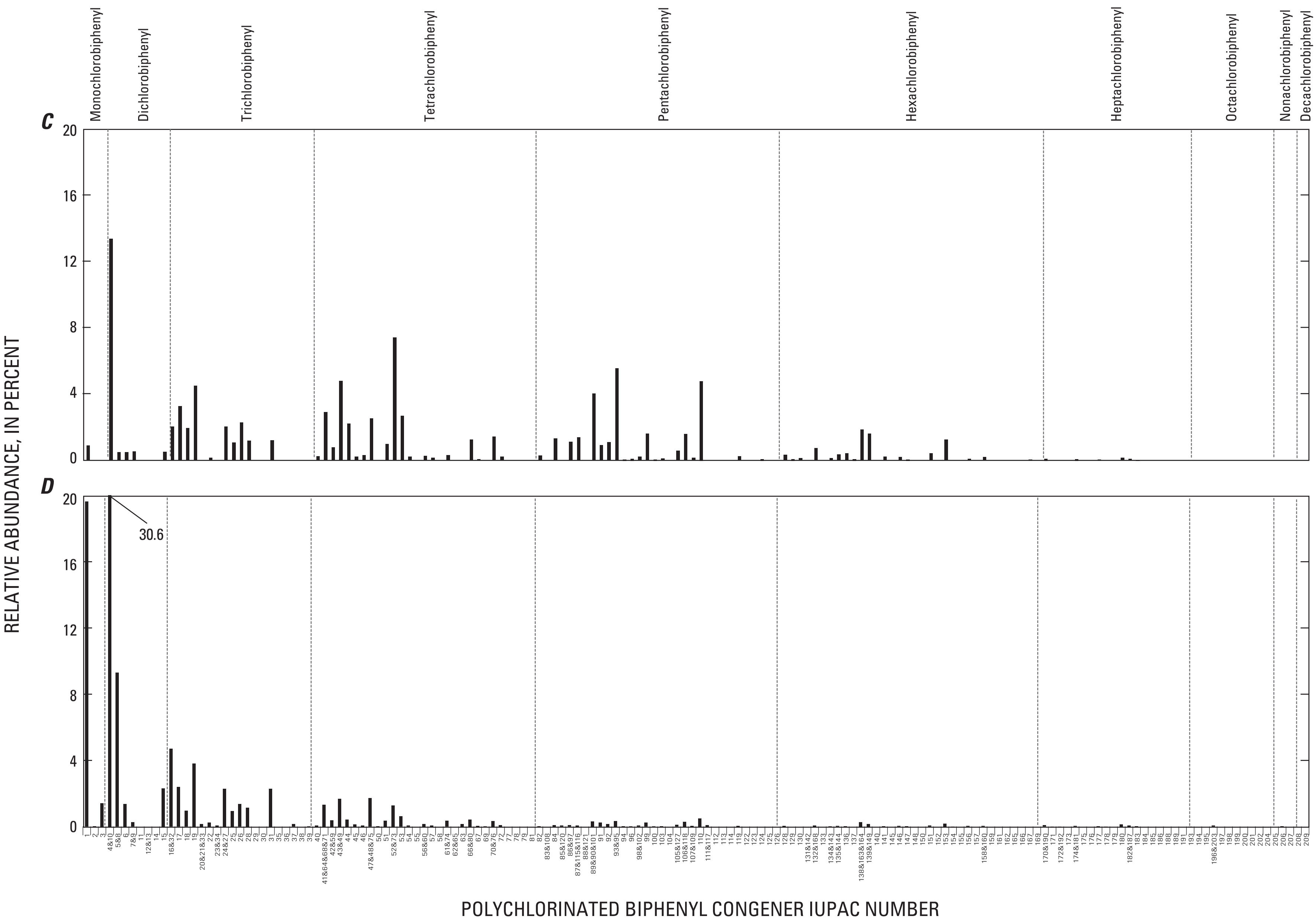

Figure 18. Relative abundances of polychlorinated biphenyls in passive in situ chemical-extraction samplers deployed in 2005 in *(A)* Mother Brook at Reservation Road, *(B)* Mother Brook at Hyde Park, *(C)* the Neponset River at Paul's Bridge, and *(D)* the Neponset River at Fairmont Avenue.—Continued

Cluster Analysis

While *RMSD* is useful to measure congener patterns in PCB samples collected at adjacent stations, cluster analysis is a statistical technique useful for characterizing the PCB-congener patterns of an entire population. Cluster analysis can be used to classify similar samples into groups called "clusters," and, perhaps more important, distinguish samples with differing PCB-congener patterns from one another. The results are often displayed graphically in the form of a dendrogram or a tree-like plot, in which the lengths of the branches indicate the degree of dissimilarity (or similarity) between clusters. The dendrograms that represent PCB-congener data from bottom-sediment samples (fig. 19A) and PISCES[12] (fig. 19B) show two major clusters each.

Cluster 1 is based on concentrations of PCBs in samples collected from the Neponset River upstream of the confluence with Mother Brook and upstream of facility #2 in Mother Brook. This cluster indicates that the PCB congeners in these upstream samples (cluster 1) are categorically different from the PCB congeners in samples from the lower Neponset River and Estuary; therefore, the PCBs in the upstream samples likely originated from source areas other than those responsible for most of the PCBs in the lower Neponset River. PCB concentrations in sediment and water samples collected downstream of facility #2 in Mother Brook and in the Neponset River downstream of the confluence with Mother Brook were generally much higher than those collected upstream of that area.

The upstream source of PCBs to the Neponset River is most likely facility #1, which is known to have contaminated Meadow Brook, a tributary to the Neponset River (U.S. Environmental Protection Agency, 2004). Further evidence for this inference is the similarity between PCB-congener patterns measured in PISCES deployed just downstream of the Meadow Brook confluence (Neponset Street) and PISCES deployed near Paul's Bridge (*RMSD* equal to about 1, fig. 17B), which in this case separates the upper and lower reaches of the Neponset River. Sources of PCBs to Mother Brook upstream of facility #2 (cluster 1, fig. 19A) appear not to be substantive; PCB concentrations in sediment and water samples collected upstream of facility #2 in Mother Brook were generally much lower than those in samples collected downstream of that area.

Cluster 2 is based on samples collected from the Neponset River downstream of the confluence with Mother Brook and downstream of facility #2 in Mother Brook. PCBs measured in these downstream samples account for most PCBs in the lower parts of Mother Brook and the Neponset River as well as the Neponset River Estuary. Cluster 2 can be resolved into cluster subgroups 2a and 2b. Cluster 2a is based on data from samples collected in Mother Brook downstream of facility #2, the Neponset River near the confluence with Mother Brook, bottom-sediment grab samples collected downstream of the Tileston and Hollingsworth Dam, one core-sediment sample collected from the Braided Channel, and samples collected from the Neponset River Estuary, with the exception of one PISCES sample collected just downstream of the Walter Baker Dam. Cluster 2b is based on data from sediment samples (grabs and cores) collected between Fairmont Avenue and the Tileston and Hollingsworth Dam, a core-sediment sample collected from the Walter Baker Impoundment, PISCES samples collected downstream of Fairmont Avenue in the Neponset River, and one PISCES sample collected from the estuary near the Milton Village Marina. Therefore, data indicate that widespread PCB contamination of the downstream parts of Mother Brook, the lower Neponset River, and the Neponset River Estuary originated from Mother Brook—more specifically, from facility #2 and near Hyde Park Avenue just downstream of facility #2 on Mother Brook.

History of PCB Contamination in the Neponset River

The history of PCB contamination in the Neponset River and its tributaries suggests why the clusters are not based on samples from contiguous stations. The PCB-congener pattern measured in a sediment core collected from the former Jenkins Impoundment (or Braided Channel) is similar to the congener pattern in a sediment grab sample collected far upstream in Mother Brook near facility #2. The date 1955 can be assigned to these sediments because that is when the Jenkins Dam was destroyed and presumably when PCB-laden sediments stopped accumulating in that part of the river. After the dam was destroyed, the river quickly incised itself into the bottom sediment once trapped behind the dam. These sediments remain today in the form of semipermanent midchannel islands.

The 1955 flood also destroyed the Tileston and Hollingsworth and Walter Baker Dams. PCB-contaminated sediments that were trapped behind these two dams likely were transported downstream and deposited in the Neponset River Estuary. Additionally, more than a decade passed before the Tileston and Hollingsworth and Walter Baker Dams were rebuilt. As a result, PCBs disposed in Mother Brook during that time interval could have been transported from the river to the estuary, unobstructed by either dam. Once river water with its PCB-laden sediment reached the estuary, it would have dropped the sediment and PCB load in the low flow water near the river mouth. This may explain the similarity among PCB-congener patterns measured in bottom-sediment grab samples collected from the Neponset River Estuary, Mother Brook, and parts of the lower Neponset River (Cluster 2a).

In contrast, the dissimilarity between PCB-congener patterns measured in bottom-sediment samples collected from the Neponset River and Estuary (fig. 19A, Subclusters 2ai and 2aii) likely results from the mixing of PCBs in the estuary

[12] PISCES and bottom-sediment data (grab and core) used in cluster analysis included data from samples collected as part of the 2002 study (Breault and others, 2004b).

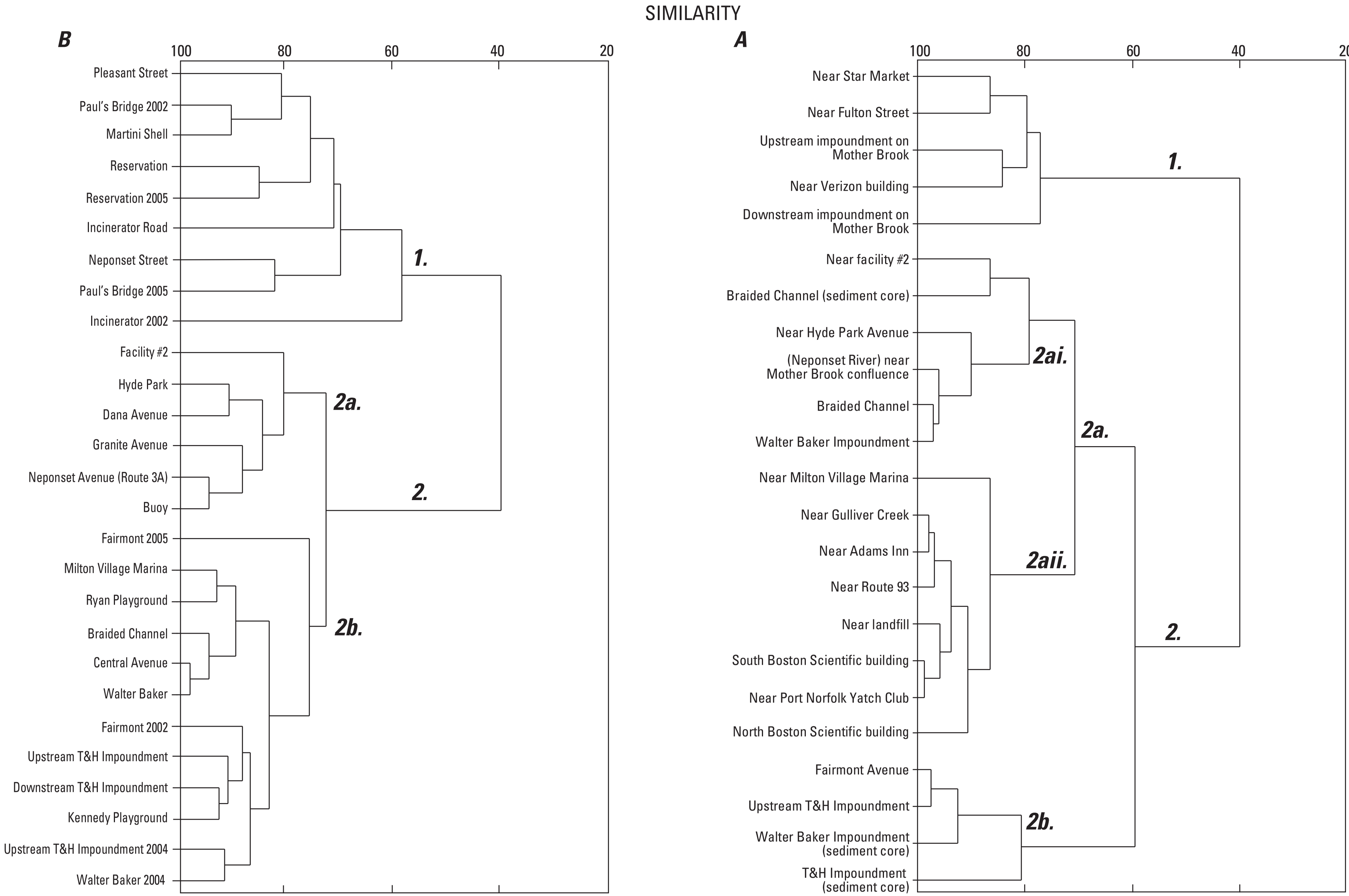

Figure 19. Dendrograms of PCB-concentration data from *(A)* bottom-sediment grab samples and *(B)* passive in situ chemical-extraction samples.

from the Neponset River and from other sources. PCBs from Boston Harbor (transported directly or indirectly from other tributaries) may have been washed into the estuary with the tide and mixed with PCBs from the Neponset River. Mixing tends to muddle the original signal (or fingerprint) of each source. This hypothesis is supported by MWRA studies of PCB-congener patterns in bottom-sediment grab samples collected from the Neponset River Estuary and Boston Harbor (Lefkovitz and others, 2006). The data collected during this study suggest that PCB-congener patterns "…revealed that PCBs in sediment from Station DB10 [collected from the Neponset River Estuary] were different from other sediment samples [collected from Boston Harbor]" and that the PCB-congener patterns measured in sediment samples collected from the harbor were "…similar and closer to the pattern of Aroclor 1254" (Lefkovitz and others, 2006).

Sediment samples represented by Cluster 2b generally contained the highest PCB concentrations measured in this study; sediment at and near the stations associated with Cluster 2b appear to be responsible for most of the PCBs in the water column today (as measured by PISCES). One plausible explanation would be an unidentified source of PCBs that is continuing to discharge PCBs to the river. This source would have to be near, or discharging large amounts of PCBs to, the Neponset River somewhere near Fairmont Avenue. Another plausible explanation, which does not include another source area, is transformation: specifically, in situ anaerobic reductive dechlorination of PCBs that originated from Mother Brook and were subsequently deposited behind the Tileston and Hollingsworth and Walter Baker Dams. PCBs from contaminated sediments in these areas, in turn, could contaminate the overlying water by means of diffusive release of dissolved and colloidal PCBs from the bed or resuspension and subsequent desorption from resuspended particles (Achman and others, 1993). A third possibility is a combination of a new source and in situ dechlorination.

In the process of anaerobic dechlorination, chlorine atoms are removed from the biphenyl ring with hydrogen atoms, thereby reducing the average number of chlorine atoms per biphenyl molecule. Thus, the process of anaerobic dechlorination does not convert PCBs congeners into a different type of compound; rather, it results in the conversion of heavier PCB congeners (more chlorinated) to lighter PCB congeners (less chlorinated). For example, removal of the chlorine atom in the meta position of PCB 63 (2,3,4,6-tetrachlorobiphenyl) by microbial action results in the formation of PCB 30 (2,4,6-trichlorobiphenyl), which in turn may be dechlorinated to form PCB 3 (4-monochlorobiphenyl) by removal of both chlorine atoms in the ortho position (Qingzhong and others, 1997).

Any one of the many identified dechlorination pathways may account for the predominance of mono- and dichlorobiphenyls observed in bottom-sediment samples collected in some parts of the Neponset River. Moreover, the transformation of heavier congeners to lighter congeners, together with the facts that lighter congeners are generally more soluble than heavier congeners and that the highest concentrations of PCBs were measured in bottom sediment collected behind the Tileston and Hollingsworth Dam, may also explain the predominance of mono- and dichlorobiphenyls observed in the PISCES samples collected downstream of Fairmont Avenue. The recurrence of congener patterns indicative of the upstream stations in water-column samples from PISCES deployed far out into the estuary (Granite Avenue, Route 3A, and Buoy) may be the result of dilution of dechlorinated PCBs from the river with nondechlorinated PCBs from the original source preserved in the estuarine sediment. The congener patterns measured in PISCES deployed in the estuary also reflect the presence of congeners from Aroclor 1254, which is thought to be entering the estuary from the harbor (Lefkovitz and others, 2006).

Several hypotheses may explain why anaerobic dechlorination may be happening in bottom sediments trapped behind the Tileston and Hollingsworth Dam and in deeper sediment behind the Walter Baker Dam. The most straightforward of these is that chlorine removal is a function of the total PCB concentration in the sediment, and that anaerobic dechlorination is effective only above some threshold concentration (Cho and others, 2003). For example, Cho and others (2003) demonstrated that PCB dechlorination did not occur below concentrations of about 35 ng/g in St. Lawrence River bottom sediment; in addition, most dechlorination did occur at concentrations above 75 ng/g. It has also been suggested that threshold concentrations are congener specific (Sokol and others, 1995).

PCB concentrations measured in core-sediment samples collected behind the Tileston and Hollingsworth and Walter Baker Dams were well above 75 ng/g, whereas PCB concentrations measured in core samples collected from the Braided Channel are less than 75 ng/g. It is unclear why PCB-congener patterns measured in sediment grab samples collected just upstream of the Tileston and Hollingsworth Dam resemble the dechlorination patterns measured in core samples from these locations, even though PCB concentrations in these grab samples are less than 35 µg/kg. It is possible that dechlorinated PCB congeners have migrated upward through interstitial water from deeper strata by means of molecular diffusion and advection. This does not appear to be the case for the sediment grab sample collected behind the Walter Baker Dam far upstream from the area where sediment at depth is enriched in PCBs at concentrations greater than 35 ng/g (Breault and others, 2004a). The sediment grab sample (BGY-128) collected from the Braided Channel was not taken from the islands, but rather from sediment beneath the free-flowing part of the river. This choice of collection site and the fact that PCB concentrations in this sample were below the threshold concentration are a possible explanation for a PCB-congener pattern that resembles the original source material as opposed to the dechlorination pattern. Oxygen concentration (< 0.5 ppm), sediment organic matter, redox potential, temperature, pH, salinity, and the absence of energetically favorable electron acceptors have been suggested in addition to threshold concentration as other critical controlling parameters for PCB dechlorination (VanBriesen and others, 2004).

Although Aroclors consist of relatively predictable amounts of different congeners, PCBs in the environment are often complex mixtures of several Aroclors. Moreover, these mixtures can be changed further by the industrial processes in which they are used or by environmental processes such as aerobic and anaerobic biodegradation, preferential transport, or metabolization. All of these processes tend to muddle congener patterns measured in environmental samples compared to the original PCB mixtures (or Aroclors). Fortunately, mathematical formulas based on the fact that some congeners in commercially produced Aroclors maintain constant ratios with one another have been developed to determine whether or not congener patterns have changed from the original source mixture (Karcher and others, 2004).

Visual inspection of PCB-congener patterns measured in environmental samples (figs. 14, 15, 16, and 18) collected from the lower Neponset River and Estuary show that PCB-congener patterns in some samples differ from typical Aroclor PCB-congener patterns (fig. 20). PCB-congener concentrations in Aroclor mixtures were analyzed by means of the same methods and laboratory as PCB concentrations in the environmental samples (appendix 5) as part of this study. To statistically confirm this observation, suites of PCB congeners (or unresolved congener groups) were categorized as either Aroclor like or not Aroclor like by comparing the ratios of certain PCB-congener (or unresolved congener-group) concentrations measured in the environmental samples with those measured in commercially available Aroclor mixtures. Concentrations of certain PCB congeners (called tracker pairs) maintain constant ratios with one another in typical Aroclor mixtures. Therefore, changes in these ratios can be attributed to processes like dechlorination, preferential transport, or metabolism, which may alter the relative abundance of individual PCB congeners. On the other hand, similar ratios measured in environmental samples and Aroclor mixtures likely indicate that tracker-pair congeners have not been altered from the original source material, or that they have been altered such that ratios have been maintained—this is especially true of two congeners of similar molecular weight and (or) stereochemistry. In other words, differences between tracker-pair ratios in environmental samples and Aroclor mixtures indicate changes caused by any of several possible environmental processes, whereas similar ratios do not unequivocally demonstrate that PCB congeners have not been altered. These ratios and other information (for example, grain-size distribution and (or) the relative solubility of different congeners), however, may nonetheless be used to identify source areas or eliminate possible source areas.

Following Karcher and others' (2004) method, 82 individual PCB congeners (or unresolved congener groups) that make up 226 tracker pairs were identified. Of these, only 20 tracker pairs measured in PISCES and 7 tracker pairs measured in bottom-sediment samples passed the rigorous statistical tests required to be categorized as Aroclor like (α=0.05). The high number of tracker pairs categorized as not Aroclor like indicates that many of the original PCBs discharged to the river have been altered.

Figure 21 shows the logarithms of the relative abundances of PCB-congener 153 and the unresolved congener group PCB 138 + 163 + 164 measured in bottom-sediment grab and PISCES samples. Also shown are the logarithms of the relative abundances of this tracker pair measured in Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260. On average, PCB congener 153 and unresolved congener group PCB 138 + 163 + 164 accounted for about 2.5 and 3.6 percent[13], respectively, of the total PCB concentrations measured in bottom-sediment grab samples: 0.77 and 1.1 percent, respectively, of the total PCB concentrations measured in PISCES samples: and 0.48 and 0.58 percent, respectively, of the total PCB concentrations measured in core-sediment samples. These differences in percentages are likely a result of sampling and (or) analytical techniques.

Visual inspection of these plots shows that the ratios of the concentrations of these congeners measured in sediment grab samples collected from the downstream reach of Mother Brook (facility #2) are similar to those measured in sediment samples collected from the Neponset River just downstream of the Mother Brook confluence, including those collected from Fairmont Avenue and just upstream of the Tileston and Hollingsworth Dam (fig. 21B). This similarity suggests that most PCBs in sediment in this part of the river originated from Mother Brook. Tracker-pair ratios measured in bottom-sediment samples collected from the downstream parts of Mother Brook and the Neponset River also confirm the Aroclor data, which suggest that the original source was likely a mixture of 1016/1242, 1254, and 1260. Tracker-pair ratios calculated from PCB-congener concentrations measured in bottom-sediment samples collected from the outer estuary appear to more closely resemble the ratios for Aroclor 1254 than Aroclor 1016/1242; this result also confirms the Aroclor data. These results are consistent with the hypothesis that PCBs from the river (a mixture of Aroclors 1016/1242, 1254, and 1260) are mixing with PCBs from Boston Harbor (primarily Aroclors 1254 and 1260). Tracker-pair ratios calculated from PCB-congener concentrations measured in bottom-sediment samples collected from the upstream parts of Mother Brook (upstream of facility #2) and the Neponset River (upstream of the Mother Brook confluence) appear to resemble Aroclor 1254 and Aroclor 1260. Other identified tracker pairs show similar results. Preferential transport of PCB congeners may result in differences in the concentration ratios of Aroclor-like tracker pairs; fine-grained sediments are expected to be enriched with heavier PCB congeners compared to coarse-grained sediment. It appears that relative concentration ratios of PCB-congener 153 to unresolved congener PCB 138 + 163 + 164, however, are similar in bottom-sediment samples collected from areas in the lower

[13] Includes data collected by Breault and others (2004b).

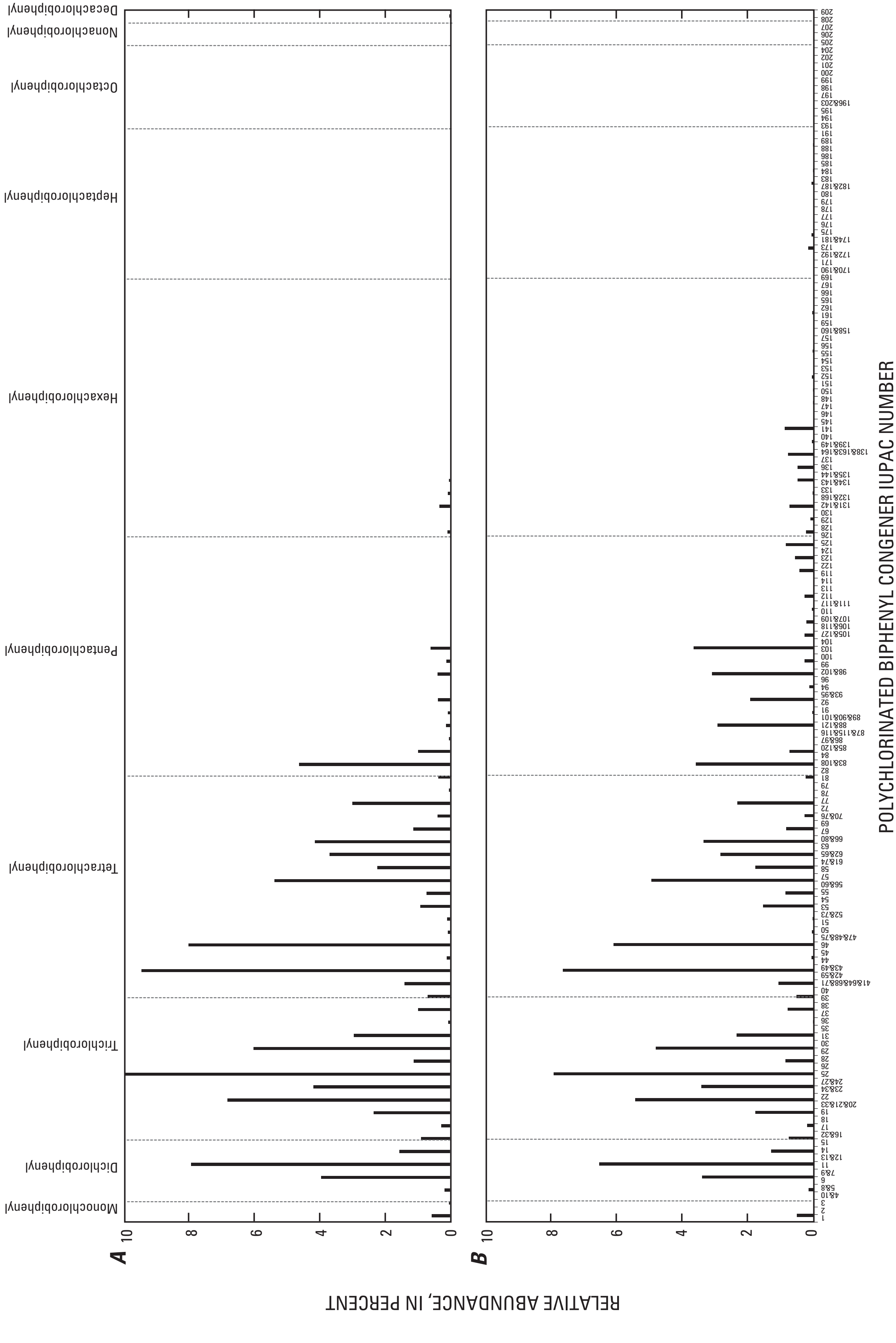

Figure 20. Relative abundances of polychlorinated biphenyls measured in *(A)* Aroclor 1016, *(B)* Aroclor 1242, *(C)* Aroclor 1254, and *(D)* Aroclor 1260.

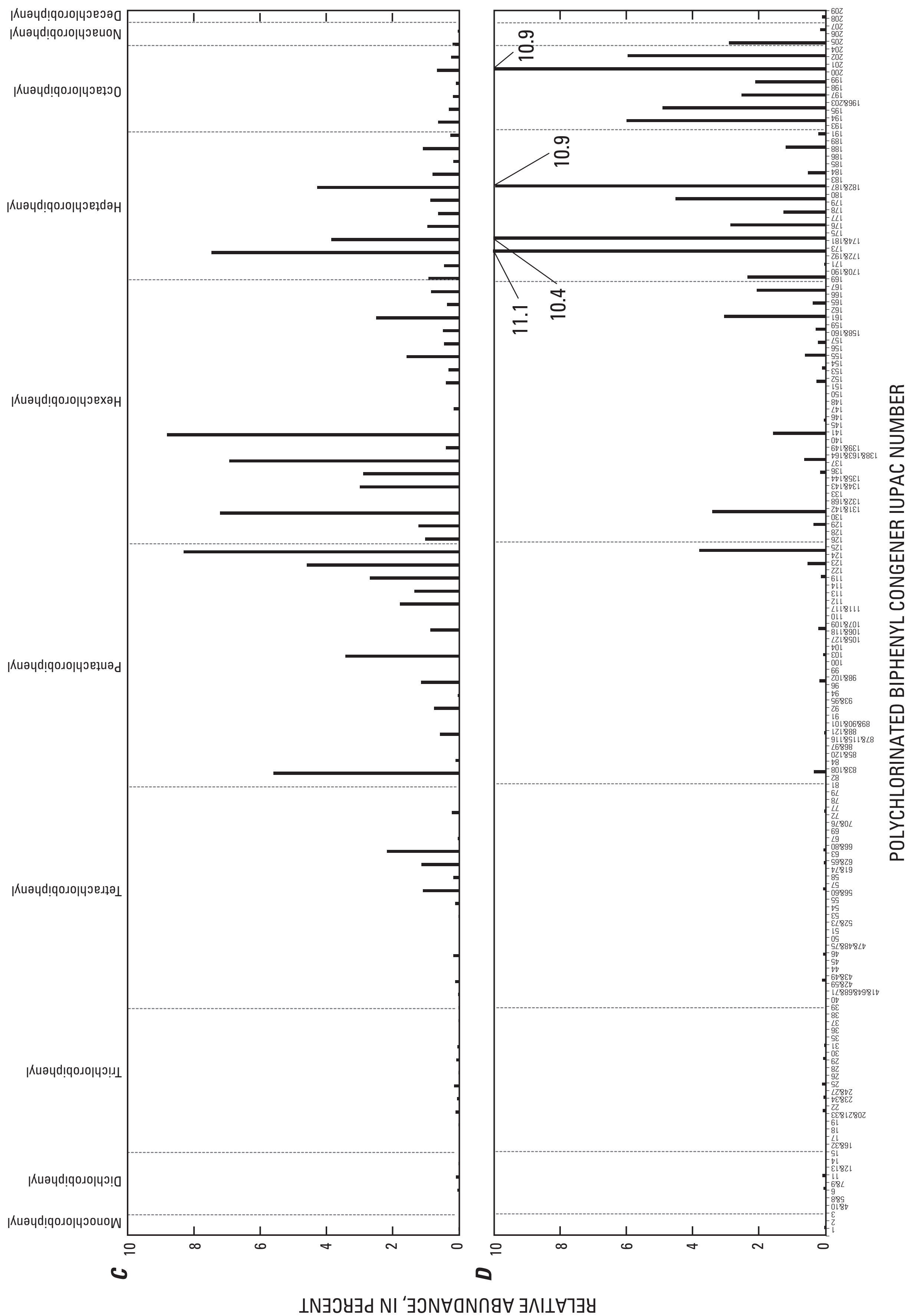

Figure 20. Relative abundances of polychlorinated biphenyls measured in *(A)* Aroclor 1016, *(B)* Aroclor 1242, *(C)* Aroclor 1254, and *(D)* Aroclor 1260.—Continued

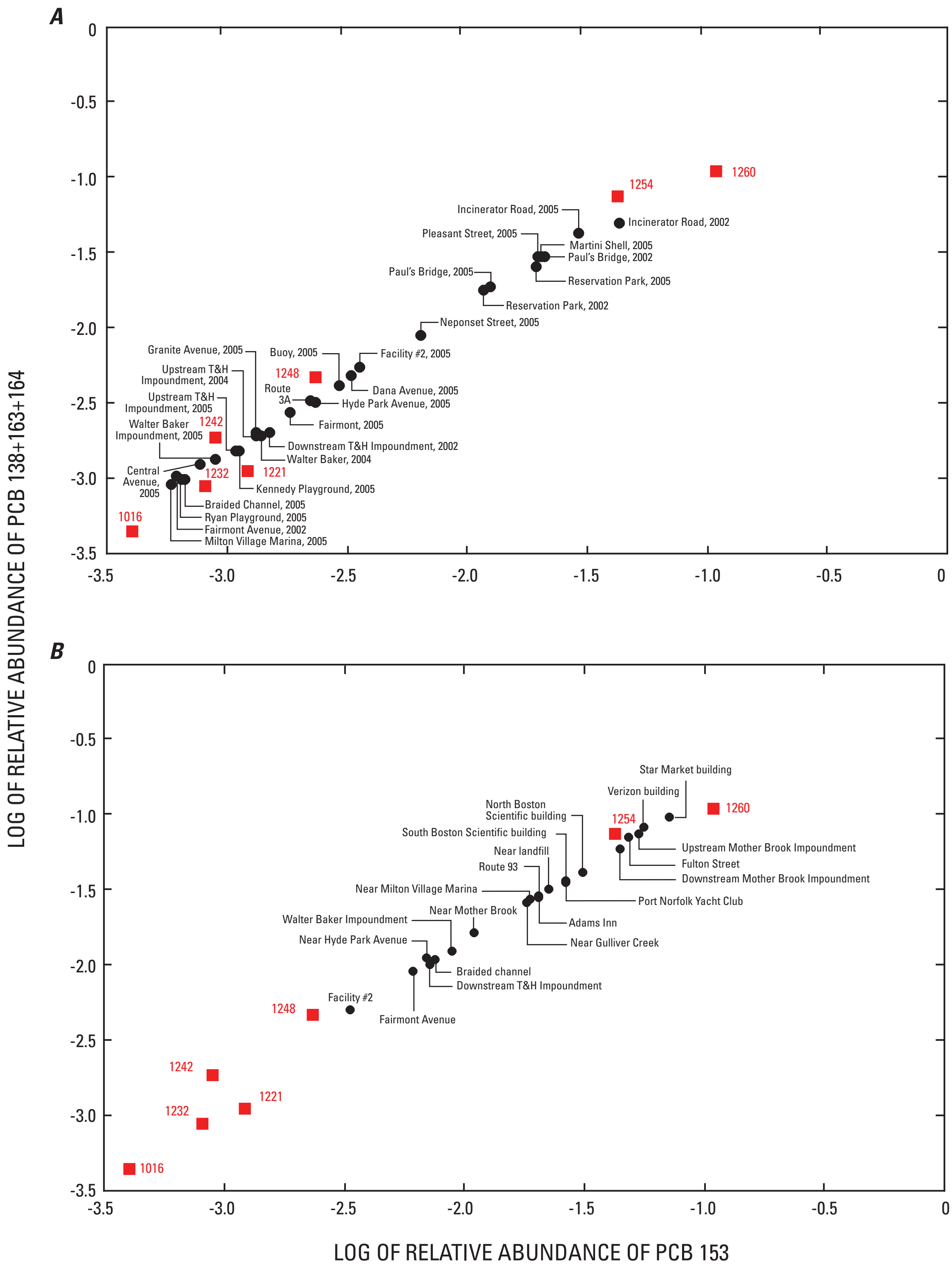

Figure 21. Relative abundances (expressed as decimal fractions) of *(A)* PCB 153 and PCB 138 + 163 + 164 in passive in situ chemical-extraction samplers and *(B)* PCB 153 and PCB 138 + 163 + 164 in bottom-sediment grab samples. Also shown are the relative abundances of these congeners in Aroclor samples.

Neponset River with a broad grain-size distribution (Breault and others, 2004b).

The ratios of the concentrations of congeners PCB 153 and PCB 138 + 163 + 164 measured in PISCES in the downstream reach of Mother Brook are similar to those measured from the Neponset River just downstream of the Mother Brook confluence, including those collected from just upstream of the Tileston and Hollingsworth Dam (fig. 21A). The relative abundance of PCB congeners of higher molecular weight (like PCB 153 and the unresolved congener PCB 138 + 163 + 164) were likely lower in water samples compared to bottom-sediment samples because of differential PCB flux from bottom sediments; PCB congeners of lighter molecular weight are generally more soluble than PCBs of higher molecular weight because the latter adhere preferentially to fine-grained sediments. This may explain the differences in the ratios of the relative abundance of dissolved PCBs 153 and 138 + 163 + 164 measured in PISCES samplers deployed in the same areas in 2002, 2004, and 2005 (fig. 21A). For example, although mean monthly air temperatures measured in 2002, 2004, and 2005 during PISCES deployment at the nearby Blue Hill Observatory in Milton, MA, were similar (about 72.1, 69.1, 71.0, respectively; Iacono, 2010), mean daily streamflows measured at the Neponset River at the Milton Village during the July and August deployment intervals of the same years were about 20, 275, and 72 ft^3/s, respectively (fig. 22). Low streamflows may have resulted in much warmer water temperatures compared to higher streamflows that in turn may slightly affect PCB-congener patterns measured in PISCES.

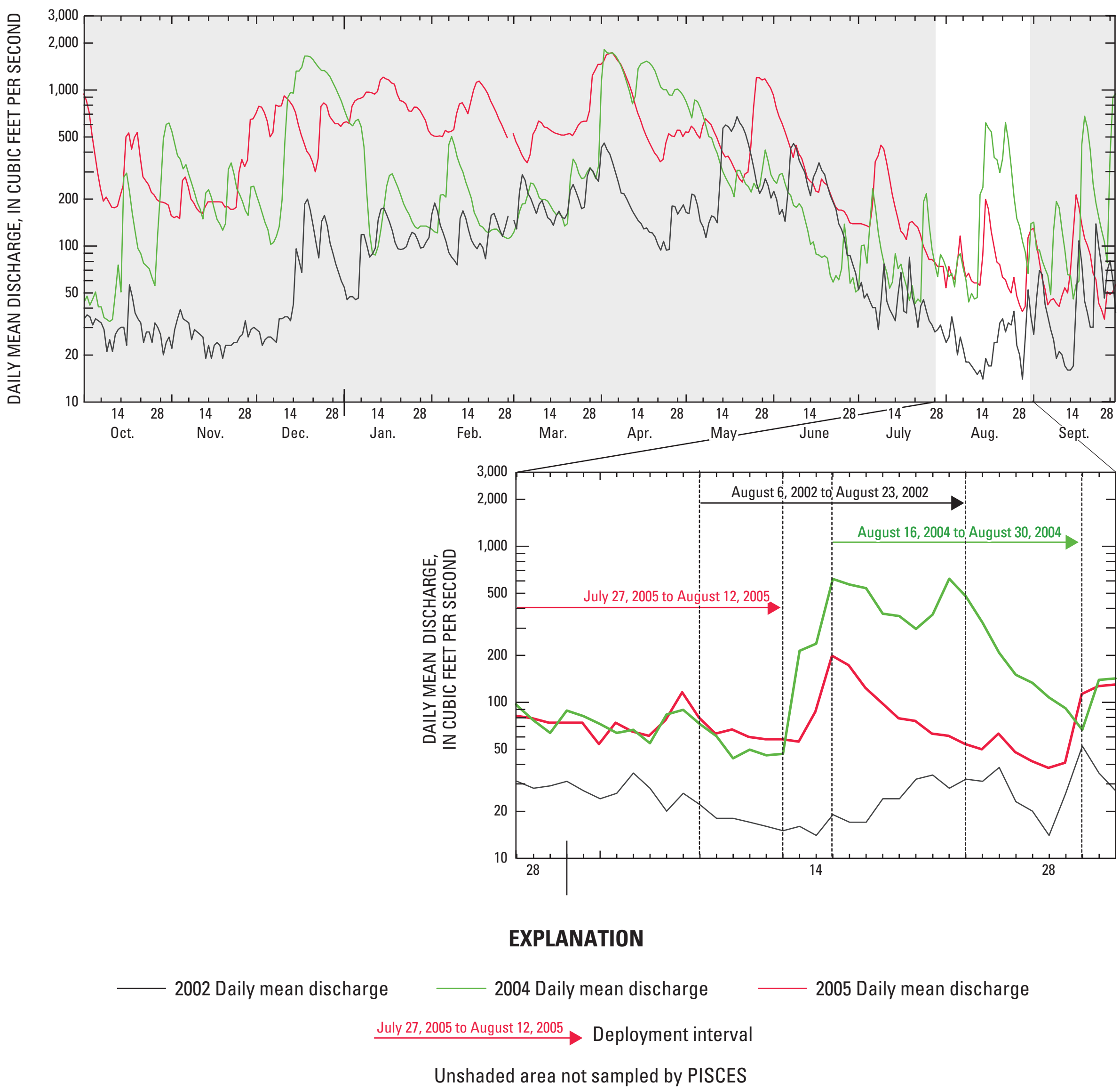

Figure 22. Daily mean discharges measured at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, during passive chemical-extraction sampler (PISCES) deployment in 2002, 2004, and 2005.

Summary

Polychlorinated biphenyls (PCBs)—209 theoretically discrete, manufactured organic compounds—are known to contaminate water, sediment, and fish in the Neponset River. The Neponset River flows through parts of the Boston, Massachusetts, area and drains directly to the Neponset River Estuary, a subembayment of Boston Harbor. Because this estuary supports anadromous fish habitat and shell fisheries, it has been designated by the Commonwealth of Massachusetts as an Area of Critical Environmental Concern. The river is dammed and impassable to fish. To identify sources and understand the transport and fate of PCBs in the river and estuary, the U.S. Geological Survey, together with the Massachusetts Department of Fish and Game, Division of Ecological Restoration, Riverways Program, undertook a study of PCBs in the river and estuary.

The concentrations, loads, and sources of PCBs in the Neponset River and Neponset River Estuary were determined by collecting, analyzing, and interpreting data from several different types of samples, including bottom sediment, extracts from passive-water samplers, fish tissue, and directly collected water. Bottom-sediment grab samples and passive in situ chemical extraction samples (or PISCES) were collected at 13 and 15 locations, respectively, and *Catostomus commersoni*, commonly known as white sucker, and *Fundulus heteroclitus*, known as common mummichog, were collected at three locations and analyzed whole, filleted, or both. Samples were analyzed for Aroclors, homologs, and PCB congeners. The mass of PCBs transported by the river to the estuary was measured by the collection of more than over 2,600 water samples in a flow-proportional manner for one year beginning in May 2005.

PCB concentrations measured in the top layers of bottom sediment ranged from 28 ng/g just upstream of the Mother Brook confluence to 24,900 ng/g measured in Mother Brook. Some bottom-sediment samples in the Neponset River and the Neponset River Estuary contained PCBs in concentrations well above sediment-quality guidelines (2,000 ng/g) and could be classified as moderately regulated waste (50 to 499 mg/kg) according to the Toxic Substances Control Act. Some measured and estimated concentrations of dissolved PCBs were above the U.S. Environmental Protection Agency's continuous chronic criterion for dissolved PCBs (14 mg/L)—concentrations above this criterion could cause harm to humans, wildlife, and fish, if exposed over long enough periods of time. PCB concentrations measured in riverine fish, both whole and fillets, were above concentrations (2,000 ng/g) considered by the U.S. Environmental Protection Agency to be safe for consumption of fish by both wildlife and humans. Specifically, concentrations of PCBs in white sucker (filleted and whole) were 3,490 and 2,450 ng/g wet wt (filleted) and 6,890 and 4,080 ng/g wet wt (whole fish). PCB-congener concentrations measured in the whole bodies of estuarine bait fish (common mummichog) were 708 ng/g wet wt.

Bottom-sediment samples analyzed for 31 elements had element concentrations generally higher than background concentrations in New England rivers and streams and estuarine environments. Concentrations also were higher than levels considered toxic to benthic organisms or bottom-dwelling insects and worms that form the base of the food chain.

Over the period of one year (May 2005 to June 2006), about 5,100 g (about 3.6 L or 1 gal of PCBs of assumed density of 1.4 g/mL) were estimated to have discharged directly into the Neponset River Estuary from the Neponset River. Generally, about one-half of these PCBs were dissolved in the water column and the other half were associated with particulate matter; however, the proportions of dissolved and particulate varied seasonally. Most PCBs transported from the river to the estuary are composed of four or fewer chlorine atoms per biphenyl molecule. The chemical phase and structure of PCBs coming from the river may have a profound effect on the fate, transport, and toxicity of PCBs in the Neponset River Estuary.

PCBs in the part of the river known locally as the "Braided Channel" appear to be trapped in semipermanent stable islands, which formed as a result of catastrophic dam failure and subsequent morphological processes. Although PCB-contaminated sediments in the Braided Channel have been exposed to a wide range of environmental conditions during the past 50 years, changing conditions in the future may cause sediment to move downstream.

Bottom-sediment and PISCES data collected as part of this study are consistent with the hypothesis that widespread PCB contamination of the lower Neponset River (originating from Mother Brook) likely started prior to 1955, at which time catastrophic failure of dams on the river released PCB-contaminated sediment downstream and into the estuary. Subsequently, all but one of the dams were rebuilt, but it is likely that PCBs from this source area continued to be released into the river. Today (2007), PCBs are mostly trapped behind the dams. Some PCBs either diffuse or are entrained back into the water column, however, and are transported downstream by river water; PCBs also are taken up by fish and wildlife and are transported in their tissue. In addition to the continuing release of PCBs from historically contaminated bottom sediment, it appears that PCBs are still (2007) originating from source areas along Mother and Meadow Brook as well as other areas along the river and Boston Harbor.

The data presented here and in other U.S. Geological Survey publications concerning the Neponset River may serve as the baseline for cleanup efforts; in the future, the data obtained from the collection of sediment, water, and fish-tissue samples may be used to assess the benefits that might be realized from removing sources of PCBs.

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Tables 2, 7, 10–17

Table 2. Polychlorinated biphenyl names and numbers designated by the International Union of Pure and Applied Chemistry.

[IUPAC, International Union of Pure and Applied Chemistry; No., number]

IUPAC No.	Compound	IUPAC No.	Compound	IUPAC No.	Compound	IUPAC No.	Compound
1	2 - Monochlorobiphenyl	54	2,2’,6,6’ - Tetrachlorobiphenyl	107	2,3,3’,4’,5 - Pentachlorobiphenyl	160	2,3,3’,4,5,6 - Hexachlorobiphenyl
2	3 - Monochlorobiphenyl	55	2,3,3’,4 - Tetrachlorobiphenyl	108	2,3,3’,4,5’ - Pentachlorobiphenyl	161	2,3,3’,4,5’,6 - Hexachlorobiphenyl
3	4 - Monochlorobiphenyl	56	2,3,3’,4’ - Tetrachlorobiphenyl	109	2,3,3’,4,6 - Pentachlorobiphenyl	162	2,3,3’,4’,5,5’ - Hexachlorobiphenyl
4	2,2’ - Dichlorobiphenyl	57	2,3,3’,5 - Tetrachlorobiphenyl	110	2,3,3’,4’,6 - Pentachlorobiphenyl	163	2,3,3’,4’,5,6 - Hexachlorobiphenyl
5	2,3 - Dichlorobiphenyl	58	2,3,3’,5’ - Tetrachlorobiphenyl	111	2,3,3’,5,5’ - Pentachlorobiphenyl	164	2,3,3’,4’,5’,6 - Hexachlorobiphenyl
6	2,3’ - Dichlorobiphenyl	59	2,3,3’,6 - Tetrachlorobiphenyl	112	2,3,3’,5,6 - Pentachlorobiphenyl	165	2,3,3’,5,5’,6 - Hexachlorobiphenyl
7	2,4 - Dichlorobiphenyl	60	2,3,4,4’ - Tetrachlorobiphenyl	113	2,3,3’,5’,6 - Pentachlorobiphenyl	166	2,3,4,4’,5,6 - Hexachlorobiphenyl
8	2,4’ - Dichlorobiphenyl	61	2,3,4,5 - Tetrachlorobiphenyl	114	2,3,4,4’,5 - Pentachlorobiphenyl	167	2,3’,4,4’,5,5’ - Hexachlorobiphenyl
9	2,5 - Dichlorobiphenyl	62	2,3,4,6 - Tetrachlorobiphenyl	115	2,3,4,4’,6 - Pentachlorobiphenyl	168	2,3’,4,4’,5’,6 - Hexachlorobiphenyl
10	2,6 - Dichlorobiphenyl	63	2,3,4’,5 - Tetrachlorobiphenyl	116	2,3,4,5,6 - Pentachlorobiphenyl	169	3,3’,4,4’,5,5’ - Hexachlorobiphenyl
11	3,3’ - Dichlorobiphenyl	64	2,3,4’,6 - Tetrachlorobiphenyl	117	2,3,4’,5,6 - Pentachlorobiphenyl	170	2,2’,3,3’,4,4’,5 - Heptachlorobiphenyl
12	3,4 - Dichlorobiphenyl	65	2,3,5,6 - Tetrachlorobiphenyl	118	2,3’,4,4’,5 - Pentachlorobiphenyl	171	2,2’,3,3’,4,4’,6 - Heptachlorobiphenyl
13	3,4’ - Dichlorobiphenyl	66	2,3’,4,4’ - Tetrachlorobiphenyl	119	2,3’,4,4’,6 - Pentachlorobiphenyl	172	2,2’,3,3’,4,5,5’ - Heptachlorobiphenyl
14	3,5 - Dichlorobiphenyl	67	2,3’,4,5 - Tetrachlorobiphenyl	120	2,3’,4,5,5’ - Pentachlorobiphenyl	173	2,2’,3,3’,4,5,6 - Heptachlorobiphenyl
15	4,4’ - Dichlorobiphenyl	68	2,3’,4,5’ - Tetrachlorobiphenyl	121	2,3’,4,5’,6 - Pentachlorobiphenyl	174	2,2’,3,3’,4,5,6’ - Heptachlorobiphenyl
16	2,2’,3 - Trichlorobiphenyl	69	2,3’,4,6 - Tetrachlorobiphenyl	122	2’,3,3’,4,5 - Pentachlorobiphenyl	175	2,2’,3,3’,4,5’,6 - Heptachlorobiphenyl
17	2,2’,4 - Trichlorobiphenyl	70	2,3’,4’,5 - Tetrachlorobiphenyl	123	2’,3,4,4’,5 - Pentachlorobiphenyl	176	2,2’,3,3’,4,6,6’ - Heptachlorobiphenyl
18	2,2’,5 - Trichlorobiphenyl	71	2,3’,4’,6 - Tetrachlorobiphenyl	124	2’,3,4,5,5’ - Pentachlorobiphenyl	177	2,2’,3,3’,4’,5,6 - Heptachlorobiphenyl
19	2,2’,6 - Trichlorobiphenyl	72	2,3’,5,5’ - Tetrachlorobiphenyl	125	2’,3,4,5,6’ - Pentachlorobiphenyl	178	2,2’,3,3’,5,5’,6 - Heptachlorobiphenyl
20	2,3,3’ - Trichlorobiphenyl	73	2,3’,5’,6 - Tetrachlorobiphenyl	126	3,3’,4,4’,5 - Pentachlorobiphenyl	179	2,2’,3,3’,5,6,6’ - Heptachlorobiphenyl
21	2,3,4 - Trichlorobiphenyl	74	2,4,4’,5 - Tetrachlorobiphenyl	127	3,3’,4,5,5’ - Pentachlorobiphenyl	180	2,2’,3,4,4’,5,5’ - Heptachlorobiphenyl
22	2,3,4’ - Trichlorobiphenyl	75	2,4,4’,6 - Tetrachlorobiphenyl	128	2,2’,3,3’,4,4’ - Hexachlorobiphenyl	181	2,2’,3,4,4’,5,6 - Heptachlorobiphenyl
23	2,3,5 - Trichlorobiphenyl	76	2’,3,4,5 - Tetrachlorobiphenyl	129	2,2’,3,3’,4,5 - Hexachlorobiphenyl	182	2,2’,3,4,4’,5,6’ - Heptachlorobiphenyl
24	2,3,6 - Trichlorobiphenyl	77	3,3’,4,4’ - Tetrachlorobiphenyl	130	2,2’,3,3’,4,5’ - Hexachlorobiphenyl	183	2,2’,3,4,4’,5’,6 - Heptachlorobiphenyl
25	2,3’,4 - Trichlorobiphenyl	78	3,3’,4,5 - Tetrachlorobiphenyl	131	2,2’,3,3’,4,6 - Hexachlorobiphenyl	184	2,2’,3,4,4’,6,6’ - Heptachlorobiphenyl
26	2,3’,5 - Trichlorobiphenyl	79	3,3’,4,5’ - Tetrachlorobiphenyl	132	2,2’,3,3’,4,6’ - Hexachlorobiphenyl	185	2,2’,3,4,5,5’,6 - Heptachlorobiphenyl
27	2,3’,6 - Trichlorobiphenyl	80	3,3’,5,5’ - Tetrachlorobiphenyl	133	2,2’,3,3’,5,5’ - Hexachlorobiphenyl	186	2,2’,3,4,5,6,6’ - Heptachlorobiphenyl
28	2,4,4’ - Trichlorobiphenyl	81	3,4,4’,5 - Tetrachlorobiphenyl	134	2,2’,3,3’,5,6 - Hexachlorobiphenyl	187	2,2’,3,4’,5,5’,6 - Heptachlorobiphenyl
29	2,4,5 - Trichlorobiphenyl	82	2,2’,3,3’,4 - Pentachlorobiphenyl	135	2,2’,3,3’,5,6’ - Hexachlorobiphenyl	188	2,2’,3,4’,5,6,6’ - Heptachlorobiphenyl
30	2,4,6 - Trichlorobiphenyl	83	2,2’,3,3’,5 - Pentachlorobiphenyl	136	2,2’,3,3’,6,6’ - Hexachlorobiphenyl	189	2,3,3’,4,4’,5,5’ - Heptachlorobiphenyl
31	2,4’,5 - Trichlorobiphenyl	84	2,2’,3,3’,6 - Pentachlorobiphenyl	137	2,2’,3,4,4’,5 - Hexachlorobiphenyl	190	2,3,3’,4,4’,5,6 - Heptachlorobiphenyl

Table 2. Polychlorinated biphenyl names and numbers designated by the International Union of Pure and Applied Chemistry.—Continued

[IUPAC, International Union of Pure and Applied Chemistry; No., number]

