FINAL REPORT
FOR
LOWER NEPONSET RIVER PCBS
PRELIMINARY ASSESSMENT
BOSTON & MILTON, MASSACHUSETTS

Prepared For:
U.S. Environmental Protection Agency
Region I
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CONTRACT NO. EP-W-05-042

EPA ID NO. MAN000102204
STATE ID NOS. TBD
TO/TDD NO. TO1-01-16-06-0009
TASK NO. 0134
DC NO. A-0186

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August 2018

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ACRONYM/ABBREVIATIONS LIST

%	Percent
A&CEM	Allis & Chalmers Electrical Manufacturing
A&CMF	Allis & Chalmers Manufacturing Facility
AUL	Activity Use & Limitation
AMEC	AMEC Environment & Infrastructure, Inc.
aka	Also known as
bgs	Below ground surface
BMP	Best Management Practices
bsg	Below surface grade
BRCPS	Boston Renaissance Charter Public School
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CDW	CDW consultants, Inc.
CESQG	Conditionally Exempt Small Quantity Generators
cfs	Cubic feet per second
CGI	Combustible Gas Indicator
CO	Carbon Monoxide
COR	Contracting Officer Representative
CWA	Clean Water Act
DCR	Department of Conservation & Recreation
DEQE	Department of Environmental Quality Engineering
DDT	Dichlorodiphenyltrichloroethane
DFG	Department of Fish and Game
DPH	Department of Public Health
EPA	U.S. Environmental Protection Agency
ft	Foot
ft^2	Square feet
GIS	Geographic Information System
H_2S	Hydrogen Sulfide
IRA	Immediate Response Action
LEL	Lower Explosive Limit
LQG	Large Quantity Generator
MA	Massachusetts
MBTA	Massachusetts Bay Transportation Authority
MCP	Massachusetts Contingency Plan
MassDEP	Massachusetts Department of Environmental Protection
MDC	Metropolitan District Commission
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams Per Liter
mL	Milliliter
µg/g	Micrograms Per gram
µg/Kg	Micrograms Per Kilogram
µg/L	Micrograms Per Liter
µR/hr	MicroRoentgens per hour
mi^2	Square miles
MWRA	Massachusetts Water Resource Authority
ng/g	Nanograms per gram
NLR	No Longer Regulated
No.	Number

ACRONYM/ABBREVIATIONS LIST

NOAA	National Oceanic and Atmospheric Administration
NOR	Notice of Responsibility
NPL	National Priorities List
NRCS	Natural Resource Conservation Service
NSR	No Significant Risk
O_2	Oxygen
OEME	Office of Environmental Measurement and Evaluation
OHM	Oil or Hazardous Material
OSRR	Office of Site Remediation and Restoration
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PISCES	Passive In-situ Chemical-Extraction System
PID	Photoionization Detector
PPE	Probable Point of Entry
ppb	Parts per billion
ppm	Parts per million
PWS ID	Public Water System Identification
R&D	Research and Development
RAM	Release Abatement Measure
RAO	Response Action Outcome
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RTN	Release Tracking Number
SDG	Sample Delivery Group
SEMS	Superfund Enterprise Management System
SI	Site Inspection
START	Superfund Technical Assessment and Response Team
SVE	Soil vapor extraction
SWP	Surface Water Pathway
T&BC	Thomas and Betts Corporation
TCLP	Toxicity characteristic leaching procedure
T&H	Tileston and Hollingsworth
TSCA	Toxic Substances Control Act
TDL	Target Distance Limit
US ACOE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WPA	Wellhead Protection Area

Final Preliminary Assessment Report
Lower Neponset River PCBs
Boston & Milton, Massachusetts

EPA ID No.: MAN000102204
State ID Nos.: TBD
TO/TDD No.: TO1-01-16-06-0009
Work Order No.: 30100.041.001.0134.70

INTRODUCTION

The Weston Solutions, Inc., Superfund Technical Assessment and Response Team IV (START) was requested by the U.S. Environmental Protection Agency (EPA) Region I, Office of Site Remediation and Restoration (OSRR) to perform a Preliminary Assessment (PA) of the Lower Neponset River PCBs site. The Lower Neponset River PCBs site is currently identified as a sediment contamination plume of unknown origin, encompassing a 3.7-mile segment of the Neponset River from the confluence of Mother Brook, a tributary of the Neponset River located upstream of Dana Avenue, Hyde Park, Massachusetts (MA), extending downstream to the Walter Baker Dam located upstream of Adams Street, Dorchester/Milton, MA (see Attachment A, Figure 1) [3]. The sediment contamination plume contains elevated levels of polychlorinated biphenyl (PCB) mixtures known as Aroclors, including Aroclor-1242, Aroclor-1254, and Aroclor-1260. At the current time, elevated levels of PCB-contamination have been documented in sediment samples from Walter Baker Dam Impoundment area ("Baker Dam Impoundment"), the Braided Channel area (also known as ("aka") Rice Islands), as well as the Tileston and Hollingsworth Dam Impoundment area ("T&H Dam Impoundment") (see Attachment A, Figure 2) [1; 4].

This package follows the guidelines developed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, commonly referred to as Superfund. However, these documents do not necessarily fulfill the requirements of other EPA Region I regulations such as those under the Resource Conservation and Recovery Act (RCRA) or other Federal, State, or local regulations. PAs are intended to provide a preliminary screening of sites to facilitate EPA Region I's assignment of site priorities. They are limited efforts and are not intended to supersede more detailed investigations.

The street addresses, coordinates, and contaminant locations presented in this PA report identify the general area in which the site is located. They represent one or more locations EPA considers to be part of the site based upon the screening information collected or generated in the course of this and/or previous investigation(s). The EPA Site Assessment Program is designed to identify "releases or threats of releases" of hazardous substances, and the focus of this investigation is on the release(s) or potential release(s), rather than precisely delineated site boundaries. A site is defined under the EPA Site Assessment program as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." EPA anticipates that the preliminary description of site boundaries will be refined as more information is developed regarding where the contamination has come to be located.

SITE DESCRIPTION

The Lower Neponset River PCBs site for this study is considered to be an approximately 3.7-mile riverbed segment which contains several areas where PCB-contaminated sediments have accumulated from both suspected and unknown sources and/or releases to form a plume of PCB-contaminated sediment. The site is comprised of the riverbed channel along the lower segment of the Neponset River, from the confluence of the Neponset River and Mother Brook (upstream of Dana Avenue, Hyde Park; Confluence coordinates 42.251785, -71.123205) downstream to the Baker Dam (upstream of Adams Street, Dorchester/Milton; Dam coordinates 42.270765, -71.068818) (see Attachment A, Figure 1). Sediments contaminated with elevated levels of PCBs

have been documented within the lower segment of the Neponset River and Lower Neponset River PCBs site area. The original location of the release or releases of PCBs which have resulted in the contaminated sediment is unknown. However, there are several sites within the river basin which have been identified by previous investigations as having formerly used, stored, or had releases of PCBs and are likely to have contributed to the sediment contamination plume; numerous other sites which may have used, stored, or had releases of PCBs within the river basin and may have contributed PCB-contamination to the sediment contamination plume; and still other potential sites, sources, and/or releases, which have not yet been identified, but based on the long, complex, urban and industrial history of the area along the Neponset River and within the river basin, are likely to exist and potentially have contributed to the PCB-contaminated sediment. Therefore, the PCB-contaminated sediments have accumulated from both suspected and unknown sources and/or releases of PCBs, which have accumulated to form a plume of PCB-contaminated sediment of unknown origins, which constitutes the Lower Neponset River PCBs site.

The Lower Neponset River channel ranges from approximately 40 feet to 300 feet wide, and comprises an estimated 40 acres (see Attachment A, Figure 2) within or bordering the City of Boston (Hyde Park, Mattapan, and Dorchester sections) and the Town of Milton, MA. The site is bordered by residential, commercial, industrial, and public parcels of land, including the Neponset River Greenway [aka the Neponset River trail and walkway] [57].

For the purpose of this study, the site consists of five general areas of concern: the Baker Dam Impoundment area (from the Baker Dam, upstream to Central Avenue); the Braided Channel area (from Central Avenue, upstream to the Harvest River Bridge); the Blue Hill Avenue area (upstream of the Braided Channel area, to the T&H Dam); the T&H Dam Impoundment area (from the T&H Dam, upstream to Fairmont Avenue); and the Fairmont/Mother Brook confluence area (from Fairmont Avenue, upstream to the confluence of Mother Brook with the Neponset River) (Attachment A, Figure 2) [57].

The Lower Neponset River PCBs site is located in the Neponset River Watershed (Attachment A, Figure 6). Water and sediment flow into the site via a stream channel from Mother Brook and the upper segment of the Neponset River, upstream of the confluence of Mother Brook with the Neponset River. Water flowing through the site (along the Neponset River channel) discharges at the Baker Dam, the downstream-most portion of the site, and continues to flow downstream along the Neponset River through the Neponset River Marsh/Estuary, to Dorchester Bay, and Boston Harbor [44, 45, 57].

Water also enters the site via Pine Tree Brook, a small tributary which discharges to the site (riverbed) near the Baker Dam Impoundment; overland flow; and various discharge pipes along the river banks. Several former facility discharge pipes and City of Boston and Town of Milton storm drain pipes have been observed along the site and presumably have discharged to the site riverbed at various points in the past [57].

According to the U.S. Geological Survey (USGS) and Weston START site observations, water depths along the Lower Neponset River PCBs Site range from less than 1 foot in portions of the Braided Channel area to a maximum depth of 15 feet within the T&H Dam Impoundment area [4, 57].

Numerous sediment depositional areas have been observed along the riverbed channel, including several where PCB-contaminated sediments have been documented to come to rest. These areas include, but are not limited to: the Baker Dam Impoundment, the Braided Channel, and the T&H

Dam Impoundment areas. According to USGS, the measurements of maximum sediment thickness in 2002 were 5.8, 7.6 and 9.7 ft. in the Braided Channel, Baker Dam Impoundment and T&H Dam Impoundment areas, respectively. Observations by START also noted that some areas within the riverbed channel are erosional zones, with limited sediment accumulation occurring, and other areas of the riverbed are heavily armored [2, 3, 4, 57].

Numerous wetland areas are located within and along the 3.7-mile riverbed segment of the site. The majority of the wetland acreage is within the Braided Channel, but there is wetland frontage along the majority of the edge of the riverbed channel. Based on the EPA wetland specialist's observations and review of wetland delineations, there are an estimated 4 to 5 miles of wetland frontage along the Neponset River, within the Lower Neponset River PCBs site [46].

A Site Inspection (SI) for the Lower Neponset River PCBs site is being conducted concurrently to this PA. The SI will include the examination of segments of Mother Brook from its confluence with the Neponset River, upstream 3.6 miles to the Colburn Dam Impoundment area (near Maverick Street, Dedham, MA; coordinates 42.249017, -71.159816); as well as a section of the upper Neponset River, from the confluence of the Neponset River and Mother Brook, approximately 2 miles, to the area with the Neponset River Reservation II (aka Fowl Meadow) [located near 141 Meadow Road, Boston MA (Neponset section); coordinates 42.228704, -71.129871] (see Attachment A, Figure 2A) [1]. These segments are being examined to determine background conditions within the Neponset River and Mother Brook, upstream of the confluence of the Neponset River and Mother Brook.

NEPONSET RIVER AND MOTHER BROOK

The Neponset River drains approximately 101 square miles of land and flows approximately 29 miles from its headwaters in Foxboro, MA into the Neponset River Estuary, east of Dorchester Avenue/Adams Street, Boston (Dorchester), MA. The Neponset River is then tidally influenced for approximately another 3 miles, and ultimately discharges to Dorchester Bay [44, 45, 57].

The Neponset River receives flow from the adjacent Charles River Basin through Mother Brook. Mother Brook is a flood-diversion structure that was built in the 1600s. As much as one-third of flood flows in the Charles River are commonly diverted through Mother Brook to prevent flooding in downtown Boston. Historically, water diverted from the Charles River to the Neponset River through Mother Brook was used to flood fields or to provide power to mills [57, 61].

Stream flow in the Neponset River Drainage Basin has been affected by the construction of dams, which have fragmented the Neponset River and changed low flows, high flows, and other hydrologic characteristics. In 2007, 51 dams impounded the waters of the Neponset River and its tributaries. These dams have also changed sediment regimes by trapping sediment in the impoundments behind most of the dams. Two hurricanes impacted the Northeast and destroyed many of the dams along the Neponset River in 1955, releasing sediments trapped behind the dams [4].

OPERATIONAL AND REGULATORY HISTORY AND WASTE CHARACTERISTICS

There are no specific details regarding the operational and regulatory history for the Lower Neponset River PCBs site. This approximately 3.7-mile riverbed segment contains several areas where PCB-contaminated sediments have accumulated from both suspected and unknown sources and PCB releases to form a plume of PCB-contaminated sediment of unknown origins. However,

a general operational history for the lower segment of the Neponset River, comprising the Lower Neponset River PCBs site, is summarized in the following paragraphs.

The Neponset River, like most urban rivers in the Northeast, has a long industrial history. Industrialization and subsequent urbanization began in the Neponset River Basin as early as the 1630s. By the mid-1700s, the Neponset River drained one of the most heavily industrialized drainage basins in the Nation, draining parts of, and areas adjacent to, the city of Boston [4].

Recognized as the second watershed to be industrialized in the United States, the Neponset River has a complex history of contamination from both point and non-point sources. Used historically for hydro-powered factories, the Neponset River has been home to countless industrial land use ventures, most if not all of which likely had outflow and discharge pipes pumping toxic industrial waste directly into the river [59-66].

Historically, numerous mills were established along the Lower Neponset River in the Towns of Dorchester, Milton, Hyde Park, and Mattapan, utilizing dams to generate power initially to turn mill grinding wheels and later to operate the large industrial mills [59-66].

In 1635, Israel Stoughton built the first mill and dam on the Neponset River (reportedly only the second dam in the entire New World) to turn a mill wheel and grind corn using water power. Based on available water flow and use of dams for power, numerous mills were developed along the Lower Neponset River in the subsequent years. These early mills included the first chocolate mill (originally the Hannon Chocolate Company in 1765, later known as Walter Baker Chocolate Company); at least eight paper mills (the first in 1750); and several lumber, flour, and corn mills [59-66].

By 1890, mills along Lower Neponset River were manufacturing a variety of products, including cotton goods, boots, shoes, hats, paper, cabinet wares, furniture, block tin, tin wares, leather, ironworks (nails and horse shoes), wearing apparel, soap, candles, chocolate, gossamer (rubber products), starch, textiles, and playing cards, to name a few [59-66].

From the 1930s through the 1970s, several industries using PCBs were located in the Neponset River Basin. In 1955, major flooding occurred within the river basin and across southern New England. During 1962 and 1964, in an effort to control flooding and increase recreational use of the Neponset River Basin, the Metropolitan District Commission (MDC) [now merged with the Department of Environmental Management to form the Department of Conservation and Recreation (DCR)] conducted repair work on the dams and instituted flood control measures. These measures included dredging of the Lower Neponset River to deepen the channel, and subsequently placing dredge spoils from the Neponset River in several locations along the banks adjacent to the river [8, 9, 59; 60].

Industrial activity continued in the Lower Neponset River segment until 1965, when the last major industrial facility (Walter Baker Chocolate Company, by then a division of General Foods) relocated from the lower section of the river [59; 60].

A byproduct of this early industrialization along the river was the need for dams, which were constructed mostly for purposes of power production to meet the mill requirements. As of 2007, USGS reported that 11 dam impoundments were located along the 29-mile Neponset River main stem, but they no longer serve their original purposes. The T&H Dam and the Baker Dam remain on the lower Neponset River within the area considered the site. Remnants of the former Jenkins

Dam are also located on the Lower Neponset River within the site area, downstream of the Braided Channel sediment accumulation area (forming the Rice Islands) (see Attachment A, Figure 2). One of the long-term effects of these dams is the accumulation of contaminants in the slack water and in the impounded sediments behind the dams [2, 3, 4].

This industrial past along the Lower Neponset River, combined with the urbanization that continues in the drainage basin, has likely contaminated bottom sediment throughout the river [2-4].

Previous investigations of the Neponset River, including portions of the Lower Neponset River, have included sediment and water investigations conducted by the U.S. Army Corps of Engineers (US ACOE), USGS, Massachusetts Department of Environmental Protection (MassDEP), and others.

In 2002, US ACOE conducted a study in an effort to restore fish passage, habitat, and recreational use of the Neponset River. As part of this study, two sediment cores were collected and analyzed. Analytical results indicated that the bottom sediments contained elevated concentrations of PCBs, raising concerns about sediment, water, and biota quality of the Neponset River [12].

In 2002 and 2003, USGS, in cooperation with the Massachusetts Executive Office of Environmental Affairs Riverways Program and the U.S. EPA, conducted a study which included the Lower Neponset River in Boston and Milton. As part of this study, sediment grab (0 - 4 inches below the sediment/water interface), sediment core (5-50 inches below the sediment/water interface), and water-column samples were collected and submitted for inorganics (metals), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides, and PCB analyses. Sediment samples were also analyzed for grain-size distribution. Samples were collected at 63 stations along the Lower Neponset River as follows: sediment-grab sample (20 stations), sediment-core samples (31 stations), and water column passive in-situ chemical-extraction sampler (PISCES) samples (12 stations) (see Attachment A, Figures 3, 4, and 4A) [2-3]. Analytical results indicated that several substances were present, most notably PCBs [11, 12, 13]. However, this investigation will only focus on PCB as the chemical of concern.

According to the USGS, although enriched relative to background, concentrations of most substances were equal to or less than those found in other urban rivers, with the notable exception of PCBs [2-3]. Concentrations of total PCB Aroclors detected in the sediment grab samples ranged from 160 to 10,580 micrograms per kilogram (µg/Kg), and in sediment core samples from 1,140 to 229,300 µg/Kg (see Attachment A, Figures 4 and 4A). Although the USGS reported the PCB concentrations in 2002-2003 sediment samples as parts per billion (ppb), the equivalent units of µg/Kg will be used throughout this report to maintain consistency in reporting concentrations between samples having a solid matrix [2-3].

PCB PISCES passive-water-column samplers were filled with hexane and deployed on buoys at 12 locations throughout the study area, including upstream, downstream, and within Mother Brook (see Attachment A, Figure 5). The solubility of PCBs is much greater in hexane compared to river water and, therefore, increases the likelihood of detecting PCBs that could otherwise be undetectable in whole-water samples. Consequently, the concentrations of water-quality constituents in PISCES samples are reported in nanograms per hexane sample (ng/hexane sample). After about 2 weeks, the PISCES samples were collected and their contents analyzed for 209 individual PCB congeners; Aroclor concentrations were estimated from the PCB congener data

[2-3]. Concentrations of total PCB Aroclors estimated in the PISCES samples ranged from 77 to 3,100 ng/hexane sample (see Attachment A, Figure 5) [3].

The 2002-2003 USGS study concluded that PCBs were detected at such high concentrations in the sediment samples that they posed a threat to benthic organisms and could potentially cause human health risks if humans came into contact with the sediment [3, 4].

A second USGS study, performed from 2004-2006, investigated concentrations, loads, and sources of PCBs by collection and analysis of bottom-sediment grab samples, water samples, fish tissue samples, and PISCES samples. Bottom-sediment samples were collected from the Neponset River and farther downstream in the estuary to supplement bottom-sediment data collected as part of the 2002-2003 USGS study. Specifically, riverine bottom-sediment samples were collected in and around areas near assumed sources of PCB-contamination [4]. The investigation area extended from an impoundment on Mother Brook, located approximately 0.5 miles upstream of the former L.E. Mason Facility downstream to the confluence of Mother Brook and the Neponset River. According to the USGS, the results of the 2004-2006 investigation indicated widespread PCB-contamination in the sediments of the lower Neponset River [4].

The 2004-2006 USGS study detected Total PCB Aroclors in the bottom-sediment grab samples ranging from 135.4 to 25,751µg/Kg. A total of three PCB Aroclors were detected in the bottom-sediment grab samples collected from the USGS study area and include the following (maximum concentration and sample location in parentheses): Aroclor-1242 (19,500 µg/Kg); Aroclor-1254 (5,460 µg/Kg); and Aroclor-1260 (791 µg/Kg) (see Attachment A, Figure 5A) [4]. Although the USGS reported the PCB concentrations in 2004-2006 sediment samples as nanograms per gram (ng/g), the equivalent units of µg/Kg will be used throughout this report to maintain consistency in reporting concentrations [4].

Total PCB Aroclors were measured in the 2004-2006 PISCES water column samples and ranged from 267.5 up to 3012.6 ng/ hexane sample at Fairmount Ave. A total of three PCB Aroclors were estimated in the PISCES samples collected from the study area and include the following (maximum concentration and sample location in parentheses): Aroclor-1016/1242 [2,740 ng/sample (Fairmont Ave.)]; Aroclor-1254 (543 ng/sample (Paul's Bridge)]; and Aroclor-1260 [110 ng/sample (Fairmont Ave.)] (see Attachment A, Figure 5A) [4].

According to the USGS report, the PCB concentrations significantly increased in sediment core samples collected downstream of the confluence of Mother Brook and the Neponset River. PCB concentrations generally declined with distance away from the river mouth into the estuary. The USGS investigations noted that sediment quality in the Neponset River was generally better than that of other urban rivers in the United States, except with respect to PCBs [4].

The USGS reports note that 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 allowed PCB-contaminated sediment to be transported downstream and into the lower segments of the Neponset River and its estuary. The original source area(s) were likely to continue to release PCB-contaminated sediment after the flood and during subsequent rebuilding of downstream dams [2-4].

In 2013, AMEC Environment and Infrastructure, Inc. (AMEC), at the request of MassDEP, conducted sediment core sampling to further evaluate PCBs in Neponset River sediments at four

areas along the Neponset River. The four areas are approximately 3,000 feet (ft.) downstream and 1,000, 3,000 and 4,000 ft. upstream of the confluence of the Neponset River and Mother Brook. PCB Aroclor results ranged from non-detectable concentrations up to 45,000 µg/Kg. The analytical results indicated that PCB concentrations were highest downstream of the confluence of Mother Brook and the Neponset River [5].

