

**APPENDIX A**  
**BIBLIOGRAPHY**

POINT SOURCE REFERENCES

TITLE: EPA Permit Compliance System, NPDES permitted Dischargers in Massachusetts. (Includes Effluent Data Statistics for 1988-1990 and Facility Reports.)

DATE: May 30, 1990

AUTHOR: A database maintained by United States Environmental Protection Agency

DATA: Wastewater discharges to all surface waters in the Commonwealth, are regulated by permits which co-issued by U.S. EPA and MA DEP in accordance with guidelines established by National Pollutant Discharge Elimination System. This system sets levels of effluent quality to be maintained by the POTWs and the industrial dischargers and designates implementation schedules for meeting effluent limits for discharges that contribute to water quality standards violations. NPDES permits are usually reviewed and reissued every five years.

EPA Region I Resource Information Center performed a retrieval from PCS. This retrieval consisted of two reports for each Massachusetts Major NPDES discharger: an effluent Statistical Summary Report which summarizes effluent data on an annual basis for 1988, 1989, and 1990; and a Facility Information Report, which provides general permit information on the facility (the discharger).

TITLE: Massachusetts River Basin Water Quality and Wastewater Discharge Data Survey Reports

DATE: 1983-1990 depending on the year that river basin was surveyed.

AUTHOR: Massachusetts Department of Environmental Protection, Division of Water Pollution Control

DATA: The Massachusetts Division of Water Pollution Control provides wastewater discharge data for streams and rivers. The wastewater discharge data are presented in survey reports for a designated river basin. Often these reports include data on the effluent discharge characteristics of the industrial and municipal discharges in that particular river basin. Data were available for 1986 to 1990 for some NPDES outfalls depending how often the drainage basin was surveyed. Typically, the Massachusetts Division of Water Pollution Control surveys report results from grab samples taken at various outfalls within a particular River Basin. Massachusetts DEP Division of Water Pollution Control periodically analyzes wastewater discharges for contaminants that are not specified in the NPDES outfall s permit in addition to typically monitored pollutants.

As part of duties and responsibilities of the Massachusetts Division of Water Pollution Control, periodic examinations of the water quality of various coastal waters, rivers, streams and ponds of the Commonwealth are required. The water quality surveys are conducted periodically within the various coastal river basins. Typically, the Massachusetts Division of Water Pollution Control surveys report results from grab samples taken within a particular River Basin. These surveys are used to develop state surface water standards and devise water quality management plans for a particular river basin. Water quality parameters which are commonly analyzed for, are dissolved oxygen, pH, dissolved metals, alkalinity, biochemical oxygen demand, total phosphorus and total Kjeldahl Nitrogen, etc.

TITLE: U.S. Geological Survey Gazetteers of Hydrologic Characteristics of Streams in Massachusetts- Coastal River Basins of the North Shore, Massachusetts Bay, South Shore, Buzzards Bay, and Merrimack River Basin

DATE: 1984

AUTHOR: United States Geological Survey

DATA: Daily stream flow records are maintained for all US Geological Service gaging stations and the data are available by the gage number. In 1984, the US Geological Service prepared three Gazetteers of hydrologic characteristics of Massachusetts streams categorized by Coastal River Basins in the South Shore and Buzzards Bay, Merrimack River Basin, and the North Shore in cooperation Massachusetts Division of Water Pollution Control.

TITLE: Metal distribution in a major urban estuary (Boston Harbor) impacted by ocean disposal. Chapter 7 in Wolfe, D.A. and T.P. O Connor (eds.), Urban Waste in Coastal Marine Environments, Volume 5 of Oceanic Processes in Marine Pollution. Kreiger, Malibar FL.

DATE: 1988

AUTHOR: Wallace, G.T., J.H. Waugh and K.A. Garner.

DATA: Water quality samples from Mystic, Chelsea, Neponset, and Weymouth Fore River. Collection of samples were made at low tide on 17 and 18 of August and at high tide 6 days later on 23 and 24 of August. Samples were collected at a depth of 10 cm and 13 feet. Water quality analysis included dissolved metals and trace metals in particulate form.

TITLE: Draft Final Report: Assessment of the Chemical Composition of The Fox Point CSO Effluent and Associated Subtidal and Intertidal Environments: Analysis of CSO Effluents and Surficial Sediments for Trace Metals Prior to CSO Modification and, Assessment of the Chemical Composition of the Fox Point CSO Effluent and Associated Subtidal and Intertidal Environments: Analysis of Water Column Samples for Trace Metals Prior to CSO Modification. Massachusetts Department of Environmental Protection

DATE: January 9, 1990

AUTHOR: Wallace, G.T. et al.

DATA: Water samples and surface sediment were collected at the mouth of Neponset River (intertidal area). Concentrations of dissolved and particulate metal concentrations were determined.

TITLE: Storet

DATE: December 1990

AUTHOR: A database maintained by United States Environmental Protection Agency (EPA) Office of Water

DATA: STORET, located at EPA's National Computer Center in Research Triangle Park stores, retrieves, and analyzes water quality information. STORET assists state and EPA officials in making pollution control decisions. The retrieval consisted of water quality data which was collected at the mouths of the various coastal rivers of Massachusetts Bay. Data collected within the last 5 years were retrieved.

TITLE: U.S. Geological Survey Water Resources Data Massachusetts and Rhode Island  
Water Annual Reports

DATE: 1986, 1987, 1988, 1989

AUTHOR: United States Geological Survey

DATA: These annual reports include records of stage discharge, and water quality of streams. The individual gaging station information includes its location (latitude and longitude); drainage area; period of record; gage description; average discharge; extremes for the period of discharge; extremes for period of record; extremes outside period of record; extremes for current year and monthly mean discharge values for that year. Additional water data are collected at various sites, not involved in the systematic data-collection program and are published as miscellaneous discharge measurements. Water quality parameters included dissolved oxygen, temperature, specific conductance and pH.

**TITLE:** National Estuarine Inventory Data Atlas

**DATE:** January 1987

**AUTHOR:** National Oceanic and Atmospheric Administration, National Ocean Service

**DATA:** A summary of land use from the USGS Land Use Data Analysis (LUDA) system and the USDA Soil Conservation Service 1082 National Resource Inventory (NRI). LUDA provided the basic delineation of land-use types. NRI data were used to disaggregate the LUDA agricultural acreage into cropland and pasture, to distinguish between irrigated and nonirrigated cropland, and to determine the specific crops. NRI data were also used to subdivide forest land into areas with good and poor cover. Data were reported by USGS cataloging unit and by county.

(Additional, unpublished information was provided by NOAA which compiled some data by cataloging unit x county.)

**TITLE:** Ground-Water Resources of Cape Cod, Massachusetts. USGS  
Atlas HA-692

**DATE:** 1986

**AUTHOR:** LeBlanc, D. R., J. H. Guswa, M. H. Frimpter, and C. J.  
Londquist.

**DATA:** Recharge, precipitation and stream flow measured throughout  
Barnstable County. Contains the general flow system of groundwater  
for Cape Cod, broken up into six cells.

**TITLE:** Eutrophication of Buttermilk Bay, a Cape Cod Coastal Embayment: Concentrations of Nutrients and Watershed Nutrient Budgets

**DATE:** 1988

**AUTHOR:** Valiela, I., J. E. Costa

**DATA:** Assessment of nutrient concentration and loading data into Buttermilk Bay. Nitrate and ammonia levels were measured in precipitation, groundwater, streams and surface runoff. Contributions from different input sources were calculated, such as septic system input.

**TITLE:** Universal Atlas of Cape Cod & Southern Massachusetts

**DATE:** 1988

**AUTHOR:** Universal Publishing Company

**DATA:** Barnstable County town areas

**TITLE:** none

**DATE:** 1989

**AUTHOR:** Personal communication, Cape Cod Planning and Economic  
Development Commission

**DATA:** Nitrogen application rates for golf courses.

**TITLE:** Land Use Update for Cape Cod and the Islands with Area Statistics for 1951, 1971 and 1980

**DATE:** February 1984

**AUTHOR:** MacConnell, W., D. Swartout, J. Stone

**DATA:** Land use data broken down by town. Categories used include golf course and cranberry bog land use data for 1980.

**TITLE:** None

**DATE:** October 1990

**AUTHOR:** Phone conversations with town clerks and assessors.

**DATA:** Number of residential units and winter (and estimated summer) town populations for the following Cape Cod towns: Sandwich, Barnstable, Yarmouth, Dennis, Brewster, Orleans, Eastham, Wellfleet, Truro, Provincetown, and Bourne.

**TITLE:** Mass-Balance Nitrate Model for Predicting the Effects of Land Use on Groundwater Quality in Municipal Wellhead Protection Areas.

**DATE:** July, 1988

**AUTHOR:** Frimpter, M. H., J. J. Donohue, IV, and M. V. Rapacz

**DATA:** Estimates of nitrate leachability, average lawn size, and typical lawn fertilizer use.

**TITLE:** The Relation of Ground-Water Quality to Housing Density,  
Cape Cod, Massachusetts

**DATE:** 1986

**AUTHOR:** Perskey, J. H.

**DATA:** Summary statistics of nitrate and ammonia groundwater samples from private wells throughout Barnstable County. These samples were taken between 1980 and 1984, some by Barnstable County Health Department, and the remainder by DEQE. The sampling may contain a slight bias, since some samples were taken in new housing developments, where septic systems have not affected groundwater yet. Still other samples are collected when an owner suspects a private well to be contaminated.

TITLE: Ten-Year Boston Harbor Monitoring Program First Report March 1987 - July 1989

DATE: August 15, 1990

AUTHOR: New England Aquarium

DATA: Water samples were taken at the mouths of Chelsea River (depth of 12 m), the Weymouth Fore River (7 m) and the Neponset River (7 m). Total nitrogen and total phosphorus concentrations, averaged for 15-17 samples taken over 2 years (1987-1988). Nitrogen was measured as ammonia, nitrate and nitrite. All three were primarily measured as the dissolved inorganic ion. Total phosphorus was also measured. The data was reported in units of umoles/liter. For our purposes, we converted the units to mg/liter.

**TITLE:** List of Confirmed Disposal Sites and Locations to be Investigated

**DATE:** 1990

**AUTHOR:** Massachusetts Department of Environmental Protection  
Bureau of Waste Site Cleanup

**DATA:** Includes an index of all 4,148 locations and disposal sites that have been identified in Massachusetts. The document identifies the 1,486 sites where releases of oil and/or hazardous substances have been confirmed. The list of both confirmed sites and sites to be investigated was used to identify sites within 500 ft of Massachusetts coastal waterways and the Merrimack River (to Pawtucket Dam).

**TITLE:** National Estuarine Inventory Data Atlas

**DATE:** January 1987

**AUTHOR:** National Oceanic and Atmospheric Administration, National Ocean Service

**DATA:** A summary of land use from the USGS Land Use Data Analysis (LUDA) system and the USDA Soil Conservation Service 1082 National Resource Inventory (NRI). LUDA provided the basic delineation of land-use types. NRI data were used to disaggregate the LUDA agricultural acreage into cropland and pasture, to distinguish between irrigated and nonirrigated cropland, and to determine the specific crops. NRI data were also used to subdivide forest land into areas with good and poor cover. Data were reported by USGS cataloging unit and by county.

(Additional, unpublished information was provided by NOAA which compiled some data by cataloging unit x county.)

**TITLE:** National Coastal Pollutant Discharge Inventory (NCPDI)

**DATE:** 1987

**AUTHOR:** A database and computational framework developed by the National Oceanic and Atmospheric Administration (NOAA) Strategic Assessment Branch.

**DATA:** The NCPDI calculates runoff by separate methods for urban and nonurban land-use types. For urban land, runoff was calculated separately for areas with CSOs and areas without CSOs. For areas with CSOs, estimates of flow were based on the capacity of the wastewater treatment plant. Pollutant loads were calculated by multiplying total flow by typical concentrations of pollutants in CSOs. For areas without CSOs, daily precipitation was summed for each land-use type. The total annual precipitation for each land-use type was multiplied by a land-use-specific runoff coefficient, and these values were summed. Loads were calculated using mean urban runoff concentrations by land use compiled by the National Urban Runoff Program (NURP) (EPA, 1983) and Stenstrom et al. (1984).

Nonurban runoff was calculated using the Simulator Model for Water Resources for Urban Basins (SWRRB) which was developed by the U.S. Department of Agriculture Agricultural Research Service (USDA ARS).

## **ADDITIONAL REFERENCES**

- ARS. 1976. Control of Water Pollution from Cropland. Volume 1, A Manual for Guideline Development, and Volume 2, An Overview. U.S. Department of Agriculture. Agricultural Research Services.
- CH2MHill. 1989. Combined sewer overflow facilities plan. Prepared for the Massachusetts Water Resources Authority.
- EPA. 1983. Results of the National Urban Runoff Program. Executive Summary and 2 Volumes. U.S. Environmental Protection Agency. Monitoring and Data Support Division. NTIS Nos. PB84-185545, PB84-185552, PB84-185560.
- Forstner, U. and G.T.W. Wittmann. Metal pollution in the aquatic environment. With contributions by F. Prosi and J.H. van der Lierde. Second Revised Edition. Springer-Verlag.
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- Hruby, T., S. Cotter, and K. Barnes. 1988. Land use in the coastal drainage area in and around Boston Harbor. Prepared for the Massachusetts Audubon Society.
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- McElroy, A.D., S.Y. Chiu, J.W. Nebgen, A. Aleti, and E. Vandergrift. 1975. Water pollution from non-point sources. Water Res. 9: 675-681.
- Metcalf and Eddy. 1990. Facilities Plan. Prepared for the Massachusetts Water Resources Authority.
- Menzie-Cura Associates Inc. 1991. Boston Harbor: Estimates of loading. Prepared for the Massachusetts Water Resources Authority.
- Neff, J.M. Polycyclic aromatic hydrocarbons in the aquatic environment: Sources, fates, and biological effects. Applied Science Publishers Ltd.
- NOAA. 1987a. The National Coastal Pollutant Discharge Inventory. Urban Runoff Methods Document. National Oceanic and Atmospheric Administration. Strategic Assessments Branch.
- NOAA. 1987b. The National Coastal Pollutant Discharge Inventory. Nonurban Runoff Methods Document. National

Oceanic and Atmospheric Administration. Strategic Assessments Branch.