IUPAC No.	Compound	IUPAC No.	Compound	IUPAC No.	Compound	IUPAC No.	Compound
32	2,4’,6 - Trichlorobiphenyl	85	2,2’,3,4,4’ - Pentachlorobiphenyl	138	2,2’,3,4,4’,5’ - Hexachlorobiphenyl	191	2,3,3’,4,4’,5’,6 - Heptachlorobiphenyl
33	2’,3,4 - Trichlorobiphenyl	86	2,2’,3,4,5 - Pentachlorobiphenyl	139	2,2’,3,4,4’,6 - Hexachlorobiphenyl	192	2,3,3’,4,5,5’,6 - Heptachlorobiphenyl
34	2’,3,5 - Trichlorobiphenyl	87	2,2’,3,4,5’ - Pentachlorobiphenyl	140	2,2’,3,4,4’,6’ - Hexachlorobiphenyl	193	2,3,3’,4’,5,5’,6 - Heptachlorobiphenyl
35	3,3’,4 - Trichlorobiphenyl	88	2,2’,3,4,6 - Pentachlorobiphenyl	141	2,2’,3,4,5,5’ - Hexachlorobiphenyl	194	2,2’,3,3’,4,4’,5,5’ - Octachlorobiphenyl
36	3,3’,5 - Trichlorobiphenyl	89	2,2’,3,4,6’ - Pentachlorobiphenyl	142	2,2’,3,4,5,6 - Hexachlorobiphenyl	195	2,2’,3,3’,4,4’,5,6 - Octachlorobiphenyl
37	3,4,4’ - Trichlorobiphenyl	90	2,2’,3,4’,5 - Pentachlorobiphenyl	143	2,2’,3,4,5,6’ - Hexachlorobiphenyl	196	2,2’,3,3’,4,4’,5,6’ - Octachlorobiphenyl
38	3,4,5 - Trichlorobiphenyl	91	2,2’,3,4’,6 - Pentachlorobiphenyl	144	2,2’,3,4,5’,6 - Hexachlorobiphenyl	197	2,2’,3,3’,4,4’,6,6’ - Octachlorobiphenyl
39	3,4’,5 - Trichlorobiphenyl	92	2,2’,3,5,5’ - Pentachlorobiphenyl	145	2,2’,3,4,6,6’ - Hexachlorobiphenyl	198	2,2’,3,3’,4,5,5’,6 - Octachlorobiphenyl
40	2,2’,3,3’ - Tetrachlorobiphenyl	93	2,2’,3,5,6 - Pentachlorobiphenyl	146	2,2’,3,4’,5,5’ - Hexachlorobiphenyl	199	2,2’,3,3’,4,5,5’,6’ - Octachlorobiphenyl
41	2,2’,3,4 - Tetrachlorobiphenyl	94	2,2’,3,5,6’ - Pentachlorobiphenyl	147	2,2’,3,4’,5,6 - Hexachlorobiphenyl	200	2,2’,3,3’,4,5,6,6’ - Octachlorobiphenyl
42	2,2’,3,4’ - Tetrachlorobiphenyl	95	2,2’,3,5’,6 - Pentachlorobiphenyl	148	2,2’,3,4’,5,6’ - Hexachlorobiphenyl	201	2,2’,3,3’,4,5’,6,6’ - Octachlorobiphenyl
43	2,2’,3,5 - Tetrachlorobiphenyl	96	2,2’,3,6,6’ - Pentachlorobiphenyl	149	2,2’,3,4’,5’,6 - Hexachlorobiphenyl	202	2,2’,3,3’,5,5’,6,6’ - Octachlorobiphenyl
44	2,2’,3,5’ - Tetrachlorobiphenyl	97	2,2’,3’,4,5 - Pentachlorobiphenyl	150	2,2’,3,4’,6,6’ - Hexachlorobiphenyl	203	2,2’,3,4,4’,5,5’,6 - Octachlorobiphenyl
45	2,2’,3,6 - Tetrachlorobiphenyl	98	2,2’,3’,4,6 - Pentachlorobiphenyl	151	2,2’,3,5,5’,6 - Hexachlorobiphenyl	204	2,2’,3,4,4’,5,6,6’ - Octachlorobiphenyl
46	2,2’,3,6’ - Tetrachlorobiphenyl	99	2,2’,4,4’,5 - Pentachlorobiphenyl	152	2,2’,3,5,6,6’ - Hexachlorobiphenyl	205	2,3,3’,4,4’,5,5’,6 - Octachlorobiphenyl
47	2,2’,4,4’ - Tetrachlorobiphenyl	100	2,2’,4,4’,6 - Pentachlorobiphenyl	153	2,2’,4,4’,5,5’ - Hexachlorobiphenyl	206	2,2’,3,3’,4,4’,5,5’,6 - Nonachlorobiphenyl
48	2,2’,4,5 - Tetrachlorobiphenyl	101	2,2’,4,5,5’ - Pentachlorobiphenyl	154	2,2’,4,4’,5,6’ - Hexachlorobiphenyl	207	2,2’,3,3’,4,4’,5,6,6’ - Nonachlorobiphenyl
49	2,2’,4,5’ - Tetrachlorobiphenyl	102	2,2’,4,5,6’ - Pentachlorobiphenyl	155	2,2’,4,4’,6,6’ - Hexachlorobiphenyl	208	2,2’,3,3’,4,5,5’,6,6’ - Nonachlorobiphenyl
50	2,2’,4,6 - Tetrachlorobiphenyl	103	2,2’,4,5’,6 - Pentachlorobiphenyl	156	2,3,3’,4,4’,5 - Hexachlorobiphenyl	209	2,2’,3,3’,4,4’,5,5’,6,6’ - Decachlorobiphenyl
51	2,2’,4,6’ - Tetrachlorobiphenyl	104	2,2’,4,6,6’ - Pentachlorobiphenyl	157	2,3,3’,4,4’,5’ - Hexachlorobiphenyl		
52	2,2’,5,5’ - Tetrachlorobiphenyl	105	2,3,3’,4,4’ - Pentachlorobiphenyl	158	2,3,3’,4,4’,6 - Hexachlorobiphenyl		
53	2,2’,5,6’ - Tetrachlorobiphenyl	106	2,3,3’,4,5 - Pentachlorobiphenyl	159	2,3,3’,4,5,5’ - Hexachlorobiphenyl		

Table 7. Polychlorinated biphenyl concentrations measured in bottom-sediment grab samples collected from Mother Brook and the

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram

IUPAC number	Polychlorinated biphenyl congeners							
	DDY-001 (ng/g)	BGY-139 (ng/g)	BGY-140 (ng/g)	BGY-141 (ng/g)	BGY-141-D (ng/g)	BGY-142 (ng/g)	M2Y-013 (ng/g)	M2Y-013-D (ng/g)
PCB-1	<0.0354	0.163	<0.0226	38.5	63.8	62.3	14.2	25.5
PCB-2	<0.0367	<0.0500	<0.0234	<2.67	<3.77	<1.43	<0.185	0.345
PCB-3	0.096	e0.246	e0.058	e6.06	26.8	10.5	4.14	7.19
PCB-4 + 10	0.25	0.823	0.217	204	421	183	45.8	86.1
PCB-5 + 8	e0.419	e1.31	0.28	79.9	236	93.8	34.7	65.3
PCB-6	e0.120	0.371	0.066	e13.7	49.3	23.9	6.96	12.2
PCB-7 + 9	e0.051	e0.132	e0.027	3.57	9.35	6.58	1.22	1.94
PCB-11	e0.166	e0.138	e0.091	16	24	4.19	1.14	2.18
PCB-12 + 13	<0.0239	e0.258	e0.093	17.6	30.7	12.3	3.57	6.57
PCB-14	<0.0239	e0.036	<0.0253	<1.99	<4.36	<0.798	<0.172	<0.0893
PCB-15	1.42	2.83	e0.282	748	1,040	156	31.1	55.6
PCB-16 + 32	1.57	3.28	0.281	2,130	2,730	269	39.4	65.1
PCB-17	0.771	1.89	0.222	346	495	127	28.6	46.8
PCB-18	1.68	2.5	0.281	190	243	69.7	20	31.6
PCB-19	0.206	0.645	0.082	899	1,160	86.6	15.5	26.8
PCB-20 + 21 + 33	e3.89	e3.51	e0.390	100	141	28.8	10.6	17.6
PCB-22	1.67	1.42	0.144	218	307	58.5	11.2	17.7
PCB-23 + 34	<0.0555	<0.0400	<0.0137	11.8	18.2	3.69	0.843	1.6
PCB-24 + 27	0.295	0.985	0.089	637	845	72.8	14.9	25.6
PCB-25	0.415	1.12	0.102	311	477	63.4	16.9	26.5
PCB-26	0.757	1.76	0.187	432	640	86.5	25.3	40.6
PCB-28	4.13	8.98	0.826	2,900	4,060	381	60.2	82
PCB-29	<0.0555	0.045	<0.0137	<2.37	<1.64	<1.13	<0.191	<0.174
PCB-30	<0.0737	<0.0531	<0.0182	<3.14	2.61	<1.50	<0.253	<0.230
PCB-31	3.99	5.02	0.534	477	599	184	52	97.1
PCB-35	e1.51	e1.76	e0.261	13.4	19.6	<3.66	e0.619	1.25
PCB-36	<0.0899	<0.178	<0.0519	e8.19	e10.5	e6.18	<0.359	<0.479
PCB-37	2.59	2.77	0.319	305	416	64.9	13.5	23.1
PCB-38	<0.0945	<0.187	<0.0546	e29.8	e50.3	e7.16	e1.36	2.23
PCB-39	<0.0899	<0.178	<0.0519	4.62	8.48	<3.48	<0.359	<0.479
PCB-40	1.34	1.11	0.149	86.4	86.2	31.8	6.31	9.92
PCB-41 + 64 + 68 + 71	7.98	9	0.907	1,120	1,400	322	58.5	96.7
PCB-42 + 59	2.49	2.61	0.292	325	405	98.7	17.7	28.8
PCB-43 + 49	4.35	5.9	0.827	838	1,160	224	45.7	74.7
PCB-44	5.09	5.48	0.918	443	524	159	30.7	50.6
PCB-45	0.761	0.786	0.082	85.6	83.5	23.7	4.25	6.86
PCB-46	0.347	0.301	0.032	40.7	42.2	11.3	1.95	3.41
PCB-47 + 48 + 75	2.87	4.4	0.462	906	1,290	218	39.6	68.2
PCB-50	<0.0425	<0.0611	<0.0224	8.25	11.6	1.64	0.298	0.525
PCB-51	0.278	0.512	0.048	140	191	38.8	6.25	10.8
PCB-52 + 73	7.91	8.59	1.84	749	1,000	241	49.2	81.7
PCB-53	0.979	1.65	0.187	249	302	59.9	11.8	19.9
PCB-54	<0.0425	<0.0611	<0.0224	14.3	15.4	2.83	0.551	1
PCB-55	<0.0800	<0.0920	<0.0312	10.6	9.08	4.23	0.499	0.984
PCB-56 + 60	5.39	4.21	0.751	492	445	192	25.8	42.5
PCB-57	<0.143	<0.164	<0.0556	25.3	50.9	5.31	1.78	3.29
PCB-58	<0.143	<0.164	<0.0556	<8.34	14.1	<2.77	<0.505	<0.576

Neponset River and Estuary, Massachusetts, in 2005.

per gram; <, actual value is less than value shown; e, estimated; -D, field duplicate; -LD, laboratory duplicate; --, not done]

Polychlorinated biphenyl congeners									
M2Y-014 (ng/g)	BGY-143 (ng/g)	BGY-144 (ng/g)	QYY-001 (ng/g)	QYY-002 (ng/g)	BGY-145 (ng/g)	QYY-003 (ng/g)	QYY-003-LD (ng/g)	Laboratory blank (ng/g)	Matrix spike (percent recovery)
4.37	3.18	5.2	3.74	2.37	3.36	0.443	0.315	<0.0261	92.2
e0.177	0.11	<0.112	0.148	e0.088	0.105	<0.0375	<0.0198	<0.0271	--
2.49	1.56	2.38	1.65	1.41	1.27	0.151	0.154	<0.0271	96.6
16.1	11.1	16.1	13.9	6.98	8.46	1.17	1.02	<0.0655	84.7
27.6	15.5	17.2	20.9	8.8	11	1.82	1.8	<0.0378	93.2
6.65	3.2	3.85	4.59	1.87	2.38	0.303	0.339	<0.0378	--
1.1	0.567	0.664	0.878	0.349	0.462	0.069	0.088	<0.0378	--
1.1	0.773	0.919	1.07	0.637	0.88	0.151	0.161	<0.0378	--
4.2	2.16	2.62	2.93	e1.34	e1.69	e0.207	e0.193	<0.0378	--
<0.140	<0.0405	<0.135	<0.0632	<0.0237	<0.0642	<0.0414	<0.0285	<0.0378	--
29	18.9	20.9	23.3	11.7	13.7	2.31	2.85	<0.0470	101
27.6	15.5	20.8	21.6	8.97	9.91	2.11	2.12	<0.0369	--
21.2	11.7	15.1	16	6.5	7.01	1.42	1.42	<0.0369	--
22.2	10.7	12.7	17.9	5.73	6.69	1.28	1.29	<0.0369	85.2
5.79	3.98	6.15	4.77	2.4	2.65	0.453	0.439	<0.0430	76.8
17.9	9.07	10.5	e38.9	5.38	6.51	1.42	1.47	<0.0290	--
13.9	7.48	8.79	12.1	4.41	5.25	1.14	1.27	<0.0290	--
0.638	0.385	0.409	0.53	0.173	0.238	<0.0434	<0.0419	<0.0278	98.9
7.27	4.75	6.73	6.02	2.99	3.14	0.591	0.561	<0.0369	--
14.7	7.67	10.2	10.2	4.83	5.32	0.983	0.988	<0.0278	--
21.3	10.9	14.7	15.3	6.8	7.73	1.32	1.28	<0.0278	--
68.2	37.5	45.2	54.9	22.7	24.9	6.01	6.57	<0.0255	100
<0.217	e0.063	<0.154	e0.118	<0.0529	<0.0751	<0.0434	<0.0419	<0.0278	--
<0.288	<0.0499	<0.205	<0.0940	<0.0703	<0.0996	<0.0576	<0.0556	<0.0369	--
59.1	32	36.3	46.4	17.7	21.3	4.25	4.19	<0.0278	101
1.19	0.669	0.933	e10.1	0.64	0.941	e0.145	0.162	<0.0305	--
<0.562	<0.0863	<0.392	e0.376	<0.149	<0.213	<0.104	<0.0875	<0.0290	--
18.3	10.7	12.2	16.4	7.25	8.38	1.62	1.99	<0.0305	104
0.968	e0.639	0.692	e0.771	e0.389	e0.427	<0.109	<0.0920	<0.0305	--
<0.562	0.143	<0.392	e0.266	<0.149	<0.213	<0.104	<0.0875	<0.0290	--
7.2	4.68	5.01	6.9	2.74	2.93	0.636	0.662	<0.0320	92.4
57.6	36.2	43.2	50	21.3	24.3	4.73	5.11	<0.0215	--
18.4	11.8	13.1	16.2	6.77	7.74	1.6	1.63	<0.0215	--
39.3	26.4	30.6	34.2	15.7	17.1	3.32	3.32	<0.0220	84.4
32.7	20.6	24.1	29.9	11.7	13.6	2.49	2.63	<0.0215	87.1
4.27	2.83	3.29	4.21	1.53	1.81	0.334	0.324	<0.0196	--
2.01	1.23	1.42	1.76	0.661	0.761	0.139	0.145	<0.0196	--
34.2	22.5	27.3	29.1	13.4	14.9	3.04	3.25	<0.0196	--
<0.188	0.125	<0.193	0.15	0.068	0.07	<0.0407	<0.0559	<0.0158	--
3.83	2.55	3.45	3.34	1.48	1.74	0.324	0.309	<0.0196	--
45.9	28.8	35.8	39.7	17	19.3	3.56	3.64	<0.0196	85.9
8.01	5.35	7.06	7.39	3.04	3.5	0.627	0.629	<0.0196	--
0.263	0.174	0.247	0.206	0.093	0.121	<0.0407	<0.0559	<0.0158	73.5
0.678	0.475	0.439	0.693	0.283	0.341	<0.0653	<0.0956	<0.0179	--
34.9	20.9	23.9	30.9	12.8	14.9	3.22	3.62	<0.0179	100
1.27	0.838	0.998	1.09	0.627	0.616	e0.165	<0.171	<0.0320	--
<0.572	0.271	<0.517	0.254	<0.147	0.239	<0.116	<0.171	<0.0320	--

Table 7. Polychlorinated biphenyl concentrations measured in bottom-sediment grab samples collected from Mother Brook and the

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram

IUPAC number	Polychlorinated biphenyl congeners							
	DDY-001 (ng/g)	BGY-139 (ng/g)	BGY-140 (ng/g)	BGY-141 (ng/g)	BGY-141-D (ng/g)	BGY-142 (ng/g)	M2Y-013 (ng/g)	M2Y-013-D (ng/g)
PCB-61 + 74	3.49	3.64	0.607	682	809	180	24.6	41.3
PCB-62 + 65	<0.0526	<0.0756	<0.0277	<5.69	e3.62	<1.07	<0.227	<0.341
PCB-63	0.274	0.373	0.045	85.8	153	17.5	3.66	6.79
PCB-66 + 80	7.98	7.31	1.31	982	1,110	300	44.2	73.8
PCB-67	0.487	0.411	<0.0556	79.7	93	20.1	2.95	4.69
PCB-69	<0.0526	<0.0756	<0.0277	7.5	11.2	1.24	<0.227	0.442
PCB-70 + 76	8.99	7.96	1.95	909	932	266	40.9	66.5
PCB-72	e0.128	e0.158	<0.0305	22.6	38.9	e4.35	1.68	3.11
PCB-77	e1.79	1.58	e0.444	116	150	34.2	6.37	10.9
PCB-78	<0.150	<0.108	<0.0553	<4.68	<5.73	<1.55	<0.253	<0.501
PCB-79	<0.150	<0.108	<0.0553	<4.68	<5.73	<1.55	<0.253	<0.501
PCB-81	0.36	0.264	0.127	8.27	<5.73	e3.52	0.621	1.31
PCB-82	2.01	1.53	0.718	57.3	42.6	26.9	5.01	8.19
PCB-83 + 108	0.878	0.816	0.3	34	54.9	11.3	2.9	4.83
PCB-84	3.3	2.47	1.21	81	82.7	32.1	8.67	14
PCB-85 + 120	3.18	3.01	1.32	106	85.7	41.7	9.41	16.2
PCB-86 + 97	5.33	4.37	1.9	142	143	62.2	12.5	20.8
PCB-87 + 115 + 116	7.86	6.22	2.93	146	151	75.2	15.8	28.6
PCB-88 + 121	<0.0605	<0.0476	<0.0280	<4.44	<3.55	<1.61	<0.152	<0.268
PCB-89 + 90 + 101	16.5	12.9	6.15	307	344	128	33.4	55.4
PCB-91	2.36	2.02	0.976	100	146	36.6	9.4	15.5
PCB-92	2.82	2.31	1.01	65.6	110	22.8	8.11	13.6
PCB-93 + 95	12.9	9.64	4.99	256	271	95.9	29.5	48.8
PCB-94	0.12	0.123	0.044	9.4	21	3.25	0.721	1.37
PCB-96	0.144	0.133	0.039	10.9	13.9	3.4	0.742	1.46
PCB-98 + 102	0.906	0.86	0.191	38.3	48.7	13	2.84	4.6
PCB-99	6.83	5.78	2.77	215	252	85.2	20.3	34.1
PCB-100	<0.0605	e0.049	<0.0280	5.69	10.7	2.15	0.642	1.1
PCB-103	0.12	0.119	0.047	7.13	11	e2.37	0.799	1.4
PCB-104	<0.0425	<0.0335	<0.0197	<3.12	<2.49	<1.13	<0.107	<0.188
PCB-105 + 127	5.87	4.91	2.64	171	136	85.9	15.3	25.8
PCB-106 + 118	13.2	11	5.29	308	360	131	30.5	52
PCB-107 + 109	e1.09	e0.950	0.443	32.3	50.8	12.8	2.9	5.35
PCB-110	19.3	15.4	8.56	394	464	167	48.5	80.3
PCB-111 + 117	0.324	0.429	0.348	26.9	22.1	6.82	3.08	2.15
PCB-112	<0.0592	<0.0466	<0.0274	5.28	7.39	<1.57	<0.149	0.393
PCB-113	e0.066	<0.0404	e0.034	<3.77	<3.01	<1.36	0.326	0.796
PCB-114	0.324	e0.260	0.143	14.5	13.5	6.01	0.901	1.39
PCB-119	0.395	0.372	0.147	21.3	37.4	e6.87	2.2	3.85
PCB-122	e0.174	<0.110	0.084	5.6	4.86	e2.00	<0.415	0.728
PCB-123	0.569	e0.399	0.247	9.81	9.96	4.35	0.957	1.63
PCB-124	0.798	0.519	0.28	11.7	12.1	5.1	1.24	2.17
PCB-125	<0.123	<0.158	<0.0847	6.02	e7.35	e2.00	<0.597	<0.565
PCB-126	<0.0955	e0.340	e0.095	<3.53	<4.12	<1.09	<0.462	0.567
PCB-128	4.77	3.31	1.84	19.7	20.2	12.9	6.96	11.7
PCB-129	1.25	0.826	0.425	3.4	5.89	3.84	1.24	2.24
PCB-130	1.67	1.01	0.71	7.42	9.23	4.23	2.43	3.7

Neponset River and Estuary, Massachusetts, in 2005.—Continued

per gram; <, actual value is less than value shown; e, estimated; -D, field duplicate; -LD, laboratory duplicate; --, not done]

Polychlorinated biphenyl congeners									
M2Y-014 (ng/g)	BGY-143 (ng/g)	BGY-144 (ng/g)	QYY-001 (ng/g)	QYY-002 (ng/g)	BGY-145 (ng/g)	QYY-003 (ng/g)	QYY-003-LD (ng/g)	Laboratory blank (ng/g)	Matrix spike (percent recovery)
31.1	19.6	22.3	27.2	12.1	13.7	3.2	3.43	<0.0174	--
<0.233	e0.078	<0.239	<0.0633	<0.0588	<0.0800	<0.0504	<0.0692	<0.0196	--
3.4	2.18	2.58	2.95	1.37	1.54	0.335	0.347	<0.0174	--
54.7	36.6	40.1	47.5	22.2	24.9	5.7	6.46	<0.0174	96.7
4.12	2.37	2.71	3.24	1.5	1.64	0.351	0.363	<0.0320	--
<0.233	0.178	<0.239	0.168	0.11	<0.0800	<0.0504	<0.0692	<0.0196	--
51	32.2	36.4	44.9	19.1	22.4	4.75	5.26	<0.0174	--
e1.08	0.917	1.12	e0.998	0.54	0.684	0.182	0.15	<0.0215	--
7.44	4.94	5.77	7.09	3.35	3.99	0.666	1	<0.0174	103
<0.549	<0.147	<0.380	e0.203	<0.105	<0.151	<0.0882	<0.0772	<0.0174	--
<0.549	<0.147	<0.380	<0.109	<0.105	<0.151	<0.0882	<0.0772	<0.0174	--
e1.01	0.551	e0.715	0.743	0.377	0.418	<0.0882	0.09	<0.0174	108
5.83	3.35	4.7	4.7	2.52	2.67	0.492	0.604	<0.0268	--
2.84	1.81	2.34	2.11	1.2	1.34	0.312	0.317	<0.0242	--
8.45	5.38	7.11	6.99	3.68	3.99	0.81	0.894	<0.0210	--
9.65	6.74	8.79	8.76	4.8	5.4	1.25	1.25	<0.0268	--
14.1	8.74	11.3	11.3	6.1	6.68	1.6	1.6	<0.0268	--
16.7	10.8	15.7	14.5	7.61	8.36	1.75	1.96	<0.0268	102
<0.145	0.1	<0.185	0.144	<0.0463	e0.070	<0.0423	<0.0357	<0.0248	--
33.3	21.5	29.3	27.5	15.4	17.1	4.2	4.13	<0.0210	98.9
8.31	5.53	7.49	6.77	3.6	3.95	0.886	0.918	<0.0248	--
6.82	4.45	6.06	5.55	3.2	3.53	0.846	0.804	<0.0210	--
28	18.2	24.7	23.7	12.4	13.8	3.01	3.12	<0.0248	94.6
0.554	0.366	0.496	0.423	0.24	0.257	0.077	0.067	<0.0248	--
0.715	0.441	0.531	0.591	0.269	0.303	0.067	0.069	<0.0248	--
2.71	1.68	2.11	2.03	1.03	1.18	0.251	0.27	<0.0248	--
21.7	13.9	17.9	16.9	9.55	10.6	2.77	2.74	<0.0202	98.4
0.458	0.282	0.446	0.315	0.207	0.216	0.047	0.057	<0.0248	--
0.565	0.367	0.547	0.42	0.255	0.271	0.059	0.074	<0.0248	--
<0.102	<0.0174	<0.130	<0.0190	<0.0325	<0.0469	<0.0297	<0.0251	<0.0174	85.5
18.9	11.3	15.6	15.2	8.52	9.35	2.19	2.52	<0.0197	107
34.1	22.1	29.8	28.1	16.6	18	4.87	4.92	<0.0205	94.4
3.05	2.07	2.76	2.73	1.57	1.81	0.441	e0.457	<0.0189	--
47.7	29.4	40.4	36.5	20.7	22.9	5.29	5.58	<0.0189	102
3.24	0.87	e1.16	1.42	1.05	0.946	0.159	0.202	<0.0268	--
e0.225	0.177	<0.181	0.156	e0.087	0.105	<0.0414	<0.0349	<0.0242	--
e0.198	0.167	e0.257	0.257	0.146	0.114	<0.0359	<0.0303	<0.0210	--
1.03	0.651	0.859	0.948	0.472	0.513	<0.0866	e0.125	<0.0186	102
1.71	1.15	1.6	1.43	0.838	0.933	0.228	0.229	<0.0202	--
e0.624	0.304	e0.444	e0.414	0.21	e0.239	<0.0866	<0.0527	<0.0186	--
1.11	0.75	1.01	0.869	0.619	0.551	0.142	e0.134	<0.0205	87.7
1.15	0.872	1.17	1.13	0.612	0.686	e0.139	0.143	<0.0189	--
<0.443	0.223	<0.277	0.273	<0.178	e0.179	<0.125	<0.0759	<0.0268	--
e0.373	e0.246	<0.214	e0.477	e0.228	0.161	<0.0965	<0.0587	<0.0207	--
6.14	4.3	5.95	5.79	3.74	3.93	0.936	1.1	<0.0154	--
1.13	0.687	1.15	1	0.656	0.709	0.087	0.122	<0.0154	--
2.1	1.48	2.03	1.88	1.29	1.32	0.284	0.341	<0.0154	--

Table 7. Polychlorinated biphenyl concentrations measured in bottom-sediment grab samples collected from Mother Brook and the

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram

IUPAC number	Polychlorinated biphenyl congeners							
	DDY-001 (ng/g)	BGY-139 (ng/g)	BGY-140 (ng/g)	BGY-141 (ng/g)	BGY-141-D (ng/g)	BGY-142 (ng/g)	M2Y-013 (ng/g)	M2Y-013-D (ng/g)
PCB-131 + 142	0.232	0.174	0.105	<2.27	<3.20	e1.35	0.42	0.519
PCB-132 + 168	7.14	4.45	2.66	27.3	29.6	16.4	9.51	15.5
PCB-133	0.237	0.192	0.103	<2.27	<3.20	e1.09	0.524	0.963
PCB-134 + 143	0.987	0.782	0.407	6.91	8.04	3.14	1.7	2.71
PCB-135 + 144	2.83	2.21	1.18	15.4	19.7	8.91	4.39	7.29
PCB-136	2.8	1.96	1.11	15.1	20	7.55	4.17	6.8
PCB-137	1.23	0.854	0.482	5.56	e9.46	4.26	1.76	3.01
PCB-138 + 163 + 164	27.1	19	10	110	138	66.5	36.9	60.7
PCB-139 + 149	14.1	10.3	5.93	71.6	89.6	40.3	21.3	34.2
PCB-140	0.097	0.067	0.041	<2.27	<3.20	<1.07	<0.175	<0.232
PCB-141	4.03	2.83	1.32	14.3	16.2	8.86	3.8	6.06
PCB-145	<0.0670	<0.0363	<0.0215	<2.27	<3.20	<1.07	<0.175	<0.232
PCB-146	2.49	1.88	1.01	13.3	22.2	7.71	4.14	6.98
PCB-147	0.372	0.284	0.175	4.63	11.3	<1.07	1.02	1.95
PCB-148	<0.0670	<0.0363	<0.0215	<2.27	<3.20	<1.07	<0.175	<0.232
PCB-150	<0.0670	<0.0363	<0.0215	<2.27	<3.20	<1.07	<0.175	<0.232
PCB-151	4.29	3.06	1.59	20.6	36.5	12	5.71	9.83
PCB-152	<0.0670	<0.0363	<0.0215	<2.27	<3.20	<1.07	<0.175	<0.232
PCB-153	19.6	14.4	6.75	70.6	95	41.4	25.6	41.4
PCB-154	0.157	0.144	0.073	<2.27	e5.84	<1.07	0.5	1
PCB-155	<0.0458	<0.0248	<0.0147	<1.55	<2.18	<0.729	<0.119	<0.159
PCB-156	2.26	1.76	0.885	12.4	16	6.73	3	5.54
PCB-157	0.762	0.534	0.327	2.87	4.33	2.1	0.991	1.75
PCB-158 + 160	3.22	2.19	1.31	14.5	16.1	9.3	4.5	7.34
PCB-159	0.218	0.189	<0.0472	<1.96	<2.76	<1.48	<0.230	<0.377
PCB-161	<0.0599	<0.0325	<0.0192	<2.03	<2.86	<0.954	<0.156	<0.208
PCB-162	<0.100	<0.0902	<0.0472	<1.96	<2.76	<1.48	<0.230	0.397
PCB-165	<0.0599	<0.0325	<0.0192	<2.03	<2.86	<0.954	<0.156	<0.208
PCB-166	e0.150	<0.0902	<0.0472	<1.96	<2.76	<1.48	<0.230	<0.377
PCB-167	0.896	0.658	0.369	3.94	6.04	2.89	1.41	2.48
PCB-169	<0.0830	<0.0747	<0.0391	<1.62	<2.29	<1.23	<0.190	<0.313
PCB-170 + 190	7.18	5.76	2.43	29.3	42	16	6.48	11.5
PCB-171	1.34	0.963	0.429	3.24	e6.26	3.17	1.33	2.4
PCB-172 + 192	0.835	0.629	0.276	2.78	e3.69	1.66	0.716	1.3
PCB-173	0.107	0.107	<0.0397	<2.58	<3.51	<0.904	<0.146	<0.401
PCB-174 + 181	5.33	4	1.64	18.6	21.1	8.63	3.63	6.13
PCB-175	0.229	0.155	0.065	<2.59	<3.52	<0.906	0.151	<0.402
PCB-176	0.585	0.436	0.188	<1.95	<2.65	0.976	0.638	1.02
PCB-177	2.71	1.91	0.897	9.58	14.9	5.06	2.79	4.58
PCB-178	1.01	0.738	0.34	<2.59	6.81	2.07	0.971	1.6
PCB-179	2.02	1.5	0.665	6.43	10.1	3.21	1.71	2.99
PCB-180	12.4	9.29	3.91	47.2	57.2	23.3	9.96	17.4
PCB-182 + 187	6.51	5.02	2.18	20.8	31.9	11.8	5.8	9.8
PCB-183	3.05	2.27	1.0	10.4	12.1	5.64	2.57	4.4
PCB-184	<0.0399	<0.0420	<0.0299	<1.95	<2.65	<0.681	<0.110	<0.302
PCB-185	0.613	0.489	0.197	<2.62	<3.57	<0.918	0.437	0.556
PCB-186	<0.0530	<0.0558	<0.0398	<2.59	<3.52	<0.906	<0.146	<0.402

Neponset River and Estuary, Massachusetts, in 2005.—Continued

per gram; <, actual value is less than value shown; e, estimated; -D, field duplicate; -LD, laboratory duplicate; --, not done]

Polychlorinated biphenyl congeners									
M2Y-014 (ng/g)	BGY-143 (ng/g)	BGY-144 (ng/g)	QYY-001 (ng/g)	QYY-002 (ng/g)	BGY-145 (ng/g)	QYY-003 (ng/g)	QYY-003-LD (ng/g)	Laboratory blank (ng/g)	Matrix spike (percent recovery)
0.318	0.233	0.344	0.266	0.192	0.182	0.043	e0.034	<0.0209	--
7.62	5.61	7.89	6.8	4.72	4.37	1.05	1.2	<0.0138	--
0.448	0.283	0.408	0.351	0.222	0.253	0.068	0.078	<0.0209	--
1.38	0.901	1.42	1.19	0.762	0.814	0.196	0.208	<0.0209	--
3.97	2.62	3.92	3.27	2.16	2.35	0.609	0.625	<0.0209	--
3.72	2.43	3.65	3.13	1.99	2.17	0.548	0.613	<0.0209	--
1.46	0.964	1.69	1.27	0.802	0.868	0.219	0.203	e0.024	--
33.2	23.1	32.7	30	19.6	21.4	5.3	5.71	<0.0131	93.4
19.3	12.7	18.7	15.6	10.4	11.4	2.95	3.09	<0.0209	105
<0.214	e0.116	<0.211	e0.138	0.11	0.085	e0.034	<0.0260	<0.0209	--
3.14	2.22	3.26	2.94	1.83	1.98	0.377	0.393	<0.0131	--
<0.214	<0.0539	<0.211	<0.0496	<0.0471	<0.0458	<0.0263	<0.0260	<0.0209	--
3.91	2.59	3.73	3.2	2.15	2.35	0.7	0.703	<0.0187	--
0.85	0.559	0.771	0.649	0.46	0.486	0.121	0.12	<0.0209	--
<0.214	<0.0539	<0.211	<0.0496	<0.0471	<0.0458	<0.0263	<0.0260	<0.0209	--
<0.214	<0.0539	<0.211	0.05	<0.0471	<0.0458	<0.0263	<0.0260	<0.0209	--
5.35	3.71	5.39	4.75	3.12	3.37	0.91	0.959	<0.0260	103
<0.214	<0.0539	<0.211	0.052	<0.0471	<0.0458	<0.0263	<0.0260	<0.0209	--
23.5	16.5	22.7	21.7	14.1	15.7	4.07	4.15	<0.0117	90.9
0.382	0.29	0.386	0.323	0.205	0.253	0.069	0.066	<0.0209	--
<0.146	<0.0368	<0.144	<0.0339	<0.0322	<0.0313	<0.0180	<0.0177	<0.0143	94.5
2.94	2.03	3.05	2.66	1.71	1.9	0.445	0.475	<0.0106	95.8
1.04	0.657	0.862	0.837	0.584	0.658	0.171	0.174	<0.0110	101
4.06	2.81	4.03	3.53	2.28	2.49	0.559	0.613	<0.0131	--
<0.280	0.172	<0.319	0.208	0.136	0.172	<0.0426	<0.0470	<0.0131	--
<0.191	<0.0482	<0.189	<0.0444	<0.0421	<0.0410	<0.0235	<0.0232	<0.0187	--
<0.280	<0.0973	<0.319	0.141	<0.0850	<0.104	<0.0426	<0.0470	<0.0131	--
<0.191	<0.0482	<0.189	<0.0444	<0.0421	<0.0410	<0.0235	<0.0232	<0.0187	--
<0.280	<0.0973	<0.319	e0.158	<0.0850	<0.104	<0.0426	<0.0470	<0.0131	--
1.3	0.888	1.19	1.11	0.755	0.867	0.215	0.254	<0.0105	98
<0.232	<0.0807	<0.264	<0.104	<0.0705	e0.129	<0.0353	<0.0389	<0.0109	99.9
6.2	4.59	6.61	5.68	3.97	4.21	0.962	1.1	<0.0191	98.1
1.37	0.93	1.37	1.23	0.894	0.861	0.246	0.279	<0.0160	--
0.685	0.479	0.693	0.624	0.424	0.453	0.113	0.119	<0.0160	--
<0.108	0.06	<0.179	0.054	<0.0428	<0.0433	<0.0497	<0.0280	<0.0160	--
3.37	2.33	3.21	3.06	2.05	2.15	0.43	0.544	<0.0162	--
e0.143	0.134	<0.180	0.198	0.142	0.145	<0.0498	0.046	<0.0160	--
0.527	0.385	0.56	0.545	0.341	0.356	0.096	0.107	<0.0121	--
2.56	2	2.67	2.52	1.82	1.87	0.493	0.565	<0.0162	--
0.911	0.67	0.926	0.866	0.619	0.655	0.167	0.21	<0.0160	--
1.81	1.33	1.76	1.72	1.16	1.23	0.344	0.35	<0.0121	--
9.68	7.08	10.2	9.13	6.34	6.68	1.78	1.79	<0.0160	97.1
6.11	4.62	5.97	5.97	4.22	4.39	1.28	1.34	<0.0160	94
2.6	2.05	2.84	2.72	1.95	1.98	0.567	0.601	<0.0162	101
<0.0815	<0.0234	<0.135	<0.0391	<0.0323	<0.0326	<0.0375	<0.0211	<0.0121	--
0.39	0.252	0.366	0.342	0.234	0.261	<0.0505	0.057	<0.0162	--
<0.108	<0.0311	<0.180	<0.0520	<0.0429	<0.0433	<0.0498	<0.0280	<0.0160	--

Table 7. Polychlorinated biphenyl concentrations measured in bottom-sediment grab samples collected from Mother Brook and the

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram

IUPAC number	DDY-001 (ng/g)	BGY-139 (ng/g)	BGY-140 (ng/g)	BGY-141 (ng/g)	BGY-141-D (ng/g)	BGY-142 (ng/g)	M2Y-013 (ng/g)	M2Y-013-D (ng/g)
Polychlorinated biphenyl congeners								
PCB-188	<0.0399	<0.0420	<0.0299	<1.95	<2.65	<0.681	<0.110	<0.302
PCB-189	0.228	0.227	0.081	<2.19	<2.98	<0.766	0.232	0.588
PCB-191	0.281	0.237	0.085	<2.58	<3.51	<0.904	0.27	<0.401
PCB-193	0.698	0.518	0.237	<2.58	5.79	e1.29	0.617	0.973
PCB-194	3.2	3.11	0.983	e14.1	e20.8	e7.87	e2.48	5.87
PCB-195	1.18	1.06	e0.387	e5.95	<5.46	e3.28	e0.955	2.17
PCB-196 + 203	4.05	3.71	1.38	e16.3	23.1	7.9	2.89	5.88
PCB-197	0.129	0.086	0.039	<3.38	<3.59	<0.810	e0.108	<0.422
PCB-198	0.224	0.249	e0.065	<4.84	<5.13	<1.16	<0.123	<0.604
PCB-199	3.94	3.27	1.32	e12.9	19.8	6.9	2.37	4.95
PCB-200	0.383	e0.332	0.13	<3.38	<3.59	<0.810	e0.218	0.527
PCB-201	0.404	0.348	0.154	<3.38	<3.59	<0.810	e0.271	0.661
PCB-202	0.925	0.845	0.306	<3.87	<4.11	e1.48	e0.561	1.29
PCB-204	<0.0547	<0.0667	<0.0306	<3.38	<3.59	<0.810	<0.0862	<0.422
PCB-205	e0.157	e0.173	e0.056	<3.86	<4.09	<0.924	<0.0983	<0.481
PCB-206	5.47	5.4	1.71	14.8	e14.4	4.5	1.76	3.7
PCB-207	0.726	0.633	0.228	<5.00	<4.70	<2.57	<0.275	<0.607
PCB-208	2.97	2.66	0.97	7.13	<4.70	<2.57	0.813	1.29
PCB-209	6.9	6.5	2	8.35	<11.6	3.2	1.48	2.71
Total	366	321	120	21,700	28,100	5,920	1,330	2,250
Polychlorinated biphenyl homologs								
Total Monochlorobiphenyls	0.096	0.163	<0.0234	38.5	90.5	72.8	18.4	33.1
Total Dichlorobiphenyls	1.67	4.03	0.563	1,070	1,810	479	125	230
Total Trichlorobiphenyls	18.1	30.4	3.07	8,980	12,200	1,500	309	506
Total Tetrachlorobiphenyls	61.4	66.1	10.5	8,430	10,300	2,450	426	709
Total Pentachlorobiphenyls	106	85	42.8	2,590	2,910	1,060	267	447
Total Hexachlorobiphenyls	103	73.1	38.8	440	564	259	142	234
Total Heptachlorobiphenyls	45.1	34.2	14.6	148	202	81.6	38.3	65.2
Total Octachlorobiphenyls	14.4	12.7	4.32	<5.15	42.9	14.8	5.25	21.3
Total Nonachlorobiphenyls	9.16	8.7	2.91	21.9	<5.48	4.5	2.57	4.99
Decachlorobiphenyls	6.9	6.5	2	8.35	<11.6	3.2	1.48	2.71
Polychlorinated biphenyl Aroclors								
Aroclor 1221	<0.0697	<0.0950	<0.0481	<5.07	<8.29	<2.72	<0.352	<0.221
Aroclor 1232	<0.251	<0.181	<0.0796	<10.7	<12.8	<5.09	<0.861	<0.783
Aroclor 1016/1242	37.2	62.7	7.3	13,900	19,500	2,770	634	1,050
Aroclor 1248	<0.427	<0.491	<0.172	<35.2	<24.5	<8.28	<1.51	<2.11
Aroclor 1254	200	164	76	5,030	5,460	2,230	487	835
Aroclor 1260	160	123	52.1	617	791	319	135	236

Neponset River and Estuary, Massachusetts, in 2005.—Continued

per gram; <, actual value is less than value shown; e, estimated; -D, field duplicate; -LD, laboratory duplicate; --, not done]

Polychlorinated biphenyl congeners									
M2Y-014 (ng/g)	BGY-143 (ng/g)	BGY-144 (ng/g)	QYY-001 (ng/g)	QYY-002 (ng/g)	BGY-145 (ng/g)	QYY-003 (ng/g)	QYY-003-LD (ng/g)	Laboratory blank (ng/g)	Matrix spike (percent recovery)
<0.0815	<0.0234	<0.135	<0.0391	<0.0323	<0.0326	<0.0375	<0.0211	<0.0121	88.2
e0.192	0.198	e0.190	0.2	0.167	0.179	<0.0422	e0.085	<0.0136	101
0.267	0.164	<0.179	0.217	0.145	0.175	<0.0497	<0.0280	<0.0160	--
0.681	0.46	0.697	0.573	0.389	0.43	0.127	0.122	<0.0160	--
e2.88	1.95	e2.93	2.45	e1.69	1.86	0.549	0.585	<0.0271	107
0.951	0.683	e0.999	0.817	0.55	0.652	e0.167	0.187	<0.0271	--
3.14	2.18	3.21	2.76	1.88	2.0	0.556	0.581	<0.0255	104
<0.145	0.061	<0.218	0.093	0.069	0.07	<0.0258	<0.0404	<0.0178	--
<0.208	0.103	<0.312	0.12	e0.088	e0.063	<0.0369	<0.0578	<0.0255	--
2.47	1.9	2.55	2.36	1.76	1.8	0.534	0.498	<0.0255	--
0.235	0.15	e0.294	0.203	0.142	e0.136	0.044	<0.0404	<0.0178	--
e0.154	0.255	0.368	0.321	0.261	0.264	0.09	0.088	<0.0178	--
0.703	0.522	0.672	0.65	0.493	0.539	0.194	0.188	<0.0204	99
<0.145	<0.0200	<0.218	<0.0308	<0.0461	<0.0228	<0.0258	<0.0404	<0.0178	--
<0.166	0.107	<0.249	0.129	e0.067	e0.091	<0.0294	<0.0461	<0.0203	103
1.85	1.41	2.22	1.78	1.35	1.29	0.456	0.494	<0.0467	100
<0.394	0.181	<0.288	0.226	0.202	e0.189	0.065	e0.069	<0.0400	--
0.803	0.596	0.855	0.671	0.524	0.539	0.22	0.205	<0.0400	95.8
2.38	1.24	2	1.33	1.09	1.16	0.446	0.51	e0.023	93.8
1,280	806	1,010	1,070	531	596	130	137	<0.0655	--
Polychlorinated biphenyl homologs									
6.86	4.85	7.58	5.54	3.78	4.73	0.594	0.469	<0.0271	--
85.7	52.2	62.2	67.6	30.3	36.9	5.82	6.26	<0.0655	--
300	163	201	222	96.5	110	22.6	23.7	<0.0430	--
442	285	331	390	170	193	39.2	42.4	<0.0320	--
273	173	233	222	123	136	31.7	32.5	<0.0268	--
127	87.7	125	113	74	80	19.9	21.2	<0.0260	--
37.2	27.7	37.8	35.7	24.9	26	6.6	7.23	<0.0191	--
7.5	7.92	6.8	9.91	5.16	7.18	1.97	2.13	<0.0271	--
2.66	2.18	3.07	2.68	2.08	1.83	0.74	0.698	<0.0467	--
2.38	1.24	2	1.33	1.09	1.16	0.446	0.51	<0.0184	--
Polychlorinated biphenyl Aroclors									
<0.265	<0.0770	<0.256	<0.120	<0.0979	<0.122	<0.0787	<0.0542	<0.0718	--
<0.980	<0.170	<0.696	<0.320	<0.239	<0.339	<0.196	<0.189	<0.125	--
673	364	423	532	209	243	50.7	52.6	<0.144	--
<1.71	<0.786	<1.55	<0.660	<0.438	<0.710	<0.348	<0.510	<0.121	--
526	334	449	427	233	256	61.2	63.1	<0.268	--
131	97.5	139	124	87	91.4	23.5	24.8	<0.136	--

Table 10. Concentrations of dissolved polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006.

[IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng/L, nanogram per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners									
	May 2005 A (ng/L)	May 2005 B (ng/L)	June 2005 (ng/L)	July 2005 (ng/L)	August 2005 (ng/L)	September 2005 (ng/L)	December 2005 (ng/L)	January 2006 (ng/L)	February 2006 (ng/L)	March–April 2006 (ng/L)
PCB-1	0.033	<0.026	0.046	0.056	0.205	e0.163	e0.048	<0.011	e0.068	<0.137
PCB-2	<0.021	<0.026	<0.034	<0.051	<0.028	<0.051	<0.019	<0.011	<0.058	<0.135
PCB-3	<0.021	<0.026	<0.034	<0.051	<0.028	<0.051	<0.019	<0.011	<0.058	<0.135
PCB-4 + 10	5.03	<0.071	5.35	5.10	8.36	8.0	0.200	0.264	0.485	0.820
PCB-5 + 8	0.138	<0.041	0.092	<0.052	0.153	0.141	<0.041	<0.019	<0.042	<0.072
PCB-6	<0.033	<0.041	<0.054	<0.052	0.044	<0.038	<0.041	<0.019	<0.042	<0.072
PCB-7 + 9	<0.033	<0.041	<0.054	<0.052	<0.034	e0.205	<0.041	e0.020	<0.042	<0.072
PCB-11	<0.033	<0.041	<0.054	<0.052	<0.034	e0.093	<0.041	<0.019	<0.042	<0.072
PCB-12 + 13	<0.033	<0.041	<0.054	<0.052	<0.034	<0.038	<0.041	<0.019	<0.042	<0.072
PCB-14	<0.033	<0.041	<0.054	<0.052	<0.034	<0.038	<0.041	<0.019	<0.042	<0.072
PCB-15	<0.041	<0.051	<0.068	<0.065	<0.043	<0.042	<0.045	<0.020	<0.046	<0.078
PCB-16 + 32	0.546	<0.030	0.525	0.572	0.696	0.84	0.077	0.111	0.107	0.150
PCB-17	0.390	<0.030	0.363	0.344	0.469	0.527	<0.044	0.035	0.083	<0.091
PCB-18	0.265	<0.030	0.293	0.290	0.462	0.468	<0.044	0.049	0.085	<0.091
PCB-19	1.14	<0.035	1.24	1.22	1.91	1.45	0.145	0.174	0.123	0.417
PCB-20 + 21 + 33	<0.048	<0.033	<0.043	<0.053	<0.040	e0.020	<0.047	<0.015	<0.038	<0.102
PCB-22	<0.048	<0.033	<0.043	<0.053	<0.040	0.040	<0.047	<0.015	<0.038	<0.102
PCB-23 + 34	<0.025	<0.023	<0.028	<0.017	<0.017	<0.019	<0.027	<0.015	<0.030	<0.056
PCB-24 + 27	0.430	<0.030	0.445	0.460	0.584	0.621	0.046	0.071	<0.048	0.113
PCB-25	0.062	<0.023	0.082	0.049	0.069	0.078	<0.027	<0.015	<0.030	<0.056
PCB-26	0.130	<0.023	0.143	0.129	0.134	0.193	<0.027	0.016	<0.030	<0.056
PCB-28	0.101	<0.021	0.113	0.089	0.089	0.130	0.037	0.035	0.052	0.133
PCB-29	<0.025	<0.023	<0.028	<0.017	<0.017	<0.019	<0.027	<0.015	<0.030	<0.056
PCB-30	<0.033	<0.030	<0.037	<0.023	<0.023	<0.030	<0.044	<0.024	<0.048	<0.091
PCB-31	0.192	<0.023	0.170	0.122	0.193	0.210	<0.027	0.024	0.047	0.069
PCB-35	<0.050	<0.035	<0.045	<0.056	<0.042	<0.012	<0.051	<0.016	<0.042	<0.112
PCB-36	<0.048	<0.033	<0.043	<0.053	<0.040	<0.011	<0.047	<0.015	<0.038	<0.102
PCB-37	<0.050	<0.035	<0.045	<0.056	<0.042	0.023	<0.051	<0.016	<0.042	<0.112
PCB-38	<0.050	<0.035	<0.045	<0.056	<0.042	<0.012	<0.051	<0.016	e0.189	<0.112
PCB-39	<0.048	<0.033	<0.043	<0.053	<0.040	<0.011	<0.047	<0.015	<0.038	<0.102
PCB-40	<0.048	<0.024	<0.103	<0.061	<0.053	0.042	<0.076	<0.030	<0.105	<0.189
PCB-41 + 64 + 68 + 71	0.590	<0.016	0.490	0.393	0.301	0.335	0.089	0.102	0.774	0.207
PCB-42 + 59	0.066	<0.016	0.076	0.091	0.094	e0.013	<0.025	<0.020	<0.032	<0.083
PCB-43 + 49	0.230	<0.016	0.206	0.220	0.231	0.244	0.033	0.051	0.129	<0.080
PCB-44	0.122	<0.016	0.156	0.174	0.203	0.210	0.037	0.057	0.065	<0.083
PCB-45	0.038	<0.014	0.052	0.045	0.072	0.059	<0.022	<0.017	<0.029	<0.074
PCB-46	0.022	<0.014	0.033	e0.039	e0.040	0.032	<0.022	<0.017	<0.029	<0.074
PCB-47 + 48 + 75	1.14	0.046	1.30	0.819	0.637	0.401	0.318	0.234	6.00	0.301
PCB-50	<0.012	<0.011	<0.023	<0.023	<0.022	<0.008	<0.018	<0.015	<0.024	<0.062
PCB-51	0.512	<0.014	0.478	0.277	0.241	0.144	0.070	0.048	0.371	0.092
PCB-52 + 73	0.251	<0.014	0.318	0.323	0.349	0.380	0.071	0.095	0.084	0.146
PCB-53	0.169	<0.014	0.229	0.210	0.250	0.205	0.028	0.052	0.030	<0.074
PCB-54	e0.023	<0.011	<0.023	0.024	e0.026	0.020	<0.018	<0.015	<0.024	<0.062
PCB-55	<0.027	<0.013	<0.058	<0.034	<0.029	<0.012	<0.041	<0.016	<0.057	<0.104
PCB-56 + 60	<0.027	<0.013	<0.058	<0.034	<0.029	0.035	<0.041	<0.016	<0.057	<0.104
PCB-57	<0.048	<0.024	<0.103	<0.061	<0.053	<0.024	<0.076	<0.030	<0.105	<0.189
PCB-58	<0.048	<0.024	<0.103	<0.061	<0.053	<0.024	<0.076	<0.030	<0.105	<0.189

Table 10. Concentrations of dissolved polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (01105566), Milton, Massachusetts, 2005–2006.—Continued

[IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng/L, nanogram per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners									
	May 2005 A (ng/L)	May 2005 B (ng/L)	June 2005 (ng/L)	July 2005 (ng/L)	August 2005 (ng/L)	September 2005 (ng/L)	December 2005 (ng/L)	January 2006 (ng/L)	February 2006 (ng/L)	March–April 2006 (ng/L)
PCB-61 + 74	<0.026	<0.013	<0.056	<0.033	<0.029	e0.029	<0.039	<0.015	<0.054	<0.098
PCB-62 + 65	<0.015	<0.014	<0.029	<0.029	<0.027	<0.009	<0.022	<0.017	<0.029	<0.074
PCB-63	<0.026	<0.013	<0.056	<0.033	<0.029	<0.012	<0.039	<0.015	<0.054	<0.098
PCB-66 + 80	0.046	<0.013	<0.056	0.048	0.051	0.046	<0.039	<0.015	<0.054	<0.098
PCB-67	<0.048	<0.024	<0.103	<0.061	<0.053	<0.024	<0.076	<0.030	<0.105	<0.189
PCB-69	<0.015	<0.014	<0.029	<0.029	<0.027	<0.009	<0.022	<0.017	<0.029	<0.074
PCB-70 + 76	0.041	<0.013	<0.056	0.038	0.037	0.047	<0.039	0.016	<0.054	<0.098
PCB-72	<0.016	<0.016	<0.032	<0.032	<0.030	<0.011	<0.025	<0.020	<0.032	<0.083
PCB-77	<0.048	<0.024	<0.048	<0.052	<0.047	<0.012	<0.035	<0.019	<0.054	<0.112
PCB-78	<0.048	<0.024	<0.048	<0.052	<0.047	<0.012	<0.035	<0.019	<0.054	<0.112
PCB-79	<0.048	<0.024	<0.048	<0.052	<0.047	<0.012	<0.035	<0.019	<0.054	<0.112
PCB-81	<0.048	<0.024	<0.048	<0.052	<0.047	<0.012	<0.035	<0.019	<0.054	<0.112
PCB-82	<0.039	<0.034	<0.049	<0.052	<0.028	<0.021	<0.045	<0.031	<0.068	<0.117
PCB-83 + 108	<0.034	<0.032	<0.033	<0.038	<0.031	<0.015	<0.025	<0.020	<0.037	<0.066
PCB-84	0.032	<0.028	0.054	0.047	0.045	0.049	<0.021	<0.017	<0.032	<0.056
PCB-85 + 120	<0.039	<0.034	<0.049	<0.052	<0.028	<0.021	<0.045	<0.031	<0.068	<0.117
PCB-86 + 97	<0.039	<0.034	<0.049	<0.052	<0.028	<0.021	<0.045	<0.031	<0.068	<0.117
PCB-87 + 115 + 116	<0.039	<0.034	<0.049	<0.052	<0.028	0.034	<0.045	<0.031	<0.068	<0.117
PCB-88 + 121	<0.034	<0.033	<0.034	<0.039	<0.032	<0.015	<0.026	<0.021	<0.039	<0.068
PCB-89 + 90 + 101	0.078	<0.028	0.077	0.084	0.059	0.074	<0.021	0.034	<0.032	<0.056
PCB-91	0.049	<0.033	e0.039	<0.039	0.037	e0.039	<0.026	<0.021	<0.039	<0.068
PCB-92	<0.029	<0.028	<0.029	<0.033	<0.027	0.024	<0.021	<0.017	<0.032	<0.056
PCB-93 + 95	0.106	<0.033	0.146	0.166	0.134	0.162	0.042	0.057	0.054	0.127
PCB-94	<0.034	<0.033	<0.034	<0.039	<0.032	<0.015	<0.026	<0.021	<0.039	<0.068
PCB-96	<0.034	<0.033	<0.034	<0.039	<0.032	<0.015	<0.026	<0.021	<0.039	<0.068
PCB-98 + 102	<0.034	<0.033	<0.034	<0.039	<0.032	<0.015	<0.026	<0.021	<0.039	<0.068
PCB-99	0.034	<0.027	<0.028	<0.032	0.029	0.033	<0.021	<0.016	<0.031	<0.055
PCB-100	<0.034	<0.033	<0.034	<0.039	<0.032	<0.015	<0.026	<0.021	<0.039	<0.068
PCB-103	<0.034	<0.033	<0.034	<0.039	<0.032	0.016	<0.026	<0.021	<0.039	<0.068
PCB-104	<0.024	<0.023	<0.024	<0.027	<0.022	<0.011	<0.018	<0.014	<0.027	<0.048
PCB-105 + 127	<0.029	<0.025	<0.036	<0.038	<0.020	<0.015	<0.032	<0.022	<0.048	<0.083
PCB-106 + 118	<0.026	<0.022	<0.033	<0.032	0.032	0.029	<0.032	<0.022	<0.048	<0.083
PCB-107 + 109	<0.027	<0.024	<0.034	<0.037	<0.019	<0.015	<0.031	<0.022	<0.047	<0.082
PCB-110	0.106	<0.024	0.112	0.124	0.111	0.112	<0.031	0.045	<0.047	<0.082
PCB-111 + 117	<0.039	<0.034	<0.049	<0.052	<0.028	<0.021	<0.045	<0.031	<0.068	<0.117
PCB-112	<0.034	<0.032	<0.033	<0.038	<0.031	<0.015	<0.025	<0.020	<0.037	<0.066
PCB-113	<0.029	<0.028	<0.029	<0.033	<0.027	<0.012	<0.021	<0.017	<0.032	<0.056
PCB-114	<0.027	<0.024	<0.034	<0.036	<0.019	<0.015	<0.031	<0.021	<0.047	<0.081
PCB-119	<0.028	<0.027	<0.028	<0.032	<0.026	<0.012	<0.021	<0.016	<0.031	<0.055
PCB-122	<0.027	<0.024	<0.034	<0.036	<0.019	<0.015	<0.031	<0.021	<0.047	<0.081
PCB-123	<0.026	<0.022	<0.033	<0.032	<0.019	<0.015	<0.032	<0.022	<0.048	<0.083
PCB-124	<0.027	<0.024	<0.034	<0.037	<0.019	<0.015	<0.031	<0.022	<0.047	<0.082
PCB-125	<0.039	<0.034	<0.049	<0.052	<0.028	<0.021	<0.045	<0.031	<0.068	<0.117
PCB-126	<0.030	<0.026	<0.038	<0.040	<0.021	<0.015	<0.032	<0.022	<0.049	<0.084
PCB-128	<0.020	<0.019	<0.039	<0.033	<0.033	<0.022	<0.034	<0.021	<0.043	<0.083
PCB-129	<0.020	<0.019	<0.039	<0.033	<0.033	<0.022	<0.034	<0.021	<0.043	<0.083
PCB-130	<0.020	<0.019	<0.039	<0.033	<0.033	<0.022	<0.034	<0.021	<0.043	<0.083