According to MassDEP and USGS documents, the PCB-contaminated sediments are mostly trapped behind the two rebuilt dams (the T&H Dam and the Baker Dam), and within the former Jenkins Dam impoundment, where sediments form the Braided Channel section of the river. Maximum PCB concentrations within the Lower Neponset River range up to 229,300 µg/Kg, while Mother Brook concentrations have ranged up to 73,400 µg/Kg (LE Mason sample SD-8A – Nov. 2000) [2-5; 8-9]. Following the 2009 excavation of the lower portion of Mother Brook to the confluence of the Neponset River, the maximum PCB concentration detected in post-excavation samples in Mother Brook was below the remedial action goal set forth in the 27 May 2007 Confirmation of Agreement Letter from MassDEP [6-7]. This was accomplished by excavation and off-site disposal of contaminated soil and sediment (approximately 2,500 tons) adjacent to and from within Mother Brook, and by construction of a subsurface vertical barrier wall to prevent the migration of contaminants from source areas to the brook. Closure sediment samples collected between 0 and 2 feet below surface grade (bsg) during excavation activities indicated the concentration of PCBs remaining in the brook following excavation was 1,670 µg/Kg (maximum concentration of 2,700 µg/kg), which was consistent with background [7].

USGS noted that some PCBs have diffused or been entrained back into the water column and are being transported downstream by river water into the estuary. In addition to the continuing release of PCBs from historically contaminated bottom sediment, USGS suggests that PCBs are still (as of 2003) originating from source areas along Mother and Meadow Brook, as well as other sources along the river [2-4].

The USGS reported that the data suggest that PCBs in river water were likely derived from several different sources; however, the exact locations of the historical contamination could not be conclusively determined. Although inconclusive, the data suggests that a major source of PCBs was likely on Mother Brook or near the confluence of the Neponset River with Mother Brook [2-4].

In 2008, Massachusetts Department of Fish and Game (DFG) requested the MassDEP, the Division of Marine Fisheries and the Department of Conservation and Recreation (DCR) review the USGS Reports on the Neponset River. This review found that PCB concentrations in the top layers of bottom sediment ranged from 28 µg/Kg just upstream of the confluence of Mother Brook with the Neponset River to 24,900 µg/Kg measured farther upstream in Mother Brook. In addition, some bottom-sediment samples in the Neponset River and the Neponset River Estuary contained PCBs at concentrations well above sediment quality guidelines (2,000 µg/Kg) and could be classified as moderately regulated waste (50,000 to 499,000 µg/Kg) according to the Toxic Substances Control Act (TSCA). Some measured and estimated concentrations of dissolved PCBs were above the EPA continuous chronic criterion for dissolved PCBs [14 milligrams per Liter (mg/L)]. Concentrations above this criterion could cause harm to humans, wildlife, and fish, if exposed for long enough periods of time. PCB concentrations measured in riverine fish were above the concentrations (2,000 µg/Kg) considered safe for consumption by wildlife and humans by EPA [8-9].

The Department of Public Health (DPH) has placed a public health fish consumption advisory for the Neponset River between the Hollingsworth and Vose Dam in Walpole and the Baker Dam in Boston due to the PCB-contamination as well as dichlorodiphenyltrichloroethane (DDT) that has been identified through other studies. The advisory covers three different categories identified as P-1, P-2, and P-4. P-1 indicates that children younger than 12 years of age, pregnant women, women of childbearing age who may become pregnant, and nursing mothers should not eat any fish from this water body. P-2 indicates that the general public should not consume any of the affected fish species (American Eel and White Sucker) from this water body. P-4 indicates that the general public should limit consumption of non-affected fish from this water body to two meals per month. Despite the warnings listed above, the Neponset River Watershed Association indicates that people still fish at a wide variety of locations along the Neponset River [8-9; 27].

MassDEP has completed a file review of PCB waste sites within the Neponset River Basin. A total of 34 sites have been identified that had or have PCBs as a contaminant of concern, and are located in the vicinity of the Neponset River or one of its tributaries. MassDEP also concluded that the major sources of the PCB-contamination to the lower Neponset River are located along Lower Mother Brook. Overall MassDEP identified 10 properties that could be sources of PCBs to the Neponset River either directly or through one of its tributaries. Two of these sites are located on the Neponset River, upstream of the confluence of Mother Brook and the Neponset River, six sites are located along the lower sections of Mother Brook, and two sites are located downstream of the Mother Brook confluence on the Lower Neponset River [8-9].

The two sites located upstream of the confluence of Mother Brook and the Neponset River include the Canton Airport Site [Release Tracking Numbers (RTN's) 4-3000941, 4-3020140, and 4-0022292], which is located along Neponset Street in Canton approximately 6 miles upstream of the Mother Brook confluence, and the Norwood PCB site (RTN 4-3000403) which is located along Meadow Brook in Norwood and is located approximately 7.5 miles upstream of the confluence of Mother Brook and the Neponset River. The six sites located along Lower Mother Brook include: (1) the former LE Mason Facility at 98 Business Street (RTN 3-730); (2) the former Allis & Chalmers Electrical Manufacturing Facility at 1377 Hyde Park Avenue (RTN 3-27067); (3) the Former American Tool and Machine at 1415 Hyde Park Avenue (RTN's 3-27790, 3-27791, 3-28336 & 3-28835); (4) the former Allis & Chalmers Electrical Manufacturing Facility at 1344 Hyde Park (3-32581); (5) the former location of a Junkyard/Paint Manufacturing Facility at 56R Business Street (RTN 3-23869); and (6) North and South Banks of Mother Brook (RTN 3-27168). The two sites located downstream of the confluence of Mother Brook and the Neponset River include the former Lewis Chemical Facility at 16 Fairmont Court (RTN's 3-1616, 3-0031548, and 3-0031697) and the former Bay State Paper at 892 River Street (RTN's 3-25435 and 3-0027201) [8-9].

Former LE Mason Facility (RTN 3-0730)

The Former LE Mason Facility is located at 98 Business Street in the southwestern portion of the Hyde Park section of the city of Boston. The site abuts the northwestern banks of the Mother Brook, a tributary of the Neponset River. The site is situated in a mixed residential and industrial area, which is zoned for both light industrial and residential use. The site has been used for various manufacturing purposes for over 130 years (since before 1891). Between 1945 and 2002, the site was occupied by LE Mason, a producer of cast zinc and aluminum electrical supplies. In 1999, LE Mason was acquired by Thomas and Betts Corporation (T&BC). The operations performed on the site included zinc and aluminum die-casting, wet spray painting, assembly and packaging of the finished products, and shipping and receiving. Since 2002, those operations are no longer

conducted at the facility and it is instead used as office and storage space for a moving company, and a small shipping company [7].

In November 1986, a subsurface investigation was conducted at the site, in which oil and/or hazardous materials (OHM) contamination in soil and groundwater was documented. The MassDEP assigned RTN 3-0730 to the entire site in 1987. On 3 January 1996, the site was classified as a Tier IB Transition-site (Permit No. 104178) and a Tier IB Extension was approved by MassDEP extending the permit through March 21, 2007. Additional permit extensions were granted by MassDEP through April 3, 2011 [7].

Several assessment and remedial actions have occurred at the site. The results of past site investigations concluded that soil, groundwater, and indoor air on the site and sediment in the adjacent Mother Brook have been impacted by releases of OHM to the environment. OHM identified at the site included chlorinated and non-chlorinated volatile organic compounds (VOCs), PAHs, petroleum hydrocarbons, heavy metals, and PCBs.

Between 1997 and 2000, several assessment activities occurred. Contamination was found to be up to 50 feet below grade around the property, within the property boundaries. Later, sediment samples were collected upstream and downstream of the site. The upstream sample results had a maximum of 520 µg/Kg total PCBs, while downstream sample results had a maximum of 2,183,300 µg/Kg total PCBs. Subsequent remedial activities included excavation of 2,024 tons of PCB-impacted soil/sediment and post-excavation confirmation sampling [6-7].

Former Allis & Chalmers Manufacturing Facility (RTN 3-27067)

The Former Allis & Chalmers Manufacturing Facility (A&CMF) is located at 1377 Hyde Park Avenue in the Hyde Park section of Boston, Massachusetts. Currently, the property consists of a Shaw's Supermarket building and associated parking. The site is situated in a mixed industrial, commercial, and residential area. Mother Brook, located immediately adjacent to the site behind the building, flows eastwardly and discharges to the Neponset River [10].

Between 1930 and 1972, the site was a research and development (R&D) facility for electrical equipment for Condit Electrical Manufacturing Company (which was later owned by Allis & Chalmers Corporation).

In October 2007, MassDEP significantly modified its prior directions for the conduct response action in connection with RTN 3-27067. This included directing that on-going Immediate Response Action (IRA) work to remediate and stabilize the 1377 Hyde Park Avenue stream bank was to be conducted by both Thomas and Betts Corporation (T&BC) and New Albertons. T&BC is the responsible party for response actions at the Former L. E. Mason facility, located west and upstream of the A&CMF. In 1999, LE Mason was acquired by T&BC. New Albertons is the parent company of Shaw's Supermarkets, Inc. This response action included the dredging and remediation of portions of Mother Brook that are upstream of, adjacent to, and downstream of the A&CMF. During this dredging and remediation, T&BC used a portion of the supermarket's property to stockpile excavated sediments from Mother Brook. During the stockpiling activities, T&BC identified two discharge pipes along the embankment behind the supermarket building and collected soil and sediment samples at the end of each of the pipes, directly surrounding the pipes, and along the embankment. Analytical results of the samples collected indicated the presence of PCBs at concentrations ranging from 0.3 to 3,400,000 µg/Kg. With the exception of one sample, only Aroclor-1248 was detected in the samples; other Aroclors were not detected.

On 6 September 2007, following the detection of PCBs in the soil and sediment, MassDEP issued a Notice of Responsibility (NOR) and issued RTN 3-27067. In October 2007, MassDEP directed that going forward, RTN 3-27067 was to be used to track work on the upland areas of the 1377 Hyde Park Ave property. MassDEP directed that RTN 3-27168 was associated with the on-going IRA work to remediate and stabilize the 1377 Hyde Park Ave stream bank (as well as the PCB-contaminated stream bank on the far side of Mother Brook) and was to be conducted jointly by T&BC and Shaw's Supermarket.

A Phase I, Phase II, and Method 3 Risk Characterization (M3RC) were conducted to characterize the site. In addition, a Class B-2 Response Action Outcome (RAO) Statement was submitted to MassDEP. The RAO Statement concluded that the PCBs in soil did not constitute PCB remediation waste and were not subject to regulation under TSCA and the PCB MegaRule, and that No Significant Risk of Harm to Human Health exists [10].

Former American Tool and Machine (RTN 3-028835)

The Former American Tool and Machine facility is located at 1415 Hyde Park Avenue in the Hyde Park section of Boston, Massachusetts. The site is occupied by a former tool and machine manufacturing mill structure (three-story brick former mill and one-story warehouse) which was renovated to relocate the Boston Renaissance Charter Public School (BRCPS). The mill building was constructed prior to 1917, and the warehouse building was constructed in the mid-1970s. The site is bounded by the Mother Brook and commercial property to the north, a Massachusetts Bay Transportation Authority (MBTA) right of way to the west, Dacy Street and multi-unit residential property to the south and Hyde Park Avenue and commercial property to the east [11-12].

T&BC is the responsible party for response actions at the Former L. E. Mason facility, located west and upstream of the BRCPS. These response actions included the dredging and remediation of portions of Mother Brook that are upstream of, adjacent to, and downstream of the BRCPS. An agreement between the parties conducting response actions on the Mother Brook project and the BRCPS provided access to the BRCPS site for the purpose of facilitating the on-going remediation activities along the Mother Brook. Specifically, BRCPS agreed to provide access to the subject site for the purpose of constructing a temporary stockpile pad that was to be located on the northern end of the BRCPS site, for use in temporary stockpiling of excavated soil from the Mother Brook, equipment access to the Brook, and for conducting remedial activities on the brook's bank. Analytical results of samples collected prior to the preparation of a stockpile pad on the BRCPS property indicated elevated levels of PCBs (specifically Aroclor-1254) ranging from 49,000 µg/Kg to 640,000 µg/Kg. Additional investigations confirmed the extent of PCB-contamination. BRCPS prepared a Modified Release Abatement Measure (RAM) Plan and excavated and removed for off-site disposal 8,720 tons of TCSA (≥50,000 µg/Kg) characterized waste and 5,563 tons of Non-TSCA (<50,000 µg/Kg) characterized waste from the property [11-12].

Former Allis & Chalmers Electrical Manufacturing (RTN 3-032581)

The Former Allis & Chalmers Electrical Manufacturing (A&CEM) facility is located at 1344 Hyde Park Avenue in the Hyde Park section of Boston, Massachusetts. The site is bounded by the Mother Brook to the south, Hyde Park Avenue to the west, and residential and commercial properties to the north and east. Margin Street is located to the south, on the opposite side of Mother Brook [13].

The site was occupied by the Robert Bleakie & Co. Woolen Mill by 1891. By 1917, the site was occupied by the American Felt Co. Between 1930 and 1974, the Condit Electrical Manufacturing Co. (which later became Allis & Chalmers Electrical Manufacturing), occupied the property until

a fire in 1974. Historical records show that a major fire occurred at the facility on 17 April 1974. The A&CEM facility property is currently occupied by a three-story multi-unit residential brick building (Blake Estates I and II) constructed in 1980. The Blake Estates I and Blake Estates II apartment building house 263 residents on the property [13].

The LE Mason excavation of Mother Brook included the stretch of the river immediately abutting the A&CEM property. Sampling of sediments at the outfall pipes of the A&CEM facility indicated maximum PCBs of 42,000 µg/Kg. In 2013 EPA/Weston Solutions, Inc. Superfund Technical Assessment and Response Team (START) conducted soil sampling and identified a source area on the property. The maximum Aroclor concentration was Aroclor-1248 (6,700 µg/Kg), Aroclor-1254 (7,600 µg/Kg), and Aroclor-1260 (2,500 µg/Kg). In December 2015, a Permanent Solution Statement was submitted to MassDEP. The statement concluded that a release of PCBs was identified in soil on the subject site, but a Method 3 Risk Assessment indicated that contamination concentrations in site soils were present at a level of No Significant Risk at the subject site. It also determined that an Activity and Use Limitation was not necessary to maintain a condition of No Significant Risk. The Method 3 Risk Characterization noted that produce expected to be grown on the site should follow Best Management Practices (BMPs) for gardening in urban areas. Therefore, it is recommended that gardening BMPs be employed on the site. A Permanent Solution with Conditions is applicable for the site [13].

Former Junkyard/Paint Manufacturing Facility (RTN 3-23869)

The Former Junkyard/Paint Manufacturing Facility consists of three vacant parcels of a six-parcel property known as 54-64A Business Street that is currently owned by The Village at Cleary Square, LLC and has been redeveloped as a residential condominium community. Portions of the property were operated as a gristmill, a sash and blind factory, and a coal company before 1891; and from the 1930s to the 1960s, the Dampney Paint Co., a paint formulation company, occupied the northern portion of the Site that abuts the railroad tracks. According to historical records, the property was primarily operated by Hyde Park Auto Replacement Parts, Inc., as an auto salvage business between 1934 and 2004 [14].

A limited subsurface investigation was conducted between June 2002 and October 2003 as part of a request by a condominium complex prior to redevelopment. Test-pitting activities uncovered stained soils and car and building debris. Soil samples were taken across the property, and several analytes were detected, including PCBs above the RCS-1 Reportable Concentrations and the Method 1 S-1 GW-2 and GW-3 standards. In 2004, a RAM Plan was submitted to MassDEP. The RAM was performed between May 2004 and January 2005 and resulted in the excavation and off-site disposal of a total of 10,862 tons of impacted soil. In 2005, a RAM Completion and Class A-3 RAO Statement was submitted to MassDEP. Based on the results of the RAM and a Method 3 Risk Characterization, a level of No Significant Risk (NSR) to human health, safety, welfare, and the environment has been achieved with the implementation of A Notice of Activity and Use Limitation (AUL) to restrict future use of a portion of the Site. An AUL was recorded for a portion of the property on 4 April 2005 [14].

North and South Banks of Mother Brook (RTN 3-27168)

The North and South Banks of Mother Brook has been defined as encompassing the North and South Banks along a stretch of approximately 400 feet of Mother Brook between the easterly (downstream) side of the MBTA/Amtrak railroad bridge (upstream limit) and the westerly (upstream) side of the Hyde Park Avenue bridge (downstream limit). The boundaries extend from the top of the stream bank to the toe of the stream bank on both the north and south sides of Mother Brook between the two bridges. The North Bank of Mother Brook site includes the bank of Mother

Brook immediately south of the Former Allis & Chalmers Electrical Manufacturing Research and Development facility (now a Shaw's Supermarket). The South Bank of Mother Brook site includes the bank of Mother Brook immediately north of the Former American Tool and Machine Company (now the Boston Renaissance Charter Public School). PCBs on the North Bank were discovered during the remediation of the Former LE Mason property and the downstream portion of Mother Brook. A subsequent IRA of both the North and South banks indicated elevated PCBs within surface soils. Excavation extended approximately 6 feet horizontally into the banks. Additional excavation was completed as required for reconstruction purposes and based on confirmatory soil samples. Both banks were covered in July 2010. A direct contact barrier was constructed on the North Bank to contain any remaining PCB-contamination, and to prevent migration of PCB-contaminated soil and/or sediment into Mother Brook, while gravel, crushed stone, and rip rap installed on the South Bank serve to stabilize the bank. Following stabilization of the South Bank, woody vegetation on the bank was restored, and permanent fencing restricts access to both banks [15].

In November 2010, a Response Action Outcome Partial Statement (RAO-P) for a Class A-3 Permanent Solution was submitted for the North Bank. A Method 3 Risk Characterization was performed to evaluate the risk posed by the northern bank portion of the site. The results of the Risk Characterization indicated that a condition of No Significant Risk exists for current and foreseeable future land uses on the northern bank of Mother Brook, based on the placement of an AUL on 1377 Hyde Park Avenue and the appropriately restricted uses of the Amtrak Parcel portion of the site consistent with its status as a rail right-of-way for which no AUL is required [16].

<u>Former Norwood PCB Superfund Site (RTN 4-3000403)</u>
The Norwood PCB Superfund Site is approximately 26 acres of an industrial/commercial area in Norwood, Massachusetts. The site includes several commercial, industrial, residential, parking areas, and fields. A portion of the property is referred to as the Hurley property, which was formerly occupied by the Grant Gear building and was used to manufacture electronic equipment and gears. The Hurley property is now owned by MonkeySports Capital MA, LLC. The site is bordered to the north by Meadow Brook, to the east by the heavily commercial U.S. Route 1 and the Dean Street access road, to the south by Dean Street, and to the west by the residential Pellana Road [17-18].

Contamination at the Norwood PCB Site originated from disposal practices of the parties who previously owned/operated businesses on the Hurley property. The building was constructed in 1942 by Bendix Aviation Corporation, which produced navigational control systems and conducted other electronic research in the building for the U.S. Navy. In October 1947, the land was purchased by Tobe Deutschman Corporation, which manufactured electrical equipment at the Site, including capacitors and transformers. The property was purchased in October 1956 by Cornell-Dubilier Electronics, Inc., which also manufactured electrical equipment at the facility. In January 1960, the property was briefly owned by Maryvale Corporation, and then purchased by the Friedland Brothers. The Friedland Brothers leased the property to Federal Pacific Electric Company, which held the lease on the property until October 1979. During the period from 1960 to 1979, Federal Pacific Electric operated a business at the site, and sublet portions of the facility to Cornell-Dubilier Electronics, Inc. and to Arrow Hart Corporation, which also manufactured electrical equipment at the facility [17-18].

In April 1983, Massachusetts Department of Environmental Quality Engineering (DEQE), now known as MassDEP, began sampling at the property and identified PCB soil contamination.

Beginning in June 1983, EPA began removing contaminated soils from the site. A total of 518 tons of contaminated soils were excavated and removed from the site [17-18].

Several investigations between 1983 and 1996 indicated elevated levels of PCBs in surface soils on and off property, in sediments adjacent to Meadow Brook, and in portions of the building. Analytical results indicated PCBs up to 26,000,000 µg/Kg in soils. PCBs were found up to 20 feet deep in some locations. Sediment samples indicated PCBs as high as 1,100,000 µg/Kg, and dredge soil piles indicated PCBs as high as 3,850,000 µg/Kg. Remedial activities began at the property in late 1996 and included building demolition, soil/brook remediation including excavation of Meadow Brook sediments, and excavation of PCB-impacted soils. In May 2008, construction began for retail development on the property and was substantially completed in 2009 [18].

Former Canton Airport (RTN's 4-3000941, 4-3020140, and 4-0022292)

The Former Canton Airport site is a former local airport located on Neponset Street, east of Interstate 95 in Canton, MA. The Canton Airport operated from the 1930s until it was closed in the mid-1950s. From the 1950s until the 1980s, several tenants occupied the property and buildings, including a helicopter repair company, a scrap metal dealer, and a truck repair shop. The property currently consists of wetlands and wooded areas. PCBs were initially detected in surface soil samples around the site buildings in 1984 as part of a due diligence investigation for a potential buyer. The site was originally placed on the MassDEP site list in January 1990 due to PCBs in soils. An IRA was approved by MassDEP in 2001. Surface soil sampling during the IRA indicated PCBs as high as 18,000,000 µg/Kg. Fencing was placed around the areas with the highest PCB levels in soil. Excavation of soils outside of the fenced area was completed. Between 2005 and 2006, the three vacant on-site building were demolished and the debris was removed [19].

Former Lewis Chemical (RTN's 3-001616, 3-31548, and 3-31697)

The Former Lewis Chemical Site is located at 0 and 12-24 Fairmount Court in Hyde Park, Massachusetts (RTN 3-001616). The site also includes a parcel of State land owned by the DCR (The Neponset River Reservation) located off Fairmount Court, located between the Neponset River and the Former Lewis Chemical facility (RTN 3-31548). An additional RTN (3-31697) is associated with the property for a release condition related to total lead in the soil. The Former Lewis Chemical property (current 12-24 Fairmount Court) was occupied by several businesses in the late 1800s and early 1900s including the Royal Remedy Co Laboratory, a mason and picture painting company, a quilted brush factory, mill stone manufacturer, a carpenter, dental tool manufacturer, a knitting business, a chemical and dye company, and residential apartments. The property operated as a leather manufacturing company from 1940 to the early 1960s. Lewis Chemical collected, stored, transported, and processed hazardous waste on the property from 1963 until 1983. MassDEP issued a court order to Lewis Chemical to cease operations in 1983. The City of Boston gained ownership of the property in October 2000 via tax foreclosure. The former building was demolished in July 2013 and only the foundation slab remains [20-21].