Shacklette, H.T. and J.G. Boerngen. 1984. Element Concentrations in Soils and Other Surficial Materials in the Coterminous United States. U.S. Geological Services Professional Paper 1270.

Stenstrom, M. and others. 1984. Oil and Grease in Urban Stormwaters. J. Environmental Engineering 110:58-72.

Alpert, D.J. and P.K. Hopke. 1980. A quantitative determination of sources in the Boston urban aerosol. *Atmos. Environ.*, 14: 1137-1146.

Applied target transformation factor analysis to the data of Hopke et al. (1976) to apportion the observed aerosol concentrations to various sources. 90% of V was attributed to oil combustion and 90% of Pb and Br was attributed to auto emissions.

Atlantic Environmental Services. 1988. Management of Manufactured Gas Plant Sites. Vol III. Risk Assessment.

Provides a compilation of PAH concentration levels in air by compound and by environment (i.e., residential, rural, urban and specific locations and seasons).

Connecticut Department of Environmental Protection. 1987. Report on Long Island Sound Study Activities (Draft)--III. Pollutant Loadings to Long Island Sound, pp. 25-54. Connecticut Department of Environmental Protection, Water Compliance Unit.

Estimated atmospheric loadings of nutrients and heavy metals to Long Island Sound based on local measurements and on the scaling, by area ratios, of loading estimates for Chesapeake Bay and the Great Lakes.

DeWiest, F. 1978. Any factors influencing the dispersion and the transport of heavy hydrocarbons associated with airborne particles. *Atmos. Environ.*, 12: 1705-1711. 44% of aerosol-bound fluoranthene was associated with particles > 1 $\mu$ m while no benzopyrenes were associated with that size fraction; the cause may be redistribution of volatile compounds to larger ambient particles, while the less volatile remain on the particles on which they were emitted.

Doskey, P.V. and A.W. Andren. 1981. Modeling the flux of atmospheric polychlorinated biphenyls across the air/water interface. *Environ. Sci. Technol.*, 15: 705-711.

Aerosol deposition velocity of PCBs is estimated as 0.5 cm/s. Vapor phase, defined as fraction passing 0.3  $\mu$ m filter, may actually be bound to submicron particles. Other measurement difficulties: desorption of PCBs from filter, adsorbents are less efficient for the more volatile congeners, usual analytical chemical methods are inadequate to identify and quantitate compounds.

Fogg, T.R. and W.F. Fitzgerald. 1979. Mercury in southern New England coastal rains. *J. Geophys. Res.*, 84: 6987-6989.

Hg concentration in rain was measured at Centerville, MA (Cape Cod) during Sep/Oct 1975; notes the complex nature of scavenging of Hg by rain, that Hg behaves as a vapor rather than as an aerosol.

Galloway, J.N. and D.M. Whelpdale. 1987. WATOX-86 overview and western North Atlantic Ocean S and N atmospheric budgets. *Global Biogeochem. Cycles*, 1(4): 261-281.

Provides estimates of deposition velocity of NO<sub>x</sub>, NO<sub>3</sub>, and HNO<sub>3</sub> and N concentration measured by aircraft 50 km east of Boston.

Galloway, J.N., D.M. Whelpdale and G.T. Wolff. 1984. The flux of S and N eastward from North America. *Atmos. Environ.*, 18: 2595- 2607.

NO<sub>x</sub> concentration for the east coast is reported as a function of latitude range.

Galloway, J.N., J.D. Thornton, S.A. Norton, H.L. Volchok and R.A.N. McLean. 1982. Trace metals in atmospheric deposition: A review and assessment. *Atmos. Environ.*, 16: 1677-1700.  
Summaries of toxic metal concentration in wet deposition for urban and rural areas. No studies for Be, Se, Sn, Te, Tl.

Gladney, E.S., W.H. Zoller, A.G. Jones and G.E. Gordon. 1974. Composition and size distributions of atmospheric particulate matter in the Boston area. *Environ. Sci. Technol.*, 8: 551-559.  
Estimated the concentration of heavy metals in aerosols as a function of aerosol size for two locations in the Boston area, using instrumental neutron activation analysis.

Graham, W.F. and R.A. Duce. 1982. The atmospheric transport of phosphorus to the western North Atlantic. *Atmos. Environ.*, 16: 1089-1097.  
Atmospheric phosphorus concentrations were measured off the eastern coast of North America, with one station located near Cape Cod. Concentration decayed exponentially with distance from the coast; this relationship was used to estimate a total deposition velocity which includes both wet and dry fallout.

Gschwend, P.M., and R.A. Hites. 1981. Fluxes of polycyclic aromatic hydrocarbons to marine and lacustrine sediments in the northeastern United States. *Geochim. Cosmochim. Acta* 45: 2359- 2367.  
PAH flux in Boston Harbor (off Calf Island, an urban area) and at remote areas off the coast of Maine was estimated based on concentrations in core samples and <sup>210</sup>Pb activity. Flux reached a maximum in 1950 (5 to 10 times that in 1980), attributed to coal combustion. No temporal resolution for Boston Harbor due to bioturbation of core samples. Greater concentrations in urban areas is attributed to runoff.

Harvey, G.R. and W.G. Steinhauer. 1974. Atmospheric transport of polychlorobiphenyls to the North Atlantic. *Atmos. Environ.*, 8: 777-782.  
PCB concentration in aerosols and in the vapor phase was measured at Vineyard Sound, Georges Bank, Bermuda, and the Grand Banks.

Hites, R.A. and K. Bieman. 1972. Water pollution: Organic compounds in the Charles River, Boston. *Science*, 178: 158-160.  
Water samples collected weekly from the Harvard Bridge were analyzed for naphthalene. Concentrations were successfully fitted to a runoff model which assumes an exponential dependence on rainfall. A likely source of this naphthalene is auto exhaust condensate washed directly from streets into the Charles River.

Hopke, P.K., E.S. Gladney, G.E. Gordon, W.H. Zoller and A.B. Jones. 1976. The use of multivariate analysis to identify sources of selected elements in the Boston urban aerosol. *Atmos. Environ.*, 10: 1015-1025.  
Concentration of trace metals in aerosols from samples collected in 1970 from locations around Boston Harbor were analyzed using instrumental neutron activation. Identified an incinerator in Somerville, auto emissions, and oil-fueled power plants in East Cambridge and Charlestown as sources.

Jaffrezo, J.-L. and J.-L. Colin. 1988. Rain-aerosol coupling in urban area: Scavenging ratio measurements and identification of some transfer processes. *Atmos. Environ.*, 22(5): 929-935.  
Washout ratios of Zn, Fe and other elements were calculated from measurements taken in Paris. Power law relates concentration in rain to concentration in air.

Keeler, G.J. and P.J. Samson. 1989. Spatial representativeness of trace element ratios. *Environ. Sci. Technol.*, 23(11): 1358-1364.

Quantitative transport bias analysis was used to infer the source areas for trace elements measured in aerosol samples taken at six locations in the northeastern United States during August, 1983. The nearest location to Massachusetts Bay was Narragansett, RI. Se and Zn were associated with coal combustion in the Midwest; Zn was also associated with incineration, smelters, and the iron-steel industry. V was associated with oil combustion in the northeast. As was associated with the Midwest and with smelters in the Sudbury region of Canada. Sb was associated with coal combustion, incineration and antimony roasting along the east coast from Washington, D.C. to Connecticut.

Kertesz-Saringer, M., E. Meszaros and T. Varkonyi. 1971. On the size distribution of benzo[a]pyrene containing particles in urban air. *Atmos. Environ.*, 5: 429-431. Half of B[a]P measured in Budapest is in the size range  $<0.3 \mu\text{m}$  (median diameter); distribution may be bimodal, extending to 12-14  $\mu\text{m}$  diameter.

Ligocki, M.P., C. Leuenberger and J.F. Pankow. 1985a. Trace organic compounds in rain--II. Gas scavenging of neutral organic compounds. *Atmos. Environ.*, 19: 1609-1617.

Table of gas scavenging ratios is presented for PAHs.

Ligocki, M.P., C. Leuenberger and J.F. Pankow. 1985b. Trace organic compounds in rain--III. Particle scavenging of neutral organic compounds. *Atmos. Environ.*, 19: 1619-1626.

Table of particle scavenging ratios is presented for PAHs.

Lowenthal, D.H., K.A. Rahn, G.D. Thurston and J.D. Spengler. 1987. A quantitative assessment of source contributions to inhalable particulate matter pollution in metropolitan Boston. Discussion. *Atmos. Environ.*, 21(1): 257-265.

Discussion between L/R and T/S regarding apportionment of observed aerosol concentrations to sources.

Mackay, D., S. Patterson, W.H. Schroeder. 1986. Model describing the rates of transfer processes of organic chemicals between atmosphere and water. *Environ. Sci. Technol.*, 20: 810-816.

Fugacity model for PCBs is presented which includes volatilization, absorption, dry deposition of particles, wet deposition (washout) and dissolution in rain. Observed washout ratios for PCBs are given.

McMahon, T.A. and P. Dennison. 1979. Empirical atmospheric deposition parameters--A survey. *Atmos. Environ.*, 13: 571-585.

Particle velocities and washout ratios for trace metals from Gatz (1973), Cawse (1974) and Chamberlain (1960).

McVeety, B.D. and R.A. Hites. 1988. Atmospheric deposition of polycyclic aromatic hydrocarbons to water surfaces: A mass balance approach. *Atmos. Environ.*, 22: 511-536.

Estimates aerosol deposition velocity for PAHs based on measurements taken in the region of northern Lake Superior. Gives ratio of dry to wet deposition.

Measures, C.I., B. Grant, M. Khadem, D.S. Lee and J.M. Edmond. 1984. Distribution of Be, Al, Se, and Bi in surface waters of western North Atlantic and Caribbean. *Earth Planet. Sci. Lett.*, 71: 1-12.  
Enrichment of Be in North Atlantic waters with respect to North Pacific appears dominated by fluvial sources; atmospheric deposition is negligible.

Misanchuk, B.A., D.R. Hastie and H.I. Schiff. 1987. The distribution of nitrogen oxides off the east coast of North America. *Global Biogeochem. Cycles*, 1(4): 345-355.  
Measured the concentration of NO<sub>x</sub> from an aircraft located 50 km east of Boston.

National Atmospheric Deposition Program. 1989. Annual and seasonal deposition totals for Barnstable County, MA and Middlesex County, MA. Personal communication, W. Gary Williams.  
Measurements of nutrient wet deposition by season and by year for the period 1981 through 1988.

Nicholson, K.W. 1988. The dry deposition of small particles: A review of experimental measurements. *Atmos. Environ.*, 22(12): 2653-2666.  
Notes an unacceptable disagreement in the measured values of the depositional velocity of small particles. One confounding influence is high humidity.

Rahn, K.A. 1981. The Mn/V ratio as a tracer of large-scale sources of pollution aerosol for the arctic. *Atmos. Environ.*, 15: 1457-1464.  
Measured concentration of total and non-crustal Mn and V at a rural site at Narragansett, RI.

Rahn, K.A. and D.H. Lowenthal. 1984. Elemental tracers of distant regional pollution aerosols. *Science*, 223: 132-139.  
Monitored remote site at Narragansett, RI for arsenic, antimony, selenium, non-crustal vanadium, zinc, non-crustal manganese and indium. Boston source aerosol was measured during favorable winds.

Scudlark, J.R. and T.M. Church. 1988. The atmospheric deposition of arsenic and association with acid precipitation. *Atmos. Environ.*, 22(5): 937-943.  
As flux (dry and wet deposition) was measured at Lewes, DE. As identified as a tracer of coal combustion.

Sehmel, G.A. 1980. Particle and gas dry deposition: A review. *Atmos. Environ.*, 14: 983-1011.  
Compilation of deposition velocities for an extensive list of elements. In many cases the range of V<sub>d</sub> given is very large.

Shiaris, M.P. and D. Jambard-Sweet. 1986. Polycyclic aromatic hydrocarbons in surficial sediments of Boston Harbor, Massachusetts, USA. *Mar. Pol. Bul.*, 17: 469-472.  
Measured PAH concentration in core samples taken from 24 locations within and near to Boston Harbor. Areas of highest concentration were the Inner Harbor, and offshore of Logan Airport and Moon Island. Urban runoff is attributed as the source for the first two areas, sewage overflow for the third.

Swackhamer, D.L., B.M. McVeety and R.A. Hites. 1988. Deposition and evaporation of polychlorobiphenyl congeners to and from Siskiwit Lake, Isle Royale, Lake Superior. *Environ. Sci. Technol.*, 22: 664-672.

Measured concentration of PCBs in air, rain, snow, water and sediments during winter and summer. Dry deposition velocity was given. Wet deposition is 3X greater than dry, dominated by particle washout. PCBs are associated with submicron particles in air.

Thurston, G.D. and J.D. Spengler. 1985. A quantitative assessment of source contributions to inhalable particulate matter pollution in metropolitan Boston. *Atmos. Environ.*, 19: 9-25.

