Dissolved and Particulate Transport of Chemical Contaminants in the Northeast and Northwest Branches of the Anacostia River

June, 1997
Revised April, 1998

ICPRB Report # 97-10

Final Report

Dissolved and Particulate Transport of Chemical Contaminants in the Northeast and Northwest Branches of the Anacostia River

Submitted to:

Department of Consumer and Regulatory Affairs
Environmental Regulation Administration
2100 Martin Luther King Jr. Ave., SE
Washington, D.C. 20020

Submitted by:

Barry Gruessner
Interstate Commission on the Potomac River Basin
Suite 300, 6110 Executive Blvd.
Rockville, MD 20852

and

Dr. David J. Velinsky
Academy of Natural Sciences
Philadelphia, PA 19103

Joseph Scudlark
College of Marine Studies
University of Delaware
Lewes, Delaware

Dr. Gregory D. Foster
Department of Chemistry
George Mason University
Fairfax, VA

Dr. Robert Mason
Chesapeake Biological Laboratory
University of Maryland
Solomons, MD

June, 1997
Revised April, 1998

ICPRB Report # 97-10

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN

6110 Executive Boulevard, Suite 300
Rockville, MD 20852

This publication has been prepared by the Interstate Commission on the Potomac River Basin in support of District of Columbia Grant #95g-96-WRMD02. Additional funds for this publication were provided by the signatory bodies to the Interstate Commission on the Potomac River Basin: Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia. The opinions expressed are those of the authors and should not be construed as representing the opinions or policies of the United States or any of its agencies, the several states, or the Commissioners of the Interstate Commission on the Potomac River Basin.

Suggested Citation:

Gruessner, B., D.J. Velinsky, G. D. Foster, R.P. Mason, and J. Scudlark. 1997. Dissolved and particulate transport of chemical contaminants in the Northeast and Northwest branches of the Anacostia River. Interstate Commission on the Potomac River Basin Report 97-10. ICPRB, Rockville, MD.

Executive Summary

Human activities in the highly urbanized basin draining to the Anacostia River have resulted in substantial chemical contamination in the lower part of the river. Pesticides, metals, polycyclic aromatic hydrocarbons and other potentially toxic substances have been detected in sediment and water samples from the tidal river in the District of Columbia. High levels of several chemicals in fish tissue samples have prompted the District to issue an advisory limiting the consumption of certain fish. As part of its overall toxic management efforts, the District is working to identify and quantify specific contaminant sources to the tidal river. A network of nontidal tributaries in the State of Maryland drains the upper two-thirds of the Anacostia River basin. These streams converge to form the Northeast and Northwest Branches of the Anacostia River, which, in turn, meet to form the tidal Anacostia River. The objectives of this study were to monitor chemical contaminant concentrations in the Northeast and Northwest Branches and estimate the chemical contaminant loads to the tidal river.

A year-long monitoring program was conducted at one site on each on the Northeast and Northwest Branches. To account for the inherent variation in contaminant concentrations, water samples were collected under nonstorm and storm flow conditions over the course of one year, and storm flow samples were collected throughout each storm event. Samples were analyzed for selected organic compounds and trace elements in both the dissolved and particulate phases using state of the art methods to achieve very low detection levels. Loads were estimated using flow-weighted mean concentrations that were calculated from the data and the historic mean annual flow measured at USGS gages near the sampling sites.

Cadmium, copper, nickel, lead, zinc, and mercury were all commonly detected in both the Northeast and Northwest Branches and their estimated loads ranged from 5 to 7000 Kg/year. Cadmium levels exceeded the chronic water quality criteria in two of the Northeast Branch samples and mercury concentrations may also be of concern. PCBs were also frequently detected, especially in the Northeast Branch, as were PAHs in both tributaries. Organochlorine pesticides were detected as well, although less frequently and at lower concentrations.

Overall, a wide variety of contaminants were commonly detected in the waters of the Northeast and Northwest Branches of the Anacostia River, under both storm and nonstorm flow conditions. The specific sources of these contaminants are unknown, but nonpoint sources are likely, since a large proportion of the total contaminant load is being transported under storm flow conditions. For many contaminants, the highest concentrations were detected in the particulate phase, suggesting that contaminants are being transported to the tidal river primarily while adsorbed to particles. These sediment bound contaminants may eventually settle out in depositional areas downstream and contribute to the contamination problems there, although exact sediment transport dynamics have not yet been studied.

It is clear that the Maryland tributaries are one of several possible current sources of contaminants to the tidal Anacostia River. If future sediment remediation efforts in the lower river are to be successful, these sources must first be characterized more completely and then controlled to the greatest extent possible.

Acknowledgments

Thanks to Dr. Mohsin Siddique of the District of Columbia Government for his guidance and support throughout this project and to Gajindar Singh (DC Government), Deirdre Murphy (Maryland Department of the Environment) and Kelly Eisenman (EPA, Chesapeake Bay Program Office) for helpful comments on the original version of this report. Special thanks to Kathryn Conko (University of Delaware), Bud Roberts (George Mason University), and Kristin Sullivan (University of Maryland) for traveling far on short notice and at all hours to collect samples (and for somehow managing to still be good company in the process).

Table of Contents

List of Tables

List of Tables (Continued)

List of Figures

Dissolved and Particulate Transport of Chemical Contaminants in the Northeast and Northwest Branches of the Anacostia River

Introduction

The tidal Anacostia River receives substantial pollutant loads from its highly urbanized basin. Based on surveys which showed elevated levels of chlordane and polychlorinated biphenyls (PCBs) in some fish tissue samples (Velinsky and Cummins, 1994), the District of Columbia has issued a human health advisory on the consumption of channel catfish, carp, and eel caught in the tidal Anacostia River. Various pesticides, metals, polycyclic aromatic hydrocarbons (PAHs), and other potentially toxic substances have been detected in sediment and water samples from the tidal river as well (Pinkney et al., 1994, Velinsky et al., 1994; Velinsky et al., 1992).

The District of Columbia has outlined its approach to managing chemical contaminants in the tidal river in it's *Anacostia River Toxics Management Action Plan* (DC ERA, 1996). The plan stresses the importance of identifying and quantifying contaminant sources in order to focus clean-up efforts in the watershed. Potential sources of chemical contaminants to the tidal Anacostia River include stormwater runoff, combined sewer discharges, and direct atmospheric deposition (DC ERA, 1996; Velinsky et al., 1992). In addition, the two main tributaries that meet to form the tidal Anacostia River (Figure 1) may also contribute significant loads of chemical contaminants to the lower river (DC ERA, 1996). The Northeast and Northwest Branches and their tributaries drain nearly two-thirds of the Anacostia River basin, including highly urbanized portions of Montgomery and Prince Georges Counties in Maryland before flowing together just upstream of the MD/DC border. Because there are few point sources, stormwater runoff may deliver the heaviest contaminant loads to the streams in this part of the watershed.

The objectives of this study were to monitor chemical contaminant concentrations in the Northeast and Northwest Branches under various flow and rainfall conditions and to use the resulting data to estimate the chemical contaminant loads to the tidal portion of the Anacostia River. This report describes the year-long monitoring study and the data that was collected and presents the load estimates.

Sampling and Analysis Methods

The Anacostia River Basin

The Anacostia River basin lies along the boundary between the Atlantic Coastal Plain and the Piedmont Plateau, commonly referred to as the Fall Line or Fall Zone (Figure 1). The western and northern sections of the basin are part of the Piedmont Plateau, while the southern and eastern section of the basin, including the tidal river in the District of Columbia, is in the Coastal Plain.

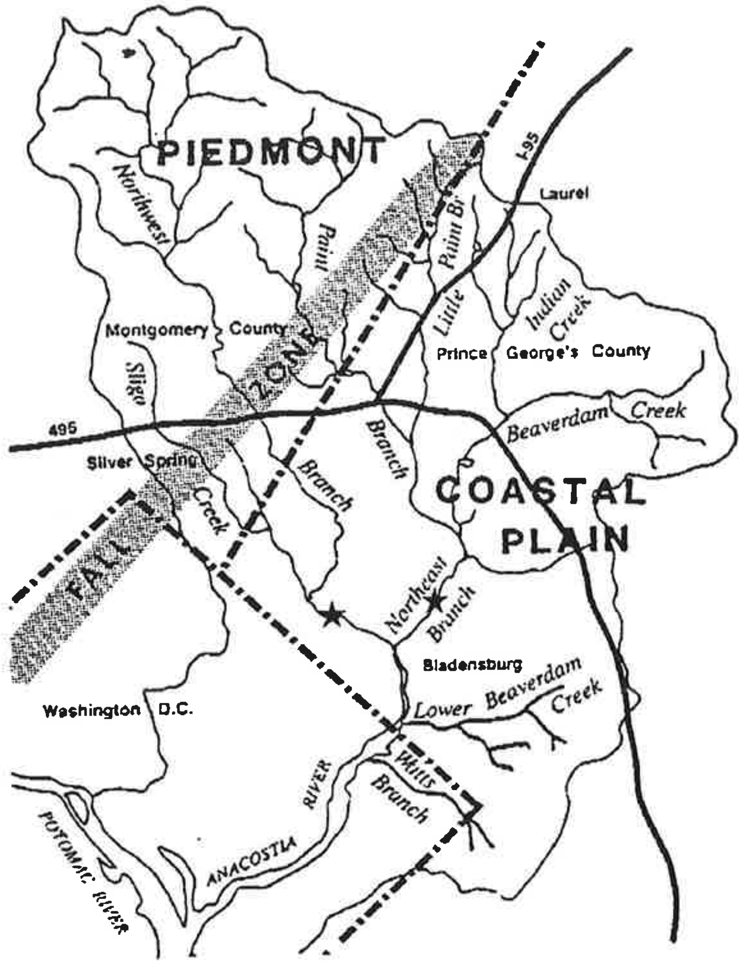


Figure 1. The Anacostia River basin in MD and DC. Stars (★) indicate the location of the sampling stations on the Northeast and Northwest Branches. Source: ICPRB, 1988.

The flow of the tidal Anacostia River is controlled by the flow of the Northeast and Northwest Branches, which join at Bladensburg, MD. The drainage area to the USGS gage on the Northeast Branch is 72.8 mi^2 and the long-term annual mean daily flow at the gage is 84.8 cubic feet per second (cfs). The drainage area to the USGS gage on the Northwest Branch is 49.4 mi^2 and the long-term annual mean daily flow at the gage is 47.7 cfs (James et al., 1995). Although the drainage area of the entire Anacostia River (170 mi^2) is small compared to the Potomac River (11,570 mi^2 at Chain Bridge in Washington, DC), the Anacostia drains a predominantly urban area and, therefore, tends to receive relatively large amounts of anthropogenic materials. Because of its large volume to inflow ratio, the water in the tidal Anacostia River has a long average residence time of about 35 days (Nemura, A. and E. Pontikakis-Coyne, 1991). The sluggish nature of the tidal river allows much of the suspended sediment and associated contaminants that are transported from the upper watershed to settle out before reaching the confluence with the Potomac Rive, due south of the US Capitol building (Scatena, 1987).

Sample Collection

The sampling scenario for the monitoring program was designed to provide a first order determination of contaminant types and concentrations in the Northeast and Northwest Branches. Contaminant concentrations may vary with time of year and flow rates. Variation due to changes in flow is especially high for those contaminants that tend to be transported adsorbed to suspended particles. High flows from stormwater runoff can be responsible for a significant proportion of the annual contaminant loads in fluvial transport (U.S. EPA, 1994a,b). To account for this inherent variation, water samples were collected under nonstorm and storm flow conditions from September, 1995 through September, 1996 at the USGS gages on the Northeast and Northwest Branches above the head of tide (Figure 1). At each station, six nonstorm flow samples and four storm flow samples were collected. Nonstorm flow sampling occurred about every other month. Storm flow samples were collected in each of the seasons, except winter. Because concentrations of contaminants in stormwater runoff can vary with rainfall amount, antecedent soil moisture, and time to previous rainfall (Athayde, et al., 1983), samples were collected under a range of flow conditions and throughout each storm event. Three samples were collected at each station during each monitored storm flow event, representing the rising limb, peak discharge, and falling limb of the storm hydrograph. These samples were either analyzed separately (for trace elements and mercury) or composited over the storm event (organic contaminants).

Samples were analyzed for selected organic contaminants and trace elements (Table 1) in both the dissolved and particulate phases, based on contaminants found during previous studies (Velinsky et al., 1994). Samples were also analyzed for total suspended matter (TSM) and dissolved and particulate organic carbon. Lastly, physical measurements, including temperature, pH, conductivity, dissolved oxygen, and turbidity were conducted in the field at the time of sampling using a Hydrolab Scout and a YSI turbidimeter.

Table 1. Chemical Analyses Performed

Organochlorine Compounds	Aromatic Hydrocarbons	Trace Elements	Ancillary Parameters
α-,β-, & γ-BHC	2-Methylnaphthalene	Aluminum	Dissolved Organic Carbon
α, γ, and oxy-Chlordane	2,6-dimethylnaphthalene	Cadmium	Paticulate Organic Carbon
trans-Nonachlor	Acenaphthalene	Copper	Total Supended Matter
Oxychlordane	Acenaphthene	Iron	Turbidity
Dieldrin	Fluorene	Mercury	Temperature
Endrin	Phenanthrene	Manganese	Dissolved Oxygen
Endrin Aldehyde	Benz(a)anthracene	Nickel	Conductivity
Endrin Ketone	Fluoranthene	Lead	pH
Heptachlor	Pyrene	Zinc	
Heptachlor Epoxide	Dibenz(a,h)anthracene		
Methoxychlor	Chrysene		
Aldrin	Benzo(a)pyrene		
o,p'-,p,p'-DDD	Indene		
p,p'-DDE	Perylene		
p,p'-DDT	Naphthalene		
Endosulfan I and II	Benzo(j)fluoranthrene		
PCBs (120 congeners)	Benzo(k)fluoranthrene		
	Benzo(ghi)perylene		

Sample Analysis

To calculate meaningful annual loads from ambient water samples, analytical methods must be sensitive enough to detect very low concentrations of contaminants. To achieve these low detection levels and avoid sample contamination, state of the art, "clean" methods were employed for all analytical work performed. Because such analyses require specialized equipment and expertise, three separate laboratories were contracted to collect and analyze the samples for mercury, other trace elements, and organic compounds. The methods used by each are summarized in the sections below.

Mercury. Samples for mercury analysis were collected using arm-length poly-gloves while wading slowly upstream to prevent contamination. Acid-cleaned 2-L Teflon bottles were rinsed three times prior to filling, filled from the approximate center of flow when possible, double-bagged and transported on ice to the lab the same day.

At the lab, subsamples were filtered for particulate mercury and particulate methylmercury analyses using a peristaltic pump and acid cleaned tubing and filter holder. The samples were filtered onto clean quartz fiber filters (nominal pore size of 0.8 μm), stored in clean Teflon vials, double bagged and frozen until analysis. The remaining water was further subsampled for dissolved methyl, reactive, and total mercury analyses. Laboratory replicates consisted of subsamples taken from the same Teflon bottle. Field replicates consisted of duplicate deployments at the same sampling location into separate Teflon bottles.

Samples for total, reactive and methyl Hg were analyzed using standard techniques for Hg analysis at low levels (e.g., Mason and Fitzgerald, 1991; Bloom, 1989; Bloom and Fitzgerald, 1988; Bloom and Crecelius, 1983). Reactive Hg was analyzed by tin chloride reduction, purge and trap and quantification by cold vapor atomic fluorescence spectrometry (CVAFS). For total and particulate Hg, samples were first pre-oxidized using 0.2 N bromine monochloride solution for an hour then reduced using hydroxylamine hydrochloride (Bloom and Crecelius, 1983), prior to quantification by the tin chloride reduction-atomic fluorescence technique. This method, outlined in EPA Method 1631 (EPA, 1995.), is based on methods developed by Bloom and Crecelius (1983) and Fitzgerald's research group at the University of Connecticut (e.g. Mason and Fitzgerald, 1991; Bloom and Fitzgerald, 1988; Gill and Fitzgerald, 1985). Dissolved and particulate methyl Hg were measured using a distillation technique prior to methylation with sodium tetraethylborate solution and analysis by gas chromatography with quantification using CVAFS. This method is similar to that of Horvat et al. (1993).

Trace elements. Quality assurance (QA) concerns encompassed all components of the project, from field collection to data validation. Both field and filter blanks were conducted and evaluated. Instantaneous grab samples were obtained by filling a pre-cleaned and tared, low density polyethylene (LDPE) bottle directly from the approximate center-of-flow of the river (except during high flows when the sample was collected from the river bank). The bottle was pre-treated at the site with three rinses of river water before collecting the sample. The LDPE bottles were cleaned using a multi-step procedure involving three day soaks in three different strengths of either HNO_3 or HCl, with several rinses of de-ionized (DI) water both during the transfers and at the end of the procedure. After cleaning, the bottles were allowed to dry under a class 1000 clean bench, and weighed to facilitate future calculations. Details of the cleaning procedure can be found in Scudlark et al. (1992).

After collection, the samples were kept on ice during transit. Upon return to the laboratory, they were immediately filtered through pre-cleaned and tared 0.4 μm Nuclepore filters using a peristaltic pump and a cleaned polycarbonate support apparatus. The filter was dried in a 40°C oven, allowed to cool in a desiccator, weighed and retained for particulate analysis. This and all future steps were done in a Class 1000 clean environment. The dissolved portion was collected in pre-cleaned LDPE bottles and acidified with double-distilled quartz HCl (Qz-HCl) to 0.04% volume/volume. Once acidified, the samples were frozen in a laboratory freezer dedicated to trace elements analysis.

The dissolved fraction of the samples was analyzed for Al, Cd, Cu, Fe, Mn, Ni, Pb, and Zn using a Perkin Elmer 3300 Atomic Absorption Spectrophotometer, equipped with a 600 HGA graphite furnace (GFAA). This instrument was also equipped with deuterium background correction and a L'vov platform was used to maximize temperature uniformity during the furnace cycle. Citric acid was used as a matrix modifier for Al and Fe to increase analytical sensitivity. The standard analyte injection was 60 μl for all elements except for Zn (10 μl). Multiple injections were used for Ni and Pb, increasing the volume of analyte to 120-180 μl and thus augmenting the sensitivity by a factor of 2 to 3.

GFAA calibration curves included an analytical blank and at least three standards. The accuracy of the calibration curve was confirmed by a standard reference material, and these results can be found in the Quality Assurance section (Appendix A, Table A-1). Replicate samples were run on separate days to verify true analytical reproducibility (which included but was not limited to instrument reproducibility). Reproducibility of less than 10% variation was deemed acceptable.

The particulate fraction was operationally defined as that portion of the sample that was retained on the 0.4 µm Nuclepore filter. The particles were digested using a technique that was modified (from: Evans and Hanson, 1993; Robisch and Clark, 1993; Conko and Rule, unpublished) to completely breakdown the filter and sediments. Briefly, the technique involved a cold soak overnight in concentrated HNO_3, followed by successive heatings with concentrated HCl and HF. The samples are brought to volume with a saturated solution of H_3BO_3 and analyzed.

Because of the higher concentrations of elements in the particulate phase, ICP-OES (Inductively Coupled Plasma - Optical Emissions Spectroscopy) analysis was employed for the same suite of elements as in the dissolved analysis. The samples were aspirated directly into the instrument without additional treatment. A blank and at least three standards per element were used to calibrate the instrument, the concentration of the standards bracketed the expected concentration of the samples. To verify both the digestion and analytical processes, a standard reference sediment was digested along with each set of samples and analyzed.

The results of certified reference material analyses are included in Table A-1. Both materials were obtained from the National Research Council of Canada. The reference material SLRS-3 is a standard river water that was run by GFAA to verify the results of the dissolved analysis; BCSS-1 is a standard river sediment that was digested and analyzed by ICP-OES to verify the particulate digestion and analysis.

Organic compounds. Surface water samples were collected using a Fultz submersible pump and placed in 37.5-L stainless steel (SS) milk cans. At the Northeast Branch site, water samples were pumped from the stream directly into the SS containers just downstream of an artificial weir which provided a naturally composited point sample. An elevated bridge across the Northwest Branch was used to sample the stream at this location. Stream water was collected incrementally across the distance of the bridge to provide a cross-sectional composite. Sample volumes ranged from about 25 L for storm samples (three from a storm were composited into one sample) to about 70 L for base flow samples. Water samples were transported in sealed SS containers and immediately stored in a walk-in cooler maintained at 0 ° C. Sample processing was initiated within 24 hours of collection.

Processing of the surface water samples was initiated with a filtration step to isolate the suspended particles from the bulk water phase. The sample water was pumped via a positive displacement pump (Model QB-1, Fluid Metering Inc., Oyster Bay, NY) through a stacked arrangement of Whatman GF/D (2.7 Tm pore diameter) overlaying Whatman GF/F (0.7 Tm nominal pore size) 15 cm glass fiber filters housed in a Millipore stainless steel filtration apparatus. The filter holder had been customized by the addition of a Teflon O-ring in place of Viton to prevent sample contamination and analyte reaction. The filtered water was collected in a fresh 37.5-L stainless steel milk can. Convoluted TFE Teflon tubing was the only type of tubing that was allowed contact with the sample during filtration. Filters were replaced in the filter apparatus as needed (when backpressure exceeded 25 psi). Used filters were folded into quarters together (i.e., both the GF/D and GF/F filters) and placed in pre-cleaned aluminum foil envelopes. The envelopes were sealed, labeled, added to zip-lock plastic bags, and placed in a freezer at -20 ° C until analyzed.