Table 10. Concentrations of dissolved polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (01105566), Milton, Massachusetts, 2005–2006.—Continued

[IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng/L, nanogram per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners									
	May 2005 A (ng/L)	May 2005 B (ng/L)	June 2005 (ng/L)	July 2005 (ng/L)	August 2005 (ng/L)	September 2005 (ng/L)	December 2005 (ng/L)	January 2006 (ng/L)	February 2006 (ng/L)	March–April 2006 (ng/L)
PCB-131 + 142	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-132 + 168	0.028	<0.017	<0.035	0.032	0.031	e0.022	<0.031	<0.020	<0.039	<0.076
PCB-133	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-134 + 143	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-135 + 144	e0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-136	0.017	<0.015	<0.023	<0.027	0.019	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-137	<0.017	<0.016	<0.033	<0.028	<0.028	<0.018	<0.029	<0.018	e0.433	<0.071
PCB-138 + 163 + 164	0.052	<0.016	0.050	0.065	0.058	0.054	<0.029	0.023	<0.036	<0.071
PCB-139 + 149	0.047	<0.015	0.060	0.064	0.048	0.055	<0.026	0.023	<0.036	<0.050
PCB-140	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-141	<0.017	<0.016	<0.033	<0.028	<0.028	<0.018	<0.029	<0.018	<0.036	<0.071
PCB-145	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-146	<0.009	<0.014	<0.021	<0.024	<0.015	<0.031	<0.023	<0.015	<0.033	<0.046
PCB-147	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-148	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-150	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-151	<0.013	<0.019	<0.029	<0.033	<0.021	<0.043	<0.032	<0.021	<0.045	<0.063
PCB-152	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-153	0.028	<0.014	<0.029	0.038	0.035	0.032	<0.026	<0.017	<0.033	<0.065
PCB-154	<0.010	<0.015	<0.023	<0.027	<0.017	<0.034	<0.026	<0.017	<0.036	<0.050
PCB-155	<0.007	<0.010	<0.016	<0.018	<0.011	<0.024	<0.018	<0.012	<0.026	<0.036
PCB-156	<0.014	<0.013	<0.026	<0.023	<0.022	<0.014	<0.022	<0.014	<0.028	<0.055
PCB-157	<0.014	<0.013	<0.027	<0.024	<0.023	<0.014	<0.023	<0.014	<0.028	<0.056
PCB-158 + 160	<0.017	<0.016	<0.033	<0.028	<0.028	<0.018	<0.029	<0.018	<0.036	<0.071
PCB-159	<0.017	<0.016	<0.033	<0.028	<0.028	<0.018	<0.029	<0.018	<0.036	<0.071
PCB-161	<0.009	<0.014	<0.021	<0.024	<0.015	<0.031	<0.023	<0.015	<0.033	<0.046
PCB-162	<0.017	<0.016	<0.033	<0.028	<0.028	<0.018	<0.029	<0.018	<0.036	<0.071
PCB-165	<0.009	<0.014	<0.021	<0.024	<0.015	<0.031	<0.023	<0.015	<0.033	<0.046
PCB-166	<0.017	<0.016	<0.033	<0.028	<0.028	<0.018	<0.029	<0.018	<0.036	<0.071
PCB-167	<0.014	<0.013	<0.026	<0.022	<0.022	<0.014	<0.022	<0.014	<0.028	<0.054
PCB-169	<0.014	<0.013	<0.027	<0.023	<0.023	<0.014	<0.022	<0.014	<0.028	<0.055
PCB-170 + 190	<0.014	<0.025	<0.044	<0.037	<0.023	<0.016	<0.037	<0.014	<0.045	<0.064
PCB-171	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.031	<0.012	<0.037	<0.053
PCB-172 + 192	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.031	<0.012	<0.037	<0.053
PCB-173	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.031	<0.012	<0.037	<0.053
PCB-174 + 181	<0.011	<0.022	<0.037	<0.032	<0.019	<0.013	<0.032	<0.012	<0.038	<0.054
PCB-175	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.032	<0.012	<0.038	<0.054
PCB-176	<0.008	<0.016	<0.027	<0.023	<0.014	<0.010	<0.024	<0.009	<0.029	<0.042
PCB-177	<0.011	<0.022	<0.037	<0.032	<0.019	<0.013	<0.032	<0.012	<0.038	<0.054
PCB-178	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.032	<0.012	<0.038	<0.054
PCB-179	<0.008	<0.016	<0.027	<0.023	<0.014	<0.010	<0.024	<0.009	<0.029	<0.042
PCB-180	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.031	<0.012	<0.037	<0.053
PCB-182 + 187	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.032	<0.012	<0.038	<0.054
PCB-183	<0.011	<0.022	<0.037	<0.032	<0.019	<0.013	<0.032	<0.012	<0.038	<0.054
PCB-184	<0.008	<0.016	<0.027	<0.023	<0.014	<0.010	<0.024	<0.009	<0.029	<0.042
PCB-185	<0.011	<0.022	<0.037	<0.032	<0.019	<0.013	<0.032	<0.012	<0.038	<0.054
PCB-186	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.032	<0.012	<0.038	<0.054

Table 10. Concentrations of dissolved polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (01105566), Milton, Massachusetts, 2005–2006.—Continued

[IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng/L, nanogram per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	May 2005 A (ng/L)	May 2005 B (ng/L)	June 2005 (ng/L)	July 2005 (ng/L)	August 2005 (ng/L)	September 2005 (ng/L)	December 2005 (ng/L)	January 2006 (ng/L)	February 2006 (ng/L)	March–April 2006 (ng/L)
	Polychlorinated biphenyl congeners									
PCB-188	<0.008	<0.016	<0.027	<0.023	<0.014	<0.010	<0.024	<0.009	<0.029	<0.042
PCB-189	<0.009	<0.018	<0.031	<0.026	<0.016	<0.011	<0.026	<0.010	<0.031	<0.044
PCB-191	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.031	<0.012	<0.037	<0.053
PCB-193	<0.011	<0.021	<0.037	<0.031	<0.019	<0.013	<0.031	<0.012	<0.037	<0.053
PCB-194	<0.035	<0.033	<0.061	<0.045	<0.054	<0.034	<0.046	<0.030	<0.060	<0.112
PCB-195	<0.035	<0.033	<0.061	<0.045	<0.054	<0.034	<0.046	<0.030	<0.060	<0.112
PCB-196 + 203	<0.032	<0.031	<0.057	<0.043	<0.051	<0.033	<0.046	<0.030	<0.059	<0.111
PCB-197	<0.023	<0.022	<0.040	<0.030	<0.036	<0.024	<0.033	<0.021	<0.042	<0.079
PCB-198	<0.032	<0.031	<0.057	<0.043	<0.051	<0.033	<0.046	<0.030	<0.059	<0.111
PCB-199	<0.032	<0.031	<0.057	<0.043	<0.051	<0.033	<0.046	<0.030	<0.059	<0.111
PCB-200	<0.023	<0.022	<0.040	<0.030	<0.036	<0.024	<0.033	<0.021	<0.042	<0.079
PCB-201	<0.023	<0.022	<0.040	<0.030	<0.036	<0.024	<0.033	<0.021	<0.042	<0.079
PCB-202	<0.026	<0.025	<0.045	<0.034	<0.041	<0.027	<0.037	<0.024	<0.048	<0.089
PCB-204	<0.023	<0.022	<0.040	<0.030	<0.036	<0.024	<0.033	<0.021	<0.042	<0.079
PCB-205	<0.026	<0.025	<0.045	<0.034	<0.041	<0.025	<0.035	<0.023	<0.046	<0.085
PCB-206	<0.049	<0.060	<0.085	<0.085	<0.049	<0.041	<0.046	<0.036	<0.107	<0.196
PCB-207	<0.042	<0.052	<0.073	<0.073	<0.042	<0.037	<0.040	<0.032	<0.094	<0.173
PCB-208	<0.042	<0.052	<0.073	<0.073	<0.042	<0.037	<0.040	<0.032	<0.094	<0.173
PCB-209	<0.014	<0.017	<0.027	<0.035	<0.025	<0.016	<0.018	<0.022	<0.041	<0.170
Total	12.3	0.046	12.7	11.7	16.5	15.6	1.19	1.61	8.49	2.57
	Polychlorinated biphenyl homologs									
Total Monochlorobiphenyls	0.033	<0.026	0.046	0.056	0.205	<0.051	--	--	--	--
Total Dichlorobiphenyls	5.17	<0.071	5.44	5.10	8.56	8.1	0.200	0.264	0.485	0.820
Total Trichlorobiphenyls	3.25	<0.035	3.38	3.28	4.61	4.58	0.305	0.514	0.497	0.883
Total Tetrachlorobiphenyls	3.22	0.046	3.34	2.66	2.46	2.20	0.646	0.657	7.46	0.746
Total Pentachlorobiphenyls	0.407	<0.034	0.388	0.421	0.446	0.533	0.042	0.135	0.054	0.127
Total Hexachlorobiphenyls	0.171	<0.019	0.111	0.198	0.191	0.141	--	0.046	--	--
Total Heptachlorobiphenyls	<0.014	<0.025	<0.044	<0.037	<0.023	<0.016	--	--	--	--
Total Octachlorobiphenyls	<0.035	<0.033	<0.061	<0.045	<0.054	<0.034	--	--	--	--
Total Nonachlorobiphenyls	<0.049	<0.060	<0.085	<0.085	<0.049	<0.041	--	--	--	--
Decachlorobiphenyls	<0.014	<0.017	<0.027	<0.035	<0.025	<0.016	--	--	--	--
	Polychlorinated biphenyl Aroclors									
Aroclor 1221	<0.062	<0.077	<0.104	<0.100	<0.066	<0.098	<0.079	<0.036	<0.112	<0.260
Aroclor 1232	<0.113	<0.104	<0.128	<0.175	<0.097	<0.175	<0.151	<0.083	<0.200	<0.467
Aroclor 1016/1242	2.65	<0.155	2.54	1.91	3.41	3.60	<0.168	0.410	0.699	0.769
Aroclor 1248	<0.144	<0.091	<0.310	<0.185	<0.170	<0.068	<0.216	<0.110	<0.298	<0.539
Aroclor 1254	<0.396	<0.346	<0.496	<0.528	0.294	0.670	<0.455	<0.316	<0.683	<1.178
Aroclor 1260	<0.099	<0.184	<0.313	<0.269	<0.163	<0.116	<0.268	<0.102	<0.319	<0.455

Table 11. Concentrations of particulate polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006.

[IUPAC, International Union of Pure and Applied Chemistry; ng/L, nanograms per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners								
	May 2005 (ng/L)	June 2005 (ng/L)	July 2005 (ng/L)	August 2005 (ng/L)	September 2005 (ng/L)	December 2005 (ng/L)	January 2006 (ng/L)	February 2006 (ng/L)	March–April 2006 (ng/L)
PCB-1	0.288	0.217	0.266	0.293	e0.042	<0.039	<0.014	<0.036	e0.204
PCB-2	<0.024	<0.014	<0.047	<0.038	e0.176	<0.039	<0.014	<0.035	<0.068
PCB-3	0.159	0.120	0.188	0.122	e0.030	<0.039	0.043	e0.042	<0.068
PCB-4 + 10	0.946	0.656	0.834	1.90	1.18	<0.053	0.122	0.094	<0.213
PCB-5 + 8	0.460	0.381	0.528	0.482	0.551	0.049	0.096	0.079	0.132
PCB-6	0.081	0.076	0.113	0.108	0.122	<0.030	<0.009	<0.034	<0.121
PCB-7 + 9	<0.014	<0.024	<0.034	<0.039	e0.032	<0.030	<0.009	<0.034	<0.121
PCB-11	e0.201	0.031	0.110	e0.060	e0.125	e0.086	<0.009	e0.094	<0.121
PCB-12 + 13	e0.039	e0.042	e0.070	e0.071	e0.25	<0.030	<0.009	<0.034	<0.121
PCB-14	<0.014	<0.024	<0.034	<0.039	<0.011	<0.030	<0.009	<0.034	<0.121
PCB-15	0.624	0.519	0.640	0.647	0.554	e0.111	0.175	0.183	0.158
PCB-16 + 32	0.350	0.275	0.436	0.580	0.546	0.087	0.089	0.101	<0.217
PCB-17	0.264	0.219	0.260	0.398	0.368	<0.052	0.055	<0.090	<0.217
PCB-18	0.159	0.127	0.182	0.337	<0.026	<0.052	0.051	<0.090	<0.217
PCB-19	0.267	0.201	0.291	0.494	0.322	<0.061	0.047	<0.106	<0.253
PCB-20 + 21 + 33	0.055	<0.034	0.060	0.068	0.043	<0.047	0.027	<0.062	<0.111
PCB-22	0.055	0.050	0.068	0.099	0.083	<0.047	0.026	<0.062	<0.111
PCB-23 + 34	<0.015	<0.014	<0.020	<0.036	<0.016	<0.032	<0.008	<0.055	<0.133
PCB-24 + 27	0.220	0.169	0.245	0.353	0.248	<0.052	0.040	<0.090	<0.217
PCB-25	0.149	0.119	0.155	0.217	0.168	<0.032	0.027	<0.055	<0.133
PCB-26	0.210	0.197	0.282	0.368	0.282	<0.032	0.048	<0.055	<0.133
PCB-28	0.302	0.243	0.362	0.424	0.432	0.088	0.132	0.127	<0.156
PCB-29	<0.015	<0.014	<0.020	<0.036	<0.016	<0.032	<0.008	<0.055	<0.133
PCB-30	<0.020	<0.019	<0.027	<0.048	<0.026	<0.052	<0.014	<0.090	<0.217
PCB-31	0.350	0.360	0.393	0.550	0.444	e0.055	0.079	0.075	<0.133
PCB-35	<0.028	<0.036	<0.042	<0.058	0.031	<0.051	<0.012	<0.068	<0.121
PCB-36	<0.027	<0.034	<0.040	<0.055	<0.026	<0.047	<0.011	<0.062	<0.111
PCB-37	0.108	0.080	0.102	0.100	e0.118	<0.051	0.041	<0.068	<0.121
PCB-38	e0.053	e0.045	<0.042	<0.058	e0.104	<0.051	<0.012	<0.068	<0.121
PCB-39	<0.027	<0.034	<0.040	<0.055	<0.026	<0.047	<0.011	<0.062	<0.111
PCB-40	<0.064	<0.069	<0.106	<0.112	e0.072	<0.116	<0.044	<0.136	<0.210
PCB-41 + 64 + 68 + 71	0.511	0.473	0.734	0.798	1.00	0.152	0.177	<0.072	<0.135
PCB-42 + 59	0.117	0.115	0.178	0.207	0.219	<0.052	<0.020	<0.072	<0.135
PCB-43 + 49	0.359	0.297	0.491	0.563	0.582	0.075	0.126	0.112	<0.130
PCB-44	0.196	0.184	0.313	0.425	0.371	<0.052	0.097	<0.072	<0.135
PCB-45	0.035	0.030	0.049	0.078	0.046	<0.046	<0.018	<0.064	<0.120
PCB-46	0.020	<0.021	0.039	0.040	0.031	<0.046	<0.018	<0.064	<0.120
PCB-47 + 48 + 75	1.01	1.05	2.05	1.34	3.68	0.272	0.217	0.954	<0.120
PCB-50	<0.015	<0.017	<0.016	<0.023	<0.018	<0.039	<0.015	<0.053	<0.101
PCB-51	0.146	0.140	0.265	0.160	0.421	<0.046	0.032	<0.064	<0.120
PCB-52 + 73	0.409	0.357	0.540	0.707	0.644	0.068	0.154	0.112	<0.120
PCB-53	0.137	0.116	0.169	0.243	0.199	<0.046	0.035	<0.064	<0.120
PCB-54	<0.015	<0.017	<0.016	<0.023	<0.018	<0.039	<0.015	<0.053	<0.101
PCB-55	<0.036	<0.038	<0.059	<0.063	<0.017	<0.063	<0.024	<0.074	<0.115
PCB-56 + 60	0.102	0.085	0.121	0.147	0.147	<0.063	0.057	<0.074	<0.115
PCB-57	<0.064	<0.069	<0.106	<0.112	<0.032	<0.116	<0.044	<0.136	<0.210
PCB-58	<0.064	<0.069	<0.106	<0.112	<0.032	<0.116	<0.044	<0.136	<0.210
PCB-61 + 74	0.104	0.087	0.129	0.149	0.160	<0.060	0.043	<0.070	<0.108

Table 11. Concentrations of particulate polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006.—Continued

[IUPAC, International Union of Pure and Applied Chemistry; ng/L, nanograms per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners								
	May 2005 (ng/L)	June 2005 (ng/L)	July 2005 (ng/L)	August 2005 (ng/L)	September 2005 (ng/L)	December 2005 (ng/L)	January 2006 (ng/L)	February 2006 (ng/L)	March–April 2006 (ng/L)
PCB-62 + 65	<0.018	<0.021	<0.020	<0.029	<0.021	<0.046	<0.018	<0.064	<0.120
PCB-63	e0.057	e0.061	e0.092	<0.061	e0.062	<0.060	<0.022	<0.070	<0.108
PCB-66 + 80	0.206	0.185	0.254	0.299	0.300	<0.060	0.091	0.077	<0.108
PCB-67	<0.064	<0.069	<0.106	<0.112	<0.032	<0.116	<0.044	<0.136	<0.210
PCB-69	<0.018	<0.021	<0.020	<0.029	<0.021	<0.046	<0.018	<0.064	<0.120
PCB-70 + 76	0.193	0.152	0.258	0.258	0.287	<0.060	0.093	<0.070	<0.108
PCB-72	0.022	<0.023	0.029	<0.031	<0.024	<0.052	<0.020	<0.072	<0.135
PCB-77	e0.088	e0.063	<0.049	<0.063	e0.092	<0.042	0.024	<0.104	<0.132
PCB-78	<0.037	<0.055	<0.049	<0.063	<0.037	<0.042	<0.014	<0.104	<0.132
PCB-79	<0.037	<0.055	<0.049	<0.063	<0.037	<0.042	<0.014	<0.104	<0.132
PCB-81	e0.143	<0.055	<0.049	<0.063	<0.037	<0.042	<0.014	<0.104	<0.132
PCB-82	<0.069	<0.049	0.065	<0.074	e0.087	<0.057	<0.034	<0.128	<0.169
PCB-83 + 108	0.036	0.038	0.054	<0.042	0.051	<0.032	<0.012	<0.083	<0.099
PCB-84	0.097	0.093	e0.121	0.119	0.137	<0.027	0.034	<0.071	<0.085
PCB-85 + 120	e0.076	0.053	e0.086	e0.078	e0.083	<0.057	<0.034	<0.128	<0.169
PCB-86 + 97	0.101	0.093	0.136	0.107	0.144	<0.057	0.040	<0.128	<0.169
PCB-87 + 115 + 116	0.131	0.147	0.173	0.177	0.203	<0.057	0.067	<0.128	<0.169
PCB-88 + 121	<0.020	<0.011	<0.037	<0.043	<0.023	<0.033	<0.013	<0.087	<0.103
PCB-89 + 90 + 101	0.336	0.266	0.363	0.328	0.351	0.054	0.115	0.104	<0.085
PCB-91	0.115	0.083	0.129	0.129	0.125	<0.033	0.035	<0.087	<0.103
PCB-92	0.092	0.087	0.107	0.091	e0.109	<0.027	0.030	<0.071	<0.085
PCB-93 + 95	0.302	0.275	0.424	0.359	0.423	0.065	0.114	<0.087	<0.103
PCB-94	<0.020	<0.011	<0.037	<0.043	<0.023	<0.033	<0.013	<0.087	<0.103
PCB-96	<0.020	<0.011	<0.037	<0.043	<0.023	<0.033	<0.013	<0.087	<0.103
PCB-98 + 102	0.031	e0.022	<0.037	0.052	e0.034	<0.033	<0.013	<0.087	<0.103
PCB-99	0.171	0.138	0.170	0.165	0.176	<0.026	0.068	<0.070	<0.083
PCB-100	<0.020	<0.011	<0.037	<0.043	<0.023	<0.033	<0.013	<0.087	<0.103
PCB-103	e0.026	<0.011	<0.037	<0.043	<0.023	<0.033	<0.013	<0.087	<0.103
PCB-104	<0.014	<0.007	<0.026	<0.030	<0.017	<0.023	<0.009	<0.061	<0.072
PCB-105 + 127	0.086	0.092	0.106	0.108	e0.108	<0.040	0.046	<0.090	<0.119
PCB-106 + 118	0.265	0.192	0.272	0.247	0.290	<0.040	0.096	0.103	<0.113
PCB-107 + 109	<0.048	<0.035	<0.041	<0.052	0.029	<0.040	<0.023	<0.089	<0.118
PCB-110	0.498	0.450	0.578	0.512	0.595	0.067	0.175	0.169	<0.118
PCB-111 + 117	<0.069	<0.049	<0.058	<0.074	e0.020	<0.057	<0.034	<0.128	<0.169
PCB-112	<0.020	<0.010	<0.037	<0.042	<0.023	<0.032	<0.012	<0.083	<0.099
PCB-113	<0.017	<0.009	<0.032	<0.037	<0.019	<0.027	<0.011	<0.071	<0.085
PCB-114	<0.048	<0.034	<0.040	<0.052	e0.016	<0.039	<0.023	<0.088	<0.116
PCB-119	0.033	0.021	<0.030	<0.035	e0.023	<0.026	<0.010	<0.070	<0.083
PCB-122	<0.048	<0.034	<0.040	<0.052	<0.012	<0.039	<0.023	<0.088	<0.116
PCB-123	<0.047	<0.031	<0.040	<0.056	<0.012	<0.040	<0.024	<0.087	<0.113
PCB-124	<0.048	<0.035	<0.041	<0.052	<0.012	<0.040	<0.023	<0.089	<0.118
PCB-125	<0.069	<0.049	<0.058	<0.074	<0.018	<0.057	<0.034	<0.128	<0.169
PCB-126	<0.053	<0.038	<0.045	<0.058	<0.013	<0.041	<0.024	<0.092	<0.122
PCB-128	0.090	0.079	0.093	0.072	0.117	<0.113	0.034	<0.111	<0.090
PCB-129	<0.021	<0.020	<0.045	<0.038	0.032	<0.113	<0.018	<0.111	<0.090
PCB-130	0.033	e0.025	<0.045	<0.038	0.047	<0.113	<0.018	<0.111	<0.090
PCB-131 + 142	<0.016	<0.020	<0.025	<0.020	<0.016	<0.046	<0.013	<0.063	<0.087
PCB-132 + 168	0.144	0.133	0.138	0.109	0.163	<0.104	0.045	<0.102	<0.083

Table 11. Concentrations of particulate polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (01105566), Milton, Massachusetts, 2005–2006.—Continued

[IUPAC, International Union of Pure and Applied Chemistry; ng/L, nanograms per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners								
	May 2005 (ng/L)	June 2005 (ng/L)	July 2005 (ng/L)	August 2005 (ng/L)	September 2005 (ng/L)	December 2005 (ng/L)	January 2006 (ng/L)	February 2006 (ng/L)	March–April 2006 (ng/L)
PCB-133	<0.016	<0.020	<0.025	<0.020	<0.016	<0.046	<0.013	<0.063	<0.087
PCB-134 + 143	0.021	<0.020	<0.025	<0.020	e0.022	<0.046	<0.013	<0.063	<0.087
PCB-135 + 144	0.056	0.053	0.066	0.054	0.075	<0.046	0.024	<0.063	<0.087
PCB-136	0.071	0.058	0.074	0.055	0.064	<0.046	0.022	<0.063	<0.087
PCB-137	0.034	0.022	<0.038	<0.032	<0.026	<0.096	e0.073	e0.138	<0.076
PCB-138 + 163 + 164	0.498	0.382	0.446	0.359	0.517	<0.096	0.155	0.153	<0.076
PCB-139 + 149	0.288	0.269	0.288	0.252	0.312	<0.046	0.093	0.083	<0.087
PCB-140	<0.016	<0.020	<0.025	<0.020	<0.016	<0.046	<0.013	<0.063	<0.087
PCB-141	0.052	0.047	0.051	0.042	0.058	<0.096	0.017	<0.094	<0.076
PCB-145	<0.016	<0.020	<0.025	<0.020	<0.016	<0.046	<0.013	<0.063	<0.087
PCB-146	0.059	e0.049	0.044	e0.030	e0.056	<0.042	0.020	<0.057	<0.079
PCB-147	0.018	<0.020	<0.025	<0.020	e0.019	<0.046	<0.013	<0.063	<0.087
PCB-148	<0.016	<0.020	<0.025	<0.020	<0.016	<0.046	<0.013	<0.063	<0.087
PCB-150	<0.016	<0.020	<0.025	<0.020	<0.016	<0.046	<0.013	<0.063	<0.087
PCB-151	0.076	0.067	0.095	0.062	0.094	<0.057	0.029	<0.079	<0.108
PCB-152	<0.016	<0.020	<0.025	<0.020	<0.016	<0.046	<0.013	<0.063	<0.087
PCB-153	0.308	0.231	0.274	0.233	0.295	<0.088	0.099	<0.087	<0.070
PCB-154	<0.016	<0.020	<0.025	<0.020	<0.016	<0.046	<0.013	<0.063	<0.087
PCB-155	<0.011	<0.014	<0.017	<0.013	<0.011	<0.032	<0.009	<0.045	<0.061
PCB-156	0.036	e0.028	e0.036	<0.026	0.049	<0.075	0.014	<0.073	<0.059
PCB-157	e0.018	<0.014	<0.032	<0.027	<0.020	<0.076	<0.012	<0.075	<0.060
PCB-158 + 160	0.048	0.045	0.051	e0.048	0.060	<0.096	0.017	<0.094	<0.076
PCB-159	<0.018	<0.017	<0.038	<0.032	<0.026	<0.096	<0.016	<0.094	<0.076
PCB-161	<0.015	<0.018	<0.022	<0.018	<0.015	<0.042	<0.012	<0.057	<0.079
PCB-162	<0.018	<0.017	<0.038	<0.032	<0.026	<0.096	<0.016	<0.094	<0.076
PCB-165	<0.015	<0.018	<0.022	<0.018	<0.015	<0.042	<0.012	<0.057	<0.079
PCB-166	<0.018	<0.017	<0.038	<0.032	<0.026	<0.096	<0.016	<0.094	<0.076
PCB-167	0.017	0.021	<0.030	<0.026	<0.020	<0.074	<0.012	<0.072	<0.059
PCB-169	<0.015	<0.014	<0.032	<0.027	<0.020	<0.075	<0.012	<0.074	<0.060
PCB-170 + 190	0.089	0.087	0.098	0.109	0.140	<0.065	0.036	<0.083	e0.124
PCB-171	e0.025	<0.013	e0.025	<0.042	<0.030	<0.054	<0.023	<0.069	<0.081
PCB-172 + 192	<0.014	<0.013	<0.020	<0.042	<0.030	<0.054	<0.023	<0.069	<0.081
PCB-173	<0.014	<0.013	<0.020	<0.042	<0.030	<0.054	<0.023	<0.069	<0.081
PCB-174 + 181	0.055	0.044	<0.020	0.047	0.067	<0.056	<0.024	<0.071	<0.084
PCB-175	<0.014	<0.013	<0.020	<0.042	<0.030	<0.055	<0.024	<0.071	<0.084
PCB-176	<0.011	<0.010	<0.015	<0.032	<0.023	<0.042	<0.018	<0.054	<0.064
PCB-177	0.037	0.029	0.033	<0.028	0.051	<0.056	<0.024	<0.071	<0.084
PCB-178	<0.014	<0.013	<0.020	<0.042	<0.030	<0.055	<0.024	<0.071	<0.084
PCB-179	0.029	0.022	0.021	<0.032	0.040	<0.042	<0.018	<0.054	<0.064
PCB-180	0.135	0.124	0.135	0.121	0.149	<0.054	0.052	<0.069	<0.081
PCB-182 + 187	0.074	0.067	0.071	0.055	0.087	<0.055	0.026	<0.071	<0.084
PCB-183	0.034	0.031	e0.026	0.033	0.049	<0.056	<0.024	<0.071	<0.084
PCB-184	<0.011	<0.010	<0.015	<0.032	<0.023	<0.042	<0.018	<0.054	<0.064
PCB-185	<0.015	<0.014	<0.020	<0.028	<0.030	<0.056	<0.024	<0.071	<0.084
PCB-186	<0.014	<0.013	<0.020	<0.042	<0.030	<0.055	<0.024	<0.071	<0.084
PCB-188	<0.011	<0.010	<0.015	<0.032	<0.023	<0.042	<0.018	<0.054	<0.064
PCB-189	<0.012	<0.011	<0.017	<0.036	<0.025	<0.045	<0.019	<0.057	<0.068
PCB-191	<0.014	<0.013	<0.020	<0.042	<0.030	<0.054	<0.023	<0.069	<0.081

Table 11. Concentrations of particulate polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (01105566), Milton, Massachusetts, 2005–2006.—Continued

[IUPAC, International Union of Pure and Applied Chemistry; ng/L, nanograms per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	May 2005 (ng/L)	June 2005 (ng/L)	July 2005 (ng/L)	August 2005 (ng/L)	September 2005 (ng/L)	December 2005 (ng/L)	January 2006 (ng/L)	February 2006 (ng/L)	March–April 2006 (ng/L)
	Polychlorinated biphenyl congeners								
PCB-193	<0.014	<0.013	<0.020	<0.042	<0.030	<0.054	<0.023	<0.069	<0.081
PCB-194	e0.041	e0.032	<0.042	<0.059	e0.062	<0.070	<0.021	<0.133	<0.138
PCB-195	<0.020	<0.025	<0.042	<0.059	<0.052	<0.070	<0.021	<0.133	<0.138
PCB-196 + 203	e0.051	0.045	<0.039	<0.055	e0.078	<0.069	<0.021	<0.132	<0.137
PCB-197	<0.013	<0.016	<0.027	<0.038	<0.036	<0.049	<0.015	<0.094	<0.097
PCB-198	<0.019	<0.023	<0.039	<0.055	<0.050	<0.069	<0.021	<0.132	<0.137
PCB-199	0.037	e0.033	<0.039	<0.055	e0.057	<0.069	<0.021	<0.132	<0.137
PCB-200	<0.013	<0.016	<0.027	<0.038	<0.036	<0.049	<0.015	<0.094	<0.097
PCB-201	<0.013	<0.016	<0.027	<0.038	<0.036	<0.049	<0.015	<0.094	<0.097
PCB-202	<0.015	<0.019	<0.031	<0.044	<0.041	<0.056	<0.017	<0.106	<0.110
PCB-204	<0.013	<0.016	<0.027	<0.038	<0.036	<0.049	<0.015	<0.094	<0.097
PCB-205	<0.015	<0.019	<0.031	<0.044	<0.038	<0.053	<0.016	<0.101	<0.105
PCB-206	<0.055	<0.034	<0.055	<0.081	e0.058	<0.119	<0.025	<0.217	<0.332
PCB-207	<0.047	<0.029	<0.047	<0.069	<0.042	<0.105	<0.022	<0.191	<0.292
PCB-208	<0.047	<0.029	<0.047	<0.069	<0.042	<0.105	<0.022	<0.191	<0.292
PCB-209	0.045	0.039	<0.020	<0.025	0.060	<0.055	<0.018	<0.067	<0.224
Total	13.3	11.3	15.6	16.9	18.6	0.972	3.75	2.52	0.291
	Polychlorinated biphenyl homologs								
Total Monochlorobiphenyls	0.447	0.338	0.454	0.415	<0.022	--	0.043	--	--
Total Dichlorobiphenyls	2.11	1.66	2.22	3.14	2.41	0.049	0.392	0.356	0.291
Total Trichlorobiphenyls	2.49	2.04	2.83	3.99	2.97	0.174	0.662	0.303	--
Total Tetrachlorobiphenyls	3.57	3.27	5.62	5.41	8.1	0.567	1.15	1.25	--
Total Pentachlorobiphenyls	2.29	2.02	2.58	2.40	2.52	0.186	0.823	0.375	--
Total Hexachlorobiphenyls	1.85	1.41	1.62	1.24	1.88	--	0.568	0.236	--
Total Heptachlorobiphenyls	0.453	0.403	0.359	0.364	0.582	--	0.114	--	--
Total Octachlorobiphenyls	0.037	0.045	<0.042	<0.059	<0.052	--	--	--	--
Total Nonachlorobiphenyls	<0.055	<0.034	<0.055	<0.081	<0.047	--	--	--	--
Decachlorobiphenyls	0.045	0.039	<0.020	<0.025	0.060	--	--	--	--
	Polychlorinated biphenyl Aroclors								
Aroclor 1221	<0.046	<0.046	<0.089	<0.075	<0.042	<0.075	<0.028	<0.068	<0.231
Aroclor 1232	<0.082	<0.064	<0.160	<0.163	<0.089	<0.177	<0.050	<0.307	<0.739
Aroclor 1016/1242	4.83	4.23	5.56	6.81	5.42	0.518	1.36	1.07	<0.824
Aroclor 1248	<0.192	<0.207	<0.319	<0.337	<0.142	<0.331	<0.126	<0.396	<0.746
Aroclor 1254	4.02	3.78	4.78	4.50	5.22	<0.577	1.76	<1.280	<1.693
Aroclor 1260	1.83	1.72	1.84	1.86	2.39	<0.464	0.630	<0.594	<0.698

Table 12. Polychlorinated biphenyl concentrations in white sucker *(Catostomus commersoni)* collected from the Neponset River, Massachusetts, 2005.

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; percent lipid for fillets from fish collected from the Tileston and Hollingsworth Impoundment equal to 2.92; percent lipid for whole fish collected from the Tileston and Hollingsworth Impoundment equal to 7.621; percent lipid for fillets from fish collected from the Walter Baker Impoundment equal to 2.88; percent lipid for whole fish collected from the Walter Baker Impoundment equal to 6.2184; Tileston and Hollingsworth and Walter Baker whole-fish sample sizes equal to 10.1 and 10.3 g, respectively; laboratory blank 1 corresponds to fillet samples; laboratory blank 2 corresponds to whole fish samples; matrix spike 1 results correspond to fillet samples; matrix spike 2 results correspond to whole fish samples; matrix spike 3 corresponds to fillet samples collected from the Tileston and Hollingsworth Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 4 corresponds to fillet samples collected from the Walter Baker Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 5 corresponds to whole fish samples analyzed by high resolution gas chromatography spectrometry. IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram per gram; ng, nanogram; <, actual value is less than value shown; e, estimated]

IUPAC number	Polychlorinated biphenyl congeners										
	Fish samples				Quality-control samples						
	Tileston and Hollingsworth Impoundment (ng/g wet weight)		Walter Baker Impoundment (ng/g wet weight)		Laboratory blanks (ng/sample)		Matrix spike (percent recovery)				
	Fillet	Whole	Fillet	Whole	1	2	1	2	3	4	5
PCB-1	37.7	70.8	14.3	36.4	<0.0122	<0.082	87.4	71.5	--	--	--
PCB-2	<0.307	<0.152	<0.152	<0.101	<0.0121	<0.081	--	--	--	--	--
PCB-3	1.25	1.96	0.443	1.31	<0.0121	<0.081	97.4	74.7	--	--	--
PCB-4 + 10	172	315	80.2	197	<0.0206	<0.174	85.6	70.1	--	--	--
PCB-5 + 8	117	178	37.8	96.4	<0.0120	<0.098	101	73.1	--	--	--
PCB-6	16.5	30	8.29	19.2	<0.0120	<0.098	--	--	--	--	--
PCB-7 + 9	3.07	7.11	1.37	3.7	<0.0120	e0.327	--	--	--	--	--
PCB-11	0.135	<0.095	0.085	e0.191	<0.0120	<0.098	--	--	--	--	--
PCB-12 + 13	e0.191	0.467	0.143	0.611	<0.0120	<0.098	--	--	--	--	--
PCB-14	<0.114	<0.095	<0.0444	<0.102	<0.0120	<0.098	--	--	--	--	--
PCB-15	9.92	25.6	7	22.8	<0.0131	<0.112	113	79	--	--	--
PCB-16 + 32	133	279	74.3	164	<0.0192	<0.214	--	--	--	--	--
PCB-17	89.1	194	48.2	110	<0.0192	<0.214	--	--	--	--	--
PCB-18	21.1	53.6	18.5	40.5	<0.0192	<0.214	86.3	72.8	--	--	--
PCB-19	52	116	25.5	68.3	<0.0226	<0.251	78.8	68.9	--	--	--
PCB-20 + 21 + 33	8.4	16.7	6.46	12	<0.0191	<0.124	--	--	--	--	--
PCB-22	11.9	25.7	11.5	21.2	<0.0191	<0.124	--	--	--	--	--
PCB-23 + 34	2.49	5.85	1.54	3.17	<0.0131	<0.137	92.2	71.7	--	--	--
PCB-24 + 27	50	114	25.4	65.9	<0.0192	<0.214	--	--	--	--	--
PCB-25	20.8	46.9	15.5	39.1	<0.0131	<0.137	--	--	--	--	--
PCB-26	42.6	96.2	35.9	77.9	<0.0131	<0.137	--	--	--	--	--
PCB-28	89.6	248	98.9	164	<0.0133	<0.150	103	74.2	--	--	--
PCB-29	<0.156	0.328	<0.135	<0.205	<0.0131	<0.137	--	--	--	--	--
PCB-30	<0.229	e0.266	<0.198	<0.321	<0.0192	<0.214	--	--	--	--	--
PCB-31	90.3	159	61.1	147	<0.0131	<0.137	96.9	79.6	--	--	--
PCB-35	<0.518	<0.289	<0.263	<0.276	<0.0196	<0.134	--	--	--	--	--
PCB-36	<0.505	0.683	0.311	0.528	<0.0191	<0.124	--	--	--	--	--
PCB-37	3.42	9.64	4.17	8.21	<0.0196	<0.134	107	78.3	--	--	--
PCB-38	<0.518	<0.558	<0.263	<0.328	<0.0196	<0.134	--	--	--	--	--
PCB-39	<0.505	<0.267	<0.256	<0.255	<0.0191	<0.124	--	--	--	--	--
PCB-40	5.29	10.5	6.42	11.2	<0.0294	<0.187	94.4	72	--	--	--
PCB-41 + 64 + 68 + 71	125	283	129	219	<0.0125	<0.154	--	--	--	--	--
PCB-42 + 59	37	81.3	39.9	65	<0.0125	<0.154	--	--	--	--	--
PCB-43 + 49	153	338	146	223	<0.0130	<0.145	93.1	68.3	--	--	--
PCB-44	53.9	116	62.8	105	<0.0125	<0.154	90	72	--	--	--
PCB-45	5.8	11.2	5.58	10.3	<0.0111	<0.132	--	--	--	--	--
PCB-46	3.34	6.94	2.81	5.16	<0.0111	<0.132	--	--	--	--	--
PCB-47 + 48 + 75	132	333	119	187	<0.0111	<0.132	--	--	--	--	--

Table 12. Polychlorinated biphenyl concentrations in white sucker *(Catostomus commersoni)* collected from the Neponset River, Massachusetts, 2005.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; percent lipid for fillets from fish collected from the Tileston and Hollingsworth Impoundment equal to 2.92; percent lipid for whole fish collected from the Tileston and Hollingsworth Impoundment equal to 7.621; percent lipid for fillets from fish collected from the Walter Baker Impoundment equal to 2.88; percent lipid for whole fish collected from the Walter Baker Impoundment equal to 6.2184; Tileston and Hollingsworth and Walter Baker whole-fish sample sizes equal to 10.1 and 10.3 g, respectively; laboratory blank 1 corresponds to fillet samples; laboratory blank 2 corresponds to whole fish samples; matrix spike 1 results correspond to fillet samples; matrix spike 2 results correspond to whole fish samples; matrix spike 3 corresponds to fillet samples collected from the Tileston and Hollingsworth Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 4 corresponds to fillet samples collected from the Walter Baker Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 5 corresponds to whole fish samples analyzed by high resolution gas chromatography spectrometry. IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram per gram; ng, nanogram; <, actual value is less than value shown; e, estimated]

IUPAC number	Polychlorinated biphenyl congeners										
	Fish samples				Quality-control samples						
	Tileston and Hollingsworth Impoundment (ng/g wet weight)		Walter Baker Impoundment (ng/g wet weight)		Laboratory blanks (ng/sample)		Matrix spike (percent recovery)				
	Fillet	Whole	Fillet	Whole	1	2	1	2	3	4	5
PCB-50	0.857	2.06	0.511	1.1	<0.0093	<0.112	--	--	--	--	--
PCB-51	19.3	46.9	11.9	23.8	<0.0111	<0.132	--	--	--	--	--
PCB-52 + 73	50.9	105	35.8	73	<0.0111	<0.132	91.3	69.2	--	--	--
PCB-53	31.2	72.6	20.6	42.2	<0.0111	<0.132	--	--	--	--	--
PCB-54	1.34	3.43	0.668	1.85	<0.0093	<0.112	76.5	63.3	--	--	--
PCB-55	e0.301	0.684	0.272	e0.369	<0.0157	<0.101	--	--	--	--	--
PCB-56 + 60	30.8	70.5	27	40.3	<0.0157	<0.101	96.3	76.2	--	--	--
PCB-57	4.49	8.81	3.16	6.03	<0.0294	<0.187	--	--	--	--	--
PCB-58	0.989	1.93	0.852	e1.04	<0.0294	<0.187	--	--	--	--	--
PCB-61 + 74	46.1	132	52.5	77.7	<0.0151	<0.099	--	--	--	--	--
PCB-62 + 65	0.329	<0.321	0.272	<0.191	<0.0111	<0.132	--	--	--	--	--
PCB-63	11	28.6	11.1	16.8	<0.0151	<0.099	--	--	--	--	--
PCB-66 + 80	80.2	200	83.4	121	<0.0151	<0.099	96.6	76.2	--	--	--
PCB-67	2.76	5.69	2.1	4.27	<0.0294	<0.187	--	--	--	--	--
PCB-69	1.08	2.18	0.78	1.4	<0.0111	<0.132	--	--	--	--	--
PCB-70 + 76	67.8	125	60.7	89.8	<0.0151	<0.099	--	--	--	--	--
PCB-72	7.15	17.6	6.37	10.6	<0.0125	<0.154	--	--	--	--	--
PCB-77	3.47	11.1	3.77	9.12	e0.0045	e0.00170	106	79.1	75.9	77	112
PCB-78	0.631	e1.07	e0.503	e0.714	<0.0106	<0.084	--	--	--	--	--
PCB-79	e2.52	<0.256	e1.76	<0.296	<0.0106	<0.084	--	--	--	--	--
PCB-81	e2.64	e4.52	1.98	2.34	<0.0106	<0.084	104	79.6	--	--	--
PCB-82	10.9	21.3	9.11	13.1	<0.0184	<0.152	--	--	--	--	--
PCB-83 + 108	7.7	13.9	5.77	8.84	<0.0160	<0.092	--	--	--	--	--
PCB-84	20.3	35.2	13.5	21.3	<0.0136	<0.080	--	--	--	--	--
PCB-85 + 120	28.3	54.5	22.4	31.4	<0.0184	<0.152	--	--	--	--	--
PCB-86 + 97	43.8	82.9	30.7	42	<0.0184	<0.152	--	--	--	--	--
PCB-87 + 115 + 116	49.7	124	35.1	61.7	<0.0184	<0.152	101	76.2	--	--	--
PCB-88 + 121	0.509	0.805	0.391	0.525	<0.0164	<0.097	--	--	--	--	--
PCB-89 + 90 + 101	134	247	84.1	121	<0.0136	<0.080	98.4	75.1	--	--	--
PCB-91	33.3	64.2	24.6	35.5	<0.0164	<0.097	--	--	--	--	--
PCB-92	24.1	48.2	14.7	24.8	<0.0136	<0.080	--	--	--	--	--
PCB-93 + 95	81.1	140	48.1	75.9	<0.0164	<0.097	98.8	75.6	--	--	--
PCB-94	1.94	4.38	1.22	2.28	<0.0164	<0.097	--	--	--	--	--
PCB-96	1.61	3.3	1.06	1.73	<0.0164	<0.097	--	--	--	--	--
PCB-98 + 102	7.07	14.3	5.36	8.86	<0.0164	<0.097	--	--	--	--	--
PCB-99	91.5	170	64.1	86.6	<0.0133	<0.078	98.4	78.2	--	--	--

Table 12. Polychlorinated biphenyl concentrations in white sucker *(Catostomus commersoni)* collected from the Neponset River, Massachusetts, 2005.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; percent lipid for fillets from fish collected from the Tileston and Hollingsworth Impoundment equal to 2.92; percent lipid for whole fish collected from the Tileston and Hollingsworth Impoundment equal to 7.621; percent lipid for fillets from fish collected from the Walter Baker Impoundment equal to 2.88; percent lipid for whole fish collected from the Walter Baker Impoundment equal to 6.2184; Tileston and Hollingsworth and Walter Baker whole-fish sample sizes equal to 10.1 and 10.3 g, respectively; laboratory blank 1 corresponds to fillet samples; laboratory blank 2 corresponds to whole fish samples; matrix spike 1 results correspond to fillet samples; matrix spike 2 results correspond to whole fish samples; matrix spike 3 corresponds to fillet samples collected from the Tileston and Hollingsworth Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 4 corresponds to fillet samples collected from the Walter Baker Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 5 corresponds to whole fish samples analyzed by high resolution gas chromatography spectrometry. IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram per gram; ng, nanogram; <, actual value is less than value shown; e, estimated]

IUPAC number	Polychlorinated biphenyl congeners										
	Fish samples				Quality-control samples						
	Tileston and Hollingsworth Impoundment (ng/g wet weight)		Walter Baker Impoundment (ng/g wet weight)		Laboratory blanks (ng/sample)		Matrix spike (percent recovery)				
	Fillet	Whole	Fillet	Whole	1	2	1	2	3	4	5
PCB-100	2.85	7.08	1.81	2.83	<0.0164	<0.097	--	--	--	--	--
PCB-103	3.08	6.9	1.92	3.06	<0.0164	<0.097	--	--	--	--	--
PCB-104	0.064	<0.183	0.033	e0.105	<0.0115	<0.068	90.7	72	--	--	--
PCB-105 + 127	30.4	63.5	24.2	32.7	<0.0135	<0.109	99.5	76.6	--	--	--
PCB-106 + 118	121	214	85.1	108	<0.0152	<0.111	98.5	75.6	--	--	--
PCB-107 + 109	11.3	21.3	8.13	10.5	<0.0129	<0.108	--	--	--	--	--
PCB-110	161	306	115	164	<0.0129	<0.108	101	77.3	--	--	--
PCB-111 + 117	12.7	e2.25	11.3	e3.13	<0.0184	<0.152	--	--	--	--	--
PCB-112	0.798	1.67	0.742	0.95	<0.0160	<0.092	--	--	--	--	--
PCB-113	1.66	2.35	1.07	1.31	<0.0136	<0.080	--	--	--	--	--
PCB-114	2.6	5.05	2.25	2.78	<0.0133	<0.107	103	75.4	--	--	--
PCB-119	10.9	22	7.39	10.4	<0.0133	<0.078	--	--	--	--	--
PCB-122	1.05	1.92	0.754	0.875	<0.0133	<0.107	--	--	--	--	--
PCB-123	4.22	6.39	2.73	3.4	<0.0152	<0.111	90.5	71.6	--	--	--
PCB-124	4.57	7.82	2.77	3.59	<0.0129	<0.108	--	--	--	--	--
PCB-125	1.09	e0.417	0.813	1.12	<0.0184	<0.152	--	--	--	--	--
PCB-126	0.169	0.56	0.154	0.362	0.00051	e0.00054	--	--	81	82.7	108
PCB-128	23.2	40.4	12	16.9	<0.0134	<0.110	--	--	--	--	--
PCB-129	5.45	9.34	2.82	3.89	<0.0134	<0.110	--	--	--	--	--
PCB-130	8.05	14.9	4.77	7.09	<0.0134	<0.110	--	--	--	--	--
PCB-131 + 142	1.55	2.33	0.767	0.959	<0.0071	<0.122	--	--	--	--	--
PCB-132 + 168	40.5	56.9	16.5	27.1	<0.0128	<0.100	--	--	--	--	--
PCB-133	2.49	4.16	1.55	1.76	<0.0071	<0.122	--	--	--	--	--
PCB-134 + 143	4.97	0.508	2.6	0.253	<0.0071	<0.122	--	--	--	--	--
PCB-135 + 144	13.1	22.7	7.23	11.4	<0.0071	<0.122	--	--	--	--	--
PCB-136	11	19.7	5.32	8.27	<0.0071	<0.122	--	--	--	--	--
PCB-137	8.27	14	4.07	5.82	<0.0114	<0.093	--	--	--	--	--
PCB-138 + 163 + 164	174	266	90.1	118	<0.0114	<0.093	95.1	77	--	--	--
PCB-139 + 149	77	133	43.8	66.6	<0.0071	<0.122	101	80.4	--	--	--
PCB-140	1.08	1.65	0.584	0.704	<0.0071	<0.122	--	--	--	--	--
PCB-141	12.5	23.1	6.43	9.9	<0.0114	<0.093	--	--	--	--	--
PCB-145	0.054	<0.159	0.033	<0.215	<0.0071	<0.122	--	--	--	--	--
PCB-146	21.8	34.7	12.3	15.6	<0.0064	<0.110	--	--	--	--	--
PCB-147	5.12	9.46	3.09	4.21	<0.0071	<0.122	--	--	--	--	--
PCB-148	0.271	0.649	0.181	0.284	<0.0071	<0.122	--	--	--	--	--
PCB-150	0.305	0.681	0.176	0.264	<0.0071	<0.122	--	--	--	--	--
PCB-151	20.7	36.6	11.3	16.6	<0.0084	<0.149	100	79.6	--	--	--
PCB-152	0.218	0.512	0.119	0.216	<0.0071	<0.122	--	--	--	--	--

Table 12. Polychlorinated biphenyl concentrations in white sucker *(Catostomus commersoni)* collected from the Neponset River, Massachusetts, 2005.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; percent lipid for fillets from fish collected from the Tileston and Hollingsworth Impoundment equal to 2.92; percent lipid for whole fish collected from the Tileston and Hollingsworth Impoundment equal to 7.621; percent lipid for fillets from fish collected from the Walter Baker Impoundment equal to 2.88; percent lipid for whole fish collected from the Walter Baker Impoundment equal to 6.2184; Tileston and Hollingsworth and Walter Baker whole-fish sample sizes equal to 10.1 and 10.3 g, respectively; laboratory blank 1 corresponds to fillet samples; laboratory blank 2 corresponds to whole fish samples; matrix spike 1 results correspond to fillet samples; matrix spike 2 results correspond to whole fish samples; matrix spike 3 corresponds to fillet samples collected from the Tileston and Hollingsworth Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 4 corresponds to fillet samples collected from the Walter Baker Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 5 corresponds to whole fish samples analyzed by high resolution gas chromatography spectrometry. IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram per gram; ng, nanogram; <, actual value is less than value shown; e, estimated]

IUPAC number	Polychlorinated biphenyl congeners										
	Fish samples				Quality-control samples						
	Tileston and Hollingsworth Impoundment (ng/g wet weight)		Walter Baker Impoundment (ng/g wet weight)		Laboratory blanks (ng/sample)		Matrix spike (percent recovery)				
	Fillet	Whole	Fillet	Whole	1	2	1	2	3	4	5
PCB-153	145	203	76.4	94.9	<0.0109	<0.085	98.7	77.9	--	--	--
PCB-154	2.28	4.43	1.36	1.92	<0.0071	<0.122	--	--	--	--	--
PCB-155	<0.0134	<0.110	<0.0217	<0.148	<0.0051	<0.084	96.1	78	--	--	--
PCB-156	11.1	18.8	6.38	8.2	<0.0096	<0.074	96.5	73.4	--	--	--
PCB-157	2.87	4.76	1.6	2.06	<0.0099	<0.074	99.5	73.5	--	--	--
PCB-158 + 160	18.4	31	9.52	13.1	<0.0114	<0.093	--	--	--	--	--
PCB-159	0.682	1.15	0.5	0.735	<0.0114	<0.093	--	--	--	--	--
PCB-161	0.03	<0.144	<0.0277	<0.195	<0.0064	<0.110	--	--	--	--	--
PCB-162	0.939	1.38	0.51	0.707	<0.0114	<0.093	--	--	--	--	--
PCB-165	0.13	0.316	0.118	<0.195	<0.0064	<0.110	--	--	--	--	--
PCB-166	0.811	1.44	0.454	0.601	<0.0114	<0.093	--	--	--	--	--
PCB-167	6.17	8.55	3.16	3.63	<0.0096	<0.071	97.8	75	--	--	--
PCB-169	0.00401	0.0102	0.00267	<0.00855	0.00053	e0.00061	105	73.4	81.3	83.3	113
PCB-170 + 190	17.6	33.3	11.4	15.2	<0.0176	<0.208	100	77	--	--	--
PCB-171	3.22	6.08	1.96	2.77	<0.0138	<0.170	--	--	--	--	--
PCB-172 + 192	1.9	3.97	1.26	1.9	<0.0138	<0.170	--	--	--	--	--
PCB-173	0.253	0.492	0.14	0.24	<0.0138	<0.170	--	--	--	--	--
PCB-174 + 181	6.32	12.1	4.18	7.47	<0.0141	<0.169	--	--	--	--	--
PCB-175	0.465	0.952	0.303	0.386	<0.0141	<0.168	--	--	--	--	--
PCB-176	1.05	2.2	0.66	1.07	<0.0107	<0.133	--	--	--	--	--
PCB-177	5.29	10.4	3.69	5.62	<0.0141	<0.169	--	--	--	--	--
PCB-178	2.12	4.36	1.51	2.19	<0.0141	<0.168	--	--	--	--	--
PCB-179	2.76	6.15	1.71	2.94	<0.0107	<0.133	--	--	--	--	--
PCB-180	26	52.9	17.8	26.3	<0.0138	<0.170	93	76.8	--	--	--
PCB-182 + 187	17	31.9	12.1	17.8	<0.0141	<0.168	97.8	78.6	--	--	--
PCB-183	7.06	13.2	4.6	6.75	<0.0141	<0.169	98.6	79.3	--	--	--
PCB-184	0.022	<0.110	<0.0161	<0.097	<0.0107	<0.133	--	--	--	--	--
PCB-185	0.949	1.87	0.647	0.987	<0.0141	<0.169	--	--	--	--	--
PCB-186	<0.0252	<0.139	<0.0211	<0.123	<0.0141	<0.168	--	--	--	--	--
PCB-188	0.034	0.129	0.027	<0.097	<0.0107	<0.133	96	79.5	--	--	--
PCB-189	0.604	1.26	0.392	0.599	<0.0137	<0.144	102	75.6	--	--	--
PCB-191	0.578	1.19	0.372	0.483	<0.0138	<0.170	--	--	--	--	--
PCB-193	1.69	3.37	1.21	1.67	<0.0138	<0.170	--	--	--	--	--
PCB-194	4.55	9.65	3.96	4.66	<0.0175	<0.276	98.5	77.9	--	--	--
PCB-195	1.58	3.47	1.36	e1.63	<0.0175	<0.276	--	--	--	--	--
PCB-196 + 203	5.65	11.4	4.69	5.9	<0.0168	<0.265	98.6	79.8	--	--	--

Table 12. Polychlorinated biphenyl concentrations in white sucker *(Catostomus commersoni)* collected from the Neponset River, Massachusetts, 2005.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; percent lipid for fillets from fish collected from the Tileston and Hollingsworth Impoundment equal to 2.92; percent lipid for whole fish collected from the Tileston and Hollingsworth Impoundment equal to 7.621; percent lipid for fillets from fish collected from the Walter Baker Impoundment equal to 2.88; percent lipid for whole fish collected from the Walter Baker Impoundment equal to 6.2184; Tileston and Hollingsworth and Walter Baker whole-fish sample sizes equal to 10.1 and 10.3 g, respectively; laboratory blank 1 corresponds to fillet samples; laboratory blank 2 corresponds to whole fish samples; matrix spike 1 results correspond to fillet samples; matrix spike 2 results correspond to whole fish samples; matrix spike 3 corresponds to fillet samples collected from the Tileston and Hollingsworth Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 4 corresponds to fillet samples collected from the Walter Baker Impoundment and analyzed by high resolution gas chromatography mass spectrometry; matrix spike 5 corresponds to whole fish samples analyzed by high resolution gas chromatography spectrometry. IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram per gram; ng, nanogram; <, actual value is less than value shown; e, estimated]

IUPAC number	Polychlorinated biphenyl congeners										
	Fish samples				Quality-control samples						
	Tileston and Hollingsworth Impoundment (ng/g wet weight)		Walter Baker Impoundment (ng/g wet weight)		Laboratory blanks (ng/sample)		Matrix spike (percent recovery)				
	Fillet	Whole	Fillet	Whole	1	2	1	2	3	4	5
PCB-197	0.129	e0.375	0.108	e0.148	<0.0115	<0.184	--	--	--	--	--
PCB-198	0.21	0.55	0.184	0.311	<0.0168	<0.265	--	--	--	--	--
PCB-199	5.01	9.6	4.03	5.15	<0.0168	<0.265	--	--	--	--	--
PCB-200	0.323	0.738	0.257	0.371	<0.0115	<0.184	--	--	--	--	--
PCB-201	0.483	0.925	0.354	0.419	<0.0115	<0.184	--	--	--	--	--
PCB-202	0.939	1.99	0.71	0.963	<0.0128	<0.210	94.6	77.6	--	--	--
PCB-204	<0.0140	<0.145	<0.0125	<0.111	<0.0115	<0.184	--	--	--	--	--
PCB-205	0.212	e0.486	0.197	e0.259	<0.0133	<0.208	97	74.4	--	--	--
PCB-206	2.46	4.61	1.91	2.45	<0.0270	<0.325	101	76.6	--	--	--
PCB-207	0.28	0.634	0.205	0.377	<0.0247	<0.279	--	--	--	--	--
PCB-208	0.97	1.58	0.704	1.03	<0.0247	<0.279	107	80	--	--	--
PCB-209	0.897	1.43	0.688	0.918	<0.0097	<0.185	96.7	76.4	--	--	--
Total	3,490	6,890	2,450	4,080	<0.0294	<0.325	--	--	--	--	--
Polychlorinated biphenyl homologs											
Total Monochlorobiphenyls	38.9	72.8	14.8	37.7	<0.0122	<0.0819	--	--	--	--	--
Total Dichlorobiphenyls	318	556	135	340	<0.0206	<0.174	--	--	--	--	--
Total Trichlorobiphenyls	615	1,370	427	922	<0.0226	<0.251	--	--	--	--	--
Total Tetrachlorobiphenyls	876	2,000	835	1,340	<0.0294	<0.187	--	--	--	--	--
Total Pentachlorobiphenyls	905	1,690	627	881	<0.0184	<0.152	--	--	--	--	--
Total Hexachlorobiphenyls	620	966	326	442	<0.0134	<0.149	--	--	--	--	--
Total Heptachlorobiphenyls	94.9	186	64.1	94.4	<0.0176	<0.208	--	--	--	--	--
Total Octachlorobiphenyls	19.1	38.3	15.9	17.8	<0.0175	<0.276	--	--	--	--	--
Total Nonachlorobiphenyls	3.71	6.82	2.82	3.86	<0.0270	<0.325	--	--	--	--	--
Decachlorobiphenyls	0.897	1.43	0.688	0.918	<0.0097	<0.185	--	--	--	--	--
Polychlorinated biphenyl Aroclors											
Aroclor 1221	<0.795	<0.291	<0.446	<0.194	<0.0232	<0.186	--	--	--	--	--
Aroclor 1232	<1.42	<0.520	<0.673	<1.09	<0.0653	<0.728	--	--	--	--	--
Aroclor 1016/1242	1,210	2,430	822	1,700	<0.0730	<0.813	--	--	--	--	--
Aroclor 1248	<2.72	<0.930	<2.7	<1.01	<0.0830	<0.847	--	--	--	--	--
Aroclor 1254	1,850	3,770	1,300	1,900	<0.184	<1.52	--	--	--	--	--
Aroclor 1260	359	706	240	343	<0.125	<1.48	--	--	--	--	--

Table 13. Polychlorinated biphenyl concentrations in the whole bodies of common mummichog *(Fundulus heteroclitus)* collected from the Neponset River Estuary, Massachusetts, 2005.