Measurements of trace metals in Watertown, MA for fine (<2.5 $\mu$ m) and coarse (2.5 to 15 $\mu$ m) fractions. Absolute Principal Component Scores plus regression were used to estimate sources: Soil (Si, Fe, Ca); Auto emissions (Br, Pb); Coal combustion, non-local (Se, S); Residual oil (Ni, V); Salt (Cl). Se is associated with As, traceable to Ohio Valley.

U.S. Environmental Protection Agency. 1990. Aerometric Information Retrieval System, Air Quality Subsystem, Quick Look Report. Personal communication, Ms. Bonnie Potocki.

Data table of concentration of Benzo[a]pyrene measured at locations in the Boston area.

Wallace, G.T. Jr., G. Hoffman, and R.A. Duce. 1977. The influence of organic matter and atmospheric deposition on the particulate trace metal concentration of northwest Atlantic surface seawater. *Mar. Chem.*, 5: 143-170.

Major mass of Cu, Zn, Pb, Cd is associated with particles of <1 $\mu$ m. A single estimate of dry deposition velocity is provided for these elements.

Walsh, P.R., R.A. Duce and J.L. Fasching. 1979. Tropospheric arsenic over marine and continental regions. *J. Geophys. Res.*, 84: 1710-1718.

Measurements at Providence (urban), 1.7(1.7) ng/m<sup>3</sup> particulate and 0.21(0.23) ng/m<sup>3</sup> vapor; Narragansett (rural coast); and Bermuda, Oahu, Samoa (marine). Can't distinguish natural and anthropomorphic sources.

Windsor, J.G. and R.A. Hites. 1979. Polycyclic aromatic hydrocarbons in Gulf of Maine sediments and Nova Scotia soils. *Geochem. Cosmochim. Acta*, 43: 27-33. Sediment samples collected along a line trending NE from Boston Harbor showed an exponential decrease in PAH concentration. The source of PAH in concentrations > 50 ppb is attributed to urban runoff of large particulates which settle rapidly. Low level concentrations are due to long-range aeolian transport of smaller particulates. Size distribution of PAH aerosols was noted to be bimodal, with modes at 1  $\mu$ m and > 10  $\mu$ m.

Whitby, K.T., R.E. Charlson, W.E. Wilson and R.K. Stevens. 1974. The size of suspended particle matter in air. *Science*, 183: 1098- 1100.

Discussion. Whitby et al. (1972) showed atmospheric aerosols to have a bimodal, rather than a unimodal, mass distribution. One mode is < 1 $\mu$ m, another in the 5 to 15  $\mu$ m range; each mode has different sources.

Wood, J.M. 1974. Biological cycles for toxic elements in the environment. *Science*, 183: 1049-1052.

Identified toxic or potentially toxic metals.

Zoller, W.H., and G.E. Gordon. 1970. Instrumental neutron activation analysis of atmospheric pollutants utilizing Ge(Li) gamma-ray detectors. *Analyt. Chem.*, 42: 257-265.

Concentration of trace elements in aerosols was analyzed in samples collected in Cambridge, Boston, and Wellesley. V was observed in very high concentrations, perhaps resulting from the burning of residual oil.

**APPENDIX B**

**SEDIMENT DATA FOR MASSACHUSETTS BAYS**

## GLOUCESTER HARBOR, personal communication Dr. Alan Michael

	Stat 6	Stat 1
Sed Class 1		1
Arsenic	2.10	2.80
Cadmium	0.48	0.28
Chromium	0.22	11.00
Copper	10.00	11.00
Lead	18.00	8.60
Mercury	0.091	0.032
Nickel	6.70	5.20
Zinc	35.00	19.00

All measurements in mg/Kg wet weight.

## SALEM HARBOR from Tier II - Chemical Evaluation Report, 1991

	BW1	BW2	BW3	BW4	BW6	S2	S3	S6
Sed Class	3	1	1	1	1	3	3	3
Arsenic	12.00	6.00	1.00	3.00	3.00	4.00	5.00	7.00
Cadmium	2.80	0.60	0.04	0.04	0.60	0.05	2.00	2.20
Chromium	87.00	36.00	16.00	9.00	14.00	320.00	660.00	770.00
Copper	170.00	11.00	21.00	4.00	5.00	31.00	64.00	110.00
Lead	520.00	16.00	95.00	4.00	6.00	59.00	110.00	260.00
Mercury	2.40	0.04	0.12	0.04	0.04	0.25	0.54	1.00
Nickel	24.00	21.00	8.00	7.00	12.00	16.00	2.30	24.00
Zinc	340.00	50.00	69.00	14.00	21.00	65.00	110.00	200.00
Total PAH	32.00	0.00	4.60	0.30	0.70	4.90	7.60	22.60
Total PCB	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

All data in U<sub>g</sub>/g dry weight. BDL = Below Detection Limits.

## NATIONAL STATUS AND TRENDS PROGRAM, 1988 Fine sediments

STATION	SAL	CASI
Sed class	3	3
Ag	2.83	0.32
As	19.24	20.91
Cd	9.79	0.51
Cr	3373.98	103.42
Cu	125.67	33.38
Hg	1.68	0.25
Ni	46.03	41.79
Pb	260.1	108.9
Sb	5	7.03
Se	1.48	0
Sn	19.14	8.61
Zn	342	155

METALS IN ug/g DRY WEIGHT

North Shore

DISTRIBUTION OF POLLUTED MATERIALS IN MASS BAY, NEA, 1976

Stations	C1A	C1B	C2A	C2B	C3A	C3B	C5A	C5B
sed class	2	3	3	2	3	3	3	2
Cd	0.89	1.05	1.52	1.88	2.25	2.82	0.65	0.69
Cr	73	87	382	157	1042	545	96	68
Cu	32.8	34.3	18.3	16.3	26.7	55.2	36.7	20.4
Hg	98	227	203	146	150	135	184	58
Ni	9.8	8.2	2	9.2	11.9	36	38.7	16
Pb	0.55	55	45	23	71	76	35	21
Zn	78	70	42	34	117	161	113	44
METALS IN ppm dry weight								
PCB ppb	22.5	16.1	23	6.6	26.1	30.5	21.6	22

NATIONAL STATUS AND TRENDS PROGRAM, 1986 Fine sediments

STATION BHD1

Sed class	2
Ag	4.64
As	11.62
Cd	1.68
Cr	284.99
Cu	155.27
Hg	1.05
Ni	41.23
Pb	166.44
Sb	10.01
Se	0.87
Sn	22.56
Zn	213

METALS IN ug/g DRY WEIGHT

ORGANIC DATA IN NG/G DRY WEIGHT

Tot DDT	36.59
Tot CHP	17.88
Tot PCB	357.24
Tot PAH	6546

BOSTON HARBOR SURVEY, MASS DEP, 1990

1987 SURVEY		1986 SURVEY		1985 SURVEY		
Station	BH01	Station	BH01	BH01A	Station	BH01
sed class	3	sed class	2	3		3
Al	10800	Ag	1.6	1.2	Ag	1
Cd	2.3	Cd	2	5.2	As	12
Cr	140	Cr	52	156	Cd	1
Cu	320	Cu	85	400	Cr	40
Ni	24	Hg	0.36	1.176	Cu	90
Pb	220	Ni	19	60	Ni	17
Zn	360	Pb	172	440	Pb	230
		Zn	212	640	Zn	235

METALS IN mg/kg DRY WEIGHT

Tot PCB	0.44	Tot PCB	1.04	2.98	Tot PAH	67.54
		Tot PAH	54.51	8.26	Tot PCB	0.63

ORGANICS IN ug/g DRY WEIGHT

ORGANIC POLLUTANT BIOGEOCHEMISTRY STUDIES, BATTELLE, 1984

Stations	BH-2
Total PAH (ug/g)	880
Total PCB (ng/g)	139

Mystic

APPLICATION FOR WAIVER 301(h), NUT & DEER ISLANDS, 1984, METCALF & EDDY FROM DWPC 1972

Station	96	97
sed class	2	3
Cd	1.5	3.2
Cr	68	38
Cu	63	170
Hg	1.45	1.2
Ni	24	38
Pb	140	640
Zn	130	650

Units mg/kg dry weight

SAMPLING, 1979

Station	1			4			6			7 Stations			
	3	2	2	2	2	2	DIA	DIC	DIB	DOA			
Ag	13.7	7.8	4.7	7.3	Ag	0.1	0.01	0.1	1.6				
Cd	11.1	4.5	3.5	3.8	An	2	2	2	3				
Cr	0.257	0.292	0.224	0.21	As	4	3	4	4				
Cu	0.367	0.134	0.116	0.139	Be	5.1	3.9	3.1	8.1				
Hg	4.9	5.9	8	4.7	Cd	0.6	4.1	3.5	2.6				
Pb	0.7	0.123	0.115	0.122	Cr	35.9	101	84	216				
Zn	0.803	0.233	0.194	0.216	Cu	29	331	259	142				
Units mg/g dry weight				Hg				0.45	1.2	0.63	0.82		
Station	1			6			7						
PCBs (ng/g)	889			137			94						
				Se				2	2	2	3		
				Th				3	3	3	5		
				Zn				67.4	224	190	207		

Units ug/g

SAMPLING '84

Stations	3	4	5
sed class	2	3	2
Ag	0.4	1.3	0.2
An	7.7	26	4.8
As	11.5	38.9	7.2
Be	6.9	26.4	2.2
Cd	1.5	10.4	2.6
Cr	188	852	71.4
Cu	92.7	397	129
Hg	1.24	4.5	0.49
Ni	23	87	11.3
Pb	77	130	72
Se	1.9	6.5	1.2
Th	15.3	51.9	9.6
Zn	156	758	281

Units ug/g

Mystic

MYSTIC, MALDEN AND ISLAND END RIVERS, DEQE

Metals in ug/g dry weight

STATION	28	23	44	39	41	34
sed class	3	3	3	3	3	3
Antimony	6.9	13	3.9	6.8	8.1	7
Arsenic	27	340	2.7	44	25	12
Beryllium	0.57	1.1	0.32	0.57	0.67	0.58
Cadmium	11	12	1.2	9.5	6.5	2.1
Chromium	97	150	9.4	140	49	34
Copper	150	200	24	250	150	55
Lead	270	390	130	220	380	350
Mercury	0.41	0.777	0.121	0.982	0.605	0.244
Nickel	45	64	13	77	37	23
Selenium	6.1	11	3.2	5.8	6.5	6
Silver	1.1	2.2	0.65	1.1	6.3	1.2
Thallium	0.61	1.1	0.32	0.58	0.57	0.6
Zinc	850	1700	95	430	870	250
TOT PAH ug/kg	23000	2000	68000	44000	463000	35000
PCB ug/g	6.7	4.3		1.6	1.8	0.3

STATION	6	5	4	7	17	3
sed class	3	3	3	3	3	3
Antimony	9.6	4.9	7.4	14	15	6.1
Arsenic	26	37	25	26	130	26
Beryllium	0.8	0.41	0.62	1.2	1.2	0.91
Cadmium	8.5	5.8	3.9	16	12	4.4
Chromium	96	61	70	130	96	72
Copper	330	84	120	740	560	67
Lead	790	89	170	1400	350	160
Mercury	1.78	1.02	0.892	1.71	1.25	0.521
Nickel	35	18	25	56	110	0.2
Selenium	2.6	1	1.2	2.4	2.9	1.2
Silver	5	0.82	1.2	7.7	7	1
Thallium	1.6	0.81	1.2	2.4	2.4	1
Zinc	630	310	230	1400	660	250
TOT PAH ug/kg	1610000	4000	42000	789000	561000	110000
PCB ug/g	3.3 ND		0.66	4.7	2.2	1.1

## TRACE METAL ANALYSIS OF BOSTON HARBOR WATER SEDIMENTS, 1972

OUTER HARBOR Surface concentrations in ppm.