The organochlorine (OC) pesticides, PCBs and polycyclic aromatic hydrocarbons (PAHs) (Appendix A, Table A-2) were extracted from filtered water using the Goulden large-sample extractor (GLSE). GLSE theory and general operational parameters have been previously reported by Foster and Rogerson (1990) and Foster et al. (1991 and 1993). Dichloromethane (DCM) was used as the extraction solvent. Surrogate standards were added to sample water immediately prior to extraction. The sample was delivered to the entrance side arm of the GLSE using a fluid metering pump at a rate of 110 mL/min. A solvent recovery system was configured in line with the GLSE to recycle DCM escaping in the waste stream, returning the recovered DCM back into the second mixing chamber of the GLSE. Throughout the extraction, the level of DCM in the main extraction chamber was checked and additional volumes were added to keep the solvent volume constant at approximately 300 mL. After sample extraction, the DCM layer was passed through a powder funnel containing pre-cleaned anhydrous sodium sulfate and collected in a 500 mL boiling flask. The DCM was reduced in volume to 1 mL using rotary flash evaporation and nitrogen gas blowdown. One milliliter of n-Octane was added as a keeper solvent prior to solvent volume reduction.

Preserved filters were thawed to room temperature, placed in Soxhlet extraction thimbles, spiked with the surrogate standards for OC pesticide, PCB, and PAH schedules (Appendix A, Table A-3), and extracted for 24 hours with ethyl acetate. Both GF/D and GF/F filters were combined for each sample in the glass thimbles. The filter extracts were reduced in volume to 1 mL using rotary film evaporation and nitrogen gas blowdown. Again, n-Octane was added to the extracts prior to solvent volume reduction to serve as a keeper solvent.

Following GLSE and Soxhlet extraction and solvent volume reduction, organochlorine pesticides, PCBs, and PAH were class fractionated on alumina/silica chromatography columns prior to analysis using electron capture gas chromatography (GC) or gas chromatography/mass spectrometry (GC/MS). Custom fractionation columns were made by fusing 125 mL glass separatory funnels with 11 cm long glass chromatography columns equipped with ground glass stopcocks. The columns were packed, in order of filling from bottom to top, with 2 g of granular anhydrous sodium sulfate (J.T. Baker Chemical Co.), 3 g of fully activated silica gel (60/200 mesh, Fisher Chemical Co.; previously activated at 135 °C), 6 g of 2% (wt/wt) water deactivated neutral alumina (80/200 mesh, Fisher Chemical Co.; previously activated at 500 °C), and 4 g of anhydrous sodium sulfate.

Fractionation columns were initially pre-rinsed with 50 mL of n-hexane, and the extracts were loaded directly onto the top sodium sulfate layer of the sorbent bed via a transfer pipet and eluted with 45 mL of n-hexane (containing PCBs, hexachlorobenzene, aldrin, heptachlor, *trans*-nonachlor, p,p'-DDE, and a portion of the total p,p'-DDT) followed by 45 mL of DCM (PAH and remaining OC pesticides). Each eluent was collected separately in 50 mL centrifuge tubes and both were concentrated by using a Savant Speed Vac (Savant Instruments, Inc., Farmingdale, NY). One half milliliter of n-Octane was added before solvent volume reduction as a keeper solvent. The samples were reduced to a final volume of 0.5 mL and analyzed using GC-ECD or GC/MS.

A Hewlett-Packard (HP) 5890 Series II GC equipped with an electron capture detector was used to measure all of the organochlorine compounds. The GC operational conditions are listed in Appendix A, Table A-3. The GC-ECD output occured through an HP 3396A recording integrator, which transmitted the final data report after each run to an HP Vectra QS/20 microcomputer through HP 3396A File Server ver. 1.2 software. Hard copies of each chromatogram obtained from GC analysis were retained. The report files uploaded to the Vectra computer were imported into Quattro Pro (Borland) spreadsheets, evaluated as needed, and stored on both floppy disks and the Vectra QS/20 hard drive.

The GC/MS system consisted of an HP GCD system. The system was controlled and operated through HP Chemstation software according to the conditions listed below in Table 3. The mass spectrometer was tuned and calibrated daily with perfluorotributyl amine. GC/MS data files, quantitation files, and calibration files were stored on floppy disks and on the hard drive of the GCD computer and were backed up on Zip Drive floppy disks. All GC separations were carried out using high resolution capillary columns to attain the highest degree of efficiency and resolution in the analysis.

GC-ECD and GC/MS instruments were calibrated prior to the analysis of each batch of 20-25 samples. Primary standards were prepared either from neat compounds (Chem Service Inc., West Chester, PA) or were obtained as prepared solutions with known analyte concentrations (Chem Service). Secondary calibration standards were prepared from the primary standards using the appropriate mixtures and dilutions. The PCB calibration standard was prepared from a 7:5:5 (wt/wt/wt) mixture of Aroclors 1232:1248:1262. There are 112 PCB congeners associated with 80 GC-ECD peaks that are quantitated in each dissolved phase and suspended particle sample. The retention times of the PCB congeners were assigned according to the relative retention times reported by Eganhouse et al. (1989) and Shulz et al. (1989) for DB-5 capillary columns and were further verified by using GC/MS to identify PCB congeners eluting from our HP-1 column. PCB nomenclature in this study conforms to that reported by Ballschmitter and Zell (1981).

Four point calibrations were performed in the analysis of PCB's, OC pesticides (GC-ECD), and PAH (GC/MS) and linear regressions constants were evaluated (in $y = mx + b$ format). The resulting regression constants were incorporated into Quattro Pro spreadsheets for quantitation and evaluation of the mass of analyte in each sample vial. During calibration, the analyte and internal standard masses were known to four significant figures and all integrated GC peak areas (instrument ADC output) were obtained from the HP 3396A integrating recorder (GC-ECD). GC peak identifications were based upon the retention time of the analyte peak relative to the retention time of the nearest internal standard (with a tolerance of ± 0.0025 relative time). All quantitation was performed automatically with the aid of the HP 3396 integrator for GC-ECD. Calibration RRF data was recorded and a hard copy was saved on file daily to query instrument variability and drift through time. Propagated uncertainties are reported for each analyte using standard quantitative error analysis techniques.

All non-volumetric glassware was scrupulously cleaned with Alconox detergent in hot tap water, rinsed with distilled water, and fired in a muffle furnace at 450 °C for 15 hours. Fired glassware was stored wrapped in aluminum foil (all aluminum foil used for wrapping and storage in this study is fired at 450 °C prior to use), and was repeatedly rinsed with solvent before use. Volumetric glassware was initially soaked in 20% aqueous nitric acid, washed in Alconox detergent, rinsed with distilled water, and hexane rinsed repeatedly prior to use. Volumetric glassware was also stored wrapped in aluminum foil.

Stainless steel milk cans were washed in the same manner as glassware but were not fired. The cans were repeatedly rinsed with methanol and n-hexane prior to use and were stored with their lids securely fastened to prevent the entry of organics into the clean can from ambient air. The GLSE was cleaned by filling it with distilled water and adding Alconox detergent followed by boiling the mixture with immersion heaters for one hour. The extractor was drained and rinsed repeatedly with distilled water and methanol. It was then soaked in 20% aqueous nitric acid, rinsed with distilled water, and repeatedly solvent rinsed prior to use. Positive displacement pumps and associated Teflon tubing were thoroughly washed with hot soapy tap water, distilled water and methanol between experiments. All tubing and Swagelock connections were sonicated in a hot soap water bath on a monthly basis. All exposed ends of Teflon tubing were kept wrapped with aluminum foil when not in use to prevent contamination. Milk cans that were in contact with the samples were solvent rinsed with 50 mL of DCM following GLSE extraction. The solvent rinses are analyzed for all target analytes using the usual procedures.

Quality assurance (QA) practices in organic pollutant analysis included (a) laboratory and field blanks, (b) sample container solvent rinses, (c) full suite QA spikes, (d) surrogate standard spikes for each constituent schedule, and (e) OC pesticide confirmation in GC analysis by cross checking identifications using a DB-1701 GC column, and (f) National Institute of Standards and Technology standard reference sediment analysis.

A QA matrix spike as defined in this study represented the addition of each target analyte to a large volume distilled water sample and to clean GF/F filters. The spiked matrices were processed in the usual fashion to determine analyte recoveries through the methods. QA spike solutions for the GLSE dissolved phase samples were prepared as a methanol solution (5 mL) to give a final concentration of 10 ng/L for each component (for PCBs, the amount corresponds to 300 ng/L total PCBs and for Soxhlet samples the spiking range was 100 ng for PAHs to 2.5 ng for organochlorine (OC) pesticides. In addition, a suite of surrogate standards was added to each sample to evaluate the performance of each sample analysis. The surrogates used in this study are listed in Table A-3. Corrections were made to normalize analyte concentrations relative to the recoveries of the appropriate surrogate standards. Surrogate corrections greatly improve the repeatability of measured analyte concentrations in the samples. Lastly, OC pesticide identifications made with the primary HP-1 GC column were confirmed upon subsequent analysis and detection on a DB-1701 GC capillary column via GC-ECD. Confirmed pesticide identifications are those which have been subjected to both GC columns. River sediment (SRM 1941a) was analyzed to provide a measure of the systematic errors resulting from the analysis of the filtered particulates. A sample of 1.5 g of SRM 1941a was placed on a GF/F filter and was processed as a normal filtered particle sample.

Comparison of Results to EPA Water Quality Criteria

The data for selected chemicals were compared to available EPA numeric water quality criteria (40 CFR 131 and amendments) for acute and chronic exposure in freshwater. Aquatic organisms exposed to chemical concentrations above these criteria may suffer negative effects after short (acute) or long term (chronic) exposure. Acute criteria are one-hour average concentrations of dissolved or biologically available chemical. Chronic criteria are similarly defined, yet they are four-day average contaminant concentrations. No attempt was made to document whether the measured concentrations were sustained for these periods of time, although the concentrations of organic chemicals represent the average concentration over the sampling time for each storm (from several hours to several days), and, therefore, are more likely to meet the duration requirements. Exceedences of the numeric criteria does not necessarily mean that the water quality standard has been violated. Such an exceedence does, however, provide and indication of whether chemical contaminants were occurring at potentially toxic concentrations.

Load Calculations

As described above, storm flow samples were collected at three points during each storm and the dissolved and particulate fractions were analyzed for contaminants. Samples collected for trace element analysis were analyzed individually (3 samples per storm) and the results from a given storm were later averaged to generate storm mean concentrations. These storm means are comparable to those from the organic compound samples, which were composited in the field. For the few occasions when analytical problems resulted in missing values, storm means were calculated from the available data only. "Total" contaminant concentrations were either measured directly (in the case of mercury) or calculated by adding the concentrations for the particulate and dissolved fractions. Particulate concentrations, originally reported in μg/g or ng/g, were converted to μg/L by multiplying by the TSS concentration (Appendix A). When a chemical was not detected or it's concentration was below the quantifiable levels for the method being used, the chemical was assigned a concentration of zero for all calculations. The resulting dataset consists of dissolved, particulate and total concentrations for each chemical from each of the six nonstorm flow and four storm flow sampling events

Previous work has demonstrated that the load estimates calculated by methods of varying complexity usually agree within a factor of 2 to 3 (Godfrey et al., 1996). For this reason, and because the data collected from this monitoring study is not extensive, a relatively simple and easily implemented model was chosen to estimate contaminant loads. The model uses flow-weighted mean concentrations that were calculated from the dataset described above and the corresponding flow values measured at nearby USGS gaging stations to compute average annual loads. These flow-weighted means, in turn, were used with the historic average annual yearly discharge (James et al., 1995) to estimate contaminant loads to the tidal Anacostia River from the Northeast and Northwest Branches (Equation 1).

$$L_i = k \left(\frac{\Sigma(C_i\, Q_i)}{\Sigma Q_i}\right) Q_{avg} \qquad (1)$$

Where:

L_i = Load of constituent i (Kg/yr).
K = Unit conversion factor.
C_i = Concentration of constituent i (µg/L).
Q_i = Instantaneous flow associated with C_i (cfs).
Q_{avg} = Historic total annual average flow (ft^3).

It is important to remember that the uncertainty in the flow-weighted mean concentration for a given chemical (and the annual load estimate derived from it) increases with the percentage of times that chemical's concentration cannot be quantified. When a chemical concentration cannot be accurately quantified because of the limits of the analytical method, the chemical's actual concentration may be anything from zero up to the method quantitation limit. The uncertainty created by values below the quantification level is compounded for summed parameters such as PCBs and PAHs. Each PCB congener or constituent PAH may actually be present at the quantitation limit, therefore the total concentration may be as high as the sum of quantitation limits for each component. The quantitation limits achieved in this study are sufficiently low to greatly reduce that uncertainty.

Results

Sample Collection

The monitoring period roughly coincided with water year 1996 (October 1, 1995 through September 30, 1996). Water year 1996 was one of the wettest years on record for the Washington, DC metropolitan area. Two periods of extensive flooding occurred in the Potomac River basin during this time. The first and most severe followed rapid snowmelt and rainfall in January, 1996, and the second was in the wake of a hurricane in August, 1996. Figure 1 shows the mean daily flow values at the Northeast and Northwest Branches from September 25, 1995 through September 30, 1996 on a log scale. The times when storm flow and nonstorm flow samples were collected are also indicated.

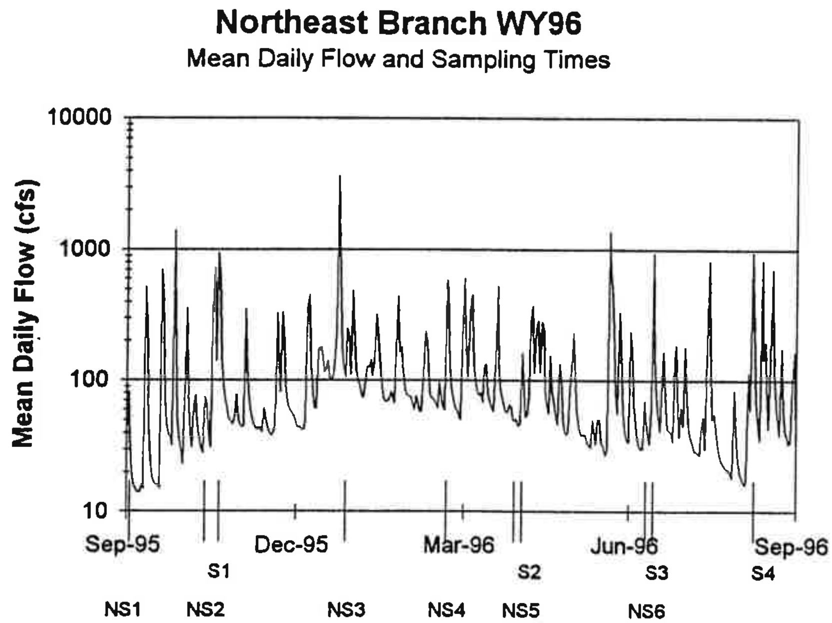
Figure 2 shows that flows in both branches of the river were highest during the winter months, including the high flows of the January flood. The large number of brief increases in flow stem from the high level of imperviousness in the watershed, which creates a relatively large volume of runoff from even small amounts of rainfall, and flood control measures such as stream channelization, which rapidly convey the runoff to the larger stream segments, including the Northeast and Northwest Branches.

Figures 3 through 6 show detailed hydrographs from flow data recorded every 15-minutes during the periods preceding and including the collection of storm flow samples. Sample collection times are indicated as well. The plots indicate that the storm flow samples were collected at points throughout the storm flow periods (thereby integrating contaminant concentrations that may vary throughout a given storm), after no less than 24 hours of dry weather (allowing time for contaminant buildup since the previous wash-off), and under various flow volume and antecedent rainfall conditions.

Contaminant Concentrations and Loads

Tables 2 through 17 provide summaries of the contaminant data for the Northeast and Northwest Branches (see also Appendix A for the complete analytical data). These summary tables include the percentage of samples where the concentration was above quantifiable levels, and the minimum, maximum, and arithmetic average concentrations (dissolved, particulate and dissolved plus particulate) for each chemical, under both nonstorm and storm flow conditions.

Tables 18 through 33 present the flow-weighted mean concentrations and contaminant loads for the same contaminant groups. The flow-weighted means were calculated from the combined nonstorm and storm data. The load estimates, in turn, were calculated from the flow-weighted means and the historic mean daily flows (as described above).



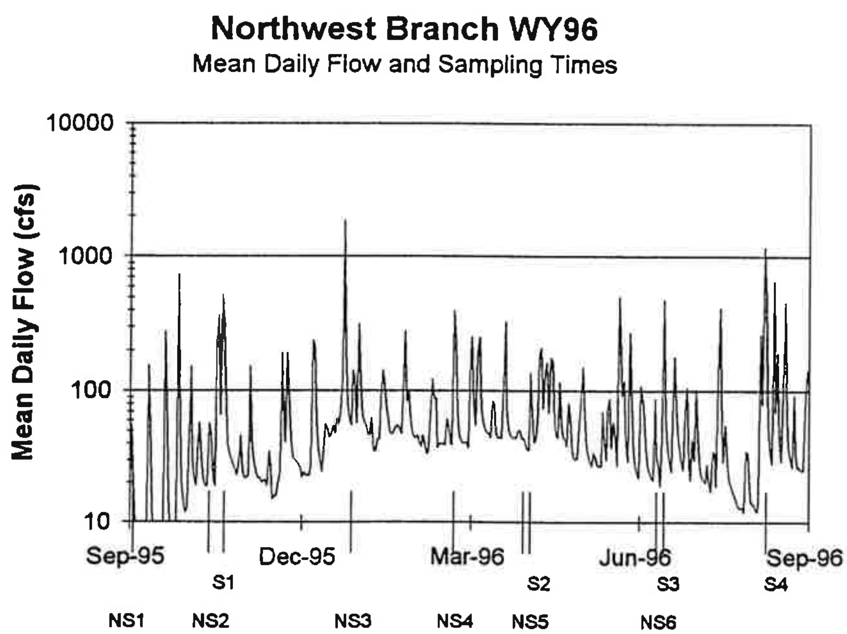
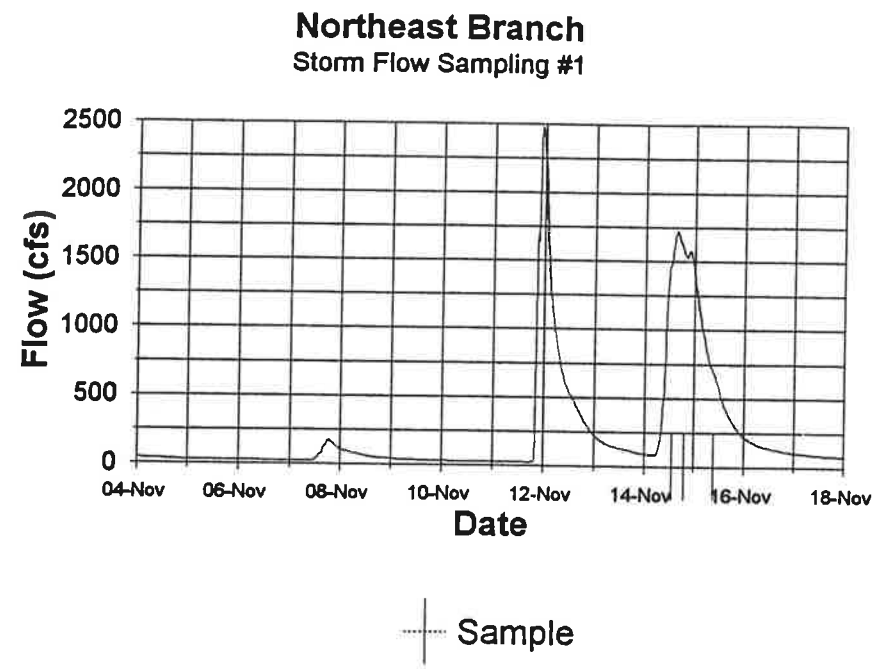


Figure 2. Mean daily flow values at the USGS gages on the Northeast and Northwest Branches from September 25, 1995 through September 30, 1996. Sample collection times for storm flow (S) and nonstorm flow (NS) are marked with vertical bars on the x-axis.