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; percent lipid equal to 1.45; sample size equal to about 10.3 g; IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram per gram; ng, nanogram; <, actual value is less than value shown; e, estimated; --, not done]

Polychlorinated biphenyl congeners				
IUPAC number	Neponset Estuary (ng/g wet weight)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)	
PCB-1	2.63	<0.015	91.8	--
PCB-2	<0.048	<0.015	--	--
PCB-3	<0.048	<0.015	98.5	--
PCB-4 + 10	16	<0.036	92.5	--
PCB-5 + 8	6.22	<0.020	96.9	--
PCB-6	1.38	<0.020	--	--
PCB-7 + 9	0.184	<0.020	--	--
PCB-11	e0.159	<0.020	--	--
PCB-12 + 13	<0.077	<0.020	--	--
PCB-14	<0.077	<0.020	--	--
PCB-15	0.702	<0.024	104	--
PCB-16 + 32	17.9	<0.028	--	--
PCB-17	10.7	<0.028	--	--
PCB-18	7.76	<0.028	91.9	--
PCB-19	4.07	<0.033	87.8	--
PCB-20 + 21 + 33	1.11	<0.023	--	--
PCB-22	2.89	<0.023	--	--
PCB-23 + 34	0.268	<0.018	91.6	--
PCB-24 + 27	6.2	<0.028	--	--
PCB-25	2.8	<0.018	--	--
PCB-26	7.38	<0.018	--	--
PCB-28	27.9	<0.019	87.4	--
PCB-29	0.043	<0.018	--	--
PCB-30	<0.054	<0.028	--	--
PCB-31	17.9	<0.018	88.2	--
PCB-35	<0.089	<0.026	--	--
PCB-36	<0.079	<0.023	--	--
PCB-37	0.406	<0.026	103	--
PCB-38	e0.930	<0.026	--	--
PCB-39	<0.079	<0.023	--	--
PCB-40	1.82	<0.028	91.6	--
PCB-41 + 64 + 68 + 71	38.9	<0.015	--	--
PCB-42 + 59	9.12	<0.015	--	--
PCB-43 + 49	33.3	<0.013	90.2	--
PCB-44	17.1	<0.015	93.6	--
PCB-45	1.49	<0.013	--	--
PCB-46	0.381	<0.013	--	--

Polychlorinated biphenyl congeners				
IUPAC number	Neponset Estuary (ng/g wet weight)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)	
PCB-47 + 48 + 75	27.9	<0.013	--	--
PCB-50	0.089	<0.011	--	--
PCB-51	3	<0.013	--	--
PCB-52 + 73	36.4	<0.013	90.5	--
PCB-53	5.81	<0.013	--	--
PCB-54	0.146	<0.011	87.3	--
PCB-55	<0.083	<0.015	--	--
PCB-56 + 60	9.16	<0.015	101	--
PCB-57	0.47	<0.028	--	--
PCB-58	0.176	<0.028	--	--
PCB-61 + 74	21.9	<0.014	--	--
PCB-62 + 65	e0.166	<0.013	--	--
PCB-63	2.9	<0.014	--	--
PCB-66 + 80	34.1	<0.014	95.2	--
PCB-67	e0.263	<0.028	--	--
PCB-69	<0.091	<0.013	--	--
PCB-70 + 76	16	<0.014	--	--
PCB-72	1.32	<0.015	--	--
*PCB-77	0.667	0.0005	103	96.9
PCB-78	<0.057	<0.012	--	--
PCB-79	e0.619	<0.012	--	--
PCB-81	0.55	<0.012	107	--
PCB-82	1.25	<0.016	--	--
PCB-83 + 108	1.2	<0.025	--	--
PCB-84	1.9	<0.021	--	--
PCB-85 + 120	8.99	<0.016	--	--
PCB-86 + 97	5.12	<0.016	--	--
PCB-87 + 115 + 116	<0.135	<0.016	98	--
PCB-88 + 121	<0.064	<0.026	--	--
PCB-89 + 90 + 101	25.8	<0.021	94.4	--
PCB-91	5.13	<0.026	--	--
PCB-92	5.88	<0.021	--	--
PCB-93 + 95	17.2	<0.026	93.6	--
PCB-94	0.222	<0.026	--	--
PCB-96	0.206	<0.026	--	--
PCB-98 + 102	1.62	<0.026		--

Table 13. Polychlorinated biphenyl concentrations in the whole bodies of common mummichog *(Fundulus heteroclitus)* collected from the Neponset River Estuary, Massachusetts, 2005.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; percent lipid equal to 1.45; sample size equal to about 10.3 g; IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram per gram; ng, nanogram; <, actual value is less than value shown; e, estimated; --, not done]

Polychlorinated biphenyl congeners				
IUPAC number	Neponset Estuary (ng/g wet weight)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)	
PCB-99	21.1	<0.021	96.1	--
PCB-100	0.477	<0.026	--	--
PCB-103	0.586	<0.026	--	--
PCB-104	<0.044	<0.018	87.6	--
PCB-105 + 127	10.1	<0.011	99.7	--
PCB-106 + 118	27.7	<0.011	97.3	--
PCB-107 + 109	2.64	<0.011	--	--
PCB-110	26.2	<0.011	100	--
PCB-111 + 117	14.1	<0.016	--	--
PCB-112	0.225	<0.025	--	--
PCB-113	0.164	<0.021	--	--
PCB-114	0.809	<0.010	99.3	--
PCB-119	1.85	<0.021	--	--
PCB-122	<0.091	<0.010	--	--
PCB-123	0.801	<0.011	92	--
PCB-124	0.464	<0.011	--	--
PCB-125	0.215	<0.016	--	--
*PCB-126	0.062	e0.0003	--	100
PCB-128	4.12	<0.016	--	--
PCB-129	0.438	<0.016	--	--
PCB-130	1.62	<0.016	--	--
PCB-131 + 142	<0.069	<0.012	--	--
PCB-132 + 168	2.99	<0.014	--	--
PCB-133	0.446	<0.012	--	--
PCB-134 + 143	0.506	<0.012	--	--
PCB-135 + 144	1.99	<0.012	--	--
PCB-136	1.23	<0.012	--	--
PCB-137	1.22	<0.014	--	--
PCB-138 + 163 + 164	26.8	<0.014	96.4	--
PCB-139 + 149	10.5	<0.012	101	--
PCB-140	0.153	<0.012	--	--
PCB-141	2.21	<0.014	--	--
PCB-145	<0.069	<0.012	--	--
PCB-146	3.86	<0.011	--	--
PCB-147	0.788	<0.012	--	--
PCB-148	<0.069	<0.012	--	--
PCB-150	<0.069	<0.012	--	--
PCB-151	4.28	<0.015	97.2	--
PCB-152	<0.069	<0.012	--	--
PCB-153	24	<0.012	94.4	--
PCB-154	0.445	<0.012	--	--
PCB-155	<0.048	<0.008	91.4	--
PCB-156	1.79	<0.011	99	--
PCB-157	0.477	<0.011	99.3	--
PCB-158 + 160	3.35	<0.014	--	--
PCB-159	0.215	<0.014	--	--
PCB-161	<0.061	<0.011	--	--
PCB-162	0.168	<0.014	--	--
PCB-165	<0.061	<0.011	--	--
PCB-166	0.161	<0.014	--	--
PCB-167	0.988	<0.010	96.5	--
*PCB-169	0.0015	0.0002	100	99.4
PCB-170 + 190	4.12	<0.014	97	--
PCB-171	0.919	<0.012	--	--
PCB-172 + 192	0.494	<0.012	--	--
PCB-173	<0.086	<0.012	--	--
PCB-174 + 181	1.26	<0.012	--	--
PCB-175	0.137	<0.012	--	--
PCB-176	0.212	<0.009	--	--
PCB-177	1.76	<0.012	--	--
PCB-178	0.702	<0.012	--	--
PCB-179	0.448	<0.009	--	--
PCB-180	8.08	<0.012	95.5	--
PCB-182 + 187	5.64	<0.012	96.1	--
PCB-183	2.5	<0.012	96.6	--
PCB-184	<0.066	<0.009	--	--
PCB-185	0.194	<0.012	--	--
PCB-186	<0.087	<0.012	--	--
PCB-188	<0.066	<0.009	94.8	--
PCB-189	0.097	<0.009	96.3	--
PCB-191	0.179	<0.012	--	--
PCB-193	0.485	<0.012	--	--
PCB-194	1.33	<0.021	100	--
PCB-195	0.549	<0.021	--	--
PCB-196 + 203	1.86	<0.021	97.5	--

Table 13. Polychlorinated biphenyl concentrations in the whole bodies of common mummichog *(Fundulus heteroclitus)* collected from the Neponset River Estuary, Massachusetts, 2005.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; percent lipid equal to 1.45; sample size equal to about 10.3 g; IUPAC, International Union of Pure and Applied Chemistry; ng/g, nanogram per gram; ng, nanogram; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Neponset Estuary (ng/g wet weight)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)	
Polychlorinated biphenyl congeners				
PCB-197	e0.064	<0.015	--	--
PCB-198	<0.076	<0.021	--	--
PCB-199	1.65	<0.021	--	--
PCB-200	e0.056	<0.015	--	--
PCB-201	0.233	<0.015	--	--
PCB-202	0.459	<0.017	98.7	--
PCB-204	<0.054	<0.015	--	--
PCB-205	e0.062	<0.016	100	--
PCB-206	0.586	<0.057	94	--
PCB-207	0.143	<0.048	--	--
PCB-208	0.336	<0.048	93.5	--
PCB-209	0.408	<0.024	91.7	--
Total	708	<	--	--
Polychlorinated biphenyl homologs				
Total Monochlorobiphenyls	2.63	<	--	--
Total Dichlorobiphenyls	24.5	<	--	--
Total Trichlorobiphenyls	107	<	--	--
Total Tetrachlorobiphenyls	262	<	--	--
Total Pentachlorobiphenyls	182	<	--	--
Total Hexachlorobiphenyls	94.7	<	--	--
Total Heptachlorobiphenyls	27.2	<	--	--
Total Octachlorobiphenyls	6.08	<	--	--
Total Nonachlorobiphenyls	1.07	<	--	--
Decachlorobiphenyls	0.408	<	--	--
Polychlorinated biphenyl Aroclors				
Aroclor 1221	<0.146	<0.0378	--	--
Aroclor 1232	<0.185	<0.0955	--	--
Aroclor 1016/1242	227	<0.107	--	--
Aroclor 1248	<1.74	<0.0836	--	--
Aroclor 1254	262	<0.207	--	--
Aroclor 1260	104	<0.0987	--	--

[*] Structurally, PCBs generally resemble propeller blades because the large chlorine atoms sterically interfere with coplanarity of the benzene rings; however, as long as the chlorine atoms are far enough apart, the benzene rings can be considered coplanar. In nonorthosubstituted PCB congeners, hydrogen atoms are not substituted by chlorine atoms at the ortho positions or the positions adjacent to the other ring, and therefore, the benzene rings are coplanar.

Table 14. Masses and concentrations of total polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, October and November 2005.

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; ng/L, nanogram per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; laboratory QC samples correspond to October and November samples; --, not done]

IUPAC number	Polychlorinated biphenyl congeners					
	Monthly composite river samples				Quality-control samples	
	10/1/2005 (ng/sample)	11/1/2005 (ng/sample)	10/1/2005 (ng/L)	11/1/2005 (ng/L)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
PCB-1	8.36	e2.18	0.419	e0.187	<1.63	85.1
PCB-2	e0.136	<0.186	e0.006	<0.016	<1.64	--
PCB-3	e3.29	0.793	e0.164	0.068	<1.64	95.2
PCB-4 + 10	54.9	24.3	2.75	2.09	<0.498	85.8
PCB-5 + 8	13.9	3.38	0.697	0.291	<0.647	94.1
PCB-6	3.13	0.936	0.157	0.081	<0.647	--
PCB-7 + 9	2.96	e2.06	0.148	e0.177	e0.586	--
PCB-11	e0.484	<0.700	e0.024	<0.060	e0.394	--
PCB-12 + 13	2	<0.700	0.100	<0.060	<0.647	--
PCB-14	<0.098	<0.700	<0.004	<0.060	<0.647	--
PCB-15	18	2.74	0.903	0.236	<0.767	106
PCB-16 + 32	17.2	5.42	0.863	0.467	<0.249	--
PCB-17	10.3	4.34	0.517	0.374	<0.249	--
PCB-18	7.92	3.03	0.397	0.261	<0.249	87.8
PCB-19	23.7	7.05	1.189	0.607	<0.290	80.7
PCB-20 + 21 + 33	1.53	e0.482	0.077	e0.041	<0.112	--
PCB-22	2.06	e0.562	0.103	e0.048	<0.112	--
PCB-23 + 34	<0.263	<0.255	<0.013	<0.021	<0.164	88.1
PCB-24 + 27	12.9	3.65	0.647	0.314	<0.249	--
PCB-25	4.72	1.39	0.237	0.120	<0.164	--
PCB-26	7.87	2.48	0.395	0.214	<0.164	--
PCB-28	12.7	3.78	0.637	0.326	<0.174	86.1
PCB-29	<0.263	<0.255	<0.013	<0.021	<0.164	--
PCB-30	<0.398	<0.386	<0.019	<0.033	<0.249	--
PCB-31	12	3.63	0.602	0.313	<0.164	103
PCB-35	<0.397	<0.411	<0.019	<0.035	<0.131	--
PCB-36	<0.342	<0.354	<0.017	<0.030	<0.112	--
PCB-37	<0.397	<0.411	<0.019	<0.035	<0.131	113
PCB-38	<0.397	<0.411	<0.019	<0.035	<0.131	--
PCB-39	<0.342	<0.354	<0.017	<0.030	<0.112	--
PCB-40	2.76	0.662	0.138	0.057	<0.271	87.5
PCB-41 + 64 + 68 + 71	20.2	4.71	1.013	0.406	<0.123	--
PCB-42 + 59	7.03	1.4	0.353	0.121	<0.123	--
PCB-43 + 49	20.6	3.83	1.033	0.330	<0.121	87.7
PCB-44	13	2.5	0.652	0.215	<0.123	83.1
PCB-45	2.48	0.639	0.124	0.055	<0.110	--
PCB-46	1.36	e0.269	0.068	e0.023	<0.110	--
PCB-47 + 48 + 75	31.1	7.64	1.560	0.658	<0.110	--
PCB-50	0.189	<0.182	0.009	<0.015	<0.091	--
PCB-51	5.08	1.37	0.255	0.118	<0.110	--
PCB-52 + 73	24.5	5.2	1.229	0.448	<0.110	81.7
PCB-53	9.36	2.06	0.469	0.177	<0.110	--
PCB-54	0.672	<0.182	0.034	<0.015	<0.091	68.6
PCB-55	<0.486	<0.122	<0.024	<0.010	<0.150	--
PCB-56 + 60	4.28	0.893	0.215	0.077	<0.150	99.4

Table 14. Masses and concentrations of total polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, October and November 2005.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; ng/L, nanogram per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; laboratory QC samples correspond to October and November samples; --, not done]

IUPAC number	Polychlorinated biphenyl congeners					
	Monthly composite river samples				Quality-control samples	
	10/1/2005 (ng/sample)	11/1/2005 (ng/sample)	10/1/2005 (ng/L)	11/1/2005 (ng/L)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
PCB-57	<0.882	0.289	<0.044	0.025	<0.271	--
PCB-58	<0.882	<0.222	<0.044	<0.019	<0.271	--
PCB-61 + 74	4.32	0.656	0.217	0.057	<0.145	--
PCB-62 + 65	e0.170	<0.219	e0.008	<0.018	<0.110	--
PCB-63	0.999	0.221	0.050	0.019	<0.145	--
PCB-66 + 80	8.98	1.5	0.450	0.129	<0.145	94.1
PCB-67	<0.882	<0.222	<0.044	<0.019	<0.271	--
PCB-69	e0.168	<0.219	e0.008	<0.018	<0.110	--
PCB-70 + 76	9.09	1.6	0.456	0.138	<0.145	--
PCB-72	0.801	<0.245	0.040	<0.021	<0.123	--
PCB-77	e0.772	<0.301	e0.038	<0.025	<0.110	110
PCB-78	<0.409	<0.301	<0.020	<0.025	<0.110	--
PCB-79	<0.409	<0.301	<0.020	<0.025	<0.110	--
PCB-81	<0.409	<0.301	<0.020	<0.025	<0.110	107
PCB-82	e1.79	<0.662	e0.089	<0.057	<0.309	--
PCB-83 + 108	1.24	e0.282	0.062	e0.024	<0.266	--
PCB-84	4.65	e0.809	0.233	e0.069	<0.230	--
PCB-85 + 120	3.26	<0.662	0.163	<0.057	<0.309	--
PCB-86 + 97	4.99	0.998	0.250	0.086	<0.309	--
PCB-87 + 115 + 116	6.22	1.21	0.312	0.104	<0.309	101
PCB-88 + 121	<0.332	<0.274	<0.016	<0.023	<0.280	--
PCB-89 + 90 + 101	14.9	2.67	0.747	0.230	<0.230	96.5
PCB-91	4.67	e0.779	0.234	e0.067	<0.280	--
PCB-92	4.21	0.77	0.211	0.066	<0.230	--
PCB-93 + 95	16.8	3.21	0.843	0.276	<0.280	89.4
PCB-94	0.492	<0.274	0.025	<0.023	<0.280	--
PCB-96	0.569	<0.274	0.029	<0.023	<0.280	--
PCB-98 + 102	1.32	e0.337	0.066	e0.029	<0.280	--
PCB-99	7.46	1.12	0.374	0.096	<0.226	97.5
PCB-100	0.444	<0.274	0.022	<0.023	<0.280	--
PCB-103	0.563	<0.274	0.028	<0.023	<0.280	--
PCB-104	<0.233	<0.192	<0.011	<0.016	<0.196	78.4
PCB-105 + 127	3.76	0.826	0.189	0.071	<0.226	110
PCB-106 + 118	10.4	1.67	0.522	0.144	<0.213	92.8
PCB-107 + 109	e0.936	<0.468	e0.046	<0.040	<0.218	--
PCB-110	23	3.96	1.153	0.341	<0.218	103
PCB-111 + 117	<0.580	<0.662	<0.029	<0.057	<0.309	--
PCB-112	<0.316	e0.324	<0.015	e0.027	<0.266	--
PCB-113	<0.273	<0.225	<0.013	<0.019	<0.230	--
PCB-114	<0.415	<0.475	<0.020	<0.040	<0.221	106
PCB-119	1.04	<0.222	0.052	<0.019	<0.226	--
PCB-122	<0.415	<0.475	<0.020	<0.040	<0.221	--
PCB-123	e0.492	<0.468	e0.024	<0.040	<0.213	86.8
PCB-124	e0.442	<0.468	e0.022	<0.040	<0.218	--
PCB-125	<0.580	<0.662	<0.029	<0.057	<0.309	--

Table 14. Masses and concentrations of total polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, October and November 2005.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; ng/L, nanogram per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; laboratory QC samples correspond to October and November samples; --, not done]

IUPAC number	Polychlorinated biphenyl congeners					
	Monthly composite river samples				Quality-control samples	
	10/1/2005 (ng/sample)	11/1/2005 (ng/sample)	10/1/2005 (ng/L)	11/1/2005 (ng/L)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
PCB-126	<0.450	<0.514	<0.022	<0.044	<0.240	--
PCB-128	3.33	e0.531	0.167	e0.045	<0.133	--
PCB-129	0.948	<0.375	0.048	<0.032	<0.133	--
PCB-130	1.13	<0.375	0.057	<0.032	<0.133	--
PCB-131 + 142	0.243	<0.170	0.012	<0.014	<0.158	--
PCB-132 + 168	5.95	1.15	0.298	0.099	<0.121	--
PCB-133	0.276	<0.170	0.014	<0.014	<0.158	--
PCB-134 + 143	<0.223	<0.170	<0.011	<0.014	<0.158	--
PCB-135 + 144	2.5	<0.170	0.125	<0.014	<0.158	--
PCB-136	2.54	0.542	0.127	0.047	<0.158	--
PCB-137	0.952	<0.319	0.048	<0.027	<0.113	--
PCB-138 + 163 + 164	18.7	2.92	0.938	0.252	<0.113	96.8
PCB-139 + 149	11.3	2.04	0.567	0.176	<0.158	105
PCB-140	<0.223	<0.170	<0.011	<0.014	<0.158	--
PCB-141	2.01	<0.319	0.101	<0.027	<0.113	--
PCB-145	<0.223	<0.170	<0.011	<0.014	<0.158	--
PCB-146	2.06	0.33	0.103	0.028	<0.145	--
PCB-147	e0.523	<0.170	e0.026	<0.014	<0.158	--
PCB-148	<0.223	<0.170	<0.011	<0.014	<0.158	--
PCB-150	<0.223	<0.170	<0.011	<0.014	<0.158	--
PCB-151	2.96	0.567	0.148	0.049	<0.196	102
PCB-152	<0.223	<0.170	<0.011	<0.014	<0.158	--
PCB-153	11.8	2.02	0.592	0.174	<0.103	93.3
PCB-154	0.236	<0.170	0.012	<0.014	<0.158	--
PCB-155	<0.158	<0.120	<0.007	<0.010	<0.111	90
PCB-156	1.3	<0.252	0.065	<0.021	<0.090	95.5
PCB-157	0.527	<0.258	0.026	<0.022	<0.092	98
PCB-158 + 160	2.36	0.39	0.118	0.034	<0.113	--
PCB-159	<0.453	<0.319	<0.022	<0.027	<0.113	--
PCB-161	<0.205	<0.156	<0.010	<0.013	<0.145	--
PCB-162	<0.453	<0.319	<0.022	<0.027	<0.113	--
PCB-165	<0.205	<0.156	<0.010	<0.013	<0.145	--
PCB-166	<0.453	<0.319	<0.022	<0.027	<0.113	--
PCB-167	e0.448	<0.248	e0.022	<0.021	<0.088	96.6
PCB-169	<0.363	<0.256	<0.018	<0.022	<0.091	96.5
PCB-170 + 190	3.82	e0.913	0.192	e0.078	<0.202	96.7
PCB-171	0.699	<0.245	0.035	<0.021	<0.169	--
PCB-172 + 192	0.458	<0.245	0.023	<0.021	<0.169	--
PCB-173	<0.274	<0.245	<0.013	<0.021	<0.169	--
PCB-174 + 181	<0.271	<0.242	<0.013	<0.020	<0.167	--
PCB-175	<0.272	<0.242	<0.013	<0.020	<0.167	--
PCB-176	0.303	<0.188	0.015	<0.016	<0.130	--
PCB-177	1.48	<0.242	0.074	<0.020	<0.167	--
PCB-178	0.486	<0.242	0.024	<0.020	<0.167	--
PCB-179	0.94	0.225	0.047	0.019	<0.130	--

Table 14. Masses and concentrations of total polychlorinated biphenyls measured in water samples collected at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, October and November 2005.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; ng/L, nanogram per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; laboratory QC samples correspond to October and November samples; --, not done]

IUPAC number	Polychlorinated biphenyl congeners					
	Monthly composite river samples				Quality-control samples	
	10/1/2005 (ng/sample)	11/1/2005 (ng/sample)	10/1/2005 (ng/L)	11/1/2005 (ng/L)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
PCB-180	5.89	0.928	0.295	0.080	<0.169	96.1
PCB-182 + 187	3.17	0.422	0.159	0.036	<0.167	93.7
PCB-183	1.39	<0.242	0.070	<0.020	<0.167	95.4
PCB-184	<0.211	<0.188	<0.010	<0.016	<0.130	--
PCB-185	e0.281	<0.242	e0.014	<0.020	<0.167	--
PCB-186	<0.272	<0.242	<0.013	<0.020	<0.167	--
PCB-188	<0.211	<0.188	<0.010	<0.016	<0.130	90.3
PCB-189	<0.230	<0.205	<0.011	<0.017	<0.141	97.4
PCB-191	<0.274	<0.245	<0.013	<0.021	<0.169	--
PCB-193	0.44	<0.245	0.022	<0.021	<0.169	--
PCB-194	e1.72	e0.493	e0.086	e0.042	<0.188	100
PCB-195	e0.750	<0.371	e0.037	<0.031	<0.188	--
PCB-196 + 203	1.95	<0.364	0.098	<0.031	<0.184	101
PCB-197	<0.153	<0.260	<0.007	<0.022	<0.131	--
PCB-198	<0.215	<0.364	<0.010	<0.031	<0.184	--
PCB-199	1.86	<0.364	0.093	<0.031	<0.184	--
PCB-200	<0.153	<0.260	<0.007	<0.022	<0.131	--
PCB-201	0.159	<0.260	0.008	<0.022	<0.131	--
PCB-202	0.398	<0.292	0.020	<0.025	<0.148	95.5
PCB-204	<0.153	<0.260	<0.007	<0.022	<0.131	--
PCB-205	<0.168	<0.285	<0.008	<0.024	<0.144	97.6
PCB-206	1.59	<0.816	0.080	<0.070	<0.860	93.6
PCB-207	<0.574	<0.740	<0.028	<0.063	<0.780	--
PCB-208	0.753	<0.740	0.038	<0.063	<0.780	96.5
PCB-209	1.32	<0.287	0.066	<0.024	<0.138	92
Total	591	130	29.6	11.2	<1.64	--
Polychlorinated biphenyl homologs						
Total Monochlorobiphenyls	8.36	0.793	0.419	0.068	<1.64	--
Total Dichlorobiphenyls	94.9	31.4	4.76	2.70	<0.767	--
Total Trichlorobiphenyls	113	34.8	5.67	3.00	<0.290	--
Total Tetrachlorobiphenyls	167	35.2	8.38	3.03	<0.271	--
Total Pentachlorobiphenyls	110	16.4	5.52	1.41	<0.309	--
Total Hexachlorobiphenyls	71.1	9.96	3.57	0.858	<0.196	--
Total Heptachlorobiphenyls	19.1	1.58	0.958	0.136	<0.202	--
Total Octachlorobiphenyls	4.37	<0.371	0.219	<0.031	<0.188	--
Total Nonachlorobiphenyls	2.34	<0.816	0.117	<0.070	<0.860	--
Decachlorobiphenyls	1.32	<0.287	0.066	<0.024	<0.138	--
Polychlorinated biphenyl Aroclors						
Aroclor 1221	<0.245	<1.33	<0.012	<0.114	<3.12	--
Aroclor 1232	<1.35	<1.31	<0.067	<0.112	<5.58	--
Aroclor 1016/1242	177	52.5	8.88	4.52	<2.46	--
Aroclor 1248	<2.59	<1.35	<0.129	<0.116	<0.798	--
Aroclor 1254	187	33.3	9.38	2.87	<3.09	--
Aroclor 1260	78.8	6.59	3.95	0.568	<1.43	--

Table 15. Concentrations of particulate and dissolved polychlorinated biphenyls in water upstream (at Blue Hill Avenue) and downstream (at Central Avenue) of the Braided Channel, Neponset River, Massachusetts, October, 15, 2005.

[Analyzed by AXYS Analytical Services Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners											
									Quality-control samples			
	Blue Hill Avenue				Central Avenue				Laboratory blank		Matrix spike	
	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
PCB-1	5.85	0.493	37.6	3.17	7.92	0.596	23.4	1.76	<2.13	e0.333	75.1	79.8
PCB-2	<0.419	<0.035	<0.142	<0.011	0.361	0.027	<0.283	<0.021	<2.12	0.287	--	--
PCB-3	2.51	0.212	e1.07	e0.090	2.86	0.215	e0.417	e0.031	<2.12	e0.064	94.6	89.5
PCB-4 + 10	12.6	1.06	76.3	6.433	19.5	1.47	91	6.85	<0.324	<0.072	69.6	82.1
PCB-5 + 8	13.3	1.12	18.5	1.560	12.9	0.971	12.8	0.963	<0.183	e0.141	91	87.7
PCB-6	2.47	0.208	3.57	0.301	2.75	0.207	2.88	0.217	e0.256	<0.041	--	--
PCB-7 + 9	e1.28	e0.107	e1.35	e0.113	e0.855	e0.064	e1.47	e0.110	e1.52	e0.246	--	--
PCB-11	e1.66	e0.139	e2.28	e0.192	e1.27	e0.095	e1.27	e0.095	<0.183	e0.367	--	--
PCB-12 + 13	0.847	0.071	e6.75	e0.569	e1.63	e0.122	<0.240	<0.018	<0.183	e0.457	--	--
PCB-14	<0.309	<0.026	<0.195	<0.016	e4.10	e0.308	<0.240	<0.018	<0.183	e0.061	--	--
PCB-15	13.4	1.13	e3.01	e0.253	13.5	1.02	e3.82	e0.287	e0.623	e0.093	107	85.9
PCB-16 + 32	9.25	0.780	12.0	1.012	10.5	0.790	13.6	1.02	<0.108	e0.093	--	--
PCB-17	6.46	0.545	8.64	0.728	8.16	0.614	10.7	0.805	<0.108	<0.056	--	--
PCB-18	2.79	0.235	4.67	0.394	4.23	0.318	6.99	0.526	<0.108	<0.056	77.5	82.9
PCB-19	3.61	0.304	12.0	1.012	5.58	0.420	16.8	1.26	<0.129	<0.066	64.7	78.4
PCB-20 + 21 + 33	0.788	0.066	e0.602	e0.050	1.14	0.086	e0.498	e0.037	e0.113	<0.077	--	--
PCB-22	1.28	0.108	0.531	0.045	1.71	0.129	0.999	0.075	<0.075	<0.077	--	--
PCB-23 + 34	0.188	0.016	<0.129	<0.010	0.256	0.019	0.156	0.012	<0.068	<0.035	79.9	76.1
PCB-24 + 27	4.91	0.414	6.94	0.585	5.76	0.433	9.35	0.704	<0.108	<0.056	--	--
PCB-25	3.37	0.284	1.76	0.148	4.02	0.302	1.91	0.144	<0.068	e0.078	--	--
PCB-26	5.52	0.465	3.14	0.265	6.13	0.461	3.97	0.299	<0.068	e0.188	--	--
PCB-28	8.84	0.745	2.38	0.201	e8.66	e0.651	3.57	0.269	e0.096	e0.079	92.9	88.5
PCB-29	<0.153	<0.012	<0.129	<0.010	<0.086	<0.006	<0.107	<0.008	<0.068	e0.042	--	--
PCB-30	<0.242	<0.020	<0.205	<0.017	<0.136	<0.010	<0.170	<0.012	<0.108	<0.056	--	--
PCB-31	8.83	0.745	5.25	0.443	12	0.903	5.36	0.403	<0.068	e0.053	92.2	85.3
PCB-35	<0.221	<0.018	<0.399	<0.033	0.242	0.018	<0.445	<0.033	<0.080	e0.698	--	--
PCB-36	<0.206	<0.017	<0.373	<0.031	e0.242	e0.018	<0.416	<0.031	<0.075	e1.06	--	--
PCB-37	e1.25	e0.105	<0.399	<0.033	2.41	0.181	e0.549	e0.041	<0.080	e0.138	105	88.5
PCB-38	0.456	0.038	0.525	0.044	e0.823	e0.061	e0.560	e0.042	<0.080	<0.082	--	--

Table 15. Concentrations of particulate and dissolved polychlorinated biphenyls in water upstream (at Blue Hill Avenue) and downstream (at Central Avenue) of the Braided Channel, Neponset River, Massachusetts, October, 15, 2005.—Continued

[Analyzed by AXYS Analytical Services Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners											
									Quality-control samples			
	Blue Hill Avenue				Central Avenue				Laboratory blank		Matrix spike	
	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
PCB-39	<0.206	<0.017	<0.373	<0.031	e0.222	e0.016	<0.416	<0.031	<0.075	e0.082	--	--
PCB-40	0.76	0.064	0.329	0.028	1.13	0.085	0.548	0.041	<0.191	<0.136	88.5	81.8
PCB-41 + 64 + 68 + 71	9.33	0.787	4.42	0.373	12.8	0.963	6.23	0.469	<0.080	<0.074	--	--
PCB-42 + 59	2.37	0.200	0.999	0.084	3.51	0.264	0.427	0.032	<0.080	<0.074	--	--
PCB-43 + 49	8.54	0.720	3.73	0.315	11.8	0.888	4.69	0.353	<0.084	<0.077	83.9	82.8
PCB-44	3.66	0.309	1.73	0.146	6.19	0.466	3.37	0.254	<0.080	<0.074	82.9	80.7
PCB-45	e0.372	e0.031	0.423	0.036	0.887	0.067	0.64	0.048	<0.071	<0.065	--	--
PCB-46	0.314	0.026	0.221	0.019	0.508	0.038	0.389	0.029	<0.071	<0.065	--	--
PCB-47 + 48 + 75	12.7	1.07	10.8	0.911	20.4	1.53	13.1	0.986	<0.071	<0.065	--	--
PCB-50	<0.180	<0.015	<0.098	<0.008	<0.128	<0.009	0.101	0.008	<0.060	<0.055	--	--
PCB-51	1.84	0.155	2.65	0.223	2.88	0.217	2.8	0.211	<0.071	<0.065	--	--
PCB-52 + 73	7.99	0.674	4.34	0.366	11.7	0.880	5.9	0.444	<0.071	<0.065	80.8	79.1
PCB-53	2.39	0.202	2.3	0.194	3.39	0.255	3.11	0.234	<0.071	<0.065	--	--
PCB-54	e0.190	e0.016	0.236	0.020	e0.260	e0.019	0.284	0.021	<0.060	<0.055	63.5	73.3
PCB-55	<0.097	<0.008	<0.080	<0.006	<0.161	<0.012	<0.093	<0.006	<0.100	<0.072	--	--
PCB-56 + 60	2.06	0.174	e0.215	e0.018	3.14	0.236	0.587	0.044	<0.100	<0.072	93.4	84.3
PCB-57	0.53	0.045	<0.152	<0.012	e0.655	e0.049	<0.177	<0.013	<0.191	<0.136	--	--
PCB-58	<0.184	<0.015	<0.152	<0.012	<0.306	<0.023	<0.177	<0.013	<0.191	<0.136	--	--
PCB-61 + 74	2.04	0.172	0.346	0.029	3.08	0.232	0.448	0.034	<0.098	<0.070	--	--
PCB-62 + 65	<0.213	<0.017	<0.116	<0.009	<0.151	<0.011	<0.110	<0.008	<0.071	<0.065	--	--
PCB-63	0.674	0.057	0.156	0.013	0.86	0.065	0.187	0.014	<0.098	<0.070	--	--
PCB-66 + 80	3.59	0.303	0.644	0.054	5.72	0.430	0.993	0.075	<0.098	<0.070	92	84
PCB-67	0.266	0.022	<0.152	<0.012	0.552	0.042	<0.177	<0.013	<0.191	<0.136	--	--
PCB-69	7.83	0.660	<0.116	<0.009	<0.151	<0.011	<0.110	<0.008	<0.071	<0.065	--	--
PCB-70 + 76	3.29	0.277	0.721	0.061	5.14	0.387	1.05	0.079	<0.098	<0.070	--	--
PCB-72	0.39	0.033	<0.132	<0.011	e0.614	e0.046	<0.125	<0.009	<0.080	<0.074	--	--
PCB-77	0.643	0.054	e0.235	e0.019	e1.71	e0.128	e0.186	e0.013	<0.145	e0.165	102	92.5
PCB-78	<0.150	<0.012	<0.149	<0.012	<0.173	<0.013	<0.160	<0.012	<0.145	<0.082	--	--
PCB-79	<0.150	<0.012	<0.149	<0.012	<0.173	<0.013	<0.160	<0.012	<0.145	<0.082	--	--
PCB-81	<0.150	<0.012	<0.149	<0.012	0.269	0.020	<0.160	<0.012	<0.145	e0.242	103	94.5

Table 15. Concentrations of particulate and dissolved polychlorinated biphenyls in water upstream (at Blue Hill Avenue) and downstream (at Central Avenue) of the Braided Channel, Neponset River, Massachusetts, October, 15, 2005.—Continued

[Analyzed by AXYS Analytical Services Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners											
									Quality-control samples			
	Blue Hill Avenue				Central Avenue				Laboratory blank		Matrix spike	
	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
PCB-82	0.639	0.054	<0.108	<0.009	1.06	0.080	e0.195	e0.014	<0.081	<0.097	--	--
PCB-83 + 108	e0.676	e0.056	<0.153	<0.012	e0.745	e0.056	<0.237	<0.017	<0.093	<0.063	--	--
PCB-84	1.46	0.123	e0.388	e0.032	2.03	0.153	e0.701	e0.052	<0.080	<0.054	--	--
PCB-85 + 120	1.26	0.106	e0.163	e0.013	e2.49	e0.187	e0.216	e0.016	<0.081	e0.747	--	--
PCB-86 + 97	1.83	0.154	0.33	0.028	2.63	0.198	0.562	0.042	<0.081	<0.097	--	--
PCB-87 + 115 + 116	2.83	0.239	e0.355	e0.029	3.79	0.285	<0.134	<0.010	<0.081	<0.097	97.1	88.4
PCB-88 + 121	<0.240	<0.020	<0.156	<0.013	<0.162	<0.012	<0.242	<0.018	<0.095	<0.064	--	--
PCB-89 + 90 + 101	5.32	0.449	1.02	0.086	7.54	0.567	1.33	0.100	<0.080	<0.054	93	83.2
PCB-91	1.89	0.159	e0.441	e0.037	2.64	0.199	0.548	0.041	<0.095	<0.064	--	--
PCB-92	1.73	0.146	0.39	0.033	2.33	0.175	e0.422	e0.031	<0.080	<0.054	--	--
PCB-93 + 95	5.03	0.424	1.5	0.126	7.26	0.546	2.45	0.184	<0.095	<0.064	89.2	81.5
PCB-94	<0.240	<0.020	<0.156	<0.013	0.377	0.028	<0.242	<0.018	<0.095	<0.064	--	--
PCB-96	<0.240	<0.020	<0.156	<0.013	0.246	0.019	<0.242	<0.018	<0.095	<0.064	--	--
PCB-98 + 102	0.5	0.042	e0.212	e0.017	0.747	0.056	<0.242	<0.018	<0.095	<0.064	--	--
PCB-99	3.09	0.261	0.441	0.037	3.99	0.300	0.605	0.046	<0.077	e0.052	93.6	82.6
PCB-100	<0.240	<0.020	<0.156	<0.013	e0.292	e0.021	<0.242	<0.018	<0.095	<0.064	--	--
PCB-103	<0.240	<0.020	<0.156	<0.013	0.398	0.030	<0.242	<0.018	<0.095	e0.097	--	--
PCB-104	<0.175	<0.014	<0.114	<0.009	<0.119	<0.008	<0.176	<0.013	<0.069	<0.046	78.7	78.3
PCB-105 + 127	1.68	0.142	e0.128	e0.010	2.2	0.166	<0.093	<0.006	<0.056	<0.068	97.7	85.5
PCB-106 + 118	4.04	0.341	0.462	0.039	6.2	0.467	0.531	0.040	<0.052	<0.071	91.8	80.9
PCB-107 + 109	0.4	0.034	<0.075	<0.006	0.642	0.048	<0.092	<0.006	<0.056	<0.067	--	--
PCB-110	8.51	0.718	1.37	0.116	11.4	0.858	1.97	0.148	<0.056	<0.067	94.3	83.9
PCB-111 + 117	<0.197	<0.016	<0.108	<0.009	0.321	0.024	e0.171	e0.012	<0.081	<0.097	--	--
PCB-112	<0.236	<0.019	<0.153	<0.012	<0.160	<0.012	<0.237	<0.017	<0.093	<0.063	--	--
PCB-113	<0.202	<0.017	<0.131	<0.011	<0.136	<0.010	<0.203	<0.015	<0.080	<0.054	--	--
PCB-114	e0.153	e0.012	<0.075	<0.006	e0.159	e0.011	<0.093	<0.006	<0.056	<0.067	99.3	85.1
PCB-119	0.66	0.056	<0.127	<0.010	0.702	0.053	<0.196	<0.014	<0.077	<0.052	--	--
PCB-122	<0.136	<0.011	<0.075	<0.006	0.134	0.010	<0.093	<0.006	<0.056	<0.067	--	--
PCB-123	0.173	0.015	<0.073	<0.006	0.249	0.019	<0.093	<0.006	<0.052	e0.079	85.3	78.4
PCB-124	e0.213	e0.017	<0.075	<0.006	e0.247	e0.018	<0.092	<0.006	<0.056	<0.067	--	--

Table 15. Concentrations of particulate and dissolved polychlorinated biphenyls in water upstream (at Blue Hill Avenue) and downstream (at Central Avenue) of the Braided Channel, Neponset River, Massachusetts, October, 15, 2005.—Continued

[Analyzed by AXYS Analytical Services Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners											
									Quality-control samples			
	Blue Hill Avenue				Central Avenue				Laboratory blank		Matrix spike	
	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
PCB-125	<0.197	<0.016	<0.108	<0.009	<0.166	<0.012	<0.134	<0.010	<0.081	<0.097	--	--
PCB-126	<0.143	<0.012	<0.079	<0.006	<0.121	<0.009	<0.097	<0.007	<0.059	<0.070	--	--
PCB-128	1.27	0.107	<0.095	<0.008	1.76	0.132	0.236	0.018	<0.022	<0.106	--	--
PCB-129	0.274	0.023	<0.095	<0.008	0.409	0.031	<0.113	<0.008	<0.022	<0.106	--	--
PCB-130	0.519	0.044	<0.095	<0.008	0.633	0.048	<0.113	<0.008	e0.034	<0.106	--	--
PCB-131 + 142	<0.155	<0.013	<0.080	<0.006	<0.112	<0.008	<0.109	<0.008	<0.065	<0.054	--	--
PCB-132 + 168	2.13	0.180	0.247	0.021	2.75	0.207	0.321	0.024	<0.020	<0.097	--	--
PCB-133	<0.155	<0.013	<0.080	<0.006	0.193	0.015	<0.109	<0.008	<0.065	<0.054	--	--
PCB-134 + 143	0.358	0.030	<0.080	<0.006	e0.551	e0.041	<0.109	<0.008	<0.065	<0.054	--	--
PCB-135 + 144	0.907	0.076	e0.121	e0.010	1.3	0.098	0.198	0.015	<0.065	<0.054	--	--
PCB-136	1.04	0.088	0.162	0.014	1.21	0.091	0.215	0.016	<0.065	<0.054	--	--
PCB-137	0.321	0.027	<0.081	<0.006	0.474	0.036	<0.096	<0.007	0.025	<0.090	--	--
PCB-138 + 163 + 164	7.03	0.593	0.639	0.054	9.35	0.704	0.975	0.073	0.023	<0.090	94.1	88.5
PCB-139 + 149	4.11	0.347	0.527	0.044	5.57	0.419	e0.641	e0.048	<0.065	<0.054	98.2	85
PCB-140	<0.155	<0.013	<0.080	<0.006	<0.112	<0.008	<0.109	<0.008	<0.065	<0.054	--	--
PCB-141	e0.529	e0.044	<0.081	<0.006	0.96	0.072	<0.096	<0.007	e0.034	<0.090	--	--
PCB-145	<0.155	<0.013	<0.080	<0.006	<0.112	<0.008	<0.109	<0.008	<0.065	<0.054	--	--
PCB-146	0.833	0.070	0.151	0.013	1.24	0.093	0.141	0.011	<0.060	<0.049	--	--
PCB-147	0.288	0.024	<0.080	<0.006	e0.426	e0.032	<0.109	<0.008	<0.065	<0.054	--	--
PCB-148	<0.155	<0.013	<0.080	<0.006	<0.112	<0.008	<0.109	<0.008	<0.065	<0.054	--	--
PCB-150	<0.155	<0.013	<0.080	<0.006	<0.112	<0.008	<0.109	<0.008	<0.065	<0.054	--	--
PCB-151	1.17	0.099	0.178	0.015	1.61	0.121	e0.306	e0.023	<0.082	<0.067	99.6	87
PCB-152	<0.155	<0.013	<0.080	<0.006	<0.112	<0.008	<0.109	<0.008	<0.065	<0.054	--	--
PCB-153	4.29	0.362	0.511	0.043	6.24	0.470	0.611	0.046	0.018	<0.082	94.7	88.1
PCB-154	<0.155	<0.013	<0.080	<0.006	0.145	0.011	<0.109	<0.008	<0.065	<0.054	--	--
PCB-155	<0.108	<0.009	<0.056	<0.004	<0.078	<0.005	<0.076	<0.005	<0.046	<0.038	89.6	79.5
PCB-156	0.554	0.047	<0.063	<0.005	0.84	0.063	<0.075	<0.005	0.029	<0.071	93.9	88
PCB-157	0.168	0.014	<0.064	<0.005	0.242	0.018	<0.076	<0.005	0.021	<0.071	94.9	88.3
PCB-158 + 160	0.798	0.067	0.091	0.008	1.01	0.076	e0.122	e0.009	<0.018	<0.090	--	--
PCB-159	<0.135	<0.011	<0.081	<0.006	<0.162	<0.012	<0.096	<0.007	<0.018	<0.090	--	--

Table 15. Concentrations of particulate and dissolved polychlorinated biphenyls in water upstream (at Blue Hill Avenue) and downstream (at Central Avenue) of the Braided Channel, Neponset River, Massachusetts, October, 15, 2005.—Continued

[Analyzed by AXYS Analytical Services Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners											
									Quality-control samples			
	Blue Hill Avenue				Central Avenue				Laboratory blank		Matrix spike	
	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
PCB-161	<0.141	<0.011	<0.073	<0.006	<0.102	<0.007	<0.099	<0.007	<0.060	<0.049	--	--
PCB-162	<0.135	<0.011	<0.081	<0.006	<0.162	<0.012	<0.096	<0.007	<0.018	<0.090	--	--
PCB-165	<0.141	<0.011	<0.073	<0.006	<0.102	<0.007	<0.099	<0.007	<0.060	<0.049	--	--
PCB-166	<0.135	<0.011	<0.081	<0.006	<0.162	<0.012	<0.096	<0.007	<0.018	<0.090	--	--
PCB-167	0.244	0.021	<0.062	<0.005	0.327	0.025	<0.073	<0.005	0.016	<0.069	93.1	86.2
PCB-169	<0.106	<0.008	<0.064	<0.005	<0.128	<0.009	<0.076	<0.005	e0.043	<0.071	96.1	88.4
PCB-170 + 190	1.21	0.102	0.14	0.012	1.85	0.139	e0.228	e0.017	<0.129	<0.110	96.7	85.4
PCB-171	<0.100	<0.008	<0.043	<0.003	0.329	0.025	<0.110	<0.008	<0.105	<0.089	--	--
PCB-172 + 192	e0.132	e0.011	<0.043	<0.003	e0.219	e0.016	<0.110	<0.008	<0.105	<0.089	--	--
PCB-173	<0.100	<0.008	<0.043	<0.003	<0.132	<0.009	<0.110	<0.008	<0.105	<0.089	--	--
PCB-174 + 181	0.71	0.060	e0.047	e0.003	e0.888	e0.066	<0.111	<0.008	<0.105	<0.090	--	--
PCB-175	<0.101	<0.008	<0.044	<0.003	<0.135	<0.010	<0.112	<0.008	<0.107	<0.091	--	--
PCB-176	0.091	0.008	e0.035	e0.002	e0.173	e0.013	<0.086	<0.006	<0.082	<0.070	--	--
PCB-177	0.467	0.039	<0.043	<0.003	0.773	0.058	<0.111	<0.008	<0.105	<0.090	--	--
PCB-178	e0.134	e0.011	<0.044	<0.003	0.214	0.016	<0.112	<0.008	<0.107	<0.091	--	--
PCB-179	0.357	0.030	e0.034	e0.002	0.517	0.039	e0.107	e0.008	<0.082	<0.070	--	--
PCB-180	<0.100	<0.008	0.269	0.023	2.51	0.189	<0.110	<0.008	<0.105	<0.089	91.3	84.1
PCB-182 + 187	1.1	0.093	0.108	0.009	1.29	0.097	0.182	0.014	<0.107	<0.091	93.7	86.2
PCB-183	e0.536	e0.045	e0.046	e0.003	0.634	0.048	<0.111	<0.008	<0.105	<0.090	94.5	87.5
PCB-184	<0.078	<0.006	e0.040	e0.003	<0.104	<0.007	<0.086	<0.006	<0.082	<0.070	--	--
PCB-185	e0.114	e0.009	<0.043	<0.003	0.143	0.011	<0.111	<0.008	<0.105	<0.090	--	--
PCB-186	<0.101	<0.008	<0.044	<0.003	<0.135	<0.010	<0.112	<0.008	<0.107	<0.091	--	--
PCB-188	<0.078	<0.006	<0.034	<0.002	<0.104	<0.007	<0.086	<0.006	<0.082	<0.070	92	85.3
PCB-189	0.111	0.009	e0.051	e0.004	<0.110	<0.008	<0.092	<0.006	<0.087	<0.074	94.1	84.6
PCB-191	<0.100	<0.008	<0.043	<0.003	<0.132	<0.009	<0.110	<0.008	<0.105	<0.089	--	--
PCB-193	<0.100	<0.008	<0.043	<0.003	<0.132	<0.009	<0.110	<0.008	<0.105	<0.089	--	--
PCB-194	e0.418	e0.035	e0.174	e0.014	e0.751	e0.056	<0.301	<0.022	<0.137	<0.115	98.9	85.4
PCB-195	<0.306	<0.025	e0.155	e0.013	<0.213	<0.016	<0.301	<0.022	<0.137	<0.115	--	--
PCB-196 + 203	e0.405	e0.034	e0.148	e0.012	e0.764	e0.057	<0.291	<0.021	<0.133	<0.111	98.3	85.9
PCB-197	<0.212	<0.017	<0.095	<0.008	<0.148	<0.011	<0.209	<0.015	<0.095	<0.080	--	--