STATION	DF1	DF2	DF3	DF4	DF5	DF6	IH2	IH1	IH3
sed class	3	3	3	3	2	3	3	3	3
Cadmium	13.4			7.6	0.8	4.8	10	3.3	7.8
Chromium	165			402	109	179	144		174
Cobalt	11			18	29	9	13.9	13.6	6.8
Copper	108			206	63	105	310	226	357
Lead	102			151	44	91	675	161	411
Mercury	0.9	3.3	2.5	2.4	0.3	4	1.5	0.92	2.33
Molybden	3.5			9.4	4.7	9	12.3	5	7.5
Nickel	25			38	65	23	45	44	87
Vanadium	49			111	74	52	510	416	1110
Zinc	171			400	126	188	1230	445	985

NATIONAL STATUS AND TRENDS PROGRAM, 1988 Fine sediments

STATION	BOS
Sed class	3
Ag	11.65
As	16.98
Cd	3.24
Cr	419.32
Cu	256.13
Hg	1.7
Ni	53.9
Pb	207.37
Sb	12.32
Se	1.29
Sn	42.86
Zn	452

METALS in ug/g DRY WEIGHT

ORGANICS in ng/g DRY WEIGHT

Tot DDT	34
Tot ChIP	47.87
Tot PCB	11218.76
Tot PAH	57778

BOSTON HARBOR SURVEY, MASS DEP, 1990

1986 SURVEY		1985 SURVEY			
Station	BH04A	Station	BH04	BH05	BH06
sed class	3		3	3	3
Ag	1.2	Ag	1.5	2	1.5
Cd	4.4	Al			21100
Cr	220	As	9.3	19	22
Cu	296	cd	8	6	2.5
Hg	1.288	Cr	115	245	210
Ni	0.39	Cu	295	265	160
Pb	300	Ni	40	38	30
Zn	392	Pb	250	305	110
	Zn		550	330	220

METALS IN mg/kg DRY WEIGHT

ORGANICS in ug/g DRY WEIGHT		05-S	06-S		
Tot PCB	2.57	Tot PCB	7	0.68	0.27
Tot PAH	10.83	Tot PAH	16.6	24	

ORGANIC POLLUTANT BIOGEOCHEMISTRY STUDIES, BATTELLE, 1984

Stations	BH-1
Total PAH (ug/g)	2.7
Total PCB (ng/g)	70.4

Charles

APPLICATION FOR WAIVER 301(h), NJT & DEER ISLANDS, 1984, METCALF & EDDY

FROM DWPC 1972	SAMPLING '79, M&E.		SAMPLING '84		
Station	98 Station	2	3 Stations	1	2
sed class	3 sed class	3	2 sed class	3	3
Cd	6 Ag	9.2	0.133 Ag	3.5	1.9
Cr	240 Cd	8.8	0.081 An	6	6.4
Cu	220 Cr	0.418	0.16 As	8.8	9.6
Hg	2.2 Cu	0.339	0.084 Be	8.85	8.9
Ni	37 Hg	6.3	7.5 Cd	5.3	3.2
Pb	260 Pb	0.402	2.8 Cr	350	274
Zn	350 Zn	0.506	6.8 Cu	267	168
Units mg/kg dry weight			Hg	1.79	1.58
			Ni	41.5	31.1
			Pb	235	128
			Se	1.5	1.6
			Th	12	12.8
			Zn	406	252

UNITS ug/g DRY WEIGHT

PCBs (ng/ 414 170

POST DREDGING STUDIES AT THE CHARLES RIVER DAM SITE, NEA 1973

Station	1	2	3	4	5	6
sed class	3	3	1	3	3	3
Cd	2.4	20.1	1.1	4.1	4	4.8
Cu	279	449.2	74.3	369.2	299.5	252.3
Hg	0.99	2.84	0.48	1.59	2	3.52
Pb	1051.8	1024	58.4	465.6	410.6	409.3
Zn	497.8	1189.4	95.4	416.6	751.1	628.3

Units ppm dry weight

CONTAMINANT LEVELS IN BOSTON HARBOR, ZDANOWICZ

STATION	BT1	BT2
sed class	1	2
Cadmium	0.95	3.31
Chromium	43	227
Copper	37.6	134
Lead	37.8	107

All measurements in ug/g dry weight.

PROGRESS REPORT BOSTON HARBOR STUDY OF SOURCES.,1990

Data From Core X, Inner Harbor. Data in ug/g.

sed class	3	
Aluminum	69.34	From top .5 cm.
Cadmium	2.27	
Chromium	325.46	
Copper	284.03	
Iron	49.17 mg/g	
Lead	465.94	
Manganese	420.02 mg/g	
Nickel	48.11	
Zinc	345.92	

TRACE METAL ANALYSIS OF BOSTON HARBOR WATER SEDIMENTS,1972

STATION IH4

sed class	3
Cadmium	29
Chromium	116
Cobalt	17.5
Copper	494
Lead	595
Mercury	5.7
Molybdenur	14
Nickel	75
Vanadium	600
Zinc	1360

Neponset

NATIONAL STATUS AND TRENDS PROGRAM, 1988

STATION BHDB

Sed class	2
Ag	4.34
As	16.71
Cd	1.87
Cr	265.25
Cu	157.39
Hg	1.09
Ni	40.28
Pb	175.8
Sb	9.43
Se	0.7
Sn	20.67
Zn	242

METALS IN ug/g DRY WEIGHT

ORGANIC DATA IN NG/G DRY WEIGHT

Tot DDT	62.39
Tot CHIP	31.06
Tot PCB	876.67
Tot PAH	8901

BOSTON HARBOR SURVEY, MASS DEP, 1990

1987 SURVEY

1986 SURVEY

1985 SURVEY

Station	BH10A	BH10B	BH10S	Station	BH09	BH10A	BH10B	Station	BH10
sed class	3	2	3	sed class	2	2	3		2
Al	10400	7700	6400	Ag	2.4	1.6	1.6	Ag	2
Cd	2.2	2.9	1	Cd	1.6	2.8	2.8	As	12
Cr	150	140	70	Cr	100	132	92	Cd	2
Cu	540	130	150	Cu	96	128	96	Cr	124
Ni	22	16	15	Hg	0.784	0.856	0.44	Cu	128
Pb	180	200	420	Ni	19	20	17	Hg	1.3
Zn	330	260	130	Pb	120	196	204	Ni	22
				Zn	148	220	212	Pb	160
				METALS IN mg/kg DRY WEIGHT			Zn		192

Tot PCB	0.85	2.4	1.12	Tot PCB	0.83	0.86	5.47	Tot PCB	1.7
PCB'S IN ug/g DRY WEIGHT			Tot PAH	1.16	2.47	5.82	Tot PAH	3.43	

Neponset

APPLICATION FOR WAIVER 301(h), NUT & DEER ISLANDS, 1984, METCALF & EDDY  
FROM DWPC 1972

FROM DWPC 1972

Station	153	154	155	156	157	158	159	160	161
	3	3	3	3	3	2	1	3	3
Cd	4.1	1.8	1.4	2.2	2.2	1.7	0.3	6.8	7.1
Cr	220	48	160	190	130	69	14	230	210
Cu	170	38	120	150	120	82	14	180	180
Hg	3	1.1	1.8	2.1	1.9	1.2	0.14	2.3	2.4
Ni	46	20	38	44	38	25	12	47	43
Pb	200	58	170	170	150	150	34	160	330
Zn	340	490	220	750	210	300	190	280	290

Units mg/kg dry weight

Station	162	163	164	165	166
sed class	3	3	3	3	3
Cd	3.1	2.4	3.6	9.3	6.9
Cr	130	38	95	190	66
Cu	110	92	80	150	270
Hg	2.1	0.95	1.5	2.7	1
Ni	35	17	27	38	25
Pb	160	400	120	220	1000
Zn	180	240	170	270	570

CDM 79 Survey

Station	A	B	C	D	E
sed class		3 1		3 3	1
Cd		3 2		2 2	2
Cr		79.1 72		73 110	36
Cu		123 59.5		64 115	31.5
Hg		0.75 0.34		1.6 0.78	0.36
Ni		27 23		23 37	24
Pb		280 96		100 200	78
Zn		220 84.5		75 195	80

Units mg/kg dry weight

Station	F	G	H	J	K	L	M
sed class		3 3		3 3		3	3 3
Cd		4 3		5 9		6	9 7
Cr		230 205		170 96		155	13 260
Cu		210 175		170 255		190	200 230
Hg		1.5 1.3		0.65 1.5		1.3	1.7
Ni		45 43		81 56		40	39 52
Pb		300 280		280 1950		500	260 320
Zn		300 240		405 830		345	250 265

Units mg/kg dry weight

Neponset

SAMPLING, 1979

Station	11	17	24	25	29
sed class	2	2	1	1	2
Ag	5.1	4.6	7	3.1	9.2
Cd	2.4	3.1	1.8	1.3	2.16
Cr	0.184	0.129	0.07	0.068	0.113
Cu	0.121	0.102	0.057	0.046	0.087
Hg	4.7	5	3.7	1.7	4.53
Pb	0.144	0.144	0.059	0.065	0.125
Zn	0.173	0.198	0.105	0.085	0.171

Units mg/g dry weight

Station	11
PCBs (ng/	243

SAMPLING '84

Stations	12	13	14	15	16	17	18
sed class	2	1	2	2	2	3	2
Ag	0.1	0.1	0.1	0.2	0.3	2.4	0.3
An	2	2	1	2	6	7.9	3
As	3.2	2.4	2	4.2	8	11.9	2.2
Be	6.56	5	5.08	7.21	9.29	14.9	8.94
Cd	1.4	0.4	0.9	0.6	1.4	4	1.1
Cr	167	62.6	98.5	73.2	217	358	20.3
Cu	87.9	39.1	67.9	50.6	154	292	126
Hg	0.76	0.4	1	0.57	0.56	2.64	1.45
Ni	19.9	12.2	17.6	17.7	28.4	46.2	24.8
Pb	92	55	11	73	142	237	142
Se	0.6	0.5	0.4	0.6	1.4	2	0.8
Th	5	4	3	5	11	15.8	6
Zn	146	79.2	140	105	214	427	177

Units ug/g

ASSESSMENT OF THE CHEMICAL COMPOSITION OF THE FOX POINT..., 1990

STATION	Savin Hill Cove		Thompson Island		Neponset River	
	Min	Max	Min	Max	Min	Max
Aluminum	51.6	83.5	58.3	86.6	52.8	91.6
Cadmium	1.96	2.6	0.43	4.55	0.69	1.4
Chromium	196.7	247.9	63.4	308.7	64.8	121.9
Copper	163.5	206.3	43.2	257.9	32.3	76.6
Iron	39.2	55.4	33.5	45	23.2	34.9
Lead	202.7	279.6	63	234.7	66.5	121.4
Manganese	0.521	0.981	0.415	0.796	0.433	0.58
Nickel	31.1	42.9	21.9	41.9	15.7	28.4
Zinc	213.1	338.8	42	279.6	34.4	210.2

Min max data expressed in ug/g for top .5cm of core.

Neponset

TRACE METAL ANALYSIS OF BOSTON HARBOR WATER SEDIMENTS, 1972

OUTER HARBOR Surface concentrations in ppm.

STATION	TL1	TL2	TL3	TL4	TL5a	TL5B	TL6	3 TL8	QB1
sed class	3	3	3	3	3	3	3	3 TL8	QB1
Cadmium	5						5.4		2 3
Chromium	145					141	229		3.6 11.2
Cobalt	15						12		92 433
Copper	117					129	265		12 37
Lead	116					199	153		35 363
Mercury	2.8	4.1	3.5	2.3	1.8	1.8		3.8	52 256
Molybden	8				4.6	6.7			1.4 3.9
Nickel	31				9	38			8.9 4.9
Vanadium	57				40	38			36 57
Zinc	256				427	396			79 48
									205 455
STATION	QB2	QB3	QB4	QB5	DB1	DB2	DB3	2 DB4	
sed class	2	3	2	2	2	3		2 DB4	
Cadmium	2.4	2.7	1	2.9	2.7	14.9			2
Chromium	4	312	254	57	122	125			2.7
Cobalt	0.2	24	1	18	9	15			19
Copper	48	212	57	35	120	88			4
Lead	20	241	72	56	60	128			24
Mercury	1.1	3.5	0.9	0.8	0.2		1.2		21
Molybden	4.8	8	4	7.3	3.9	1.9			0.5
Nickel	19	51	28	22	34	35			0.8
Vanadium	51	100	42	50	68	53			14
Zinc	130	312	112	108	261	213			19
									61
STATION	DB5	DB6	DB7	DB8	DB9	DB10	DB11	2 DB12	
sed class	2	3	3	3	3	2		2 DB12	
Cadmium	3.7			5.2	8.6			0.9	3
Chromium	135			225	274			38	
Cobalt	16			23	34			14	
Copper	40			118	129			25	
Lead	136			130	172			13	
Mercury	1.5	2.7	2.6	2.7	2.6	1		0.7	
Molybden	4.2			4.5	11			6.4	1.8
Nickel	23			33	43			33	
Vanadium	64			103	129			32	
Zinc	223			195	288			131	

Neponset

STATION	DB13	DB14	DB15	DB16	DB17
sed class	3	1	2	3	2
Cadmium	6.3		3.3		4.4
Chromium	128		166		97
Cobalt	6		11		22
Copper	108		97		102
Lead	117				177
Mercury	6.7	0.4	1.1	2.1	1.3
Molybden	6		2.2		2.1
Nickel	35		29		35
Vanadium	43		45		60
Zinc	183		194		245

NATIONAL STATUS AND TRENDS PROGRAM, 1988 Fine sediments  
STATION BHHB

Sed class	2
Ag	5.28
As	7.77
Cd	1.29
Cr	260.87
Cu	119.61
Hg	0.92
Ni	65.28
Pb	162.23
Sb	19.74
Se	0.96
Sn	16.29
Zn	265

METALS IN ug/g DRY WEIGHT

ORGANIC DATA IN NG/G DRY WEIGHT

Tot DDT	34.22
Tot CHIP	20.35
Tot PCB	329.11
Tot PAH	4142

BOSTON HARBOR SURVEY, MASS DEP, 1990  
1987 SURVEY      1985 SURVEY

Station	BH12	Station	BH12	BH12A
sed class	1		3	2
Al	5750	Ag	3	1
Cd	0.5	As	53	9.4
Cr	84	Cd	2	1.5
Cu	60	Cr	50	150
Ni	13	Cu	90	120
Pb	67	Ni	20	20
Zn	83	Pb	60	145
		Zn	165	180

METALS IN mg/kg DRY WEIGHT

Tot PCB	0.23	Tot PCB	0.44
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PCB'S IN ug/g DRY WEIGHT

ORGANIC POLLUTANT BIOGEOCHEMISTRY STUDIES, BATTELLE, 1984

Stations	BH-4	BH-5	BH-6
Total PAH (ug/g)	6.5	6	2.4
Total PCB (ng/g)	330	100	60.6

Weymouth

APPLICATION FOR WAIVER 301(h), NUT & DEER ISLANDS, 1984, METCALF & EDDY  
 SAMPLING, 1979      SAMPLING, 1982      SAMPLING '84

Station	30 Stations	CH	Stations	21	22	23
sed class	1		1 sed class	1	2	1
Ag	6.8 Ag		0.1 Ag	0.1	0.2	0.1
Cd	2.5 An		2 An	2	3	2
Cr	0.081 As		2 As	3	5	4.2
Cu	0.061 Be		7 Be	5.81	6.52	5.11
Hg	6 Cd		0.3 Cd	0.6	0.5	0.4
Pb	0.074 Cr		75.5 Cr	71.8	137	74.2
Zn	0.143 Cu		42.8 Cu	42.9	81.3	40.4
Units mg/g dry weigh	Hg		0.24 Hg	0.48	0.76	0.24
	Ni		16 Ni	23	24.7	13
	Pb		2 Pb	87	152	75
	Se		2 Se	0.5	0.8	0.5
	Th		4 Th	4	6	4
	Zn		26.9 Zn	109	146	88.1
	Units ug/g		Units ug/g			

A HISTOPATHOLOGICAL AND CHEMICAL ASSESSMENT..., EPA, 1988

STATION	QBAYC1	QBAY3	QBAY4	QBX1	QBX2	QBX3	QBX4
sed class	1	1	1	2	2	2	1
Cadmium	0.81	1.68	0.64	0.51	0.4	1.87	0.61
Chromium	45.8	73.3	56.7	117.6	117	157	67
Copper	44.5	316	51.2	83.4	72.5	139	56.4
Lead	46.8	147	43.7	86	83.9	134	54.9
Mercury	0.442	0.784	0.391	0.805	0.04	0.006	0.1
Metals measured in w/g dry weight				From top 2" of core.			
TOT PAH				5810	6650	18400	3150
TOT PCB				5.91	4.65	5.38	3.6
Organics measured in ng/g dry weight				From top 2" of core.			