In July 2010, a RAM Plan was developed to address elevated VOC concentrations in soil and subsequently reduce soil gas concentrations that were infiltrating ambient air inside the vacant building. In June 2013, a RAM Completion Report was completed documenting the soil vapor extraction (SVE) system installed at the former building and subsequent demolition of the building in July 2013 [22].

Several remedial activities have been conducted at the DCR portion of the site. A Phase I Site Investigation was conducted at the DCR-owned portion of land between the Neponset River and

the Lewis Chemical Site. A review of previous reports during the Phase I Site Investigation indicated that PCBs were discovered during many investigations, mostly near the former tank farm pad at the former Lewis Chemical property. PCBs were found down to 15 feet. Samples collected by Woodard and Curran in 2008 indicated PCBs as high as 300,000 µg/Kg at 0-3 feet. Nobis conducted soil boring in 2013 and found PCBs as high as 13,000,000 µg/Kg in soils. Elevated PCBs have been found in surface soils along the DCR-owned property. There is no documented use of PCBs at the adjacent former Lewis Chemical. However, relatively high concentrations of PCBs detected in soils immediately adjacent to the former tank farm pad area, along with the detection of PCBs within drain sludge in that area, strongly suggests Lewis Chemical used, stored, and/or disposed of PCBs at one time [21; 23].

Former Bay State Paper Company (RTN's 3-0025435 and 3-0027201)

The Former Bay State Paper Company is located at 892 River Street in Hyde Park, Boston, Massachusetts. The property was used as paper mills dating back to 1773. The Tileston & Hollingsworth Paper Company operated at the site until 1967. The site was owned by several other companies before Bay State Paper, which operated until 2004. The property is bounded by the Neponset River and the MBTA Railroad to the south; Lefevre Street to the east; River Street to the north; and River Street Terrace to the west [24].

Releases at the site have occurred at six separate times. The releases, which appear in a cluster on the southeastern portion of the site, were all related to fuel oil deliveries and have been remediated to a condition of No Significant Risk [24].

A 2005 Phase II assessment reported a Reportable Concentration of PCBs based on 17 samples collected from throughout the property. Soil around the base of two transformers exceeded the 2,000 µg/Kg allowed by the Massachusetts Contingency Plan (MCP). The soils under transformer T-4 had elevated PCBs up to 1,740,000 µg/Kg and under transformer TSI-014 had elevated PCBs up to 4,920 µg/Kg. In 2008, a RAM plan was submitted for the redevelopment of the property into a retail shopping center. The redevelopment involved demolition of a majority of the above-grade portions of the existing brick and masonry paper mill facility, localized remedial excavations, earthwork to raise site grades above the existing facility basement level, and construction of a retail shopping center comprised of seven new buildings and a renovated 1902 powerhouse building [24-25]. The RAM plan included the phasing out and off-site disposal of TSCA-regulated soil/media at former Transformers T-4 and TSI-014 [26].

In 2008, MassDEP completed an evaluation of the USGS reports, collected and evaluated additional sediment data upstream and downstream of the confluence of Mother Brook and the Neponset River, completed a preliminary evaluation of technical reports submitted for all the sites listed above, and was in the process of completing comprehensive technical screening audits for sites in the area. The MassDEP noted that this preliminary evaluation was consistent with the conclusions of the USGS reports. The concentrations of PCBs in both the surface water and sediments of the Neponset River increase dramatically at the Mother Brook confluence, and the chemical signature also dramatically shifts. According to MassDEP, this provides strong evidence that PCBs from facilities in lower Mother Brook are largely responsible for PCB-contamination in the Neponset River from the Mother Brook confluence to the Baker Dam. According to MassDEP, the technical evidence indicates that the largest contributor of PCBs in the lower Neponset River is the Former LE Mason Facility, where PCBs excavated in Mother Brook adjacent to the facility extended to depths of 34 feet. Other sources along lower Mother Brook, and along the Neponset River, both upstream and downstream of the confluence, appear to be less significant. MassDEP, noted that it is clear the former Norwood PCB site has made a significant contribution to PCBs to

the Neponset River, and evidence of PCBs from this facility extend into the Neponset River Estuary. However, due to the location of the Norwood PCB site approximately 7.5 miles upstream of the Mother Brook confluence, much of this contamination is spread out in depositional areas along the entire river course [9].

MassDEP analyzed National Oceanic and Atmospheric Administration (NOAA) congeners for the 28 sediment samples collected by the USGS for which congener data was available, in order to document the changes in PCB congener pattern in sediments at and downstream of the Mother Brook confluence. There are 18 PCB NOAA congeners which have been identified as those that do not readily biodegrade. For areas upstream of LE Mason within Mother Brook, and areas upstream of the Mother Brook confluence within the Neponset River, the PCBs are dominated by the more heavily chlorinated penta-deca congeners. Within Mother Brook, from LE Mason to the confluence with the Neponset River, and downstream to the Baker Dam, the PCB congeners are dominated by the mono-tetra variety. MassDEP noted that this evidence provides strong technical evidence that the major sources of PCBs to the lower Neponset River are from lower Mother Brook [9].

The MassDEP evaluation also identified that in 1962, the Neponset River was dredged from the Baker Dam to the T&H Dam. In 1964, the Neponset River was dredged from the T&H Dam to the Neponset Valley Parkway (Paul's Bridge). The dredge spoils were distributed in low-lying areas along the banks of the Neponset River in 14 discrete areas. In eight of the 14 locations, the dredge spoils were deposited near parks and residential areas which are accessible to the general public. Due to a concern over the presence of PCBs in the dredge spoils, MassDEP completed a sampling program within the eight dredge spoils areas of concern. The only dredge spoil area where PCBs have been identified is in the back yards of eight residential properties located along Riverside Square in Hyde Park [9].

MassDEP and EPA completed investigations of the magnitude and extent of the PCB-contamination in the back yards of Riverside Square properties from 2009 through 2012. PCBs are present in surface soils above concentrations that pose an imminent hazard at 5 Riverside Square, and at concentrations that present a long term risk to human health at 1 and 15 Riverside Square. To remove this risk, remediation of PCB-contaminated soil still needs to be completed in the back yards of these three residential properties [9].

MassDEP also noted in a 2015 Neponset River PCBs Contamination document that a then-recent investigation of technical reports submitted for the former Bay State Paper Company revealed that additional dredging activities were completed for flood control purposes from directly behind the T&H Dam in 1960. The dredge spoils would be expected to be highly contaminated with PCBs, and were placed on the property presently owned by the DCR on the south side of the Neponset River, directly across the Neponset River from the 892 River Street property. The extent of PCB-contamination in this area has not been investigated. MassDEP also noted a detailed evaluation of the entire flood control dredging project conducted by the MDC should be completed to determine if there are other upland areas where dredge spoils have been disposed [9].

On 27 October 2015, MassDEP requested that the EPA evaluate the Neponset River for potential listing on the National Priorities List (NPL) as the surface water, sediment, and fish within the Neponset River and Estuary are contaminated with PCBs. The contamination is spread from Norwood to the Neponset River Estuary, with the highest concentrations located downstream of the Mother Brook confluence. The highest concentrations of PCBs are present in sediments behind the T&H Dam, behind the Baker Dam, and in the vicinity of the former Jenkins Dam where a

series of mid-channel islands now exist in an area identified as the Braided Channel. MassDEP noted that the presence of PCBs presents an ecological risk to aquatic life and a risk to humans through fish consumption. Although DPH has placed fish consumption advisories for the Neponset River, the Neponset River Watershed Association has documented that fishing still occurs at a variety of locations. Dredging of Neponset River for flood control in the early through mid-1960s spread PCB-contaminated sediment to a variety of upland areas, some of which are presently used for residential and recreational purposes. Long-term human health risk due to PCB-contamination levels has been documented in the back yards of three residential properties located along Riverside Square in Hyde Park. The full extent of dredge spoils excavation and disposition along the Neponset River has not been fully evaluated [9].

In a 2015 letter to EPA, MassDEP noted that remediation of the Neponset River will be a large scale project. PCB-contaminated sediments would have to first be remediated to minimize the potential for further migration of PCBs downstream and into the estuary. This remediation would facilitate the goals of the Massachusetts Department of Fish and Game to dismantle the dams to restore the river channel to its natural conditions, and to promote fish passage. MassDEP further noted that PCBs that present a risk to residential and recreational receptors should be remediated from upland areas. In 2002, USGS calculated sediment volumes that would need to be removed an estimated at 22,960 and 7,780 cubic yards from behind the T&H Dam and the Baker Dam, respectively [3, 9].

The above investigations are discussed in greater detail in the Waste/Source Sampling section and Surface Water Pathway sections of this report.

Table 1 presents identified structures or areas associated with the Lower Neponset River PCBs site that are documented or potential sources of contamination, the containment features associated with each source, and the relative location of each source.

Table 1

Source Evaluation for the Lower Neponset River PCBs site

Source Area	Containment Features	Spatial Location
Contaminated sediments	None	Lower Neponset River (confluence of the Neponset River and Mother Brook downstream to Walter Baker Dam)

[2, 3, 4, 57]

Table 2 summarizes the types of potentially hazardous substances which have been disposed of, used, or stored on the areas associated with the Lower Neponset River PCBs site.

Table 2

Hazardous Waste Quantity for the Lower Neponset River PCBs site

Substance	Quantity or Volume/Area	Years of Use/Storage	Years of Disposal	Source Area

PCBs	Unknown (in excess of 60,000 cubic yards*)	Unknown	Unknown	Contaminated sediments (known and unknown sources)

PCBs = Polychlorinated biphenyls.
* = Assumes total volume of sediment within Braided Channel Segment, Baker Dam Impoundment, and Tileston & Hollingsworth Dam Impoundment is contaminated with PCBs.

[3.9]

There are six additional sites located in Boston that are listed in the Superfund Enterprise Management System (SEMS) database [28]. In addition, there are 653 sites listed in the Resource Conservation and Recovery Act Information System (RCRIS). Eighty-eight of these RCRA facilities are located within 1 radial mile of the site boundary [29, 58].

A historical environmental records/database review was provided by Environmental Data Resources Inc. (EDR) to aid START in determining potential sources of attribution to the site and surface water pathway [58]. The database review lists sites with environmental concerns found within a specified radius of the subject area of concern or parcel. EDR completed the data search of sites with environmental concerns found within 1-mile of the Lower Neponset River site boundary, defined as the lower Neponset River channel from the confluence of Mother Brook with the Neponset River, downstream to the Baker Dam. The review also identified "Orphan sites" which may be located within one-radial mile of the site based on the available information but whose specific locations are unable to be mapped due to poor or inadequate address information. The EDR assessment revealed the following key points:

- EDR identified 83 sites available for mapping within 1-radial miles of the site boundary (based on addresses or coordinates) and another 119 orphan sites that are potentially located with 1-radial mile of the site, whose locations could not be confirmed. Some EDR locations identified have multiple federal or state sites listed for that map location. These may be locations where multiple sites have occupied the same location throughout the years, map locations which may overlap with other sites, or those which have the same address or map identified coordinates [58].
- Three of the sites identified within 1 radial mile of the site boundary are EPA Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Enterprise Management System (CERCLA/SEMS) sites and three additional identified sites are EPA CERCLA/SEMS-Archive sites [58].
- EDR identified 88 current or former RCRA facilities within 1 radial mile of the site boundary. These consist of two RCRA Large Quantity Generator (LQG) sites, eight RCRA-Small Quantity Generators (SQG) sites, 30 RCRA-Conditionally Exempt Small Quantity Generators (CESQG) sites, and 48 RCRA - Non Generators/No Longer Regulated (Non-Gen/NLR) sites located within 1 radial mile of the site boundary. Non Gen/NLR sites include former RCRA facilities that are no longer operating at this location or that have changed processes and are no longer using RCRA regulated substances [58].
- EDR also identified 15 mapped locations of PCB related occurrences or releases within 1 radial mile of the site boundary. Some of these sites are within the EPA and/or State data systems; and in some cases multiple PCB releases are listed as having occurred at one mapped location [58].

WASTE/SOURCE SAMPLING

Historical Waste/Source Sampling

As noted previously, the Lower Neponset River PCBs site is considered an approximately 3.7-mile riverbed segment where PCB-contaminated sediments have likely accumulated from both suspected and unknown sources and PCB releases to form a plume of PCB-contaminated sediment of unknown origins. Since there is no known source of the sediment contamination plume, the sediment lying within the stream channel is considered waste/source material. To date, no known previous investigations have focused solely on the lower portion of the Neponset River between the confluence of Mother Brook and the Neponset River downstream to the Baker Dam. Previous investigations have included, as part of their activities, the collection of sediment samples from the Lower Neponset River PCBs Site area. No direct waste/source sampling has been conducted in association with the Lower Neponset River PCBs site.

US ACOE, USGS, MassDEP, and others have conducted previous investigations of the Neponset River and Mother Brook, which have included sediment sampling of segments within the Lower Neponset River, considered the site, as part of their investigations.

In 2002, US ACOE conducted a study in an effort to restore fish passage, habitat, and recreational use of the Neponset River. As part of this study, two sediment cores were collected and analyzed. USGS reports reported that during the US ACOE study, one sediment-core sample was collected from the Baker Dam Impoundment and one sediment-core sample was collected from the T&H Dam Impoundment. These bottom-sediment cores were found to be saturated with in many contaminants, most notably PCBs. Analytical results indicated that the bottom sediments contained elevated concentrations of PCBs [2-3]. No additional information is available regarding the concentrations or findings of the US ACOE investigation.

The USGS New England Water Science Center collected sediment samples between 2002-2003 and 2004-2006 from Mother Brook and the Neponset River [2-3].

The initial investigation in 2002-2003 focused on the Neponset River. Sediment samples were collected at 51 sampling stations along the lower Neponset River by sediment-grab samplers (20 sites) and sediment-core samplers (31 sites). Sample locations BGY-100 through BGY-104 are located on the Upper Neponset River, upstream of the Mother Brook confluence; sample locations BGY-105 through BGY-107 are located on the Lower Neponset River downstream of the Mother Brook confluence; sample locations BGY-108 through BGY-111, BGY-113, BGY-114, and M2Y-001 and M2Y-002 are located in the T&H Impoundment area; sample locations BGY-112, BGY-115 through BGY-119, BGY-121, BGY-124, and M2Y-003 and M2Y-004 are located on the Lower Neponset River between the T&H Dam and the Braided Channel; sample locations BGY-120, BGY-122, BGY-123, BGY-125 through BGY-129, and M2Y-005 through M2Y-011 are located in the Braided Channel; sample location M2Y-012 is located between the Braided Channel and the Baker Dam; and sample locations BGY-130 through BGY-138 are located in the Baker Dam Impoundment area. The samples were analyzed for concentrations of elements, PAHs, toxicity characteristic leaching procedure (TCLP) metals, PCBs, and organochlorine pesticides, and also for grain-size distribution [2-3].

In October 2002, sediment-grab samples were collected from 20 randomly selected locations between Fowl Meadow and the Baker Dam. An Eckman dredge, stainless-steel scoop, and stainless-steel spoon were used to collect sediment-grab samples, depending on the water depth. The top 4 inches (if available) of the sample was either removed from the dredge or scooped from the sediment surface, homogenized, screened through a 6-mm sieve, and placed in pre-cleaned

containers. The one exception was that downstream sediment-grab sample BGY-139 was not sieved. The sediment grab samples were analyzed for a suite of elements and organic compounds including PCBs. Between December 2002 and February 2003, 31 sediment-core samples were collected. Sediment-core sampling locations were limited to areas of sediment deposition just upstream of the Baker and T&H Dams and within the Braided Channel. Like the grab samples, a random-sampling design was used to collect the 31 sediment cores. A hand corer with a disposable 2.5-inch inside-diameter Lexan-core barrel was used to collect the sediment cores. The core barrel was pushed or hammered into the sediment until it could be driven no further. Core samples were homogenized, and placed in pre-cleaned containers; however, sediment core samples were not sieved. The sediment core samples were analyzed for a suite of elements and organic compounds including PCBs [2-3].

PCBs were detected in all but six grab samples (BGY-100, BGY-102, BGY-103, BGY-118, BGY-119, and BGY-133). Of the nine PCB Aroclors tested for only three Aroclors were detected (Aroclors -1242, -1254, and -1260) [2-3].

Three PCB Aroclors were detected in the 17 sediment-grab samples (including duplicates) collected from the Lower Neponset River and include the following (maximum concentration and sample location in parentheses): Aroclor-1242 [7,100 µg/Kg in M2Y-003]; Aroclor-1254 (3,400 µg/Kg in BGY-105); and Aroclor-1260 (970 µg/Kg in BGY-112) (see Attachment A, Figures 4 and 4A) [2-3].

Three PCB Aroclors were detected in the 30 sediment-core samples (including duplicates) collected from the Lower Neponset River and include the following (maximum concentration and sample location in parentheses): Aroclor-1242 (208,000 µg/Kg in M2Y-002); Aroclor-1254 (17,000 µg/Kg in BGY-113/BGY-113D, M2Y-002, and BGY-128/BGY-128D); and Aroclor-1260 (5,800 µg/Kg in BGY-113D) (see Attachment A, Figures 4 and 4A) [2-3].

The 2004-2006 USGS study investigated concentrations, loads, and sources of PCBs by collection and analysis of bottom-sediment grab samples, water samples, fish tissue samples, and PISCES samples. Bottom-sediment samples were collected from the river and farther downstream in the estuary to supplement bottom-sediment data collected as part of the 2002-2003 USGS study. Specifically, riverine bottom-sediment samples were collected in and around areas near assumed sources of PCB-contamination [4].

A total of 15 bottom-grab and PISCES samples (including 5 field duplicates) were collected from 10 locations within our study area. Analytical results indicated Aroclor-1221, Aroclor-1232, and Aroclor-1248 were not detected above the laboratory reporting limit; Aroclor-1016/1242 was detected ranging from 7.3 µg/Kg up to 19,500 µg/Kg; Aroclor-1254 was detected ranging from 76 µg/Kg up to 5,460 µg/Kg; Aroclor-1260 was detected ranging from 8.8 µg/Kg up to 791 µg/Kg; and total Aroclors was detected ranging from 175.8 µg/Kg up to 25,751 µg/Kg (see Attachment A, Figure 5A) [4].

Analytical results of the USGS bottom-sediment core samples indicated the PCB concentrations significantly increased in sediment core samples collected downstream of the Mother Brook confluence [4].

According to USGS, total PCB concentrations 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, with a minimum concentration of 28 µg/Kg in a sample from the Neponset River (behind Star Market) upstream of

the Mother Brook confluence; and a maximum concentration of 24,900 µg/Kg in a sample from within Mother Brook at sample location BGY-141. Concentrations in sediment grabs in Mother Brook averaged about 60 times less (270 µg/Kg) upstream of BGY-141 than downstream of this location (15,400 µg/Kg). PCB concentrations in Neponset River sediments downstream of Mother Brook averaged about 11,400 µg/Kg and about 900 µg/Kg in estuarine mud samples. The USGS noted that PCB concentrations generally declined with distance away from the river mouth into the estuary [4].

In 2013, AMEC, at the request of MassDEP, provided additional sediment core sampling to further evaluate PCBs in Neponset River sediments. MassDEP requested that AMEC conduct core sediment sampling at four areas along the Neponset River. The four areas are approximately 3,000 feet (ft.) downstream and 1,000, 3,000 and 4,000 ft. upstream of the confluence of the Neponset River and Mother Brook. At each of the four sediment core locations, AMEC collected samples from three depth intervals [0-1 ft. (-0001), 1-2 ft. (-0102), and 2-3 ft.(-0203], resulting in a total of 12 sediment core samples (SD-US4K-01 through SD-US4K-03, SD-US3K-04 through SD-US3K-06, SD-US1K-07 through SD-US1K-09, and SD-DS3K-10 through SD-DS3K-12). One cluster of samples (SD-DS3K-10 through SD-DS3K-12) were collected within the Lower Neponset River site. PCB Aroclor results ranged from non-detectable concentrations up to 45,000 µg/Kg in the downstream sample SD-DS3K-10-0102. The analytical results indicated that PCB concentrations were highest downstream of the Mother Brook/Neponset River confluence [5].

In 2014, USGS concluded that the major sources of the PCB-contamination are located along lower Mother Brook, but no specific sources were mentioned by name. MassDEP noted that the data suggest that widespread PCB-contamination of the lower Neponset River originated from Mother Brook starting sometime around the early 1950s. 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, which was not completed for over a decade [2-4]. According to MassDEP correspondences in 2015, PCBs are mostly trapped behind the two rebuilt dams (the T&H Dam and the Baker Dam), and within the former Jenkins Dam impoundment, where sediments form the Braided Channel section of the river [2-5; 8-9]. 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 [8-9].

In 2002, bottom sediment volumes were estimated by USGS at 620,000 cubic feet (22,960 cubic yards) in the T&H Dam Impoundment; 790,000 cubic feet (29,260 cubic yards) in the Braided Channel area; and 210,000 cubic feet (7,780 cubic yards) in the Baker Dam Impoundment [4; 9]. US ACOE noted that PCBs in the Braided Channel segment appear to be trapped in semi-permanent 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 [4].

Based on available historical data generated from samples along the Neponset River and Mother Brook, several areas along the 3.7-mile Lower Neponset River riverbed between the confluence of Mother Brook and the Neponset River, downstream to the Baker Dam, indicate the riverbed channel sediments are contaminated with hazardous substances (PCBs).

The PCB-contaminated sediments appear to have likely accumulated from both suspected and unknown historical sources and releases to form a plume of PCB-contaminated sediment of

unknown origins within the Lower Neponset River. Estimates of the PCB-contaminated sediments exceed 30,000 cubic yards behind the two remaining dams along the Lower Neponset River. In addition, PCB-contaminated sediment has been documented within other areas of the river, including the Braided Channel segment of the Lower Neponset River. No volume estimates are available for these additional PCB-contaminated sediment areas and require additional investigation.

GROUNDWATER PATHWAY

The mean annual precipitation of Boston, MA, is 43.0 inches [30]. For the purposes of this report, START assumes that 43.0 inches of rain per year is representative of the mean annual precipitation rate at the Lower Neponset River PCBs site.

The Lower Neponset River PCBs site consists of portions of the Neponset River within the riverbed channel, between the confluence of Mother Brook and the Neponset River downstream to the Walter Baker Dam. Based on the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Web Soil Survey, the majority of the Lower Neponset River PCBs site is considered water and wetlands [31]. The areas surrounding the river are predominantly classified as urban land, 0 to 15 percent slopes [31].