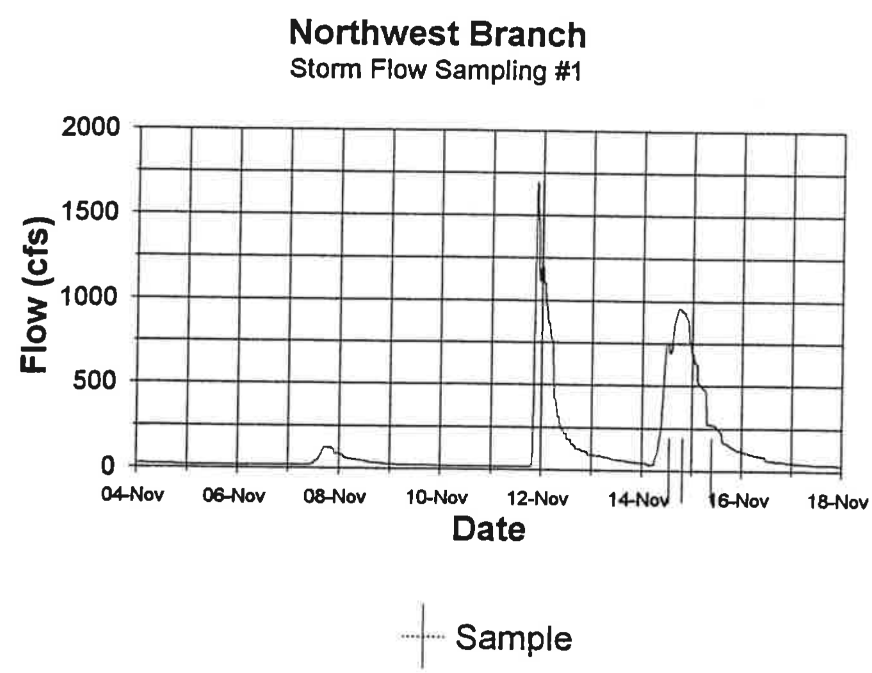
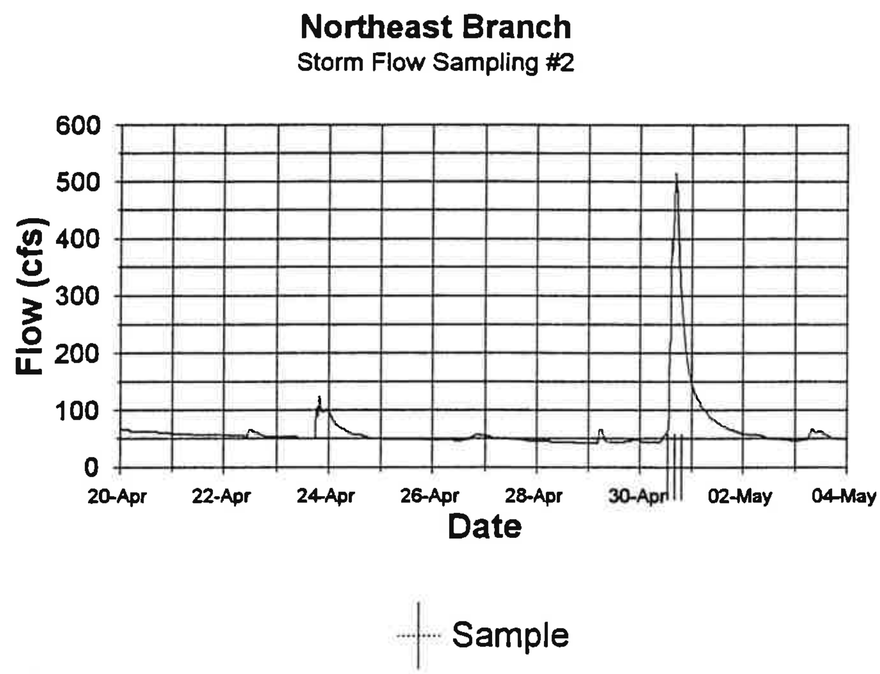


Figure 3. Hydrographs from 15-minute flow data collected at the USGS gages on the Northeast and Northwest Branches preceding and through storm flow sampling during November, 1995. Sample collection times are marked with vertical bars on the x-axis.



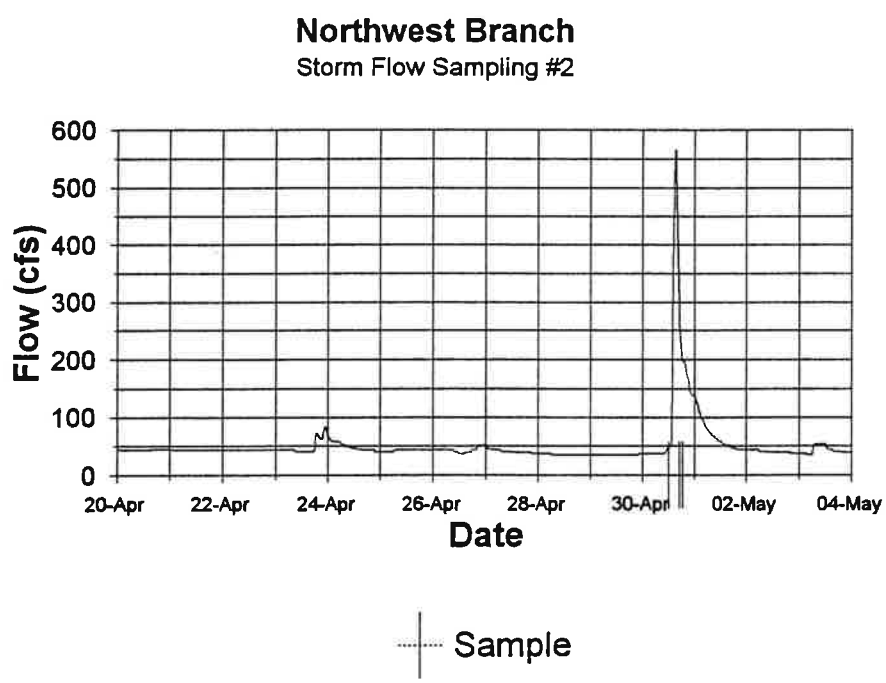
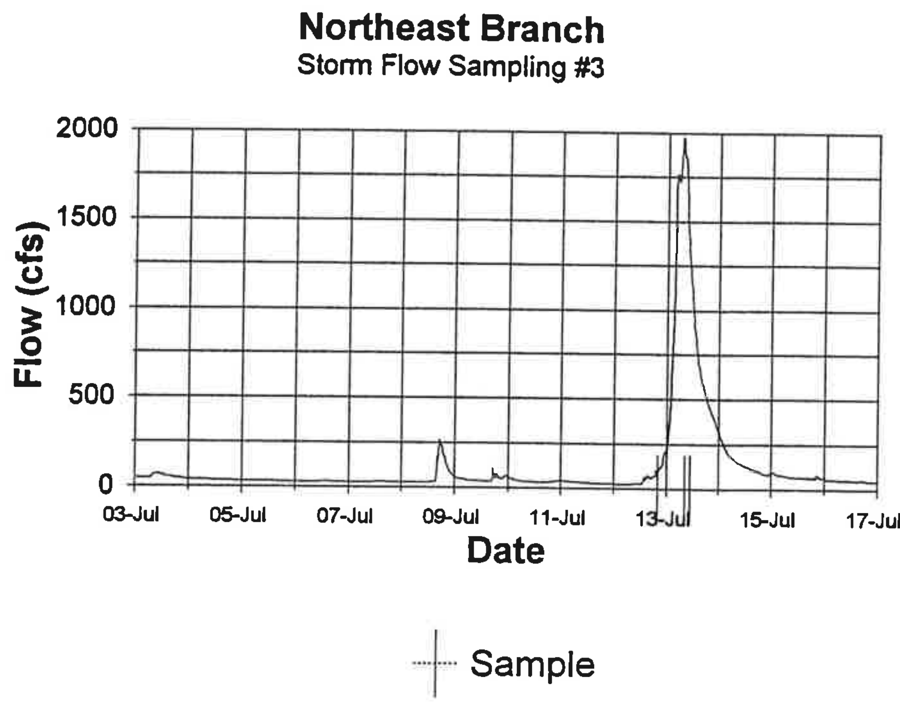


Figure 4. Hydrographs from 15-minute flow data collected at the USGS gages on the Northeast and Northwest Branches preceding and through storm flow sampling during late April, 1996. Sample collection times are marked with vertical bars on the x-axis.



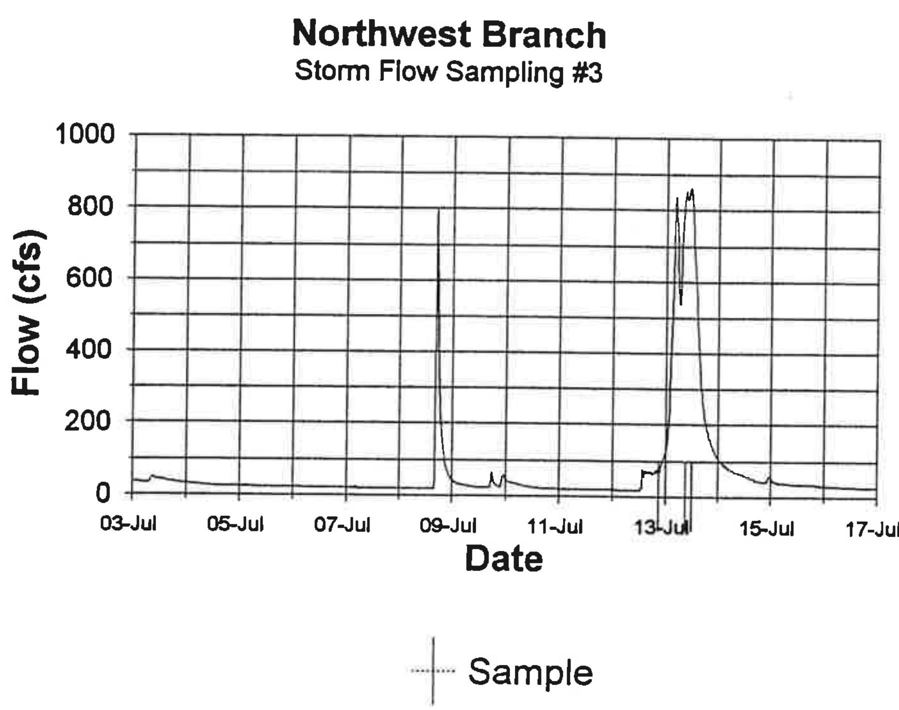
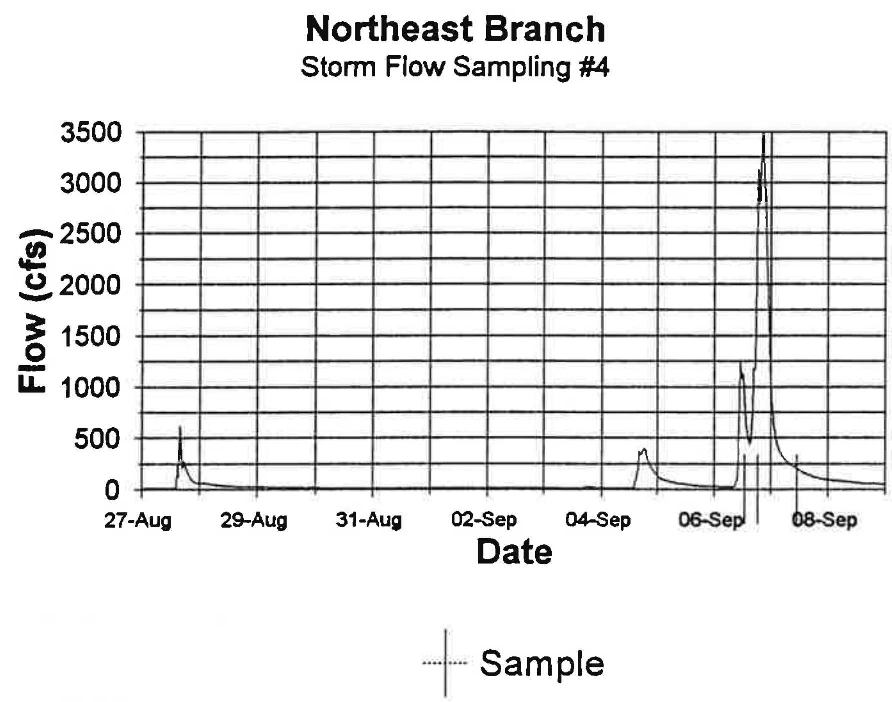


Figure 5. Hydrographs from 15-minute flow data collected at the USGS gages on the Northeast and Northwest Branches preceding and through storm flow sampling during July, 1996. Sample collection times are marked with vertical bars on the x-axis.



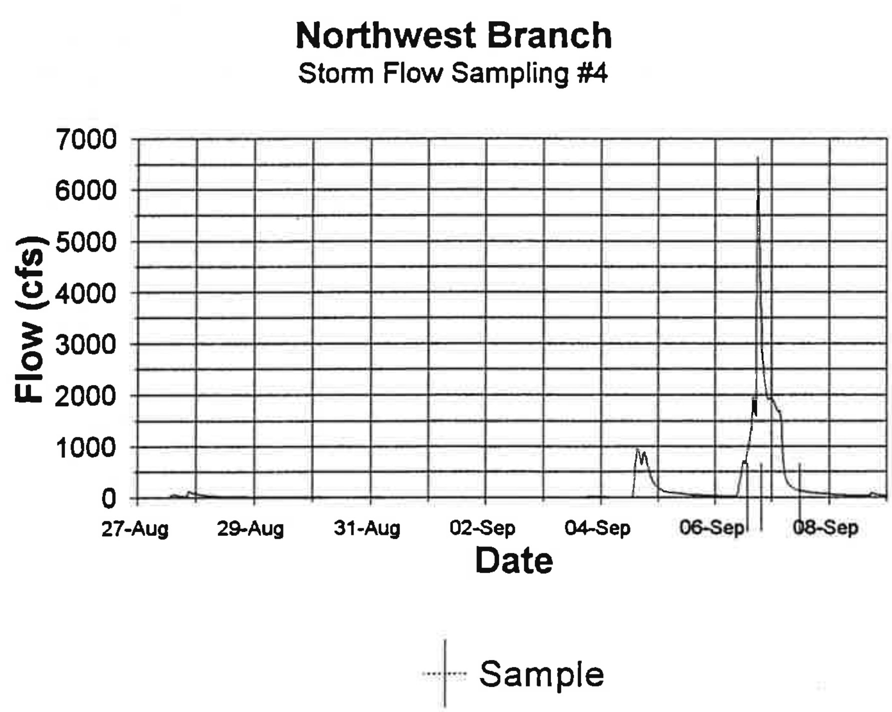


Figure 6. Hydrographs from 15-minute flow data collected at the USGS gages on the Northeast and Northwest Branches preceding and through storm flow sampling during September, 1996. Sample collection times are marked with vertical bars on the x-axis.

Table 2. Trace Element Data Summary - Northeast Branch of the Anacostia River

Analyte	Percent Detection NSF	Percent Detection SF	Minimum NSF	Minimum SF	Maximum NSF	Maximum SF	Mean NSF	Mean SF
			All Concentrations ug/L except Mercury = ng/L					
DISSOLVED PHASE								
Aluminum	100	100	10.71	17.42	64.51	178.60	29.11	62.71
Cadmium	100	100	0.06	0.04	1.30	1.87	0.31	0.26
Copper	100	100	0.34	1.57	3.16	4.26	1.58	2.62
Iron	100	100	32.40	39.77	224.81	341.90	115.24	164.91
Manganese	100	100	10.4	0.93	256.1	115.7	104.88	42.38
Nickel	100	100	2.13	2.17	8.65	8.46	4.49	3.88
Lead	100	100	0.17	0.03	0.38	0.49	0.26	0.26
Zinc	100	100	0.33	3.29	10.41	20.65	5.13	8.87
PARTICULATE PHASE								
Aluminum	100	100	52.45	10.86	948.59	66675.85	270.75	23818.35
Cadmium	80	91	BDL	BDL	0.09	0.80	0.02	0.31
Copper	67	92	BDL	BDL	7.87	94.14	1.78	21.39
Iron	100	100	36.21	16.68	563.61	9900.86	158.22	2658.22
Manganese	100	100	1.69	2.18	109.83	1499.37	22.63	476.15
Nickel	100	100	0.12	0.01	5.88	32.13	1.41	12.96
Lead	60	100	BDL	0.01	1.25	113.72	0.37	40.79
Zinc	100	100	0.47	0.38	14.96	306.57	4.38	63.45
Mercury	100	100	106	2.54	3.39	102.12	2.42	33.25
TOTAL (DISSOLVED+PARTICULATE)								
Aluminum			97.80	29.35	987.39	66715.72	299.86	23881.06
Cadmium			0.07	0.12	1.39	1.96	0.38	0.58
Copper			0.35	1.82	9.10	98.40	3.36	24.01
Iron			68.61	142.78	788.42	10117.97	273.46	2823.13
Manganese			12.09	29.53	265.77	1556.52	127.51	518.53
Nickel			2.32	2.18	10.17	36.29	5.89	16.84
Lead			0.18	0.29	1.53	113.77	0.65	41.05
Zinc			0.80	7.33	21.94	318.54	9.51	72.32
Mercury	100	100	5.48	6.68	11.84	82.20	8.95	33.39

NSF=nonstorm flow conditions, SF=storm flow conditions
Total=sum of particulate and dissolved, except mercury measured directly
BDL=Below Detection Limit (Treated as zero for calculations)
For nonstorm flow samples, N=6 for all analytes, except particulate cadmium and ead (N=5)
For stormflow samples, N=12 for all analytes except particulate cadmium and lead (N=11).
Dissolved mercury not measured.
Particulate mercury values sometimes exceed total mercury due to subsampling error.

Table 3. Trace Element Data Summary - Northwest Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
			All Concentrations ug/L except Mercury = ng/L					
DISSOLVED PHASE								
Aluminum	100	100	14.00	13.55	22.72	242.55	18.09	72.69
Cadmium	100	100	0.04	0.03	0.53	0.42	0.18	0.14
Copper	100	100	0.35	1.45	2.85	3.30	1.48	2.34
Iron	100	100	99.00	59.60	231.29	282.50	154.56	158.50
Manganese	100	100	14.76	1.04	178.90	65.40	71.91	30.94
Nickel	100	100	1.44	2.00	4.02	5.36	2.45	2.87
Lead	100	100	BDL	BDL	0.25	1.56	0.15	0.38
Zinc	100	100	0.96	1.90	6.02	16.27	3.49	7.25
PARTICULATE PHASE								
Aluminum	100	100	23.50	253.53	2930.58	303133.14	590.76	45876.94
Cadmium	80	100	BDL	BDL	0.05	4.65	0.02	0.73
Copper	67	92	BDL	BDL	20.71	128.63	4.66	31.04
Iron	100	100	11.65	44.74	408.88	32472.13	201.69	5933.27
Manganese	100	100	0.66	11.09	526.67	5001.25	101.48	984.74
Nickel	100	100	0.01	0.25	17.55	118.73	4.58	24.41
Lead	80	91	BDL	BDL	4.84	464.14	1.19	84.95
Zinc	100	100	0.26	2.25	11.85	328.32	5.10	74.77
Mercury	100	100	0.26	1.69	3.45	164.17	1.26	41.05
TOTAL (DISSOLVED+PARTICULATE)								
Aluminum			46.22	269.95	2944.58	313176.41	608.85	45949.63
Cadmium			0.04	0.19	0.57	4.69	0.20	0.94
Copper			1.61	1.54	21.70	130.96	6.15	33.38
Iron			128.62	304.24	625.80	32544.65	356.25	6091.77
Manganese			33.27	56.15	541.44	5022.16	173.39	1015.68
Nickel			2.16	2.84	19.00	121.87	7.03	27.28
Lead			0.10	0.09	5.03	464.25	1.32	85.34
Zinc			3.24	10.29	15.41	331.59	8.59	82.03
Mercury	100	100	2.01	2.34	10.47	47.86	4.80	27.66

NSF=nonstorm flow conditions, SF=storm flow conditions

Total=sum of particulate and dissolved, except mercury measured directly

BDL=Below Detection Limit (Treated as zero for calculations)

For nonstorm flow samples, N=6 for all analytes, except particulate cadmium and ead (N=5)

For stormflow samples, N=12 for all analytes except particulate cadmium and lead (N=11).

Dissolved mercury not measured.

Particulate mercury values sometimes exceed total mercury due to subsampling error.

Table 4. PCB Data Summary - Northeast Branch of the Anacostia River

Congenor Class	Percent Detection NSF	Percent Detection SF	Minimum NSF	Minimum SF	Maximum NSF	Maximum SF	Mean NSF	Mean SF
					All Concentrations ng/L			
DISSOLVED PHASE								
Dichlorobiphenyls	17	50	BDL	BDL	0.014	0.178	0.002	0.056
Trichlorobiphenyls	100	100	0.062	0.083	0.966	0.787	0.441	0.375
Tetrachlorobiphenyls	100	100	0.618	0.248	0.804	1.001	0.677	0.481
Pentachlororbiphenyls	100	100	0.475	0.313	1.166	0.735	0.872	0.593
Hexachlorobiphenyls	100	100	0.253	0.179	0.662	0.502	0.493	0.406
Heptachlorobiphenyls	100	100	0.168	0.130	0.440	0.446	0.294	0.281
Octachlorobiphenyls	67	100	BDL	0.027	0.079	0.215	0.046	0.095
Nonachlorobiphenyls	50	75	BDL	BDL	0.020	0.016	0.004	0.009
Total-PCBs	NA	NA	6.238	30.889	11.501	49.401	9.600	40.243
PARTICULATE PHASE								
Dichlorobiphenyls	50	0	BDL	BDL	0.068	BDL	0.018	NA
Trichlorobiphenyls	83	25	0.011	BDL	0.148	0.829	0.074	0.207
Tetrachlorobiphenyls	100	100	BDL	0.129	0.394	1.338	0.108	0.705
Pentachlororbiphenyls	100	100	0.052	1.460	1.554	3.302	0.356	2.270
Hexachlorobiphenyls	100	100	0.035	2.319	0.256	5.754	0.128	4.358
Heptachlorobiphenyls	100	100	0.060	2.459	1.861	7.676	0.477	4.540
Octachlorobiphenyls	100	75	BDL	0.903	0.070	2.994	0.022	2.182
Nonachlorobiphenyls	100	100	BDL	0.117	0.035	0.321	0.013	0.198
Total-PCBs	NA	NA	3.175	17.872	7.028	28.281	4.409	23.085
TOTAL (DISSOLVED+PARTICULATE)								
Dichlorobiphenyls	NA	NA	BDL	BDL	0.068	0.178	0.020	0.056
Trichlorobiphenyls	NA	NA	0.073	0.083	1.115	1.356	0.516	0.582
Tetrachlorobiphenyls	NA	NA	0.674	0.377	1.027	1.980	0.785	1.186
Pentachlororbiphenyls	NA	NA	0.589	2.147	2.423	3.615	1.228	2.863
Hexachlorobiphenyls	NA	NA	0.378	2.498	0.830	6.232	0.621	4.764
Heptachlorobiphenyls	NA	NA	0.229	2.589	2.301	8.123	0.771	4.821
Octachlorobiphenyls	NA	NA	BDL	0.930	0.126	3.209	0.068	2.277
Nonachlorobiphenyls	NA	NA	BDL	0.117	0.036	0.337	0.017	0.207
Total-PCBs	NA	NA	9.414	48.761	18.139	77.682	14.010	63.328

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=All congenors Below Detection Limit (treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all congenors.