CONTAMINANT LEVELS IN BOSTON HARBOR, ZDANOWICZ

STATION	BT4	BT5	BT6
sed class	1	2	1
Cadmium	0.58	3.01	0.69
Chromium	65.9	146	86.2
Copper	43.7	119	68.4
Lead	58.5	138	69.6
All measurements in ug/g dry weight			

Weymouth

TRACE METAL ANALYSIS OF BOSTON HARBOR WATER SEDIMENTS, 1972

Surface concentrations in ppm.

STATION	HB1	HB2	HB3	HB4a	HB4b	HB5	HB6
sed class	2	2	3	1	1	2	2
Cadmium	2.2	2.2	3	1.1	3.3	1.6	3
Chromium	88	43		36	29	19	222
Cobalt	9	11	5	3	23	5	13
Copper	33	41	105	44	20	9	77
Lead	59	70	347	20	18	21	133
Mercury	1	0.51	1.61		0.04	0.07	1
Molybden	3.9	2.5		2.7	3.9	0.5	7.3
Nickel	18	22	42	15	38	11	39
Vanadium	45	63	51	23	40	14	73
Zinc	81	118	215	154	77	30	170

Harbor

BOSTON HARBOR SURVEY, MASS DEP, 1990

1986 SURVEY		1985 SURVEY	
Station	BH11A	BH11B	Station BH11A
sed class	3	3	3
Ag	1.6	2.8	Ag 2
Cd	3.2	2	As 19
Cr	80	76	Cd 6
Cu	304	108	Cr 245
Hg	1.032	3.01	Cu 265
Ni	27	17	Ni 38
Pb	560	200	Pb 305
Zn	520	204	Zn 330
METALS IN mg/kg DRY WEIGHT			
Tot PCB		2.16	Tot PCB 0.32

APPLICATION FOR WAIVER 301(h), NUT & DEER ISLANDS, 1984, METCALF & EDDY

SAMPLING, 1979				Sampling '82			SAMPLING '84		
Station	14	15	21	22 Stations	0	NIB	NO	Stations	11
sed class	3	2	3	1 sed class	2	1	1	2 sed class	2
Ag	7.73	7.8	14.3	3.8 Ag	0.1	0.1	0.1	Ag	0.3
Cd	4.4	2.9	3	1 An	2	2	2	An	3.2
Cr	0.255	0.259	0.302	0.054 As	3	3	3	6 As	4.7
Cu	0.239	0.143	0.192	0.034 Be	4.3	5	5	7.4 Be	7.3
Hg	6.1	5.7	9.4	4.7 Cd	0.1	0.3	0.3	0.2 Cd	1.4
Pb	0.215	0.157	0.234	0.07 Cr	23.4	52.9	52.9	35.7 Cr	176
Zn	0.317	0.197	0.242	0.107 Cu	15	40.9	40.9	21 Cu	125
Units mg/g dry weight				Hg	0.59	0.46	0.46	0.92 Hg	1.1
				Ni	7.3	10.4	10.4	14.9 Ni	22.4
				Pb	2	2	2	2 Pb	94
				Se	2	2	2	2 Se	0.8
				Th	3	4	4	4 Th	6.3
Station	14			Zn	53.7	94	94	82.4 Zn	183
PCBs (ng/	365			Units ug/g					

TRACE METAL ANALYSIS OF BOSTON HARBOR WATER SEDIMENTS, 1972

STATION	O11	O12	O13	O14	O15	O16	O17
sed class	3	3	3	2	2	2	1
Cadmium	7.9		2.6	2.1	4.8	4.8	2
Chromium	167	31	109	108	150	256	26
Cobalt	10		12	6	27	28	17
Copper	360	39	70	48	73	116	16
Lead	112	82	89	87	42	168	18
Mercury	2.3	2	1.6	0.4	0.8	1.1	0.3
Molybden	0.5	10.2	11.4	1.9	1.8	3	0.8
Nickel	40	25	8	18	27	44	32
Vanadium	48	31	56	37	43	80	25
Zinc	200	168	191	107	157	216	63

SITE EVALUATION STUDIES OF THE MASS BAY DISPOSAL SITE,  
U.S. ARMY CORPS OF ENGINEERS 1988

Station	REF JUN85	REF JAN86	OFF SEP85	ON SEP85	ON SEP85
sed class	2	2	2	2	2
As	11.3	12.1	10	12	13.3
Cd	3	3	3	4	3
Cr	70.3	64	72	134	102
Cu	18	27	23	75	64
Hg			0.1	0.01	
Ni	33.3	24	24	31	26
Pb	41.3	97	58	151	161
Zn	95.3	110	105	233	206
METALS IN ppm dry weight					
PAH, ppm	3				
PCB ppb	75	48	495	1240	329

DISTRIBUTION OF POLLUTED MATERIALS IN MASS BAY, NEA, 1976

Offshore Stations

Stations	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B
sed class	2	1	1	1	2	2	2	2	2	3
Cd	0.45	0.37	0.29	0.45	0.95	1.21	0.46	3.59	0.34	0.65
Cr	0.41	35	15	17	48	82	29	49	64	122
Cu	7.2	8.1	2.6	3.4	14.2	19.8	4	6.1	10	14.3
Hg	112	23		76	85	105	57	102	319	310
Ni	13.5	13.4	8.1	7.2	21.2	24.3	10.6	12.5	22.4	
Pb	0.18	16	9	10	31	40	14	21	36	29
Zn		43	24	20	162	95	41	42	101	
METALS IN ppm dry weight										
PCB ppb	2.4	2.7	0.2	4.4	1.8	2.7	0.3	2.3	3.3	1.8

Stations	6A	6B	8A	8B	9A	9B	10A	10B	11A	11B
Sed Class	1	1	3	3	3	3	2	3	3	3
Cd	0.31	0.29	1.08	1.01	1.99	1.03	0.28		1.19	0.49
Cr	10	28	121	82	126	55	97	93	85	69
Cu	1.9	4.9	29.1	16.2	27	16.3	14.9	36	17.9	16.2
Hg		22	457	196	172	288	89	264	162	177
Ni	6.1	9.9	32.4	11.9	26.8	44.5	14	55.9	34.7	17.8
Pb	6	12	50.03	71.92	44.27	73.49	34	49	51	91
Zn	26	28	2495	51	108	216	97	110	541	68
METALS IN ppm dry weight										
PCB ppb	1	3.1	3.6	2.1	1.2	0.32	1.3	2.3	4.7	7

Bay

Stations	12A	12B	13A	13B	14A	14B	15A	15B	16A	16B
sed class	3	2	2	3	2	3	2	2	3	3
Cd	0.12	0.19	2.14	0.6	0.38	0.9		0.29	0.17	0.64
Cr	94	91	104	83	26	15	37	46	74	51
Cu	21	10.4	24.5	19	11.4	14.6	11.5	9.8	15.7	9.9
Hg	323	107	132	409	111	167	50	121	168	236
Ni	29.6	31.3	45.6	35.6	28.9	15.4	16.7	23.1	8.4	14.4
Pb	38	44	65	106	33	14	16	46	35	46
Zn	119	80	110	116	332	304	68	245	20	84
METALS IN ppm dry weight										
PCB ppb	11.8	11.8	5.8	15.2	0.9	1.1	0.9	1.4	18	15.1

Stations	17A	17B	18A	18B	19A	19B	20A	20B	21A	21B
sed class	3	3	3	2	1	3	3	2	3	2
Cd	1.05	0.47	1.13	1.77	0.57	1.66	0.26	0.46	0.45	0.72
Cr	105	39	73	92	71	61	70	74	91	87
Cu	20.6	9.9	19.8	21.1	14.2	9.9	15.9	15.5	23.6	28.4
Hg	262	294	151	71	33	568	341	125	161	126
Ni	29.4	15.9	27.9	46.1	22.1	40.1	15.7	17.9	38.8	29.1
Pb	71	24	50	61	43	34	52	67	149	38
Zn	146	23	131	131	96	108	29	123	172	151
METALS IN ppm dry weight										
PCB ppb	3.1	0.9	2.1	2	2	2.1	3.3	6.5	7.9	12.8

Stations	22A	22B	23A	23B	24A	24B	25A	25B	26A	26B
sed class	3	3	2	3	3	2	2	2	3	2
Cd	0.13	0.79	0.66	0.32	0.14	0.74	0.45	0.38	0.35	0.43
Cr	57	90	47	46	45	45	59	18	76	32
Cu	20.3	19.1	13.7	10.3	10.5	17.5	9.6	7.2	16.9	3.9
Hg	4240	544	130	333	273	101	129	109	108	88
Ni	32.4	26.7	23.9	19.9	14.8	21	14	9.3	22.3	5.5
Pb	38	35	32	28	22	38	41	16	41	22
Zn	88	106	78	189	62	65	51	103	3131	10
METALS IN ppm dry weight										
PCB ppb	10.7	17.7	0.27	1.6	3.3	13.9	2.5		0.8	0.31

Stations	27A	27B	28A	28B	29A	29B	30A	30B	31A	31B
sed class	2	1	3	2	2	2	3	2	3	3
Cd	0.69		0.54	0.79	0.94	0.76	0.1	0.1	0.59	0.97
Cr	42	41	48	41	66	44	37	48	66	58
Cu	18.4	16.4	8.5	9.6	16.5	10.7	10	12.5	16.3	15.2
Hg	80	42	166	80	103	94	159	53	160	172
Ni	15.8	16.8	15.3	13.3	22.5	19.3	15	11.2	32	23.5
Pb	37	27	29	38	41	25	31	35	62	34
Zn	48	78	124	60	195	248	110	96	271	270
METALS IN ppm dry weight										
PCB ppb	0.7	4.9		0.37	5.6	2.1	6.2	3.5	7	

Bay

Stations	32A	32B
sed class	3	3
Cd	1.3	0.93
Cr	0.73	66
Cu	14.6	21.7
Hg	234	156
Ni	24.6	26.3
Pb	52	45
Zn	390	324
METALS IN ppm dry weight		
PCB ppb	4.3	4.8

ORGANIC POLLUTANT BIOGEOCHEMISTRY STUDIES, BATTELLE, 1984

Stations	BH-7	MB-1	MB-4	MB-5	MB-6	MB-7	MB-8	MB-9	MB-10	
Total PAH (ug/g)		0.8	14.3	2.3	0.6	3.5	1.3	0.3	0.2	1.5
Total PCB (ng/g)		14.5	39.3	21	4.6	82.9	24.7	23.4	2.3	25.3
Stations	MB-11	MB-13	MB-14	MB-16	CC-1	CC-2				
Total PAH (ug/g)	1.9	0.5	0.7	0.6	1	1.4				
Total PCB (ng/g)	7	6.7	10.3	5.1	31.3	26.9				

APPLICATION FOR WAIVER 301(h), NUT & DEER ISLANDS, 1984, METCALF & EDDY

SAMPLING, 1979		Sampling '82		SAMPLING '84				
Station	9 Stations	CS	PD	Stations	6	7A	8	24
sed class	1		1	2 sed class	1	2	1	1
Ag	2.4 Ag		8	5.9 Ag	0.1	0.07	0.1	0.1
Cd	0.7 An	0.062	0.56 An		2	1	2	3
Cr	0.018 As	0.1	0.1 As		4	2	7	4
Cu	0.014 Be	0.1	0.1 Be		5.59	3.24	4.82	6.97
Hg	3.7 Cd	2	2 Cd		0.1	0.1	0.1	0.1
Pb	0.011 Cr	2	2 Cr		11	16.6	12.3	25.3
Zn	0.043 Cu	2	2 Cu		4.6	2.4	1.5	2.8
Units mg/g dry weigh	Hg	48.7	89.4 Hg		0.15	0.71	0.05	0.14
	Ni	4	4 Ni		5.3	9.2	9.1	15.5
	Pb	3	3 Pb		19	7.1	20	15
	Se	6.5	4.1 Se		0.9	0.4	0.5	0.7
	Th	11.7	16 Th		5	3	4	6
	Zn	27	22.6 Zn		26.5	37	37.3	53.1
				Units ug/g				

## DISPOSAL AREA MONITORING, USACOE, 1990

Station	1	5	3 FG23	FG9	SE	
sed class	2	2	2	2	2	2
Arsenic	16.7	13.3	15	13	16.3	14.3
Chromium		16.7				
Copper	21.7	29	23.7	18.7	23.3	19
Lead	46.2	62.4	51.8	40	46.7	46.3
Nickel	32.7	31	30.7	32.7	29.7	31.3
Zinc	94.9	104.6	93.2	95	94.3	84.7
PCB	0.05	0.22	0.06	0.04	0.08	0.04

All measurements in ppm. Means for top 2cm of cores.