According to the Bedrock Geology Map of Massachusetts, the bedrock underlying the Lower Neponset River PCBs site is Mattapan Volcanic Complex (Proterozoic Z or younger) consisting of rhyolite, melaphyre, agglomerate, and tuff; and Roxbury Conglomerate (Proterozoic Z to earliest Paleozoic) consisting of conglomerate, sandstone, siltstone, argillite, and melaphyre, consisting of the Brookline, Dorchester, and Squantum Members [32].

The Lower Neponset River PCBs site is not located within a wellhead protection area [34]. The groundwater beneath the Lower Neponset River PCBs site is classified as category GW-3 by MassDEP [33]. The GW-3 classification applies to groundwater at all disposal sites that is a potential source of discharge to surface water bodies [33].

Although the Lower Neponset River PCBs site stretches for 3.7-miles, START assumes that groundwater characteristics are similar throughout the entire site distance for this investigation. According to previous reports, depth to groundwater along the Lower Neponset River PCBs site, as measured in the area of Fairmont Court, Hyde Park, MA (Former Lewis Chemical) property, ranges from 3 to 14 feet bgs [20, pp. 37-58; 21, p. 16]. According to previous reports, groundwater is estimated to flow toward the Neponset River with an approximate gradient of 0.03feet/foot [21, pp. 16 & 22]. Groundwater in the bedrock aquifer also flows toward the east with an approximate gradient of 0.1 feet/foot. [21, p. 16].

CDW consultants, Inc. (CDW), noted in their 2014 investigation that precipitation at the DCR Neponset River Reservation, adjacent to Fairmont Court (Former Lewis Chemical Site), Hyde Park, MA, infiltrates into the ground and/or flows into the adjacent Neponset River. This, along with seasonal variations in surface water elevations of the Neponset River, can affect groundwater flow patterns and therefore contaminant flow paths and behavior. While groundwater is generally considered to flow from the Former Lewis Chemical property to the river, a reversal of flow from the river to the surrounding properties are possible during flood events [21, p.15].
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All or part of the following seven MA towns are located within 4 radial miles of the Lower Neponset River PCBs site: Boston, MA (population: 617,594); Brookline, MA (population:

58,732); Milton, MA (population: 27,003); Dedham, MA (population: 24,729); Canton, MA (population: 21,561); Quincy, MA (population: 92,271); and Westwood, MA (population: 14,618) [35-36].

The nearest public drinking water supply wells are five overburden wells which constitute the Dedham-Westwood Water District [Public Water System Identification Number (PWS ID No.) MA3073000], located southwest of the Lower Neponset River PCBs site between 2 and 3 radial miles from the site [37]. An additional nine supply wells that serve the system are located between 3 and 4 miles from the Lower Neponset River PCBs site. The Dedham-Westwood Water District System is a community water system, which supplies drinking water to 25 or more people in their residence year-round [38]. Public drinking water wells located within 4 radial miles of the property are served by both overburden and bedrock wells. The Dedham-Westwood Water District System serves approximately 39,347 people from 14 supply wells. For the purposes of this evaluation, START assumes each well contributes equally to the system and serves approximately 2,810 people [37].

Based on Geographic Information System (GIS) products from the EPA, residents within the towns of Dedham and Westwood are also served by private drinking water supply wells; however, the exact numbers and locations are unknown [40].

Approximately 617,594 people in the City of Boston are served by the MWRA [35; 37; 39]. The MWRA is comprised of surface water sources located in central MA greater than 4 miles from the Lower Neponset River PCBs site [39]. Based on GIS information, a very small number of people located between 1 and 4 radial miles of the Lower Neponset River PCBs site are served by private wells; however; the exact number could not be determined [37; 40].

Approximately 58,732 people in the Town of Brookline are served by the MWRA [35]. None of the population in Brookline is served by private wells [37; 40].

Approximately 27,003 people in the Town of Milton are served by the MWRA [35]. Based on GIS information, a small number of people located between 0.25 and 4 radial miles of the Lower Neponset River PCBs site within Milton are served by private wells; however; the exact number could not be determined [37; 40].

Approximately 92,271 people in the City of Quincy are served by the MWRA [35]. None of the population in Quincy is served by private wells [37; 40].

Approximately 21,561 people in the Town of Canton are served by both public groundwater supply sources. None of the population in Canton is served by private wells [37; 40].

The nearest private drinking water wells are reportedly located 0 to 0.25 mile south of the Lower Neponset River PCBs site [40].

Table 3 summarizes public groundwater supply sources within 4 radial miles of the Lower Neponset River PCBs site.

Table 3

Public Groundwater Supply Sources
Within 4 Radial Miles of Lower Neponset River PCBs Site

Distance from Site (miles)	Source Name	PWS ID No./Type	Location of Source[a]	Estimated Population Served	Source Type[b]
2-3	Dedham-Westwood Water District (5 Wells) Well A2, Well E, Well E1, Well E2, White Lodge Well #5	MA3073000/Comm.	Dedham, MA	14,052	Overburden
3-4	Dedham-Westwood Water District (9 Wells) Well B1, Well B2, Well D1, Well D2, Well F, White Lodge Well #3A, White Lodge Well #4A, White Lodge Well 1, White Lodge Well 2	MA3073000/Comm.	Dedham, MA	25,294	Overburden/ Bedrock

[a] Indicates Town in which well is located.
[b] Overburden, Bedrock, or Unknown.

Comm. = Community water system.
PWS ID No. = Public Water System Identification Number.
= Number.

[37]

The EPA New England GIS Center provided START with the following three maps for the Lower Neponset River PCBs Site: Population by Radius (1990 U.S. Census) within 4 Radial Miles of the Lower Neponset River PCBs; Population by Radius on Private Wells (1990 U.S. Census) within 4 Radial Miles of the Lower Neponset River PCBs; and Population by Radius (2010 U.S. Census) within 4 Radial Miles of the Lower Neponset River PCBs. The EPA GIS Center calculated the population data by using shapefiles of the population block group data from the respective census and overlaying that onto a base map which contained the property boundary and associated radial rings around the boundary (*i.e.* property boundary to ¼ mile, ¼ mile to ½ mile, ½ to l mile, 1 mile to 2 miles, 2 miles to 3 miles, and 3 miles to 4 miles). For block groups that overlapped radial rings, the EPA GIS Center calculated the percentage of the block group which fell within each of the radial rings, which translated to the population within that block group which fell within each of the radial rings [40].

As part of the 1990 U.S. Census, the source of survey participants' drinking water was requested as part of the questionnaire. This information, which was grouped by the U.S. Census Bureau into block groups, was used to determine the number of people within radial rings of the property who relied on private drinking water wells as their source of drinking water. The 2010 U.S. Census questionnaire did not request the source of water; therefore, START utilized the information provided by the three EPA GIS Center maps to determine the approximate population currently served by private drinking water wells. START calculated the percentage change in total population for the entire 4-mile radius *(i.e.,* percentage change was not calculated for each individual radial ring). Once the percentage change in total population was calculated, START applied that percentage change to determine the estimated population utilizing private drinking water wells for their drinking water within each radial ring [40].

The nearest off-site private drinking water supply well is located between 0 and 0.25 miles south of the site [40]. The total population which relies on groundwater as a drinking water supply source within 4 radial miles of the Lower Neponset River PCBs site is estimated to be 40,223 [37; 40]. Table 4 summarizes estimated drinking water populations served by public and private groundwater sources within 4 radial miles of the Lower Neponset River PCBs site.

Table 4

Estimated Drinking Water Populations Served by Groundwater Sources Within 4 Radial Miles of the Lower Neponset River PCBs site

Radial Distance From Lower Neponset River PCBs (miles)	Estimated Population Served by Private Wells	Estimated Population Served by Public Wells	Total Estimated Population Served by Groundwater Sources Within the Ring
0.00 < 0.25	12	0	12
0.25 < 0.50	18	0	18
0.50 < 1.00	46	0	46
1.00 < 2.00	183	0	183
2.00 < 3.00	258	14,052	14,310
3.00 < 4.00	260	25,294	25,654
TOTAL	877	39,346	40,223

Notes:
< = Less than

[37; 40]

To date, there is no known documentation of PCB concentrations exceeding state standards in groundwater drinking water sources within 4 radial miles of the Lower Neponset River PCBs Site. Elevated PCB concentrations as high as 95 [micrograms per Liter (µg/L) or ppb] were documented at the DCR property immediately adjacent to the Former Lewis chemical site between 2002 and 2006; However, this PCB-contamination is likely moving from one of the know potential sources (Lewis Chemical) toward the Neponset River and contributing to the plume of contaminated sediment [21, p.20].

No groundwater pathway samples were collected as part of this EPA PA. Based on the lack of available data, no release of hazardous substances to the groundwater from on-site sources/sediment plume has been documented. Due to the limited use of drinking water in the immediate area, no impacts to drinking water supply or nearby residential populations are known or suspected.

SURFACE WATER PATHWAY

The Lower Neponset River PCBs site is located in the Neponset River Watershed [41]. The drainage area of the Neponset River Watershed basin is 130 square miles (mi^2) [42]. The Neponset River is a regulated floodway, with a 1% chance of flooding with base flood elevation [44-45].

The most upstream probable point of entry (PPE) to the Lower Neponset River PCBs 15-mile downstream surface water pathway (SWP) is located at the confluence of the Neponset River and Mother Brook (upstream of Dana Avenue, Hyde Park, MA) (PPE 1). The most downstream PPE is located along the Neponset River at the Baker Dam (upstream of Adams Street, Dorchester/Milton, MA) (PPE 2), 3.7-miles downstream of the most upstream PPE. Therefore, the SWP extends 18.7 miles. The SWP extends past 15 miles due to the difference in distances from the terminus to the two PPEs located along the SWP (see Attachment A, Figure 6A).

The 15-mile downstream SWP from the Lower Neponset River PCBs site is located in the Neponset River Watershed, and includes the following surface water bodies: Neponset River (7.87 miles), Dorchester Bay, and Boston Harbor (10.83 mile arc from the mouth of the Neponset River). The 15-mile downstream SWP terminus is located in Boston Harbor (Attachment A, Figure 6A) [36; 43].

There is one USGS gauging station located along the SWP on the Neponset River (adjacent to the Baker Dam). To include additional flow rates for the Neponset River, START utilized the USGS MA StreamStats website [43].

The drainage area at PPE 1, located at the confluence of Mother Brook and the Neponset River, is 97.5 mi^2. The drainage area at the Neponset River at PPE 2 is 101 mi^2. Using the USGS conversion factor of 1.8 cubic feet per second (cfs)/mi^2, the flowrate for the Neponset River ranges from 175.5 cfs to 181.8 cfs [43].

The remaining portion of the Lower Neponset River PCBs site SWP is 15 miles with the terminus being located within Boston Harbor. All water bodies after PPE 2 (Baker Dam): Neponset River, Dorchester Bay, and Boston Harbor, are tidally influenced and therefore their flow rates are listed as Not Applicable.

Table 5 summarizes surface water bodies along the 15-mile downstream SWP from the Lower Neponset River PCBs site.

Table 5

Surface Water Bodies Along the 15-Mile Downstream Surface Water Pathway from the Lower Neponset River PCBs site

Surface Water Body	Descriptor[a]	Length of Reach (miles)*	Flow Characteristics (cfs)[b]	Length of Wetland Frontage (miles)
Lower Neponset River	Moderate stream	3.7	175.5 to 181.8	4-5
Neponset River/ Dorchester Bay/Boston Harbor	Coastal tidal water	15	NA	0

[a] Minimal stream <10 cfs. Moderate to large stream (flow = >100 cfs to 1,000 cfs). Coastal tidal waters (flow not applicable).
[b] Cubic feet per second
* Distance measured from PPE.

[43; 110]

The Neponset River is a fishery. Fish types found in the river include American Eel, Brown Bullhead, and White Sucker. A fish advisory for the Neponset River has been issued by the MA DPH for the consumption of American Eel and White Sucker due to PCBs and DDT [47]. Primary Contact Recreation in the Neponset River has been classified as impaired by MassDEP due to *Escherichia coli* (*E. Coli*), *Enterococcus*, and PCBs [48]. Primary Contact Recreation is defined by MassDEP as any recreation or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water. These include, but are not limited to, wading, swimming, diving, surfing, and water skiing [48].

The segment of the Neponset River from the confluence of Mother Brook to 3.7-miles downstream of the confluence to the Baker Dam in Milton, is designated a Class B surface water body. The segment of the Neponset River from the Baker Dam to the mouth of Dorchester Bay, which is tidally influenced, is also designated a Class SB surface water body [48-49]. Class B waters are designated as a habitat for fish, other aquatic life, and wildlife, including their reproduction, migration, growth and other critical functions, and for primary and secondary recreation. Class SB waters are designated as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. In certain waters, habitat for fish, other aquatic life and wildlife may include, but is not limited to, seagrass. Where designated in the tables to 314 CMR 4.00 for shellfishing, these waters shall be suitable for shellfish harvesting with depuration (Restricted and Conditionally Restricted Shellfish Areas). These waters shall have consistently good aesthetic value [49]. Dorchester Bay and Boston Harbor have been designated a Class SB surface water bodies [63]. Ninety-three percent (93%) of the area assessed in Boston Harbor (Proper) supports aquatic life use [64].

Streamflow of the Neponset River Drainage Basin has also been affected by the construction of dams, which have fragmented the Neponset River and changed low flows, high flows, and other hydrologic characteristics. In 2007, 51 dams are located along the Neponset River and its tributaries, impounded the water and sediments behind the dams [4]. These dams have also changed sediment regimes by trapping sediment in the impoundments behind most of the dams. Two hurricanes impacted the Northeast and destroyed many of the dams along the Neponset River in 1955, releasing sediments trapped behind the dams [65].

Two dams are currently located along the SWP, downstream of the most upstream PPE and include the Baker Dam and the T&H Dam. The Baker Dam, located upstream of Adams Street in Dorchester/Milton, is classified as a Significant Hazard Potential. The T&H Dam, located east of River Street Terrace in Hyde Park, is also classified as a Significant Hazard Potential [48]. Significant Hazard Potential dam refers to dams located where failure may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s) or railroad(s) or cause interruption of use or service of relatively important facilities [53].

The Neponset River is the most upstream Clean Water Act (CWA)-protected water body along the 15-mile downstream SWP. In addition, based on review of the National Wetland Inventory maps, there are approximately 1.14 miles of wetland frontage located along the SWP. [46]. However, more detailed review and on-site wetland observations indicate that there are between 4 and 5 miles of emergent and scrub-shrub fresh-water wetland frontage along the Neponset River from the confluence of Mother Brook to 3.7-miles downstream to the Baker Dam in Milton [57]. Additional marsh/wetlands areas are located farther downstream within the 15-mile downstream SWP; these wetland areas are tidally influenced [100]. There are four listed priority species habitats along the 15-mile downstream SWP [49]. Information regarding the specific type of

priority habitat (State Threatened, State Endangered, Federal Threatened, or Federal Endangered), or the names of the listed threatened or endangered species habitats, was not available during the writing of this report. The Neponset River Estuary Area of Critical Environmental Concern (sensitive environment) begins at the Baker Dam in Dorchester/Milton. This area of Critical Environmental Concern separates the coastal estuary from the inland fresh-water portion of the Neponset, and extends to the mouth of the river at Commercial Point in Boston and Squantum Point in Quincy [52]. There are no known drinking water intakes located along the 15-mile downstream SWP from the property [34].

Table 6 summarizes sensitive environments along the 15-mile downstream SWP from the Lower Neponset River PCBs site.

Table 6

Sensitive Environments Along the 15-Mile Downstream Surface Water Pathway from the Lower Neponset River PCBs Site

Sensitive Environment Name	Sensitive Environment Type	Surface Water Body	Downstream Distance from PPE (miles)	Flow Rate at Environment (cfs)[a]
Neponset River - Wetlands	Wetlands	Neponset River	0 to 3.7	175.5 to 181.8
Neponset River - Clean Water Act	Clean Water Act Water body	Neponset River	0 to 3.7	175.5 to 181.8
Neponset River Estuary - Area of Critical Environmental Concern	Area of Critical Environmental Concern	Neponset River Estuary	3.7 to 7.7	NA

[a] Cubic feet per second
NA = Not applicable.
PPE = Probable Point of Entry.

[43; 46; 51]

The Neponset River, which was America's most industrialized river during the early 1700s, drains parts of, and areas adjacent to, the city of Boston, MA. Industrial activity continued until 1965 when the last major industrial facility relocated from the lower section of the river. A byproduct of this early industrialization was dams, which were constructed mostly for purposes of power production. Today, 11 dam impoundment areas are located along the 29-mile Neponset River main stem, but they no longer serve their original purposes. Two dams, the T&H Dam and the Baker Dam, remain on the lower Neponset River within the area considered the site. Remnants of the former Jenkins Dam are located on the lower Neponset River within the site area, downstream of the Braided Channel sediment accumulation area (aka Wild Rice Islands). Three additional dams remain along the western segment of Mother Brook, upstream of the former LE Mason facility (see Attachment A, Figure 2). One of the long-term effects of these dams is the accumulation of contaminants in the slack water and in the impounded sediments behind the dams [2-4].

USGS New England Water Science Center collected sediment, water, and fish tissue samples between 2002-2003 and 2004-2006 from Mother Brook and the Neponset River. The study was conducted in an effort to restore fish passage, habitat, and recreational use of the Neponset River. The initial investigation in 2002-2003 focused on the Neponset River. Samples of sediment and water were collected at 63 sampling locations along the lower Neponset River. These included

20 sediment-grab sample locations, 31 sediment-core sample locations, and 12 PISCES water column sample stations. The USGS 2004–2006 investigation involved the collection of additional sediment and surface water samples, and focused on source identification within the Neponset River and Mother Brook. Bottom-sediment samples were collected from the river and farther downstream in the estuary to supplement bottom-sediment data collected as part of the 2002-2003 USGS study. Specifically, riverine bottom-sediment samples were collected in and around areas near assumed sources of PCB-contamination. Bottom-sediment grab samples were collected at 23 locations in the Neponset River, Neponset River Estuary, and Mother Brook [2-4].

Analytical results from the 2002-2003 study indicated PCBs were detected in all but six of the 20 surface sediment-grab samples. Of the nine PCB Aroclors analyzed for in the sediment samples, only three Aroclors were detected above their individual reporting limits for the sample (Arolcor-1242, Arolcor-1254, and Arolcor-1260). The remaining six Aroclors (-1016, -1221, -1232, -1248, -1262, -1268) were not detected in any of the 51 grab-sediment and core-sediment samples [2-3].

PCB Aroclor analytical results for 2002-2003 sediment-grab samples (surface sediment samples) collected from the Neponset River indicate that three Aroclors were detected above reporting limits and consist of the following (maximum concentration and sample location in parentheses): Aroclor-1242 (7,100 µg/Kg in M2Y-003); Aroclor-1254 (3,400 µg/Kg in BGY-105); and Aroclor-1260 (970 µg/Kg in BGY-112) (see Attachment A, Figures 4 and 4A) [2-3].

PCB Aroclor analytical results for 2002-2003 sediment-core samples (deep sediment samples) collected from the Neponset River indicate that the same three Aroclors were detected above reporting limits and consist of the following (maximum concentration and sample location in parentheses): Aroclors-1242 (208,000 µg/Kg in M2Y-002); Aroclors-1254 (17,000 µg/Kg in BGY-113/BGY-113D, M2Y-002, and BGY-128/BGY-128D); and Aroclors-1260 (5,800 µg/Kg in BGY-113D) (See Figures 4 and 4A) [2-3].

PCB PISCES passive-water-column samplers were filled with hexane and deployed on buoys at 12 locations throughout the study area, including upstream, downstream, and within Mother Brook. The solubility of PCBs is much greater in hexane compared to river water and, therefore, increases the likelihood of detecting PCBs that could otherwise be undetectable in whole-water samples. Consequently, the concentrations of water-quality constituents in PISCES samples are reported in nanograms per hexane sample (ng/hexane sample). After about 2 weeks, the PISCES samples were collected and their contents analyzed for 209 individual PCB congeners; Aroclor concentrations were estimated from the PCB congener data [2-3].

The total concentration of PCBs by congener and by Aroclor were calculated by USGS for the 23 PISCES samples collected from the 12 sample stations in 2002-2003. Analytical results of the PISCES samples indicated the sum of the concentrations of PCBs by congener had a maximum concentration of 6,177 ng/hexane sample in PISCES Sample Number 8 and the sum of the concentrations of PCBs by Aroclor had a maximum concentration of 3,100 ng/hexane sample in PISCES Sample Number 8. PISCES analytical data also indicate that Aroclor-1254 was detected in several water column samples with a maximum concentration of 397 ng/ hexane sample in PISCES Sample Number 8, located at the Ryan Playground Station location (See Figure 5) [2-3].

A second USGS study, performed from 2004-2006, investigated concentrations, loads, and sources of PCBs by collection and analysis of bottom-sediment grab samples, water samples, fish tissue samples, and PISCES samples. Bottom-sediment samples were collected from the Neponset River and farther downstream in the estuary to supplement bottom-sediment data collected as part of the

2002-2003 USGS study. Specifically, riverine bottom-sediment samples were collected in and around areas near assumed sources of PCB-contamination [4]. The investigation area extended from a Mother Brook impoundment, located approximately 0.5 miles upstream of the former L.E. Mason Facility, downstream to the confluence of Mother Brook and the Neponset River. According to USGS, the results of the 2004-2006 investigation indicated widespread PCB-contamination in the sediments of the lower Neponset River [4,].

Total PCB congeners were measured in the 2004-2006 bottom-sediment grab samples and ranged from 120 µg/Kg in BGY-140 up to 28,100 µg/Kg in BGY-141D (both locations along Mother Brook). A total of three PCB Aroclors were detected in the bottom-sediment grab samples collected from the study area and consisted of the following (maximum concentration and sample location in parentheses): Aroclor-1242 (19,500 µg/Kg in BGY-141D); Aroclor-1254 (5,460 µg/Kg in BGY-141D); and Aroclor-1260 (791 µg/Kg in BGY-141D) [4].

Total PCB congeners were detected in the 2004-2006 PISCES water-column samples and ranged from 64.4 ng/sample at Incinerator Road station and up to 5,360 ng/sample at the Fairmount Ave. station. Three PCB Aroclors were detected in the PISCES water column samples collected from the study area and include the following (maximum concentration and sample location in parentheses): Aroclor-1016/1242 (2,740 ng/sample at the Fairmount Avenue station); Aroclor-1254 (306 ng/sample at the Facility #2 station); and Aroclor-1260 (110 ng/sample at the Fairmount Ave. station) [4].