For nonstorm flow samples, N=6 for all congenors.

Table 5. PCB Data Summary - Northwest Branch of the Anacostia River

Congenor Class	Percent Detection NSF	Percent Detection SF	Minimum NSF	Minimum SF	Maximum NSF	Maximum SF	Mean NSF	Mean SF
			All Concentrations ng/L					
DISSOLVED PHASE								
Dichlorobiphenyls	33	25	BDL	BDL	0.103	0.068	0.022	0.017
Trichlorobiphenyls	100	75	0.058	BDL	0.704	0.215	0.360	0.106
Tetrachlorobiphenyls	100	75	0.243	BDL	0.878	0.691	0.630	0.267
Pentachlororbiphenyls	100	100	0.155	0.104	0.732	0.733	0.379	0.355
Hexachlorobiphenyls	100	100	0.005	0.143	0.674	0.754	0.296	0.375
Heptachlorobiphenyls	100	100	0.089	0.035	0.684	0.125	0.334	0.088
Octachlorobiphenyls	83	75	BDL	BDL	0.081	0.032	0.036	0.021
Nonachlorobiphenyls	33	100	BDL	0.005	0.013	0.019	0.003	0.009
Total-PCBs	NA	NA	5.133	5.442	10.051	77.127	7.673	29.318
PARTICULATE PHASE								
Dichlorobiphenyls	17	0	BDL	BDL	0.011	0.046	0.002	0.012
Trichlorobiphenyls	33	50	BDL	BDL	1.115	1.430	0.190	0.375
Tetrachlorobiphenyls	50	75	BDL	BDL	1.269	3.443	0.220	0.950
Pentachlororbiphenyls	83	100	BDL	0.178	0.980	7.247	0.227	2.299
Hexachlorobiphenyls	83	100	BDL	0.079	0.462	6.152	0.160	2.322
Heptachlorobiphenyls	83	100	BDL	0.350	1.719	6.510	0.539	2.194
Octachlorobiphenyls	50	100	BDL	0.128	0.528	3.601	0.108	1.891
Nonachlorobiphenyls	67	75	BDL	BDL	0.137	0.329	0.030	0.182
Total-PCBs	NA	NA	BDL	1.190	4.788	28.383	1.477	10.224
TOTAL (DISSOLVED+PARTICULATE)								
Dichlorobiphenyls	NA	NA	BDL	BDL	0.103	0.068	0.023	0.029
Trichlorobiphenyls	NA	NA	0.085	0.072	1.323	1.645	0.550	0.481
Tetrachlorobiphenyls	NA	NA	0.273	0.016	1.975	4.135	0.850	1.216
Pentachlororbiphenyls	NA	NA	0.323	0.497	1.249	7.979	0.606	2.654
Hexachlorobiphenyls	NA	NA	0.186	0.556	0.762	6.549	0.456	2.696
Heptachlorobiphenyls	NA	NA	0.318	0.385	1.808	6.636	0.872	2.283
Octachlorobiphenyls	NA	NA	0.041	0.128	0.528	3.623	0.144	1.912
Nonachlorobiphenyls	NA	NA	BDL	0.019	0.137	0.335	0.033	0.192
Total-PCBs	NA	NA	5.367	6.632	13.167	105.510	9.149	39.543

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=All congenors Below Detection Limit (treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=6 for all analytes except particulate Cadmium and Lead (N=5).

For nonstorm flow samples, N=12 for all analytes, except particulate Cadmium and Lead (N=11)

Table 6. PAH Data Summary: Dissolved Fraction - Northeast Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
					All Concentrations ng/L			
Acenaphthene	100	100	0.116	1.941	16.717	16.675	3.788	6.150
Acenaphthylene	83	100	BDL	0.603	1.838	0.813	0.729	0.756
Benz[a]anthracene	100	75	0.707	BDL	9.212	4.528	3.849	2.679
Benzo[a]pyrene	100	75	BDL	BDL	3.005	3.903	1.346	1.998
Benzo[ghi]perylene	100	100	0.120	0.394	1.860	2.076	0.648	1.199
Benzo[j]fluoranthene	83	100	BDL	0.734	2.903	3.505	1.280	1.687
Benzo[k]fluoranthene	100	75	0.369	BDL	2.635	1.675	0.973	1.115
Chrysene	100	100	1.003	2.550	12.135	10.296	3.845	6.063
Dibenz[a,h]anthracene	83	75	BDL	BDL	2.157	2.804	1.018	1.226
Fluoranthene	100	100	8.327	14.649	98.308	67.520	26.005	42.424
Fluorene	100	100	0.475	1.740	50.260	25.631	10.501	10.383
Indeno[1,2,3-cd]pyrene	83	100	BDL	1.527	2.665	3.647	1.368	2.556
Naphthalene	83	75	BDL	BDL	16.216	15.005	5.950	6.111
Naphthalene, 2,6-dimethyl	100	100	0.201	1.506	7.750	7.643	2.157	3.616
Naphthalene, 2-methyl	100	100	0.427	1.094	16.458	8.183	4.388	3.511
Perylene	83	75	BDL	BDL	4.707	3.865	1.486	2.139
Phenanthrene	100	100	2.237	3.227	134.935	42.587	28.194	18.291
Pyrene	100	100	2.931	0.139	73.434	59.001	19.190	26.688
Total Dissolved PAH	NA	NA	34.942	56.666	422.969	245.566	116.714	138.590

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 7. PAH Data Summary: Particulate Fraction - Northeast Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
					All Concentrations ng/L			
Acenaphthene	33	75	BDL	BDL	0.749	9.089	0.191	5.885
Acenaphthylene	67	75	BDL	BDL	0.391	3.235	0.149	2.211
Benz[a]anthracene	83	100	BDL	78.393	51.023	278.358	11.113	175.515
Benzo[a]pyrene	83	100	BDL	80.112	61.709	371.886	12.717	259.251
Benzo[ghi]perylene	100	100	0.731	71.156	40.245	293.620	9.631	184.151
Benzo[j]fluoranthene	100	100	0.296	7.484	45.154	359.962	10.358	121.540
Benzo[k]fluoranthene	100	100	0.728	85.944	20.914	810.638	5.393	323.590
Chrysene	100	100	1.965	116.715	50.788	702.772	12.476	448.336
Dibenz[a,h]anthracene	67	100	BDL	6.889	6.572	56.537	2.053	28.048
Fluoranthene	100	100	2.282	274.762	88.537	783.634	21.946	574.620
Fluorene	33	100	BDL	1.393	1.597	14.523	0.357	9.709
Indeno[1,2,3-cd]pyrene	83	100	BDL	4.662	22.891	232.455	6.156	88.060
Naphthalene	50	75	BDL	BDL	0.388	5.182	0.165	3.463
Naphthalene, 2,6-dimethyl	33	75	BDL	BDL	0.619	4.216	0.141	2.524
Naphthalene, 2-methyl	67	100	BDL	0.216	0.285	5.921	0.136	3.729
Perylene	100	100	1.037	23.846	14.515	91.258	4.680	56.504
Phenanthrene	67	100	BDL	20.104	32.822	278.027	6.399	189.011
Pyrene	83	100	BDL	11.936	89.433	546.024	17.490	317.183
Total Particulate PAH	NA	NA	9.616	959.306	528.093	4501.515	121.550	2793.330

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 8. PAH Data Summary: Dissolved + Particulate Fractions - Northeast Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
Acenaphthene	NA	NA	0.116	1.941	17.466	25.763	3.979	12.035
Acenaphthylene	NA	NA	BDL	0.797	2.230	4.047	0.878	2.967
Benz[a]anthracene	NA	NA	0.717	82.380	60.235	280.558	14.963	178.194
Benzo[a]pyrene	NA	NA	0.369	83.002	62.327	371.886	14.063	261.249
Benzo[ghi]perylene	NA	NA	0.851	73.231	40.758	294.014	10.279	185.350
Benzo[j]fluoranthene	NA	NA	0.807	8.861	48.056	363.467	11.637	123.227
Benzo[k]fluoranthene	NA	NA	1.184	87.146	23.549	812.313	6.366	324.704
Chrysene	NA	NA	2.968	119.265	62.923	713.068	16.321	454.399
Dibenz[a,h]anthracene	NA	NA	0.027	7.038	7.609	58.487	3.071	29.274
Fluoranthene	NA	NA	11.987	313.993	186.846	851.154	47.951	617.043
Fluorene	NA	NA	0.475	4.669	51.856	40.154	10.858	20.091
Indeno[1,2,3-cd]pyrene	NA	NA	0.148	6.189	25.001	235.401	7.524	90.616
Naphthalene	NA	NA	0.182	4.770	16.216	15.005	6.115	9.574
Naphthalene, 2,6-dimethyl	NA	NA	0.201	3.228	8.369	11.859	2.297	6.140
Naphthalene, 2-methyl	NA	NA	0.571	5.746	16.673	8.399	4.524	7.240
Perylene	NA	NA	1.863	27.711	16.430	94.694	6.166	58.643
Phenanthrene	NA	NA	2.452	33.458	167.757	320.614	34.593	207.301
Pyrene	NA	NA	3.346	12.075	162.867	605.025	36.679	343.871
Total PAH	NA	NA	47.748	1063.866	951.061	4747.082	238.264	2931.920

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 9. PAH Data Summary: Dissolved Fraction - Northwest Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
					All Concentrations ng/L			
Acenaphthene	83	100	BDL	1.095	9.596	8.994	2.903	3.423
Acenaphthylene	83	100	BDL	0.770	1.898	0.971	0.541	0.847
Benz[a]anthracene	100	100	2.039	0.720	8.855	7.765	3.640	3.853
Benzo[a]pyrene	83	100	BDL	1.291	6.564	6.652	2.392	3.458
Benzo[ghi]perylene	100	100	0.120	1.355	3.039	2.367	0.883	1.701
Benzo[j]fluoranthene	100	50	0.416	0.345	4.553	5.828	1.911	2.056
Benzo[k]fluoranthene	100	100	0.345	BDL	5.544	2.453	1.580	0.925
Chrysene	100	100	1.518	2.014	14.602	8.785	6.299	4.327
Dibenz[a,h]anthracene	83	75	BDL	BDL	2.760	4.599	1.383	1.214
Fluoranthene	100	100	6.347	10.195	58.401	71.910	24.970	32.993
Fluorene	100	100	0.350	1.441	28.638	23.326	10.514	7.301
Indeno[1,2,3-cd]pyrene	100	100	1.610	1.267	3.392	6.020	2.016	2.860
Naphthalene	67	75	BDL	BDL	14.352	12.541	4.410	4.387
Naphthalene, 2,6-dimethyl	100	100	0.098	1.465	74.232	16.821	17.132	6.102
Naphthalene, 2-methyl	100	100	0.399	0.882	62.651	10.063	13.681	3.300
Perylene	100	50	0.868	BDL	4.936	5.143	2.084	1.785
Phenanthrene	100	75	0.524	BDL	34.915	12.716	16.422	5.697
Pyrene	100	100	4.629	6.780	38.597	55.156	17.769	23.330
Total Dissolved PAH	NA	NA	32.772	41.642	353.089	236.340	130.530	109.558

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 10. PAH Data Summary: Particulate Fraction - Northwest Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
			All Concentrations ng/L					
Acenaphthene	33	100	BDL	1.965	0.355	40.730	0.067	18.146
Acenaphthylene	100	100	0.065	1.890	0.357	14.475	0.215	7.619
Benz[a]anthracene	100	100	0.198	84.981	124.928	632.883	24.358	395.682
Benzo[a]pyrene	100	75	0.409	BDL	142.598	903.557	27.660	560.391
Benzo[ghi]perylene	100	100	1.345	119.869	138.604	419.946	28.875	331.000
Benzo[j]fluoranthene	100	100	1.027	2.329	30.321	24.565	10.296	17.280
Benzo[k]fluoranthene	100	100	0.641	8.170	190.999	1555.661	34.831	748.988
Chrysene	100	100	3.120	164.646	205.599	1694.230	42.913	1166.536
Dibenz[a,h]anthracene	83	100	BDL	2.132	33.439	97.532	6.466	48.427
Fluoranthene	100	100	2.764	313.708	317.342	2603.849	65.308	1434.383
Fluorene	50	100	BDL	4.855	1.271	81.040	0.324	33.182
Indeno[1,2,3-cd]pyrene	83	100	BDL	10.388	133.929	377.026	25.130	145.584
Naphthalene	67	100	BDL	1.212	0.373	21.638	0.212	9.859
Naphthalene, 2,6-dimethyl	50	100	BDL	0.685	0.576	37.297	0.157	11.513
Naphthalene, 2-methyl	83	100	BDL	2.265	0.348	21.423	0.193	9.710
Perylene	100	100	0.170	37.934	29.710	601.046	7.161	420.651
Phenanthrene	83	100	BDL	104.074	20.858	879.020	6.841	487.115
Pyrene	100	100	1.098	267.228	201.153	958.426	45.051	658.599
Total Particulate PAH	NA	NA	19.379	1174.410	1570.817	8957.625	326.057	6504.666

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 11. PAH Data Summary: Dissolved + Particulate Fractions - Northwest Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
Acenaphthene	NA	NA	BDL	3.060	9.596	49.724	2.970	21.569
Acenaphthylene	NA	NA	0.307	2.760	2.255	15.445	0.756	8.467
Benz[a]anthracene	NA	NA	2.633	91.148	133.783	640.648	27.998	399.536
Benzo[a]pyrene	NA	NA	1.894	4.335	149.163	910.209	30.052	563.849
Benzo[ghi]perylene	NA	NA	1.465	122.236	141.644	421.301	29.758	332.701
Benzo[j]fluoranthene	NA	NA	2.312	2.674	34.873	26.556	12.207	19.336
Benzo[k]fluoranthene	NA	NA	1.745	10.623	196.543	1555.661	36.411	749.913
Chrysene	NA	NA	4.638	166.660	220.201	1696.434	49.212	1170.863
Dibenz[a,h]anthracene	NA	NA	1.155	2.132	36.199	97.611	7.849	49.641
Fluoranthene	NA	NA	15.456	344.920	375.742	2675.759	90.278	1467.376
Fluorene	NA	NA	0.350	7.527	29.909	104.366	10.838	40.483
Indeno[1,2,3-cd]pyrene	NA	NA	1.610	12.901	137.321	378.293	27.146	148.443
Naphthalene	NA	NA	0.259	6.457	14.352	21.638	4.622	14.246
Naphthalene, 2,6-dimethyl	NA	NA	0.304	4.371	74.232	54.118	17.289	17.615
Naphthalene, 2-methyl	NA	NA	0.708	5.953	62.651	22.304	13.874	13.010
Perylene	NA	NA	1.095	43.076	34.646	603.045	9.244	422.436
Phenanthrene	NA	NA	6.957	111.293	55.774	891.736	23.264	492.811
Pyrene	NA	NA	14.193	274.007	216.914	1013.582	62.820	681.929
Total PAH	NA	NA	92.309	1275.627	1923.906	9193.965	456.588	6614.224

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 12. Organochlorine Pesticide Data Summary: Dissolved Fraction - Northeast Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
					All Concentrations ng/L			
Aldrin	0	0	BDL	BDL	BDL	BDL	NA	NA
Alpha-BHC	83	75	BDL	BDL	3.971	0.416	1.159	0.199
Beta-BHC	83	50	BDL	BDL	0.660	0.287	0.264	0.093
Gamma-BHC	100	100	0.262	0.153	0.711	0.466	0.418	0.268
cis-Chlordane	67	75	BDL	BDL	0.548	0.267	0.213	0.188
Oxychlordane	100	75	0.108	BDL	0.349	0.147	0.201	0.082
trans-Nonachlor	100	100	0.077	0.077	0.585	0.460	0.279	0.195
o,p'-DDD	17	0	BDL	BDL	0.165	BDL	0.027	NA
p,p'-DDD	50	75	BDL	BDL	0.253	0.088	0.069	0.048
p,p'-DDE	50	0	BDL	BDL	0.653	BDL	0.244	NA
4,4'-DDT	50	75	BDL	BDL	0.800	0.170	0.258	0.085
Dieldrin	83	100	BDL	0.179	1.441	0.490	0.502	0.347
Endosulfan I	83	50	BDL	BDL	0.467	0.307	0.276	0.083
Endosulfan II	33	25	BDL	BDL	0.071	0.060	0.018	0.015
Endosulfan Sulfate	67	75	BDL	BDL	0.800	0.170	0.227	0.088
Endrin	33	0	BDL	BDL	0.165	BDL	0.052	NA
Endrin Aldehyde	17	0	BDL	BDL	0.225	BDL	0.037	NA
Endrin Ketone	83	100	BDL	0.054	5.230	2.025	1.686	1.449
Heptachlor	0	0	BDL	BDL	BDL	BDL	NA	NA
Heptachlor Epoxide	100	100	0.461	0.553	1.061	0.900	0.686	0.690
Methoxychlor	100	50	0.076	BDL	0.502	0.058	0.173	0.026

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 13. Organochlorine Pesticide Data Summary: Particulate Fraction - Northeast Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
			All Concentrations ng/L					
Aldrin	0	0	BDL	BDL	BDL	BDL	NA	NA
Alpha-BHC	0	0	BDL	BDL	BDL	BDL	NA	NA
Beta-BHC	50	0	BDL	BDL	0.018	BDL	0.006	NA
Gamma-BHC	0	50	BDL	BDL	BDL	0.053	NA	0.022
cis-Chlordane	33	100	BDL	0.033	0.203	3.104	0.044	2.107
Oxychlordane	33	75	BDL	BDL	0.054	0.475	0.015	0.309
trans-Nonachlor	67	75	BDL	BDL	0.159	2.530	0.063	1.602
o,p'-DDD	0	25	BDL	BDL	BDL	2.031	NA	0.508
p,p'-DDD	0	75	BDL	BDL	0.154	1.327	0.026	0.731
p,p'-DDE	50	25	BDL	BDL	0.059	0.285	0.018	0.071
4,4'-DDT	0	75	BDL	BDL	BDL	0.255	NA	0.168
Dieldrin	50	25	BDL	BDL	0.106	1.395	0.040	0.349
Endosulfan I	33	50	BDL	BDL	0.154	0.402	0.032	0.109
Endosulfan II	0	0	BDL	BDL	BDL	BDL	NA	NA
Endosulfan Sulfate	17	75	BDL	BDL	0.030	0.255	0.005	0.170
Endrin	17	50	BDL	BDL	0.093	0.584	0.015	0.198
Endrin Aldehyde	0	75	BDL	BDL	BDL	2.712	NA	1.245
Endrin Ketone	50	75	BDL	BDL	0.832	11.847	0.161	7.845
Heptachlor	0	0	BDL	BDL	BDL	BDL	NA	NA
Heptachlor Epoxide	83	100	BDL	0.269	0.068	0.792	0.034	0.624
Methoxychlor	0	0	BDL	BDL	BDL	BDL	NA	NA

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 14. Organochlorine Pesticide Data Summary: Dissolved + Particulate Fractions Northeast Branch of the Anacostia River

Analyte	Percent Detection NSF	Percent Detection SF	Minimum NSF	Minimum SF	Maximum NSF	Maximum SF	Mean NSF	Mean SF
Aldrin	NA	NA	BDL	BDL	BDL	BDL	NA	NA
Alpha-BHC	NA	NA	BDL	BDL	3.971	0.416	1.159	0.199
Beta-BHC	NA	NA	0.018	BDL	0.660	0.287	0.270	0.093
Gamma-BHC	NA	NA	0.262	0.175	0.711	0.466	0.418	0.290
cis-Chlordane	NA	NA	BDL	0.033	0.751	3.368	0.256	2.295
Oxychlordane	NA	NA	0.108	0.147	0.349	0.498	0.216	0.391
trans-Nonachlor	NA	NA	0.077	0.460	0.585	2.659	0.343	1.797
o,p'-DDD	NA	NA	BDL	BDL	0.165	2.031	0.027	0.508
p,p'-DDD	NA	NA	BDL	0.039	0.407	1.416	0.094	0.778
p,p'-DDE	NA	NA	BDL	BDL	0.712	0.285	0.262	0.071
4,4'-DDT	NA	NA	BDL	0.111	0.800	0.425	0.258	0.253
Dieldrin	NA	NA	BDL	0.179	1.542	1.885	0.543	0.696
Endosulfan I	NA	NA	BDL	BDL	0.505	0.402	0.308	0.193
Endosulfan II	NA	NA	BDL	BDL	0.071	0.060	0.018	0.015
Endosulfan Sulfate	NA	NA	BDL	0.111	0.800	0.425	0.232	0.258
Endrin	NA	NA	BDL	BDL	0.165	0.584	0.067	0.198
Endrin Aldehyde	NA	NA	BDL	BDL	0.225	2.712	0.037	1.245
Endrin Ketone	NA	NA	BDL	0.054	6.062	13.872	1.847	9.294
Heptachlor	NA	NA	BDL	BDL	BDL	BDL	NA	NA
Heptachlor Epoxide	NA	NA	0.492	1.170	1.129	1.387	0.720	1.314
Methoxychlor	NA	NA	0.076	BDL	0.502	0.058	0.173	0.026