## FINAL EIR FOR THE IDENTIFICATION OF DREDGED MATERIAL DISPOSAL SITES IN CAPE COD BAY, 1990

SITE	B	C	D	E
sed class	2	2	2	2
Arsenic	14	16	15	15
Cadmium	0.7	0.9	0.9	0.8
Chromium	43	48	39	30
Copper	18	20	20	16
Lead	40	36	38	31
Mercury	0.3	0.4	0.6	0.6
Nickel	22	27	26.92	22.78
Vanadium	92	98	20	16
Zinc	84	88	108	87

All measurements in ug/g dry weight and averaged from four stations.

## TRACE METAL ANALYSIS OF BOSTON HARBOR WATER SEDIMENTS, 1972

Surface concentrations in ppm.

	STATION 018	019
sed class	1	1
Cadmium	3.3	2.4
Chromium	74	63
Cobalt	22	12
Copper	36	40
Lead	16	40
Mercury	0.2	0.2
Molybden	1.9	4
Nickel	39	16
Vanadium	99	42
Zinc	110	99

## Wellfleet Harbor Dredging Project, 1987, U.S.A.C.O.E.

Station	1	2	3	5
Sed Class	2	3	3	1
As	17.8	23.6	27.3	8.5
Cd	4	4	9	3
Cu	28	31	69	17
Hg	0.3	0.2	0.71	0.2
Ni	18	18	49	11
Pb	37	46	126	26
Zn	107	114	306	66
Metals in ppm				
PCB	13	13	13	13
PCB in ppb				

**APPENDIX C**

**CONFIRMED HAZARDOUS WASTE SITES WITHIN 500' OF COASTAL  
WATERS OR THE MERRIMACK RIVER**

***2.0 Sites Within 500 Feet Of Massachusetts Coastal  
Waterways And The Merrimack River To Pawtucket Dam***

***2.1 Coastal***

**Amesbury**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pot</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-0204	Bailey's Pond Parcel Merrimack & Beacon Sts	C	H	ME	1
3-0528	Former Merrimack Hat Merrimack & Beacon Sts	B	H	ME	2
3-1615	Property Merrimack Street	C	H	ME	3

**Salisbury**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pot</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1181	Exxon Station 591 No. End Blvd.	C	P	NS	218

**Newburyport**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pot</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-2637	Bank of New England 345 Merrimack St	C	H&P	ME	213
3-2947	Former C&D Oil Co. 115 Water Street	C	H&P	ME	214

**Newburyport (continued)**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-2425	Gould Associates 374 Merrimack St	B	P	ME	217
3-1295	Motor Shop 37 Liberty St	C	UNK	ME	6
3-1771	Property(Gas Station) 189 Merrimack St	C	P	ME	5
3-1965	Property Merrimack & Kent Sts	C	P	ME	4
3-0919	Towle Silver Co 280 Merrimack St	B	UNK	ME	216
3-2683	WE Atkinson Co 27 Water Street	B	P	ME	215

**Rowley**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
N/A	N/A	N/A	N/A	N/A	N/A

**Ipswich**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
N/A	N/A	N/A	N/A	N/A	N/A

### Newbury

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### Essex

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### Gloucester

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-0752	Americold 159 E Main Street	B	UNK	NS	172
3-0753	Americold 69 Rogers St	B	UNK	NS	173
3-0134	Cape Ann Forge Whittemore St	B	P	NS	10
3-2130	Exxon Station 1 Holly St	C	P	IP	12
3-0841	Former Gas Station 134 Washington St	C	H	IP	174
3-2890	Gloucester Harbor Cove 27 Rogers Street	C	P	NS	175
3-2172	Gloucester Marine Railways 9 Harbor Loop	C	P	NS	9

**Gloucester (continued)**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-3017	Lobster Cove Mkt & Marina 33 River Road	C	P	IP	11
3-2305	Mass Electric 26 Rogers St	C	P	NS	178
3-1152	Mobil Station Rogers & Main St	C	P	NS	7
3-2878	Property 8 School Street	C	P	NS	8

**Rockport**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1090	Cape Ann Tool Pigeon Cove	B	H&P	NS	13
3-1091	Tarr School School Street	C	P	NS	14

**Manchester**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-3248	Marine Storage Assn 12 Ashland Avenue	C	P	NS	15

**Beverly**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1566	Best Petroleum 437 Rentoul St	C	P	IP	51
3-0234	Beverly Chemical Co Water Street (Tuck's Pt)	B	H & P	NS	16
3-2451	Beverly DPW Yard 148 Park Street	C	P	IP	52
3-3185	DiPiero's Exxon 472-474 Rentoul St	C	P	IP	56
3-2585	Former Marina Yard 11 Cabot St	C	P	IP	58
3-0606	Gateway Towers 58-60 Rentoul St	C	H & P	IP	57
3-1938	Previous Building 190-200 Rentoul and 31-33 Park	C	H	IP	55
3-2887	Morton Thiokol Yentron Division 12 Congress	C	P	NS	234
3-0100	Property 123 Park St	C	P	IP	59
3-1811	Property 11-25 Water St	C	P	NS	60
3-3027	Property 324-326 Rentoul St	C	UNK	IP	53
3-3285	Richdale Store #64 74 Rentoul St	C	P	IP	54

**Beverly (continued)**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1585	Shore Sales 97 River Street	C	P	IP	233

**Salem**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1709	Boston Gas-Salem Lng Pit Pierce Ave & Wait St	A	H & P	NS	17
3-1212	Derbie Landing Marina 10 White St	C	UNK	NS	44
3-2135	Former Tank Farm 57 Wharf St	C	H & P	NS	45
3-0426	Grit & Grease Chambers 50 Fort Avenue	C	H	NS	46
3-0433	GTE Sylvania 71 Loring Avenue	B	H	NS	50
3-0918	Jeff's Auto Service 65 Bridge St	C	UNK	NS	48
3-2898	Mass Electric Derby & Hawthorne	C	UNK	NS	18
3-0865	New England Power 24 Fort Avenue	C	P	NS	47
3-1359	Property 285 Derby St	C	P	NS	21

### Salem (continued)

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-1776	Property 311 Derby Street	C	UNK	NS	22
3-2084	Property 281 Derby & 24-26 Congress	C	P	NS	19
3-1710	Salem Warehouse 12 Franklin St	C	H	NS	49
3-1480	Southland Corp Congress & Derby	B	P	NS	20

### Marblehead

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-0830	Cloutman's Boal Yard Cliff & Commonwealth	C	P	NS	24
3-0605	Former Exxon Station 27 Atlantic Ave	C	P	NS	61
3-3235	Mobil Station 11 Atlantic Ave	C	P	NS	62
3-2300	Phillips & Lee Gulf Station 28 Atlantic Ave	C	P	NS	63
3-2122	Property Doak's Lane	C	P	NS	25
3-1683	Star of the Sea 80 Atlantic Ave	C	P	NS	64

### Swampscott

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-2440	BP Service Station 441 Humphrey St	C	P	NS	66
3-0438	Former Gas Station 646 Humphrey St	C	P	NS	67
3-2006	Gas Station 545 Humphrey St	C	P	NS	68
3-1433	King's Landing Humphrey St	C	P	NS	65
3-2306	Mobil Station 620 Humphrey St	C	P	NS	69

### Lynn

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-1678	Eastern Smelting 37-39 Bubler St	B	UNK	NS	26
3-1308	Former Coal Gasification Plant Riley Way	A	H&P	NS	27
3-2379	GE, Cooper St Lots Cooper & River Sts	C	P	NS	28
3-2160	GE River Works South Commercial St	B	H&P	NS	70
3-3047	Property 100 Marine Blvd	C	H&P	NS	71

**Saugus**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pot</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-0044	Dewey Daggett Landfill Route 107	C	H	NS	177
3-1599	GE Landfill Route 107, 1100 Western Ave	B	H	NS	178

**Nahant**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pot</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
N/A	N/A	N/A	N/A	N/A	N/A

**Revere**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pot</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1568	Best Petroleum 1761 No Shore Rd	C	P	MB	72
3-2032	Martin's Auto Body 1456 No Shore Rd	C	UNK	MB	73
3-0770	Property 460 Revere Beach Blvd	C	P	MB	74
3-1467	Revere Property 646 Ocean Ave	C	P	MB	75

### Chelsea

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-2645	Belcher Tank Farm 99 Marginal St	C	P	MB	99
3-2298	Chelsea Creek Headworks (MYFIA) 340 Marginal St	C	P	MB	100
3-0163	Cumberland Farms Oil Term 123 Eastern Avenue	C	H & P	MB	101
3-2211	Gulf Oil 281 Eastern Avenue	C	P	MB	102
3-0821	Northeast Petroleum 324-264 Marginal St	C	H & P	MB	106
3-1795	Property 295 Eastern Ave	C	UNK	MB	103
3-0291	Samuel Cabot, Inc. 229 Marginal St	A & B	H & P	MB	105

### Winthrop

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-1283	Deer Island Treatment Plant Deer Island	C	P	MB	149

### Everett

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-0308	Boston Gas Plant Rover St	C	UNK	MB	146
3-0309	Former Coal Gasification Facility Market & Beahen Sts	A	H	MB	147
3-1395	Independent Cement Commercial St	C	H	MB	148

### Somerville

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-0434	Cambridge Machine Prod 100 Foley St	B	H&P	MS	30
3-0951	Garity Oil Co 100 Sturtevant St	B	P	MS	31
3-0649	HK Porter Co 74 Foley St	B	P	MS	29
3-1096	Penn Oil Co Sturtevant St	C	P	MS	32

### Charlestown (Boston)

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-0923	Boston Ed-Mystic Sta 176 Alford St	C	H&P	MB	40

**Charlestown (Boston - continued)**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pot</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-2039	Bunker Hill Refinery 423 Medford St	C	P	MB	33
3-0244	Federal Metal Finishing 18 Derrance St	B	H	MB	37
3-2057	Former Dry Cleaner Chelsea & Gray Sts	C	H	MB	41
3-2058	Loop Viaduct 169 Portland	C	H&P	MB	42
3-1307	Massport 333 Medford St	B	P	MB	34
3-0694	Massport, Former Schlavone Site 100 Terminal St	C	H	MB	39
3-2551	Moran-Mystic Pier Terminal St	C	P	MB	38
3-2910	Ryan Field Alford St	B	P	MB	35
3-2530	New Charlestown Pump Station Alford St	C	H&P	MB	36
3-0040	Whitmore Wright 62 Alford St	B	UNK	MB	43

### East Boston

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-1935	Avis Rent A Car 375 McClellan Hwy	C	P	MB	114
3-1577	Belcher New England Oil Terminal McClellan Hwy	C	P	MB	115
3-2641	Construction Lot 480 McClellan Hwy	C	P	MB	118
3-1486	Coverall Service Co 79 Addison St	B	H	MB	110
3-3068	East Boston Central Pier Clyde St	C	P	MB	108
3-0700	Former Amoco 470 Meridian St	C	P	MB	117
3-0177	Lockport Manufacturing 99A Condor St	B	UNK	MB	111
3-1116	Massport 256 Marginal St	C	P	MB	109
3-1558	Mobil Oil Corp 580 Chelsea St	C	P	MB	112
3-0526	Old Navy Fuel Depot McClellan Hwy	C	P	MB	113
3-1923	Property 175 McClellan Hwy	C	P	MB	116
3-1906	Service Station 52 Meridian	C	P	MB	107

## Boston

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-2297	Columbus Park Headworks (MWRA) Columbus Park	C	P	MB	119
3-0248	Former Mobil Station 425 Summer St	C	P	MB	129
3-2809	Harbor Gateway Industrial Park Drydock Avenue	B	P	MB	122
3-1819	Property 324 Marginal St	C	UNK	MB	121
3-2674	Property 285 McClellan Hwy	C	P	MB	120
3-2169	US Navy Boston Naval Shipyard	B & B	H	MB	124

## Dorchester (Boston)

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-0152	B/W Cable Systems 65 Bay Street	B	H	MB	138
3-2656	Boston Globe 135 Morrissey Blvd	B	H & P	MB	139
3-2706	Commercial Property 725 Morrissey Blvd	C	P	MB	140
3-2478	Marina 24 Erikson St	C	P	MB	141

**Dorchester (Boston - continued)**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1430	Mile Rd Dump Columbia Pt	C	UNK	MB	142
3-0182	Puritan Mill 741 Morrissey Blvd	C	P	MB	143
3-0252	Recording and Statistical Co 55 Morrissey Blvd	B	H	MB	144
3-3239	Shell Station 655 Morrissey Blvd	C	P	MB	145

**South Boston**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1447	Atlantic Sea Cove 400-408 C St	C	P	MB	125
3-1901	Decon Transportation 329 W 2nd St	C	P	MB	126
3-0996	Eastern Index Corp 206 W 2nd St	C	P	MB	127
3-0636	Former Farnsworth Fiber Co 24 Farnsworth St	B	P	MB	128
3-0045	J&B Plastics Co 314 W 2nd St	B	UNK	MB	129
3-0058	King Terminal Summer, E 1st & K Sts	C	H	MB	130