Analytical results of the USGS bottom-sediment samples indicated total PCB concentrations varied, with a minimum concentration of 28 µg/Kg in the Neponset River (behind Star Market) just upstream of the Mother Brook confluence, and a maximum concentration of 24,900 µg/Kg measured at sample location BGY-141 (Facility #2 station) in Mother Brook. Concentrations in sediment grab samples in Mother Brook averaged about 60 times less (270 µg/Kg) upstream of Facility #2 than downstream of this location (15,400 µg/Kg). PCB concentrations in Neponset River sediments downstream of Mother Brook averaged about 11,400 µg/Kg and about 900 µg/Kg in estuarine mud samples (downstream of the Baker Dam). According to the USGS, PCB concentrations generally declined with distance away from the river mouth into the estuary [4].

A SI investigation of the Lower Neponset River PCBs site is occurring concurrently to this PA. The SI will include the examination of PCB-contamination in sediments along the 3.7-mile segment which comprises the site; within segments of Mother Brook from its confluence with the Neponset River, upstream 3.6 miles to the Colburn Dam impoundment area (near Maverick Street, Dedham, MA; coordinates 42.249017, -71.159816); as well as a section of the upper Neponset River, from the confluence of the Neponset River and Mother Brook, approximately 2 miles, to the area with the Neponset River Reservation II (aka Fowl Meadow) [located near 141 Meadow Road, Boston MA (Neponset section); coordinates 42.228704, -71.129871] (see Attachment A, Figure 2A) [1, 57]. The Mother Brook and upper Neponset River segments are being examined to determine background conditions within the Neponset River, upstream of the confluence of the Neponset River and Mother Brook.

Based on available historical sediment PCB analytical data collected for samples along the Neponset River and Mother Brook, several areas along the 3.7-mile Lower Neponset River riverbed from the confluence of Mother Brook and the Neponset River downstream to the Baker Dam, indicate that a release of hazardous substances (PCBs) to the SWP has been documented. Furthermore, the data suggest that PCB-contaminated sediments have accumulated to form a

plume of PCB-contaminated sediment of unknown origins. Impacts to the local surface water, on-site fishery, and sensitive environments are suspected based on the available PCB data.

SOIL EXPOSURE PATHWAY

The Lower Neponset River PCBs site is considered an approximately 3.7-mile riverbed segment which contains several areas where PCB-contaminated sediments that have likely accumulated from both suspected and unknown sources and releases to form a plume of PCB-contaminated sediment of unknown origins. The site extends along the Neponset River from the confluence of Mother Brook and the Neponset River located upstream of Dana Avenue, Hyde Park, Massachusetts (MA), downstream to the Baker Dam located upstream of Adams Street, Dorchester/Milton, MA (see Attachment A, Figure 1) [3]

There are sections of the northern and southern banks of the Neponset River that are lined by residential properties [57]. An estimated 73,336 and 423,686 people reside within 1 radial mile and 4 radial miles of the Lower Neponset River PCBs site, respectively [40]. There are no state and/or federally designated endangered species habitats known to be located on the Lower Neponset River PCBs site [50].

There are one school and two day-care facilities located within 200 feet of the Neponset River PCBs Site [54; 55; 67; 68; 69]. The MATCH Community Day Charter Public School is located at 100 Poydras Street, Hyde Park, approximately 100 feet north of the Neponset River channel and the site. The MATCH Community Day Charter Public School has an enrollment of approximately 650 students per year [69]. In addition, there are two day-care facilities located within 200 feet of the Neponset River, the South Side Head Start (695 Truman Hwy 204, Hyde Park) and the Laronde De Marie-Claire Early Learning Center (130 River St, Mattapan) [54; 55; 67; 68]. The South Side Head Start services a maximum of 60 children per year [67]. The Laronde De Marie-Claire Early Learning Center services a maximum of 47 children per year [68].

Access to the Neponset River PCBs site is generally unrestricted, except where private properties abutting the river restrict pedestrian access [57]. Public recreational use land encompasses and borders the majority of the 3.7-mile site. There are five public canoe launches and approximately 1.5 miles of developed recreational multi-use walking/biking trails (Neponset Riverwalk) bordering the Lower Neponset River PCBs site. There are seven recreation areas located along the edge if the site/river, West Street Park, Neponset River Reservation, Doyle Playground, Kennedy Playground, City Natives Community Gardens, Neponset River Reservation I, and Ryan Playground [57].

The site is defined as portions of the Neponset River channel containing PCB-contaminated sediment forming a plume of contaminated sediments of unknown origins. In the past, sediment dredging has occurred with disposal of the possibly contaminated sediments spoils in upland areas; however, these areas are not being evaluated as part of the Lower Neponset River PCBs Site investigation. Therefore, the soil exposure pathway was not evaluated.

AIR PATHWAY

The Lower Neponset River PCBs site is considered an approximately 3.7-mile riverbed segment which contains several areas where PCB-contaminated sediments have likely come to accumulate from both suspected and unknown sources and releases to form a plume of PCB-contaminated sediment of unknown origins. The site consists of the river channel segment of the Neponset River,

from the confluence of the Neponset River and Mother Brook, downstream to the Baker Dam. Based on the definition of the site, there are no on-site workers and no residents on the site [57]. Numerous residences are located adjacent to the north and south riverbanks, along the edges/border of the site. The nearest residences (571 Truman Parkway and 5 Warren Street, Milton) are located less than 35 feet from the banks of the river channel [57].

As noted in the Soil Exposure Pathway section above, there are one school and two day-care facilities located within 200 feet of the Neponset River PCBs Site [54; 55; 67; 68; 69]. These consist of the MATCH Community Day Charter Public School, South Side Head Start, and the Laronde De Marie-Claire Early Learning Center serving approximately 650 students, 60 children, and 47 children per year. [54; 55; 67; 68; 69].

Also as noted in the Soil Exposure Pathway section above, access to the Neponset River site is generally unrestricted. The river and surrounding areas are used for recreational purposes and include five public canoe launches, approximately 1.5 miles of developed recreational multi-use walking/biking trails (Neponset Riverwalk), and seven recreation areas located along the edge if the site/river [57].

An estimated 423,686 people reside within 4 radial miles of the Lower Neponset River PCBs site [40].

Table 7 summarizes the estimated population within 4 radial miles of the Lower Neponset River PCBs site.

Table 7

Estimated Population Within 4 Radial Miles of the Lower Neponset River PCBs site

Radial Distance From the Lower Neponset River PCBs site (miles)	Estimated Population
On Property	0
> 0.00 to < 0.25	17,343
> 0.25 to < 0.50	19,194
> 0.50 to < 1.00	36,799
> 1.00 to < 2.00	103,439
> 2.00 to < 3.00	128,148
> 3.00 to < 4.00	118,763
TOTAL	423,686

< = Less than. > = Greater than.

[40]

Approximately 6,842.5 acres of wetlands, CWA-protected water bodies, nine listed priority species habitats, and the Neponset River Estuary Area of Critical Environmental Concern are located within 4 radial miles of the Lower Neponset River PCBs site [46; 51; 52]. Information regarding the specific type of priority habitat (State Threatened, State Endangered, Federal Threatened, or Federal Endangered), or the names of the listed threatened or endangered species habitats, was not available during the writing of this report [50; 51].

Table 8 summarizes sensitive environments located within 4 radial miles of the Lower Neponset River PCBs site.

No quantitative laboratory-analyzed air samples are known to have been collected from the Lower Neponset River PCBs site. START did not conduct Air Pathway sampling as part of this PA. During the 1 and 2 August 2017 on-site reconnaissance conducted at the Lower Neponset River PCBs site, START personnel conducted periodic ambient air monitoring using a MultiRAE Plus (LEL, O_2, H_2S, CO, and PID) meter and a Micro R radiation meter. No readings above background levels were detected in the ambient air [57].

Based on the lack of quantitative data, no release of hazardous substances to the ambient air from on-site sources has been documented. No air pathway impacts to nearby residential populations or sensitive environments are known or suspected.

Table 8

Sensitive Environments Located Within 4 Radial Miles of the Lower Neponset River PCBs site

Radial Distance From Lower Neponset River PCBs site (miles)	Sensitive Environments/Species (status)
On Property	7.7 acres of wetlands
	Clean Water Act-protected water body
>0 to < 0.25	9.7 acres of wetlands
	Clean Water Act-protected water body
	Area of Critical Environmental Concern
> 0.25 to < 0.50	41.5 acres of wetlands
	Clean Water Act-protected water body
	Area of Critical Environmental Concern
> 0.50 to < 1.00	220.8 acres of wetlands
	Clean Water Act-protected water body
	Area of Critical Environmental Concern
> 1.00 to < 2.00	1,091.1 acres of wetlands
	Clean Water Act-protected water body
	Two listed priority species habitats
	Area of Critical Environmental Concern
> 2.00 to < 3.00	2,082.1 acres of wetlands
	Clean Water Act-protected water body
	Two listed priority species habitats
	Area of Critical Environmental Concern
> 3.00 to < 4.00	3,389.6 acres of wetlands
	Clean Water Act-protected water body
	Five listed priority species habitats
	Area of Critical Environmental Concern

[46; 50; 52]

SUMMARY

The Lower Neponset River PCBs site for this study is considered to be an approximately 3.7-mile riverbed segment which contains several areas where PCB-contaminated sediments have accumulated from both suspected and unknown sources and/or releases to form a plume of PCB-contaminated sediment. The site is comprised of the riverbed channel along the lower segment of the Neponset River, from the confluence of the Neponset River and Mother Brook (upstream of Dana Avenue, Hyde Park; Confluence coordinates 42.251785, -71.123205) downstream to the Baker Dam (upstream of Adams Street, Dorchester/Milton; Dam coordinates 42.270765, -71.068818) (see Attachment A, Figure 1). Sediments contaminated with elevated levels of PCBs have been documented within the lower segment of the Neponset River and Lower Neponset River PCBs site area. The original location of the release or releases of PCBs which have resulted in the contaminated sediment is unknown. However, there are several sites within the river basin which have been identified by previous investigations as having formerly used, stored, or had releases of PCBs and are likely to have contributed to the sediment contamination plume; numerous other sites which may have used, stored, or had releases of PCBs within the river basin and may have contributed PCB-contamination to the sediment contamination plume; and still other potential sites, sources, and/or releases, which have not yet been identified, but based on the long, complex, urban and industrial history of the area along the Neponset River and within the river basin, are likely to exist and potentially have contributed to the PCB-contaminated sediment. Therefore, the PCB-contaminated sediments have accumulated from both suspected and unknown sources and/or releases of PCBs, which have accumulated to form a plume of PCB-contaminated sediment of unknown origins, which constitutes the Lower Neponset River PCBs site.

The Lower Neponset River channel ranges from approximately 40 feet to 300 feet wide, and comprises an estimated 40 acres (see Attachment A, Figure 2) within or bordering the City of Boston (Hyde Park, Mattapan, and Dorchester sections) and the Town of Milton, MA. The site is bordered by residential, commercial, industrial, and public parcels of land, including the Neponset River Greenway [aka the Neponset River trail and walkway].

For the purpose of this study, the site consists of five general areas of concern: the Baker Dam Impoundment area (from the Baker Dam, upstream to Central Avenue); the Braided Channel area (from Central Avenue, upstream to the Harvest River Bridge); the Blue Hill Avenue area (upstream of the Braided Channel area, to the T&H Dam); the T&H Dam Impoundment area (from the T&H Dam, upstream to Fairmont Avenue); and the Fairmont/Mother Brook confluence area (from Fairmont Avenue, upstream to the confluence of Mother Brook with the Neponset River) (Attachment A, Figure 2).

The Lower Neponset River PCBs site is located in the Neponset River Watershed (Attachment A, Figure 6). Water and sediment flow into the site via a stream channel from Mother Brook and the upper segment of the Neponset River, upstream of the confluence of Mother Brook with the Neponset River. Water flowing through the site (along the Neponset River channel) discharges at the Baker Dam, the downstream-most portion of the site, and continues to flow downstream along the Neponset River through the Neponset River Marsh/Estuary, to Dorchester Bay, and Boston Harbor.

Water also enters the site via Pine Tree Brook, a small tributary which discharges to the site (riverbed) near the Baker Dam Impoundment; overland flow; and various discharge pipes along the river banks. Several former facility discharge pipes and City of Boston and Town of Milton

storm drain pipes have been observed along the site and presumably have discharged to the site riverbed at various points in the past.

According to the U.S. Geological Survey (USGS) and Weston START site observations, water depths along the Lower Neponset River PCBs Site range from less than 1 foot in portions of the Braided Channel area to a maximum depth of 15 feet within the T&H Dam Impoundment area.

Numerous sediment depositional areas have been observed along the riverbed channel, including several where PCB-contaminated sediments have been documented to come to rest. These areas include, but are not limited to: the Baker Dam Impoundment, the Braided Channel, and the T&H Dam Impoundment areas. According to USGS, the measurements of maximum sediment thickness in 2002 were 5.8, 7.6 and 9.7 ft. in the Braided Channel, Baker Dam Impoundment and T&H Dam Impoundment areas, respectively. Observations by START also noted that some areas within the riverbed channel are erosional zones, with limited sediment accumulation occurring, and other areas of the riverbed are heavily armored.

Numerous wetland areas are located within and along the 3.7-mile riverbed segment of the site. The majority of the wetland acreage is within the Braided Channel, but there is wetland frontage along the majority of the edge of the riverbed channel. Based on the EPA wetland specialist's observations and review of wetland delineations, there are an estimated 4 to 5 miles of wetland frontage along the Neponset River, within the Lower Neponset River PCBs site.

There are no specific details regarding the operational and regulatory history for the Lower Neponset River PCBs site. This approximately 3.7-mile riverbed segment contains several areas where PCB-contaminated sediments have accumulated from both suspected and unknown sources and PCB releases to form a plume of PCB-contaminated sediment of unknown origins. However, a general operational history for the lower segment of the Neponset River, comprising the Lower Neponset River PCBs site, is summarized in the following paragraphs.

The Neponset River, like most urban rivers in the Northeast, has a long industrial history. Industrialization and subsequent urbanization began in the Neponset River Basin as early as the 1630s. By the mid-1700s, the Neponset River drained one of the most heavily industrialized drainage basins in the Nation, draining parts of, and areas adjacent to, the city of Boston.

Recognized as the second watershed to be industrialized in the United States, the Neponset River has a complex history of contamination from both point and non-point sources. Used historically for hydro-powered factories, the Neponset River has been home to countless industrial land use ventures, most if not all of which likely had outflow and discharge pipes pumping toxic industrial waste directly into the river.

Historically, numerous mills were established along the Lower Neponset River in the Towns of Dorchester, Milton, Hyde Park, and Mattapan, utilizing dams to generate power initially to turn mill grinding wheels and later to operate the large industrial mills.

Previous investigations of the Neponset River, including portions of the Lower Neponset River, have included sediment and water investigations conducted by the U.S. Army Corps of Engineers (US ACOE), USGS, Massachusetts Department of Environmental Protection (MassDEP), and others.

In 2002, US ACOE conducted a study in an effort to restore fish passage, habitat, and recreational use of the Neponset River. As part of this study, two sediment cores were collected and analyzed. Analytical results indicated that the bottom sediments contained elevated concentrations of PCBs, raising concerns about sediment, water, and biota quality of the Neponset River.

In 2002 and 2003, the USGS, in cooperation with the Massachusetts Executive Office of Environmental Affairs Riverways Program and the U.S. EPA, conducted a study which included the Lower Neponset River in Boston and Milton. According to the USGS, although enriched relative to background, concentrations of most substances were equal to or less than those found in other urban rivers, with the notable exception of PCBs.

MassDEP has completed a file review of PCB waste sites within the Neponset River Basin. A total of 34 sites have been identified that had or have PCBs as a contaminant of concern, and are located in the vicinity of the Neponset River or one of its tributaries. MassDEP also concluded that the major sources of the PCB-contamination to the lower Neponset River are located along Lower Mother Brook. Overall MassDEP identified 10 properties that could be sources of PCBs to the Neponset River either directly or through one of its tributaries. Two of these sites are located on the Neponset River, upstream of the confluence of Mother Brook and the Neponset River, six sites are located along the lower sections of Mother Brook, and two sites are located downstream of the Mother Brook confluence on the Lower Neponset River.

In 2008, MassDEP completed an evaluation of the USGS reports, collected and evaluated additional sediment data upstream and downstream of the confluence of Mother Brook and the Neponset River, completed a preliminary evaluation of technical reports submitted for all the sites listed above, and was in the process of completing comprehensive technical screening audits for sites in the area. The MassDEP noted that this preliminary evaluation was consistent with the conclusions of the USGS reports. The concentrations of PCBs in both the surface water and sediments of the Neponset River increase dramatically at the Mother Brook confluence, and the chemical signature also dramatically shifts. According to MassDEP, this provides strong evidence that PCBs from facilities in lower Mother Brook are largely responsible for PCB-contamination in the Neponset River from the Mother Brook confluence to the Baker Dam.

MassDEP analyzed National Oceanic and Atmospheric Administration (NOAA) congeners for the 28 sediment samples collected by the USGS for which congener data was available, in order to document the changes in PCB congener pattern in sediments at and downstream of the Mother Brook confluence. There are 18 PCB NOAA congeners which have been identified as those that do not readily biodegrade. For areas upstream of LE Mason within Mother Brook, and areas upstream of the Mother Brook confluence within the Neponset River, the PCBs are dominated by the more heavily chlorinated penta-deca congeners. Within Mother Brook, from LE Mason to the confluence with the Neponset River, and downstream to the Baker Dam, the PCB congeners are dominated by the mono-tetra variety. MassDEP noted that this evidence provides strong technical evidence that the major sources of PCBs to the lower Neponset River are from lower Mother Brook.

The MassDEP evaluation also identified that in 1962, the Neponset River was dredged from the Baker Dam to the T&H Dam. In 1964, the Neponset River was dredged from the T&H Dam to the Neponset Valley Parkway (Paul's Bridge). The dredge spoils were distributed in low-lying areas along the banks of the Neponset River in 14 discrete areas. In eight of the 14 locations, the dredge spoils were deposited near parks and residential areas which are accessible to the general public. Due to a concern over the presence of PCBs in the dredge spoils, MassDEP completed a

sampling program within the eight dredge spoils areas of concern. The only dredge spoil area where PCBs have been identified is in the back yards of eight residential properties located along Riverside Square in Hyde Park.

MassDEP and EPA completed investigations of the magnitude and extent of the PCB-contamination in the back yards of Riverside Square properties from 2009 through 2012. PCBs are present in surface soils above concentrations that pose an imminent hazard at 5 Riverside Square, and at concentrations that present a long term risk to human health at 1 and 15 Riverside Square. To remove this risk, remediation of PCB-contaminated soil still needs to be completed in the back yards of these three residential properties.

MassDEP also noted in a 2015 Neponset River PCBs Contamination document that a then-recent investigation of technical reports submitted for the former Bay State Paper Company revealed that additional dredging activities were completed for flood control purposes from directly behind the T&H Dam in 1960. The dredge spoils would be expected to be highly contaminated with PCBs, and were placed on the property presently owned by the DCR on the south side of the Neponset River, directly across the Neponset River from the 892 River Street property. The extent of PCB-contamination in this area has not been investigated. MassDEP also noted a detailed evaluation of the entire flood control dredging project conducted by the MDC should be completed to determine if there are other upland areas where dredge spoils have been disposed.

On 27 October 2015, MassDEP requested that the EPA evaluate the Neponset River for potential listing on the National Priorities List (NPL) as the surface water, sediment, and fish within the Neponset River and Estuary are contaminated with PCBs. The contamination is spread from Norwood to the Neponset River Estuary, with the highest concentrations located downstream of the Mother Brook confluence. The highest concentrations of PCBs are present in sediments behind the T&H Dam, behind the Baker Dam, and in the vicinity of the former Jenkins Dam where a series of mid-channel islands now exist in an area identified as the Braided Channel. MassDEP noted that the presence of PCBs presents an ecological risk to aquatic life and a risk to humans through fish consumption. Although DPH has placed fish consumption advisories for the Neponset River, the Neponset River Watershed Association has documented that fishing still occurs at a variety of locations. Dredging of Neponset River for flood control in the early through mid-1960s spread PCB-contaminated sediment to a variety of upland areas, some of which are presently used for residential and recreational purposes. Long-term human health risk due to PCB-contamination levels has been documented in the back yards of three residential properties located along Riverside Square in Hyde Park. The full extent of dredge spoils excavation and disposition along the Neponset River has not been fully evaluated.

In a 2015 letter to EPA, MassDEP noted that remediation of the Neponset River will be a large scale project. PCB-contaminated sediments would have to first be remediated to minimize the potential for further migration of PCBs downstream and into the estuary. This remediation would facilitate the goals of the Massachusetts Department of Fish and Game to dismantle the dams to restore the river channel to its natural conditions, and to promote fish passage. MassDEP further noted that PCBs that present a risk to residential and recreational receptors should be remediated from upland areas. In 2002, USGS calculated sediment volumes that would need to be removed an estimated at 22,960 and 7,780 cubic yards from behind the T&H Dam and the Baker Dam, respectively.

In 2014, USGS concluded that the major sources of the PCB-contamination are located along lower Mother Brook, but no specific sources were mentioned by name. MassDEP noted that the

data suggests that widespread PCB-contamination of the lower Neponset River originated from Mother Brook starting sometime around the early 1950's. 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, which was not completed for over a decade. According to MassDEP correspondences in 2015, PCBs are mostly trapped behind the two rebuilt dams (the T&H Dam and the Baker Dam), and within the former Jenkins Dam impoundment, where sediments form the Braided Channel section of the river. 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 2002, bottom sediment volumes were estimated by USGS at 620,000 cubic feet (22,960 cubic yards) in the T&H Dam Impoundment; 790,000 cubic feet (29,260 cubic yards) in the Braided Channel area, and 210,000 cubic feet (7,780 cubic yards) in the Baker Dam Impoundment. US ACOE noted that PCBs in the Braided Channel segment appear to be trapped in semi-permanent 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.

Based on available historical data generated from samples along the Neponset River and Mother Brook, several areas along the 3.7-mile Lower Neponset River riverbed between the confluence of Mother Brook and the Neponset River, downstream to the Baker Dam, indicate the riverbed channel sediment are contaminated with hazardous substances (PCBs).