Table 15. Concentrations of particulate and dissolved polychlorinated biphenyls in water upstream (at Blue Hill Avenue) and downstream (at Central Avenue) of the Braided Channel, Neponset River, Massachusetts, October, 15, 2005.—Continued

[Analyzed by AXYS Analytical Services Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Blue Hill Avenue				Central Avenue				Quality-control samples: Laboratory blank		Quality-control samples: Matrix spike	
	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Particulate (ng/liter)	Dissolved (ng/sample)	Dissolved (ng/liter)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
Polychlorinated biphenyl congeners												
PCB-198	<0.296	<0.024	<0.133	<0.011	<0.206	<0.015	<0.291	<0.021	<0.133	<0.111	--	--
PCB-199	e0.573	e0.048	<0.133	<0.011	e0.837	e0.062	<0.291	<0.021	<0.133	<0.111	--	--
PCB-200	<0.212	<0.017	<0.095	<0.008	<0.148	<0.011	<0.209	<0.015	<0.095	<0.080	--	--
PCB-201	<0.212	<0.017	<0.095	<0.008	<0.148	<0.011	<0.209	<0.015	<0.095	<0.080	--	--
PCB-202	<0.240	<0.020	<0.108	<0.009	<0.167	<0.012	<0.236	<0.017	<0.108	<0.090	94.5	84.1
PCB-204	<0.212	<0.017	<0.095	<0.008	<0.148	<0.011	<0.209	<0.015	<0.095	<0.080	--	--
PCB-205	<0.227	<0.019	<0.102	<0.008	<0.158	<0.011	<0.224	<0.016	<0.102	<0.085	92.2	81.4
PCB-206	0.563	0.047	<0.302	<0.025	0.948	0.071	e0.312	e0.023	<0.173	<0.428	92.1	82.2
PCB-207	<0.229	<0.019	<0.273	<0.023	<0.430	<0.032	e0.261	e0.019	e0.173	<0.387	--	--
PCB-208	<0.229	<0.019	<0.273	<0.023	0.502	0.038	<0.191	<0.014	e0.193	<0.387	94.5	83.7
PCB-209	0.517	0.044	0.142	0.012	0.809	0.061	e0.259	e0.019	<0.123	e0.162	90.4	78.4
Total	251	21.2	237	19.983	320	24.1	259	19.5	0.132	0.287	--	--
Polychlorinated biphenyl homologs												
Total Monochlorobiphenyls	8.36	0.705	37.6	3.170	11.1	0.835	23.4	1.76	<2.13	0.287	--	--
Total Dichlorobiphenyls	42.6	3.59	98.4	8.297	48.7	3.66	107	8.05	<0.324	<0.0721	--	--
Total Trichlorobiphenyls	56.3	4.75	57.8	4.874	62.1	4.67	73.4	5.52	<0.129	<0.0824	--	--
Total Tetrachlorobiphenyls	71.2	6.00	34.0	2.867	94	7.07	44.9	3.38	<0.191	<0.136	--	--
Total Pentachlorobiphenyls	41	3.46	5.51	0.465	56.9	4.28	8	0.602	<0.0948	<0.0968	--	--
Total Hexachlorobiphenyls	26.3	2.22	2.51	0.212	36.3	2.73	2.7	0.203	0.132	<0.106	--	--
Total Heptachlorobiphenyls	4.05	0.341	0.517	0.044	8.26	0.622	0.182	0.014	<0.129	<0.110	--	--
Total Octachlorobiphenyls	<0.306	<0.025	<0.137	<0.011	<0.213	<0.016	<0.301	<0.022	<0.137	<0.115	--	--
Total Nonachlorobiphenyls	0.563	0.047	<0.302	<0.025	1.45	0.109	<0.211	<0.015	<0.173	<0.428	--	--
Decachlorobiphenyls	0.517	0.044	0.142	0.012	0.809	0.061	<0.167	<0.012	<0.123	<0.0930	--	--
Polychlorinated biphenyl Aroclors												
Aroclor 1221	<0.802	<0.067	<0.371	<0.031	<0.414	<0.031	<0.542	<0.040	<4.05	<0.0775	--	--
Aroclor 1232	<1.43	<0.120	<0.697	<0.058	<0.462	<0.034	<0.969	<0.072	<7.24	<0.189	--	--
Aroclor 1016/1242	128	10.79	117	9.87	111	8.35	109	8.20	<0.695	<0.211	--	--
Aroclor 1248	<1.39	<0.117	<0.759	<0.063	<0.996	<0.074	<0.721	<0.054	<0.537	<0.425	--	--
Aroclor 1254	77.5	6.53	7.71	0.650	104	7.83	11.7	0.880	<0.808	<0.968	--	--
Aroclor 1260	8.59	0.724	2.9	0.245	35.5	2.67	<0.959	<0.072	<0.916	<0.781	--	--

Table 16. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed in

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; St., Street;

IUPAC number	Polychlorinated biphenyl congeners								
	Pleasant St. (ng/sample)	Neponset St. (ng/sample)	Paul's Bridge (ng/sample)	Paul's Bridge-D (ng/sample)	Incinerator Road (ng/sample)	Reservation Park (ng/sample)	Reservation Park-D (ng/sample)	Facility #2 (ng/sample)	Facility #2-D (ng/sample)
PCB-1	e3.54	6.67	12.4	7.86	e2.25	3.91	3.62	53.2	20.7
PCB-2	<0.780	<0.257	<0.544	<0.941	<0.248	<0.806	<0.628	<0.418	<0.225
PCB-3	e1.23	e0.596	e1.40	e1.23	e0.348	e2.98	e2.05	5.66	2.26
PCB-4 + 10	10.6	116	189	111	<0.462	14.4	10.6	181	79.2
PCB-5 + 8	2.99	4.45	7.19	4.05	e0.388	4.68	3.67	79.1	38.5
PCB-6	0.96	5.56	6.87	4.4	<0.266	e2.10	1.48	18.8	9.2
PCB-7 + 9	e0.931	5.62	7.6	4.75	<0.266	e0.955	e0.643	3.61	1.35
PCB-11	<0.247	<0.369	<0.397	<0.377	<0.266	e1.08	e0.549	e1.62	e0.440
PCB-12 + 13	e0.456	<0.369	e0.473	<0.377	<0.266	e0.786	e0.622	e4.13	e2.03
PCB-14	<0.247	<0.369	<0.397	<0.377	<0.266	<0.311	<0.275	<0.357	<0.204
PCB-15	e3.12	3.85	7.46	4.24	<0.332	3.96	2.87	28.1	12.3
PCB-16 + 32	5.42	16.5	28.6	17.4	0.782	8.12	6.03	55.1	27
PCB-17	4.02	35.5	44.8	28.7	<0.412	6.59	4.12	38.8	20.7
PCB-18	6.47	14.8	26.9	17	0.89	9.4	6.18	48.8	24.1
PCB-19	3.21	38.4	63.4	37.8	<0.480	4.52	3.18	27.7	12.8
PCB-20 + 21 + 33	e3.48	3.67	e10.6	e6.62	0.601	4.21	2.25	23.8	11.9
PCB-22	e0.922	1.12	2.33	1.35	<0.457	2.94	1.65	19	10.2
PCB-23 + 34	<0.598	<0.332	<0.614	<0.612	<0.310	<0.568	<0.381	0.757	0.368
PCB-24 + 27	2.79	17.8	28.8	17	<0.412	3.72	2.34	15.4	7.02
PCB-25	2.26	11.1	14.9	9.51	<0.310	1.9	1.21	9.97	5.39
PCB-26	3.86	24.2	31.9	19.5	<0.310	3.43	2.39	15.9	8.31
PCB-28	6.17	8.76	16.9	9.92	1.71	10.9	7.67	75.5	42
PCB-29	<0.598	<0.332	<0.614	<0.612	<0.310	<0.568	<0.381	<0.419	<0.273
PCB-30	<0.794	<0.441	<0.815	<0.813	<0.412	<0.755	<0.505	<0.556	<0.362
PCB-31	5.59	8.8	16.6	10.8	1.24	9.4	6.16	67	32.6
PCB-35	e1.04	<0.788	e1.35	<1.19	<0.480	<1.11	<0.591	0.844	<0.412
PCB-36	e2.07	<0.750	<0.850	<1.13	<0.457	e2.32	<0.562	e1.36	e0.409
PCB-37	e2.52	<0.788	3.01	e2.15	<0.480	1.99	1.7	14.2	6.75
PCB-38	<0.795	<0.788	<0.893	<1.19	<0.480	<1.11	<0.591	<0.657	<0.412
PCB-39	<0.756	<0.750	<0.850	<1.13	<0.457	<1.06	<0.562	<0.625	<0.392
PCB-40	e1.46	1.3	3.52	2.12	<0.909	e2.07	1.32	10.2	4.34
PCB-41 + 64 + 68 + 71	9.22	19.5	39.7	25.9	4.4	12.2	8.49	61.8	30.1
PCB-42 + 59	1.89	4.58	10.9	7.01	e0.593	<0.922	1.49	20.1	9.49
PCB-43 + 49	11.4	30.9	65.5	42.3	2.08	9.02	5.71	45.4	22.2
PCB-44	10.6	12.3	31	18.9	2.5	8.06	4.99	42.4	20.6
PCB-45	1.59	1.09	3.39	2.02	<0.389	1.75	0.906	8.3	3.43
PCB-46	<0.643	2.15	4.69	2.76	<0.389	<0.838	<0.594	3.57	1.62
PCB-47 + 48 + 75	5.26	16.1	33.9	22.9	0.977	6.33	3.8	32.4	16
PCB-50	<0.519	<0.415	0.474	e0.438	<0.315	<0.677	<0.480	<0.343	<0.286
PCB-51	1.15	8.75	13.5	8.9	<0.389	1.13	0.678	4.52	2.35
PCB-52 + 73	26.3	41.8	101	65.4	5.23	16.2	10.2	54.1	26.8
PCB-53	4.71	20.8	36.8	23.9	0.985	4.08	2.41	12.7	5.91
PCB-54	<0.519	2.07	3.16	2.15	<0.315	<0.677	<0.480	0.403	<0.286
PCB-55	<0.561	<0.447	<0.553	<0.435	<0.510	<0.974	<0.600	<0.592	<0.415
PCB-56 + 60	e1.68	0.939	3.58	2.51	0.926	3.59	2.09	33.8	16.3
PCB-57	<1.00	1.77	1.91	1.8	<0.909	<1.74	<1.07	<1.06	<0.741
PCB-58	<1.00	<0.797	<0.986	<0.776	<0.909	<1.74	<1.07	<1.06	<0.741
PCB-61 + 74	e4.70	1.55	4.47	3.01	e1.15	3.47	2.6	30.6	16.4
PCB-62 + 65	e0.733	<0.513	<0.463	<0.223	<0.389	<0.838	<0.594	<0.425	<0.354

Mother Brook and the Neponset River and Estuary from July 25 through August 12, 2005.

Ave., Avenue; -D, field duplicate; ng, nanogram; e, estimated; <, actual value is less than value shown; --, not done]

Polychlorinated biphenyl congeners										
Hyde Park Ave. (ng/sample)	Dana Ave. (ng/sample)	Fairmont Ave. (ng/sample)	Fairmont Ave.-D (ng/sample)	Milton Village Marina (ng/sample)	Granite Ave. (ng/sample)	Granite Ave.-D (ng/sample)	Neponset Ave. Rte. 3A Bridge (ng/sample)	Buoy (Neponset Estuary) (ng/sample)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
242	156	983	1,050	718	168	168	34.9	23.3	<0.0398	85.3
e1.28	<0.661	1.3	1.33	<0.854	<0.670	<0.795	<1.18	<0.525	<0.0413	--
10	7.95	75.5	71.2	33.7	10.4	10.4	e3.72	e3.08	<0.0413	88.5
421	341	1,580	1,590	1,770	656	678	199	166	<0.172	87.4
98.4	78.8	513	450	322	136	137	44.1	31.8	<0.0990	92.5
26.9	21	75.3	66.7	71.6	33.1	33.2	10.6	e7.32	<0.0990	--
5.68	5.33	11.8	16.1	13	6.34	7.09	3.08	2.5	<0.0990	--
e2.57	e1.89	e6.78	e7.55	e7.70	e8.03	e8.87	e5.66	e6.61	<0.0990	--
e7.10	e5.17	e11.5	e10.6	e17.9	e12.6	e12.2	e5.38	e4.12	<0.0990	--
<0.281	<0.298	<0.424	<0.293	<0.246	<0.810	<1.04	e0.568	<0.395	<0.0990	--
59.8	60.8	113	126	188	90.1	88.4	36.1	24.6	<0.123	101
87.3	85.4	226	261	223	128	131	51.9	45.5	<0.109	--
54.7	52.8	124	124	166	94.4	97	37.3	32.4	<0.109	--
57.2	50.7	49.7	49.9	126	103	107	43.3	39	<0.109	83.3
59.5	66.3	196	200	227	90	95.7	31.1	26.8	<0.127	79.3
17.1	14	8.07	8.91	19.7	31.9	30.6	15.5	13.7	<0.104	--
19.2	16.2	14	13.3	27.9	26.5	26.8	12.2	10.8	<0.104	--
e0.616	e0.621	4.41	3.24	3.54	1.77	1.76	<0.379	<0.662	<0.0823	90.3
26.8	29.7	118	119	119	51.1	54.9	19.8	17	<0.109	--
15	14.4	41.4	56.7	57.3	32.7	32.6	13.3	11.8	<0.0823	--
23	24.8	66.4	74.4	102	60.5	61.4	25.2	21	<0.0823	--
85.4	80.5	54.2	65.5	117	114	111	53	46.1	<0.0754	87.3
<0.390	<0.374	<0.534	<0.521	<0.248	<0.625	<0.523	<0.379	<0.662	<0.0823	--
<0.517	<0.496	<0.709	<0.692	<0.329	<0.830	<0.694	<0.503	<0.879	<0.109	--
66.8	57.9	103	134	170	130	133	55.7	47.1	<0.0823	95
<0.522	e0.849	<0.754	e1.26	0.845	e2.74	1.44	e1.40	e1.27	<0.109	--
<0.497	e1.26	<0.717	<0.636	e1.17	e1.52	<1.02	e1.10	e1.36	<0.104	--
13.3	10.9	7.09	8.34	17.2	17.2	16.7	8.26	7.08	<0.109	102
e0.700	<0.587	e2.24	e2.92	e1.93	<1.35	<1.07	<0.473	<0.901	<0.109	--
<0.497	<0.559	1.21	0.898	e0.599	<1.29	<1.02	<0.450	<0.857	<0.104	--
9.28	6.31	4.41	3.49	12.1	12.5	12.2	6.21	5.99	<0.155	89.9
57.6	48.1	60.8	76.4	90.2	83.2	83.8	38.2	35.5	<0.0808	--
19	16.1	16.7	23.4	29.1	26	26.6	12.2	11.7	<0.0808	--
43.4	40.2	71.4	103	87.7	65.2	66.4	29.3	27.6	<0.0826	85.4
38	32.3	20.6	25.2	57.2	54.3	54.5	24.8	24.6	<0.0808	83.6
7.71	6.89	7.28	6.95	12.4	12.4	12.2	5.64	5.07	<0.0735	--
4.08	3.94	3.38	3.88	6.58	5.37	5.73	2.39	2.44	<0.0735	--
30.4	29	78.9	99.7	58.7	46.3	46.1	21.8	19.5	<0.0735	--
0.44	0.347	1.51	1.43	0.959	0.575	<0.429	<0.287	<0.374	<0.0594	--
6.11	7.58	18.3	20.5	16.7	9.63	10.1	4.14	3.54	<0.0735	--
53.3	55.4	59.4	73.2	102	77.8	79.3	34.5	33.8	<0.0735	83.6
15.2	18.6	27.8	37.3	40.9	26.7	26.6	10.9	10.1	<0.0735	--
0.726	1.19	2.91	3.16	2.79	1.47	1.46	0.553	0.481	<0.0594	77.7
<0.694	<0.476	<0.639	<0.582	<0.588	<0.703	<0.565	e0.530	<0.416	<0.0869	--
24.5	16.8	8.31	8.6	15.4	25.2	24.2	12.5	11.5	<0.0869	94.1
<1.24	<0.848	5.53	3.04	2.18	1.66	<1.01	e0.813	<0.741	<0.155	--
<1.24	<0.848	<1.14	<1.04	<1.05	<1.25	<1.01	<0.401	<0.741	<0.155	--
23.5	16.4	11.6	25.3	17.3	24.3	22.9	12	11.7	<0.0843	--
<0.462	<0.425	<0.354	<0.562	<0.313	<0.587	<0.531	<0.355	<0.463	<0.0735	--

Table 16. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed in

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; St., Street;

IUPAC number	Polychlorinated biphenyl congeners								
	Pleasant St. (ng/sample)	Neponset St. (ng/sample)	Paul's Bridge (ng/sample)	Paul's Bridge-D (ng/sample)	Incinerator Road (ng/sample)	Reservation Park (ng/sample)	Reservation Park-D (ng/sample)	Facility #2 (ng/sample)	Facility #2-D (ng/sample)
PCB-63	<0.544	0.655	1.08	e0.576	<0.495	<0.945	<0.582	2.88	1.6
PCB-66 + 80	5.73	5.56	17.1	11.4	2.11	6.68	3.97	50	25.8
PCB-67	<1.00	<0.797	1.07	0.79	<0.909	<1.74	<1.07	3.26	1.54
PCB-69	<0.643	<0.513	<0.463	<0.223	<0.389	<0.838	<0.594	<0.425	<0.354
PCB-70 + 76	9.22	7.06	20	12.6	3.21	7.46	6	54.8	28.1
PCB-72	<0.707	1.71	2.97	2.27	<0.428	<0.922	<0.653	e0.495	<0.390
PCB-77	e0.909	<0.447	e2.28	e1.41	<0.670	<1.00	<0.638	4.9	2.61
PCB-78	<0.720	<0.447	<0.425	<0.578	<0.670	<1.00	<0.638	<0.832	<0.523
PCB-79	<0.720	<0.447	<0.425	<0.578	<0.670	<1.00	<0.638	<0.832	<0.523
PCB-81	<0.720	<0.447	e0.619	<0.578	<0.670	<1.00	<0.638	<0.832	<0.523
PCB-82	e1.12	0.88	3.83	2.92	<0.918	<1.21	e0.696	3.9	1.94
PCB-83 + 108	e3.98	e3.82	e6.30	e6.50	e2.77	<0.419	e4.22	e4.03	e3.74
PCB-84	5.28	4.56	17.8	12.1	1.42	2.81	1.69	6.15	3.36
PCB-85 + 120	e0.869	1.74	e6.77	e4.32	<0.918	e1.71	e0.792	5.84	2.54
PCB-86 + 97	4.56	3.76	14.9	10.6	e1.62	3.41	2.04	9.04	4.57
PCB-87 + 115 + 116	6.33	4.52	18.5	13	1.87	4.28	2.98	10.5	5.3
PCB-88 + 121	<0.432	<0.435	<0.404	<0.436	<0.429	<0.428	<0.559	<0.364	<0.258
PCB-89 + 90 + 101	15.4	12.9	53.1	37.6	5.48	10.5	6.62	19.6	10.5
PCB-91	3.43	4.04	12.2	8.54	0.686	1.87	1.25	5.34	2.8
PCB-92	3.28	4.36	14.2	10.5	0.885	1.8	1.04	3.46	1.8
PCB-93 + 95	20.9	19.1	74.4	50.4	4.56	11.6	7.23	19.2	9.2
PCB-94	<0.432	e0.444	0.909	0.726	<0.429	<0.428	<0.559	e0.421	<0.258
PCB-96	<0.432	0.61	1.3	1.16	<0.429	<0.428	<0.559	0.71	e0.363
PCB-98 + 102	0.925	e0.577	2.83	2.18	0.681	0.61	<0.559	1.72	0.965
PCB-99	5.28	5	20.9	15.5	1.95	4.62	2.69	11.1	5.77
PCB-100	<0.432	<0.435	0.848	0.559	<0.429	<0.428	<0.559	<0.364	<0.258
PCB-103	<0.432	<0.435	1.54	1.35	<0.429	<0.428	<0.559	<0.364	<0.258
PCB-104	<0.304	<0.306	<0.284	<0.306	<0.301	<0.300	<0.393	<0.255	<0.181
PCB-105 + 127	e4.62	3.23	7.1	6.21	2.53	2.1	1.4	10	7.46
PCB-106 + 118	7.85	5.5	20.2	15.6	3.41	6.15	3.66	17	8.82
PCB-107 + 109	e0.765	0.684	2.2	1.65	<0.647	<0.851	<0.396	e1.72	e0.867
PCB-110	18.8	17.2	63.2	44.2	4.55	12	7.2	22.8	11.7
PCB-111 + 117	<0.631	<0.595	1.94	e0.884	<0.918	<1.21	<0.562	0.938	0.671
PCB-112	<0.423	<0.426	<0.395	<0.426	<0.420	<0.419	<0.547	<0.356	<0.252
PCB-113	<0.367	<0.369	e0.494	<0.370	<0.364	<0.363	<0.474	<0.309	<0.219
PCB-114	<0.438	<0.414	<0.419	<0.293	<0.638	<0.839	<0.390	e0.786	<0.411
PCB-119	0.867	1.28	3.23	2.44	<0.350	<0.349	<0.456	0.97	<0.210
PCB-122	<0.438	<0.414	<0.419	<0.293	<0.638	<0.839	<0.390	<0.510	<0.411
PCB-123	<0.409	<0.406	e0.750	<0.282	<0.613	<0.862	<0.414	<0.520	<0.404
PCB-124	<0.444	<0.420	1.15	0.922	<0.647	<0.851	<0.396	e0.646	<0.416
PCB-125	<0.631	<0.595	<0.602	<0.421	<0.918	<1.21	<0.562	<0.734	<0.591
PCB-126	<0.488	<0.461	<0.466	<0.326	<0.711	<0.935	<0.435	<0.569	<0.457
PCB-128	1.76	0.714	4.48	3.24	<0.799	<1.49	<0.674	1.77	<0.946
PCB-129	<0.526	<0.412	1.24	0.86	<0.799	<1.49	<0.674	<0.678	<0.946
PCB-130	<0.526	<0.412	1.75	1.21	<0.799	<1.49	<0.674	<0.678	<0.946
PCB-131 + 142	<0.409	<0.347	<0.382	<0.286	<0.309	<0.528	<0.460	<0.437	<0.361
PCB-132 + 168	3.76	2.63	9.55	7.51	e1.16	1.9	1.91	2.64	e1.80
PCB-133	<0.409	<0.347	<0.382	e0.346	<0.309	<0.528	<0.460	<0.437	<0.361
PCB-134 + 143	0.631	0.5	1.69	1.41	<0.309	<0.528	<0.460	<0.437	<0.361

Mother Brook and the Neponset River and Estuary from July 25 through August 12, 2005.—Continued

Ave., Avenue; -D, field duplicate; ng, nanogram; e, estimated; <, actual value is less than value shown; --, not done]

Polychlorinated biphenyl congeners										
Hyde Park Ave. (ng/sample)	Dana Ave. (ng/sample)	Fairmont Ave. (ng/sample)	Fairmont Ave.-D (ng/sample)	Milton Village Marina (ng/sample)	Granite Ave. (ng/sample)	Granite Ave.-D (ng/sample)	Neponset Ave. Rte. 3A Bridge (ng/sample)	Buoy (Neponset Estuary) (ng/sample)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
2.32	1.95	8.28	7.87	3.75	3.81	3.01	1.44	e1.67	<0.0843	--
36.8	27.1	14.2	30.8	27.5	37.8	36.7	18.9	18.8	<0.0843	93.7
2.36	1.83	2.09	3.19	2.63	2.98	2.69	1.22	1.69	<0.155	--
<0.462	<0.425	1.29	1	0.617	<0.587	<0.531	<0.355	<0.463	<0.0735	--
38.3	29.6	11.9	24.1	26.3	38.7	37.6	18.7	18.2	<0.0843	--
<0.508	e0.772	5.43	4.41	2.19	e1.40	e1.32	0.926	<0.510	<0.0808	--
3.39	2.39	e1.95	4.89	e3.25	4	3.25	1.59	1.9	<0.0798	105
<1.31	<0.532	<1.25	<1.17	<0.355	<0.675	<0.582	<0.253	<0.477	<0.0798	--
<1.31	<0.532	<1.25	<1.17	<0.355	<0.675	<0.582	<0.253	<0.477	<0.0798	--
<1.31	<0.532	<1.25	<1.17	<0.355	<0.675	<0.582	<0.253	<0.477	<0.0798	104
3.01	2.26	1.27	1.35	2.21	2.32	2.61	1.18	1.36	<0.302	--
e4.35	e5.33	e4.41	e5.96	e3.90	e3.92	e4.57	e3.55	e4.02	<0.240	--
5.31	6.52	4.35	5.78	7.23	6.5	6.22	3.26	3.48	<0.208	--
e4.18	e3.37	2.66	3.55	e3.18	3.49	e3.67	e1.94	e2.42	<0.302	--
7.11	5.89	3.26	6.26	5.32	6.26	5.98	3.14	3.66	<0.302	--
8.29	8.54	3.39	4.09	5.81	7.36	7.38	4.25	3.69	<0.302	96.1
<0.545	<0.511	<0.574	<0.537	<0.400	<0.526	<0.503	<0.470	<0.539	<0.246	--
15.3	17	13.9	20.6	14.4	14.9	15	8.3	8.89	<0.208	92.7
4.15	4.68	10.5	14.1	5.84	5.66	5.12	2.57	2.43	<0.246	--
3.03	3.77	8.11	8.53	4.69	3.49	3.72	1.88	1.85	<0.208	--
16.8	22.2	15.6	19.3	22.3	21.5	21.5	11.2	11.5	<0.246	91.5
<0.545	<0.511	1.44	1.51	0.508	<0.526	<0.503	<0.470	<0.539	<0.246	--
<0.545	e0.594	0.821	1.29	0.906	0.817	0.777	<0.470	<0.539	<0.246	--
1.58	1.7	2.77	3.95	1.91	1.68	1.65	1.09	e1.11	<0.246	--
7.84	7.82	8.9	15.8	7.25	8.66	7.98	4.58	4.64	<0.200	94.6
<0.545	<0.511	1.33	1.14	<0.400	<0.526	<0.503	<0.470	<0.539	<0.246	--
<0.545	<0.511	1.23	1.32	0.582	<0.526	<0.503	<0.470	<0.539	<0.246	--
<0.383	<0.359	<0.403	<0.377	<0.281	<0.369	<0.354	<0.330	<0.379	<0.173	83.1
5.95	6.28	2.7	8.41	e4.17	6.26	6.35	4.08	4.31	0.916	104
10.7	9.53	9.11	22	7.09	9.17	8.55	5.12	5.29	<0.205	87.1
e1.05	e0.992	2.06	2.95	e0.756	e0.769	e0.750	<0.335	<0.540	<0.213	--
19.2	20.3	21.4	31	21.2	20	19.7	10.8	11.2	<0.213	98.4
<1.02	<0.710	5.3	5.36	1.71	<0.707	<0.662	<0.476	<0.767	<0.302	--
<0.534	<0.501	<0.562	<0.526	<0.391	<0.514	<0.493	<0.460	<0.528	<0.240	--
<0.463	<0.434	<0.487	<0.456	<0.339	<0.446	<0.427	<0.399	<0.457	<0.208	--
<0.708	<0.493	<0.492	0.755	<0.296	<0.492	<0.460	<0.331	<0.533	<0.210	97.1
<0.445	0.741	2.4	2.77	1.05	0.693	e0.623	<0.383	<0.440	<0.200	--
<0.708	<0.493	<0.492	<0.446	<0.296	<0.492	<0.460	<0.331	<0.533	<0.210	--
<0.683	<0.467	<0.480	<0.452	<0.274	<0.471	<0.435	<0.316	<0.498	<0.205	82
<0.718	<0.500	e0.565	<0.453	<0.300	<0.499	<0.466	<0.335	<0.540	<0.213	--
<1.02	<0.710	<0.708	<0.642	<0.426	<0.707	<0.662	<0.476	<0.767	<0.302	--
<0.789	<0.550	<0.548	<0.497	<0.330	<0.548	<0.512	<0.368	<0.593	<0.234	--
1.18	1.74	2.23	2.94	0.713	1.07	0.763	<0.482	0.663	<0.0674	--
<0.905	<0.741	<1.05	<0.964	<0.327	<0.336	<0.443	<0.482	<0.349	<0.0674	--
<0.905	<0.741	<1.05	<0.964	e0.338	<0.336	<0.443	<0.482	<0.349	<0.0674	--
<0.514	<0.224	<0.370	<0.498	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--
2.32	e3.40	3.22	3.73	1.95	2.2	1.96	e1.32	1.25	<0.0603	--
<0.514	<0.224	e0.513	<0.498	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--
<0.514	0.509	0.861	1.16	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--

Table 16. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed in

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; St., Street;

IUPAC number	Polychlorinated biphenyl congeners								
	Pleasant St. (ng/sample)	Neponset St. (ng/sample)	Paul's Bridge (ng/sample)	Paul's Bridge-D (ng/sample)	Incinerator Road (ng/sample)	Reservation Park (ng/sample)	Reservation Park-D (ng/sample)	Facility #2 (ng/sample)	Facility #2-D (ng/sample)
PCB-135 + 144	1.6	1.24	4.61	3.79	0.454	1.01	0.614	1.04	0.722
PCB-136	1.76	1.49	6.04	3.97	0.532	1.23	0.698	1.22	0.636
PCB-137	<0.447	e0.503	1.17	0.758	<0.679	<1.27	<0.573	<0.576	<0.804
PCB-138 + 163 + 164	8.13	5.53	23.5	18.6	2.76	6.86	4.28	7.73	3.96
PCB-139 + 149	7.44	4.7	20.1	16.1	1.77	5.1	3.13	4.91	2.4
PCB-140	<0.409	<0.347	<0.382	<0.286	<0.309	<0.528	<0.460	<0.437	<0.361
PCB-141	1.01	e0.414	2.77	2.47	<0.679	<1.27	<0.573	1.15	<0.804
PCB-145	<0.409	<0.347	<0.382	<0.286	<0.309	<0.528	<0.460	<0.437	<0.361
PCB-146	e1.05	0.719	2.72	2.09	e0.372	<0.472	<0.412	0.831	0.446
PCB-147	<0.409	<0.347	0.805	0.63	<0.309	<0.528	<0.460	<0.437	<0.361
PCB-148	<0.409	<0.347	<0.382	<0.286	<0.309	<0.528	<0.460	<0.437	<0.361
PCB-150	<0.409	<0.347	<0.382	<0.286	<0.309	<0.528	<0.460	<0.437	<0.361
PCB-151	2.03	1.67	5.5	4.26	0.608	1.49	1.05	1.48	0.711
PCB-152	<0.409	<0.347	<0.382	<0.286	<0.309	<0.528	<0.460	<0.437	<0.361
PCB-153	5.39	3.98	15.8	12.5	1.89	5.74	2.66	4.93	2.64
PCB-154	<0.409	<0.347	<0.382	0.339	<0.309	<0.528	<0.460	<0.437	<0.361
PCB-155	<0.279	<0.237	<0.261	<0.195	<0.211	<0.361	<0.314	<0.298	<0.247
PCB-156	0.557	<0.282	1.29	1.09	<0.547	<1.02	<0.462	0.885	<0.648
PCB-157	<0.375	<0.294	<0.489	<0.421	<0.570	<1.06	<0.481	<0.484	<0.675
PCB-158 + 160	1.05	0.769	2.61	2.25	<0.679	<1.27	<0.573	1.13	<0.804
PCB-159	<0.447	<0.350	<0.582	<0.502	<0.679	<1.27	<0.573	<0.576	<0.804
PCB-161	<0.366	<0.311	<0.342	<0.256	<0.276	<0.472	<0.412	<0.391	<0.323
PCB-162	<0.447	<0.350	<0.582	<0.502	<0.679	<1.27	<0.573	<0.576	<0.804
PCB-165	<0.366	<0.311	<0.342	<0.256	<0.276	<0.472	<0.412	<0.391	<0.323
PCB-166	<0.447	<0.350	<0.582	<0.502	<0.679	<1.27	<0.573	<0.576	<0.804
PCB-167	<0.356	<0.279	0.685	0.516	<0.542	<1.01	<0.457	<0.459	<0.641
PCB-169	e0.492	<0.290	<0.483	<0.416	<0.563	<1.05	<0.475	<0.478	<0.667
PCB-170 + 190	0.891	<0.463	1.32	1.32	<0.235	e0.696	e0.499	1.02	1.07
PCB-171	<0.228	<0.389	0.319	<0.281	<0.197	<0.278	<0.314	<0.268	<0.281
PCB-172 + 192	<0.228	<0.389	<0.255	<0.281	<0.197	<0.278	<0.314	<0.268	<0.281
PCB-173	<0.228	<0.389	<0.255	<0.281	<0.197	<0.278	<0.314	<0.268	<0.281
PCB-174 + 181	<0.232	<0.395	1.01	0.923	<0.200	0.822	0.441	0.809	0.476
PCB-175	<0.229	<0.390	<0.255	<0.281	<0.197	<0.279	<0.315	<0.268	<0.281
PCB-176	<0.172	<0.293	<0.192	<0.211	<0.148	<0.210	<0.237	<0.202	<0.212
PCB-177	0.367	<0.395	0.757	0.468	<0.200	0.311	<0.319	0.483	e0.323
PCB-178	<0.229	<0.390	<0.255	<0.281	<0.197	<0.279	<0.315	<0.268	<0.281
PCB-179	e3.59	e3.38	e3.54	e4.84	e3.29	e3.01	e4.64	e3.50	e5.31
PCB-180	1.01	e0.453	2.12	1.52	0.438	1.53	1.24	1.84	1.13
PCB-182 + 187	0.859	<0.390	1.19	1.13	0.307	1.02	0.498	1.09	0.602
PCB-183	e0.261	<0.395	0.623	0.458	<0.200	0.511	<0.319	0.532	<0.285
PCB-184	<0.172	<0.293	<0.192	<0.211	<0.148	<0.210	<0.237	<0.202	<0.212
PCB-185	<0.232	<0.395	<0.258	<0.285	<0.200	<0.283	<0.319	<0.272	<0.285
PCB-186	<0.229	<0.390	<0.255	<0.281	<0.197	<0.279	<0.315	<0.268	<0.281
PCB-188	<0.172	<0.293	<0.192	<0.211	<0.148	<0.210	<0.237	<0.202	<0.212
PCB-189	<0.193	<0.330	<0.216	<0.238	<0.167	<0.236	<0.267	<0.227	<0.238
PCB-191	<0.228	<0.389	<0.255	<0.281	<0.197	<0.278	<0.314	<0.268	<0.281
PCB-193	<0.228	<0.389	<0.255	<0.281	<0.197	<0.278	<0.314	<0.268	<0.281
PCB-194	<0.392	<0.757	<0.700	<0.850	<0.664	<0.806	<0.661	<0.669	<0.608
PCB-195	<0.392	<0.757	<0.700	<0.850	<0.664	<0.806	<0.661	<0.669	<0.608

Mother Brook and the Neponset River and Estuary from July 25 through August 12, 2005.—Continued

Ave., Avenue; -D, field duplicate; ng, nanogram; e, estimated; <, actual value is less than value shown; --, not done]

Polychlorinated biphenyl congeners										
Hyde Park Ave. (ng/sample)	Dana Ave. (ng/sample)	Fairmont Ave. (ng/sample)	Fairmont Ave.-D (ng/sample)	Milton Village Marina (ng/sample)	Granite Ave. (ng/sample)	Granite Ave.-D (ng/sample)	Neponset Ave. Rte. 3A Bridge (ng/sample)	Buoy (Neponset Estuary) (ng/sample)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
1.07	1.15	2.02	2.32	0.849	1.11	0.982	0.588	0.764	<0.0997	--
1.17	1.46	1.72	2.19	1.27	1.3	1.19	0.716	0.893	<0.0997	--
<0.769	e2.80	<0.893	1.4	<0.278	<0.286	<0.377	<0.410	<0.297	<0.0573	--
6.14	8.14	12.5	15.8	4.76	5.65	5.29	3.38	3.64	<0.0573	94.2
4.11	5.16	8.35	9.71	3.94	4.6	4.21	2.82	2.98	<0.0997	103
<0.514	<0.224	<0.370	<0.498	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--
0.94	1.08	1.44	2	0.355	e0.554	0.399	<0.410	e0.334	<0.0573	--
<0.514	<0.224	<0.370	<0.498	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--
<0.460	0.899	1.84	2.25	0.652	0.689	0.561	0.321	0.41	<0.0892	--
<0.514	e0.257	1.51	1.1	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--
<0.514	<0.224	<0.370	<0.498	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--
<0.514	<0.224	<0.370	<0.498	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--
1.38	1.53	3.28	3.34	1.38	1.5	1.6	0.841	1.03	<0.124	100
<0.514	<0.224	<0.370	<0.498	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--
4.53	5.62	8.65	10.4	3.1	3.67	3.48	2.3	2.6	<0.0513	92.4
<0.514	<0.224	0.558	0.562	<0.334	<0.318	<0.294	<0.235	<0.310	<0.0997	--
<0.351	<0.153	<0.253	<0.340	<0.228	<0.217	<0.201	<0.161	<0.212	<0.0681	90.2
<0.620	e1.15	1.86	2.16	<0.224	<0.230	<0.303	<0.330	<0.239	<0.0462	96.5
<0.645	<0.529	<0.749	<0.688	<0.233	<0.240	<0.316	<0.344	<0.249	<0.0481	99.8
<0.769	1.18	1.65	2.59	0.506	0.695	e0.699	<0.410	0.374	<0.0573	--
<0.769	<0.630	<0.893	<0.820	<0.278	<0.286	<0.377	<0.410	<0.297	<0.0573	--
<0.460	<0.200	<0.331	<0.445	<0.299	<0.285	<0.263	<0.210	<0.277	<0.0892	--
<0.769	<0.630	<0.893	<0.820	<0.278	<0.286	<0.377	<0.410	<0.297	<0.0573	--
<0.460	<0.200	<0.331	<0.445	<0.299	<0.285	<0.263	<0.210	<0.277	<0.0892	--
<0.769	<0.630	<0.893	<0.820	<0.278	<0.286	<0.377	<0.410	<0.297	<0.0573	--
<0.613	<0.502	<0.712	0.909	<0.221	<0.228	<0.300	<0.327	<0.237	<0.0457	96.7
<0.638	<0.522	<0.740	<0.680	<0.230	<0.237	<0.312	<0.340	<0.246	<0.0475	97.9
0.873	2.49	5.12	4.39	0.333	0.522	e0.654	<0.317	<0.311	<0.131	97.8
<0.273	0.318	0.923	0.526	<0.131	<0.204	<0.284	<0.266	<0.261	<0.110	--
<0.273	<0.301	0.626	0.633	<0.131	<0.204	<0.284	<0.266	<0.261	<0.110	--
<0.273	<0.301	<0.328	<0.421	<0.131	<0.204	<0.284	<0.266	<0.261	<0.110	--
0.616	1.16	2.18	2.06	<0.133	<0.207	<0.289	<0.270	<0.265	<0.111	--
<0.274	<0.301	<0.328	<0.422	<0.131	<0.204	<0.285	<0.266	<0.262	<0.110	--
<0.206	<0.227	0.258	<0.317	<0.0984	<0.154	<0.214	<0.200	<0.197	<0.0827	--
0.36	0.645	1.76	1.45	0.197	0.307	<0.289	<0.270	<0.265	<0.111	--
<0.274	<0.301	0.786	0.501	<0.131	<0.204	<0.285	<0.266	<0.262	<0.110	--
e3.42	e5.04	e4.53	e5.24	e3.10	e3.03	e4.34	e3.20	e3.51	e1.51	--
1.52	3.26	8.32	6.78	0.544	0.741	0.466	0.37	0.345	<0.110	97
0.7	1.29	4.37	3.14	0.378	0.676	0.496	e0.419	0.484	<0.110	96.4
<0.277	0.724	2.03	1.73	<0.133	<0.207	<0.289	<0.270	<0.265	<0.111	101
<0.206	<0.227	<0.247	<0.317	<0.0984	<0.154	<0.214	<0.200	<0.197	<0.0827	--
<0.277	<0.305	<0.333	<0.427	<0.133	<0.207	<0.289	<0.270	<0.265	<0.111	--
<0.274	<0.301	<0.328	<0.422	<0.131	<0.204	<0.285	<0.266	<0.262	<0.110	--
<0.206	<0.227	<0.247	<0.317	<0.0984	<0.154	<0.214	<0.200	<0.197	<0.0827	92.2
<0.232	<0.255	<0.278	<0.357	<0.111	<0.173	<0.241	<0.225	<0.222	<0.0931	99.5
<0.273	<0.301	<0.328	<0.421	<0.131	<0.204	<0.284	<0.266	<0.261	<0.110	--
<0.273	<0.301	0.632	0.642	<0.131	<0.204	<0.284	<0.266	<0.261	<0.110	--
<0.464	e1.15	e3.68	e2.69	<0.320	<0.442	<0.331	<0.146	<0.327	<0.140	105
<0.464	<0.625	e1.40	e1.15	<0.320	<0.442	<0.331	<0.146	<0.327	<0.140	--

Table 16. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed in

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; St., Street;

IUPAC number	Pleasant St. (ng/sample)	Neponset St. (ng/sample)	Paul's Bridge (ng/sample)	Paul's Bridge-D (ng/sample)	Incinerator Road (ng/sample)	Reserva-tion Park (ng/sample)	Reservation Park-D (ng/sample)	Facility #2 (ng/sample)	Facility #2-D (ng/sample)
	Polychlorinated biphenyl congeners								
PCB-196 + 203	<0.369	<0.712	<0.658	<0.799	<0.625	<0.757	<0.621	<0.628	<0.571
PCB-197	<0.258	<0.498	<0.460	<0.559	<0.437	<0.530	<0.434	<0.439	<0.399
PCB-198	<0.369	<0.712	<0.658	<0.799	<0.625	<0.757	<0.621	<0.628	<0.571
PCB-199	<0.369	<0.712	<0.658	<0.799	<0.625	<0.757	<0.621	e0.726	<0.571
PCB-200	<0.258	<0.498	<0.460	<0.559	<0.437	<0.530	<0.434	<0.439	<0.399
PCB-201	<0.258	<0.498	<0.460	<0.559	<0.437	<0.530	<0.434	<0.439	<0.399
PCB-202	<0.295	<0.570	<0.527	<0.640	<0.500	<0.606	<0.497	<0.503	<0.457
PCB-204	<0.258	<0.498	<0.460	<0.559	<0.437	<0.530	<0.434	<0.439	<0.399
PCB-205	<0.294	<0.568	<0.525	<0.637	<0.498	<0.604	<0.495	<0.501	<0.455
PCB-206	<0.540	<0.431	<0.417	<0.536	<0.483	<0.590	<0.678	<0.681	<0.514
PCB-207	e0.528	<0.369	<0.357	<0.459	<0.414	<0.505	<0.581	<0.583	<0.441
PCB-208	<0.462	<0.369	<0.357	<0.459	<0.414	<0.505	<0.581	<0.583	<0.441
PCB-209	<0.282	<0.477	<0.522	<0.344	<0.248	0.407	0.338	<0.310	<0.311
Total	273	616	1,360	891	64.4	264	176	1,440	700
	Polychlorinated biphenyl homologs								
Total Monochlorobiphenyls	<0.780	6.67	12.4	7.86	<0.248	3.91	3.62	58.9	23
Total Dichlorobiphenyls	14.5	135	218	128	<0.462	23	18.6	311	141
Total Trichlorobiphenyls	39.8	181	278	169	5.21	67.1	44.9	413	209
Total Tetrachlorobiphenyls	87.1	181	399	259	22.4	79.9	54.6	476	235
Total Pentachlorobiphenyls	92.8	89.4	336	238	28	61.7	37.8	148	77.4
Total Hexachlorobiphenyls	35.1	23.9	106	83.6	8.01	23.3	14.3	29.7	11.5
Total Heptachlorobiphenyls	3.13	<0.463	7.33	5.83	0.745	4.19	2.18	5.78	3.28
Total Octachlorobiphenyls	<0.392	<0.757	<0.700	<0.850	<0.664	<0.806	<0.661	<0.669	<0.608
Total Nonachlorobiphenyls	<0.540	<0.431	<0.417	<0.536	<0.483	<0.590	<0.678	<0.681	<0.514
Decachlorobiphenyls	<0.282	<0.477	<0.522	<0.344	<0.248	0.407	0.338	<0.310	<0.311
	Polychlorinated biphenyl Aroclors								
Aroclor 1221	<1.48	<0.702	<1.03	<1.79	<0.506	<1.53	<1.19	<0.795	<0.427
Aroclor 1232	<2.70	<1.50	<2.77	<3.20	<1.40	<2.74	<2.14	<1.89	<1.23
Aroclor 1016/1242	80.6	140	257	158	14.6	130	89.9	1,030	521
Aroclor 1248	<3.97	<3.17	<2.95	<2.32	<2.72	<5.20	<3.67	<3.16	<2.22
Aroclor 1254	162	133	543	391	38.2	123	77.1	306	156
Aroclor 1260	13.5	<3.29	28.8	23.4	3.11	14.5	8.8	24.1	15.6

Mother Brook and the Neponset River and Estuary from July 25 through August 12, 2005.—Continued

Ave., Avenue; -D, field duplicate; ng, nanogram; e, estimated; <, actual value is less than value shown; --, not done]

Hyde Park Ave. (ng/sample)	Dana Ave. (ng/sample)	Fairmont Ave. (ng/sample)	Fairmont Ave.-D (ng/sample)	Milton Village Marina (ng/sample)	Granite Ave. (ng/sample)	Granite Ave.-D (ng/sample)	Neponset Ave. Rte. 3A Bridge (ng/sample)	Buoy (Neponset Estuary) (ng/sample)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
Polychlorinated biphenyl congeners										
<0.436	e1.15	3.67	2.61	<0.301	<0.416	<0.312	<0.137	<0.307	<0.132	99.9
<0.305	<0.411	<0.283	<0.611	<0.210	<0.291	<0.218	<0.0958	<0.215	<0.0922	--
<0.436	<0.588	<0.405	<0.873	<0.301	<0.416	<0.312	<0.137	<0.307	<0.132	--
<0.436	e0.909	e3.55	e2.63	<0.301	<0.416	<0.312	<0.137	<0.307	<0.132	--
<0.305	<0.411	e0.327	<0.611	<0.210	<0.291	<0.218	<0.0958	<0.215	<0.0922	--
<0.305	<0.411	e0.433	<0.611	<0.210	<0.291	<0.218	<0.0958	<0.215	<0.0922	--
<0.350	<0.471	e0.493	<0.699	<0.241	<0.333	<0.250	<0.110	<0.246	<0.106	97.5
<0.305	<0.411	<0.283	<0.611	<0.210	<0.291	<0.218	<0.0958	<0.215	<0.0922	--
<0.348	<0.469	<0.323	<0.696	<0.240	<0.332	<0.248	<0.109	<0.245	<0.105	99.3
<0.545	<0.839	1.84	1.14	<0.379	<0.442	<0.574	<0.622	<0.413	e0.268	96.4
<0.467	<0.718	<0.420	<0.892	<0.324	<0.378	<0.491	<0.533	<0.354	<0.144	--
<0.467	<0.718	0.532	<0.892	<0.324	<0.378	<0.491	<0.533	<0.354	<0.144	93.9
<0.292	<0.234	<0.285	<0.323	<0.137	<0.356	<0.362	<0.168	<0.138	<0.0555	87.5
1,940	1,690	5,020	5,360	5,240	2,680	2,710	1,020	889	0.916	--
Polychlorinated biphenyl homologs										
253	163	1,060	1,120	752	178	178	34.9	23.3	<0.0413	--
612	507	2,290	2,250	2,370	922	944	293	225	<0.172	--
525	504	1,010	1,120	1,380	881	902	366	318	<0.127	--
416	362	442	591	615	560	555	258	244	<0.155	--
108	117	123	182	110	119	113	61.5	62.3	0.916	--
22.8	28.5	51.7	64.5	19.5	22.5	20.4	11	14.6	<0.124	--
4.07	9.89	27	21.9	1.45	2.25	0.962	0.37	0.829	<0.131	--
<0.464	<0.625	3.67	2.61	<0.320	<0.442	<0.331	<0.146	<0.327	<0.140	--
<0.545	<0.839	2.37	1.14	<0.379	<0.442	<0.574	<0.622	<0.413	<0.168	--
<0.292	<0.234	<0.285	<0.323	<0.137	<0.356	<0.362	<0.168	<0.138	<0.0555	--
Polychlorinated biphenyl Aroclors										
<0.924	<1.26	<2.33	<0.987	<0.987	<1.54	<1.97	<2.24	<0.998	<0.188	--
<1.76	<2.25	<4.17	<2.35	<2.35	<2.82	<2.70	<4.01	<2.99	<0.372	--
1,170	1,020	2,740	2,660	2,660	1,840	1,860	745	623	<0.415	--
<3.70	<2.63	<3.41	<3.47	<3.47	<3.75	<3.28	<2.20	<2.86	<0.464	--
232	223	155	261	261	223	213	120	120	<3.02	--
17	46	110	91.6	91.6	8.97	3.31	2.63	2.45	<0.928	--

Table 17. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed concurrently with the collection and analysis of white sucker tissue, Neponset River, Massachusetts, 2004.