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 15. Organochlorine Pesticide Data Summary: Dissolved Fraction - Northwest Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
			All Concentrations ng/L					
Aldrin	0	0	BDL	BDL	BDL	BDL	NA	NA
Alpha-BHC	33	75	BDL	BDL	1.219	0.169	0.302	0.118
Beta-BHC	50	25	BDL	BDL	0.264	0.283	0.094	0.071
Gamma-BHC	100	100	0.101	0.084	0.708	0.412	0.405	0.233
cis-Chlordane	100	100	0.071	0.141	0.907	0.526	0.425	0.329
Oxychlordane	33	50	BDL	BDL	0.391	0.144	0.098	0.069
trans-Nonachlor	67	100	BDL	0.052	0.333	0.217	0.128	0.144
o,p'-DDD	50	0	BDL	BDL	0.581	BDL	0.159	NA
p,p'-DDD	50	25	BDL	BDL	0.212	0.057	0.082	0.014
p,p'-DDE	0	0	BDL	BDL	BDL	BDL	NA	NA
4,4'-DDT	50	50	BDL	BDL	0.418	0.157	0.122	0.075
Dieldrin	100	75	0.155	BDL	1.544	0.545	0.701	0.250
Endosulfan I	17	0	BDL	BDL	0.102	BDL	0.017	NA
Endosulfan II	33	25	BDL	BDL	0.164	BDL	0.054	NA
Endosulfan Sulfate	50	50	BDL	BDL	0.418	0.157	0.122	0.075
Endrin	0	0	BDL	BDL	BDL	BDL	NA	NA
Endrin Aldehyde	0	0	BDL	BDL	BDL	BDL	NA	NA
Endrin Ketone	100	100	1.159	0.932	5.851	3.048	3.283	1.942
Heptachlor	0	0	BDL	BDL	BDL	BDL	NA	NA
Heptachlor Epoxide	100	100	0.682	0.397	1.883	1.247	1.092	0.827
Methoxychlor	100	50	0.037	BDL	0.196	0.038	0.112	0.016

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 16. Organochlorine Pesticide Data Summary: Particulate Fraction - Northwest Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
			All Concentrations ng/L					
Aldrin	0	0	BDL	BDL	BDL	BDL	NA	NA
Alpha-BHC	0	25	BDL	BDL	BDL	0.012	NA	0.003
Beta-BHC	0	0	BDL	BDL	BDL	BDL	NA	NA
Gamma-BHC	83	100	BDL	BDL	BDL	0.133	NA	0.059
cis-Chlordane	83	100	BDL	2.772	0.687	17.934	0.201	9.902
Oxychlordane	83	100	BDL	0.308	0.069	1.684	0.030	0.976
trans-Nonachlor	0	25	BDL	2.215	0.521	12.728	0.144	7.163
o,p'-DDD	50	100	BDL	BDL	BDL	0.913	NA	0.228
p,p'-DDD	0	0	BDL	0.282	0.726	2.073	0.147	1.183
p,p'-DDE	17	50	BDL	BDL	BDL	BDL	NA	NA
4,4'-DDT	67	50	BDL	BDL	0.064	0.152	0.011	0.062
Dieldrin	33	50	BDL	BDL	0.182	4.500	0.062	1.446
Endosulfan I	17	25	BDL	BDL	0.212	1.593	0.040	0.416
Endosulfan II	17	50	BDL	BDL	0.093	0.558	0.016	0.139
Endosulfan Sulfate	0	0	BDL	BDL	0.064	0.152	0.011	0.062
Endrin	17	100	BDL	BDL	BDL	BDL	NA	NA
Endrin Aldehyde	100	100	BDL	0.423	0.070	1.392	0.012	0.859
Endrin Ketone	0	75	0.150	7.228	1.682	39.255	0.782	24.804
Heptachlor	0	0	BDL	BDL	BDL	BDL	NA	NA
Heptachlor Epoxide	100	100	0.030	0.313	0.469	4.125	0.120	2.369
Methoxychlor	17	25	BDL	BDL	0.167	0.130	0.028	0.032

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 17. Organochlorine Pesticide Data Summary: Dissolved + Particulate Fraction Northwest Branch of the Anacostia River

Analyte	Percent Detection		Minimum		Maximum		Mean	
	NSF	SF	NSF	SF	NSF	SF	NSF	SF
Aldrin	NA	NA	BDL	BDL	BDL	BDL	NA	NA
Alpha-BHC	NA	NA	BDL	BDL	1.219	0.181	0.302	0.121
Beta-BHC	NA	NA	BDL	BDL	0.264	0.283	0.094	0.071
Gamma-BHC	NA	NA	0.101	0.084	0.708	0.545	0.405	0.293
cis-Chlordane	NA	NA	0.071	2.995	1.593	18.460	0.626	10.232
Oxychlordane	NA	NA	BDL	0.308	0.416	1.828	0.128	1.045
trans-Nonachlor	NA	NA	BDL	2.326	0.854	12.945	0.273	7.307
o,p'-DDD	NA	NA	BDL	BDL	0.581	0.913	0.159	0.228
p,p'-DDD	NA	NA	BDL	0.282	0.832	2.130	0.228	1.197
p,p'-DDE	NA	NA	BDL	BDL	BDL	BDL	NA	NA
4,4'-DDT	NA	NA	BDL	BDL	0.418	0.238	0.132	0.137
Dieldrin	NA	NA	0.261	BDL	1.624	4.798	0.764	1.697
Endosulfan I	NA	NA	BDL	BDL	0.212	1.593	0.056	0.416
Endosulfan II	NA	NA	BDL	BDL	0.164	0.558	0.070	0.139
Endosulfan Sulfate	NA	NA	BDL	BDL	0.418	0.238	0.132	0.137
Endrin	NA	NA	BDL	BDL	BDL	BDL	NA	NA
Endrin Aldehyde	NA	NA	BDL	0.423	0.070	1.392	0.012	0.859
Endrin Ketone	NA	NA	2.610	8.161	7.408	42.303	4.065	26.746
Heptachlor	NA	NA	BDL	BDL	BDL	BDL	NA	NA
Heptachlor Epoxide	NA	NA	0.715	0.827	1.988	4.577	1.212	3.195
Methoxychlor	NA	NA	0.059	BDL	0.204	0.154	0.139	0.048

NSF=nonstorm flow conditions, SF=storm flow conditions

BDL=Below Detection Limit (Treated as zero for calculations), NA=Not Applicable

For stormflow samples, N=4 for all analytes.

For nonstorm flow samples, N=6 for all analytes.

Table 18. Trace Element Loads - Northeast Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc.	Load (kg/yr)
DISSOLVED PHASE		
Aluminum	67.86	5,138.86
Cadmium	0.30	22.95
Copper	2.45	185.35
Iron	163.82	12,405.87
Manganese	47.71	3,612.75
Nickel	4.04	305.75
Lead	0.24	18.52
Zinc	7.82	591.88
PARTICULATE PHASE		
Aluminum	22,240.54	1,684,195.83
Cadmium	0.32	24.04
Copper	15.03	1,137.83
Iron	2,264.99	171,519.39
Manganese	433.87	32,855.52
Nickel	11.24	850.95
Lead	40.06	3,033.90
Zinc	48.47	3,670.42
Mercury	25.81	1.95
TOTAL (DISSOLVED+PARTICULATE)		
Aluminum	22,308.40	1,689,334.69
Cadmium	0.71	53.94
Copper	17.47	1,323.18
Iron	2,428.81	183,925.26
Manganese	481.58	36,468.27
Nickel	15.27	1,156.69
Lead	40.32	3,052.99
Zinc	56.29	4,262.30
Mercury	29.13	2.21

All Concentrations ug/L except mercury = ng/L

Total=sum of particulate and dissolved, except mercury measured directly

Dissolved mercury not measured.

Below detection limit results treated as zero for calculations.

Table 19. Trace Element Loads - Northwest Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc.	Load (kg/yr)
DISSOLVED PHASE		
Aluminum	84.82	3,612.90
Cadmium	0.15	6.45
Copper	2.35	100.24
Iron	150.11	6,393.98
Manganese	27.06	1,152.82
Nickel	2.92	124.22
Lead	0.35	14.93
Zinc	6.34	269.99
PARTICULATE PHASE		
Aluminum	44,649.42	1,901,891.23
Cadmium	0.75	31.78
Copper	28.51	1,214.34
Iron	5,083.23	216,525.62
Manganese	783.12	33,357.98
Nickel	23.22	988.89
Lead	85.29	3,633.14
Zinc	68.22	2,905.74
Mercury	40.45	1.72
TOTAL (DISSOLVED+PARTICULATE)		
Aluminum	44,734.24	1,905,504.14
Cadmium	0.92	39.09
Copper	30.86	1,314.58
Iron	5,233.33	222,919.60
Manganese	810.19	34,510.81
Nickel	26.13	1,113.10
Lead	85.66	3,648.72
Zinc	74.55	3,175.73
Mercury	21.95	0.94

All Concentrations ug/L except mercury = ng/L

Total=sum of particulate and dissolved, except mercury measured directly

Dissolved mercury not measured.

Below detection limit results treated as zero for calculations.

Table 20. PCB Loads - Northeast Branch of the Anacostia River

Congenor Class	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
DISSOLVED PHASE		
Dichlorobiphenyls	0.023	0.002
Trichlorobiphenyls	0.293	0.022
Tetrachlorobiphenyls	0.385	0.029
Pentachlororbiphenyls	0.576	0.044
Hexachlorobiphenyls	0.398	0.030
Heptachlorobiphenyls	0.303	0.023
Octachlorobiphenyls	0.105	0.008
Nonachlorobiphenyls	0.008	0.001
Total-PCBs	38.042	2.881
PARTICULATE PHASE		
Dichlorobiphenyls	0.001	0.000
Trichlorobiphenyls	0.247	0.019
Tetrachlorobiphenyls	0.614	0.046
Pentachlororbiphenyls	2.300	0.174
Hexachlorobiphenyls	3.929	0.298
Heptachlorobiphenyls	4.554	0.345
Octachlorobiphenyls	2.033	0.154
Nonachlorobiphenyls	0.193	0.015
Total-PCBs	22.048	1.670
TOTAL (DISSOLVED+PARTICULATE)		
Dichlorobiphenyls	0.023	0.002
Trichlorobiphenyls	0.540	0.041
Tetrachlorobiphenyls	0.998	0.076
Pentachlororbiphenyls	2.876	0.218
Hexachlorobiphenyls	4.327	0.328
Heptachlorobiphenyls	4.857	0.368
Octachlorobiphenyls	2.138	0.162
Nonachlorobiphenyls	0.201	0.015
Total-PCBs	60.090	4.550

Below detection limit results treated as zero for calculations.

Table 21. PCB Loads - Northwest Branch of the Anacostia River

Congenor Class	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
DISSOLVED PHASE		
Dichlorobiphenyls	0.0053	0.0002
Trichlorobiphenyls	0.1151	0.0049
Tetrachlorobiphenyls	0.2477	0.0106
Pentachlororbiphenyl	0.2951	0.0126
Hexachlorobiphenyls	0.3273	0.0139
Heptachlorobiphenyls	0.0994	0.0042
Octachlorobiphenyls	0.0249	0.0011
Nonachlorobiphenyls	0.0067	0.0003
Total-PCBs	16.0215	0.6825
PARTICULATE PHASE		
Dichlorobiphenyls	0.0097	0.0004
Trichlorobiphenyls	0.1074	0.0046
Tetrachlorobiphenyls	0.2759	0.0118
Pentachlororbiphenyl	0.8514	0.0363
Hexachlorobiphenyls	1.0469	0.0446
Heptachlorobiphenyls	1.1085	0.0472
Octachlorobiphenyls	1.5594	0.0664
Nonachlorobiphenyls	0.2376	0.0101
Total-PCBs	5.1968	0.2214
TOTAL (DISSOLVED+PARTICULATE)		
Dichlorobiphenyls	0.0150	0.0006
Trichlorobiphenyls	0.2225	0.0095
Tetrachlorobiphenyls	0.5236	0.0223
Pentachlororbiphenyl	1.1466	0.0488
Hexachlorobiphenyls	1.3742	0.0585
Heptachlorobiphenyls	1.2079	0.0515
Octachlorobiphenyls	1.5843	0.0675
Nonachlorobiphenyls	0.2443	0.0104
Total-PCBs	21.2183	0.9038

Below detection limit results treated as zero for calculations.

Table 22. PAH Loads: Dissolved Fraction Northeast Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Acenaphthene	5.779	0.438
Acenaphthylene	0.803	0.061
Benz[a]anthracene	2.243	0.170
Benzo[a]pyrene	1.596	0.121
Benzo[ghi]perylene	1.258	0.095
Benzo[j]fluoranthene	1.276	0.097
Benzo[k]fluoranthene	0.925	0.070
Chrysene	5.165	0.391
Dibenz[a,h]anthracene	0.799	0.061
Fluoranthene	37.472	2.838
Fluorene	9.138	0.692
Indeno[1,2,3-cd]pyrene	2.188	0.166
Naphthalene	7.650	0.579
Naphthalene, 2,6-dimethyl	2.685	0.203
Naphthalene, 2-methyl	4.069	0.308
Perylene	2.131	0.161
Phenanthrene	18.035	1.366
Pyrene	23.258	1.761
Total Dissolved PAH	126.471	9.577

Below detection limit results treated as zero for calculations.

Table 23. PAH Loads: Particulate Fraction Northeast Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Acenaphthene	4.808	0.364
Acenaphthylene	1.978	0.150
Benz[a]anthracene	157.484	11.926
Benzo[a]pyrene	228.632	17.313
Benzo[ghi]perylene	173.156	13.113
Benzo[j]fluoranthene	60.610	4.590
Benzo[k]fluoranthene	327.295	24.785
Chrysene	410.492	31.085
Dibenz[a,h]anthracene	23.687	1.794
Fluoranthene	494.723	37.464
Fluorene	7.688	0.582
Indeno[1,2,3-cd]pyrene	82.940	6.281
Naphthalene	2.966	0.225
Naphthalene, 2,6-dimethyl	1.963	0.149
Naphthalene, 2-methyl	2.988	0.226
Perylene	53.312	4.037
Phenanthrene	151.465	11.470
Pyrene	272.484	20.634
Total Particulate PAH	2,458.669	186.186

Below detection limit results treated as zero for calculations.

Table 24. PAH Loads: Dissolved+Particulate Fraction Northeast Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Acenaphthene	10.587	0.802
Acenaphthylene	2.782	0.211
Benz[a]anthracene	159.727	12.096
Benzo[a]pyrene	230.227	17.434
Benzo[ghi]perylene	174.414	13.208
Benzo[j]fluoranthene	61.886	4.686
Benzo[k]fluoranthene	328.219	24.855
Chrysene	415.657	31.476
Dibenz[a,h]anthracene	24.486	1.854
Fluoranthene	532.194	40.301
Fluorene	16.826	1.274
Indeno[1,2,3-cd]pyrene	85.128	6.446
Naphthalene	10.616	0.804
Naphthalene, 2,6-dimethyl	4.647	0.352
Naphthalene, 2-methyl	7.057	0.534
Perylene	55.443	4.199
Phenanthrene	169.500	12.836
Pyrene	295.742	22.396
Total PAH	2,585.140	195.763

Below detection limit results treated as zero for calculations.

Table 25. PAH Loads: Dissolved Fraction Northwest Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Acenaphthene	2.058	0.088
Acenaphthylene	0.801	0.034
Benz[a]anthracene	2.449	0.104
Benzo[a]pyrene	2.424	0.103
Benzo[ghi]perylene	1.658	0.071
Benzo[j]fluoranthene	1.297	0.055
Benzo[k]fluoranthene	0.488	0.021
Chrysene	3.143	0.134
Dibenz[a,h]anthracene	0.451	0.019
Fluoranthene	20.491	0.873
Fluorene	3.602	0.153
Indeno[1,2,3-cd]pyrene	2.028	0.086
Naphthalene	4.678	0.199
Naphthalene, 2,6-dimethyl	3.950	0.168
Naphthalene, 2-methyl	3.726	0.159
Perylene	1.300	0.055
Phenanthrene	3.849	0.164
Pyrene	15.362	0.654
Total Dissolved PAH	73.756	3.142

Below detection limit results treated as zero for calculations.

Table 26. PAH Loads: Particulate Fraction Northwest Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Acenaphthene	13.935	0.594
Acenaphthylene	6.813	0.290
Benz[a]anthracene	366.396	15.607
Benzo[a]pyrene	524.972	22.362
Benzo[ghi]perylene	312.550	13.313
Benzo[j]fluoranthene	18.120	0.772
Benzo[k]fluoranthene	1,023.266	43.587
Chrysene	1,177.495	50.157
Dibenz[a,h]anthracene	46.022	1.960
Fluoranthene	1,218.168	51.889
Fluorene	22.966	0.978
Indeno[1,2,3-cd]pyrene	120.754	5.144
Naphthalene	8.283	0.353
Naphthalene, 2,6-dimethyl	5.363	0.228
Naphthalene, 2-methyl	7.626	0.325
Perylene	405.582	17.276
Phenanthrene	427.740	18.220
Pyrene	596.163	25.394
Total Particulate PAH	6,302.215	268.450

Below detection limit results treated as zero for calculations.

Table 27. PAH Loads: Dissolved+Particulate Fraction - Northwest Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Acenaphthene	15.993	0.681
Acenaphthylene	7.614	0.324
Benz[a]anthracene	368.845	15.711
Benzo[a]pyrene	527.396	22.465
Benzo[ghi]perylene	314.208	13.384
Benzo[j]fluoranthene	19.417	0.827
Benzo[k]fluoranthene	1,023.754	43.608
Chrysene	1,180.638	50.291
Dibenz[a,h]anthracene	46.473	1.980
Fluoranthene	1,238.659	52.762
Fluorene	26.568	1.132
Indeno[1,2,3-cd]pyrene	122.782	5.230
Naphthalene	12.961	0.552
Naphthalene, 2,6-dimethyl	9.313	0.397
Naphthalene, 2-methyl	11.352	0.484
Perylene	406.882	17.332
Phenanthrene	431.589	18.384
Pyrene	611.525	26.049
Total PAH	6,375.971	271.592

Below detection limit results treated as zero for calculations.

Table 28. Organochlorine Pesticide Loads: Dissolved Fraction - Northeast Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Aldrin	NA	NA
Alpha-BHC	0.305	0.023
Beta-BHC	0.061	0.005
Gamma-BHC	0.229	0.017
cis-Chlordane	0.169	0.013
Oxychlordane	0.108	0.008
trans-Nonachlor	0.231	0.017
o,p'-DDD	0.002	0.000
p,p'-DDD	0.057	0.004
p,p'-DDE	0.025	0.002
4,4'-DDT	0.095	0.007
Dieldrin	0.330	0.025
Endosulfan I	0.118	0.009
Endosulfan II	0.005	0.000
Endosulfan Sulfate	0.098	0.007
Endrin	0.003	0.000
Endrin Aldehyde	0.002	0.000
Endrin Ketone	1.313	0.099
Heptachlor	NA	NA
Heptachlor Epoxide	0.717	0.054
Methoxychlor	0.030	0.002

Below detection limit results treated as zero for calculations.

Table 29. Organochlorine Pesticide Loads: Particulate Fraction - Northeast Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Aldrin	NA	NA
Alpha-BHC	NA	NA
Beta-BHC	0.000	0.000
Gamma-BHC	0.025	0.002
cis-Chlordane	1.764	0.134
Oxychlordane	0.252	0.019
trans-Nonachlor	1.388	0.105
o,p'-DDD	0.134	0.010
p,p'-DDD	0.611	0.046
p,p'-DDE	0.085	0.006
4,4'-DDT	0.192	0.015
Dieldrin	0.096	0.007
Endosulfan I	0.041	0.003
Endosulfan II	NA	NA
Endosulfan Sulfate	0.195	0.015
Endrin	0.242	0.018
Endrin Aldehyde	1.336	0.101
Endrin Ketone	6.466	0.490
Heptachlor	NA	NA
Heptachlor Epoxide	0.544	0.041
Methoxychlor	NA	NA

Below detection limit results treated as zero for calculations.

Table 30. Organochlorine Pesticide Loads: Dissolved+Particulate Fraction - Northeast Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Aldrin	NA	NA
Alpha-BHC	0.305	0.023
Beta-BHC	0.061	0.005
Gamma-BHC	0.254	0.019
cis-Chlordane	1.933	0.146
Oxychlordane	0.360	0.027
trans-Nonachlor	1.618	0.123
o,p'-DDD	0.136	0.010
p,p'-DDD	0.668	0.051
p,p'-DDE	0.110	0.008
4,4'-DDT	0.287	0.022
Dieldrin	0.426	0.032
Endosulfan I	0.159	0.012
Endosulfan II	0.005	0.000
Endosulfan Sulfate	0.293	0.022
Endrin	0.245	0.019
Endrin Aldehyde	1.338	0.101
Endrin Ketone	7.779	0.589
Heptachlor	NA	NA
Heptachlor Epoxide	1.261	0.095
Methoxychlor	0.030	0.002

Below detection limit results treated as zero for calculations.