The PCB-contaminated sediments appear to have likely accumulated from both suspected and unknown historical sources and releases to form a plume of PCB-contaminated sediment of unknown origins within the Lower Neponset River. Estimates of the PCB-contaminated sediments exceed 30,000 cubic yards behind the two remaining dams along the Lower Neponset River. An additional 29,260 cubic yards of PCB-contaminated sediments reside in the Braided Channel area. In addition, PCB-contaminated sediment has been documented within other areas of the river, including near the confluence of Mother Brook, within the Lower Neponset River. No volume estimates are available for these additional PCB-contaminated sediment areas.

The groundwater beneath the Lower Neponset River PCBs site is classified as category GW-3 by MassDEP. The GW-3 classification applies to groundwater at all disposal sites that is a potential source of discharge to surface water bodies. The nearest public drinking water supply wells are five overburden wells which constitute the Dedham-Westwood Water District [Public Water System Identification Number (PWS ID No.) MA3073000], located southwest of the property between 2 to 3 radial miles from the property. The nearest off-site private drinking water supply well is located between 0 and 0.25 miles south of the site. The total population which relies on groundwater as a drinking water supply source within 4 radial miles of the Lower Neponset River PCBs site is estimated to be 40,223.

To date, no documentation of PCB concentrations exceeding state standards in groundwater drinking water sources within 4 radial miles of the Lower Neponset River PCBs Site are known. Elevated PCB concentrations as high as 95 µg/L were documented at the DCR property immediately adjacent to the Former Lewis chemical site between 2002 and 2006; However, this PCB-contamination is likely moving from one of the know potential sources (Lewis Chemical) toward the Neponset River and contributing to the plume of contaminated sediment.

No groundwater pathway samples were collected as part of this EPA PA. Based on the lack of available data, no release of hazardous substances to the groundwater from on-site sources/sediment plume has been documented. Due to the limited use of drinking water in the immediate area, no impacts to drinking water supply or nearby residential populations are known or suspected.

The most upstream probable point of entry (PPE) to the Lower Neponset River PCBs 15-mile downstream surface water pathway (SWP) is located at the confluence of the Neponset River and Mother Brook (upstream of Dana Avenue, Hyde Park, MA) (PPE 1). The most downstream PPE is located along the Neponset River at the Baker Dam (upstream of Adams Street, Dorchester/Milton, MA) (PPE 2), 3.7-miles downstream of the most upstream PPE. Therefore the Surface Water Pathway (SWP) extends 18.7 miles. The SWP extends past 15 miles due to the difference in distances from the terminus to the two PPEs located along the SWP (see Attachment A, Figure 6A).

The 15-mile downstream SWP from the Lower Neponset River PCBs site is located in the Neponset River Watershed, and includes the following surface water bodies: Neponset River (7.87 miles), Dorchester Bay, and Boston Harbor (10.83 mile arc from the mouth of the Neponset River). The 15-mile downstream SWP terminus is located in Boston Harbor (Attachment A, Figure 6A)

Numerous wetland areas are located within and along site. The majority of the wetland acreage is within the Braided Channel Section, but there is wetland frontage along the majority of the edge of the riverbed channel. Based on the EPA wetland specialist's observations and review of wetland delineations, there are an estimated 4 to 5 miles of wetland frontage along the Neponset River, within the Lower Neponset River PCBs site.

The Neponset River is a fishery. Fish types found in the river include American Eel, Brown Bullhead, and White Sucker. A fish advisory for the Neponset River has been issued by the MA DPH for the consumption of American Eel and White Sucker due to PCBs and DDT. Primary Contact Recreation in the Neponset River has been classified as impaired by MassDEP due to Escherichia coli (E. Coli), Enterococcus, and PCBs. Primary Contact Recreation is defined by MassDEP as any recreation or other water use in which there is prolonged and intimate contact with the water with a significant risk of ingestion of water. These include, but are not limited to, wading, swimming, diving, surfing and water skiing.

Based on available historical sediment PCB analytical data collected for samples along the Neponset River and Mother Brook, several areas along the 3.7-mile Lower Neponset River riverbed from the confluence of Mother Brook and the Neponset River downstream to the Baker Dam, indicate that a release of hazardous substances (PCBs) to the surface water pathway has been documented. Furthermore, the data suggests that PCB-contaminated sediments have accumulated to form a plume of PCB-contaminated sediment of unknown origins. Impacts to the local surface water, onsite fishery, and sensitive environments are suspected based on the available PCB data.

There are portions along the northern and southern banks of the Neponset River that are lined by residential properties, adjacent to the banks of the river. An estimated 73,336 and 423,686 people reside within 1 radial mile and 4 radial miles of the Lower Neponset River PCBs site, respectively. There are no state and/or federally designated endangered species habitats known to be located on the Lower Neponset River PCBs site.

There is one school and two day-care facilities located within 200 feet of the Neponset River PCBs Site. The MATCH Community Day Charter Public School has an enrollment of approximately 650 students per year. In addition, there are two day-care facilities located within 200 feet of the Neponset River, the South Side Head Start serving 60 children per year and the Laronde De Marie-Claire Early Learning Center serving 47 children per year.

The site is defined as portions of the Neponset River channel containing PCB-contaminated sediment forming a plume of contaminated sediments of unknown origins. In the past sediment dredging has occurred with disposing of the possibly contaminated sediments spoils in upland areas, however these areas are not being evaluated as part of the Lower Neponset River PCBs Site investigation. Therefore no soils exposure was not evaluated.

An estimated 423,686 people reside within 4 radial miles of the Lower Neponset River PCBs site. Approximately 6,842.5 acres of wetlands, CWA-protected water bodies, nine listed priority species habitats, and the Neponset River Estuary Area of Critical Environmental Concern are located within 4 radial miles of the Lower Neponset River PCBs site.

No quantitative laboratory-analyzed air samples are known to have been collected from the Lower Neponset River PCBs site. Based on the lack of quantitative data, no release of hazardous substances to the ambient air from on-site sources has been documented. No air pathway impacts to nearby residential populations or sensitive environments are known or suspected.

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ATTACHMENT A

LOWER NEPOSET RIVER PCBS SITE
FIGURES

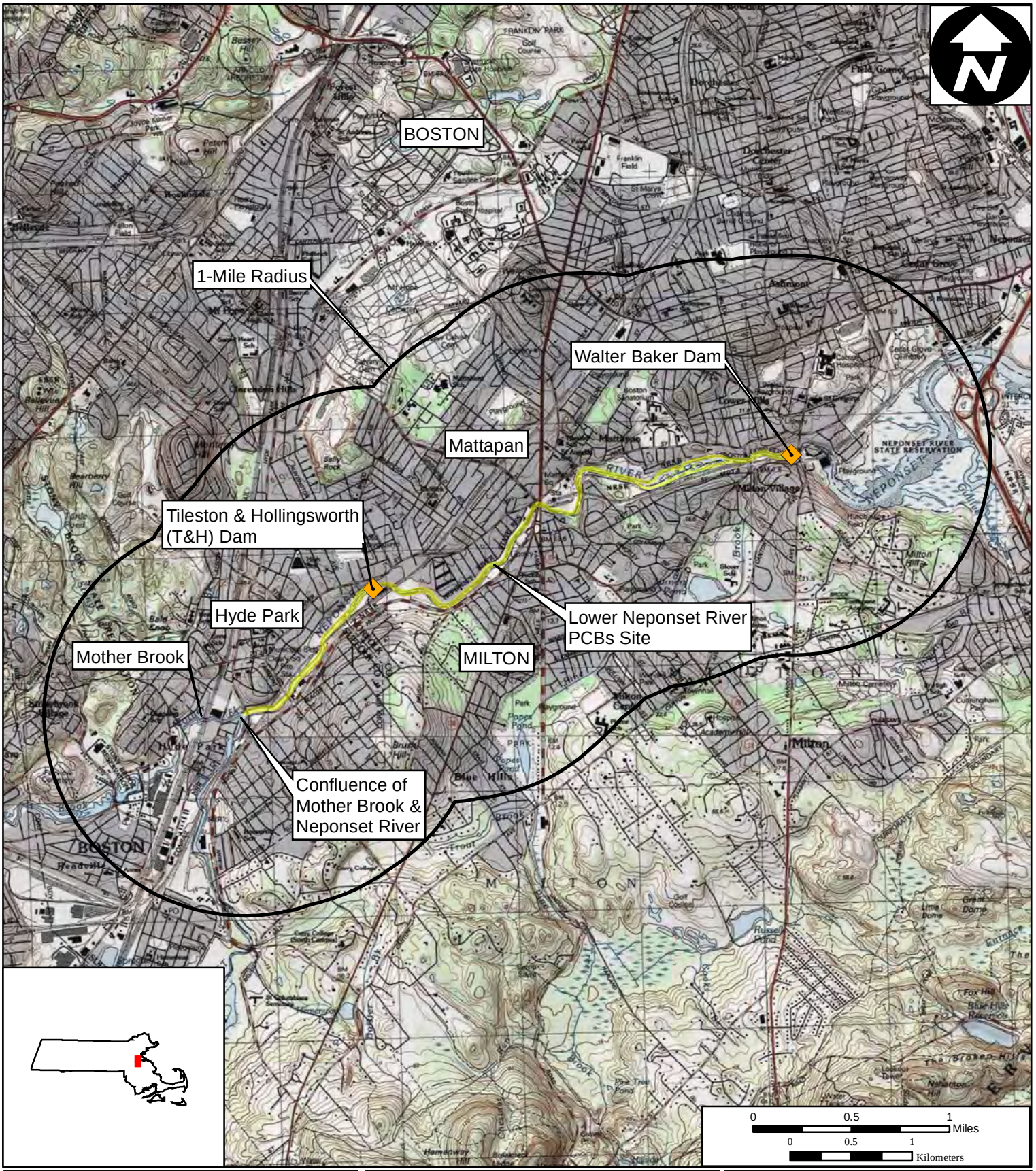

Figure 1

Site Location Map

Lower Neponset River PCBs
Boston/Milton, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number:	TO1-01-16-06-0009
Created by:	B. Mace
Created on:	4 April 2017
Modified by:	B. Mace
Modified on:	31 August 2018

Data Sources:
Topos: MicroPath/USGS/USA Topo Maps
Quadrangle Names: Blue Hill, Boston South, MA
All other data: START, MassGIS, MassDEP

WESTON SOLUTIONS

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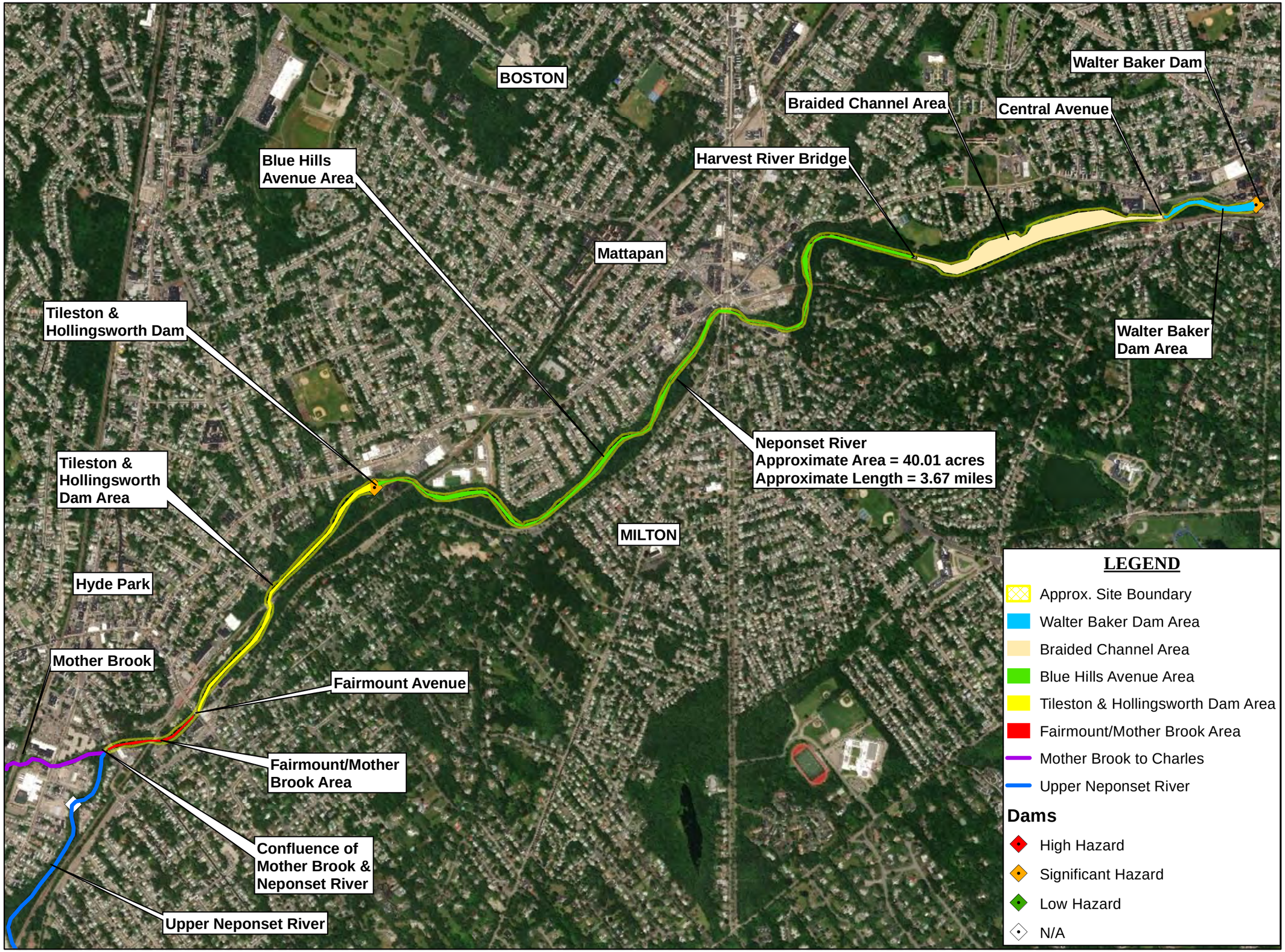

Figure 2

Site Map

Lower Neponset River PCBs
Boston/Milton, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number:	TO1-01-16-06-0009
Created by:	B. Mace
Created on:	3 April 2017
Modified by:	B. Mace
Modified on:	31 August 2018

Data Sources:

Imagery: ESRI, i-cubed, USDA FSA, USGS AEX, GeoEye, Getmapping, Aerogrid, IGP
Topos: MicroPath
All other data: START, MassGIS, MassDEP USGS

WESTON SOLUTIONS

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Figure 2A

Area of Concern Map

Lower Neponset River PCBs
Boston, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number:	TO1-01-16-06-0009
Created by:	B. Mace
Created on:	3 April 2017
Modified by:	B. Mace
Modified on:	31 August 2018

LEGEND

- Approximate Site Boundary
- Mother Brook to Maverick St.
- Upper Neponset River

Dams

- High Hazard
- Significant Hazard
- Low Hazard
- N/A

0 0.25 0.5
Miles

0 1,500 3,000
Feet

Data Sources:

Imagery: ESRI, i-cubed, USDA FSA, USGS AEX, GeoEye, Getmapping, Aerogrid, IGP
Topos: MicroPath
All other data: START, MassGIS, MassDEP

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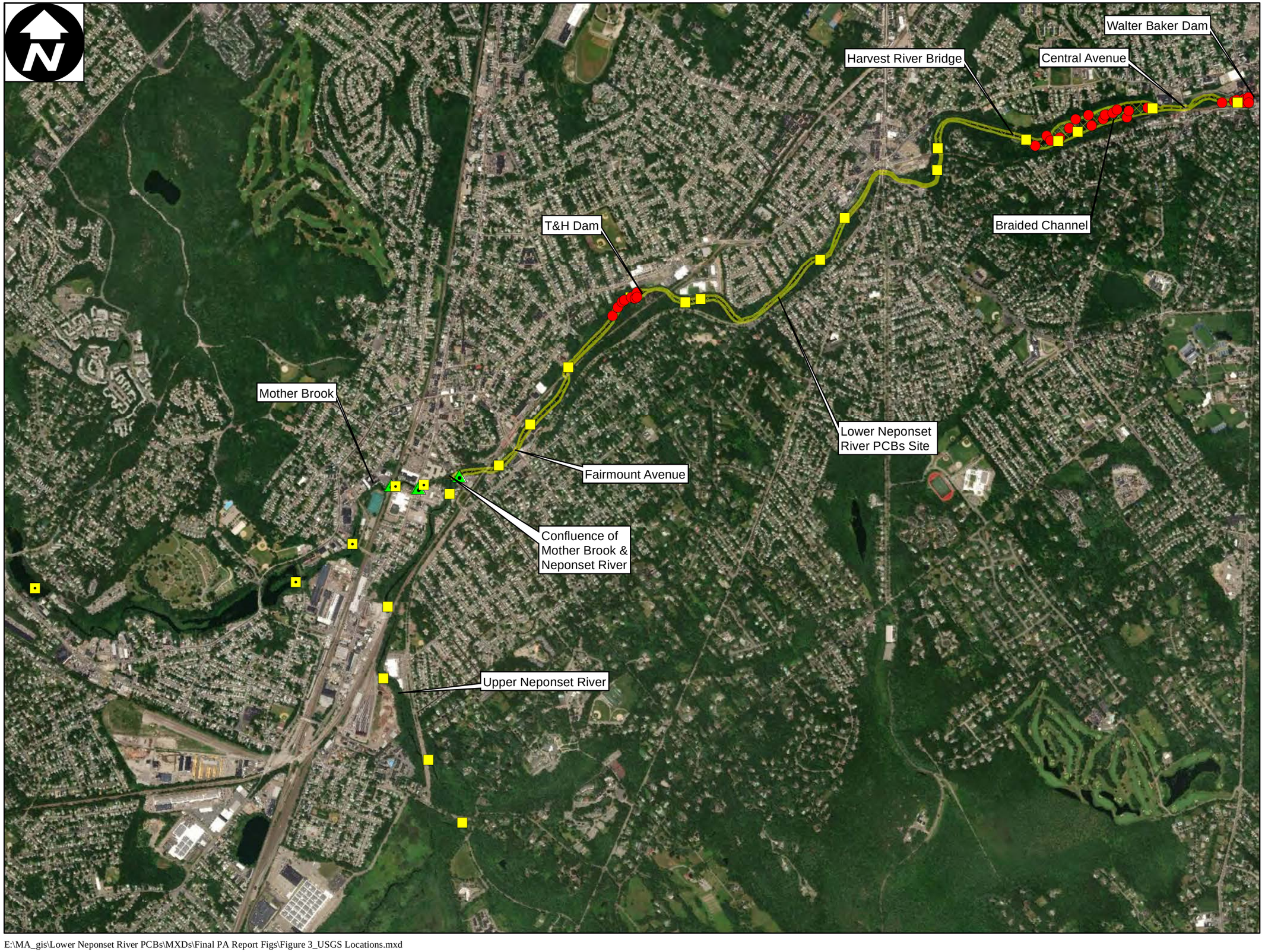

Figure 3

2002-2003 and 2004-2006 USGS Sample Locations

Lower Neponset River PCBs
Boston, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number:	TO1-01-16-06-0009
Created by:	B. Mace
Created on:	3 April 2017
Modified by:	B. Mace
Modified on:	31 August 2018

LEGEND

- Approx Site Boundary
- 2002 Sediment-Core Locations
- 2002 Sediment-Grab Locations
- 2005 Sediment Grab Locations
- 2002/2005 PISCES Locations
- 2005 PISCES Locations

PISCES = Passive in-situ chemical-extraction sampler

0 0.2 0.4
Miles

Data Sources:

Imagery: ESRI, i-cubed, USDA FSA, USGS AEX, GeoEye, Getmapping, Aerogrid, IGP
Topos: MicroPath
All other data: START, MassGIS, MassDEP USGS

WESTON SOLUTIONS

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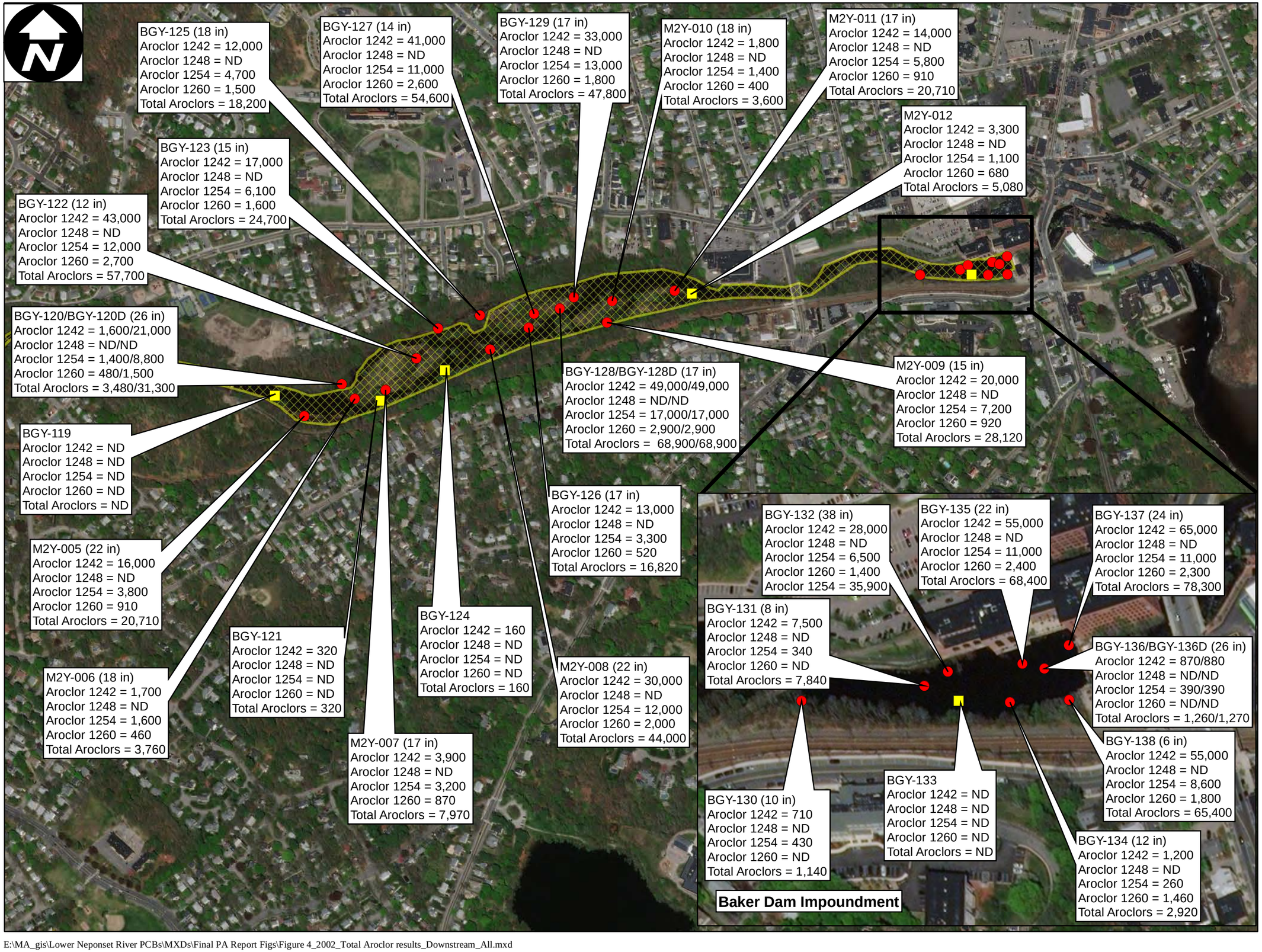

Figure 4

PCB Concentrations in USGS 2002-2003 Grab and Core Sediment Samples - Downstream Locations)

Lower Neponset River PCBs
Boston, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number:	TO1-01-16-06-0009
Created by:	B. Mace
Created on:	3 April 2017
Modified by:	B. Mace
Modified on:	31 August 2018

LEGEND

- Site
- Sediment-Core Locations
- Sediment-Grab Locations

All results in micrograms per Kilogram (µg/Kg).