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; -D, field duplicate; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners					
	Tileston and Hollingsworth (ng/sample)	Tileston and Hollingsworth-D (ng/sample)	Walter Baker Impoundment (ng/sample)	Walter Baker Impoundment-D (ng/sample)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
PCB-1	419	392	176	335	<0.621	95.7
PCB-2	<1.20	<2.49	<0.758	<1.76	<0.613	--
PCB-3	31.9	31	13.1	25.2	<0.613	95.1
PCB-3	917	897	319	614	<1.08	91.6
PCB-5 + 8	303	306	115	217	<0.625	98.1
PCB-6	58.8	59.9	20.1	38.5	<0.625	--
PCB-7 + 9	13	12.5	4.59	8.62	<0.625	--
PCB-11	e9.93	e9.44	e6.26	e7.65	<0.625	--
PCB-12 + 13	e13.7	e13.3	e3.82	e7.45	<0.625	--
PCB-14	<0.539	<0.781	<0.488	<0.565	<0.625	--
PCB-15	131	127	34.5	65.2	<0.683	101
PCB-16 + 32	185	188	48.7	94.6	<1.52	--
PCB-17	139	143	37.6	73.3	<1.52	--
PCB-18	89.2	91.8	19.2	37	<1.52	87.7
PCB-19	151	155	43.3	83.9	<1.79	85.9
PCB-20 + 21 + 33	12.7	13.2	2.57	4.81	<0.944	--
PCB-22	19.2	19.5	4.22	8.05	<0.944	--
PCB-23 + 34	2.36	2.39	0.632	1.46	<1.04	91.4
PCB-24 + 27	91.3	93.1	25.6	50	<1.52	--
PCB-25	41.8	42.2	10.2	19.6	<1.04	--
PCB-26	70.6	73.2	16.9	32	<1.04	--
PCB-28	95.6	86.9	19.1	35	<1.05	106
PCB-29	<0.293	<0.452	<0.332	<0.423	<1.04	--
PCB-30	<0.430	<0.664	<0.488	<0.622	<1.52	--
PCB-31	114	127	29.6	59	<1.04	92.7
PCB-35	0.624	<0.985	<0.681	<1.25	<0.968	--
PCB-36	0.831	<0.960	<0.664	<1.22	<0.944	--
PCB-37	11	11.2	2.29	4.61	<0.968	110
PCB-38	<0.600	<0.985	<0.681	<1.25	<0.968	--
PCB-39	e0.586	<0.960	<0.664	<1.22	<0.944	--
PCB-40	7.75	7.61	1.62	2.69	<1.28	90.9
PCB-41 + 64 + 68 + 71	66.9	71.6	14.1	28.2	<0.963	--
PCB-42 + 59	22	22.4	4.52	8.82	<0.963	--
PCB-43 + 49	68	75.3	15.8	31.1	<1.00	86.5
PCB-44	40.6	42.7	7.47	14.9	<0.963	86
PCB-45	8.91	9.13	1.88	3.37	<0.857	--
PCB-46	4.71	5.17	1.03	1.82	<0.857	--
PCB-47 + 48 + 75	48.8	50.8	11.3	23.3	<0.857	--
PCB-50	0.878	0.831	<0.339	0.424	<0.713	--
PCB-51	14.4	15.5	3.71	7.6	<0.857	--
PCB-52 + 73	82.1	86.6	17.7	35.8	<0.857	81.7
PCB-53	32.9	35.2	7.73	15.8	<0.857	--
PCB-54	2.35	2.63	0.674	1.26	<0.713	70.1
PCB-55	<0.519	<0.921	<0.418	<0.553	<0.687	--
PCB-56 + 60	10.5	10.4	2.37	4.5	<0.687	95.8

Table 17. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed concurrently with the collection and analysis of white sucker tissue, Neponset River, Massachusetts, 2004.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; -D, field duplicate; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners					
	Tileston and Hollingsworth (ng/sample)	Tileston and Hollingsworth-D (ng/sample)	Walter Baker Impoundment (ng/sample)	Walter Baker Impoundment-D (ng/sample)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
PCB-57	1.78	2.32	<0.779	<1.03	<1.28	--
PCB-58	<0.968	<1.72	<0.779	<1.03	<1.28	--
PCB-61 + 74	11.6	11.7	2.33	5.28	<0.660	--
PCB-62 + 65	<0.324	<0.793	<0.408	<0.269	<0.857	--
PCB-63	3.02	2.93	0.736	1.6	<0.660	--
PCB-66 + 80	19.5	21.1	4.25	9.05	<0.660	91.4
PCB-67	1.72	2.19	<0.779	<1.03	<1.28	--
PCB-69	e0.453	<0.793	<0.408	<0.269	<0.857	--
PCB-70 + 76	21.1	22.2	4.56	9.49	<0.660	--
PCB-72	2.03	2.01	0.563	1.02	<0.963	--
PCB-77	2.46	2.49	0.589	1.18	<0.662	105
PCB-78	<0.600	<0.986	<0.418	<0.422	<0.662	--
PCB-79	<0.600	<0.986	<0.418	<0.422	<0.662	--
PCB-81	<0.600	<0.986	<0.418	<0.422	<0.662	105
PCB-82	2.1	1.92	<0.660	1.02	<0.746	--
PCB-83 + 108	1.64	1.72	e0.426	e0.85	<0.865	--
PCB-84	7.28	7.55	1.89	3.35	<0.737	--
PCB-85 + 120	3.39	3.65	0.897	1.76	<0.746	--
PCB-86 + 97	5.97	6.24	1.48	3.04	<0.746	--
PCB-87 + 115 + 116	6.97	7.34	1.72	3.69	<0.746	105
PCB-88 + 121	<0.321	<0.513	<0.240	<0.293	<0.885	--
PCB-89 + 90 + 101	17.6	19	4.82	9.78	<0.737	100
PCB-91	6.08	6.78	1.59	3.4	<0.885	--
PCB-92	5.14	5.83	1.49	2.93	<0.737	--
PCB-93 + 95	25.7	28.3	6.92	13.2	<0.885	94.4
PCB-94	0.678	0.582	<0.240	<0.293	<0.885	--
PCB-96	0.731	0.918	<0.240	0.352	<0.885	--
PCB-98 + 102	1.98	2.11	0.514	1.08	<0.885	--
PCB-99	8.12	8.86	2.18	4.52	<0.720	100
PCB-100	0.448	<0.513	<0.240	<0.293	<0.885	--
PCB-103	0.573	0.694	<0.240	e0.461	<0.885	--
PCB-104	<0.227	<0.363	<0.169	<0.207	<0.625	--
PCB-105 + 127	2.74	2.95	0.603	1.61	<0.546	82.2
PCB-106 + 118	8.15	9.53	2.33	4.62	<0.631	105
PCB-107 + 109	e0.728	e0.923	<0.460	0.577	<0.520	98.9
PCB-110	23.4	24.9	6.26	12.6	<0.520	104
PCB-111 + 117	1.33	1.37	<0.660	e0.639	<0.746	--
PCB-112	0.427	<0.502	<0.234	<0.286	<0.865	--
PCB-113	<0.267	<0.428	<0.200	<0.244	<0.737	--
PCB-114	<0.362	<0.633	<0.473	<0.339	<0.535	109
PCB-119	1.19	1.12	e0.325	0.73	<0.720	--
PCB-122	<0.362	<0.633	<0.473	<0.339	<0.535	--
PCB-123	<0.367	<0.682	<0.501	<0.366	<0.631	90
PCB-124	0.382	<0.615	<0.460	<0.330	<0.520	--
PCB-125	<0.504	<0.882	<0.660	<0.473	<0.746	--

Table 17. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed concurrently with the collection and analysis of white sucker tissue, Neponset River, Massachusetts, 2004.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; -D, field duplicate; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners					
	Tileston and Hollingsworth (ng/sample)	Tileston and Hollingsworth-D (ng/sample)	Walter Baker Impoundment (ng/sample)	Walter Baker Impoundment-D (ng/sample)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
PCB-126	<0.381	<0.667	<0.499	<0.358	<0.564	--
PCB-128	0.986	1.42	0.326	0.772	<0.847	--
PCB-129	<0.573	<0.903	<0.320	<0.361	<0.847	--
PCB-130	<0.573	<0.903	<0.320	<0.361	<0.847	--
PCB-131 + 142	<0.187	<0.632	<0.303	<0.301	<0.718	--
PCB-132 + 168	2.63	3.12	0.933	1.53	<0.807	--
PCB-133	<0.187	<0.632	<0.303	<0.301	<0.718	--
PCB-134 + 143	0.499	<0.632	<0.303	<0.301	<0.718	--
PCB-135 + 144	1.3	1.5	e0.351	0.864	<0.718	--
PCB-136	1.55	1.63	0.459	0.945	<0.718	--
PCB-137	<0.487	<0.767	<0.272	<0.307	<0.720	--
PCB-138 + 163 + 164	6.56	6.99	1.96	4.13	<0.720	93.2
PCB-139 + 149	5.72	5.94	1.74	3.34	<0.718	109
PCB-140	<0.187	<0.632	<0.303	<0.301	<0.718	--
PCB-141	0.744	0.975	<0.272	0.478	<0.720	--
PCB-145	<0.187	<0.632	<0.303	<0.301	<0.718	--
PCB-146	0.795	0.982	0.342	0.598	<0.655	--
PCB-147	0.261	<0.632	<0.303	<0.301	<0.718	--
PCB-148	<0.187	<0.632	<0.303	<0.301	<0.718	--
PCB-150	<0.187	<0.632	<0.303	<0.301	<0.718	--
PCB-151	1.72	1.85	0.564	0.999	<0.854	107
PCB-152	<0.187	<0.632	<0.303	<0.301	<0.718	--
PCB-153	4.18	5.22	1.5	2.96	<0.686	96.4
PCB-154	<0.187	<0.632	<0.303	<0.301	<0.718	--
PCB-155	<0.134	<0.451	<0.216	<0.215	<0.513	93.9
PCB-156	<0.410	<0.647	<0.229	0.283	<0.607	93.9
PCB-157	<0.422	<0.666	<0.236	<0.266	<0.624	97.2
PCB-158 + 160	e0.802	0.895	<0.272	0.527	<0.720	--
PCB-159	<0.487	<0.767	<0.272	<0.307	<0.720	--
PCB-161	<0.171	<0.576	<0.276	<0.274	<0.655	--
PCB-162	<0.487	<0.767	<0.272	<0.307	<0.720	--
PCB-165	<0.171	<0.576	<0.276	<0.274	<0.655	--
PCB-166	<0.487	<0.767	<0.272	<0.307	<0.720	--
PCB-167	<0.410	<0.646	<0.229	<0.258	<0.606	97.1
PCB-169	<0.435	<0.686	<0.243	<0.274	<0.643	97.6
PCB-170 + 190	0.521	<0.634	<0.329	e0.828	<0.635	99.2
PCB-171	<0.295	<0.497	<0.258	<0.325	<0.498	--
PCB-172 + 192	<0.295	<0.497	<0.258	<0.325	<0.498	--
PCB-173	<0.295	<0.497	<0.258	<0.325	<0.498	--
PCB-174 + 181	<0.302	<0.509	<0.264	<0.333	<0.510	--
PCB-175	<0.301	<0.508	<0.264	<0.332	<0.509	--
PCB-176	<0.229	<0.387	<0.201	<0.253	<0.388	--
PCB-177	<0.302	<0.509	<0.264	<0.333	<0.510	--
PCB-178	<0.301	<0.508	<0.264	<0.332	<0.509	--
PCB-179	<0.229	<0.387	<0.201	<0.253	<0.388	--

Table 17. Polychlorinated biphenyl concentrations in hexane measured in passive in situ chemical-extraction samplers deployed concurrently with the collection and analysis of white sucker tissue, Neponset River, Massachusetts, 2004.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; -D, field duplicate; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners					
	Tileston and Hollingsworth (ng/sample)	Tileston and Hollingsworth-D (ng/sample)	Walter Baker Impoundment (ng/sample)	Walter Baker Impoundment-D (ng/sample)	Laboratory blank (ng/sample)	Matrix spike (percent recovery)
PCB-180	0.666	0.801	0.377	0.839	<0.498	90.9
PCB-182 + 187	0.47	0.631	<0.264	0.487	<0.509	94.8
PCB-183	<0.302	<0.509	<0.264	<0.333	<0.510	97.9
PCB-184	<0.229	<0.387	<0.201	<0.253	<0.388	--
PCB-185	<0.302	<0.509	<0.264	<0.333	<0.510	--
PCB-186	<0.301	<0.508	<0.264	<0.332	<0.509	--
PCB-188	<0.229	<0.387	<0.201	<0.253	<0.388	90
PCB-189	<0.293	<0.494	<0.256	<0.323	<0.495	98.8
PCB-191	<0.295	<0.497	<0.258	<0.325	<0.498	--
PCB-193	<0.295	<0.497	<0.258	<0.325	<0.498	--
PCB-194	<0.333	<0.736	<0.439	<0.387	<0.820	96.1
PCB-195	<0.333	<0.736	<0.439	<0.387	<0.820	--
PCB-196 + 203	<0.320	<0.707	<0.422	<0.373	<0.788	101
PCB-197	<0.220	<0.486	<0.290	<0.256	<0.542	--
PCB-198	<0.320	<0.707	<0.422	<0.373	<0.788	--
PCB-199	<0.320	<0.707	<0.422	<0.373	<0.788	--
PCB-200	<0.220	<0.486	<0.290	<0.256	<0.542	--
PCB-201	<0.220	<0.486	<0.290	<0.256	<0.542	--
PCB-202	<0.244	<0.539	<0.322	<0.284	<0.601	94.6
PCB-204	<0.220	<0.486	<0.290	<0.256	<0.542	--
PCB-205	<0.255	<0.563	<0.336	<0.296	<0.627	95.2
PCB-206	<0.496	<1.04	<0.609	<0.529	<0.991	101
PCB-207	<0.453	<0.951	<0.556	<0.483	<0.905	--
PCB-208	<0.453	<0.951	<0.556	<0.483	<0.905	107
PCB-209	<0.252	<0.408	<0.310	<0.270	<0.394	95
Total	3,530	3,550	1,090	2,100	<1.79	--
Polychlorinated biphenyl homologs						
Total Monochlorobiphenyls	451	423	189	360	<0.621	--
Total Dichlorobiphenyls	1,420	1,400	493	944	<1.08	--
Total Trichlorobiphenyls	1,020	1,050	260	503	<1.79	--
Total Tetrachlorobiphenyls	474	503	103	207	<1.28	--
Total Pentachlorobiphenyls	132	141	32.7	68.3	<0.885	--
Total Hexachlorobiphenyls	26.9	30.5	7.83	17.4	<0.854	--
Total Heptachlorobiphenyls	1.66	1.43	0.377	1.33	<0.635	--
Total Octachlorobiphenyls	<0.333	<0.736	<0.439	<0.387	<0.820	--
Total Nonachlorobiphenyls	<0.496	<1.04	<0.609	<0.529	<0.991	--
Decachlorobiphenyls	<0.252	<0.408	<0.310	<0.270	<0.394	--
Polychlorinated biphenyl Aroclors						
Aroclor 1221	<2.32	<4.79	<1.46	<3.4	<1.19	--
Aroclor 1232	<4.15	<8.57	<2.61	<6.08	<5.18	--
Aroclor 1016/1242	2,290	2,330	695	1,320	<5.78	--
Aroclor 1248	<2.74	<5.1	<2.62	<2.92	<5.52	--
Aroclor 1254	211	224	53.7	113	<7.46	--
Aroclor 1260	8.42	5.69	2.68	5.96	<4.51	--

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Appendix 1. Sampling and Sample Processing Techniques

Contents

Sampling and Sample Processing Techniques....102
Bottom-Sediment Grab Sampling and Sample Processing....102
Automatic, Flow-Proportional, Fixed-Point Sampling of Water and Sample Processing....102
Fish Sampling and Processing for Tissue Samples....102
Stormwater Sampling and Sample Processing....103
Passive Chemical-Extraction Samplers....103
Reference....103

Figure

1–1. Photograph showing *(A)* apparatus and *(B)* schematic diagram of apparatus for the separation of particulate (with diameters greater than one micron) and dissolved (with diameters less than one micron) polychlorinated biphenyls....103

Appendix 1. Sampling and Sample Processing Techniques

Sampling techniques included automatic, flow-proportional, fixed point sampling of water and the collection of bottom-sediment grab, fish-tissue, stormwater, and passive in situ chemical-extraction samples.

Bottom-Sediment Grab Sampling and Sample Processing

Bottom-sediment grab samples were collected at 23 locations in the Neponset River, Neponset River Estuary, and Mother Brook. In water deeper than about 3 ft, the top 4 in. of sediment was collected by means of a stainless-steel dredge. In water shallower than about 3 ft, bottom sediment was scooped by a Teflon scoop directly into a precleaned Teflon bag. A minimum of three samples was collected at each sampling location. In the lab, grab samples were manually homogenized in the Teflon bag and squeezed out of the bag into 500-mL amber-glass jars. Sediment grab samples were sent on ice to a commercial laboratory for PCB-congener analysis. Subsamples were also collected and sent to a commercial laboratory for elemental analysis.

Automatic, Flow-Proportional, Fixed-Point Sampling of Water and Sample Processing

The mass of PCBs transported in river water to the estuary was measured for one year (May 2005 to April 2006) by outfitting a USGS streamgage (Neponset River at Milton Village, 011055566) with an ISCO automated sampler and Campbell Scientific, Inc.[14] data logger. Each time a specified volume of water passed the streamgage, the data logger initiated a sequence that included purging the intake line; rinsing the intake line with river water; and opening a two-way valve, which directed a 50-mL sample of river water into a 20–L precleaned Teflon bag. The specified volume was 1.6, 3.2, or 6.4 Mft^3, predicted on the basis of long-term discharge records and local weather forecasts. The 50-mL samples were composited in this way for 1 month. At the end of each month, the samples were retrieved and brought to the USGS laboratory in Northborough. One exception to this procedure was implemented during March and April 2006, when low streamflow necessitated combining the water samples collected during these two months into one sample. For this reason, 11 (instead of 12) flow-proportional water samples were collected between May 2005 and April 2006, with each sample consisting of 120 to 617 discrete samples. These samples comprise a total of 2,656 discrete water samples or about 133 L of river water collected over a period of one year. Ideally, similar numbers of samples would have been collected each month; however, unpredictable changes in the flow regime as a result of changes in weather (for example, storms or dry spells) and streamflow regulation (for example, diversion of water from the Charles River into Mother Brook) resulted in variation in the number of discrete monthly samples collected.

Dissolved and particulate PCBs in water samples were extracted from the water phase onto a glass-fiber filter (GFF; particulate) and an XAD–2 resin column (dissolved). Samples were pumped slowly at less than 3 mL/min by a peristaltic pump with C–Flex tubing in the pump head and Teflon tubing through a GFF with 0.1-µm pore size that had been baked at 400°C for 4 hours and a XAD–2 resin extraction column (fig. 1–1). Teflon tubing and the filter housing were cleaned by soaking in acetone, hexane, and methanol, in that order (Litten, 1993); C–Flex tubing was soaked in methanol only. After being soaked, the tubing and filter housings were rinsed with tap water. After the sample was filtered, the Teflon sample bag was rinsed with 1 L of tap water, which was also filtered through the GFF cartridge and XAD–2 extraction column, to remove any remaining solids left behind in the bag. GFF cartridges, XAD columns, and Teflon sample bags were wrapped in hexane-rinsed aluminum foil, put on ice, and shipped to a commercial laboratory for PCB analysis.

Fish Sampling and Processing for Tissue Samples

White sucker *(Catostomus commersoni)* were collected twice (in August 2003 and September 2005) from the Tileston and Hollingsworth and Walter Baker Impoundments in gill nets along the bank and across the river. Eight fish were collected from each impoundment on each sampling date (a total of 32 fish), stored on ice, and brought back to the USGS laboratory in Northborough. Common mummichog were collected from the Neponset River Estuary on July 6, 2006, in minnow traps baited with cat food. Cat-food containers were perforated with a sharp knife so that the fish could smell, but not eat, the bait and were placed in the minnow traps.

In the lab, fish were measured and weighed. Fish were then wrapped in aluminum foil, packed on ice, and shipped overnight to a commercial laboratory for PCB-congener analysis. Fish collected in 2003 were skinned and filleted prior to analysis, whereas fish collected in 2005 were analyzed whole. White sucker collected in 2005, however, had their stomach contents emptied prior to analysis by removal of the intestinal tract, extrusion of the contents, and replacement of the intestines. Intestinal contents were removed so that PCB-congener concentrations and patterns measured in fish tissue were not biased by PCB-contaminated bottom sediment that may have been ingested by the fish just prior to capture. This procedure was done to determine the primary pathway(s)—PCB-contaminated water and (or) PCB-contaminated bottom sediment—through which fish, white sucker in particular, became contaminated with PCBs in the Neponset River. Five samples of filleted and whole fish were homogenized by sampling location and date.

[14] Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

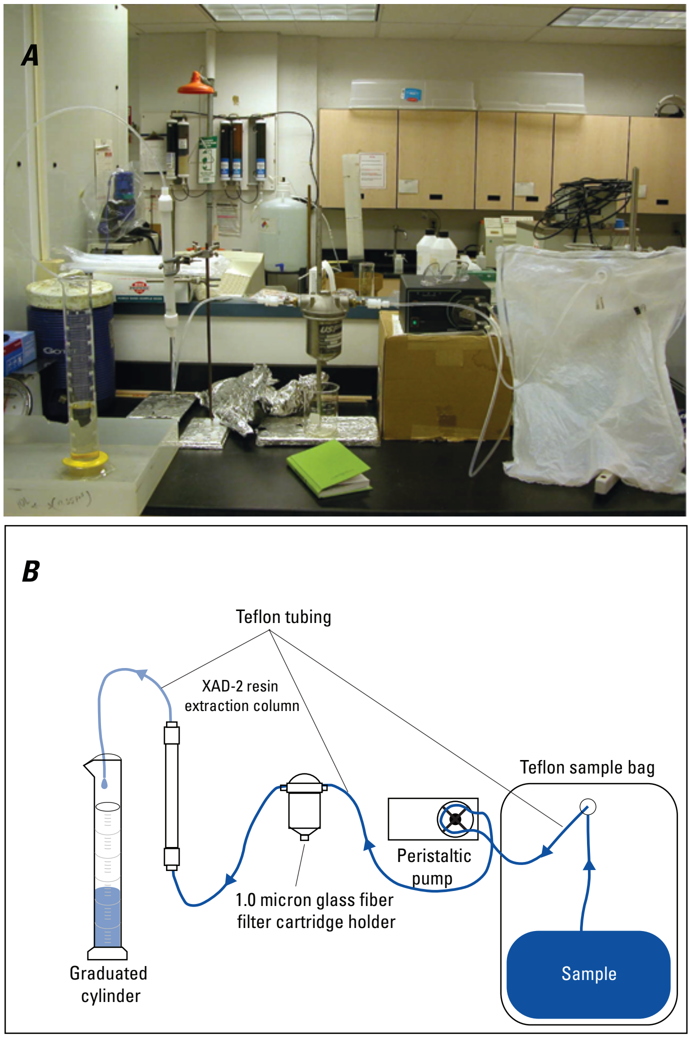

Figure 1–1. *(A)* Apparatus and *(B)* schematic diagram of apparatus for the separation of particulate (with diameters greater than one micron) and dissolved (with diameters less than one micron) polychlorinated biphenyls.

Stormwater Sampling and Sample Processing

Isokinetic, equal-width integrated (EWI) samples were collected by means of a USGS DH–81 sampler with a 1–L precleaned (acetone, hexane, and DIW rinse) Teflon bottle at about 20 locations along the cross section of the river. Once filled, the 1–L Teflon bottle was poured into a 20–L Teflon bag. While water quality was being sampled, concurrent measurements of streamflow were made with an acoustic doppler current profiler (ADCP). Water samples were brought back to the USGS laboratory in Northborough and processed as described previously.

Passive Chemical-Extraction Samplers

PISCES were deployed at 15 sampling locations in the Neponset River, Neponset River Estuary, and Mother Brook. Prior to deployment, samplers were cleaned in the laboratory with soap and water and a deionized water (DIW) rinse and then were air dried. Low-density polyethylene membranes and Viton O–Rings were cleaned by a 7-hour Soxhlet extraction with hexane. After being cleaned, the samplers were assembled and wrapped in hexane-rinsed aluminum foil. In the field, the assembled samplers were rinsed with hexane again and were filled with 0.2 L of hexane just before deployment. PISCES were attached to cinder blocks, buoys, bridges, or pilings about 6 in. below the surface of the water. Dissolved PCBs diffuse from the water column through the membrane during the time the samplers are deployed, thus providing time-integrated samples of dissolved PCBs. PISCES were retrieved after nearly two weeks. At the time of sample collection, hexane from each PISCES was carefully poured into a 125-mL amber-glass vial and sent on ice to AXYS Analytical Laboratory for PCB-congener analysis. At the time of retrieval, water temperature and specific conductance were measured, and the condition of each sampler was noted.

Reference

Litten, S., Mead, B., and Hassett, J., 1993, Application of passive samplers (PISCES) to locating a source of PCBs on the Black River, New York: Environmental Toxicology and Chemistry, v. 12, p. 639–647.

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Appendix 2. Chemical Analysis of Water, Sediment, and Fish

Contents

Chemical Analysis of Water, Sediment, and Fish 106
PCB–Congener Analysis 106
Bias and Variability of PCB–Congener Concentrations 106
Elemental Analysis 107
Bias and Variability of Element Concentrations 107

Appendix 2. Chemical Analysis of Water, Sediment, and Fish

Water, bottom-sediment, fish-tissue, stormwater, and passive in situ chemical-extraction samples were analyzed for 209 PCB congeners using high-resolution gas chromatography/low-resolution mass spectrometry (HRGC/LRMS). Fish-tissue samples were also analyzed for three nonorthosubstituted, coplanar PCBs using high-resolution gas chromatography/high-resolution mass spectrometry (HRGC/HRMS).[15]

PCB–Congener Analysis

AXYS Analytical Services, Ltd., a commercial laboratory in Sidney, British Columbia, Canada, analyzed the water, bottom-sediment, and fish-tissue samples. Methods were documented in internal documents prepared by AXYS Analytical Services, Ltd., hereafter named AXYS Analytical (AXYS Analytical, written commun., 2005). The condition of each sample received at the laboratory was noted, including labeling, holding times, and temperature. Samples were stored at the laboratory at -20°C until analysis. Just prior to analysis, samples or subsamples split on the basis of weight were spiked with a blend of isotopically labeled (^{13}C) surrogate standards and extracted. Sediment and tissue samples were dried with sodium sulphate (Na_2SO_4) prior to extraction. Samples were extracted by means of the Soxhlet procedure with dichloromethane (DCM), with the exception of particulate samples, which were extracted by the Dean-Stark procedure with toluene. Tissue samples were also eluted through a gel-permeation column to remove lipids. For water samples, the masses of PCBs on the filter and resin column (in nanograms) quantified the mass of PCBs in the volume of water that had passed through the filter and column in each sample. Mass values were divided by the volume of each water sample to give dissolved and particulate PCB concentrations. Teflon sample bags used to collect water samples were rinsed with seastar water, methanol, and DCM, in that order. After the methanol and water were discarded, the DCM was dried by means of Na_2SO_4 and added to the XAD extract.

Next, extracts were split into two or more samples by weight; one split sample was archived or, in the case of tissue analysis, used for HRGC/HRMS. The one-half of the extract for chemical analysis was purified by means of Florisil or a combination of Florisil, acid/base silica, and alumina chromatographic columns (not necessarily in that order). Tissue-sample extracts were further purified in carbon celite chromatographic columns to remove selected analytes. Once purified, the extracts were reduced in volume, spiked with labeled recovery (internal) standards, and split into two equal fractions. One fraction was analyzed for PCBs by HRGC/LRMS. In some cases, extracts were diluted and reanalyzed.

PCB concentrations were determined by HRGC/LRMS with a gas chromatograph (GC) equipped with a quadrupole mass spectrometer (MS). A J&W Scientific, Inc., DB-5 chromatography column (60 m, 0.25-mm inside diameter, 0.10-µm film thickness) was coupled directly to the MS source. The MS was operated at a unit-mass resolution in the electron ionization (EI) mode with multiple ion detection (MID) that acquired two characteristic ions for each target analyte and surrogate standard. A splitless/split injection sequence was used (AXYS Analytical, written commun., 2005). Gas chromatography/electron capture detection (ECD) analysis was done with a gas chromatograph, a ^{63}Ni electron-capture detector, and an integrator. A J&W Scientific DB–5 capillary column was coupled directly to the ECD source. When needed, confirmation was provided by simultaneous analysis with a J&W Scientific DB–17MS capillary column (30 m long, 0.25-mm inside diameter, 0.25-µm film thickness) (AXYS Analytical, written commun., 2005).

Coplanar PCB congeners were analyzed by means of a Micromass Ultima high-resolution mass selective detector (MSD) interfaced to a HP 6890 GC. A DB–5 chromatography column was coupled directly to the MS source. The MS was operated at 10,000 (static) mass resolution in the EI mode with MID. At least two ions were acquired for each target and surrogate compound. Target concentrations were determined by the isotope-dilution or internal-standard method by means of Micromass OPUSQUAN software. A splitless/split injection sequence was used.

Initial calibration was done by means of a series of solutions that covered the working concentration range of the instrument. These solutions contained surrogates, recovery standards, and target compounds. Calibration was verified at least once every 12 hours by analysis of a midlevel calibration standard. Sample-specific detection limits were determined from the analysis data by converting the minimum detectable signal (equal to three times the noise level) to a concentration by the same procedures used to convert the target peak response to concentrations. (AXYS Analytical, written commun., 2005).

Bias and Variability of PCB–Congener Concentrations

Environmental samples were analyzed by AXYS Analytical in batches of 20 samples or fewer. Each sample batch was accompanied by quality assurance/quality control (QA/QC) samples—including procedural blanks, ^{13}C-labeled surrogate standards, labeled recovery (internal) standards, matrix-spike samples, or laboratory duplicate samples—to test laboratory bias and variability. Before analytical results were accepted, QA/QC had to meet method criteria that included PCB–congener concentrations measured in procedural blanks that were less than 1 ng/sample; congener-specific percent-recovery values for ^{13}C-labeled surrogate standards, recovery standards, and matrix-spike samples that generally were 40–130 percent, 60–130 percent, and 60–130 percent, respectively; and relative percent differences (RPD) between duplicate samples of 40 percent or less. Laboratory instruments were calibrated in

[15] Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

accordance with AXYS Analytical's standard operating procedures (SOP; AXYS Analytical, written commun., 2005). The percent difference between midlevel calibration standards and calibration verification concentrations had to be within 20 percent of the actual concentrations. The condition of each batch and the results of QA/QC samples are discussed by sample type and batch in appendix 3.

Elemental Analysis

SGS Laboratory, a commercial laboratory in Ontario, Canada, analyzed the bottom-sediment samples. The condition of each sample received at the laboratory was noted, including labeling, holding times, temperature. Just prior to chemical analysis, an aliquot (about 1 g) was collected from each bottom-sediment grab sample and milled in a stainless-steel mortar.[16] Next, the sample was digested in 2 mL of nitric acid HNO_3 and heated at 80 to 90°C for 0.5 hour. After the sample had cooled slightly, the digestates were spiked with 4 mL of hydrochloric acid (HCl) and heated for 2 hours in a water bath. Next, the digestates were allowed to cool to room temperature and diluted with distilled water to a final volume of 20 mL. About 5 mL of this solution was poured into a test tube for inductively coupled plasma mass spectrometry (ICP–MS) analysis by an Optima spectrometer.

[16] Milling of bottom-sediment samples may expose to the digestive acids elements that otherwise would be locked in mineral grains. Therefore, elements exposed to digestive acids by milling are likely to be detected at greater concentrations than elements in unmilled samples. Milling may bias samples by increasing measured concentrations of chromium and nickel.

Bias and Variability of Element Concentrations

Environmental samples were analyzed by SGS in batches of up to 40 samples. Each batch was accompanied by QA/QC samples—including procedural blanks, laboratory spikes, matrix spikes, matrix-spike samples, recovery standards, or standard reference material—to test laboratory bias and variability. Before analytical results were accepted, QA/QC samples had to meet method criteria that included element concentrations measured in procedural blanks that were less than quantification limits; RPDs between laboratory duplicate and matrix-spike samples that were no more than 10 percent; percent-recovery ranges that were 50–100 percent; and standard reference materials that were within 20 percent of certified values. Laboratory instruments were calibrated in accordance with the SOPs of SGS (SOP; SGS, written commun., 2005) and were required to meet method specifications. The condition of each batch and the results of the QA/QC analysis are discussed by sample type and batch in appendix 3.

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Appendix 3. Quality Assurance and Quality Control

Contents

Quality Assurance and Quality Control 110
Bias and Variability in Field and Laboratory Analyses 110
Flow-Proportional Water Samples (AXYS Batches WG16542, WG17610, WG18055, and WG18692) 111
Passive In Situ Chemical-Extraction Samples (AXYS Batches WG13865 and WG16781) 112
Bottom-Sediment Grab Samples (AXYS Batch WG16492) 112
Fish-Tissue Samples (AXYS Batches WG15112, WG17077, WG17812, and WG19863) 112
Bottom-Sediment Grab Samples (SGS, Batch 084037) 113
References 113

Tables

3–1. Percent recoveries of ^{13}C-labeled surrogate standards measured in spiked XAD columns 110
3–2. Masses and concentrations of polychlorinated biphenyls in point and equal-width-increment water samples collected at the U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Massachusetts, June 7, 2006 114
3–3. Masses and concentrations of particulate and dissolved polychlorinated biphenyls in equipment blanks 119

Appendix 3. Quality Assurance and Quality Control

Field and laboratory quality-assurance/quality-control (QA/QC) samples were evaluated as part of this study. Field QA/QC samples included field duplicates, ^{13}C-labeled field spikes, an equipment blank, a standard reference material, and a pair of samples collected to characterize differences between fixed-point samples and samples integrated across the channel cross section. Laboratory QA/QC samples included procedural blanks, ^{13}C-labeled surrogate standards, recovery standards, matrix-spike samples, and laboratory duplicate samples.

Bias and Variability in Field and Laboratory Analyses

Environmental samples were collected and analyzed along with QA/QC samples, including field duplicates and ^{13}C-labeled field spikes. These QA/QC samples were collected, processed, and analyzed in exactly the same way as the environmental samples. Therefore, by their very nature, field QA/QC samples are affected by bias and variability associated with environmental conditions, sample collection, and sample processing, as well as with laboratory processing (appendix 1). Duplicate PISCES samples were collected at 7 of 15 locations from two samplers hung from the same buoy/cinder block at the same location and analyzed separately. Duplicate sediment samples collected at 2 of 13 locations consisted of two representative aliquots of sediment that were taken from separate bottom-sediment grab samples and analyzed separately. Field spikes were processed by XAD columns that were spiked with ^{13}C-labeled surrogate standards.

Field QA/QC data[17] indicate that PCBs (and other constituents) in samples were neither lost nor gained as a result of processing, shipping, handling, holding times, or laboratory analytical procedures:

- RPDs for total PCB-congener concentrations between duplicate PISCES samples ranged from 0.56 to 69 percent and averaged about 32 percent; however, the range of RPDs for individual PCB congeners was much wider;
- RPDs for total PCB-congener concentrations between duplicate sediment grab samples ranged from 26 to 51 percent and averaged about 39 percent; however, the range of RPDs for individual PCB congeners was much wider;
- Root mean square differences (RMSDs) between PCB concentrations in duplicate PISCES samples ranged from 0.05 to 0.30 and averaged about 0.18;
- RMSDs between PCB concentrations in duplicate sediment grab split samples ranged from 0.11 to 0.21 and averaged about 0.16;
- RPDs calculated for detectable element concentrations between duplicate bottom-sediment grab samples were less than 25 percent (8.9 percent, on average) with a few exceptions. In particular, RPDs calculated for detectable copper, molybdenum, silver, and zinc concentrations measured in BGY–141 split samples were 26, 46, 86, and 27 percent, respectively; and
- Percent recoveries of ^{13}C-labeled surrogate standards measured in spiked XAD columns ranged from 82 to 130 percent and averaged about 100 percent (table 3–1).

In addition to routine QA/QC, samples were collected to test the study design. Specifically, the use of a single point sample to represent concentrations across the river was tested by collecting paired water samples. The sample pair consisted of a 17–L water sample collected at the fixed-point sampling location (the USGS streamgage at Milton Village) by means of the pump from the automatic sampler and a 14–L water sample collected by equal-width increment (EWI) methods (Wilde and others, 1999) at the same time from the entire width of the river. These samples were processed and analyzed by the same methods as the other water samples.

Table 3–1. Percent recoveries of ^{13}C-labeled surrogate standards measured in spiked XAD columns.

[^{13}C, Carbon-13, a natural, stable isotope of carbon; EWI, equal-width-intergrated sample; --, not done]

Sample	Batch	^{13}C-labeled surrogates		
		PCB-31	PCB-95	PCB-153
May 05a	WG16542	93.3	103	96.7
May 05b	WG16542	100	99.4	103
June 05	WG16542	94.3	107.0	107
July 05	WG16542	102	112	108
August 05	WG16542	130	116	107
September 05	WG17610	82.5	97.7	102
October 05	WG18055	103	89.4	93.3
November 05	WG18055	103	89.4	93.3
December 05	WG18692	--	--	--
January 06	WG18692	--	--	--
February 06	WG18692	--	--	--
March–April 06	WG18692	--	--	--
Point sample	WG18692	--	--	--
EWI	WG18692	--	--	--
Blue Hill Avenue	WG17610	86.0	97.5	95.5
Central Avenue	WG17610	87.1	98.4	102
Tap water	WG17610	85.1	103	104

[17] Data presented here are from PISCES and sediment-grab samples collected as part of this study.

Comparison of calculated PCB-congener concentrations[18] measured in fixed-point and EWI samples indicates that, at least under the flow conditions at the time of sampling, concentrations measured through fixed-point sampling could be considered representative of the entire cross section; RPDs were about 18 percent, on average, for all PCB congeners (table 3–2). More than 90 percent of the detected PCB-congener concentrations were greater in the EWI sample than in the fixed-point sample; however, the RPDs between the EWI and fixed-point samples were low with a maximum of about 43 percent. Some of the observed differences between the concentrations measured in the EWI and fixed-point samples may be explained by environmental variability. The fixed-point sample was collected during a time interval of about 5 minutes, whereas the EWI sample took about 45 minutes to collect; during this time interval, the flow increased from 1,680 to 1,750 ft^3/sec. PCB-congener patterns measured in fixed-point and EWI samples were also similar with an RMSD equal to 0.41.

Because about 1 L of tap water was used to rinse sample bags and equipment, it was necessary to ensure that the tap water was free of PCBs, or at least to quantify tap-water PCB concentrations and thus to determine the effectiveness of cleaning. Some tap water that had been used to rinse a sample bag was collected as an equipment blank sample. Several individual PCB congeners were detected in the tap-water equipment blank; however, most did not meet AXYS Analytical quantification limits (table 2–3). Of the PCB congeners that were measured at concentrations greater than analytical quantification limits, only one group of unresolved PCB congeners (PCB 47 + 48 + 75) was detected in particulate (1.06 ng/sample) and dissolved (4.56 ng/sample) form at concentrations above 1 ng/sample (considered acceptable for blank samples). PCB 6 (0.104 ng/sample), PCB 14 (0.122 ng/sample), PCB 51 (0.582 ng/sample), and PCB 89 + 90 + 101 (0.112 ng/sample) were detected in the XAD sample, but the concentrations were all less than 1 ng/sample. The total concentrations of PCB-congeners measured in particulate and dissolved tap-water samples corresponded to a particulate PCB concentration of about 0.063 ng/L and a dissolved PCB concentration of about 0.324 ng/L. It is unclear whether or not PCBs in the equipment blank were the result of contaminated tap water or inadequate cleaning of filter apparatus.

XAD columns with sufficient sorptive capacity were used to sorb dissolved PCBs in large-volume (about 20-L) water samples collected from the Neponset River. The sorptive capacity needed was determined from PCB-congener concentrations measured in samples collected in PISCES samplers deployed near the USGS Milton Village streamgage in the Walter Baker Impoundment (Breault and others, 2004a). The ability of XAD resin to sorb PCBs was tested by filtering an environmental sample through two XAD columns in series; breakthrough of PCBs would be indicated by the detection of PCBs on the second column. Only one group of unresolved PCB congeners (PCB 47 + 48 + 75) was detected in the second XAD column (0.621 ng/sample, less than 0.4 percent of the total dissolved PCB concentration for that sample).

[18] PCB-congener concentrations (ng/L) were calculated by dividing the mass of PCB congeners measured in water samples (ng/sample) by the volume of water filtered (L). Estimated congener concentrations and censored congeners were excluded.

Flow-Proportional Water Samples (AXYS Batches WG16542, WG17610, WG18055, and WG18692)

On July 19, August 1, and September 13, 2005, XAD columns, GFFs, and Teflon bags were shipped overnight from U.S. Geological Survey (USGS) in Northborough, MA, to AXYS Analytical Services, Ltd. in Sidney, British Columbia (hereafter named AXYS Analytical, Ltd.). Columns, GFFs, and Teflon bags were shipped in coolers packed with ice. The condition of the columns, glass-fiber filers (GFFs), and Teflon sample bags received by the laboratory was good. Although temperatures in the coolers were high (16 to 27°C), AXYS Analytical scientists determined that these high temperatures would not compromise the integrity of the samples (Brian Fowler, AXYS Analytical, Sidney, British Columbia, written commun., 2005). The samples were assigned batch number WG16542. PCB-congener concentrations measured in the blank sample analyzed with batch WG16542 were all less than the detection limit. The percent surrogate recoveries of the ^{13}C-labeled PCB 3, PCB 28, PCB 101, PCB 118, PCB 180, PCB 202, and PCB 206 surrogates were below method criteria in the XAD procedural blank; however, it was determined that this difference would not substantially affect PCB-congener quantification (Candice Navaroli, AXYS Analytical, Sidney, British Columbia, written commun., 2005). The percent recoveries of PCB 37 (133 percent) and PCB-54 (56.4 percent) in particulate XAD matrix-spike samples were above and below method criteria, respectively. As a result, PCB 37 and PCB 54 data for batch WG16542 were flagged as outside quantification limits and excluded from data analysis. All other QA/QC results were within method criteria. No laboratory duplicates were analyzed with this batch.

On November 9, 2005, XAD-2 columns, GFFs, and Teflon bags were shipped to AXYS Analytical. The condition of the columns, GFFs, and Teflon sample bags received by the laboratory was good. These samples were assigned batch number WG17610. Two blank samples (WG17610-101 and WG17610-103) were analyzed with batch WG17610. Most PCB-congener concentrations measured in blank sample WG17610-101 were less than the detection limit; however, 26 PCB congeners were detected. Of these, the concentration of only one PCB congener (PCB 36; 1.06 ng/sample) was greater than 1.0 ng/sample. Similarly, most PCB-congener concentrations measured in the other blank sample (WG17610-103) were less than the detection limit; however, 16 PCB congeners were detected. Of these, the concentration of one PCB congener (PCB 7; 1.52 ng/sample) was greater than 1.0 ng/sample. The percent recoveries of the ^{13}C-labeled PCB 3, PCB 8, and PCB 28 surrogates in the XAD procedural blank and the ^{13}C-labeled PCB-3 surrogate in water samples collected at Blue Hill Avenue and Central Street were below method criteria; however, it was determined that this difference would not substantially affect PCB-congener quantification (Ziqing Ou, AXYS Analytical, Sidney, British Columbia, written commun., 2005). The percent recoveries for matrix spikes were within method criteria for all PCB congeners with the exception of particulate concentrations for PCB 54 measured in a spiked XAD-2 column (63.5 percent); percent recoveries may be similar for PCB 54 measured in environmental samples. No laboratory duplicates were analyzed with this batch.

On December 14, 2005, XAD-2 columns, GFFs, and Teflon bags were shipped overnight to AXYS Analytical. The condition of the columns, GFFs, and Teflon sample bags received by the laboratory was good. These samples were assigned batch number WG18055. PCB-congener concentrations measured in the blank sample analyzed with batch WG18055 were all less than the detection limit, with two exceptions: PCB 7 (0.586 ng/sample) and PCB 11 (0.394 ng/sample), were detected but in concentrations less than 1.0 ng/sample. Percent recoveries for ^{13}C-labeled surrogate standards and labeled recovery (internal) standards were within method criteria. The percent recoveries for particulate matrix spikes were within method criteria for all PCB congeners with the exception of PCB 54 (63.5 percent) measured in a spiked XAD-2 column and GFF; percent recoveries may be similar for PCB 54 measured in environmental samples. No laboratory duplicates were analyzed with this batch.

On February 21, March 15, May 16, and June 14, 2006, XAD-2 columns, GFFs, and Teflon bags were shipped overnight to AXYS Analytical. The condition of the columns, GFFs, and Teflon sample bags received by the laboratory was good, with one exception: samples shipped on March 15, 2006 arrived at the laboratory at 6°C, slightly higher than the targeted temperature (4°C). These samples were assigned batch number WG18692. Two blanks were analyzed along with batch WG18692. A few PCB congeners were measured in the first blank sample analyzed with batch WG18692, but all detected PCB-congener concentrations were less than 1.0 ng/sample. No PCB congeners were detected in the second blank sample analyzed with batch WG18692. The percent recoveries of ^{13}C-labeled surrogate standards and labeled recovery (internal) standards were within method criteria, with one exception. The percent recoveries of the ^{13}C-labeled PCB 28, PCB 101, PCB 118, PCB 180, PCB 202, PCB 206, and PCB 209 surrogates in particulate samples collected during February 2006 were below method criteria. Matrix-spike percent recoveries were within method criteria for all PCB congeners. No laboratory duplicates were analyzed with this batch.

Passive In Situ Chemical-Extraction Samples (AXYS Batches WG13865 and WG16781)

On September 2, 2004, four hexane samples collected from passive in situ chemical extraction samplers (PISCES) were shipped overnight in a cooler packed with ice to AXYS Analytical. The condition of the hexane samples received by the laboratory was good. These samples were assigned batch number WG13865. PCB-congener concentrations measured in the blank sample analyzed with batch WG13865 were all less than the detection limit. Percent recoveries for ^{13}C-labeled surrogate standards, labeled recovery (internal) standards, and matrix-spike samples were within method criteria, with one exception: the percent surrogate recoveries of ^{13}C-labeled surrogates in the procedural blank were all below method criteria because some of the blank sample was accidentally spilled in the laboratory. It is unlikely that this accident affected the analytical results (Ziqing Ou, AXYS Analytical, Sidney, British Columbia, written commun., 2005). No laboratory duplicates were analyzed with this batch.

On August 16, 2005, 18 hexane samples collected from PISCES samplers were shipped in a cooler packed with ice overnight to AXYS Analytical. The condition of the hexane samples received by the laboratory was good; however, the temperature in the cooler (6°C) was slightly higher than the targeted temperature (4°C). These samples were assigned batch number WG16781. PCB-congener concentrations measured in the blank sample analyzed with batch WG16781 were all less than the detection limit, with three exceptions: PCB 105 + 127 (0.916 ng/sample), PCB 179 (1.51 ng/sample), and PCB 206 (0.268 ng/sample). As a result of these findings, PCB 179 data were flagged as outside quantification limits and excluded from data analysis. Percent recoveries for ^{13}C-labeled surrogate standards, labeled recovery (internal) standards, and matrix-spike samples were within method criteria. No laboratory duplicates were analyzed with this batch.

Bottom-Sediment Grab Samples (AXYS Batch WG16492)

On June 7, 2005, 14 bottom-sediment grab samples were shipped overnight in a cooler packed with ice to AXYS Analytical. The condition of the grab samples received by the laboratory was good; however, the temperature in the cooler (10°C) was slightly higher than the targeted temperature (4°C). These samples were assigned batch number WG16492. PCB-congener concentrations measured in the blank sample analyzed with batch WG16492 were all less than the detection limit, with two exceptions: PCB 137 (0.024 ng/sample) and PCB 209 (0.023 ng/sample), which were detected but in concentrations less than 1.0 ng/sample. The percent recoveries for ^{13}C-labeled surrogate standards, labeled recovery (internal) standards, and matrix-spike samples were within method criteria. Bottom-sediment grab sample QYY 003, which was collected from the Neponset River Estuary, was selected by laboratory personnel for duplicate analysis. The RPDs for PCB-congener concentrations between duplicate aliquots of sample QYY 003 were less than 40 percent and averaged 8 percent.

Fish-Tissue Samples (AXYS Batches WG15112, WG17077, WG17812, and WG19863)

On September 2, 2004, 16 white sucker were shipped overnight to AXYS Analytical. Fish were wrapped in hexane-rinsed aluminum foil and packed in a cooler with ice. The condition of the tissue samples received by the laboratory was good. These fish were skinned, filleted, and assigned batch number WG15112. PCB-congener concentrations measured in the blank sample analyzed with batch WG15112 were all less than the detection limit. The percent recoveries for ^{13}C-labeled surrogate standards, labeled recovery (internal) standards, and matrix-spike samples were within method criteria. No laboratory duplicates were analyzed with this batch.

Skinless fillet extracts, which were analyzed for coplanar PCB congeners by high-resolution gas chromatography/high-resolution mass spectrometry (HRGC/HRMS), were also assigned batch number WG15112. PCB-congener concentrations measured in the blank sample (corn oil) analyzed with batch WG17077 were detected at very low levels (PCB 77, 0.00045 ng/sample; PCB 126, 0.00051 ng/sample; and PCB 169, 0.00053 ng/sample). The percent recoveries of ^{13}C-labeled surrogates and matrix-spike samples were within method criteria. No laboratory duplicates were analyzed with this batch.

On September 26, 2005, 16 whole white sucker were shipped overnight to AXYS Analytical. The fish were wrapped in hexane-rinsed aluminum foil and packed in a cooler with ice. The condition of the tissue samples received by the laboratory was good. These samples were assigned batch number WG17812. PCB-congener concentrations measured in the blank sample analyzed with batch WG17812 were all less than the detection limit, with one exception: PCB 7 (0.327 ng/sample), which was detected at a concentration less than 1.0 ng/sample. The percent recoveries of ^{13}C-labeled surrogates in the fish-tissue sample collected from the Tileston and Hollingsworth Impoundment were generally within the method criteria; however, PCB 118 (131 percent), PCB 180 (130 percent), and PCB 202 (130 percent) were high. Generally, the percent recoveries for matrix-spike samples were also within the method criteria; however, PCB 43 + 49 (68.3 percent), PCB 52 + 73 (69.2 percent), and PCB 54 (63.3 percent) were low. No laboratory duplicates were analyzed with this batch.

Whole fish-tissue extracts, which were analyzed for coplanar PCB congeners by HRGC/HRMS, were assigned batch number WG17077. PCB-congener concentrations in the blank sample (corn oil) analyzed with batch WG17077 were detected at very low levels (PCB 77, 0.00170 ng/sample; PCB 126, 0.00054 ng/sample; and PCB 169, 0.00061 ng/sample). The percent recoveries for ^{13}C-labeled surrogates and matrix-spike samples were within method criteria. No laboratory duplicates were analyzed with this batch.

On July 6, 2006, 21 whole common mummichog were shipped overnight to AXYS Analytical. Fish were wrapped in hexane-rinsed aluminum foil and packed in a cooler with ice. The condition of the tissue samples received by the laboratory was good. These samples were assigned batch number WG19863. PCB-congener concentrations in the blank sample analyzed with batch WG19863 were all less than the detection limit. The percent recoveries for ^{13}C-labeled surrogate standards, labeled recovery (internal) standards, and matrix-spike samples were within method criteria. No laboratory duplicates were analyzed with this batch.

Whole fish-tissue extracts, which were analyzed for coplanar PCB congeners by HRGC/HRMS, were also assigned batch number WG19863. PCB-congener concentrations measured in the blank sample (corn oil) were detected at very low levels (PCB 77, 0.000482 ng/sample; PCB 126, 0.000272 ng/sample; and PCB 169, 0.000248 ng/sample). The percent recoveries of ^{13}C-labeled surrogates and matrix-spike samples were within method criteria. No laboratory duplicates were analyzed with this batch.

Bottom-Sediment Grab Samples (SGS, Batch 084037)

On August 7, 2005, 14 bottom-sediment grab samples were shipped overnight to SGS, Toronto, Ontario. Bottom-sediment grab samples were shipped in a cooler packed with ice. The condition of the grab samples received by the laboratory was good. These samples were assigned batch number 084037. Element concentrations measured in the blank sample analyzed with batch 084037 were all less than the detection limit. Bottom-sediment grab samples DDY–001 and QYY–003, which were collected from Mother Brook and the Neponset River Estuary, respectively, were selected by laboratory personnel for duplicate analysis. The RPDs for element concentrations between duplicate aliquots of samples DDY–001 and QYY–003 were less than 10 percent, with a few exceptions: the RPDs for beryllium concentrations between duplicate aliquots of sample DYY–001 and silver concentrations between duplicate aliquots of sample QYY–003 were about 40 percent. Element concentrations measured in performance and blind (standard submitted by USGS) performance standards were generally within acceptable limits; however, concentrations of 9 of the 23 elements measured in the blind performance sample were slightly higher than best estimates for the true number. Best estimates do not meet the National Institute of Standards and Technology (NIST) qualification limits; however, chemical concentrations are not certified in NIST standards if analyzed by means of a mild digestion like the one used as part of this study. NIST standards that were sent to SGS and analyzed by the same basic methods but with a more robust digestion (by hydrofluoric acid) generally were within certified values (Breault, R.F., U.S. Geological Survey, unpub. data, 2005).

References

Breault, R.F., Cooke, M.G., and Merrill, Michael, 2004a, Sediment quality and polychlorinated biphenyls in the lower Neponset River, Massachusetts, and implications for urban river restoration: U.S. Geological Survey Scientific Investigations Report 2004–5109, 48 p.

Wilde, F.D., Radtke, D.B., Gibs, Jacob, and Iwatsubo, R.T., 1999, Collection of water samples, *in* National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A4, accessed September 10, 2002, at http://water.usgs.gov/owq/FieldManual/chapter4/html/Ch4_contents.html

Table 3–2. Masses and concentrations of polychlorinated biphenyls in point and equal-width-increment water samples collected at the U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Massachusetts, June 7, 2006.