### South Boston (continued)

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-2702	L St Bath House L ST & Day Blvd	C	P	MB	131
3-0839	Leldaw Waste Systems 530 E 1st St	C	P	MB	132
3-1416	Norcross Co 401 W 1st St	B	P	MB	133
3-3077	So Boston Yacht Club 1849 Columbia Rd	C	P	MB	134
3-1918	South Postal Annex 135 A St	C	P	MB	135
3-0555	South Station Foundation Summer St	C	P	MB	136
3-0257	Texaco South Boston Terminal 900 E 1st St	C	UNK	MB	137

### Quincy

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-0915	Captain's Cove Cove Way	C	H & P	MB	90
3-2192	Commercial Property 399 E Squantum St	C	P	MB	92
3-0966	Frank's Tire 678 Southern Artery	C	P	MB	91

### Quincy

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-1016	Gasoline Spill 198 Commander Shea	C	P	MB	93
3-0971	Getty Station 665 Quincy Shore Dr	C	P	MB	94
3-2252	Jordan Marsh 500 Commander Shea	C	P	MB	95
3-2427	McLeod's Surfside Station 305 Quincy Shore Dr	C	H&P	MB	96
3-1859	Marina Bay Complex 333 Victory Rd	C	P	MB	97
3-2786	Pompeo Motors 686 Southern Artery	C	H&P	MB	89
3-1443	Property 573-593 Southern Artery	C	P	MB	86
3-1704	Property 542 E Squentum	C	UNK	MB	98
3-3222	Quincy DPW Garage 55 Sea Street	C	P	MB	84
3-0117	Quinoid Industries 728 Southern Artery	C	P	MB	88
3-1291	Stop N Shop 495 Southern Artery	C	H	MB	85
3-0005	Sunoco Station 555 Southern Artery	C	P	MB	87

**Braintree**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-2893	Ames-Zeyre 444 Quincy Ave	C	P	WF	150
3-2389	Arrow Rivet Co	B	H	WF	151
3-1799	General Chemical Co 60 Columbia Terr	B	H	WF	151
3-0260	Cligo Braintree Terminal	C	H & P	WF	153
3-0529	Clean Harbors, Inc. 385 Quincy Ave	C	H & P	WF	153
3-1605	Filbotte's Auto Salvage Columbia Terr & Cliff St	C	P	WF	154
3-2085	Metropolitan Yacht Club 30 Vinedale St	C	P	WF	155
3-0145	Plywood Ranch 288 Quincy Avenue	C	P	WF	156
3-2010	Property 431-441 Quincy Ave	C	P	WF	157

**Weymouth**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1571	Best Petroleum 520 Bridge St	C	P	WF	152
3-2387	Boston Edison Edger Station 1 Bridge St	C	P	WB	159

**Weymouth (continued)**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-1314	Property 770-780 Bridge St	C	P	WF	161
3-3146 3-3227	Shell Station Shell Station 351 Bridge Street	C	P	WF	162
3-1547	Short Stop Auto Electronics 525 Bridge St	B	P	WF	163

**Hingham**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-0037	Beal's Cove Village Beal's Cove Rd	C	P	WB	158
3-1310	Former Sunoco 223 Lincoln St	C	P	WB	164
3-0648	Lincoln Plaza Lincoln & Beal Sts	C	H&P	WB	165
3-2788	Mobil Station 24 Summer St	C	P	WB	166
3-0570	Property 119 Beal St	C	H	WB	167
3-1513	Shaw Seab 425 Lincoln St	C	P	WB	168

## Hull

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-1767	Hull Fire Dept 671 Nantasket	C	P	MB	76
3-0337	Hull Mun Lighting Plant Edgewater Avenue	C	P	MB	82
3-0661	Neal's Service 288A Atlantic Ave	C	UNK	MB	78
3-3025	Property 7-131/2 Nantasket Ave	C	P	MB	79
3-3114	Property 6 A Street	C	UNK	MB	80
3-3159	Waveland Marina 7 A Street	C	P	MB	77
3-0907	Waveland Service Station 669 Nantasket Avenue	C	P	MB	81

## Cohasset

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-1814	Old State House 40 Border St	C	P	SS	169
3-1478	Residence 52 Jerusalem Rd	C	P	SS	170
3-2552	Restaurant 44 Border St	C	P	SS	171

### Scituate

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### Marshfield

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
4-0466	Green Harbor Marina Route 139	C	P	SS	180
4-0378	Taylor Marine Corp 95 Central St	C	P	SS	179

### Duxbury

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### Plymouth

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
4-0445	Bradley Automotive 23 Sandwich Street	C	H&P	N/A	184
4-0140	Cannon Engineering Cordage Park	B	H&P	N/A	181
4-0293	Clark's Sunoco State Road	C	P	N/A	187

**Plymouth (continued)**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
4-0272	Eagle Snacks Sandri Dr & Hedge Rd	C	P	N/A	182
4-0539	Getty Gas Station 724 State Road	C	P	N/A	188
4-0446	Lew's & Sons Gulf 102 Court Street	C	H&P	N/A	183
4-0600	Property 115 Sandwich St	C	P	N/A	186
4-0770	Revere Copper & Brass Water St Facility	B	H&P	N/A	187
4-0418	Souse's Garage 111 Sandwich St	C	H	N/A	185

**Sandwich**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
N/A	N/A	N/A	N/A	N/A	N/A

**Barnstable**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pet</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
4-0732	Property 64 Harbor Rd	C	P	N/A	235
4-0624	Lewis Bay Motel 53 South Street	C	UNK	N/A	236

**Barnstable (continued)**

4-0609	Property 335 Eel River Road	C	P	N/A	237
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**Yarmouth**

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
4-0867	Greg's Auto Sales 12 Delivery Road	C	H	N/A	238
4-0519	Ship Shops 130 Pleasant Street	C	UNK	N/A	239

**Dennis**

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

**Brewster**

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

**Harwich**

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### Chatham

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
4-0264	Old Mill Boatyard 608 Stage Harbor Road	C	UNK	N/A	240

### Orleans

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
4-0136	Property 14 Anchor Way	C	UNK	N/A	241

### Eastham

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### Wellfleet

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### Truro

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
4-0172	USAF No Truro Installation STP Off Aldrich Rd	C	UNK	N/A	203

### Provincetown

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### *2.2 Inland Merrimack River To Pawtucket Dam*

#### Merrimac

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

#### West Newbury

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

#### Haverhill

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-2324	Cleary Cleaners 205 Water Street	C	H	ME	189
3-2396	Cumberland Farms River and Lowell Sts.	C	P	ME	190
3-1541	Dairy Queen 454 River Street	C	P	ME	191

**Haverhill (continued)**

3-2189	Haverhill Gazette 447 West Lowell Ave	C	P	ME	192
3-2771	Merrimac Valley Regional Transit 85 Railroad Ave	C	P	ME	193
3-1312	Merrimac Industrial Finishers 33 Railroad Avenue	B	H	ME	194
3-1448	Metal Flake, Inc. 1015 Western Ave	B	H	ME	195
3-1324	Paperboard Corp. 100 South Kimbell	B	P	ME	196
3-1672	Property 310 East Broadway	C	UNK	ME	197
3-1838	Property 285 South River Street	C	UNK	ME	198
3-1852	Property 163 Merrimack Street	C	UNK	ME	199
3-2940	Property 261 River Street	C	P	ME	200
3-3157	Property 25-35 Railroad Sq.	C	H	ME	201
3-2323	Shelly Motor Co. 229 Water Street	C	P	ME	202

### Groveland

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### Methuen

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-2879	Merimac Valley Wood Products 476 Lowell Street	B	P	ME	219
3-1685	Methuen Dump Site Burnham & Riverside	C	UNK	ME	222
3-0142	Middle East Bakery 1111 Riverside	C	P	ME	220
3-0179	Old Colony Gas Station 460 Lowell Street	C	P	ME	221

### North Andover

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pot	Drainage Basin	Menzie-Cura Assoc. Site No.
3-0870	Exxon Station 141 Sutton Street	C	P	ME	223
3-3064	Property 231 Sutton Street	C	H&P	ME	224
3-2253	Service Chemical Co. 221 Sutton Street	B	H	ME	225

### Lawrence

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-0330	Canal Street Area Canal Street	B	H&P	ME	206
3-1013	Cyr Oil Co. 100 Water Street	C	P	ME	227
3-2420	First Mutual Bank of Boston 360 Merrimack Street	C	H	ME	228
3-3140	Gibco-Life Technologies 421 Merrimack Street	B	P	ME	229
3-2934	Lawrence Pumps 371 Market Street	B	H&P	ME	232
3-0995	Property 31 Merrimack Street	C	UNK	ME	230

### Andover

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
N/A	N/A	N/A	N/A	N/A	N/A

### Dracut

DEP Site Number	DEP Name and Site Location	Site Class	H-Haz Mat P-Pet	Drainage Basin	Menzie-Cura Assoc. Site No.
3-2364	Property 888 Merrimack Avenue	C	P	ME	231

**Lowell**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pot</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
3-0487	Citgo Station 745 Aiken Avenue	C	P	ME	204
3-0601	Jetline-Geochem 283 Howard Street	C	UNK	ME	205
3-2609	Kinny's Texaco 262 Pawtucket St.	C	P	ME	203
3-1610	Property Riverby Street	C	H	ME	206
3-2086	Property 160 Martin Street	C	H	ME	207
3-1609	Property 129 Martin Street	C	H	ME	208
3-2928	St. John's Property E Merrimack & Nesmith	C	P	ME	209
3-0852	Starr Realty Property 43 Lakeview Avenue	C	P	ME	210

**Tewksbury**

<b>DEP Site Number</b>	<b>DEP Name and Site Location</b>	<b>Site Class</b>	<b>H-Haz Mat P-Pot</b>	<b>Drainage Basin</b>	<b>Menzie-Cura Assoc. Site No.</b>
N/A	N/A	N/A	N/A	N/A	N/A

**APPENDIX D**

**WATER QUALITY PROBLEMS IDENTIFIED  
IN MASSACHUSETTS COASTAL WATERS  
AND WITHIN THE MOUTHS OF  
ESTUARIES AND RIVERS  
DISCHARGING TO MASSACHUSETTS BAY**

**APPENDIX D**

**WATER QUALITY PROBLEMS IDENTIFIED  
IN MASSACHUSETTS COASTAL WATERS  
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DISCHARGING TO MASSACHUSETTS BAY**

**WATER QUALITY PROBLEMS IDENTIFIED IN NEAR COASTAL AND RIVER WATERS BY MASSACHUSETTS DWPC.**

<b>SEGMENT DESCRIPTION</b>	<b>RIVER MILES</b>	<b>WATER USE CLASSIFICATION</b>	<b>SUPPORT STATUS</b>	<b>WATER QUALITY PROBLEMS</b>	<b>SOURCE(S) OF PROBLEMS</b>	<b>ABATEMENT NEEDS TO MEET CLASSIFICATION</b>
<b>Merrimack River</b>						
Rocks Bridge to Routes 1 and 1A Bridge, Newburyport	11.8-3.0	SB	PS	Fecal Coliform bacteria Lead	Upstream sources	-----  -Further research needed to confirm and locate sources of metal contamination
Route 1 and 1A Bridge to the Atlantic Ocean Newburyport	3.0-0.0	SB	NS	Fecal Coliform bacteria Shellfishing banned	-Untreated wastewater discharges in Salisbury. -Upstream	-Plan and specifications complete for Salisbury secondary WWTP. Expected plant completion in 1989.
<b>North Shore Drainage</b>						
<b>Ipswich River Basin Drainage</b>						
Sylvania Dam, Ipswich to mouth in Ipswich Bay, Ipswich	4.5-0.0	SA	NS	-Total coliform bacteria, Shell-fishing restricted	-Surface runoff. -Illegal connections or leakage into Farley Brook, Ipswich.	-----

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SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	SUPPORT STATUS	WATER QUALITY PROBLEMS	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
<b>Parker River Central Street Newbury to its mouth at Plum Island Sound Newbury</b>	9.0-0.0	SA/AD	S	Dissolved oxygen Fecal coliform bacteria	-Untreated discharges. -Natural conditions	-----
<b>Waters River from headwaters to confluence with Danvers River, Danvers</b>	2.0-0.0	SB	PS	Fecal coliform bacteria, Heavy metals in sediments	-Unknown	-Needs investigation
<b>Headwaters Crane Brook to Mill Pond, Danvers</b>	3.9-1.6	B/WWF/AD	NS	Fecal coliform bacteria Metals	-Unknown -Landfill upstream	-Needs further investigation
<b>Crane River from Mill Pond to Danvers River, Danvers</b>	1.6-0.0	SB	NS	Fecal coliform bacteria, Heavy metals and PAH's in sediment	-Unknown	-Needs further investigation
<b>Porter River from Frost Fish Brook to confluence with Danvers River, Danvers</b>	1.5-0.0	SB	PS	Fecal coliform bacteria, Heavy metals and PAH's in sediments	-Unknown	-Needs investigation
<b>Goldwait Brook from Cedar Pond to North River, Peabody</b>	3.3-0.0	B/WWF/AD	NS	Fecal coliform bacteria, Metals Nutrients, Low D.O., PAH's and heavy metals in sediments	-Landfill -Industrial complex -Former tanneries -Sediment	-Needs further investigation

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North River from confluence of Goldthwait Brook and Proctor Brook to confluence with Danvers River, Salem	2.7-0.0	SB	NS	Fecal coliform bacteria, Metals Oil and grease Low D.O. Nutrients, PAH's PCB's and heavy metals in sediments	-Former tanneries -Sediment -Unknown	-Needs further investigation
Bass River, from headwaters to confluence with Danvers River, Beverly	3.7-1.3 1.3-0.0	B/WWF/AD SB	PS	Fecal coliform bacteria PAH's and heavy metals in sediment	-Sediment -Unknown	-Needs investigation
Danvers River from source to mouth	1.9-0.0	SB	PS	Fecal coliform bacteria PAH's and heavy metals in sediment	-Sediment -Unknown	-----
Forest River, Salem	0.5-0.0	SB	PS	Fecal coliform bacteria PAH's and heavy metals in sediment	-Unknown -Sediment	-Needs investigation
Essex River from source to mouth	4.9-0.0	SA	PS	Fecal coliform bacteria	-Unknown	-----
Annisquam River from source to mouth	3.6-0.0	SA	NS	Fecal coliform bacteria, Shell-fishing restricted	-Domestic sewage -Vessel discharges -Combined sewage overflows	

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Saugus River from source to mouth	8.6-4.3 4.3-0.0	B SB	NS	Fecal coliform bacteria, Dissolved oxygen, Metals	-Urban runoff -Unknown	-Needs further investigations.
Pines River from source to mouth	6.4-0.0	SB	NS	Fecal coliform bacteria	-Unknown	
Essex Bay	1.15 MI(2)	SA	U	-----	-Essex river tributary to bay has known coliform problems	-----
Rockport Harbor	0.019mi(2)	SB	U	-----	-Rockport secondary wastewater treatment plant discharges to bay	-----
Gloucester Harbor	2.24 mi(2)	SB	PS	Fecal coliform bacteria Low D.O. PCB's and PAH's in sediment	-CSOs -Vessel discharges -Urban runoff	-New WWTP recently completed construction, outfall and diffuser to be extended
Manchester Harbor	0.29 mi(2)	SB	PS	Fecal coliform bacteria	-Vessel discharges -Polluted tributary water	-Stop tributary contamination.