ND = Not Detected.
D = Duplicate sample.

0 450 900
Feet

Data Sources:

Imagery: ESRI, i-cubed, USDA FSA, USGS AEX, GeoEye, Getmapping, Aerogrid, IGP
Topos: MicroPath
All other data: START, MassGIS, MassDEP USGS

WESTON SOLUTIONS

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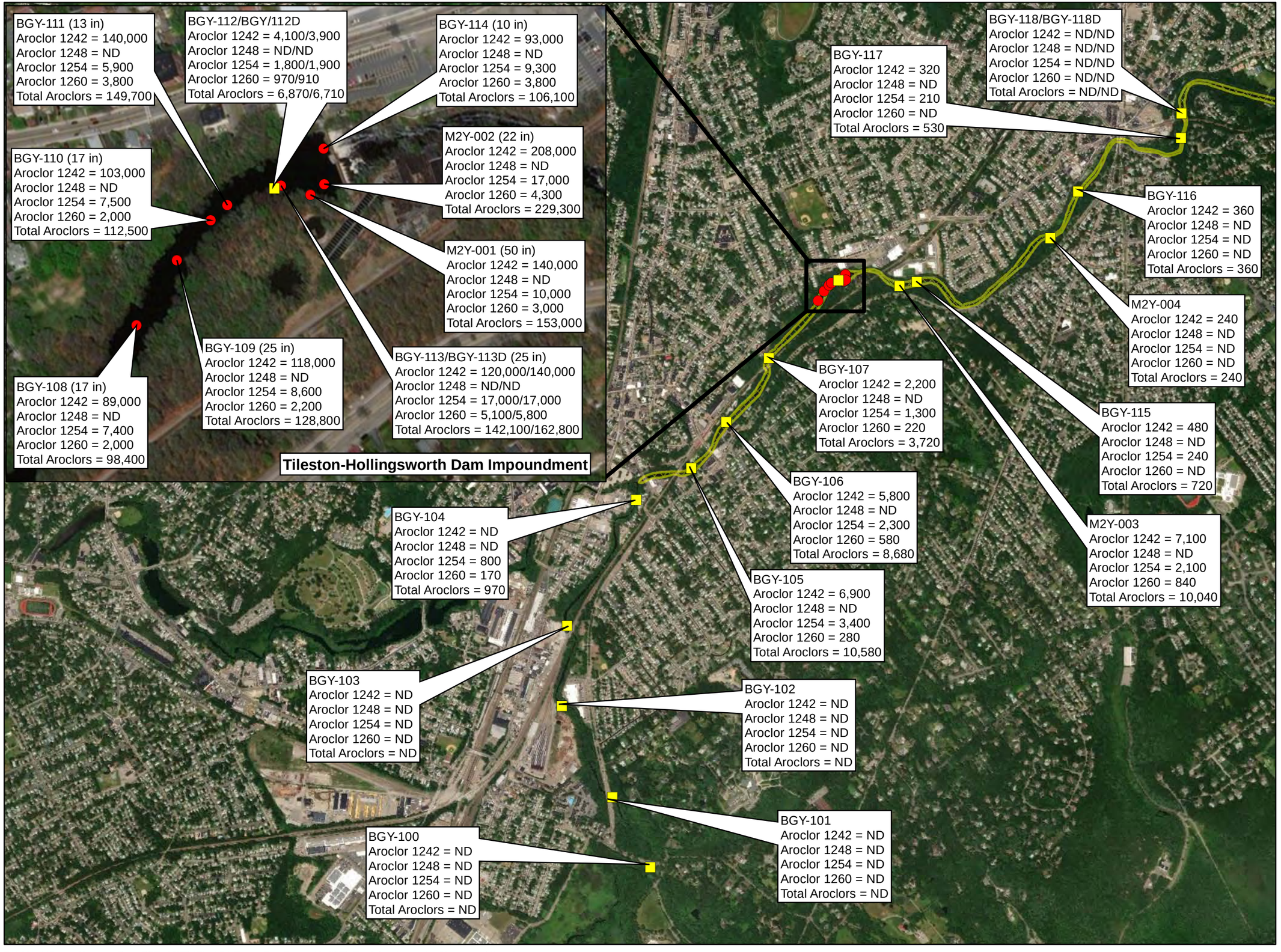

Figure 4A

PCB Concentrations in USGS 2002–2003 Grab and Core Sediment Sample - Upstream Locations

Lower Neponset River PCBs
Boston, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number:	TO1-01-16-06-0009
Created by:	B. Mace
Created on:	3 April 2017
Modified by:	B. Mace
Modified on:	31 August 2018

LEGEND

- Site
- Sediment-Core Locations
- Sediment-Grab Locations

All results in micrograms per Kilogram (µg/Kg).

ND = Not Detected.
D = Duplicate sample.

0 1,000 2,000
Feet

Data Sources:

Imagery: ESRI, i-cubed, USDA FSA, USGS AEX, GeoEye, Getmapping, Aerogrid, IGP
Topos: MicroPath
All other data: START, MassGIS, MassDEP USGS

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Central Avenue/Central Ave D
Aroclors1016 and 1242 = 1,720/1,820
Aroclor 1254 = 266/274
Aroclor 1260 = 3.42/6.07
Total PCBs by Aroclor = 1,989/2,100

Walter Baker Impoundment/Walter Baker Impoundment D
Aroclors1016 and 1242 = 1,060/1,100
Aroclor 1254 = 167/188
Aroclor 1260 = <1.90/2.46
Total PCBs by Aroclor = 1,227/1,290

Ryan Playground/Ryan Playground D
Aroclors1016 and 1242 = 1,160/3,090
Aroclor 1254 = 172/397
Aroclor 1260 = 6.50/7.76
Total PCBs by Aroclor = 1,339/3,495

T&H Impoundment (downstream)/T&H Impoundment (downstream) D
Aroclors1016 and 1242 = 2,570/2,340
Aroclor 1254 = 304/286
Aroclor 1260 = 33.6/28.2
Total PCBs by Aroclor = 2,908/2,654

T&H Impoundment (upstream)/T&H Impoundment (upstream)
Aroclors1016 and 1242 = 1,420/1,600
Aroclor 1254 = 131/144
Aroclor 1260 = 9.87/17.6
Total PCBs by Aroclor = 1,561/1,762

Braided Channel/Braided Channel D
Aroclors1016 and 1242 = 2,000/2,630
Aroclor 1254 = 324/324
Aroclor 1260 = 6.45/6.45
Total PCBs by Aroclor = 2,330/2,960

Reservation Park/Reservation Park D
Aroclors1016 and 1242 = 38.0/39.6
Aroclor 1254 = 38.7/57.0
Aroclor 1260 = <2.70/<3.60
Total PCBs by Aroclor = 77/97

Fairmont Avenue/Fairmont Avenue D
Aroclors1016 and 1242 = 2,880/1,990
Aroclor 1254 = 189/143
Aroclor 1260 = 31.1/12.9
Total PCBs by Aroclor = 3,100/2,146

Kennedy Playground/Kennedy Playground
Aroclors1016 and 1242 = 1,160/862
Aroclor 1254 = 172/397
Aroclor 1260 = 6.50/7.76
Total PCBs by Aroclor = 1,339/971

Incinerator Road
Aroclors1016 and 1242 = <6.11
Aroclor 1254 = <12.4
Aroclor 1260 = <4.17
Total PCBs by Aroclor = <22.68

Martini Shell/Martini Shell D
Aroclors1016 and 1242 = 17.0/16.7
Aroclor 1254 = 116/99.7
Aroclor 1260 =2.26/<4.81
Total PCBs by Aroclor = 135/116

Paul's Bridge/Paul's Bridge D
Aroclors1016 and 1242 = 17.5/30.7
Aroclor 1254 = 93.3/223
Aroclor 1260 = <3.95/5.10
Total PCBs by Aroclor = 111/259

Figure 5

PCB Concentrations in USGS 2002-2003 PISCES Samples

Lower Neponset River PCBs
Boston, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number: TO1-01-16-06-0009
Created by: B. Mace
Created on: 3 April 2017
Modified by: B. Mace
Modified on: 31 August 2018

LEGEND

Approx. Site Boundary

PISCES Location

PISCES = Passive In-Situ Concentration Extraction Sampler
All results in ng/hexane sample.
ng = nanograms
D = Duplicate Sample

0 0.25 0.5
Miles

Data Sources:

Imagery: ESRI, i-cubed, USDA FSA, USGS AEX, GeoEye, Getmapping, Aerogrid, IGP
Topos: MicroPath
All other data: START, MassGIS, MassDEP USGS

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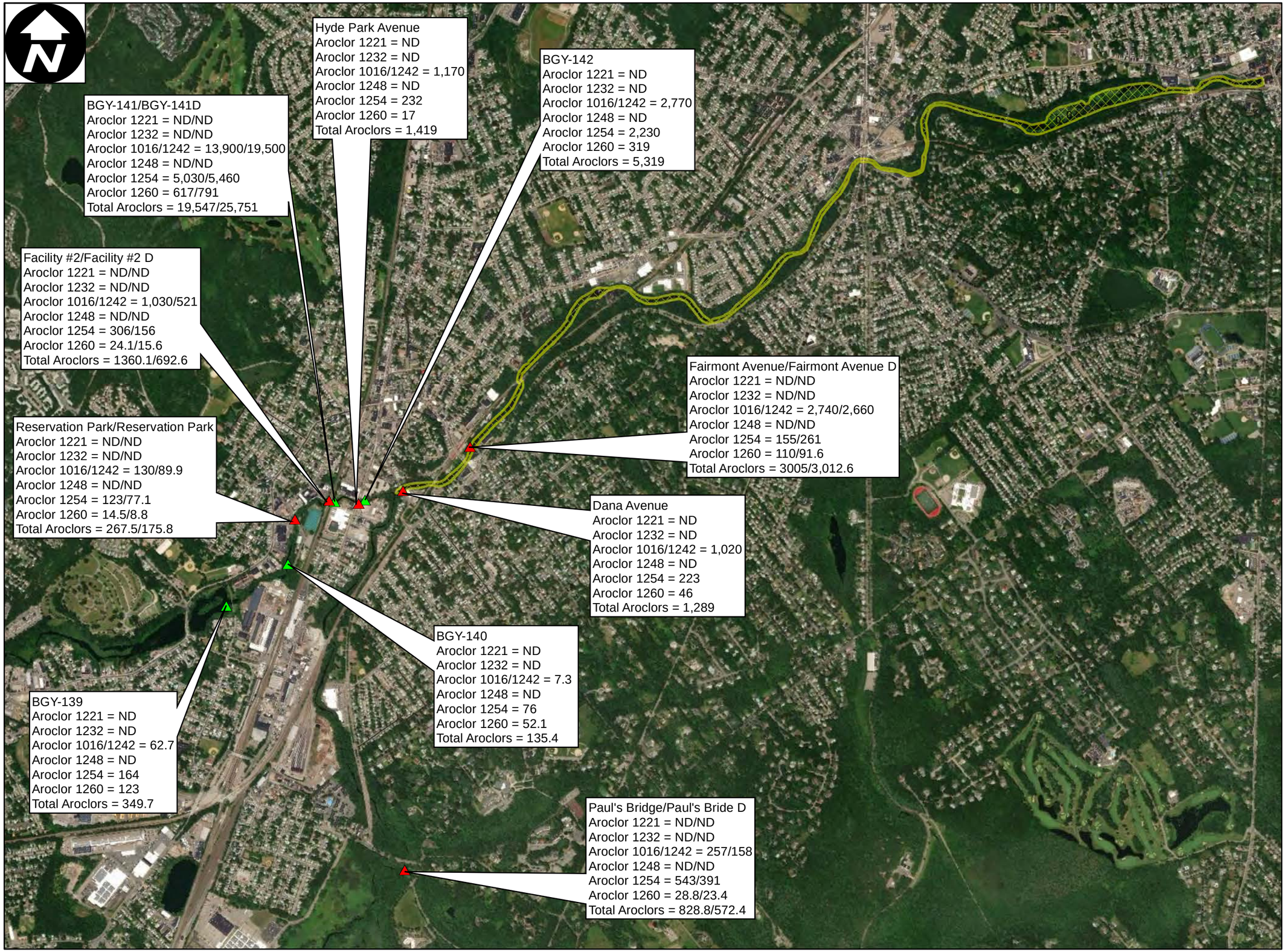

Figure 5A

PCB Concentrations in USGS 2004–2006 Bottom-Grab Sediment and PISCES Samples

Lower Neponset River PCBs
Boston/Milton, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number:	TO1-01-16-06-0009
Created by:	B. Mace
Created on:	3 April 2017
Modified by:	B. Mace
Modified on:	31 August 2018

LEGEND

- Approx. Site Boundary
- Sediment Grab Locations
- PISCES Locations

Sediment Grab Results in microgram per Kilogram (µg/Kg).

PISCES Results in nanograms per hexane sample (ng/hexane sample).

D = Duplicate sample.

0 0.25 0.5
Miles

Data Sources:

Imagery: ESRI, i-cubed, USDA FSA, USGS AEX, GeoEye, Getmapping, Aerogrid, IGP
Topos: MicroPath
All other data: START, MassGIS, MassDEP USGS

WESTON SOLUTIONS

E:\MA_gis\Lower Neponset River PCBs\MXDs\Final PA Report Figs\Figure 5A_2005_Total Aroclor results_All.mxd

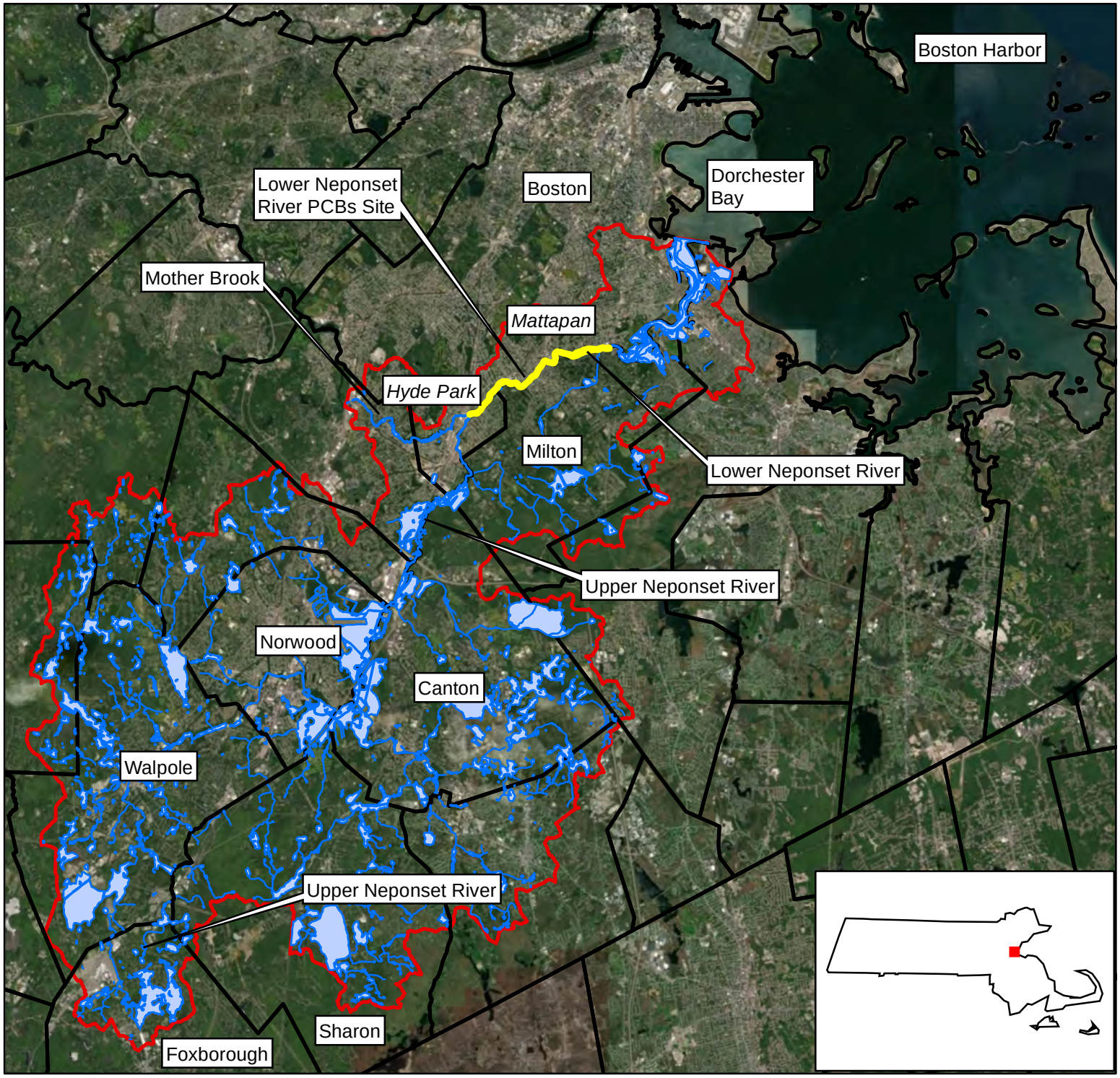

Figure 6

Neponset River Watershed

Lower Neponset River PCBs
Boston/Milton, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) IV
Contract No. EP-S3-15-01

TDD Number: TO1-01-16-06-0009
Created by: B. Mace
Created on: 3 April 2018
Modified by: B. Mace
Modified on: 31 August 2018

LEGEND

- Site Boundary
- Neponset Watershed
- Ponds
- Streams/Rivers
- Town Boundary

N

0 2.5 5

Miles

Data Sources:

Imagery: ESRI, i-cubed, USDA FSA, USGS AEX, GeoEye, Getmapping, Aerogrid, IGP
Topos: MicroPath
All other data: START, MassGIS

WESTON SOLUTIONS

E:\MA_gis\Lower Neponset River PCBs\MXDs\Final PA Report Figs\Figure 6_Watershed.mxd

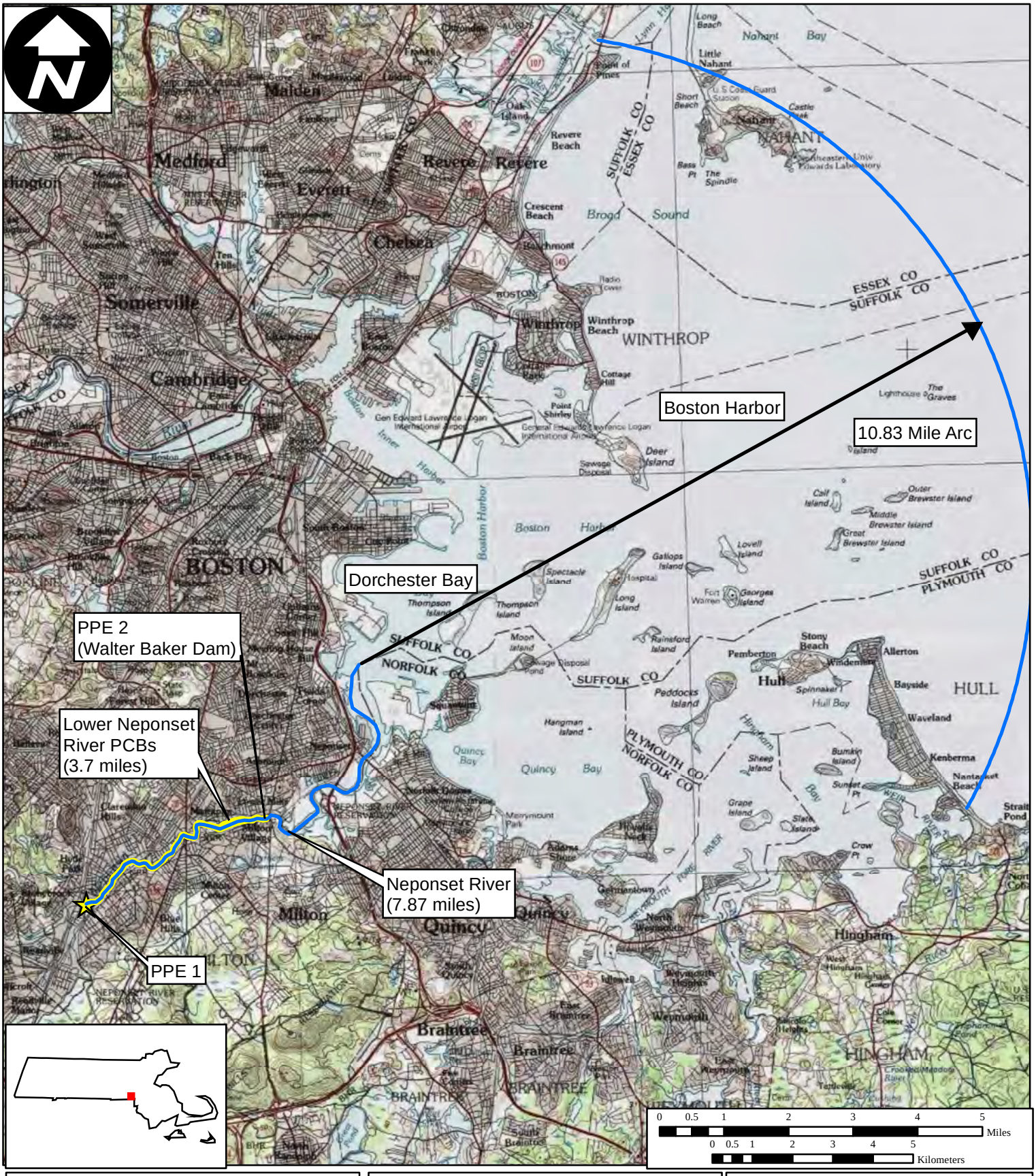

Figure 6A

Surface Water Pathway

Lower Neponset River PCBs
Boston/Milton, Massachusetts

EPA Region I
Superfund Technical Assessment and Response Team (START) III
Contract No. EP-S3-15-01

TDD Number:	TO1-01-16-06-0009
Created by:	B. Mace
Created on:	3 April 2017
Modified by:	B. Mace
Modified on:	31 August 2018

Data Sources:

Topos: MicroPath/USGS
Quadrangle Name: Boston, MA
All other data: START

WESTON SOLUTIONS

E:\MA_gis\Lower Neponset River PCBs\MXDs\Final PA Report Figs\Figure 6A_SWP.mxd

EPA Potential Hazardous Waste Site Preliminary Assessment Form

Identification

State: MA	CERCLIS Number: MAN000102204

CERCLIS Discovery Date: 6/15/17

1. *General Site Information*

Name: Lower Neponset River PCBs	Street Address: Neponset Rive, Boston (Hyde Park) - Milton, Massachusetts				
City: Boston-Milton	State: MA	Zip Code: 02136	County: Suffolk	Co. Code: 025	Cong. Dist: 7th
Latitude: 42 º 15 ' 104 " Longitude: -71 º 07 ' 392 "	Approximate Area of Site: 40.01 Acres _____ Square Ft		Status of Site: ☐ Active ☐ Not Specified ☐ Inactive ☒ NA (GW plume, etc.)		