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; EWI, equal-width increment; ng, nanogram; ng/L, nanograms per liter; RPD, relative percent difference; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, relative percent difference was not calculated because concentrations of one or more of the congeners measured in the point sample or the EWI sample were less than detection limit or estimated; analytical batch number WG18692 was assigned to these samples by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; fixed-point and EWI sample volumes were equal to 17.13 and 13.90 L, respectively]

Polychlorinated biphenyl congeners					
IUPAC number	Point sample (ng/sample)	EWI (ng/sample)	Point sample (ng/L)	EWI (ng/L)	RPD
PCB-1	12.8	e20.3	0.747	e1.460	--
PCB-2	<0.514	<0.595	<0.030	<0.042	--
PCB-3	1.92	2.06	0.112	0.148	27.8
PCB-4 + 10	55.6	69.6	3.25	5.01	42.7
PCB-5 + 8	11.8	14.1	0.689	1.014	38.2
PCB-6	2.94	3.41	0.172	0.245	35.3
PCB-7 + 9	e0.740	0.982	e0.043	0.071	--
PCB-11	<0.335	<0.378	<0.019	<0.027	--
PCB-12 + 13	0.88	e0.761	0.051	e0.054	--
PCB-14	<0.335	<0.378	<0.019	<0.027	--
PCB-15	12.8	9.9	0.747	0.712	4.8
PCB-16 + 32	24.8	29	1.45	2.09	36.1
PCB-17	15	18.2	0.876	1.31	39.7
PCB-18	12.6	14.8	0.736	1.06	36.6
PCB-19	17.9	22	1.04	1.58	40.9
PCB-20 + 21 + 33	3.21	3.93	0.187	0.283	40.6
PCB-22	3.14	3.67	0.183	0.264	36.1
PCB-23 + 34	<0.262	<0.613	<0.015	<0.044	--
PCB-24 + 27	12.4	13.9	0.724	1.00	32.0
PCB-25	4.77	4.99	0.278	0.359	25.3
PCB-26	8.85	9.3	0.517	0.669	25.7
PCB-28	17.5	19.8	1.02	1.42	32.9
PCB-29	<0.262	<0.613	<0.015	<0.044	--
PCB-30	<0.425	<0.993	<0.024	<0.071	--
PCB-31	17.7	16.4	1.03	1.18	13.2
PCB-35	<0.430	<0.862	<0.025	<0.062	--
PCB-36	<0.393	<0.788	<0.022	<0.056	--
PCB-37	3.02	3.62	0.176	0.260	38.5
PCB-38	<0.430	<0.862	<0.025	<0.062	--
PCB-39	<0.393	<0.788	<0.022	<0.056	--
PCB-40	3.17	3.08	0.185	0.222	18.0
PCB-41 + 64 + 68 + 71	22.6	21.2	1.32	1.53	14.5
PCB-42 + 59	7.09	7.03	0.414	0.506	20.0
PCB-43 + 49	19.6	18.2	1.14	1.31	13.5
PCB-44	14.5	13.2	0.846	0.950	11.5
PCB-45	2.61	2.42	0.152	0.174	13.3
PCB-46	1.23	0.951	0.072	0.068	4.8
PCB-47 + 48 + 75	17.1	15.5	0.998	1.115	11.1
PCB-50	<0.509	<0.635	<0.029	<0.045	--

Table 3–2. Masses and concentrations of polychlorinated biphenyls in point and equal-width-increment water samples collected at the U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Massachusetts, June 7, 2006.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; EWI, equal-width increment; ng, nanogram; ng/L, nanograms per liter; RPD, relative percent difference; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, relative percent difference was not calculated because concentrations of one or more of the congeners measured in the point sample or the EWI sample were less than detection limit or estimated; analytical batch number WG18692 was assigned to these samples by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; fixed-point and EWI sample volumes were equal to 17.13 and 13.90 L, respectively]

Polychlorinated biphenyl congeners					
IUPAC number	Point sample (ng/sample)	EWI (ng/sample)	Point sample (ng/L)	EWI (ng/L)	RPD
PCB-51	3.85	3.52	0.225	0.253	11.9
PCB-52 + 73	23.2	21.4	1.35	1.54	12.8
PCB-53	7.11	6.31	0.415	0.454	9.0
PCB-54	<0.509	<0.635	<0.029	<0.045	--
PCB-55	<0.726	<0.961	<0.042	<0.069	--
PCB-56 + 60	6.7	5.77	0.391	0.415	5.9
PCB-57	<1.32	<1.75	<0.077	<0.125	--
PCB-58	<1.32	<1.75	<0.077	<0.125	--
PCB-61 + 74	5.42	5.57	0.316	0.401	23.5
PCB-62 + 65	<0.606	<0.756	<0.035	<0.054	--
PCB-63	1.07	<0.904	0.062	<0.065	--
PCB-66 + 80	10.5	9.52	0.613	0.685	11.1
PCB-67	<1.32	<1.75	<0.077	<0.125	--
PCB-69	<0.606	<0.756	<0.035	<0.054	--
PCB-70 + 76	11	9.62	0.642	0.692	7.5
PCB-72	<0.682	<0.851	<0.039	<0.061	--
PCB-77	1.65	e1.36	0.096	e0.097	--
PCB-78	<0.484	<0.665	<0.028	<0.047	--
PCB-79	<0.484	<0.665	<0.028	<0.047	--
PCB-81	<0.484	<0.665	<0.028	<0.047	--
PCB-82	1.48	1.56	0.086	0.112	26.0
PCB-83 + 108	0.916	0.78	0.053	0.056	4.8
PCB-84	3.22	2.97	0.188	0.214	12.8
PCB-85 + 120	2.81	e2.32	0.164	e0.166	--
PCB-86 + 97	4.48	3.53	0.262	0.254	2.9
PCB-87 + 115 + 116	6.39	5.5	0.373	0.396	5.9
PCB-88 + 121	<0.436	<0.515	<0.025	<0.037	--
PCB-89 + 90 + 101	11.6	9.94	0.677	0.715	5.4
PCB-91	2.62	2.47	0.153	0.178	15.0
PCB-92	2.95	2.26	0.172	0.163	5.7
PCB-93 + 95	12	10.2	0.701	0.734	4.6
PCB-94	<0.436	<0.515	<0.025	<0.037	--
PCB-96	<0.436	<0.515	<0.025	<0.037	--
PCB-98 + 102	0.935	0.784	0.055	0.056	3.3
PCB-99	5.64	4.96	0.329	0.357	8.0
PCB-100	<0.436	<0.515	<0.025	<0.037	--
PCB-103	<0.436	<0.515	<0.025	<0.037	--
PCB-104	<0.307	<0.363	<0.017	<0.026	--
PCB-105 + 127	3.71	3.29	0.217	0.237	8.9

Table 3–2. Masses and concentrations of polychlorinated biphenyls in point and equal-width-increment water samples collected at the U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Massachusetts, June 7, 2006.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; EWI, equal-width increment; ng, nanogram; ng/L, nanograms per liter; RPD, relative percent difference; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, relative percent difference was not calculated because concentrations of one or more of the congeners measured in the point sample or the EWI sample were less than detection limit or estimated; analytical batch number WG18692 was assigned to these samples by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; fixed-point and EWI sample volumes were equal to 17.13 and 13.90 L, respectively]

Polychlorinated biphenyl congeners					
IUPAC number	Point sample (ng/sample)	EWI (ng/sample)	Point sample (ng/L)	EWI (ng/L)	RPD
PCB-106 + 118	8.74	7.28	0.510	0.524	2.6
PCB-107 + 109	0.664	<0.665	0.039	<0.047	--
PCB-110	16.3	13.8	0.952	0.993	4.2
PCB-111 + 117	<0.595	<0.951	<0.034	<0.068	--
PCB-112	<0.419	<0.496	<0.024	<0.035	--
PCB-113	<0.359	<0.425	<0.020	<0.030	--
PCB-114	<0.410	<0.656	<0.023	<0.047	--
PCB-119	0.656	0.501	0.038	0.036	6.1
PCB-122	<0.410	<0.656	<0.023	<0.047	--
PCB-123	<0.416	<0.692	<0.024	<0.049	--
PCB-124	<0.416	<0.665	<0.024	<0.047	--
PCB-125	<0.595	<0.951	<0.034	<0.068	--
PCB-126	<0.429	<0.686	<0.025	<0.049	--
PCB-128	2	2.06	0.117	0.148	23.7
PCB-129	<0.860	<1.02	<0.050	<0.073	--
PCB-130	<0.860	<1.02	<0.050	<0.073	--
PCB-131 + 142	<0.389	<0.419	<0.022	<0.030	--
PCB-132 + 168	3.11	3.28	0.182	0.236	26.1
PCB-133	<0.389	<0.419	<0.022	<0.030	--
PCB-134 + 143	<0.389	<0.419	<0.022	<0.030	--
PCB-135 + 144	1.47	1.48	0.086	0.106	21.5
PCB-136	1.73	1.38	0.101	0.099	1.7
PCB-137	e1.43	<0.865	e0.083	<0.062	--
PCB-138 + 163 + 164	10.9	10.5	0.636	0.755	17.1
PCB-139 + 149	7.26	6.64	0.424	0.478	12.0
PCB-140	<0.389	<0.419	<0.022	<0.030	--
PCB-141	1.46	1.41	0.085	0.101	17.4
PCB-145	<0.389	<0.419	<0.022	<0.030	--
PCB-146	1.46	1.21	0.085	0.087	2.1
PCB-147	<0.389	<0.419	<0.022	<0.030	--
PCB-148	<0.389	<0.419	<0.022	<0.030	--
PCB-150	<0.389	<0.419	<0.022	<0.030	--
PCB-151	2.16	1.82	0.126	0.131	3.8
PCB-152	<0.389	<0.419	<0.022	<0.030	--
PCB-153	7.6	7.13	0.444	0.513	14.5
PCB-154	<0.389	<0.419	<0.022	<0.030	--
PCB-155	<0.276	<0.297	<0.016	<0.021	--
PCB-156	0.832	0.815	0.049	0.059	18.8
PCB-157	<0.579	<0.685	<0.033	<0.049	--

Table 3–2. Masses and concentrations of polychlorinated biphenyls in point and equal-width-increment water samples collected at the U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Massachusetts, June 7, 2006.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; EWI, equal-width increment; ng, nanogram; ng/L, nanograms per liter; RPD, relative percent difference; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, relative percent difference was not calculated because concentrations of one or more of the congeners measured in the point sample or the EWI sample were less than detection limit or estimated; analytical batch number WG18692 was assigned to these samples by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; fixed-point and EWI sample volumes were equal to 17.13 and 13.90 L, respectively]

Polychlorinated biphenyl congeners					
IUPAC number	Point sample (ng/sample)	EWI (ng/sample)	Point sample (ng/L)	EWI (ng/L)	RPD
PCB-158 + 160	1.38	1.45	0.081	0.104	25.7
PCB-159	<0.731	<0.865	<0.042	<0.062	--
PCB-161	<0.353	<0.380	<0.020	<0.027	--
PCB-162	<0.731	<0.865	<0.042	<0.062	--
PCB-165	<0.353	<0.380	<0.020	<0.027	--
PCB-166	<0.731	<0.865	<0.042	<0.062	--
PCB-167	<0.562	<0.665	<0.032	<0.047	--
PCB-169	<0.572	<0.677	<0.033	<0.048	--
PCB-170 + 190	<0.777	2.13	<0.045	0.153	--
PCB-171	<0.648	<0.624	<0.037	<0.044	--
PCB-172 + 192	<0.648	<0.624	<0.037	<0.044	--
PCB-173	<0.648	<0.624	<0.037	<0.044	--
PCB-174 + 181	<0.666	<0.641	<0.038	<0.046	--
PCB-175	<0.664	<0.640	<0.038	<0.046	--
PCB-176	<0.509	<0.490	<0.029	<0.035	--
PCB-177	0.958	0.864	0.056	0.062	10.6
PCB-178	<0.664	<0.640	<0.038	<0.046	--
PCB-179	0.622	0.695	0.036	0.050	31.7
PCB-180	3.89	3.6	0.227	0.259	13.1
PCB-182 + 187	1.97	2.06	0.115	0.148	25.2
PCB-183	0.976	1.06	0.057	0.076	28.9
PCB-184	<0.509	<0.490	<0.029	<0.035	--
PCB-185	<0.666	<0.641	<0.038	<0.046	--
PCB-186	<0.664	<0.640	<0.038	<0.046	--
PCB-188	<0.509	<0.490	<0.029	<0.035	--
PCB-189	<0.538	<0.518	<0.031	<0.037	--
PCB-191	<0.648	<0.624	<0.037	<0.044	--
PCB-193	<0.648	<0.624	<0.037	<0.044	--
PCB-194	1.08	e1.14	0.063	e0.082	--
PCB-195	<0.473	<0.954	<0.027	<0.068	--
PCB-196 + 203	1.31	e1.11	0.076	e0.079	--
PCB-197	<0.335	<0.676	<0.019	<0.048	--
PCB-198	<0.471	<0.950	<0.027	<0.068	--
PCB-199	e1.03	e1.33	e0.060	e0.095	--
PCB-200	<0.335	<0.676	<0.019	<0.048	--
PCB-201	<0.335	<0.676	<0.019	<0.048	--
PCB-202	<0.379	<0.764	<0.022	<0.054	--
PCB-204	<0.335	<0.676	<0.019	<0.048	--
PCB-205	<0.363	<0.732	<0.021	<0.052	--

Table 3–2. Masses and concentrations of polychlorinated biphenyls in point and equal-width-increment water samples collected at the U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Massachusetts, June 7, 2006.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; EWI, equal-width increment; ng, nanogram; ng/L, nanograms per liter; RPD, relative percent difference; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, relative percent difference was not calculated because concentrations of one or more of the congeners measured in the point sample or the EWI sample were less than detection limit or estimated; analytical batch number WG18692 was assigned to these samples by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; fixed-point and EWI sample volumes were equal to 17.13 and 13.90 L, respectively]

Polychlorinated biphenyl congeners					
IUPAC number	Point sample (ng/sample)	EWI (ng/sample)	Point sample (ng/L)	EWI (ng/L)	RPD
PCB-206	<1.03	<1.32	<0.060	<0.094	--
PCB-207	<0.906	<1.16	<0.052	<0.083	--
PCB-208	<0.906	<1.16	<0.052	<0.083	--
PCB-209	0.706	<1.31	0.041	<0.094	--
Total	536	522	31.29	37.55	18.2
Polychlorinated biphenyl homologs					
Homolog	**Point sample (ng/sample)**	**EWI (ng/sample)**	**Point sample (ng/L)**	**EWI (ng/L)**	**RPD**
Total Monochlorobiphenyls	14.7	2.06	0.858	0.148	141.1
Total Dichlorobiphenyls	84	98	4.90	7.05	35.9
Total Trichlorobiphenyls	141	160	8.23	11.51	33.2
Total Tetrachlorobiphenyls	158	143	9.22	10.29	10.9
Total Pentachlorobiphenyls	85.1	69.8	4.97	5.02	1.1
Total Hexachlorobiphenyls	41.4	39.2	2.42	2.82	15.4
Total Heptachlorobiphenyls	8.42	10.4	0.492	0.748	41.4
Total Octachlorobiphenyls	2.39	--	0.140	--	--
Total Nonachlorobiphenyls	--	--	--	--	--
Decachlorobiphenyls	0.706	--	0.041	--	--
Polychlorinated biphenyl Aroclors					
Aroclor	**Point sample (ng/sample)**	**EWI (ng/sample)**	**Point sample (ng/L)**	**EWI (ng/L)**	**RPD**
Aroclor 1221	<0.988	<1.14	<0.057	<0.082	--
Aroclor 1232	<1.77	<3.38	<0.103	<0.243	--
Aroclor 1016/1242	226	247	13.19	17.77	29.6
Aroclor 1248	<3.76	<4.97	<0.219	<0.357	--
Aroclor 1254	165	140	9.63	10.07	4.5
Aroclor 1260	34.5	48.2	2.01	3.47	53.0

Table 3–3. Masses and concentrations of particulate and dissolved polychlorinated biphenyls in equipment blanks.

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; GFF, glass fiber filter; ng, nanograms; ng/L, nanograms per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not calculated or tested by the laboratory]

IUPAC number	Polychlorinated biphenyl congeners							
	Equipment blank				Quality-control samples			
	GFF	XAD	Tap water		Laboratory blank		Laboratory matrix spike	
	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (ng/L)	Dissolved (ng/L)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
PCB-1	e0.166	e0.508	e0.009	e0.030	<2.13	e0.333	79.8	75.1
PCB-2	<0.152	<0.221	<0.008	<0.013	<2.12	0.287	--	--
PCB-3	<0.152	<0.221	<0.008	<0.013	<2.12	e0.064	89.5	94.6
PCB-4 + 10	<0.407	e0.206	<0.024	e0.012	<0.324	<0.072	82.1	69.6
PCB-5 + 8	<0.230	<0.092	<0.013	<0.005	<0.183	e0.141	87.7	91
PCB-6	<0.230	0.104	<0.013	0.006	e0.256	<0.041	--	--
PCB-7 + 9	e0.437	e2.73	e0.025	e0.161	e1.52	e0.246	--	--
PCB-11	e0.614	e0.816	e0.036	e0.048	<0.183	e0.367	--	--
PCB-12 + 13	<0.230	e2.37	<0.013	e0.140	<0.183	e0.457	--	--
PCB-14	<0.230	0.122	<0.013	0.007	<0.183	e0.061	--	--
PCB-15	<0.251	e1.28	<0.014	e0.075	e0.623	e0.093	85.9	107
PCB-16 + 32	<0.217	e0.280	<0.012	e0.016	<0.108	e0.093	--	--
PCB-17	<0.217	<0.136	<0.012	<0.008	<0.108	<0.056	--	--
PCB-18	<0.217	<0.136	<0.012	<0.008	<0.108	<0.056	82.9	77.5
PCB-19	<0.258	<0.162	<0.015	<0.009	<0.129	<0.066	78.4	64.7
PCB-20 + 21 + 33	<0.197	<0.091	<0.011	<0.005	e0.113	<0.077	--	--
PCB-22	<0.197	e0.216	<0.011	e0.012	<0.075	<0.077	--	--
PCB-23 + 34	<0.137	<0.086	<0.008	<0.005	<0.068	<0.035	76.1	79.9
PCB-24 + 27	<0.217	<0.136	<0.012	<0.008	<0.108	<0.056	--	--
PCB-25	<0.137	<0.086	<0.008	<0.005	<0.068	e0.078	--	--
PCB-26	<0.137	<0.086	<0.008	<0.005	<0.068	e0.188	--	--
PCB-28	<0.157	<0.098	<0.009	<0.005	e0.096	e0.079	88.5	92.9
PCB-29	<0.137	<0.086	<0.008	<0.005	<0.068	e0.042	--	--
PCB-30	<0.217	<0.136	<0.012	<0.008	<0.108	<0.056	--	--
PCB-31	<0.137	<0.086	<0.008	<0.005	<0.068	e0.053	85.3	92.2
PCB-35	<0.211	e0.152	<0.012	e0.008	<0.080	e0.698	--	--
PCB-36	<0.197	<0.091	<0.011	<0.005	<0.075	e1.06	--	--
PCB-37	<0.211	<0.098	<0.012	<0.005	<0.080	e0.138	88.5	105
PCB-38	<0.211	e0.328	<0.012	e0.019	<0.080	<0.082	--	--
PCB-39	<0.197	<0.091	<0.011	<0.005	<0.075	e0.082	--	--
PCB-40	<0.293	<0.290	<0.017	<0.017	<0.191	<0.136	81.8	88.5
PCB-41 + 64 + 68 + 71	<0.468	<0.185	<0.027	<0.010	<0.080	<0.074	--	--
PCB-42 + 59	<0.468	<0.185	<0.027	<0.010	<0.080	<0.074	--	--
PCB-43 + 49	<0.491	<0.194	<0.029	<0.011	<0.084	<0.077	82.8	83.9
PCB-44	<0.468	<0.185	<0.027	<0.010	<0.080	<0.074	80.7	82.9
PCB-45	<0.412	<0.163	<0.024	<0.009	<0.071	<0.065	--	--
PCB-46	<0.412	<0.163	<0.024	<0.009	<0.071	<0.065	--	--

Table 3–3. Masses and concentrations of particulate and dissolved polychlorinated biphenyls in equipment blanks.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; GFF, glass fiber filter; ng, nanograms; ng/L, nanograms per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not calculated or tested by the laboratory]

Polychlorinated biphenyl congeners								
	Equipment blank				Quality-control samples			
IUPAC number	GFF	XAD	Tap water		Laboratory blank		Laboratory matrix spike	
	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (ng/L)	Dissolved (ng/L)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
PCB-47 + 48 + 75	1.06	4.56	0.063	0.270	<0.071	<0.065	--	--
PCB-50	<0.349	<0.138	<0.020	<0.008	<0.060	<0.055	--	--
PCB-51	<0.412	0.582	<0.024	0.034	<0.071	<0.065	--	--
PCB-52 + 73	<0.412	<0.163	<0.024	<0.009	<0.071	<0.065	79.1	80.8
PCB-53	<0.412	<0.163	<0.024	<0.009	<0.071	<0.065	--	--
PCB-54	<0.349	<0.138	<0.020	<0.008	<0.060	<0.055	73.3	63.5
PCB-55	<0.154	<0.152	<0.009	<0.008	<0.100	<0.072	--	--
PCB-56 + 60	<0.154	<0.152	<0.009	<0.008	<0.100	<0.072	84.3	93.4
PCB-57	<0.293	<0.290	<0.017	<0.017	<0.191	<0.136	--	--
PCB-58	<0.293	<0.290	<0.017	<0.017	<0.191	<0.136	--	--
PCB-61 + 74	<0.150	<0.149	<0.008	<0.008	<0.098	<0.070	--	--
PCB-62 + 65	<0.412	<0.163	<0.024	<0.009	<0.071	<0.065	--	--
PCB-63	<0.150	<0.149	<0.008	<0.008	<0.098	<0.070	--	--
PCB-66 + 80	<0.150	<0.149	<0.008	<0.008	<0.098	<0.070	84	92
PCB-67	<0.293	<0.290	<0.017	<0.017	<0.191	<0.136	--	--
PCB-69	<0.412	<0.163	<0.024	<0.009	<0.071	<0.065	--	--
PCB-70 + 76	<0.150	<0.149	<0.008	<0.008	<0.098	<0.070	--	--
PCB-72	<0.468	<0.185	<0.027	<0.010	<0.080	<0.074	--	--
PCB-77	<0.187	<0.189	<0.011	<0.011	<0.145	e0.165	92.5	102
PCB-78	<0.187	<0.189	<0.011	<0.011	<0.145	<0.082	--	--
PCB-79	<0.187	<0.189	<0.011	<0.011	<0.145	<0.082	--	--
PCB-81	<0.187	<0.189	<0.011	<0.011	<0.145	e0.242	94.5	103
PCB-82	<0.145	<0.088	<0.008	<0.005	<0.081	<0.097	--	--
PCB-83 + 108	<0.190	<0.082	<0.011	<0.004	<0.093	<0.063	--	--
PCB-84	<0.162	e0.094	<0.009	e0.005	<0.080	<0.054	--	--
PCB-85 + 120	<0.145	<0.088	<0.008	<0.005	<0.081	e0.747	--	--
PCB-86 + 97	<0.145	<0.088	<0.008	<0.005	<0.081	<0.097	--	--
PCB-87 + 115 + 116	<0.145	<0.088	<0.008	<0.005	<0.081	<0.097	88.4	97.1
PCB-88 + 121	<0.193	<0.083	<0.011	<0.004	<0.095	<0.064	--	--
PCB-89 + 90 + 101	<0.162	0.112	<0.009	0.007	<0.080	<0.054	83.2	93
PCB-91	<0.193	<0.083	<0.011	<0.004	<0.095	<0.064	--	--
PCB-92	<0.162	<0.070	<0.009	<0.004	<0.080	<0.054	--	--
PCB-93 + 95	<0.193	e0.305	<0.011	e0.018	<0.095	<0.064	81.5	89.2
PCB-94	<0.193	<0.083	<0.011	<0.004	<0.095	<0.064	--	--
PCB-96	<0.193	<0.083	<0.011	<0.004	<0.095	<0.064	--	--
PCB-98 + 102	<0.193	<0.083	<0.011	<0.004	<0.095	<0.064	--	--
PCB-99	<0.157	<0.068	<0.009	<0.004	<0.077	e0.052	82.6	93.6

Table 3–3. Masses and concentrations of particulate and dissolved polychlorinated biphenyls in equipment blanks.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; GFF, glass fiber filter; ng, nanograms; ng/L, nanograms per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not calculated or tested by the laboratory]

Polychlorinated biphenyl congeners								
	Equipment blank				Quality-control samples			
	GFF	XAD	Tap water		Laboratory blank		Laboratory matrix spike	
IUPAC number	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (ng/L)	Dissolved (ng/L)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
PCB-100	<0.193	<0.083	<0.011	<0.004	<0.095	<0.064	--	--
PCB-103	<0.193	<0.083	<0.011	<0.004	<0.095	e0.097	--	--
PCB-104	<0.141	<0.061	<0.008	<0.003	<0.069	<0.046	78.3	78.7
PCB-105 + 127	<0.101	<0.062	<0.005	<0.003	<0.056	<0.068	85.5	97.7
PCB-106 + 118	<0.096	<0.061	<0.005	<0.003	<0.052	<0.071	80.9	91.8
PCB-107 + 109	<0.100	<0.061	<0.005	<0.003	<0.056	<0.067	--	--
PCB-110	e0.137	e0.201	e0.008	e0.011	<0.056	<0.067	83.9	94.3
PCB-111 + 117	<0.145	<0.088	<0.008	<0.005	<0.081	<0.097	--	--
PCB-112	<0.190	<0.082	<0.011	<0.004	<0.093	<0.063	--	--
PCB-113	<0.162	<0.070	<0.009	<0.004	<0.080	<0.054	--	--
PCB-114	<0.101	<0.061	<0.005	<0.003	<0.056	<0.067	85.1	99.3
PCB-119	<0.157	<0.068	<0.009	<0.004	<0.077	<0.052	--	--
PCB-122	<0.101	<0.061	<0.005	<0.003	<0.056	<0.067	--	--
PCB-123	<0.096	<0.061	<0.005	<0.003	<0.052	e0.079	78.4	85.3
PCB-124	<0.100	<0.061	<0.005	<0.003	<0.056	<0.067	--	--
PCB-125	<0.145	<0.088	<0.008	<0.005	<0.081	<0.097	--	--
PCB-126	<0.105	<0.064	<0.006	<0.003	<0.059	<0.070	--	--
PCB-128	<0.180	<0.207	<0.010	<0.012	<0.022	<0.106	--	--
PCB-129	<0.180	<0.207	<0.010	<0.012	<0.022	<0.106	--	--
PCB-130	<0.180	<0.207	<0.010	<0.012	e0.034	<0.106	--	--
PCB-131 + 142	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-132 + 168	<0.164	<0.188	<0.009	<0.011	<0.020	<0.097	--	--
PCB-133	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-134 + 143	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-135 + 144	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-136	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-137	<0.153	<0.176	<0.009	<0.010	0.025	<0.090	--	--
PCB-138 + 163 + 164	<0.153	<0.176	<0.009	<0.010	0.023	<0.090	88.5	94.1
PCB-139 + 149	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	85	98.2
PCB-140	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-141	<0.153	<0.176	<0.009	<0.010	e0.034	<0.090	--	--
PCB-145	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-146	<0.156	<0.072	<0.009	<0.004	<0.060	<0.049	--	--
PCB-147	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-148	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-150	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-151	<0.214	<0.098	<0.012	<0.005	<0.082	<0.067	87	99.6

Table 3–3. Masses and concentrations of particulate and dissolved polychlorinated biphenyls in equipment blanks.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; GFF, glass fiber filter; ng, nanograms; ng/L, nanograms per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not calculated or tested by the laboratory]

IUPAC number	Polychlorinated biphenyl congeners							
	Equipment blank				Quality-control samples			
	GFF	XAD	Tap water		Laboratory blank		Laboratory matrix spike	
	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (ng/L)	Dissolved (ng/L)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
PCB-152	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-153	<0.140	<0.160	<0.008	<0.009	0.018	<0.082	88.1	94.7
PCB-154	<0.171	<0.078	<0.010	<0.004	<0.065	<0.054	--	--
PCB-155	<0.119	<0.055	<0.007	<0.003	<0.046	<0.038	79.5	89.6
PCB-156	<0.120	<0.137	<0.007	<0.008	0.029	<0.071	88	93.9
PCB-157	<0.121	<0.139	<0.007	<0.008	0.021	<0.071	88.3	94.9
PCB-158 + 160	<0.153	<0.176	<0.009	<0.010	<0.018	<0.090	--	--
PCB-159	<0.153	<0.176	<0.009	<0.010	<0.018	<0.090	--	--
PCB-161	<0.156	<0.072	<0.009	<0.004	<0.060	<0.049	--	--
PCB-162	<0.153	<0.176	<0.009	<0.010	<0.018	<0.090	--	--
PCB-165	<0.156	<0.072	<0.009	<0.004	<0.060	<0.049	--	--
PCB-166	<0.153	<0.176	<0.009	<0.010	<0.018	<0.090	--	--
PCB-167	<0.117	<0.134	<0.006	<0.007	0.016	<0.069	86.2	93.1
PCB-169	<0.121	e0.181	<0.007	e0.010	e0.043	<0.071	88.4	96.1
PCB-170 + 190	<0.109	<0.153	<0.006	<0.009	<0.129	<0.110	85.4	96.7
PCB-171	<0.088	<0.125	<0.005	<0.007	<0.105	<0.089	--	--
PCB-172 + 192	<0.088	<0.125	<0.005	<0.007	<0.105	<0.089	--	--
PCB-173	<0.088	<0.125	<0.005	<0.007	<0.105	<0.089	--	--
PCB-174 + 181	<0.088	<0.125	<0.005	<0.007	<0.105	<0.090	--	--
PCB-175	<0.090	<0.127	<0.005	<0.007	<0.107	<0.091	--	--
PCB-176	<0.069	<0.098	<0.004	<0.005	<0.082	<0.070	--	--
PCB-177	<0.088	<0.125	<0.005	<0.007	<0.105	<0.090	--	--
PCB-178	<0.090	<0.127	<0.005	<0.007	<0.107	<0.091	--	--
PCB-179	<0.069	<0.098	<0.004	<0.005	<0.082	<0.070	--	--
PCB-180	<0.088	<0.125	<0.005	<0.007	<0.105	<0.089	84.1	91.3
PCB-182 + 187	<0.090	<0.127	<0.005	<0.007	<0.107	<0.091	86.2	93.7
PCB-183	<0.088	<0.125	<0.005	<0.007	<0.105	<0.090	87.5	94.5
PCB-184	<0.069	<0.098	<0.004	<0.005	<0.082	<0.070	--	--
PCB-185	<0.088	<0.125	<0.005	<0.007	<0.105	<0.090	--	--
PCB-186	<0.090	<0.127	<0.005	<0.007	<0.107	<0.091	--	--
PCB-188	<0.069	<0.098	<0.004	<0.005	<0.082	<0.070	85.3	92
PCB-189	e0.081	<0.104	e0.004	<0.006	<0.087	<0.074	84.6	94.1
PCB-191	<0.088	<0.125	<0.005	<0.007	<0.105	<0.089	--	--
PCB-193	<0.088	<0.125	<0.005	<0.007	<0.105	<0.089	--	--
PCB-194	<0.451	<0.145	<0.026	<0.008	<0.137	<0.115	85.4	98.9
PCB-195	<0.451	<0.145	<0.026	<0.008	<0.137	<0.115	--	--
PCB-196 + 203	<0.437	e0.145	<0.025	e0.008	<0.133	<0.111	85.9	98.3

Table 3–3. Masses and concentrations of particulate and dissolved polychlorinated biphenyls in equipment blanks.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; GFF, glass fiber filter; ng, nanograms; ng/L, nanograms per liter; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not calculated or tested by the laboratory]

IUPAC number	Equipment blank				Quality-control samples			
	GFF	XAD	Tap water		Laboratory blank		Laboratory matrix spike	
	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (ng/L)	Dissolved (ng/L)	Particulate (ng/sample)	Dissolved (ng/sample)	Particulate (percent recovery)	Dissolved (percent recovery)
Polychlorinated biphenyl congeners								
PCB-197	<0.313	<0.101	<0.018	<0.005	<0.095	<0.080	--	--
PCB-198	<0.437	<0.140	<0.025	<0.008	<0.133	<0.111	--	--
PCB-199	<0.437	<0.140	<0.025	<0.008	<0.133	<0.111	--	--
PCB-200	<0.313	<0.101	<0.018	<0.005	<0.095	<0.080	--	--
PCB-201	<0.313	<0.101	<0.018	<0.005	<0.095	<0.080	--	--
PCB-202	<0.354	<0.114	<0.020	<0.006	<0.108	<0.090	84.1	94.5
PCB-204	<0.313	<0.101	<0.018	<0.005	<0.095	<0.080	--	--
PCB-205	<0.335	<0.108	<0.019	<0.006	<0.102	<0.085	81.4	92.2
PCB-206	<0.291	<0.267	<0.017	<0.015	<0.173	<0.428	82.2	92.1
PCB-207	<0.263	<0.241	<0.015	<0.014	e0.173	<0.387	--	--
PCB-208	<0.263	<0.241	<0.015	<0.014	e0.193	<0.387	83.7	94.5
PCB-209	<0.241	<0.122	<0.014	<0.007	<0.123	e0.162	78.4	90.4
Total	1.06	5.48	0.063	0.324	0.132	0.287	--	--
Polychlorinated biphenyl homologs								
Total Monochlorobiphenyls	<0.153	<0.222	<0.009	<0.013	<2.13	0.287	--	--
Total Dichlorobiphenyls	<0.407	0.226	<0.024	0.013	<0.324	<0.0721	--	--
Total Trichlorobiphenyls	<0.258	<0.162	<0.015	<0.009	<0.129	<0.0824	--	--
Total Tetrachlorobiphenyls	1.06	5.14	0.063	0.304	<0.191	<0.136	--	--
Total Pentachlorobiphenyls	<0.193	0.112	<0.011	0.007	<0.0948	<0.0968	--	--
Total Hexachlorobiphenyls	<0.214	<0.207	<0.012	<0.012	0.132	<0.106	--	--
Total Heptachlorobiphenyls	<0.109	<0.153	<0.006	<0.009	<0.129	<0.110	--	--
Total Octachlorobiphenyls	<0.451	<0.145	<0.026	<0.008	<0.137	<0.115	--	--
Total Nonachlorobiphenyls	<0.291	<0.267	<0.017	<0.015	<0.173	<0.428	--	--
Decachlorobiphenyls	<0.241	<0.122	<0.014	<0.007	<0.123	<0.0930	--	--
Polychlorinated biphenyl Aroclors								
Aroclor 1221	<0.437	<0.422	<0.025	<0.024	<4.05	<0.0775	--	--
Aroclor 1232	<0.738	<0.755	<0.043	<0.044	<7.24	<0.189	--	--
Aroclor 1016/1242	<0.874	<0.517	<0.051	<0.030	<0.695	<0.211	--	--
Aroclor 1248	<2.70	<1.07	<0.159	<0.063	<0.537	<0.425	--	--
Aroclor 1254	<1.57	<0.884	<0.092	<0.052	<0.808	<0.968	--	--
Aroclor 1260	<0.774	<1.09	<0.045	<0.064	<0.916	<0.781	--	--

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Appendix 4. Polychlorinated Biphenyl Masses Measured in Water Samples

Tables

4–1. Masses of dissolved polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–06 126
4–2. Masses of particulate polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006 132

Table 4–1. Masses of dissolved polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–06.

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners															
	Monthly composite river samples										Quality-control samples					
											Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 A (ng/sample)	May 2005 B (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-1	0.449	<0.352	0.488	0.585	1.81	e1.32	e0.525	<0.268	e0.749	<0.785	<0.303	e0.333	e0.220	76.9	79.8	84.9
PCB-2	<0.291	<0.365	<0.367	<0.540	<0.255	<0.414	<0.209	<0.265	<0.644	<0.775	<0.314	0.287	<0.215	--	--	--
PCB-3	<0.291	<0.365	<0.367	<0.540	<0.255	<0.414	<0.209	<0.265	<0.644	<0.775	<0.314	e0.064	<0.215	99.9	89.5	97.5
PCB-4 + 10	68.1	<0.964	57.4	53.5	74	64.7	2.18	5.9	5.34	4.68	<0.554	<0.072	<0.392	82.7	82.1	90.9
PCB-5 + 8	1.87	<0.555	0.988	<0.550	1.35	1.14	<0.456	<0.432	<0.472	<0.414	<0.319	e0.141	<0.224	100	87.7	98.6
PCB-6	<0.448	<0.555	<0.589	<0.550	0.391	<0.313	<0.456	<0.432	<0.472	<0.414	<0.319	<0.041	<0.224	--	--	--
PCB-7 + 9	<0.448	<0.555	<0.589	<0.550	<0.309	e1.66	<0.456	e0.457	<0.472	<0.414	<0.319	e0.246	e0.340	--	--	--
PCB-11	<0.448	<0.555	<0.589	<0.550	<0.309	e0.756	<0.456	<0.432	<0.472	<0.414	<0.319	e0.367	e0.265	--	--	--
PCB-12 + 13	<0.448	<0.555	<0.589	<0.550	<0.309	<0.313	<0.456	<0.432	<0.472	<0.414	<0.319	e0.457	<0.224	--	--	--
PCB-14	<0.448	<0.555	<0.589	<0.550	<0.309	<0.313	<0.456	<0.432	<0.472	<0.414	<0.319	e0.061	<0.224	--	--	--
PCB-15	<0.557	<0.692	<0.733	<0.685	<0.385	<0.341	<0.495	<0.468	<0.512	<0.449	<0.398	e0.093	<0.243	122	85.9	109
PCB-16 + 32	7.39	<0.417	5.63	5.99	6.16	6.79	0.839	2.49	1.18	0.856	<0.312	e0.093	<0.604	--	--	--
PCB-17	5.28	<0.417	3.89	3.61	4.15	4.26	<0.484	0.792	0.914	<0.525	<0.312	<0.056	<0.604	--	--	--
PCB-18	3.59	<0.417	3.14	3.04	4.09	3.78	<0.484	1.1	0.933	<0.525	<0.312	<0.056	<0.604	86	82.9	94
PCB-19	15.4	<0.486	13.3	12.8	16.9	11.7	1.58	3.89	1.35	2.38	<0.364	<0.066	<0.708	76	78.4	88
PCB-20 + 21 + 33	<0.653	<0.460	<0.462	<0.563	<0.356	e0.164	<0.516	<0.337	<0.428	<0.587	<0.373	<0.077	e0.980	--	--	--
PCB-22	<0.653	<0.460	<0.462	<0.563	<0.356	0.324	<0.516	<0.337	<0.428	<0.587	<0.373	<0.077	<0.373	--	--	--
PCB-23 + 34	<0.342	<0.314	<0.306	<0.188	<0.155	<0.154	<0.299	<0.337	<0.332	<0.324	<0.235	<0.035	<0.373	98.7	76.1	87.4
PCB-24 + 27	5.82	<0.417	4.77	4.82	5.17	5.02	0.503	1.58	<0.537	0.648	<0.312	<0.056	<0.604	--	--	--
PCB-25	0.837	<0.314	0.884	0.51	0.612	0.629	<0.299	<0.337	<0.332	<0.324	<0.235	e0.078	<0.373	--	--	--
PCB-26	1.76	<0.314	1.53	1.35	1.19	1.56	<0.299	0.359	<0.332	<0.324	<0.235	e0.188	<0.373	--	--	--
PCB-28	1.36	<0.288	1.21	0.931	0.79	1.05	0.398	0.776	0.578	0.762	<0.215	e0.079	e0.501	90.3	88.5	101
PCB-29	<0.342	<0.314	<0.306	<0.188	<0.155	<0.154	<0.299	<0.337	<0.332	<0.324	<0.235	e0.042	<0.373	--	--	--
PCB-30	<0.454	<0.417	<0.406	<0.249	<0.206	<0.245	<0.484	<0.546	<0.537	<0.525	<0.312	<0.056	<0.604	--	--	--
PCB-31	2.6	<0.314	1.82	1.28	1.71	1.7	<0.299	0.539	0.515	0.394	<0.235	e0.053	e0.563	115	85.3	95.2
PCB-35	<0.687	<0.483	<0.486	<0.592	<0.375	<0.097	<0.564	<0.369	<0.467	<0.641	<0.392	e0.698	<0.408	--	--	--
PCB-36	<0.653	<0.460	<0.462	<0.563	<0.356	<0.091	<0.516	<0.337	<0.428	<0.587	<0.373	e1.06	<0.373	--	--	--
PCB-37	<0.687	<0.483	<0.486	<0.592	<0.375	0.186	<0.564	<0.369	<0.467	<0.641	<0.392	e0.138	<0.408	118	88.5	103
PCB-38	<0.687	<0.483	<0.486	<0.592	<0.375	<0.097	<0.564	<0.369	e2.09	<0.641	<0.392	<0.082	<0.408	--	--	--
PCB-39	<0.653	<0.460	<0.462	<0.563	<0.356	<0.091	<0.516	<0.337	<0.428	<0.587	<0.373	e0.082	<0.373	--	--	--
PCB-40	<0.653	<0.335	<1.11	<0.648	<0.472	0.338	<0.831	<0.687	<1.16	<1.08	<0.633	<0.136	<0.945	92.7	81.8	90.1

Table 4–1. Masses of dissolved polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–06.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners															
	Monthly composite river samples										Quality-control samples					
											Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 A (ng/sample)	May 2005 B (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-41 + 64 + 68 + 71	7.98	<0.220	5.25	4.12	2.66	2.71	0.966	2.28	8.52	1.18	<0.216	<0.074	<0.391	--	--	--
PCB-42 + 59	0.889	<0.220	0.816	0.953	0.829	e0.112	<0.273	<0.451	<0.362	<0.479	<0.216	<0.074	<0.391	--	--	--
PCB-43 + 49	3.11	<0.225	2.21	2.31	2.04	1.97	0.358	1.13	1.42	<0.462	<0.221	<0.077	<0.377	85.2	82.8	79.1
PCB-44	1.65	<0.220	1.67	1.82	1.8	1.7	0.403	1.28	0.714	<0.479	<0.216	<0.074	<0.391	86.8	80.7	87.7
PCB-45	0.519	<0.200	0.559	0.471	0.638	0.475	<0.242	<0.400	<0.322	<0.426	<0.197	<0.065	<0.347	--	--	--
PCB-46	0.301	<0.200	0.359	e0.418	e0.362	0.259	<0.242	<0.400	<0.322	<0.426	<0.197	<0.065	<0.347	--	--	--
PCB-47 + 48 + 75	15.4	0.621	13.9	8.58	5.64	3.24	3.47	5.23	66.1	1.72	<0.197	<0.065	<0.347	--	--	--
PCB-50	<0.167	<0.162	<0.255	<0.249	<0.198	<0.067	<0.204	<0.336	<0.270	<0.358	<0.159	<0.055	<0.292	--	--	--
PCB-51	6.93	<0.200	5.12	2.9	2.13	1.16	0.762	1.08	4.08	0.524	<0.197	<0.065	<0.347	--	--	--
PCB-52 + 73	3.39	<0.200	3.41	3.39	3.09	3.07	0.773	2.12	0.92	0.836	<0.197	<0.065	<0.347	87.4	79.1	85.4
PCB-53	2.28	<0.200	2.46	2.2	2.21	1.66	0.309	1.17	0.33	<0.426	<0.197	<0.065	<0.347	--	--	--
PCB-54	e0.320	<0.162	<0.255	0.254	e0.237	0.161	<0.204	<0.336	<0.270	<0.358	<0.159	<0.055	<0.292	71	73.3	77.8
PCB-55	<0.366	<0.188	<0.624	<0.363	<0.265	<0.103	<0.456	<0.377	<0.636	<0.594	<0.355	<0.072	<0.518	--	--	--
PCB-56 + 60	<0.366	<0.188	<0.624	<0.363	<0.265	0.283	<0.456	<0.377	<0.636	<0.594	<0.355	<0.072	<0.518	108	84.3	94.4
PCB-57	<0.653	<0.335	<1.11	<0.648	<0.472	<0.197	<0.831	<0.687	<1.16	<1.08	<0.633	<0.136	<0.945	--	--	--
PCB-58	<0.653	<0.335	<1.11	<0.648	<0.472	<0.197	<0.831	<0.687	<1.16	<1.08	<0.633	<0.136	<0.945	--	--	--
PCB-61 + 74	<0.356	<0.182	<0.605	<0.353	<0.257	e0.238	<0.429	<0.355	<0.599	<0.560	<0.344	<0.070	<0.488	--	--	--
PCB-62 + 65	<0.207	<0.200	<0.316	<0.308	<0.245	<0.079	<0.242	<0.400	<0.322	<0.426	<0.197	<0.065	<0.347	--	--	--
PCB-63	<0.356	<0.182	<0.605	<0.353	<0.257	<0.101	<0.429	<0.355	<0.599	<0.560	<0.344	<0.070	<0.488	--	--	--
PCB-66 + 80	0.628	<0.182	<0.605	0.504	0.453	0.371	<0.429	<0.355	<0.599	<0.560	<0.344	<0.070	<0.488	102	84	91.5
PCB-67	<0.653	<0.335	<1.11	<0.648	<0.472	<0.197	<0.831	<0.687	<1.16	<1.08	<0.633	<0.136	<0.945	--	--	--
PCB-69	<0.207	<0.200	<0.316	<0.308	<0.245	<0.079	<0.242	<0.400	<0.322	<0.426	<0.197	<0.065	<0.347	--	--	--
PCB-70 + 76	0.558	<0.182	<0.605	0.397	0.326	0.381	<0.429	0.365	<0.599	<0.560	<0.344	<0.070	<0.488	--	--	--
PCB-72	<0.228	<0.220	<0.348	<0.339	<0.269	<0.090	<0.273	<0.451	<0.362	<0.479	<0.216	<0.074	<0.391	--	--	--
PCB-77	<0.661	<0.332	<0.517	<0.553	<0.417	<0.103	<0.388	<0.438	<0.599	<0.644	<0.398	e0.165	<0.259	120	92.5	106
PCB-78	<0.661	<0.332	<0.517	<0.553	<0.417	<0.103	<0.388	<0.438	<0.599	<0.644	<0.398	<0.082	<0.259	--	--	--
PCB-79	<0.661	<0.332	<0.517	<0.553	<0.417	<0.103	<0.388	<0.438	<0.599	<0.644	<0.398	<0.082	<0.259	--	--	--
PCB-81	<0.661	<0.332	<0.517	<0.553	<0.417	<0.103	<0.388	<0.438	<0.599	<0.644	<0.398	e0.242	<0.259	117	94.5	108
PCB-82	<0.537	<0.469	<0.532	<0.554	<0.249	<0.177	<0.496	<0.709	<0.753	<0.673	<0.420	<0.097	<0.435	--	--	--
PCB-83 + 108	<0.461	<0.444	<0.364	<0.404	<0.278	<0.123	<0.274	<0.454	<0.417	<0.377	<0.372	<0.063	<0.333	--	--	--
PCB-84	0.427	<0.385	0.574	0.488	0.394	0.394	<0.235	<0.389	<0.358	<0.323	<0.322	<0.054	<0.285	--	--	--
PCB-85 + 120	<0.537	<0.469	<0.532	<0.554	<0.249	<0.177	<0.496	<0.709	<0.753	<0.673	<0.420	e0.747	<0.435	--	--	--

Table 4–1. Masses of dissolved polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–06.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners															
	Monthly composite river samples										Quality-control samples					
											Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 A (ng/sample)	May 2005 B (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-86 + 97	<0.537	<0.469	<0.532	<0.554	<0.249	<0.177	<0.496	<0.709	<0.753	<0.673	<0.420	<0.097	<0.435	--	--	--
PCB-87 + 115 + 116	<0.537	<0.469	<0.532	<0.554	<0.249	0.278	<0.496	<0.709	<0.753	<0.673	<0.420	<0.097	<0.435	110	88.4	99
PCB-88 + 121	<0.471	<0.454	<0.372	<0.413	<0.284	<0.125	<0.285	<0.472	<0.434	<0.392	<0.380	<0.064	<0.346	--	--	--
PCB-89 + 90 + 101	1.05	<0.385	0.823	0.885	0.52	0.599	<0.235	0.757	<0.358	<0.323	<0.322	<0.054	<0.285	103	83.2	92.6
PCB-91	0.669	<0.454	e0.420	<0.413	0.325	e0.318	<0.285	<0.472	<0.434	<0.392	<0.380	<0.064	<0.346	--	--	--
PCB-92	<0.400	<0.385	<0.316	<0.350	<0.241	0.19	<0.235	<0.389	<0.358	<0.323	<0.322	<0.054	<0.285	--	--	--
PCB-93 + 95	1.44	<0.454	1.56	1.74	1.19	1.31	0.46	1.27	0.592	0.727	<0.380	<0.064	<0.346	94.4	81.5	88.2
PCB-94	<0.471	<0.454	<0.372	<0.413	<0.284	<0.125	<0.285	<0.472	<0.434	<0.392	<0.380	<0.064	<0.346	--	--	--
PCB-96	<0.471	<0.454	<0.372	<0.413	<0.284	<0.125	<0.285	<0.472	<0.434	<0.392	<0.380	<0.064	<0.346	--	--	--
PCB-98 + 102	<0.471	<0.454	<0.372	<0.413	<0.284	<0.125	<0.285	<0.472	<0.434	<0.392	<0.380	<0.064	<0.346	--	--	--
PCB-99	0.465	<0.370	<0.304	<0.337	0.26	0.263	<0.229	<0.380	<0.349	<0.315	<0.310	e0.052	<0.278	102	82.6	93
PCB-100	<0.471	<0.454	<0.372	<0.413	<0.284	<0.125	<0.285	<0.472	<0.434	<0.392	<0.380	<0.064	<0.346	--	--	--
PCB-103	<0.471	<0.454	<0.372	<0.413	<0.284	0.133	<0.285	<0.472	<0.434	<0.392	<0.380	e0.097	<0.346	--	--	--
PCB-104	<0.331	<0.319	<0.261	<0.290	<0.199	<0.091	<0.201	<0.333	<0.306	<0.276	<0.267	<0.046	<0.244	83.9	78.3	83.1
PCB-105 + 127	<0.396	<0.345	<0.392	<0.408	<0.183	<0.124	<0.350	<0.501	<0.532	<0.475	<0.310	<0.068	<0.307	118	85.5	99.9
PCB-106 + 118	<0.360	<0.299	<0.364	<0.344	0.283	0.238	<0.355	<0.495	<0.531	<0.474	<0.276	<0.071	<0.328	96	80.9	90.9
PCB-107 + 109	<0.378	<0.330	<0.375	<0.391	<0.175	<0.122	<0.347	<0.495	<0.526	<0.471	<0.296	<0.067	<0.304	--	--	--
PCB-110	1.44	<0.330	1.2	1.3	0.982	0.905	<0.347	1	<0.526	<0.471	<0.296	<0.067	<0.304	109	83.9	94.7
PCB-111 + 117	<0.537	<0.469	<0.532	<0.554	<0.249	<0.177	<0.496	<0.709	<0.753	<0.673	<0.420	<0.097	<0.435	--	--	--
PCB-112	<0.461	<0.444	<0.364	<0.404	<0.278	<0.123	<0.274	<0.454	<0.417	<0.377	<0.372	<0.063	<0.333	--	--	--
PCB-113	<0.400	<0.385	<0.316	<0.350	<0.241	<0.105	<0.235	<0.389	<0.358	<0.323	<0.322	<0.054	<0.285	--	--	--
PCB-114	<0.373	<0.326	<0.370	<0.385	<0.173	<0.123	<0.342	<0.489	<0.519	<0.464	<0.292	<0.067	<0.300	112	85.1	97.4
PCB-119	<0.384	<0.370	<0.304	<0.337	<0.232	<0.102	<0.229	<0.380	<0.349	<0.315	<0.310	<0.052	<0.278	--	--	--
PCB-122	<0.373	<0.326	<0.370	<0.385	<0.173	<0.123	<0.342	<0.489	<0.519	<0.464	<0.292	<0.067	<0.300	--	--	--
PCB-123	<0.360	<0.299	<0.364	<0.344	<0.175	<0.122	<0.355	<0.495	<0.531	<0.474	<0.276	e0.079	<0.328	89.2	78.4	89.9
PCB-124	<0.378	<0.330	<0.375	<0.391	<0.175	<0.122	<0.347	<0.495	<0.526	<0.471	<0.296	<0.067	<0.304	--	--	--
PCB-125	<0.537	<0.469	<0.532	<0.554	<0.249	<0.177	<0.496	<0.709	<0.753	<0.673	<0.420	<0.097	<0.435	--	--	--
PCB-126	<0.416	<0.363	<0.412	<0.429	<0.193	<0.128	<0.358	<0.511	<0.543	<0.485	<0.325	<0.070	<0.314	--	--	--
PCB-128	<0.282	<0.264	<0.420	<0.356	<0.294	<0.178	<0.374	<0.490	<0.474	<0.478	<0.289	<0.106	<0.381	--	--	--
PCB-129	<0.282	<0.264	<0.420	<0.356	<0.294	<0.178	<0.374	<0.490	<0.474	<0.478	<0.289	<0.106	<0.381	--	--	--
PCB-130	<0.282	<0.264	<0.420	<0.356	<0.294	<0.178	<0.374	<0.490	<0.474	<0.478	<0.289	<0.106	<0.381	--	--	--

Table 4–1. Masses of dissolved polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–06.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners															
	Monthly composite river samples										Quality-control samples					
											Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 A (ng/sample)	May 2005 B (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-131 + 142	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-132 + 168	0.373	<0.236	<0.376	0.336	0.275	e0.184	<0.344	<0.450	<0.435	<0.439	<0.258	<0.097	<0.350	--	--	--
PCB-133	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-134 + 143	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-135 + 144	e0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-136	0.236	<0.214	<0.254	<0.287	0.171	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-137	<0.240	<0.224	<0.357	<0.302	<0.250	<0.151	<0.318	<0.416	e4.77	<0.406	<0.246	<0.090	<0.324	--	--	--
PCB-138 + 163 + 164	0.704	<0.224	0.541	0.677	0.511	0.437	<0.318	0.523	<0.403	<0.406	<0.246	<0.090	<0.324	103	88.5	90.5
PCB-139 + 149	0.636	<0.214	0.644	0.668	0.423	0.442	<0.287	0.506	<0.406	<0.290	<0.247	<0.054	<0.269	116	85	99.7
PCB-140	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-141	<0.240	<0.224	<0.357	<0.302	<0.250	<0.151	<0.318	<0.416	<0.403	<0.406	<0.246	<0.090	<0.324	--	--	--
PCB-145	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-146	<0.128	<0.191	<0.227	<0.257	<0.135	<0.258	<0.261	<0.347	<0.368	<0.264	<0.221	<0.049	<0.244	--	--	--
PCB-147	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-148	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-150	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-151	<0.177	<0.266	<0.315	<0.356	<0.187	<0.354	<0.358	<0.476	<0.505	<0.361	<0.306	<0.067	<0.335	113	87	100
PCB-152	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-153	0.374	<0.200	<0.320	0.399	0.31	0.256	<0.292	<0.382	<0.370	<0.373	<0.220	<0.082	<0.298	103	88.1	92.2
PCB-154	<0.143	<0.214	<0.254	<0.287	<0.151	<0.282	<0.287	<0.382	<0.406	<0.290	<0.247	<0.054	<0.269	--	--	--
PCB-155	<0.0976	<0.146	<0.173	<0.196	<0.103	<0.198	<0.204	<0.271	<0.288	<0.206	<0.169	<0.038	<0.191	99	79.5	90.9
PCB-156	<0.193	<0.180	<0.288	<0.244	<0.202	<0.118	<0.248	<0.325	<0.314	<0.317	<0.198	<0.071	<0.253	106	88	92.6
PCB-157	<0.201	<0.188	<0.300	<0.254	<0.210	<0.119	<0.252	<0.330	<0.319	<0.322	<0.206	<0.071	<0.257	110	88.3	91.8
PCB-158 + 160	<0.240	<0.224	<0.357	<0.302	<0.250	<0.151	<0.318	<0.416	<0.403	<0.406	<0.246	<0.090	<0.324	--	--	--
PCB-159	<0.240	<0.224	<0.357	<0.302	<0.250	<0.151	<0.318	<0.416	<0.403	<0.406	<0.246	<0.090	<0.324	--	--	--
PCB-161	<0.128	<0.191	<0.227	<0.257	<0.135	<0.258	<0.261	<0.347	<0.368	<0.264	<0.221	<0.049	<0.244	--	--	--
PCB-162	<0.240	<0.224	<0.357	<0.302	<0.250	<0.151	<0.318	<0.416	<0.403	<0.406	<0.246	<0.090	<0.324	--	--	--
PCB-165	<0.128	<0.191	<0.227	<0.257	<0.135	<0.258	<0.261	<0.347	<0.368	<0.264	<0.221	<0.049	<0.244	--	--	--
PCB-166	<0.240	<0.224	<0.357	<0.302	<0.250	<0.151	<0.318	<0.416	<0.403	<0.406	<0.246	<0.090	<0.324	--	--	--
PCB-167	<0.191	<0.179	<0.285	<0.241	<0.199	<0.116	<0.245	<0.320	<0.310	<0.312	<0.196	<0.069	<0.249	107	86.2	91.4
PCB-169	<0.199	<0.186	<0.296	<0.251	<0.207	<0.119	<0.249	<0.326	<0.315	<0.318	<0.204	<0.071	<0.254	109	88.4	95.1
PCB-170 + 190	<0.190	<0.350	<0.473	<0.397	<0.205	<0.133	<0.412	<0.323	<0.496	<0.366	<0.293	<0.110	<0.216	104	85.4	97.6

Table 4–1. Masses of dissolved polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–06.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners															
	Monthly composite river samples										Quality-control samples					
											Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 A (ng/sample)	May 2005 B (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-171	<0.159	<0.294	<0.397	<0.333	<0.172	<0.108	<0.343	<0.269	<0.413	<0.305	<0.246	<0.089	<0.180	--	--	--
PCB-172 + 192	<0.159	<0.294	<0.397	<0.333	<0.172	<0.108	<0.343	<0.269	<0.413	<0.305	<0.246	<0.089	<0.180	--	--	--
PCB-173	<0.159	<0.294	<0.397	<0.333	<0.172	<0.108	<0.343	<0.269	<0.413	<0.305	<0.246	<0.089	<0.180	--	--	--
PCB-174 + 181	<0.162	<0.298	<0.403	<0.338	<0.175	<0.108	<0.353	<0.277	<0.425	<0.314	<0.250	<0.090	<0.185	--	--	--
PCB-175	<0.160	<0.295	<0.398	<0.334	<0.172	<0.110	<0.352	<0.276	<0.424	<0.313	<0.246	<0.091	<0.185	--	--	--
PCB-176	<0.120	<0.222	<0.299	<0.251	<0.130	<0.085	<0.270	<0.212	<0.325	<0.240	<0.185	<0.070	<0.142	--	--	--
PCB-177	<0.162	<0.298	<0.403	<0.338	<0.175	<0.108	<0.353	<0.277	<0.425	<0.314	<0.250	<0.090	<0.185	--	--	--
PCB-178	<0.160	<0.295	<0.398	<0.334	<0.172	<0.110	<0.352	<0.276	<0.424	<0.313	<0.246	<0.091	<0.185	--	--	--
PCB-179	<0.120	<0.222	<0.299	<0.251	<0.130	<0.085	<0.270	<0.212	<0.325	<0.240	<0.185	<0.070	<0.142	--	--	--
PCB-180	<0.159	<0.294	<0.397	<0.333	<0.172	<0.108	<0.343	<0.269	<0.413	<0.305	<0.246	<0.089	<0.180	104	84.1	95.4
PCB-182 + 187	<0.160	<0.295	<0.398	<0.334	<0.172	<0.110	<0.352	<0.276	<0.424	<0.313	<0.246	<0.091	<0.185	104	86.2	95.6
PCB-183	<0.162	<0.298	<0.403	<0.338	<0.175	<0.108	<0.353	<0.277	<0.425	<0.314	<0.250	<0.090	<0.185	108	87.5	96.2
PCB-184	<0.120	<0.222	<0.299	<0.251	<0.130	<0.085	<0.270	<0.212	<0.325	<0.240	<0.185	<0.070	<0.142	--	--	--
PCB-185	<0.162	<0.298	<0.403	<0.338	<0.175	<0.108	<0.353	<0.277	<0.425	<0.314	<0.250	<0.090	<0.185	--	--	--
PCB-186	<0.160	<0.295	<0.398	<0.334	<0.172	<0.110	<0.352	<0.276	<0.424	<0.313	<0.246	<0.091	<0.185	--	--	--
PCB-188	<0.120	<0.222	<0.299	<0.251	<0.130	<0.085	<0.270	<0.212	<0.325	<0.240	<0.185	<0.070	<0.142	96	85.3	90.3
PCB-189	<0.135	<0.249	<0.337	<0.282	<0.146	<0.090	<0.285	<0.224	<0.344	<0.254	<0.208	<0.074	<0.150	109	84.6	99.4
PCB-191	<0.159	<0.294	<0.397	<0.333	<0.172	<0.108	<0.343	<0.269	<0.413	<0.305	<0.246	<0.089	<0.180	--	--	--
PCB-193	<0.159	<0.294	<0.397	<0.333	<0.172	<0.108	<0.343	<0.269	<0.413	<0.305	<0.246	<0.089	<0.180	--	--	--
PCB-194	<0.474	<0.459	<0.654	<0.482	<0.486	<0.280	<0.511	<0.692	<0.663	<0.640	<0.339	<0.115	<0.843	113	85.4	108
PCB-195	<0.474	<0.459	<0.654	<0.482	<0.486	<0.280	<0.511	<0.692	<0.663	<0.640	<0.339	<0.115	e2.77	--	--	--
PCB-196 + 203	<0.446	<0.432	<0.614	<0.453	<0.456	<0.270	<0.508	<0.688	<0.660	<0.637	<0.319	<0.111	e1.80	109	85.9	108
PCB-197	<0.312	<0.302	<0.430	<0.317	<0.319	<0.194	<0.362	<0.490	<0.469	<0.453	<0.223	<0.080	<0.597	--	--	--
PCB-198	<0.446	<0.432	<0.614	<0.453	<0.456	<0.270	<0.508	<0.688	<0.660	<0.637	<0.319	<0.111	<0.839	--	--	--
PCB-199	<0.446	<0.432	<0.614	<0.453	<0.456	<0.270	<0.508	<0.688	<0.660	<0.637	<0.319	<0.111	e2.63	--	--	--
PCB-200	<0.312	<0.302	<0.430	<0.317	<0.319	<0.194	<0.362	<0.490	<0.469	<0.453	<0.223	<0.080	<0.597	--	--	--
PCB-201	<0.312	<0.302	<0.430	<0.317	<0.319	<0.194	<0.362	<0.490	<0.469	<0.453	<0.223	<0.080	<0.597	--	--	--
PCB-202	<0.357	<0.346	<0.492	<0.363	<0.366	<0.219	<0.409	<0.554	<0.531	<0.513	<0.255	<0.090	<0.675	104	84.1	102
PCB-204	<0.312	<0.302	<0.430	<0.317	<0.319	<0.194	<0.362	<0.490	<0.469	<0.453	<0.223	<0.080	<0.597	--	--	--
PCB-205	<0.355	<0.344	<0.490	<0.361	<0.364	<0.207	<0.392	<0.531	<0.509	<0.491	<0.254	<0.085	<0.647	109	81.4	108
PCB-206	<0.676	<0.822	<0.916	<0.898	<0.441	<0.336	<0.502	<0.816	<1.18	<1.12	<0.734	<0.428	<0.371	99	82.2	101
PCB-207	<0.579	<0.704	<0.784	<0.769	<0.378	<0.304	<0.443	<0.720	<1.04	<0.989	<0.629	<0.387	<0.327	--	--	--

Table 4–1. Masses of dissolved polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–06.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; A, polychlorinated biphenyls eluted from the first column of two columns in series; B, polychlorinated biphenyls eluted from the second column of two columns in series; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners															
	Monthly composite river samples										Quality-control samples					
											Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 A (ng/sample)	May 2005 B (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-208	<0.579	<0.704	<0.784	<0.769	<0.378	<0.304	<0.443	<0.720	<1.04	<0.989	<0.629	<0.387	<0.327	97.5	83.7	98.6
PCB-209	<0.200	<0.242	<0.290	<0.368	<0.225	<0.137	<0.202	<0.502	<0.456	<0.972	<0.231	e0.162	<0.188	92.6	78.4	97.6
Total	166	0.621	136	123	146	126	13	36.1	93.5	14.7	<0.734	0.287	<	--	--	--
Polychlorinated biphenyl homologs																
Total Monochlorobiphenyls	0.449	<0.365	0.488	0.585	1.81	<0.418	--	--	--	--	<0.314	0.287	<	--	--	--
Total Dichlorobiphenyls	70	<0.964	58.3	53.5	75.8	65.8	2.18	5.9	5.34	4.68	<0.554	<0.0721	<	--	--	--
Total Trichlorobiphenyls	44	<0.486	36.2	34.4	40.8	37	3.32	11.5	5.47	5.04	<0.392	<0.0824	<	--	--	--
Total Tetrachlorobiphenyls	43.6	0.621	35.8	27.9	21.8	17.8	7.04	14.7	82.1	4.26	<0.633	<0.136	<	--	--	--
Total Pentachlorobiphenyls	5.5	<0.469	4.16	4.41	3.95	4.31	0.46	3.03	0.592	0.727	<0.420	<0.0968	<	--	--	--
Total Hexachlorobiphenyls	2.32	<0.266	1.19	2.08	1.69	1.14	--	1.03	--	--	<0.306	<0.106	<	--	--	--
Total Heptachlorobiphenyls	<0.190	<0.350	<0.473	<0.397	<0.205	<0.133	--	--	--	--	<0.293	<0.110	<	--	--	--
Total Octachlorobiphenyls	<0.474	<0.459	<0.654	<0.482	<0.486	<0.280	--	--	--	--	<0.339	<0.115	<	--	--	--
Total Nonachlorobiphenyls	<0.676	<0.822	<0.916	<0.898	<0.441	<0.336	--	--	--	--	<0.734	<0.428	<	--	--	--
Decachlorobiphenyls	<0.200	<0.242	<0.290	<0.368	<0.225	<0.137	--	--	--	--	<0.231	<0.0930	<	--	--	--
Polychlorinated biphenyl Aroclors																
Aroclor 1221	<0.850	<1.05	<1.12	<1.05	<0.587	<0.794	<0.866	<0.821	<1.24	<1.49	<0.606	<0.0775	<0.426	--	--	--
Aroclor 1232	<1.54	<1.42	<1.38	<1.84	<0.866	<1.42	<1.65	<1.86	<2.21	<2.67	<1.07	<0.189	<2.05	--	--	--
Aroclor 1016/1242	35.8	<2.11	27.2	20	30.2	29.1	<1.84	9.18	7.7	4.39	<1.21	<0.211	<2.30	--	--	--
Aroclor 1248	<1.96	<1.24	<3.33	<1.94	<1.51	<0.556	<2.36	<2.48	<3.29	<3.08	<1.89	<0.425	<2.68	--	--	--
Aroclor 1254	<5.37	<4.69	<5.32	<5.54	2.6	5.41	<4.96	<7.09	<7.53	<6.73	<4.20	<0.968	<4.35	--	--	--
Aroclor 1260	<1.35	<2.49	<3.36	<2.82	<1.45	<0.944	<2.93	<2.29	<3.52	<2.60	<2.08	<0.781	<1.53	--	--	--

Table 4–2. Masses of particulate polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006.