Table 31. Organochlorine Pesticide Loads: Dissolved Fraction - Northwest Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Aldrin	NA	NA
Alpha-BHC	0.158	0.007
Beta-BHC	0.025	0.001
Gamma-BHC	0.191	0.008
cis-Chlordane	0.416	0.018
Oxychlordane	0.102	0.004
trans-Nonachlor	0.177	0.008
o,p'-DDD	0.010	0.000
p,p'-DDD	0.032	0.001
p,p'-DDE	NA	NA
4,4'-DDT	0.109	0.005
Dieldrin	0.356	0.015
Endosulfan I	0.001	0.000
Endosulfan II	0.003	0.000
Endosulfan Sulfate	0.109	0.005
Endrin	NA	NA
Endrin Aldehyde	NA	NA
Endrin Ketone	2.413	0.103
Heptachlor	NA	NA
Heptachlor Epoxide	1.015	0.043
Methoxychlor	0.015	0.001

Below detection limit results treated as zero for calculations.

Table 32. Organochlorine Pesticide Loads: Particulate Fraction - Northwest Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Aldrin	NA	NA
Alpha-BHC	0.002	0.000
Beta-BHC	NA	NA
Gamma-BHC	11.278	0.480
cis-Chlordane	1.099	0.047
Oxychlordane	8.080	0.344
trans-Nonachlor	0.190	0.008
o,p'-DDD	1.328	0.057
p,p'-DDD	NA	NA
p,p'-DDE	0.027	0.001
4,4'-DDT	0.499	0.021
Dieldrin	0.130	0.006
Endosulfan I	0.033	0.001
Endosulfan II	0.027	0.001
Endosulfan Sulfate	NA	NA
Endrin	0.914	0.039
Endrin Aldehyde	25.862	1.102
Endrin Ketone	0.039	0.002
Heptachlor	NA	NA
Heptachlor Epoxide	2.244	0.096
Methoxychlor	0.028	0.001

Below detection limit results treated as zero for calculations.

Table 33. Organochlorine Pesticide Loads: Dissolved+Particulate Fraction - Northwest Branch of the Anacostia River

Analyte	All Sample Flow-Weighted Mean Conc. (ng/L)	Load (kg/yr)
Aldrin	NA	NA
Alpha-BHC	0.160	0.007
Beta-BHC	0.025	0.001
Gamma-BHC	0.231	0.010
cis-Chlordane	11.695	0.498
Oxychlordane	1.202	0.051
trans-Nonachlor	8.257	0.352
o,p'-DDD	0.200	0.009
p,p'-DDD	1.361	0.058
p,p'-DDE	NA	NA
4,4'-DDT	0.136	0.006
Dieldrin	0.855	0.036
Endosulfan I	0.131	0.006
Endosulfan II	0.036	0.002
Endosulfan Sulfate	0.136	0.006
Endrin	NA	NA
Endrin Aldehyde	0.914	0.039
Endrin Ketone	28.275	1.204
Heptachlor	NA	NA
Heptachlor Epoxide	3.259	0.139
Methoxychlor	0.043	0.002

Below detection limit results treated as zero for calculations.

The following sections highlight the information presented in the tables for each contaminant group. The results of comparisons with EPA water quality criteria are also presented.

Trace elements. Tables 2 and 3 indicate that all of the nine trace elements included in the analysis were consistently detected in samples from both the Northeast and Northwest branches. The particulate phase usually accounted for most of the total concentration, especially during storm flow conditions when total suspended solids concentrations were higher (see turbidity and TSS data in Appendix A). Average storm flow concentrations almost always exceeded average nonstorm flow concentrations. Tables 18 and 19 show that the flow-weighted mean concentrations of several of these parameters translate to loads ranging from about one kilogram per year to over a million kilograms per year. Particulate phase flow-weighted means in the Northwest Branch tended to be higher than those for the Northeast branch, increasing the total concentrations enough to make the loads from the two tributaries similar, despite lower annual flow volumes form the Northwest Branch.

When the trace element data (a total of 18 samples, 12 storm flow and six nonstorm flow) were compared to available EPA numeric criteria for cadmium, copper, nickel, lead, zinc and mercury, some exceedences were found. In the Northeast Branch, dissolved cadmium concentrations in one storm and one nonstorm flow sample exceeded the EPA numeric criterion for chronic exposure (1.1 μg/L). While the concentration of "reactive" mercury (measured to estimate biologically available mercury and usually used for comparison to water quality criteria) in samples from both tributaries did not exceed the mercury criteria, *total* mercury concentrations in 11 of 18 samples did exceed the chronic criterion (0.012 μg/L) in the Northeast Branch (ten times in storm flow samples and once in a nonstorm flow sample) as did 12 of 18 samples in the Northwest Branch (eleven times in storm flow samples and once in a nonstorm flow sample).

Organic compounds. Tables 4, 5, 20 and 21 show that various PCB congeners were also commonly detected in samples from both tributaries. More than half of the individual congeners were above the quantitation limit in all but two of the congener classes (storm and nonstorm flow combined). PCB detections were more common, concentrations tended to be higher, and total PCB loads were larger in the Northeast Branch than in the Northwest Branch. Average concentrations for both particulate and dissolved phases tended to be higher in storm flow samples compared to nonstorm flow samples. Dissolved phase concentrations tended to be higher than particulate phase concentrations in both nonstorm and storm flow samples.

Tables 6 through 11, and 22 through 27 show that most PAHs were detected in greater than 75% percent of both storm and nonstorm samples. There was no consistent pattern in the dissolved concentrations for nonstorm versus storm samples, but particulate concentrations tended to be markedly higher in storm flow samples. As with the trace elements, PAH concentrations were generally higher in the Northwest Branch, resulting in loads that were similar to those in the Northeast Branch, despite lower flows in the Northwest Branch.

Tables 12 through 17 and 28 through 33 show that the organochlorine pesticides were detected less frequently than the other contaminants. Over half of the 21 parameters had concentrations below quantitation limits in the majority of their samples for either the dissolved or particulate phases. Contaminants were detected more frequently and at higher concentrations in nonstorm samples compared to storm samples for the dissolved phase, but, for the particulate phase, storm samples had higher detection frequencies and concentrations. Overall, detections were more frequent for dissolved phase samples for both tributaries. Concentrations were higher Northeast Branch for nonstorm samples and higher in the Northwest Branch for storm samples. Loads tended to be slightly higher in the Northwest Branch compared to the Northeast Branch.

Organic contaminant data (10 samples, four composite storm flow samples and six discrete nonstorm flow samples) were compared to available EPA numeric criteria for aldrin, endosulfan I and II, chlordane, dieldrin, endrin, and DDT. No sample concentrations exceeded the criteria for these compounds. Since there are no criteria for individual PCB congenors, the sum of the concentrations of individual PCB congenors were compared to the EPA chronic criteria developed for several different PCB aroclors (each a mix of congenors). Although not an exact match of data and criteria, this comparison provides an indication of the potential effects of all PCBs combined. In the Northeast Branch, total dissolved PCB concentrations in four of the 10 storm flow composite samples exceeded the chronic criteria for PCB arochlors. In the Northwest Branch, three of the storm flow composite samples exceeded the chronic criteria for PCB arochlors.

Load summary. Table 34 summarizes the estimated loads for selected contaminants (or contaminant groups) with the highest loads. Loads from the Northeast and Northwest Branches and the combined total load to the tidal Anacostia River are presented. As mentioned above, the loads from the two tributaries are similar, despite lower flows in the Northwest Branch. Exceptionally large amounts of aluminum, iron and manganese are being delivered by these tributaries to the tidal Anacostia River. In addition, the summed loads for related contaminants such as PCB congenors or various PAHs appear to be more significant than the loads for individual contaminants.

Discussion

For the trace elements, it appears that cadmium, copper, nickel, lead, zinc, and mercury commonly occur in both the Northeast and Northwest Branches. The exceedence of the chronic water quality criteria for cadmium in the Northeast Branch samples is of particular concern. Although the biologically available form of mercury did not exceed the criterion, total mercury levels consistently exceeded the chronic criterion in both tributaries. In a more detailed analysis of the mercury data (Mason and Sullivan, 1998), the authors conclude that mercury concentrations are elevated relative to other areas in the region an that some non-atmospheric source is likely to be playing a role.

Table 34. Load Summary for Selected Contaminants

Chemical	Northeast Branch Load (kg/yr)	Northwest Branch Load (kg/yr)	Total Load (kg/yr)
Aluminum	1700000	1900000	3600000
Cadmium	54	39	93
Copper	1300	1300	2600
Iron	180000	220000	410000
Manganese	36000	35000	71000
Nickel	1200	1100	2300
Lead	3100	3600	6700
Zinc	4300	3200	7400
Mercury	3.0	2.0	5.1
Total PCBs	4.6	0.90	5.5
Total PAHs	200	270	470
Total Chlordanes	0.30	0.90	1.2
Total DDTs	0.090	0.070	0.20
Heptachlor Epoxide	0.10	0.10	0.20
Endrin Aldehyde	0.10	0.040	0.10
Endrin Ketone	0.60	1.2	1.8

Loads are sums of dissloved and particulate fractions, expressed to two significant figures.

Below detection limit results treated as zero.

Total PCBs = sum of 112 congenors.

Total PAHs = sum of 18 analytes

Total chlordanes = sum of cis-chlordane, oxychlordane, and trans-nonachlor.

Total DDTs = sum of o,p'-DDD, p,p'-DDD, p,p'-DDE, 4,4'-DDT

In addition, the magnitude of the detected trace element concentrations suggests substantial loads of these contaminants are being delivered to the tidal Anacostia River. Total mercury and cadmium loads are lowest (about 5 and 93 Kg/year, respectively), but these are also two of the more highly toxic of the trace elements. Copper, nickel, lead, and zinc loads, on the other hand, were considerably higher, ranging from about 2000 to 7000 Kg/year. It should be noted also that load estimates for aluminum, iron and manganese were markedly higher than those for other contaminants. Because these elements are common constituents of the earth's crust, it is likely that anthropogenic sources contribute only a small portion of the overall load (US EPA, 1996; Velinsky et al., 1992).

For organic contaminants, the more frequent PCB detections and concentrations in the Northeast Branch suggest some localized source in that sub-basin. Although other sources of PCBs may remain in the watershed in the form of older electrical transformers, PCBs (along with other contaminants) were identified when the USDA's Beltsville Agricultural Center was placed on the National Priorities List (US EPA, 1993). For PAHs, high concentrations and loads of are to be expected in a highly developed watershed with extensive automotive use. Lastly, the loads for several organochlorine pesticides may also be of concern, although they were detected less frequently and at lower concentrations.

Conclusions

A wide variety of contaminants were detected in the waters of the Northeast and Northwest Branches of the Anacostia River under both storm and nonstorm flow conditions. Contaminant concentrations appear to be higher in the Northwest Branch, except for PCBs, which tended to be higher in the Northeast Branch. Cadmium, mercury, and PCBs are of highest concern in both tributaries. The specific sources of these contaminants are unknown. The presence of contaminants in nonstorm samples may indicate illicit discharges or contaminated groundwater sources. The generally higher concentrations detected in storm flow samples indicate stormwater runoff sources. In such a highly developed watershed, some amount of certain metals, PAHs, and pesticides would be expected to end up in stormwater runoff as a result of the general human activities such as automobile use. PCBs, on the other hand, are no longer in general use and may be coming from one or more specific areas in the basin.

Storm flow conditions appear to be transporting a large proportion of the total contaminant load. Total suspended solids concentrations increased dramatically in both the Northeast and Northwest Branches during high flows. For many contaminants, the highest concentrations were detected in the particulate phase, suggesting that most of the transport occurs with the contaminants adsorbed to particles suspended in the water. As the particle-laden water flows from the tributaries to the more sluggish tidal Anacostia River, the flow velocities decrease and the particles tend to settle out and become incorporated into sediment depositional areas.

Based on the data collected for this study and the load estimates developed from them, it is clear that a number of contaminants are being delivered from the Northeast and Northwest Branches in Maryland to the tidal river, primarily in the particulate phase. Many of these contaminants are the same ones that have been identified as being of concern throughout the tidal Anacostia River in the District of Columbia: metals, PAHs, PCBS, chlordane and DDT (Velinsky et al., 1997; Velinsky et al., 1992). It is probable that the contamination in the lower river stems at least partially from historic and current sources within the District of Columbia (DCRA, 1996; Velinsky, 1992), yet the data from this study show that is it is also likely that the Maryland tributaries are contributing additional contaminants to the water and sediments downstream.

Because sediment transport dynamics in the tidal Anacostia River have not yet been studied in sufficient detail to enable precise prediction of the fate of sediment particles entering the tidal river, it is unknown whether the sediment-bound contaminants from the free-flowing tributaries in Maryland are being dispersed throughout the tidal river, concentrated in a depositional areas of the tidal river, or transported on to the Potomac River. It is also unclear whether these recent sediments are as highly contaminated as those already in place. Despite these uncertainties, it is clear that the Maryland tributaries are one of several possible current sources of contaminants to the tidal Anacostia River. If future sediment remediation efforts in the lower river are to be successful, these sources must first be characterized more completely and then controlled to the greatest extent possible.

Recommendations

- The results of this study and a previous source assessment in the watershed (MWCOG, 1996) warrant a more detailed investigation of specific sources of chemical contaminants in the nontidal portion of the Anacostia River basin. At minimum, pollution prevention efforts should be focused on possible sources of the contaminants that are in the river.

- Further study of sediment transport dynamics (currently being pursued by the District) will help determine the ultimate fate and potential for downstream effects of contaminants entering the tidal river from the free-flowing tributaries.

- A study of methylmercury concentrations in fish tissue may also be appropriate, based on high levels of total mercury detected in water samples (40 CFR 131).

- As is the case with other issues in the Anacostia River basin (MWCOG, 1991), problems with chemical contaminants are not limited to the District of Columbia. It is necessary for the jurisdictions in the basin to coordinate their efforts and develop a basinwide toxics management strategy.

References

Athayde, D.E., P.E. Shelly, E.D. Driscoll, D. Gaboury and G.B. Boyd. 1983. Results of the Nationwide Urban Runoff Program: Volume I - Final Report. US EPA, Washington, DC.

Ballschmiter, K. and M. Zell. 1980. Analysis of polychlorinated biphenyls (PCB) by glass capillary gas chromatography. Fresenius Z. Anal. Chem. 302: 19-31.

Bloom, N. S. and Crecelius, E. A. 1983. Determination of mercury in seawater at sub-nanogram per liter levels. Mar. Chem. 14, 49-59

Bloom, N. S. and Fitzgerald, W. F. 1988. Determination of volatile species at the picogram level by low temperature gas chromatography with cold vapor atomic fluorescence detection. Anal. Chim. Acta. 208, 151-161.

Bloom, N. S. 1989. Determination of picogram levels of methylmercury by aqueous phase ethylation, followed by cryogenic gas chromatography with cold vapor atomic fluorescence detection. Can. J. Fish. Aquat. Sc. 46, 1131-1140.

Code of Federal Regulations. 1983. Water quality standards regulation. 40 CFR 131 and amendments. Office of the Federal Register, Washington, DC.

DC Environmental Regulation Administration. 1996. The Anacostia River toxics management action plan. Department of Consumer and Regulatory Affairs/DC ERA, Washington, DC.

Eganhouse, R.P., B.R. Gould, D.M. Olaguer, C.S. Phinney, and P.M. Sherblom. 1989. Congener-specific determination of chlorobiphenyls in biological tissues using an Aroclor-based sedondary calibration standard. Intern. J. Environ. Anal. Chem. 35:175-198.

Evans, D.W. and Hanson, P.J.; 1993; Analytical Methods for Trace Elements in Sediments by Atomic Absorption Spectrophotometry. In Sampling and Analytical Methods of the National Status and Trends Program National Benthic Surveillance and Mussel Watch Project, Vol III; Comprehensive Descriptions of Elemental Analytical Methods. NOAA Technical Memorandum NOS ORCA 71. Lauenstein and Cantillo (Eds.) Pg. 53-81.

Foster, G.D. and K.A. Lippa. 1995. Estimated annual loads of selected organonitrogen and organophosphorus pesticides in Chesapeake Bay. Environ. Sci. Technol. 29:2059-2064

Foster, G.D., P.M. Gates, W.T. Foremen, S.W. McKenzie, and F.A. Rinella. 1993. Determination of dissolved-phase pesticides in surface water from the Yakima River basin, Washington, using the Goulden large-sample extractor and gas chromatography/mass spectrometry. Environ. Sci. Technol. 27:1911-1917.

Foster, G.D. and P.F. Rogerson. 1990. Enhanced preconcentration of pesticides from water using the Goulden large-sample extractor. Intern. Environ. Anal. Chem. 41:105-117.

Foster, G.D., W.T. Foreman, and P.M. Gates. 1991. Performance of the Goulden large-sample extractor in multiclass pesticide isolation and preconcentration from stream water. J. Agric. Food Chem. 39:1618-1622.

Gill, G.A. and Fitzgerald, W.F. 1985. Mercury sampling in the open ocean at the picomolar level. Deep Sea Res. 32: 287-297.

Horvat, M., Liang, L., and Bloom, N.S. 1993. Comparison of distillation with other current isolation methods for the determination of methyl mercury compounds in low level environmental samples. Anal. Chim. Acta. 282: 153-168.

Interstate Commission on the Potomac River Basin. 1988. Anacostia: The other river. ICPRB Publication 88-1. ICPRB, Rockville, MD. 16 pages.

James, R.W., R.H. Simmons and B.M. Helinsky. 1995. Water Resources Data, Maryland and Delaware, Water Year 1995, Volume 1. Surface-Water Data. United States Geological Survey, Towson, MD.

Mason, R.P. and K.A Sullivan. 1998. Mercury and methylmercury transport through and urban watershed. Water Research, 32, 321-330.

Mason, R.P. and W.F. Fitzgerald. 1991. Mercury speciation in open ocean waters. Water Air Soil Poll. 56, 779-789.

Metropolitan Washington Council of Governments (1996), An existing source assessment of pollutants to the Anacostia Watershed, MWCOG, Washington, DC.

Metropolitan Washington Council of Governments. 1991. A Commitment to restore our home river: A six-point plan to restore the anacostia river. MWCOG Publication Number 91708. MWCOG, Washington, DC.

Nemura, A. and E. Pontikakis-Coyne. 1991. Water Quality Benefits of Combined Sewer Overflow Abatement in the Tidal Anacostia River. Metropolitan Washington Council of Governments, Washington, DC.

Pinkney, A.E., W.H. Burton, L.C. Scott, and J.B Frithsen. 1993. An assessment of the potential residual effects of the January 1992 oil spill in the Anacostia River. Versar, Inc., Columbia, MD.

Reed, J.C. and S.F. Obermeier. 1989. The geology beneath Washington, D.C. - The foundations of a nation's capitol. In: Geology, Hydrology and History of the Washington, D.C. Area. Eds: J.E. Moore and J.A. Jackson; American Geological Institute, Alexandria, VA., pp. 27-50.

Robisch, P.A. and Clark, R.C.; 1993; Sample Preparation and Analyses of Trace Metals by Atomic Absorption Spectroscopy. pg. 111-150.

Scatena, F.N. 1987. Sediment Budgets and Delivery in a Suburban Watershed: Anacostia Watershed., Ph.D. Dissertation; Johns Hopkins University, Baltimore, MD.

Schulz, D.E., G. Petrick, and J.C. Duinker. 1989. Complete characterization of polychlorinated biphenyl congeners in commercial Aroclor and Clophen mixtures by multidimensiosnal gas chromatography-electron capture detection. Environ. Sci. Technol. 23: 852-859.

Scudlark, J.R., Church, T.M., Conko, K.M. and Moore, S.M.; 1992, A Method for the Automated Collection, Proper Handling and Accurate Analysis of Trace Metals in Precipitation, U.S. Forest Service Report NC-150, Symposium Proceedings, Philadelphia, PA October 1991, pg. 57-71.

Shan, T.-H., J.A. Hopple, and G.D. Foster. 1995. Alternative method for the analysis of organochlorine compounds in tissues of aquatic organisms. Bull. Environ. Contam. Toxicol. 53:382-389.

U.S. Environmental Protection Agency 1996. Chesapeake Bay Fall Line Toxics Monitoring Program 1994 Final Report. Chesapeake Bay Program Office, Annapolis, MD.

U.S. Environmental Protection Agency 1995. Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry. EPA Method 1631, EPA 821-R-95-027.

U.S. Environmental Protection Agency 1994a. Chesapeake Bay Fall Line Toxics Monitoring Program 1992 Final Report. Chesapeake Bay Program Office, Annapolis, MD.

U.S. Environmental Protection Agency 1994b. Contaminant Trace Element Loads at the Susquehanna River Fall Line during the Spring, 1993 High Flow Event. Addendum to the Fall Line Toxics 1992 Final Report. Chesapeake Bay Program Office, Annapolis, MD.

United States Environmental Protection Agency (1993), Beltsville Agricultural Research Center (USDA), US EPA Region 3, Philadelphia, PA.

Velinsky, D.J., C.H. Haywood, T.L. Wade, and E. Reinharz. 1992. Sediment Contamination Studies of the Potomac and Anacostia Rivers around the District of Columbia. ICPRB Publication 92-2. Interstate Commission on the Potomac River Basin, Rockville (ICPRB), MD.