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Beverly Harbor	0.78 mi(2)	SB	S	Some heavy metals in sediment	-SESD	-Upgrade SESD extend outfall.
Salem Harbor	1.62 mi(2)	SB	PS	Fecal coliform bacteria PAH'S and heavy metals in sediment	-SESD -Sediments -Vessel discharges -Polluted tributary	-Upgrade SESD extend outfall. -Stop tributary contamination.
Marblehead Harbor	0.56 mi(2)	SA	S	Heavy metals found in sediments	-Possible problem from vessel discharge -Sediment contamination from SESD -Marinas	-Upgrade SESD -Extend outfall.
Lynn Harbor	6.67 mi(2)	SB	PS	Fecal coliform bacteria	-CSOs Lynn raw discharge -Urban runoff	-Upgrade Lynn treatment plant and extend diffuser outfall.
Nahant Bay	5.27 mi(2)	SA	PS	Fecal coliform bacteria	-CSO's -Lynn raw discharge	-Upgrade Lynn treatment plant and extend diffuser outfall.
Salem Sound	10.01 mi(2)	SB	PS	Fecal coliform bacteria, Heavy metals, Nutrients	-SESD not operating well	-Upgrade SESD to secondary treatment and extend ocean diffuser.

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<b>BOSTON HARBOR DRAINAGE</b>						
<b>Mystic River Inlet Upper Mystic to Amelia Earhart Dam, Somerville</b>	8.8-2.0	B/WWF	NS	Nutrients Fecal coliform bacteria	-Runoff -CSOs	-NPS control -Eliminate CSOs.
<b>Charles River Charles Basin Watertown Dam to Charles River Dam Boston</b>	9.8-0.0	C/WWF	NS	Fecal coliform bacteria, Dissolved oxygen	-CSOs -Urban runoff -In-place sediments	-CSO elimination. -BMP
<b>Neponset River Mother Brook to Milton Lower Falls Dam, Milton-Boston</b>	7.9-4.2	B/WWF	NS	Fecal coliform bacteria Nutrients Dissolved oxygen	-Combined sewer overflows	-Combined sewer elimination or treatment.
<b>Milton Lower Falls Dam to Dorchester Bay, Boston-Quincy</b>	4.2-0.0	SB	NS	Dissolved oxygen Fecal coliform bacteria, Nutrients	-Combined sewer overflows	-Combined sewer elimination or treatment
<b>Mother Brook Mother Brook Dam, Dedham to confluence with Neponset River, Boston.</b>	3.1-0.0	B/WWF	NS	Fecal coliform bacteria Nutrients	-Urban runoff -Sewer system problems	-Detailed study of area is needed.
<b>Outer Harbor (President Roads &amp; Nantasket Roads)</b>	23.0 mi(2)	SB	PS	Fecal coliform bacteria, Metals	-Deer Island WWTP -Nut Island	-Stop sludge dumping -Secondary treatment

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Inner Harbor Includes: (Fort Point Channel and Reserved Channel)	2.3 mi (2)	SC	PS	Metals, Fecal coliform bacteria Aesthetics, Oil and grease Dissolved oxygen	WWTP -Combined sewer overflows -In-place sediments -Water traffic -Tributary pollutants	-CSO treatment.
Dorchester Bay	4.6 mi(2)	SB	PS	Fecal coliform bacteria Dissolved oxygen Metals	-Combined sewer overflows -Moon Island Pumping station	-CSO separation and treatment
Quincy Bay (portion designated SA)	1.0 mi(2)	SA	NS	Fecal coliform bacteria, Shell-fishing and swimming restricted	-Storm drains	-----
Quincy Bay (excluding portion designated SA)	4.7 mi(2)	SB	PS	Fecal coliform bacteria	-Storm drain discharges -Nut Island WWTP	-Nut Island discharges tie Nut Island WWTP to Deer Island WWTP -O&M correction.
Hingham Bay vicinity Nut Island WWTP	1.0 mi(2)	SB	PS	Fecal coliform bacteria	-Storm discharges -Tributary pollutant	-O&M correction.
Hingham Bay	5.8 mi(2)	SB	S	-----	-----	-----

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Hingham Harbor	1.1 mi(2)	SA	NS	Fecal coliform bacteria Restricted shellfishing	-Storm drains	-O&M correction.
Hull Bay	2.3 mi(2)	SB	S	-----	-----	-----
Winthrop Bay	1.5 mi(2)	SB	PS	Fecal coliform bacteria, Metals	-Combined sewer overflows	-CSO treatment
<b>Weymouth &amp; Weir River</b>						
Weymouth Fore River Mary Lee Brook at Union St. to Mukusea St. Braintree	12.4-5.1	B/WWF/AD	NS	Dissolved oxygen Fecal coliform bacteria	-Runoff -Faulty sewer lines	-BMPs -Rehabilitation of sewers.
Weymouth Back River Whitmans Pond to Fresh River, Weymouth	6.1-3.2	B/WWF/AD	S	-----	-----	-----
Town River Old Quincy Reservoir to Route 3+4A, Quincy	4.7-1.5	SB	N	Fecal coliform bacteria	-Runoff -Faulty sewer lines	-BMPs -Rehabilitation of sewers.
<b>SOUTH SHORE DRAINAGE</b>						
<b>South River</b>						
Above Main Street Marshfield	10.6-6.7	B/AD	S	-----	-----	-----

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Main St. to Bourne Park Ave., Marshfield	6.7-4.6	SA/AD	NS	Fecal coliform bacteria Dissolved oxygen	-Storm drains -Subsurface disposal -Wetlands	-Eliminate sources. -Maintenance
Bourne Park Ave. to Broad Creek, Marshfield	4.6-1.2	SA/AD	PS	Fecal coliform bacteria Dissolved oxygen	-Carry over -Wetlands	-----
Broad Creek to Marshfield	1.2-0.0	SA/AD	PS	Fecal coliform bacteria, Shellfish bans Dissolved oxygen	-Subsurface disposal near Broad Creek -Wetlands	-Maintenance
Green Harbor River, Marshfield	2.5-0.0	B/WWF/AD	PS	Dissolved oxygen Nutrients Fecal coliform bacteria, Shellfish bans	-Wetlands -Failing septic systems	-Septic system rehabilitation/maintenance
Jones River to Elm St. Kingston	7.0-3.4 3.4-2.5	B/SCWF/AD B/SCWF	S	Dissolved oxygen	-Wetlands	-----
Jones River Estuary, Kingston	2.5-0.0	SA	PS	Fecal coliform bacteria Shellfish bans	-Untreated domestic wastewater discharges	-Eliminate/treat sources.
Duxbury Bay, Kingston	13.46 mi(2	SA	PS	Fecal coliform bacteria Shellfish Bans	-Untreated nonpoint runoff	-Identify sources, recommend appropriate abatement needs.

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Plymouth Harbor Plymouth	2.61 mi(2)	SA	PS	Fecal coliform bacteria Shellfish bans	-Plymouth WWTP -Combined sewer overflows -Boating dis- charges -Storm drains	-Treatment/ elimination of known discharges to harbor, in- cluding those from boats
Plymouth Bay Plymouth	---	SA	S	---	---	---
Bound Brook, Source to outlet, Hunter Pond, North Scituate	4.6-0.0	B/CWF/AD	S	---	---	---
Gulf River, Outlet Hunter Pond to Cohasset Harbor	2.4-0.0	SA	S	---	---	---
<b>North River</b>						
Curtis Crossing Dam to Third Herring Brook Hanover	11.6-9.6	SB/AD	PS	Dissolved oxygen Fecal coliform bacteria	-Wetlands -Storm drains -Subsurface dis- posal	Study underway to address sources and recommend plan to eliminate/ treat these sources

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Third Herring Brook Hanover to Dwelleys Creek, Norwell	9.6-6.5	SA/AD	NS	Fecal coliform bacteria	-Septic dis- posal -Practices -Illegal dumping of septage	-Develop septage management plan.
Dwelleys Creek to Rte. 3A, Scituate	6.5-2.0	SA/AD	NS	Fecal coliform bacteria	-Storm drains -Subsurface dis- posal	-Study will address problems
Route 3A to Mouth	2.0-0.0	SA/AD	PS	Fecal coliform bacteria, Shell- fish bans	-First Herring Brook sources	-----
First Herring Brook Outlet, Old Oaken to Simms Marina	4.0-2.2	SA/AD	NS	Fecal coliform bacteria	-Septic system leaching -Storm drains	-Cooperation with town of Scituate.
Simms Marina to Scituate WWTP Channel	2.2-0.5	SA/AD	PS	Fecal coliform bacteria	-Watercraft -Septic systems	-Pump out facility. -Eliminate sources.
Scituate WWTP to North River	0.5-0.0	SA/AD	PS	Fecal coliform bacteria Nutrients	-WWTP	-----
<b>CAPE COD COASTAL DRAINAGE AREA</b>						
Barnstable Harbor Barnstable	2.56 mi(2)	SA/AD	PS	Fecal coliform bacteria	-Surface runoff	-BMP

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Bumps River Barnstable	-----	SA/AD	PS	Fecal coliform bacteria Shell- fish bans	-Surface runoff	-BMP
Centerville Harbor Barnstable	1.44 mi(2)	SA/AD	PS	Fecal coliform bacteria	-Surface runoff	-BMP
Maraspin Creek Barnstable	-----	SA/AD	PS	Fecal coliform bacteria Shell- fish bans	-Surface runoff	-BMP
Prince Cove Barnstable	-----	SA/AD	PS	Fecal coliform bacteria Shell- fish bans	-Surface runoff	-BMP
Shoestring Bay Barnstable	-----	SA/AD	PS	Fecal coliform bacteria Shell- fish bans	-Surface runoff	-BMP
Red Brook Harbor Brewster	2.18 mi(2)	SA/AD	PS	Fecal coliform bacteria Shell- fish bans	-Surface runoff	-BMP
Quivett Creek Brewster	-----	SA/AD	PS	Fecal coliform bacteria	-Surface runoff	-BMP
Stoney Brook Brewster	-----	SA/AD	PS	Fecal coliform bacteria Shell- fish bans	-Surface runoff	-BMP
Sesuit Creek Dennis	-----	SA/AD	PS	Fecal coliform bacteria	-Surface runoff	-BMP
Swan Pond River Dennis	-----	SA/AD	PS	Fecal coliform bacteria	-Surface runoff	-BMP

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Boat Meadow River Eastham	-----	SA/AD	PS	Fecal coliform bacteria	-Surface runoff	-BMP
Rock Harbor Creek Eastham	-----	SA/AD	PS	Fecal coliform bacteria	-Surface runoff	-BMP
Provincetown Harbor Provincetown	3.82 mi(2)	SA/AD	PS	Fecal coliform bacteria, Shell-fish bans	-Septic systems -Marinas	
Old Harbor Mill Creek, Sandwich	-----	SA/AD	PS	Fecal coliform bacteria, Shell-fish bans	-Surface runoff -Boats	-BMP
Scortan Creek Sandwich	-----	SA/AD	PS	Fecal coliform bacteria, Shell-fish bans	-Surface runoff -Septic systems	-BMP
Pamet River, Truro	-----	SA/AD	PS	Fecal coliform bacteria	-Surface runoff	-BMP
Duck Creek Wellfleet	-----	SA/AD	PS	Fecal coliform bacteria, Shell-fish bans	-Surface runoff	-BMP
Herring River Wellfleet	-----	SA/AD	PS	Fecal coliform bacteria, Shell-fish bans	-Surface runoff	-BMP
Wellfleet Harbor Wellfleet	7.27 mi(2)	SA/AD	PS	Fecal coliform bacteria	-Surface runoff -Marinas	-BMP
Mill Creek Yarmouth	-----	SA/AD	PS	Fecal coliform bacteria, Shell-fish bans	-Surface runoff	-BMP