[Analyzed by AXYS Analytical Services, Ltd., Sidney British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners														
	Monthly composite river samples									Quality-control samples					
										Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-1	3.9	2.33	2.79	2.59	e0.343	<0.435	<0.335	<0.399	e1.17	<1.01	<2.13	<0.469	85.3	75.1	84.9
PCB-2	<0.328	<0.156	<0.495	<0.340	e1.43	<0.430	<0.331	<0.394	<0.392	<1.04	<2.12	<0.463	--	--	--
PCB-3	2.15	1.29	1.97	1.08	e0.246	<0.430	0.97	e0.464	<0.392	<1.04	<2.12	<0.463	99.1	94.6	97.5
PCB-4 + 10	12.8	7.03	8.74	16.8	9.55	<0.581	2.72	1.04	<1.22	<1.18	<0.324	<1.04	83.3	69.6	90.9
PCB-5 + 8	6.22	4.08	5.53	4.27	4.45	0.532	2.14	0.868	0.753	<0.680	<0.183	<0.595	97.5	91	98.6
PCB-6	1.09	0.815	1.18	0.956	0.988	<0.331	<0.217	<0.378	<0.694	<0.680	e0.256	<0.595	--	--	--
PCB-7 + 9	<0.199	<0.264	<0.361	<0.353	e0.260	<0.331	<0.217	<0.378	<0.694	<0.680	e1.52	<0.595	--	--	--
PCB-11	e2.73	0.334	1.15	e0.538	e1.01	e0.945	<0.217	e1.04	<0.694	<0.680	<0.183	<0.595	--	--	--
PCB-12 + 13	e0.528	e0.452	e0.734	e0.636	e2.02	<0.331	<0.217	<0.378	<0.694	<0.680	<0.183	<0.595	--	--	--
PCB-14	<0.199	<0.264	<0.361	<0.353	<0.089	<0.331	<0.217	<0.378	<0.694	<0.680	<0.183	<0.595	--	--	--
PCB-15	8.44	5.56	6.71	5.73	4.48	e1.21	3.92	2.01	0.904	<0.846	e0.623	<0.646	126	107	109
PCB-16 + 32	4.73	2.95	4.57	5.13	4.41	0.945	1.98	1.11	<1.24	<0.743	<0.108	<0.666	--	--	--
PCB-17	3.57	2.35	2.72	3.52	2.97	<0.568	1.23	<0.997	<1.24	<0.743	<0.108	<0.666	--	--	--
PCB-18	2.15	1.36	1.91	2.98	<0.212	<0.568	1.14	<0.997	<1.24	<0.743	<0.108	<0.666	77.2	77.5	94
PCB-19	3.61	2.16	3.05	4.37	2.6	<0.666	1.06	<1.17	<1.45	<0.866	<0.129	<0.780	67.7	64.7	88
PCB-20 + 21 + 33	0.748	<0.374	0.624	0.599	0.345	<0.518	0.595	<0.689	<0.635	<0.721	e0.113	<0.667	--	--	--
PCB-22	0.743	0.538	0.712	0.875	0.674	<0.518	0.577	<0.689	<0.635	<0.721	<0.075	<0.667	--	--	--
PCB-23 + 34	<0.211	<0.154	<0.218	<0.321	<0.133	<0.351	<0.194	<0.616	<0.765	<0.559	<0.068	<0.411	93.1	79.9	87.4
PCB-24 + 27	2.98	1.81	2.57	3.12	2	<0.568	0.895	<0.997	<1.24	<0.743	<0.108	<0.666	--	--	--
PCB-25	2.02	1.28	1.62	1.92	1.36	<0.351	0.605	<0.616	<0.765	<0.559	<0.068	<0.411	--	--	--
PCB-26	2.84	2.11	2.96	3.26	2.28	<0.351	1.07	<0.616	<0.765	<0.559	<0.068	<0.411	--	--	--
PCB-28	4.08	2.61	3.79	3.75	3.49	0.956	2.95	1.4	<0.896	<0.513	e0.096	<0.482	93.1	92.9	101
PCB-29	<0.211	<0.154	<0.218	<0.321	<0.133	<0.351	<0.194	<0.616	<0.765	<0.559	<0.068	<0.411	--	--	--
PCB-30	<0.280	<0.204	<0.290	<0.426	<0.212	<0.568	<0.314	<0.997	<1.24	<0.743	<0.108	<0.666	--	--	--
PCB-31	4.74	3.86	4.12	4.87	3.59	e0.604	1.76	0.826	<0.765	<0.559	<0.068	<0.411	107	92.2	95.2
PCB-35	<0.386	<0.393	<0.443	<0.518	0.25	<0.566	<0.286	<0.753	<0.694	<0.758	<0.080	<0.729	--	--	--
PCB-36	<0.367	<0.374	<0.421	<0.492	<0.213	<0.518	<0.262	<0.689	<0.635	<0.721	<0.075	<0.667	--	--	--
PCB-37	1.46	0.862	1.07	0.886	e0.955	<0.566	0.923	<0.753	<0.694	<0.758	<0.080	<0.729	133	105	103
PCB-38	e0.724	e0.483	<0.443	<0.518	e0.845	<0.566	<0.286	<0.753	<0.694	<0.758	<0.080	<0.729	--	--	--
PCB-39	<0.367	<0.374	<0.421	<0.492	<0.213	<0.518	<0.262	<0.689	<0.635	<0.721	<0.075	<0.667	--	--	--
PCB-40	<0.872	<0.742	<1.12	<1.00	e0.582	<1.27	<0.994	<1.50	<1.20	<1.41	<0.191	<0.736	86.8	88.5	90.1
PCB-41 + 64 + 68 + 71	6.92	5.07	7.69	7.06	8.12	1.66	3.97	<0.795	<0.775	<0.580	<0.080	<0.345	--	--	--
PCB-42 + 59	1.58	1.23	1.87	1.83	1.77	<0.571	<0.465	<0.795	<0.775	<0.580	<0.080	<0.345	--	--	--

Table 4–2. Masses of particulate polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners														
	Monthly composite river samples									Quality-control samples					
										Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-43 + 49	4.86	3.18	5.15	4.98	4.7	0.814	2.82	1.23	<0.748	<0.593	<0.084	<0.333	75.1	83.9	79.1
PCB-44	2.65	1.97	3.28	3.76	3	<0.571	2.17	<0.795	<0.775	<0.580	<0.080	<0.345	81.2	82.9	87.7
PCB-45	0.471	0.318	0.516	0.689	0.368	<0.507	<0.414	<0.706	<0.688	<0.528	<0.071	<0.307	--	--	--
PCB-46	0.27	<0.228	0.413	0.35	0.248	<0.507	<0.414	<0.706	<0.688	<0.528	<0.071	<0.307	--	--	--
PCB-47 + 48 + 75	13.7	11.3	21.5	11.9	29.7	2.97	4.86	10.5	<0.688	<0.528	<0.071	<0.307	--	--	--
PCB-50	<0.203	<0.184	<0.173	<0.208	<0.149	<0.426	<0.347	<0.593	<0.578	<0.426	<0.060	<0.258	--	--	--
PCB-51	1.97	1.5	2.78	1.42	3.4	<0.507	0.723	<0.706	<0.688	<0.528	<0.071	<0.307	--	--	--
PCB-52 + 73	5.53	3.83	5.66	6.26	5.2	0.737	3.44	1.23	<0.688	<0.528	<0.071	<0.307	76.3	80.8	85.4
PCB-53	1.86	1.24	1.77	2.15	1.61	<0.507	0.786	<0.706	<0.688	<0.528	<0.071	<0.307	--	--	--
PCB-54	<0.203	<0.184	<0.173	<0.208	<0.149	<0.426	<0.347	<0.593	<0.578	<0.426	<0.060	<0.258	56.4	63.5	77.8
PCB-55	<0.489	<0.416	<0.628	<0.561	<0.138	<0.697	<0.545	<0.825	<0.657	<0.789	<0.100	<0.404	--	--	--
PCB-56 + 60	1.38	0.916	1.27	1.3	1.19	<0.697	1.28	<0.825	<0.657	<0.789	<0.100	<0.404	110	93.4	94.4
PCB-57	<0.872	<0.742	<1.12	<1.00	<0.263	<1.27	<0.994	<1.50	<1.20	<1.41	<0.191	<0.736	--	--	--
PCB-58	<0.872	<0.742	<1.12	<1.00	<0.263	<1.27	<0.994	<1.50	<1.20	<1.41	<0.191	<0.736	--	--	--
PCB-61 + 74	1.41	0.928	1.35	1.32	1.29	<0.656	0.951	<0.777	<0.619	<0.765	<0.098	<0.380	--	--	--
PCB-62 + 65	<0.251	<0.228	<0.214	<0.258	<0.176	<0.507	<0.414	<0.706	<0.688	<0.528	<0.071	<0.307	--	--	--
PCB-63	e0.772	e0.662	e0.970	<0.544	e0.507	<0.656	<0.513	<0.777	<0.619	<0.765	<0.098	<0.380	--	--	--
PCB-66 + 80	2.79	1.98	2.66	2.65	2.42	<0.656	2.04	0.851	<0.619	<0.765	<0.098	<0.380	101	92	91.5
PCB-67	<0.872	<0.742	<1.12	<1.00	<0.263	<1.27	<0.994	<1.50	<1.20	<1.41	<0.191	<0.736	--	--	--
PCB-69	<0.251	<0.228	<0.214	<0.258	<0.176	<0.507	<0.414	<0.706	<0.688	<0.528	<0.071	<0.307	--	--	--
PCB-70 + 76	2.61	1.63	2.7	2.28	2.32	<0.656	2.07	<0.777	<0.619	<0.765	<0.098	<0.380	--	--	--
PCB-72	0.299	<0.251	0.305	<0.283	<0.199	<0.571	<0.465	<0.795	<0.775	<0.580	<0.080	<0.345	--	--	--
PCB-77	e1.20	e0.678	<0.519	<0.561	e0.746	<0.468	0.544	<1.15	<0.754	<1.51	<0.145	<0.356	128	102	106
PCB-78	<0.507	<0.598	<0.519	<0.561	<0.299	<0.468	<0.329	<1.15	<0.754	<1.51	<0.145	<0.356	--	--	--
PCB-79	<0.507	<0.598	<0.519	<0.561	<0.299	<0.468	<0.329	<1.15	<0.754	<1.51	<0.145	<0.356	--	--	--
PCB-81	e1.94	<0.598	<0.519	<0.561	<0.299	<0.468	<0.329	<1.15	<0.754	<1.51	<0.145	<0.356	122	103	108
PCB-82	<0.936	<0.535	0.676	<0.663	e0.703	<0.629	<0.767	<1.41	<0.967	<0.838	<0.081	<0.575	--	--	--
PCB-83 + 108	0.491	0.41	0.563	<0.378	0.414	<0.349	<0.288	<0.924	<0.567	<1.14	<0.093	<0.355	--	--	--
PCB-84	1.31	0.996	e1.27	1.05	1.11	<0.299	0.769	<0.792	<0.486	<0.986	<0.080	<0.305	--	--	--
PCB-85 + 120	e1.03	0.572	e0.907	e0.691	e0.671	<0.629	<0.767	<1.41	<0.967	<0.838	<0.081	<0.575	--	--	--
PCB-86 + 97	1.37	0.992	1.43	0.943	1.16	<0.629	0.895	<1.41	<0.967	<0.838	<0.081	<0.575	--	--	--
PCB-87 + 115 + 116	1.77	1.58	1.81	1.57	1.64	<0.629	1.5	<1.41	<0.967	<0.838	<0.081	<0.575	109	97.1	99

Table 4–2. Masses of particulate polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners														
	Monthly composite river samples									Quality-control samples					
										Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-88 + 121	<0.284	<0.120	<0.397	<0.386	<0.192	<0.363	<0.299	<0.961	<0.590	<1.16	<0.095	<0.370	--	--	--
PCB-89 + 90 + 101	4.54	2.85	3.8	2.9	2.84	0.59	2.58	1.14	<0.486	<0.986	<0.080	<0.305	102	93	92.6
PCB-91	1.55	0.889	1.35	1.14	1.01	<0.363	0.773	<0.961	<0.590	<1.16	<0.095	<0.370	--	--	--
PCB-92	1.24	0.933	1.12	0.801	e0.887	<0.299	0.663	<0.792	<0.486	<0.986	<0.080	<0.305	--	--	--
PCB-93 + 95	4.09	2.95	4.44	3.18	3.42	0.709	2.55	<0.961	<0.590	<1.16	<0.095	<0.370	92.7	89.2	88.2
PCB-94	<0.284	<0.120	<0.397	<0.386	<0.192	<0.363	<0.299	<0.961	<0.590	<1.16	<0.095	<0.370	--	--	--
PCB-96	<0.284	<0.120	<0.397	<0.386	<0.192	<0.363	<0.299	<0.961	<0.590	<1.16	<0.095	<0.370	--	--	--
PCB-98 + 102	0.426	e0.236	<0.397	0.462	e0.275	<0.363	<0.299	<0.961	<0.590	<1.16	<0.095	<0.370	--	--	--
PCB-99	2.31	1.48	1.78	1.46	1.42	<0.292	1.53	<0.773	<0.474	<0.948	<0.077	<0.297	103	93.6	93
PCB-100	<0.284	<0.120	<0.397	<0.386	<0.192	<0.363	<0.299	<0.961	<0.590	<1.16	<0.095	<0.370	--	--	--
PCB-103	e0.357	<0.120	<0.397	<0.386	<0.192	<0.363	<0.299	<0.961	<0.590	<1.16	<0.095	<0.370	--	--	--
PCB-104	<0.200	<0.0841	<0.279	<0.271	<0.140	<0.256	<0.211	<0.678	<0.416	<0.816	<0.069	<0.261	73.9	78.7	83.1
PCB-105 + 127	1.16	0.99	1.11	0.954	e0.874	<0.444	1.02	<0.998	<0.683	<0.617	<0.056	<0.406	123	97.7	99.9
PCB-106 + 118	3.58	2.06	2.85	2.19	2.34	<0.442	2.15	1.13	<0.646	<0.529	<0.052	<0.392	93	91.8	90.9
PCB-107 + 109	<0.660	<0.377	<0.432	<0.468	0.233	<0.439	<0.536	<0.988	<0.676	<0.590	<0.056	<0.402	--	--	--
PCB-110	6.74	4.82	6.06	4.53	4.81	0.733	3.92	1.86	<0.676	<0.590	<0.056	<0.402	111	94.3	94.7
PCB-111 + 117	<0.936	<0.535	<0.613	<0.663	e0.167	<0.629	<0.767	<1.41	<0.967	<0.838	<0.081	<0.575	--	--	--
PCB-112	<0.278	<0.117	<0.388	<0.378	<0.188	<0.349	<0.288	<0.924	<0.567	<1.14	<0.093	<0.355	--	--	--
PCB-113	<0.241	<0.102	<0.337	<0.328	<0.161	<0.299	<0.247	<0.792	<0.486	<0.986	<0.080	<0.305	--	--	--
PCB-114	<0.651	<0.372	<0.426	<0.461	e0.131	<0.433	<0.529	<0.975	<0.667	<0.582	<0.056	<0.396	116	99.3	97.4
PCB-119	0.441	0.22	<0.324	<0.315	e0.186	<0.292	<0.241	<0.773	<0.474	<0.948	<0.077	<0.297	--	--	--
PCB-122	<0.651	<0.372	<0.426	<0.461	<0.101	<0.433	<0.529	<0.975	<0.667	<0.582	<0.056	<0.396	--	--	--
PCB-123	<0.649	<0.335	<0.426	<0.502	<0.103	<0.442	<0.548	<0.960	<0.646	<0.529	<0.052	<0.392	88.4	85.3	89.9
PCB-124	<0.660	<0.377	<0.432	<0.468	<0.100	<0.439	<0.536	<0.988	<0.676	<0.590	<0.056	<0.402	--	--	--
PCB-125	<0.936	<0.535	<0.613	<0.663	<0.146	<0.629	<0.767	<1.41	<0.967	<0.838	<0.081	<0.575	--	--	--
PCB-126	<0.725	<0.414	<0.475	<0.514	<0.106	<0.453	<0.553	<1.02	<0.697	<0.649	<0.059	<0.414	--	--	--
PCB-128	1.22	0.852	0.97	0.637	0.946	<1.24	0.76	<1.23	<0.516	<0.932	<0.022	<0.396	--	--	--
PCB-129	<0.297	<0.224	<0.479	<0.343	0.261	<1.24	<0.422	<1.23	<0.516	<0.932	<0.022	<0.396	--	--	--
PCB-130	0.452	e0.274	<0.479	<0.343	0.379	<1.24	<0.422	<1.23	<0.516	<0.932	e0.034	<0.396	--	--	--
PCB-131 + 142	<0.230	<0.223	<0.264	<0.181	<0.135	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-132 + 168	1.95	1.43	1.45	0.963	1.32	<1.14	1.01	<1.13	<0.474	<0.834	<0.020	<0.364	--	--	--
PCB-133	<0.230	<0.223	<0.264	<0.181	<0.135	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--

Table 4–2. Masses of particulate polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners														
	Monthly composite river samples									Quality-control samples					
										Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	Septem-ber 2005 (ng/sample)	Decem-ber 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	Septem-ber 2005	Decem-ber-05 to April-06	May-05 to August-05	Sep-tember 2005	Decem-ber-05 to April-06
PCB-134 + 143	0.285	<0.223	<0.264	<0.181	e0.185	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-135 + 144	0.751	0.564	0.696	0.48	0.61	<0.506	0.54	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-136	0.963	0.624	0.779	0.486	0.516	<0.506	0.482	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-137	0.462	0.233	<0.407	<0.291	<0.214	<1.05	e1.65	e1.52	<0.439	<0.792	0.025	<0.337	--	--	--
PCB-138 + 163 + 164	6.74	4.1	4.67	3.18	4.18	<1.05	3.47	1.68	<0.439	<0.792	0.023	<0.337	99.2	94.1	90.5
PCB-139 + 149	3.89	2.88	3.02	2.23	2.52	<0.506	2.07	0.916	<0.498	<0.429	<0.065	<0.361	118	98.2	99.7
PCB-140	<0.230	<0.223	<0.264	<0.181	<0.135	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-141	0.709	0.509	0.535	0.374	0.466	<1.05	0.388	<1.04	<0.439	<0.792	e0.034	<0.337	--	--	--
PCB-145	<0.230	<0.223	<0.264	<0.181	<0.135	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-146	0.798	e0.529	0.456	e0.273	e0.459	<0.459	0.44	<0.638	<0.452	<0.384	<0.060	<0.327	--	--	--
PCB-147	0.24	<0.223	<0.264	<0.181	e0.159	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-148	<0.230	<0.223	<0.264	<0.181	<0.135	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-150	<0.230	<0.223	<0.264	<0.181	<0.135	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-151	1.03	0.715	1	0.547	0.763	<0.629	0.646	<0.875	<0.620	<0.532	<0.082	<0.449	114	99.6	100
PCB-152	<0.230	<0.223	<0.264	<0.181	<0.135	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-153	4.17	2.48	2.87	2.06	2.38	<0.966	2.21	<0.958	<0.403	<0.709	0.018	<0.309	96.6	94.7	92.2
PCB-154	<0.230	<0.223	<0.264	<0.181	<0.135	<0.506	<0.310	<0.703	<0.498	<0.429	<0.065	<0.361	--	--	--
PCB-155	<0.157	<0.152	<0.180	<0.123	<0.094	<0.358	<0.220	<0.498	<0.353	<0.293	<0.046	<0.255	95.2	89.6	90.9
PCB-156	0.49	e0.302	e0.380	<0.235	0.395	<0.820	0.32	<0.814	<0.342	<0.638	0.029	<0.262	107	93.9	92.6
PCB-157	e0.247	<0.160	<0.342	<0.244	<0.169	<0.833	<0.284	<0.827	<0.348	<0.665	0.021	<0.267	110	94.9	91.8
PCB-158 + 160	0.645	0.48	0.539	e0.433	0.486	<1.05	0.383	<1.04	<0.439	<0.792	<0.018	<0.337	--	--	--
PCB-159	<0.253	<0.191	<0.407	<0.291	<0.214	<1.05	<0.359	<1.04	<0.439	<0.792	<0.018	<0.337	--	--	--
PCB-161	<0.206	<0.199	<0.236	<0.162	<0.123	<0.459	<0.282	<0.638	<0.452	<0.384	<0.060	<0.327	--	--	--
PCB-162	<0.253	<0.191	<0.407	<0.291	<0.214	<1.05	<0.359	<1.04	<0.439	<0.792	<0.018	<0.337	--	--	--
PCB-165	<0.206	<0.199	<0.236	<0.162	<0.123	<0.459	<0.282	<0.638	<0.452	<0.384	<0.060	<0.327	--	--	--
PCB-166	<0.253	<0.191	<0.407	<0.291	<0.214	<1.05	<0.359	<1.04	<0.439	<0.792	<0.018	<0.337	--	--	--
PCB-167	0.227	0.225	<0.324	<0.232	<0.163	<0.809	<0.276	<0.803	<0.338	<0.631	0.016	<0.259	108	93.1	91.4
PCB-169	<0.209	<0.158	<0.337	<0.241	<0.169	<0.823	<0.281	<0.816	<0.343	<0.657	e0.043	<0.263	112	96.1	95.1
PCB-170 + 190	1.2	0.93	1.03	0.965	1.13	<0.713	0.816	<0.921	e0.712	<0.802	<0.129	<0.374	106	96.7	97.6
PCB-171	e0.350	<0.149	e0.272	<0.379	<0.246	<0.594	<0.536	<0.768	<0.468	<0.673	<0.105	<0.311	--	--	--
PCB-172 + 192	<0.202	<0.149	<0.213	<0.379	<0.246	<0.594	<0.536	<0.768	<0.468	<0.673	<0.105	<0.311	--	--	--
PCB-173	<0.202	<0.149	<0.213	<0.379	<0.246	<0.594	<0.536	<0.768	<0.468	<0.673	<0.105	<0.311	--	--	--
PCB-174 + 181	0.749	0.467	<0.216	0.413	0.541	<0.611	<0.551	<0.789	<0.482	<0.683	<0.105	<0.320	--	--	--

Table 4–2. Masses of particulate polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners														
	Monthly composite river samples									Quality-control samples					
										Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
PCB-175	<0.202	<0.149	<0.213	<0.379	<0.250	<0.609	<0.549	<0.787	<0.480	<0.674	<0.107	<0.319	--	--	--
PCB-176	<0.152	<0.112	<0.160	<0.285	<0.193	<0.467	<0.421	<0.604	<0.368	<0.507	<0.082	<0.245	--	--	--
PCB-177	0.494	0.308	0.35	<0.256	0.409	<0.611	<0.551	<0.789	<0.482	<0.683	<0.105	<0.320	--	--	--
PCB-178	<0.202	<0.149	<0.213	<0.379	<0.250	<0.609	<0.549	<0.787	<0.480	<0.674	<0.107	<0.319	--	--	--
PCB-179	0.396	0.236	0.221	<0.285	0.322	<0.467	<0.421	<0.604	<0.368	<0.507	<0.082	<0.245	--	--	--
PCB-180	1.83	1.33	1.41	1.07	1.2	<0.594	1.17	<0.768	<0.468	<0.673	<0.105	<0.311	105	91.3	95.4
PCB-182 + 187	1	0.719	0.748	0.484	0.706	<0.609	0.571	<0.787	<0.480	<0.674	<0.107	<0.319	101	93.7	95.6
PCB-183	0.466	0.329	e0.276	0.293	0.392	<0.611	<0.551	<0.789	<0.482	<0.683	<0.105	<0.320	106	94.5	96.2
PCB-184	<0.152	<0.112	<0.160	<0.285	<0.193	<0.467	<0.421	<0.604	<0.368	<0.507	<0.082	<0.245	--	--	--
PCB-185	<0.205	<0.151	<0.216	<0.256	<0.247	<0.611	<0.551	<0.789	<0.482	<0.683	<0.105	<0.320	--	--	--
PCB-186	<0.202	<0.149	<0.213	<0.379	<0.250	<0.609	<0.549	<0.787	<0.480	<0.674	<0.107	<0.319	--	--	--
PCB-188	<0.152	<0.112	<0.160	<0.285	<0.193	<0.467	<0.421	<0.604	<0.368	<0.507	<0.082	<0.245	91.8	92	90.3
PCB-189	<0.171	<0.126	<0.180	<0.321	<0.204	<0.493	<0.445	<0.638	<0.389	<0.571	<0.087	<0.259	109	94.1	99.4
PCB-191	<0.202	<0.149	<0.213	<0.379	<0.246	<0.594	<0.536	<0.768	<0.468	<0.673	<0.105	<0.311	--	--	--
PCB-193	<0.202	<0.149	<0.213	<0.379	<0.246	<0.594	<0.536	<0.768	<0.468	<0.673	<0.105	<0.311	--	--	--
PCB-194	e0.562	e0.346	<0.445	<0.523	e0.506	<0.765	<0.483	<1.47	<0.789	<0.925	<0.137	<0.593	118	98.9	108
PCB-195	<0.281	<0.272	<0.445	<0.523	<0.423	<0.765	<0.483	<1.47	<0.789	<0.925	<0.137	<0.593	--	--	--
PCB-196 + 203	e0.698	0.484	<0.419	<0.491	e0.635	<0.762	<0.480	<1.46	<0.785	<0.870	<0.133	<0.590	111	98.3	108
PCB-197	<0.185	<0.179	<0.293	<0.344	<0.293	<0.542	<0.342	<1.04	<0.559	<0.608	<0.095	<0.420	--	--	--
PCB-198	<0.264	<0.256	<0.419	<0.491	<0.409	<0.762	<0.480	<1.46	<0.785	<0.870	<0.133	<0.590	--	--	--
PCB-199	0.503	e0.361	<0.419	<0.491	e0.464	<0.762	<0.480	<1.46	<0.785	<0.870	<0.133	<0.590	--	--	--
PCB-200	<0.185	<0.179	<0.293	<0.344	<0.293	<0.542	<0.342	<1.04	<0.559	<0.608	<0.095	<0.420	--	--	--
PCB-201	<0.185	<0.179	<0.293	<0.344	<0.293	<0.542	<0.342	<1.04	<0.559	<0.608	<0.095	<0.420	--	--	--
PCB-202	<0.211	<0.205	<0.335	<0.393	<0.332	<0.613	<0.386	<1.17	<0.632	<0.697	<0.108	<0.475	105	94.5	102
PCB-204	<0.185	<0.179	<0.293	<0.344	<0.293	<0.542	<0.342	<1.04	<0.559	<0.608	<0.095	<0.420	--	--	--
PCB-205	<0.210	<0.204	<0.334	<0.392	<0.314	<0.587	<0.370	<1.12	<0.605	<0.694	<0.102	<0.455	115	92.2	108
PCB-206	<0.756	<0.375	<0.585	<0.722	e0.473	<1.30	<0.568	<2.39	<1.90	<1.67	<0.173	<0.986	98.2	92.1	101
PCB-207	<0.648	<0.321	<0.501	<0.618	<0.347	<1.15	<0.502	<2.11	<1.67	<1.43	e0.173	<0.870	--	--	--
PCB-208	<0.648	<0.321	<0.501	<0.618	<0.347	<1.15	<0.502	<2.11	<1.67	<1.43	e0.193	<0.870	96.9	94.5	98.6
PCB-209	0.611	0.419	<0.213	<0.226	0.483	<0.608	<0.409	<0.739	<1.28	<0.398	<0.123	<0.224	92.5	90.4	97.6
Total	180	121	164	150	150	10.6	83.8	27.8	1.66	<1.67	0.132	<	--	--	--

Table 4–2. Masses of particulate polychlorinated biphenyls in water at U.S. Geological Survey streamgage Neponset River at Milton Village (011055566), Milton, Massachusetts, 2005–2006.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not done]

IUPAC number	Polychlorinated biphenyl congeners														
	Monthly composite river samples									Quality-control samples					
										Laboratory blank (ng/sample)			Matrix spike (percent recovery)		
	May 2005 (ng/sample)	June 2005 (ng/sample)	July 2005 (ng/sample)	August 2005 (ng/sample)	September 2005 (ng/sample)	December 2005 (ng/sample)	January 2006 (ng/sample)	February 2006 (ng/sample)	March–April 2006 (ng/sample)	May-05 to August-05	September 2005	December-05 to April-06	May-05 to August-05	September 2005	December-05 to April-06
Polychlorinated biphenyl homologs															
Total Monochlorobiphenyls	6.05	3.62	4.76	3.67	<0.180	<	0.97	<	<	<1.04	<2.13	<	--	--	--
Total Dichlorobiphenyls	28.5	17.8	23.3	27.8	19.5	0.532	8.78	3.92	1.66	<1.18	<0.324	<	--	--	--
Total Trichlorobiphenyls	33.7	21.9	29.7	35.3	24	1.9	14.8	3.34	<	<0.866	<0.129	<	--	--	--
Total Tetrachlorobiphenyls	48.3	35.1	58.9	47.9	65.3	6.18	25.7	13.8	<	<1.51	<0.191	<	--	--	--
Total Pentachlorobiphenyls	31	21.7	27	21.2	20.4	2.03	18.4	4.13	<	<1.16	<0.0948	<	--	--	--
Total Hexachlorobiphenyls	25	15.1	17	11	15.2	<	12.7	2.6	<	<0.932	0.132	<	--	--	--
Total Heptachlorobiphenyls	6.13	4.32	3.76	3.22	4.7	<	2.56	<	<	<0.802	<0.129	<	--	--	--
Total Octachlorobiphenyls	0.503	0.484	<0.445	<0.523	<0.423	<	<	<	<	<0.925	<0.137	<	--	--	--
Total Nonachlorobiphenyls	<0.756	<0.375	<0.585	<0.722	<0.384	<	<	<	<	<1.67	<0.173	<	--	--	--
Decachlorobiphenyls	0.611	0.419	<0.213	<0.226	0.483	<	<	<	<	<0.398	<0.123	<	--	--	--
Polychlorinated biphenyl Aroclors															
Aroclor 1221	<0.624	<0.501	<0.940	<0.670	<0.342	<0.827	<0.637	<0.758	<1.32	<1.98	<4.05	<1.13	--	--	--
Aroclor 1232	<1.12	<0.694	<1.68	<1.45	<0.721	<1.93	<1.14	<3.39	<4.22	<3.55	<7.24	<2.26	--	--	--
Aroclor 1016/1242	65.3	45.3	58.3	60.3	43.8	5.65	30.4	11.8	<4.71	<2.82	<0.695	<2.53	--	--	--
Aroclor 1248	<2.61	<2.22	<3.35	<2.99	<1.15	<3.61	<2.82	<4.37	<4.26	<4.21	<0.537	<2.09	--	--	--
Aroclor 1254	54.4	40.5	50.1	39.8	42.2	<6.29	39.3	<14.1	<9.67	<9.48	<0.808	<5.75	--	--	--
Aroclor 1260	24.8	18.4	19.3	16.5	19.3	<5.06	14.1	<6.54	<3.99	<5.69	<0.916	<2.66	--	--	--

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Appendix 5. Polychlorinated Biphenyl Masses Measured in Commercially Available Aroclors

Table

5–1. Polychlorinated biphenyl masses measured in commercially available Aroclor mixtures analyzed by AXYS Analytical Services, Ltd. 140

Table 5–1. Polychlorinated biphenyl masses measured in commercially available Aroclor mixtures analyzed by AXYS Analytical Services, Ltd.

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not applicable]

IUPAC number	Polychlorinated biphenyl congeners						
	Aroclor 1221 (ng/sample)	Aroclor 1232 (ng/sample)	Aroclor 1242 (ng/sample)	Aroclor 1254 (ng/sample)	Aroclor 1260 (ng/sample)	Aroclor 1016 (ng/sample)	Aroclor 1248 (ng/sample)
PCB-1	1,280	686	22.7	0.645	0.992	14	1.76
PCB-2	124	68.4	1.2	<0.289	<0.425	0.711	<0.294
PCB-3	681	409	7.2	<0.289	<0.425	4.26	e0.630
PCB-4 + 10	280	198	146	2.61	2.28	99	16.7
PCB-5 + 8	465	365	280	4.86	3.74	199	38.7
PCB-6	134	88.4	56.2	0.883	e0.875	38.9	6.17
PCB-7 + 9	127	73.9	33.1	<0.518	<0.654	22	2.67
PCB-11	e3.96	2.48	e13.0	e14.1	e13.5	e14.8	e14.1
PCB-12 + 13	60	34.3	9.29	<0.518	<0.654	6.65	0.805
PCB-14	<0.253	<0.356	<0.807	<0.518	<0.654	<0.313	<0.442
PCB-15	147	128	76.8	0.977	<0.710	58.6	10.1
PCB-16 + 32	12.8	119	233	4.98	3.18	171	118
PCB-17	10.3	72.1	147	3.11	1.93	105	61.9
PCB-18	17.1	176	339	7.06	4.05	252	205
PCB-19	2.96	19.4	37.5	0.833	<1.11	27.7	11.9
PCB-20 + 21 + 33	11	114	206	4.09	2.51	151	108
PCB-22	4.96	57.1	101	2.29	1.31	73.7	60.8
PCB-23 + 34	e0.449	0.931	1.54	<0.380	<0.583	1.17	0.614
PCB-24 + 27	3.12	17.4	34.6	0.978	<0.944	24.6	10
PCB-25	2.91	12.7	23.3	0.55	<0.583	17.1	5.53
PCB-26	3.25	27.2	46.3	1.08	e0.753	35	18.9
PCB-28	14.7	150	327	5.98	4.23	237	205
PCB-29	<0.163	1.79	3.42	<0.380	<0.583	2.43	0.523
PCB-30	<0.244	<0.426	<1.23	<0.616	<0.944	<0.457	<0.503
PCB-31	10.5	149	261	8.19	2.49	201	225
PCB-35	<0.106	1.73	2.94	<0.816	<0.463	1.45	<0.790
PCB-36	0.132	e0.534	2.17	<0.747	<0.424	1.99	3
PCB-37	3.22	39	66.6	0.97	<0.463	22.8	33.6
PCB-38	e0.202	1.61	e4.09	<0.816	<0.463	2.85	e7.89
PCB-39	e0.740	<0.397	e1.29	<0.747	<0.424	<0.454	1.26
PCB-40	<1.40	17.6	37.5	5.73	<1.06	18	65.8
PCB-41 + 64 + 68 + 71	2.82	99	212	53.4	2.84	135	413
PCB-42 + 59	e0.984	35	76.7	8.13	<0.940	55.9	122
PCB-43 + 49	1.55	53.9	122	55.4	1.49	92.5	235
PCB-44	2.01	69.3	144	106	2.17	104	306
PCB-45	e0.817	15.9	36.8	1.72	<0.836	28	51.6
PCB-46	<0.747	6.5	12.7	e0.797	<0.836	9.64	19.8
PCB-47 + 48 + 75	1.24	43.9	100	10.9	1.34	74.9	169
PCB-50	<0.635	<0.784	0.668	<0.533	<0.702	0.553	0.744
PCB-51	<0.747	4.56	11.1	e0.853	<0.836	8.89	16.3
PCB-52 + 73	3.24	71.3	154	273	15	116	356
PCB-53	<0.747	15.2	32.4	5.34	<0.836	24.6	53.4
PCB-54	<0.635	<0.784	0.68	<0.533	<0.702	0.587	0.823

Table 5–1. Polychlorinated biphenyl masses measured in commercially available Aroclor mixtures analyzed by AXYS Analytical Services, Ltd.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not applicable]

IUPAC number	Polychlorinated biphenyl congeners						
	Aroclor 1221 (ng/sample)	Aroclor 1232 (ng/sample)	Aroclor 1242 (ng/sample)	Aroclor 1254 (ng/sample)	Aroclor 1260 (ng/sample)	Aroclor 1016 (ng/sample)	Aroclor 1248 (ng/sample)
PCB-55	<0.755	e1.51	4.8	<0.804	<0.579	e0.228	3.01
PCB-56 + 60	e1.51	56.2	126	28	1.38	3.11	260
PCB-57	<1.40	<1.39	2.44	<1.47	<1.06	1.49	3.01
PCB-58	<1.40	<1.39	<2.18	<1.47	<1.06	<0.382	<1.40
PCB-61 + 74	e1.04	35.9	83.2	36.8	e1.39	9.12	175
PCB-62 + 65	<0.747	1.14	e1.41	e1.31	e1.22	e0.892	1.75
PCB-63	<0.740	2.88	6.52	1.72	<0.546	e0.927	11.7
PCB-66 + 80	1.49	62.6	133	55.9	7.39	9.59	293
PCB-67	<1.40	5.67	12.8	<1.47	<1.06	2.68	12.4
PCB-69	<0.747	<0.921	e0.978	<0.635	<0.836	0.528	e1.29
PCB-70 + 76	1.68	74.7	157	167	2.48	15	378
PCB-72	<0.837	<1.03	1.05	<0.715	<0.940	e0.463	<0.772
PCB-77	<0.593	5.9	12.8	e12.4	e1.77	<0.310	24.8
PCB-78	<0.593	<1.07	<1.26	e1.51	<0.731	<0.310	0.853
PCB-79	<0.593	<1.07	<1.26	e4.76	<0.731	<0.310	<0.686
PCB-81	<0.593	<1.07	e1.82	e9.39	1.02	<0.310	4.49
PCB-82	<0.849	3.67	10.3	42.4	8.88	<0.464	33.5
PCB-83 + 108	<0.554	1.4	3.19	<33.5	e0.940	<0.236	10.6
PCB-84	<0.482	4.7	12.7	87.3	e6.70	e0.954	44.7
PCB-85 + 120	<0.849	4.83	e16.0	65.6	<1.45	e2.54	54.4
PCB-86 + 97	<0.849	6.59	19.4	131	5.78	<0.464	65.7
PCB-87 + 115 + 116	1.48	8.61	25.4	224	23.3	<0.464	87.8
PCB-88 + 121	<0.568	<0.586	<0.802	<34.9	2.08	e0.453	2.86
PCB-89 + 90 + 101	4.04	12.8	37	405	167	e1.89	121
PCB-91	<0.568	3.84	11	50.1	<0.912	1.73	34.6
PCB-92	e0.549	e1.86	5.32	60	15.8	e0.315	17.6
PCB-93 + 95	3.84	12.9	32.4	352	150	7.92	113
PCB-94	<0.568	<0.586	<0.802	<34.9	<0.912	0.343	1.94
PCB-96	<0.568	e0.949	2.21	<34.9	<0.912	1.44	5.57
PCB-98 + 102	<0.568	e1.89	e3.93	<34.9	e1.48	1.27	11.7
PCB-99	1.05	7.18	21.8	146	e2.70	0.55	75.2
PCB-100	<0.568	<0.586	<0.802	<34.9	<0.912	<0.246	0.803
PCB-103	<0.568	<0.586	e1.05	<34.9	<0.912	0.691	e2.04
PCB-104	<0.417	<0.430	<0.565	<24.6	<0.643	<0.173	<0.445
PCB-105 + 127	<0.615	6.08	21.7	141	6.31	<0.328	77.9
PCB-106 + 118	e0.903	8.71	34.2	338	27.8	<0.350	116
PCB-107 + 109	<0.606	<0.827	2.94	19.4	<1.02	e0.335	8.55
PCB-110	2.12	12.7	38.6	430	69.2	e0.394	142
PCB-111 + 117	<0.849	<1.16	<1.30	e6.01	<1.45	<0.464	1.42
PCB-112	<0.554	<0.571	<0.771	<33.5	<0.877	<0.236	0.707
PCB-113	<0.482	0.78	0.891	<28.7	1.58	<0.203	e1.18
PCB-114	e0.628	<0.817	1.57	8.06	<1.00	<0.320	5.77
PCB-119	<0.465	0.504	1.63	<28.0	<0.733	<0.198	3.55

Table 5–1. Polychlorinated biphenyl masses measured in commercially available Aroclor mixtures analyzed by AXYS Analytical Services, Ltd.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not applicable]

IUPAC number	Polychlorinated biphenyl congeners						
	Aroclor 1221 (ng/sample)	Aroclor 1232 (ng/sample)	Aroclor 1242 (ng/sample)	Aroclor 1254 (ng/sample)	Aroclor 1260 (ng/sample)	Aroclor 1016 (ng/sample)	Aroclor 1248 (ng/sample)
PCB-122	<0.599	<0.817	e0.903	3.38	<1.00	<0.320	2.8
PCB-123	<0.597	<0.814	2.95	19.2	11.5	<0.350	8.59
PCB-124	<0.606	<0.827	e1.74	15.5	4.25	<0.324	4.71
PCB-125	<0.849	<1.16	<1.30	e2.73	<1.45	<0.464	e1.93
PCB-126	<0.650	<0.886	<0.938	e0.649	e10.9	<0.334	<0.500
PCB-128	<0.640	<0.701	2.06	76.9	26.7	<0.282	6.4
PCB-129	<0.640	<0.701	0.745	22.3	9.83	<0.282	2.19
PCB-130	<0.640	<0.701	<0.703	23.5	12.5	<0.282	1.97
PCB-131 + 142	<0.635	<0.449	<0.779	5.93	2.4	<0.218	e0.665
PCB-132 + 168	1.31	0.843	2.5	122	134	<0.258	9.52
PCB-133	<0.635	<0.449	<0.779	2.93	4.38	<0.218	<0.523
PCB-134 + 143	<0.635	<0.449	<0.779	17.8	16.8	<0.218	1.52
PCB-135 + 144	e1.27	e0.569	0.893	41.2	90.6	<0.218	2.94
PCB-136	1.54	0.804	0.938	45.1	103	<0.218	3.59
PCB-137	<0.640	<0.701	e1.03	22.2	1.38	<0.239	1.84
PCB-138 + 163 + 164	3.89	3.38	7.9	364	487	<0.239	24.8
PCB-139 + 149	5.36	3.14	3.58	188	458	<0.218	12.7
PCB-140	<0.635	<0.449	<0.779	e2.44	<1.62	<0.218	<0.523
PCB-141	1.12	e0.836	1.21	46.7	126	<0.239	3.4
PCB-145	<0.635	<0.449	<0.779	<1.06	<1.62	<0.218	<0.523
PCB-146	0.662	<0.414	e0.769	30.7	55.3	<0.198	1.9
PCB-147	<0.635	<0.449	<0.779	7.71	e2.13	e0.378	e0.798
PCB-148	<0.635	<0.449	<0.779	<1.06	<1.62	<0.218	<0.523
PCB-150	<0.635	<0.449	<0.779	<1.06	<1.62	<0.218	<0.523
PCB-151	2.83	1.5	<0.970	42.3	199	<0.272	3.28
PCB-152	<0.635	<0.449	<0.779	<1.06	<1.62	<0.218	<0.523
PCB-153	4.3	3.09	3.82	209	484	<0.220	12.4
PCB-154	<0.635	<0.449	<0.779	2.72	1.96	<0.218	<0.523
PCB-155	<0.448	<0.317	<0.552	<0.748	<1.15	<0.155	<0.371
PCB-156	0.96	e0.557	1.37	39.2	23.1	<0.187	3.31
PCB-157	e0.618	<0.570	0.558	8.22	e5.09	<0.190	0.836
PCB-158 + 160	<0.640	<0.701	1.65	53.4	52.5	<0.239	4.22
PCB-159	<0.640	<0.701	<0.598	<0.995	9.76	<0.239	<0.568
PCB-161	<0.585	<0.414	<0.708	<0.958	<1.47	<0.198	<0.475
PCB-162	<0.640	<0.701	<0.598	1.72	e4.85	<0.239	<0.568
PCB-165	<0.585	<0.414	<0.708	<0.958	<1.47	<0.198	<0.475
PCB-166	<0.640	<0.701	<0.598	2.53	e1.08	<0.239	<0.568
PCB-167	0.621	<0.545	e0.461	12.9	9.12	<0.184	1.04
PCB-169	<0.518	<0.567	<0.468	<0.778	<0.729	<0.188	<0.445
PCB-170 + 190	e1.77	e2.26	e1.08	30.8	264	<0.386	1.97
PCB-171	e0.611	<0.477	<0.853	6.27	49.4	<0.322	<0.568
PCB-172 + 192	<0.578	<0.477	<0.853	3.46	30	<0.322	<0.568
PCB-173	<0.578	<0.477	<0.853	e0.721	4.79	<0.322	<0.568

Table 5–1. Polychlorinated biphenyl masses measured in commercially available Aroclor mixtures analyzed by AXYS Analytical Services, Ltd.—Continued

[Analyzed by AXYS Analytical Services, Ltd., Sidney, British Columbia, Canada; IUPAC, International Union of Pure and Applied Chemistry; ng, nanogram; PCB, polychlorinated biphenyl; <, actual value is less than value shown; e, estimated; --, not applicable]

IUPAC number	Polychlorinated biphenyl congeners						
	Aroclor 1221 (ng/sample)	Aroclor 1232 (ng/sample)	Aroclor 1242 (ng/sample)	Aroclor 1254 (ng/sample)	Aroclor 1260 (ng/sample)	Aroclor 1016 (ng/sample)	Aroclor 1248 (ng/sample)
PCB-174 + 181	<0.570	1.42	<0.878	15.2	216	<0.331	1.05
PCB-175	<0.580	<0.478	<0.876	0.918	9.52	<0.330	<0.582
PCB-176	<0.447	<0.368	<0.671	2.43	28.1	<0.253	<0.446
PCB-177	e0.593	0.73	<0.878	8.88	111	<0.331	e0.715
PCB-178	<0.580	<0.478	<0.876	e2.38	38.8	<0.330	<0.582
PCB-179	0.915	0.72	<0.671	4.93	93.1	<0.253	0.521
PCB-180	2.28	3.36	<0.853	32.4	481	<0.322	1.9
PCB-182 + 187	2.17	1.86	<0.876	12	262	<0.330	1.07
PCB-183	0.984	0.806	<0.878	9.36	128	<0.331	0.688
PCB-184	<0.447	<0.368	<0.671	<0.478	<0.703	<0.253	<0.446
PCB-185	<0.570	<0.470	<0.878	1.35	27	<0.331	<0.583
PCB-186	<0.580	<0.478	<0.876	<0.623	<0.917	<0.330	<0.582
PCB-188	<0.447	<0.368	<0.671	<0.478	<0.703	<0.253	<0.446
PCB-189	0.742	e0.446	<0.710	1.71	6.42	<0.268	<0.472
PCB-191	<0.578	<0.477	<0.853	1.22	10.3	<0.322	<0.568
PCB-193	<0.578	<0.477	<0.853	1.82	28.9	<0.322	<0.568
PCB-194	e1.80	e1.50	<1.80	e1.97	e108	<0.481	<1.20
PCB-195	e1.05	e1.02	<1.80	<1.71	42.2	<0.481	<1.20
PCB-196 + 203	<1.00	e1.24	<1.79	e1.78	125	<0.478	<1.19
PCB-197	<0.709	<0.502	<1.28	<1.21	e4.18	<0.341	<0.847
PCB-198	<1.00	<0.709	<1.79	<1.70	e5.80	<0.478	<1.19
PCB-199	<1.00	e0.916	<1.79	<1.70	104	<0.478	<1.19
PCB-200	<0.709	<0.502	<1.28	<1.21	12.6	<0.341	<0.847
PCB-201	<0.709	<0.502	<1.28	<1.21	11.5	<0.341	<0.847
PCB-202	<0.831	<0.589	<1.44	<1.37	19.2	<0.385	<0.958
PCB-204	<0.709	<0.502	<1.28	<1.21	<0.937	<0.341	<0.847
PCB-205	e0.909	<0.560	<1.38	<1.31	e5.43	<0.369	<0.918
PCB-206	<3.00	<1.82	<1.93	<2.33	32	<1.06	<1.75
PCB-207	<2.61	<1.59	<1.70	<2.06	4.25	<0.933	<1.55
PCB-208	<2.61	<1.59	<1.70	e2.60	9.21	<0.933	<1.55
PCB-209	0.696	<0.473	<0.991	<0.538	4	0.262	<0.553
Polychlorinated biphenyl homologs							
Total Monochlorobiphenyls	2,085	1,163	31.1	0.645	0.992	19.0	1.76
Total Dichlorobiphenyls	1,213	890	601	9.33	6.02	424	75.1
Total Trichlorobiphenyls	97.0	959	1,832	40.11	19.7	1,328	1,069
Total Tetrachlorobiphenyls	14.0	677	1,480	809	35.1	710	2,977
Total Pentachlorobiphenyls	12.5	95.3	285	2,538	493	13.9	1,053
Total Hexachlorobiphenyls	22.6	12.8	27.2	1,389	2,307	--	97.9
Total Heptachlorobiphenyls	7.09	8.9	--	133	1,788	--	7.20
Total Octachlorobiphenyls	--	--	--	--	315	--	--
Total Nonachlorobiphenyls	--	--	--	--	45.5	--	--
Decachlorobiphenyls	0.696	--	--	--	4.00	0.262	--

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