Velinsky, D.J. and J.C. Cummins. 1994. Distribution of chemical contaminants in wild fish species in the Washington, D.C. area. ICPRB Report # 94-1. ICPRB, Rockville, MD.

Velinsky, D.J., J. C. Cornwell, and G. Foster. 1994. Effects of dredging on the water quality of the Anacostia River. ICPRB Report # 94-2. ICPRB, Rockville, MD.

Appendix A

Table A-1. Results of Standard Reference Materials as a Verification of the Analysis

Analyte	Reference Sample SLRS-3				Reference Sample BCSS-1			
	Certified		Experimental		Certified		Experimental	
	Value	STD	Value	STD	Value	STD	Value	STD
Al	NA				62630.000	220.000	62700.000	1600.000
Cd	0.013	0.002	0.019	0.014	0.250	0.040	0.250	0.100
Cu	1.350	0.070	1.330	0.130	18.500	2.700	18.900	4.800
Fe	100.000	2.000	104.700	6.100	32900.000	980.000	32600.000	4900.000
Mn	3.900	0.300	3.750	0.420	229.000	15.000	218.000	24.000
Ni	0.830	0.080	0.800	0.360	55.300	3.400	50.900	6.300
Pb	0.068	0.007	0.070	0.010	22.700	3.400	25.700	0.800
Zn	1.040	0.090	1.050	0.530	119.000	12.000	107.000	15.000

NA = Not Available

Note: The standard deviations (STD) listed above represent the 95% confidence intervals. The results (experimental values with STD) presented above are within the 95% confidence for all of the elements and indicate agreement with the certified values of both the reference materials.

Table A-2. Analytical Techniques and Quantitation Limits - Organic Pollutant

Constituent	Method	Quantitation Limit	
		Dissolved (ng/L)	Particulate (ng/g)
Acenaphthene	GC/MS	0.020	1.000
Acenaphthylene	GC/MS	0.010	0.500
Aldrin	GS/ECD	0.010	0.800
alpha-BHC	GC/ECD	0.020	0.200
beta-BHC	GC/ECD	0.030	0.500
gamma-BHC	GC/ECD	0.020	0.200
Benz(a)anthracene	GC/MS	0.010	0.400
Benzo(a)pyrene	GC/MS	0.010	0.700
alpha-Chlordane	GC/ECD	0.009	0.080
gamma-Chlordane	GC/ECD	0.009	0.080
Chrysene	GC/MS	0.060	0.600
o,p'-DDD	GC/ECD	0.020	0.500
p,p'-DDD	GC/ECD	0.010	0.100
p,p'-DDE	GC/ECD	0.010	0.100
p,p'-DDT	GC/ECD	0.020	1.700
Dieldrin	GC/ECD	0.020	0.200
2,6-Dimethylnaphthalene	GC/MS	0.020	0.200
Endrin	GC/ECD	0.040	0.300
Endosulfan I	GC-ECD	0.020	0.200
Endosulfan II	GC-ECD	0.030	0.300
Fluoranthene	GC/MS	0.010	0.200
Fluorene	GC/MS	0.010	0.100
Heptachlor	GC/MS	0.010	0.100
Heptachlor expoxide	GC/MS	0.020	0.200
Hexachlorobenzene	GC/ECD	0.005	0.100
Methoxychlor	GC/ECD	0.090	0.200
2-Methylnaphthalene	GC/MS	0.020	2.000
trans-Nonachlor	GC/ECD	0.010	0.100
Oxychlordane	GC/ECD	0.009	0.100
PCB's (112 congeners)	GC/ECD	0.130	0.100
Perylene	GC/MS	0.010	0.100
Phenanthrene	GC/MS	0.010	0.100
Pyrene	GC/MS	0.010	0.100

Table A-3. Instrument Parameters for GC-ECD and GC/MS Analyses

Parameter	GC-ECD	GC/MS
Column	HP-1, 30m X 0.25mm	HP-5, 30m X 0.25mm
Carrier Gas	Helium, 40cm/s (100°)	Helium, 40cm/s (100°)
Detector Gas	Ar/Methane, 60mL/min	NA
Injection Mode/Vol.	Splitless, 2TL	Splitless, 2TL
Split:Septum Flows	30mL/min:3mL/min	30mL/min:3mL/min
Injector/Detector T	250°/325°	250°/290° TL
GC Program	85° (1min); 85°-120° @ 10°/min; 120° (1min); 120°-285° @ 3.5°/min;OCPs 120°-285° @ 1.5°/min; PCBs 285° (6.0min); 60min run	70° (1min); 70°-120° @ 10°/min; 120° (1min); 120°-290° @ 5°/min; 290° (4.5 min); 45min run
MS Source T	NA	200°
MS EM Voltage	NA	1350V
MS Acquis./Scan Rate	NA	MID/1.0s per scan
MS Mode	NA	EI, 70eV
Internal Standards	f1: PCB-30 & PCB 209 f2: Isodrin & PCB 209	Naphthalene-d8 Chrysene-d12
Surrogate Standards	<u>Schedule</u>	<u>Standard</u>
	PAH:	Phenanthrene-d10 & Fluoranthene-d10
	PCBs:	Tetrachloro-*m*-xylene & PCB 198
	OC Pesticides:	*delta*-BHC & Dibutylchlorendate

Table A-4a. Physical and Ancillary Chemical Data - Northeast Branch of the Anacostia River

Date	Time	Sample Type	Inst. Flow (cfs)	Temp. (C)	pH	Cond. (mmhos)	DO (%)	Turbidity (TU)	Alkalinity (mg/L)	Hardness (mg/L)	DOC (mg C/l)	TSS (g/L)	POC (mg C/L)
9/27/95	1000	NS1	36	16.2	7.2	0.233	98	20.4	41.8	68.272	6.02	0.0085	0.692
11/07/95	1045	NS2	27	7.6	7.2	0.242	95	7.5	42.8	68.272	4.80	0.0064	0.602
11/14/95	1315	S1-1	1536	6.6	7.0	0.104	95	146.5	27.7	35.140	8.20	0.1540	4.840
11/14/95	1930	S1-2	1544	6.1	7.1	0.998	97	128.6	30.3	40.160	9.95	0.1140	3.370
11/15/95	930	S1-3	687	6.1	6.8	0.132	92	96.8	29.0	43.172	8.23	0.0640	2.040
1/23/96	1015	NS2	104	1.6	6.8	0.360	96	26.8	29.3	65.260	3.63	0.0128	0.413
3/19/96	1000	NS3	58	8.4	7.3	0.319	99	6.1	32.4	70.280	3.04	0.0040	0.437
4/26/26	1500	NS4	48	16.7	8.0	0.254	98	6.1	35.0	72.290	4.09	0.0080	0.603
4/30/96	1245	S2-1	63	19.1	7.6	0.273	99	12.6	44.7	44.180	6.35	0.0130	1.980
4/30/96	1615	S2-2	496	17.7	7.3	0.151	91	162.3	31.4	80.320	8.76	0.1380	13.900
4/30/96	1930	S2-3	293	16.8	7.3	0.200	88	152.2	29.3	50.200	7.22	0.1360	9.430
7/9/96	1000	NS5	40	NA	NA	NA	NA	22.8	39.2	68.270	5.70	NA	0.949
7/12/96	2000	S3-1	95	22.6	7.5	0.232	94	28.6	39.2	80.320	5.85	0.0136	1.760
7/12/96	830	S3-2	1835	21.9	7.1	0.101	94	>200	26.6	40.160	5.44	0.4620	12.100
7/12/96	1115	S3-3	1204	21.9	7.2	0.114	95	>200	26.1	40.160	6.92	0.4680	11.700
9/6/96	1300	S4-1	889	24.0	7.4	0.116	95	>200	31.3	40.160	4.17	0.5520	18.500
9/6/96	1845	S4-2	3128	23.4	7.1	0.124	98	>200	28.2	60.240	6.18	0.1140	2.490
9/7/96	1115	S4-3	205	23.1	7.0	0.148	95	>200	20.9	70.280	4.82	0.7400	30.700

7/9/96 TSS sample lost. TSS value used to convert particulate concentrations to ug/L or ng/L was the average of the other nonstorm flow TSS values (0.0079).

NSF = nonstorm flow, SF= stormflow, NA = not available

cfs=cubic feet per second, Cond. = conductivity, TU = turbidity units, DOC = dissolved organic carbon, TSS = total suspended solids, POC = particulate organic carbon

Table A-4b. Physical and Ancillary Chemical Data - Northwest Branch of the Anacostia River

Date	Time	Sample Type	Inst. Flow (cfs)	Temp (C)	pH	Cond. (mmhos)	DO (%)	Turbidity (TU)	Alkalinity (mg/L)	Hardness (mg/L)	DOC (mg C/L)	TSS (g/L)	POC (mg C/L)
9/27/95	1130	NS1	20	17.3	7.2	0.193	87	8.3	48.9	66.26	4.41	0.0050	0.59
11/07/95	1145	NS2	27	8.2	7.2	0.284	60	4.2	67.4	98.39	5.36	0.0034	1.17
11/14/95	1230	S1-1	754	6.4	7.3	0.092	91	96.2	30.3	34.14	8.18	0.1760	5.47
11/14/95	2000	S1-2	934	6.6	7.0	0.916	94	130.5	30.8	37.15	10.50	0.0920	5.90
11/15/95	1015	S1-3	271	6.0	7.1	0.135	85	60.9	35.0	46.18	9.33	0.0720	2.49
1/23/96	1145	NS2	54	1.8	6.5	0.373	86	9.6	46.0	85.34	2.43	0.0052	0.35
3/19/96	1100	NS3	38	8.7	7.5	0.324	85	3.7	51.2	100.40	2.36	0.0032	0.39
4/26/26	1330	NS4	38	16.5	7.5	0.239	97	2.6	53.8	92.37	3.60	0.0067	0.73
4/30/96	1200	S2-1	48	18.6	7.5	0.268	95	8.5	56.4	100.40	3.80	0.0060	1.51
4/30/96	1700	S2-2	299	17.2	7.4	0.16	87	156.4	40.2	66.26	8.22	0.1860	20.30
4/30/96	1840	S2-3	197	17.0	7.4	0.155	90	121.6	34.5	50.20	7.44	0.1280	13.10
7/9/96	1130	NS5	24	NA	NA	NA	NA	38.2	42.8	70.28	5.74	NA	3.14
7/12/96	2100	S3-1	70	22.4	7.3	0.231	94	37.5	49.1	80.32	5.75	0.0164	1.79
7/12/96	920	S3-2	846	21.6	7.4	0.102	94	>200	31.3	60.24	4.57	0.6940	27.80
7/12/96	1200	S3-3	807	21.7	7.3	0.096	95	>200	29.6	50.20	5.55	0.7800	25.80
9/6/96	1400	S4-1	918	23.6	7.3	0.1	95	>200	26.1	34.14	4.91	0.4940	21.90
9/6/96	1945	S4-2	3523	23.4	7.1	0.104	96	>200	28.2	40.16	5.37	0.2760	7.00
9/7/96	1200	S4-3	138	23.3	7.0	0.107	98	>200	25.1	60.24	5.28	0.3800	10.70

7/9/96 TSS sample lost. TSS value used to convert particulate concentrations to ug/L or ng/L was the average of the other nonstorm flow TSS values (0.0047).

NSF = nonstorm flow, SF= stormflow, NA = not available

cfs=cubic feet per second, Cond. = conductivity, TU = turbidity units, DOC = dissolved organic carbon, TSS = total suspended solids, POC = particulate organic carbon

Table A-5a. Trace Element Data - Northeast Branch of the Anacostia River

Date	Time	Sample Type	Inst. Flow (cfs)	Particulate Al µg/g	Dissolved Al µg/L	Total Al µg/L	Particulate Cd µg/g	Dissolved Cd µg/L	Total Cd µg/L	Particulate Cu µg/g	Dissolved Cu µg/L	Total Cu µg/L
9/27/95	1130	NS1	36	6170	64.51	116.96	ISA	0.08	0.08	16.37	1.04	1.18
11/07/95	1145	NS2	27	17113	10.71	120.24	0.25	0.08	0.08	418.15	1.08	3.76
11/14/95	1230	S1-1	1536	47110	61.20	7316.18	0.60	1.87	1.96	103.87	2.35	18.35
11/14/95	2000	S1-2	1544	1261	96.10	239.88	0.04	0.18	0.18	86.80	2.11	12.00
11/15/95	1015	S1-3	687	123435	178.60	8078.46	ISA	0.11	0.11	48.17	1.73	4.81
1/23/96	1145	NS2	104	74109	38.80	987.39	6.90	1.30	1.39	614.60	1.23	9.10
3/19/96	1100	NS3	58	19840	18.44	97.80	1.50	0.29	0.30	2.37	0.34	0.35
4/26/26	1330	NS4	48	22129	30.27	207.30	<0.5	0.07	0.07	<2	3.16	3.17
4/30/96	1200	S2-1	63	836	18.49	29.35	<0.5	0.18	0.19	<2	1.82	1.83
4/30/96	1700	S2-2	496	18092	41.69	2538.39	0.26	0.16	0.20	682.16	4.26	98.40
4/30/96	1840	S2-3	293	490264	39.87	66715.72	1.20	0.11	0.27	301.80	2.33	43.37
7/9/96	1130	NS5	40	32435	11.92	269.45	1.40	0.06	0.07	<2	2.60	2.61
7/12/96	2100	S3-1	95	67459	17.42	934.86	2.20	0.09	0.12	41.47	3.66	4.22
7/12/96	920	S3-2	1835	91869	60.77	42504.46	1.60	0.05	0.79	39.54	2.87	21.14
7/12/96	1200	S3-3	1204	115667	54.93	54187.19	1.70	0.11	0.90	40.15	3.53	22.32
9/6/96	1400	S4-1	889	96139	35.64	53104.50	1.40	0.04	0.81	58.04	1.57	33.61
9/6/96	1945	S4-2	3128	108510	39.00	12409.13	1.50	0.05	0.22	78.52	3.61	12.56
9/7/96	1200	S4-3	205	51900	108.81	38514.55	0.80	0.15	0.74	18.83	1.59	15.53

< = Below Method Detection Limit

ISA = insufficient amount of particluate to analyze, cfs = cubic feet per second

Particulate concentrations in µg/g or ng/g converted to µg/L by multiplying by the TSS concentration (Table A-4) for summing with dissolved concentrations.

Table A-5a (Continued). Trace Element Data - Northeast Branch of the Anacostia River

Date	Time	Sample Type	Inst. Flow (cfs)	Particulate Fe µg/g	Dissolved Fe µg/L	Total Fe µg/L	Particulate Mn µg/g	Dissolved Mn µg/L	Total Mn µg/L	Particulate Ni µg/g	Dissolved Ni µg/L	Total Ni µg/L
9/27/95	1130	NS1	36	4259.75	32.40	68.61	198.79	10.40	12.09	22.85	2.13	2.32
11/07/95	1145	NS2	27	9953.91	115.40	179.11	793.46	115.70	120.78	81.59	4.12	4.64
11/14/95	1230	S1-1	1536	8197.92	167.70	1430.18	1672.97	60.10	317.74	94.22	2.91	17.42
11/14/95	2000	S1-2	1544	914.02	203.10	307.30	85.03	92.40	102.09	10.98	3.66	4.91
11/15/95	1015	S1-3	687	293.17	341.90	360.66	310.87	115.70	135.60	32.83	4.27	6.37
1/23/96	1145	NS2	104	13414.37	178.70	350.40	755.34	256.10	265.77	459.62	2.75	8.63
3/19/96	1100	NS3	58	16155.43	81.80	146.42	733.37	178.00	180.93	30.61	6.21	6.33
4/26/26	1330	NS4	48	70451.61	224.81	788.42	13729.03	46.90	156.73	189.68	8.65	10.17
4/30/96	1200	S2-1	63	1282.96	126.10	142.78	167.94	27.34	29.53	0.81	2.17	2.18
4/30/96	1700	S2-2	496	4938.24	188.27	869.75	785.97	61.73	170.19	232.82	4.16	36.29
4/30/96	1840	S2-3	293	72800.45	217.11	10117.97	11024.77	57.15	1556.52	162.60	4.39	26.50
7/9/96	1130	NS5	40	6231.44	58.32	107.80	827.58	22.18	28.75	26.34	3.05	3.26
7/12/96	2100	S3-1	95	12275.29	39.77	206.71	4025.41	6.16	60.91	103.40	3.48	4.89
7/12/96	920	S3-2	1835	10667.52	97.95	5026.35	2519.74	21.20	1185.32	41.66	2.97	22.22
7/12/96	1200	S3-3	1204	10819.06	100.26	5163.58	967.56	42.46	495.27	28.15	4.08	17.25
9/6/96	1400	S4-1	889	8927.22	92.65	5020.47	2414.56	0.93	1333.77	51.61	2.68	31.17
9/6/96	1945	S4-2	3128	10142.66	129.23	1285.49	1974.28	1.04	226.10	36.77	3.34	7.53
9/7/96	1200	S4-3	205	4961.48	274.87	3946.36	793.18	22.33	609.28	22.85	8.46	25.37

< = Below Method Detection Limit

ISA = insufficient amount of particluate to analyze, cfs = cubic feet per second

Particulate concentrations in µg/g or ng/g converted to µg/L by multiplying by the TSS concentration (Table A-4) for summing with dissolved concentrations.

Table A-5a (Continued). Trace Element Data - Northeast Branch of the Anacostia River

Date	Time	Sample Type	Inst. Flow (cfs)	Particulate Pb µg/g	Dissolved Pb µg/L	Total Pb µg/L	Particulate Zn µg/g	Dissolved Zn µg/L	Total Zn µg/L	Reactive Hg ng/L	Particulate Hg ng/L	Total MMHg ng/L	Particulate MMHg ng/L	Total Hg ng/L
9/27/95	1130	NS1	36	ISA	0.17	0.17	55.42	0.33	0.80	0.25	1.82	NA	0.019	6.74
11/07/95	1145	NS2	27	<1.0	0.18	0.18	163.18	4.67	5.71	0.10	1.06	0.071	0.019	5.48
11/14/95	1230	S1-1	1536	63.06	0.33	10.04	268.57	10.04	51.40	3.24	9.98	0.183	0.131	47.99
11/14/95	2000	S1-2	1544	4.22	0.23	0.71	59.16	13.32	20.06	3.77	9.51	0.133	0.081	55.85
11/15/95	1015	S1-3	687	ISA	0.21	0.21	204.83	9.47	22.58	4.67	9.86	0.118	0.047	54.88
1/23/96	1145	NS2	104	37.23	0.38	0.86	326.01	10.41	14.58	0.56	2.76	0.015	0.021	8.01
3/19/96	1100	NS3	58	34.72	0.33	0.47	410.97	4.35	5.99	3.14	3.39	<0.01	NA	11.84
4/26/26	1330	NS4	48	<1.0	0.24	0.24	1869.68	6.98	21.94	0.59	2.16	0.124	0.03 (UV)	9.90
4/30/96	1200	S2-1	63	0.40	0.28	0.29	29.08	6.95	7.33	1.20	2.54	0.075	0.064 (UV)	6.68
4/30/96	1700	S2-2	496	82.16	0.49	11.83	212.06	20.65	49.91	2.29	69.86	0.228	0.63	39.60
4/30/96	1840	S2-3	293	332.59	0.23	45.46	2254.23	11.97	318.54	3.16	102.12	0.494	0.722	82.20
7/9/96	1130	NS5	40	157.26	0.28	1.53	499.30	4.05	8.01	0.56	3.30	0.217	0.063	11.72
7/12/96	2100	S3-1	95	353.88	0.39	5.20	1653.29	4.76	27.24	0.08	3.02	0.183	0.08	14.35
7/12/96	920	S3-2	1835	135.18	0.03	62.48	167.37	4.20	81.52	0.32	28.77	0.611	1.126	32.94
7/12/96	1200	S3-3	1204	209.34	0.24	98.21	157.45	5.87	79.56	0.57	51.04	0.541	0.612	29.42
9/6/96	1400	S4-1	889	206.01	0.05	113.77	189.62	3.29	107.96	0.24	61.50	0.585	0.28	15.71
9/6/96	1945	S4-2	3128	250.18	0.31	28.83	244.15	4.70	32.53	0.45	37.50	0.551	0.31	12.35
9/7/96	1200	S4-3	205	100.54	0.31	74.71	78.34	11.25	69.22	0.52	13.25	0.296	0.114	8.70

< = Below Method Detection Limit, NA = not available

ISA = insufficient amount of particluate to analyze, cfs = cubic feet per second

Particulate concentrations in µg/g or ng/g converted to µg/L by multiplying by the TSS concentration (Table A-4) for summing with dissolved concentrations.

UV = Did not properly methylate. Underestimated value.

Total Hg values sometimes < particulate due to subsampling problems. Total values used for all calculations.