2. *Owner/Operator Information*

Owner: State of Massachusetts/City of Boston/ Department of Conservation and Recreation (DCR)			Operator: N/A		
Street Address: Boston Environment Department One City Hall Square, Room 709			Street Address:		
City: Boston			City:		
State: MA	Zip Code: 02201	Telephone: (617) 635-4416	State:	Zip Code:	Telephone:

Type of Ownership:
- ☐ Private
- ☐ Federal Agency
  - Name _____
- ☒ State
- ☐ Indian
- ☐ County
- ☒ Municipal
- ☐ Not Specified
- ☐ Other _____

How Initially Identified:
- ☐ Citizen Complaint
- ☐ PA Petition
- ☒ State/Local Program
- ☐ RCRA/CERCLA Notification
- ☐ Federal Program
- ☐ Incidental
- ☐ Not Specified
- ☐ Other _____

3. *Site Evaluator Information*

Name of Evaluator: B. Mace / J Kelly	Agency/Organization: Weston Solutions, Inc., START III	Date Prepared: 8/31/2018
Street Address: 101 Billerica Avenue, Bldg 5, Suite 103	City: North Billerica	State: MA
Name of EPA or State Agency Contact: Martha Bosworth, EPA Region I Site Assessment Manager	Street Address: 5 Post Office Square	
City: Boston	State: MA	Telephone: (617) 918-1407

4. *Site Disposition (for EPA use only)*

Emergency Response/Removal Assessment Recommendation: ☐ Yes ☐ No Date: _____	CERCLIS Recommendation: ☐ Higher Priority SI ☐ Lower Priority SI ☐ NFRAP ☐ RCRA ☐ Other _____ Date: _____	Signature: Name (Typed): Position:

EPA **Potential Hazardous Waste Site**
Preliminary Assessment Form – Page 2 of 4

CERCLIS Number:

5. *General Site Characteristics*

Predominant Land uses Within 1 Mile of Site (check all that apply):

- ☒ Industrial
- ☒ Commercial
- ☒ Residential
- ☐ Forest/Fields
- ☐ Agricultural
- ☐ Mining
- ☐ DOD
- ☐ DOE
- ☐ DOI
- ☐ Other Federal Facility _____
- ☐ Other _____

Site Setting:

- ☒ Urban
- ☐ Suburban
- ☐ Rural

Years of Operation:
Beginning Year _____
Ending Year _____
☒ Unknown

Types of Site Operation (check all that apply)

- ☐ Manufacturing (must check subcategory)
  - ☐ Lumber and Wood Products
  - ☐ Inorganic Chemicals
  - ☐ Plastic and/or Rubber Products
  - ☐ Paints, Varnishes
  - ☐ Industrial Organic Chemicals
  - ☐ Agricultural Chemicals (e.g., pesticides, fertilizers)
  - ☐ Miscellaneous Chemical Products (e.g., adhesives, explosives, ink)
  - ☐ Primary Metals
  - ☐ Metal Coating, Plating, Engraving
  - ☐ Metal Forging, Stamping
  - ☐ Fabricated Structural Metal Products
  - ☐ Electronics Equipment
  - ☐ Other Manufacturing
- ☐ Mining
  - ☐ Metals
  - ☐ Coal
  - ☐ Oil and Gas
  - ☐ Non-metallic Minerals
- ☐ Retail
- ☐ Recycling
- ☐ Junk/Salvage Yard
- ☐ Municipal Landfill
- ☐ Other Landfill
- ☐ DOD
- ☐ DOE
- ☐ DOI
- ☐ Other Federal Facility _____
- ☐ RCRA
  - ☐ Treatment, Storage, or Disposal
  - ☐ Large Quantity Generator
  - ☐ Small Quantity Generator
  - ☐ Subtitle D
    - ☐ Municipal
    - ☐ Industrial
  - ☐ "Converter"
  - ☐ "Protective Filer"
  - ☐ "Non- or Late Filler"
- ☐ Non Specified
- ☒ Other Urban River

Waste Generated:

- ☐ Onsite
- ☒ Offsite
- ☐ Onsite and Offsite

Waste Disposition Authorized By:

- ☐ Present Owner
- ☐ Former Owner
- ☐ Present & Former Owner
- ☒ Unauthorized
- ☐ Unknown

Waste Accessible to the Public:

- ☒ Yes
- ☐ No

Distance to Nearest Dwelling, School, or Workplace:
35 Feet

6. *Waste Characteristics Information*

Source Type: (check all that apply)	Source Waste Quantity: (include units)	Tier*:
☐ Landfill		
☐ Surface Impoundment		
☐ Drums		
☐ Tanks and Non-Drum Containers		
☐ Chemical Waste Pile		
☐ Scrap Metal Junk Pile		
☐ Tailings Pile		
☐ Trash Pile (open dump)		
☐ Land Treatment		
☐ Contaminated Ground Water Plume (unidentified source)		
☒ Contaminated Surface Water/Sediment (unidentified source)	~ 60,000 cubic yds.	V
☐ Contaminated Soil		
☐ Other _____		
☐ No Sources		

* C = Constituent, W = Wastestream, V = Volume, A = Area

General Types of Waste (check all that apply)

- ☐ Metals
- ☐ Organics
- ☐ Inorganics
- ☐ Solvents
- ☐ Paints/Pigments
- ☐ Laboratory/Hospital Waste
- ☐ Radioactive Waste
- ☐ Construction/ Demolition Waste
- ☐ Pesticides/Herbicides
- ☐ Acids/ Bases
- ☐ Oily Waste
- ☐ Municipal Waste
- ☐ Mining Waste
- ☐ Explosives
- ☒ Other PCBs

Physical State of Waste as Deposited (check all that apply):

- ☒ Solid
- ☒ Sludge
- ☐ Powder
- ☒ Liquid
- ☐ Gas

EPA **Potential Hazardous Waste Site**
Preliminary Assessment Form – Page 3 of 4

CERCLIS Number:

7. *Ground Water Pathway*

Is Ground Water Used for Drinking Water Within 4 Miles:
- ☒ Yes
- ☐ No

Type of Drinking Water Wells Within 4 Miles (check all that apply):
- ☒ Municipal
- ☒ Private
- ☐ None

Is there a Suspected Release to Ground Water:
- ☐ Yes
- ☒ No

Have Primary Target Drinking Water Wells Been Identified:
- ☐ Yes
- ☒ No

If Yes, Enter Primary Target Population:

_____ People

Depth to Shallowest Aquifer:

3 Feet

Karst Terrain/Aquifer Present:
- ☐ Yes
- ☒ No

Nearest Designated Wellhead Protection Area:
- ☐ Underlies Site
- ☒ > 0-4 Miles
- ☐ None Within 4 Miles

List Secondary Target Population Served by Ground Water Withdrawn From:

0 – ¼ Mile	12
> ¼ - ½ Mile	18
> ½ - 1 Mile	46
> 1 - 2 Mile	183
> 2 - 3 Mile	14,310
> 3 - 4 Mile	25,654
Total Within 4 Miles	40,223

8. *Surface Water Pathway*

Type of Surface Water Draining Site and 15 miles Downstream (check all that apply):
- ☒ Stream ☒ River ☐ Pond ☐ Lake
- ☐ Bay ☐ Ocean ☐ Other _____

Shortest Overland Distance From Any Source to Surface Water:

0 Feet

_____ Miles

Is There a Suspected Release to Surface Water:
- ☒ Yes
- ☐ No

Site is Located in:
- ☒ Annual – 10 yr Floodplain
- ☐ >10 yr – 100 yr Floodplain
- ☐ >100 – 500 yr Floodplain
- ☐ > 500 yr Floodplain

Drinking Water Intakes Located Along the Surface Water Migration Path:
- ☐ Yes
- ☒ No

Have Primary Target Drinking Water Intakes Been Identified:
- ☐ Yes
- ☒ No

If Yes, Enter Population Served by Primary Target Intakes:

_____ People

List All Secondary Target Drinking Water Intakes:

Name	Water Body	Flow (cfs)	Population Served

Total within 15 Miles _____

Fisheries Located Along the Surface Water Migration Path:
- ☒ Yes
- ☐ No

Have Primary Target Fisheries Been Identified:
- ☐ Yes
- ☒ No

List All Secondary Target Fisheries:

Water Body/Fishery Name	Flow (cfs)
Neponset River	NA
Dorchester Bay	NA
Boston Harbor	NA

EPA **Potential Hazardous Waste Site**
Preliminary Assessment Form – Page 4 of 4

CERCLIS Number:

8. *Surface Water Pathway (continued)*

Wetlands Located Along the Surface Water Migration Path:
- ☒ Yes
- ☐ No

Have Primary Target Wetlands Been Identified:
- ☒ Yes
- ☐ No

List Secondary Target Wetlands:

Water Body	Flow (cfs)	Frontage Miles
Neponset River	175.5-181.8	4-5

Other Sensitive Environments Located Along the Surface Water Migration Path:
- ☒ Yes
- ☐ No

Have Primary Target Sensitive Environments Been Identified:
- ☒ Yes
- ☐ No

List Secondary Target Sensitive Environments:

Water Body	Flow (cfs)	Sensitive Environment Type

9. *Soil Exposure Pathway*

Are People Occupying Residences or Attending School or Daycare on or Within 200 Feet of Areas of Known or Suspected Contamination:
- ☒ Yes
- ☐ No

If Yes, Enter Total Resident Population:

757 People

Number of Workers Onsite:
- ☒ None
- ☐ 1 - 100
- ☐ 101 – 1,000
- ☐ > 1,000

Have Terrestrial Sensitive Environments Been Identified on or Within 200 Feet of Areas of Known or Suspected Contamination:
- ☐ Yes
- ☒ No

If Yes, List Each Terrestrial Sensitive Environment:

10. *Air Pathway*

Is there a Suspected Release to Air:
- ☐ Yes
- ☒ No

Enter Total Population on or Within:

Onsite	0
0 – ¼ Mile	17,343
> ¼ - ½ Mile	19,194
> ½ - 1 Mile	36,799
> 1 - 2 Mile	103,439
> 2 - 3 Mile	128,148
> 3 - 4 Mile	118,763
Total Within 4 Miles	423,686

Wetlands Located Within 4 Miles of the Site:
- ☒ Yes
- ☐ No

Other Sensitive Environments Located Within 4 Miles of the Site:
- ☒ Yes
- ☐ No

List All Sensitive Environments Within ½ Mile of the Site:

Distance	Sensitive Environment Type/Wetland Area (acres)
Onsite	Wetlands (7.7)
0 – ¼ Mile	Wetland (9.7)
> ¼ - ½ Mile	Clean Water Act-water body; Wetlands (41.5)

****** CONFIDENTIAL ******
******PRE-DECISIONAL DOCUMENT ******
****** SUMMARY SCORESHEET ******
****** FOR COMPUTING PROJECTED HRS SCORE ******

****** Do Not Cite or Quote ******

Site Name: Lower Neponset River

Region: Region 1

Scenario Name: LNR - Scenario 2R

City, County, State: Boston & Milton / Suffolk & Norfolk Co., Massachusetts

Evaluator: JF Kelly

EPA ID#: MAN000102204

Date: 08/31/2018

Lat/Long: 42:16:15,-71:4:8

Congressional District:

This Scoresheet is for: PA

Scenario Name: LNR - Scenario 2R

Description: Revised (2) Attempt at scoring River Segment from Mother Brook Confluence to Walter Baker Dam (Includes Tileston & Hollingsworth Dam Impoundment). PCB only site but not source. volume>0.Overland Flow Only

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	0.0	0.0
Surface Water Migration Pathway Score (S_{sw})	100.0	10000.0
Soil Exposure Pathway Score (S_s)	0.0	0.0
Air Migration Score (S_a)	0.0	0.0
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		10000.0
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		2500.0
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4}$		50.0

Pathways not assigned a score (explain):

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Watershed Evaluated: Lower Neponset River (MB to WBD)			
Drinking Water Threat			
Likelihood of Release:			
1. Observed Release	550	550.0	
2. Potential to Release by Overland Flow:			
2a. Containment	10	10.0	
2b. Runoff	10	2.0	
2c. Distance to Surface Water	5	25.0	
2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	35	270.0	
3.Potential to Release by Flood:			
3a. Containment (Flood)	10	10.0	
3b. Flood Frequency	50	50.0	
3c. Potential to Release by Flood (lines 3a x 3b)	500	500.0	
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	500.0	
5. Likelihood of Release (higher of lines 1 and 4)	550		550.0
Waste Characteristics:			
6. Toxicity/Persistence	(a)	0.0	
7. Hazardous Waste Quantity	(a)	100.0	
8. Waste Characteristics	100		0.0
Targets:			
9. Nearest Intake	50	0.0	
10. Population:			
10a. Level I Concentrations	(b)	0.0	
10b. Level II Concentrations	(b)	0.0	
10c. Potential Contamination	(b)	0.0	
10d. Population (lines 10a + 10b + 10c)	(b)	0.0	
11. Resources	5	0.0	
12. Targets (lines 9 + 10d + 11)	(b)		0.0
Drinking Water Threat Score:			
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100		0.0
Human Food Chain Threat			
Likelihood of Release:			
14. Likelihood of Release (same value as line 5)	550		550.0
Waste Characteristics:			
15. Toxicity/Persistence/Bioaccumulation	(a)	5.0E8	
16. Hazardous Waste Quantity	(a)	100.0	
17. Waste Characteristics	1000		320.0
Targets:			
18. Food Chain Individual	50	20.0	
19. Population			
19a. Level I Concentration	(b)	0.0	
19b. Level II Concentration	(b)	0.3	
19c. Potential Human Food Chain Contamination	(b)	0.0	
19d. Population (lines 19a + 19b + 19c)	(b)	0.3	
20. Targets (lines 18 + 19d)	(b)		20.3
Human Food Chain Threat Score:			
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100		43.3
Environmental Threat			
Likelihood of Release:			
22. Likelihood of Release (same value as line 5)	550		550.0
Waste Characteristics:			
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	5.0E8	
24. Hazardous Waste Quantity	(a)	100.0	
25. Waste Characteristics	1000		320.0

Targets:			
26. Sensitive Environments			
26a. Level I Concentrations	(b)	0.0	
26b. Level II Concentrations	(b)	150.0	
26c. Potential Contamination	(b)	0.0	
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	150.0	
27. Targets (value from line 26d)	(b)		150.0
Environmental Threat Score:			
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60		60.0
Surface Water Overland/Flood Migration Component Score for a Watershed			
29. Watershed Score[c] (lines 13+21+28, subject to a max of 100}	100		100.00
Surface Water Overland/Flood Migration Component Score			
30. Component Score (S_{sw})[c] (highest score from line 29 for all watersheds evaluated)	100		100.00

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 4-25 --GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Watershed Evaluated: Lower Neponset River (MB to WBD)			
Drinking Water Threat			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	0.0	
2. Potential to Release:			
2a. Containment	10	0.0	
2b. Net Precipitation	10	0.0	
2c. Depth to Aquifer	5	0.0	
2d. Travel Time	35	0.0	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	0.0	
3. Likelihood of Release (higher of lines 1 and 2e)	550		0.0
Waste Characteristics:			
4. Toxicity/Mobility	(a)	0.0	
5. Hazardous Waste Quantity	(a)	10.0	
6. Waste Characteristics	100		0.0
Targets:			
7. Nearest Well	(b)	0.0	
8. Population:			
8a. Level I Concentrations	(b)	0.0	
8b. Level II Concentrations	(b)	0.0	
8c. Potential Contamination	(b)	0.0	
8d. Population (lines 8a + 8b + 8c)	(b)	0.0	
9. Resources	5	0.0	
10. Targets (lines 7 + 8d + 9)	(b)		0.0
Drinking Water Threat Score:			
11. Drinking Water Threat Score ([lines 3 x 6 x 10]/82,500, subject to max of 100)	100		0.0
Human Food Chain Threat			
Likelihood of Release:			
12. Likelihood of Release (same value as line 3)	550	0.0	
Waste Characteristics:			
13. Toxicity/Mobility/Persistence/Bioaccumulation	(a)	0.0	
14. Hazardous Waste Quantity	(a)	10.0	
15. Waste Characteristics	1000		0.0
Targets:			
16. Food Chain Individual	50	0.0	
17. Population			
17a. Level I Concentration	(b)	0.0	
17b. Level II Concentration	(b)	0.0	
17c. Potential Human Food Chain Contamination	(b)	0.0	
17d. Population (lines 17a + 17b + 17c)	(b)	0.0	
18. Targets (lines 16 + 17d)	(b)		0.0
Human Food Chain Threat Score:			
19. Human Food Chain Threat Score [(lines 12x15x18)/82,500,suject to max of 100]	100		0.0
Environmental Threat			
Likelihood of Release:			
20. Likelihood of Release (same value as line 3)	550		0.0
Waste Characteristics:			
21. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	0.0	
22. Hazardous Waste Quantity	(a)	10.0	
23. Waste Characteristics	1000		0.0
Targets:			
24. Sensitive Environments			
24a. Level I Concentrations	(b)	0.0	
24b. Level II Concentrations	(b)	0.0	

24c. Potential Contamination	(b)	0.0	
24d. Sensitive Environments (lines 24a + 24b + 24c)	(b)	0.0	
25. Targets (value from line 24d)	(b)		0.0
Environmental Threat Score:			
26. Environmental Threat Score [(lines 20x23x25)/82,500 subject to a max of 60]	60		0.0
Ground Water to Surface Water Migration Component Score for a Watershed			
27. Watershed Score[c] (lines 11 + 19 + 28, subject to a max of 100)	100		0.0
28. Component Score (S_{gs})[c] (highest score from line 27 for all watersheds evaluated, subject to a max of 100)	100		0.0

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 5-1 --SOIL EXPOSURE PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Exposure:			
1. Likelihood of Exposure	550		
Waste Characteristics:			
2. Toxicity	(a)	0.0	
3. Hazardous Waste Quantity	(a)		
4. Waste Characteristics	100		0.0
Targets:			
5. Resident Individual	50		
6. Resident Population:			
6a. Level I Concentrations	(b)	0	
6b. Level II Concentrations	(b)		
6c. Population (lines 6a + 6b)	(b)		
7. Workers	15	0.0	
8. Resources	5		
9. Terrestrial Sensitive Environments	(c)		
10. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)		0.0
Resident Population Threat Score			
11. Resident Population Threat Score (lines 1 x 4 x 10)	(b)		0.0
Nearby Population Threat			
Likelihood of Exposure:			
12. Attractiveness/Accessibility	100	0.0	
13. Area of Contamination	100	5.0	
14. Likelihood of Exposure	500		0.0
Waste Characteristics:			
15. Toxicity	(a)	0.0	
16. Hazardous Waste Quantity	(a)	0.0	
17. Waste Characteristics	100		0.0
Targets:			
18. Nearby Individual	1	0.0	
19. Population Within 1 Mile	(b)		
20. Targets (lines 18 + 19)	(b)		
Nearby Population Threat Score			
21. Nearby Population Threat (lines 14 x 17 x 20)	(b)		0.0
Soil Exposure Pathway Score:			
22. Pathway Score[d] (S_s), [lines (11+21)/82,500, subject to max of 100]	100		0.0

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60
[d] Do not round to nearest integer

TABLE 6-1 --AIR MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Likelihood of Release:		
1. Observed Release	550	
2. Potential to Release:		
2a. Gas Potential to Release	500	
2b. Particulate Potential to Release	500	
2c. Potential to Release (higher of lines 2a and 2b)	500	
3. Likelihood of Release (higher of lines 1 and 2c)	550	
Waste Characteristics:		
4. Toxicity/Mobility	(a)	
5. Hazardous Waste Quantity	(a)	
6. Waste Characteristics	100	
Targets:		
7. Nearest Individual	50	
8. Population:		
8a. Level I Concentrations	(b)	
8b. Level II Concentrations	(b)	
8c. Potential Contamination	(c)	
8d. Population (lines 8a + 8b + 8c)	(b)	
9. Resources	5	
10. Sensitive Environments:		
10a. Actual Contamination	(c)	
10b. Potential Contamination	(c)	
10c. Sensitive Environments (lines 10a + 10b)	(c)	
11. Targets (lines 7 + 8d + 9 + 10c)	(b)	
Air Migration Pathway Score:		
12. Pathway Score (S_a) [(lines 3 x 6 x 11)/82,500][d]	100	

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on sensitive environments is limited to a maximum of 60.
[d] Do not round to nearest integer