Table A-5b. Trace Element Data - Northwest Branch of the Anacostia River

Date	Time	Sample Type	Inst. Flow (cfs)	Particulate Al µg/g	Dissolved Al µg/L	Total Al µg/L	Particulate Cd µg/g	Dissolved Cd µg/L	Total Cd µg/L	Particulate Cu µg/g	Dissolved Cu µg/L	Total Cu µg/L
9/27/95	1130	NS1	20	37150.43	16.20	201.95	ISA	0.188	0.19	41.51	1.86	2.07
11/07/95	1145	NS2	27	861935.48	14.00	2944.58	16.0	0.167	0.22	6090.32	0.99	21.70
11/14/95	1230	S1-1	754	101813.50	70.41	17989.59	1.3	0.316	0.55	585.56	2.65	105.71
11/14/95	2000	S1-2	934	85065.64	200.20	8026.24	1.3	0.149	0.26	544.17	2.38	52.44
11/15/95	1015	S1-3	271	88901.19	75.60	6476.49	ISA	0.114	0.11	43.25	1.64	4.75
1/23/96	1145	NS2	54	25564.38	18.20	151.13	8.7	0.527	0.57	323.68	1.24	2.92
3/19/96	1100	NS3	38	59173.53	19.38	208.74	0.5	0.088	0.09	1683.24	0.35	5.74
4/26/26	1330	NS4	38	12302.56	18.05	100.48	0.9	0.052	0.06	<2	1.61	1.62
4/30/96	1200	S2-1	48	42254.75	16.42	269.95	1.1	0.244	0.25	15.26	1.45	1.54
4/30/96	1700	S2-2	299	11957.19	27.25	2251.29	0.6	0.103	0.21	<2	3.15	3.34
4/30/96	1840	S2-3	197	114920.00	42.32	14752.08	0.9	0.116	0.23	24.48	2.47	5.60
7/9/96	1130	NS5	24	5000.47	22.72	46.22	<0.5	0.035	0.04	<2	2.85	2.85
7/12/96	2100	S3-1	70	125351.72	41.38	2097.15	7.1	0.073	0.19	51.90	2.25	3.10
7/12/96	920	S3-2	846	436791.26	43.27	303176.41	6.7	0.042	4.69	185.34	2.33	130.96
7/12/96	1200	S3-3	807	106243.66	48.27	82918.33	1.7	0.031	1.36	52.46	2.02	42.94
9/6/96	1400	S4-1	918	81800.80	13.55	40423.14	1.2	0.050	0.64	31.06	3.30	18.64
9/6/96	1945	S4-2	3523	105200.00	242.55	29277.75	2.4	0.416	1.08	50.00	2.07	15.87
9/7/96	1200	S4-3	138	114963.33	51.07	43737.14	2.2	0.025	0.86	35.49	2.42	15.91

< = Below Method Detection Limit

ISA = insufficient amount of particluate to analyze, cfs = cubic feet per second

Particulate concentrations in µg/g or ng/g converted to µg/L by multiplying by the TSS concentration (Table A-4) for summing with dissolved concentrations.

Table A-5b (Continued). Trace Element Data - Northwest Branch of the Anacostia River

Date	Time	Sample Type	Inst. Flow (cfs)	Particulate Fe µg/g	Dissolved Fe µg/L	Total Fe µg/L	Particulate Mn µg/g	Dissolved Mn µg/L	Total Mn µg/L	Particulate Ni µg/g	Dissolved Ni µg/L	Total Ni µg/L
9/27/95	1130	NS1	20	33607.21	140.90	308.94	214.39	43.51	44.58	27.24	4.00	4.14
11/07/95	1145	NS2	27	120258.06	177.70	586.58	19561.29	68.70	135.21	5161.29	1.45	19.00
11/14/95	1230	S1-1	754	12555.24	182.00	2391.72	1466.54	65.40	323.51	199.41	2.58	37.68
11/14/95	2000	S1-2	934	11540.15	282.50	1344.19	2517.57	54.40	286.02	372.16	2.04	36.28
11/15/95	1015	S1-3	271	27567.32	204.90	2189.75	543.40	55.00	94.12	40.02	3.12	6.00
1/23/96	1145	NS2	54	7360.07	161.50	199.77	476.24	178.90	181.38	1333.88	1.49	8.43
3/19/96	1100	NS3	38	59000.00	99.00	287.80	3592.06	92.97	104.46	225.59	1.44	2.16
4/26/26	1330	NS4	38	58882.78	231.29	625.80	78607.78	14.76	541.44	321.44	4.02	6.17
4/30/96	1200	S2-1	48	7456.72	259.50	304.24	1848.92	45.05	56.15	42.30	2.59	2.84
4/30/96	1700	S2-2	299	52600.48	175.05	9958.74	9250.43	41.27	1761.85	34.88	3.00	9.49
4/30/96	1840	S2-3	197	19244.00	163.08	2626.31	4012.00	27.64	541.18	70.04	2.73	11.70
7/9/96	1130	NS5	24	2478.11	116.97	128.62	140.50	32.61	33.27	1.92	2.29	2.30
7/12/96	2100	S3-1	70	54841.38	59.60	959.00	33982.07	6.75	564.06	362.34	2.71	8.65
7/12/96	920	S3-2	846	46789.81	72.52	32544.65	7206.41	20.92	5022.16	171.09	3.14	121.87
7/12/96	1200	S3-3	807	10888.87	75.53	8568.85	2645.07	33.21	2096.37	38.79	3.15	33.41
9/6/96	1400	S4-1	918	7255.78	91.37	3675.72	882.71	1.04	437.10	30.96	2.02	17.32
9/6/96	1945	S4-2	3523	12720.00	247.79	3758.51	2360.00	14.46	665.82	76.00	5.36	26.34
9/7/96	1200	S4-3	138	12345.67	88.22	4779.57	878.15	6.14	339.83	36.40	2.00	15.83

< = Below Method Detection Limit

cfs = cubic feet per second

Particulate concentrations in µg/g or ng/g converted to µg/L by multiplying by the TSS concentration (Table A-4) for summing with dissolved concentrations.

Table A-5b (Continued). Trace Element Data - Northwest Branch of the Anacostia River

Date	Time	Sample Type	Inst. Flow (cfs)	Particulate Pb µg/g	Dissolved Pb µg/L	Total Pb µg/L	Zn µg/g	Zn µg/L	Zn µg/L	Reactive Hg ng/L	Particulate Hg ng/L	Total Hg ng/L	Total MMHg ng/L	Particulate MMHg ng/L
9/27/95	1130	NS1	20	ISA	0.25	0.25	219.28	4.10	5.20	0.03	0.74	2.01	0.08	0.01
11/07/95	1145	NS2	27	1424.52	0.19	5.03	3447.74	3.34	15.06	0.12	1.72	4.54	0.07	0.02
11/14/95	1230	S1-1	754	137.69	0.53	24.76	341.84	8.85	69.01	2.01	9.14	39.18	0.11	0.10
11/14/95	2000	S1-2	934	140.11	0.35	13.24	268.64	4.30	29.02	3.01	10.69	43.74	0.24	0.12
11/15/95	1015	S1-3	271	ISA	0.23	0.23	167.58	3.04	15.11	1.89	4.02	33.58	0.10	0.05
1/23/96	1145	NS2	54	14.84	0.24	0.32	129.88	6.02	6.70	0.05	0.26	2.87	0.01	0.01
3/19/96	1100	NS3	38	<1.0	0.24	0.24	1561.76	0.96	5.96	3.64	1.01	6.03	0.03	NA
4/26/26	1330	NS4	38	135.88	0.00	0.91	1767.94	3.56	15.41	BDL	0.37	2.90	0.04	0.01 (UV)
4/30/96	1200	S2-1	48	14.39	0.00	0.09	375.02	8.04	10.29	0.63	1.91	2.34	0.04	0.001 (UV)
4/30/96	1700	S2-2	299	46.04	1.56	10.12	279.05	16.27	68.17	1.30	164.17	39.74	0.49	1.23
4/30/96	1840	S2-3	197	<1.0	0.38	0.44	680.00	13.78	100.82	1.33	29.16	44.42	0.36	0.40
7/9/96	1130	NS5	24	21.68	0.00	0.10	55.54	2.98	3.24	0.54	3.45	10.47	0.23	0.08
7/12/96	2100	S3-1	70	1077.24	0.00	17.67	2085.93	4.89	39.10	0.38	1.69	12.48	0.16	0.11
7/12/96	920	S3-2	846	668.80	0.11	464.25	473.08	3.27	331.59	0.34	40.73	28.60	1.13	0.41
7/12/96	1200	S3-3	807	187.36	0.00	146.14	149.89	2.41	119.32	0.38	50.62	47.86	1.39	1.60
9/6/96	1400	S4-1	918	132.18	0.31	65.60	120.16	4.74	64.10	1.13	52.49	13.39	0.71	0.53
9/6/96	1945	S4-2	3523	370.00	1.03	103.15	292.00	15.54	96.13	1.48	100.89	12.07	1.03	0.78
9/7/96	1200	S4-3	138	245.70	0.01	93.38	104.65	1.90	41.67	0.25	27.09	14.46	0.24	0.20

< = Below Method Detection Limit

ISA = insufficient amount of particluate to analyze

UV = Did not properly methylate. Underestimated value.

Total Hg values sometimes < particulate due to subsampling problems. Total values used for all calculations.

Table A-6a. PCB Congener Data - Northeast Branch of the Anacostia River - Dissolved Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)		36	27	104	58	48	40	1256	284	1045	1407
Total Dissolved		3.8886	2.3103	1.4988	2.9835	2.5347	2.1713	3.4505	3.0902	1.9575	2.2645
Cl#	Congener										
1	3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	12+13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0437	0.0000
2	4+10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	5+8	0.0000	0.0000	0.0000	0.0143	0.0000	0.0000	0.0456	0.0000	0.0000	0.0000
2	6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0903	0.0000	0.0000	0.0000
2	7+9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0424	0.0000	0.0000	0.0000
3	16+32	0.1098	0.0000	0.0636	0.0039	0.0297	0.0000	0.0995	0.0000	0.0000	0.0000
3	17+15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1576	0.0307	0.0337	0.0379
3	18	0.0450	0.0000	0.0457	0.0628	0.0609	0.0620	0.1010	0.0151	0.0000	0.0048
3	19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	20+33+53	0.0000	0.0000	0.0000	0.2601	0.4265	0.0000	0.2213	0.2527	0.0000	0.0000
3	24+27	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0888	0.0610	0.0493	0.0600
3	25	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1192	0.0000	0.0000	0.0000
3	26	0.2966	0.0000	0.1118	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	28+31	0.0726	0.0667	0.0000	0.1467	0.1501	0.0000	0.0000	0.0000	0.0000	0.0000
3	29	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	34	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	51	0.4424	0.0533	0.3054	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	40	0.0407	0.0610	0.0000	0.0136	0.0519	0.0739	0.0000	0.0000	0.0000	0.0000
4	41+64	0.0601	0.0222	0.0044	0.0616	0.0812	0.0662	0.0872	0.0518	0.0121	0.0230
4	42	0.0000	0.0000	0.0000	0.0212	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	44	0.0000	0.0000	0.0000	0.0720	0.1304	0.0000	0.0000	0.0000	0.0000	0.0000
4	45	0.1115	0.1091	0.0000	0.0000	0.0000	0.1001	0.2910	0.1142	0.0425	0.0314
4	47	0.0000	0.0000	0.0000	0.0000	0.0000	0.0451	0.1390	0.0815	0.0402	0.0324
4	48	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	49	0.1275	0.1144	0.1983	0.0367	0.0000	0.0000	0.0483	0.0472	0.0352	0.0501
4	52	0.3224	0.1743	0.0000	0.1850	0.2830	0.1070	0.1361	0.1573	0.0000	0.1377
4	55	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	56+60	0.0000	0.0000	0.0000	0.0767	0.0000	0.0812	0.0899	0.0000	0.0000	0.0000
4	58	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	63	0.0000	0.0000	0.0000	0.0051	0.0000	0.0000	0.0500	0.0571	0.0261	0.0180

Notes: zeroes denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-6a (Continued). PCB Congener Data - Northeast Branch of the Anacostia River - Dissolved Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)		36	27	104	58	48	40	1256	284	1045	1407
Cl#	Congener										
4	67+100	0.0427	0.1208	0.1197	0.0383	0.0711	0.0000	0.0000	0.0000	0.0413	0.0000
4	69	0.0000	0.0000	0.0000	0.0085	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	70	0.0991	0.0312	0.0000	0.1067	0.0000	0.1106	0.1046	0.1161	0.0236	0.0351
4	73	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	74	0.0000	0.0000	0.0000	0.0566	0.0000	0.0522	0.0549	0.0655	0.0264	0.0255
5	103	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	132/153	0.4343	0.2729	0.1737	0.0943	0.0608	0.1112	0.0985	0.1569	0.2232	0.2571
5	107	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	119	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0013	0.0000	0.0000	0.0000
5	122	0.0042	0.0000	0.0000	0.0036	0.0000	0.0000	0.0043	0.0056	0.0000	0.0000
5	125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	66+95	0.0945	0.0000	0.0000	0.0972	0.0000	0.1128	0.1035	0.0939	0.0247	0.0198
5	77+110	0.0581	0.0259	0.0037	0.0826	0.0000	0.0929	0.0705	0.0895	0.0257	0.0133
5	82	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0173	0.0000	0.0000	0.0000
5	84+92	0.0958	0.1076	0.0263	0.1167	0.0000	0.1206	0.1125	0.1320	0.0742	0.0659
5	85	0.0303	0.0183	0.0000	0.0388	0.0000	0.0349	0.0242	0.0343	0.0000	0.0000
5	87	0.0548	0.0319	0.0054	0.0621	0.0000	0.0644	0.0477	0.0807	0.0331	0.0194
5	90+101	0.2407	0.2843	0.0785	0.2005	0.3698	0.1709	0.1368	0.2580	0.1983	0.1828
5	91	0.0147	0.0000	0.0000	0.0212	0.0442	0.0000	0.0000	0.0373	0.0000	0.0000
5	96	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	97	0.0485	0.0305	0.0000	0.0533	0.0000	0.0541	0.0377	0.0727	0.0357	0.0230
5	99	0.0906	0.0977	0.0252	0.0654	0.0000	0.0768	0.0807	0.0882	0.0723	0.0552
6	118+149	0.2191	0.2053	0.0563	0.2896	0.0000	0.2141	0.1913	0.2964	0.2193	0.2036
6	126+129	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	128	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	131	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	105	0.0346	0.0184	0.0000	0.0000	0.0000	0.0000	0.0497	0.0750	0.0196	0.0095
6	134	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	124+135+147	0.0532	0.0529	0.0188	0.0310	0.0438	0.0259	0.0385	0.0426	0.0356	0.0572
6	138	0.1664	0.1317	0.0622	0.0996	0.1070	0.1061	0.1050	0.1595	0.1114	0.1273
6	141+179	0.0537	0.0436	0.0210	0.0302	0.0499	0.0130	0.0128	0.0214	0.0188	0.0213
6	146	0.0000	0.0000	0.0000	0.0208	0.0000	0.0228	0.0210	0.0000	0.0000	0.0000
6	151	0.0576	0.0539	0.0209	0.0388	0.0525	0.0462	0.0449	0.0655	0.0721	0.0821
6	156	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: zeroes denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-6a (Continued). PCB Congener Data - Northeast Branch of the Anacostia River - Dissolved Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)		36	27	104	58	48	40	1256	284	1045	1407
Cl#	Congener										
6	158	0.0000	0.0131	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	167	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0010	0.0007	0.0009
7	170+190	0.0253	0.0000	0.0000	0.0267	0.0422	0.0000	0.0336	0.0000	0.0249	0.0340
7	171+202	0.0000	0.0000	0.0000	0.0109	0.0000	0.0000	0.0000	0.0000	0.0241	0.0271
7	172	0.0000	0.0000	0.0000	0.2021	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	173	0.0017	0.0000	0.0000	0.0004	0.0009	0.0000	0.0008	0.0019	0.0011	0.0010
7	174	0.0476	0.0203	0.0131	0.0294	0.0534	0.0252	0.0244	0.0342	0.0302	0.0442
7	175	0.0000	0.0000	0.0000	0.0000	0.0877	0.0000	0.0000	0.0000	0.0000	0.0000
7	177	0.0210	0.0000	0.0000	0.0124	0.0217	0.0000	0.0173	0.0202	0.0220	0.0227
7	178	0.0000	0.0000	0.0000	0.0054	0.0166	0.0000	0.0096	0.0152	0.0131	0.0174
7	180	0.0974	0.0748	0.0648	0.0605	0.0750	0.0615	0.0557	0.0767	0.1056	0.1643
7	183	0.0339	0.0260	0.0169	0.0172	0.0307	0.0270	0.0221	0.0335	0.0356	0.0434
7	185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	187	0.0872	0.0482	0.0355	0.0515	0.1117	0.0541	0.0519	0.0727	0.0754	0.0853
7	189	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	191	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	193	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0070
8	194	0.0000	0.0000	0.0000	0.0045	0.0139	0.0000	0.0083	0.0000	0.0104	0.0293
8	194	0.0000	0.0000	0.0000	0.0045	0.0139	0.0000	0.0083	0.0000	0.0104	0.0293
8	195+208	0.0000	0.0000	0.0000	0.0027	0.0000	0.0000	0.0054	0.0000	0.0000	0.0481
8	197	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	198	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	199	0.0000	0.0000	0.0000	0.0157	0.0161	0.0000	0.0000	0.0000	0.0000	0.0056
8	200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	201	0.0267	0.0000	0.0146	0.0000	0.0000	0.0234	0.0189	0.0325	0.0298	0.0454
8	203+196	0.0263	0.0000	0.0128	0.0162	0.0348	0.0148	0.0169	0.0232	0.0277	0.0502
8	205	0.0000	0.0000	0.0000	0.0041	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	205	0.0000	0.0000	0.0000	0.0041	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	206	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0120	0.0195	0.0087	0.0156
9	207	0.0000	0.0000	0.0000	0.0000	0.0033	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: zeroes denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-6b. PCB Congener Data - Northwest Branch of the Anacostia River - Dissolved Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)		20	27	54	38	38	24	653	181	574	1526
Total Dissolved		2.3349	1.3848	0.8979	2.6540	2.3542	3.0429	2.2716	0.5805	0.6840	1.1010
Cl#	Congener										
1	3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	12+13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	4+10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	5+8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	6	0.0000	0.0000	0.0000	0.0000	0.0000	0.1028	0.0681	0.0000	0.0000	0.0000
2	7+9	0.0274	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	16+32	0.0000	0.0000	0.0000	0.0103	0.0000	0.0294	0.0125	0.0000	0.0000	0.0000
3	17+15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0398	0.0000	0.0295	0.0481
3	18	0.0635	0.1014	0.0000	0.0879	0.0310	0.0000	0.0344	0.0000	0.0000	0.0000
3	19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	20+33+53	0.0000	0.0000	0.0000	0.3776	0.5399	0.0000	0.0000	0.0000	0.0000	0.0000
3	24+27	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0374	0.0584	0.0555	0.0761
3	25	0.1684	0.1065	0.0000	0.0000	0.0000	0.0000	0.0910	0.0000	0.0000	0.0000
3	26	0.0000	0.0000	0.0000	0.0420	0.0552	0.0000	0.0000	0.0000	0.0000	0.0000
3	28+31	0.1207	0.0000	0.0000	0.1790	0.0777	0.1102	0.0000	0.0000	0.0000	0.0000
3	29	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	34	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	51	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	40	0.0987	0.0653	0.0000	0.0296	0.0000	0.0000	0.0000	0.0218	0.0000	0.0000
4	41+64	0.0983	0.0720	0.0000	0.0777	0.0000	0.0000	0.0519	0.0151	0.0000	0.0299
4	42	0.0000	0.0000	0.0000	0.0352	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	44	0.0000	0.0000	0.0000	0.0844	0.0978	0.0000	0.0000	0.0000	0.0000	0.0000
4	45	0.0000	0.0991	0.0000	0.0000	0.0000	0.0000	0.2365	0.0603	0.0047	0.0984
4	47	0.2999	0.2593	0.0000	0.0000	0.0000	0.0000	0.1425	0.0266	0.0181	0.0701
4	48	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	49	0.0461	0.0333	0.0000	0.0424	0.0176	0.1067	0.0000	0.0000	0.0000	0.0000
4	52	0.1737	0.0952	0.0000	0.2481	0.2246	0.4671	0.0000	0.0481	0.0000	0.0000
4	55	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	56+60	0.0000	0.0000	0.0000	0.0934	0.0000	0.0000	0.0803	0.0000	0.0000	0.0000
4	58	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	63	0.0241	0.0000	0.0000	0.0000	0.0127	0.0703	0.0450	0.0221	0.0203	0.0252

Notes: zeroes denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-6b (Continued). PCB Congener Data - Northwest Branch of the Anacostia River - Dissolved Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)		20	27	54	38	38	24	653	181	574	1526
Cl#	Congener										
4	67+100	0.0623	0.0374	0.0000	0.0544	0.0908	0.0000	0.0000	0.0000	0.0000	0.0789
4	69	0.0000	0.0000	0.0000	0.0144	0.0154	0.0000	0.0000	0.0000	0.0000	0.0000
4	70	0.0753	0.0446	0.0000	0.1072	0.0000	0.0000	0.0893	0.0299	0.0121	0.0185
4	73	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	74	0.0000	0.0000	0.0000	0.0618	0.0000	0.0000	0.0459	0.0193	0.0000	0.0000
5	103	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	132/153	0.0000	0.0000	0.0226	0.0291	0.0265	0.0000	0.0729	0.0386	0.0656	0.0678
5	107	0.0000	0.0000	0.0204	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	119	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	122	0.0028	0.0034	0.0000	0.0040	0.0069	0.0000	0.0034	0.0000	0.0000	0.0000
5	125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	66+95	0.0863	0.0709	0.0000	0.0627	0.0000	0.0000	0.0815	0.0174	0.0000	0.0190
5	77+110	0.0401	0.0228	0.0046	0.0490	0.0000	0.2566	0.0701	0.0000	0.0000	0.0119
5	82	0.0120	0.0289	0.0000	0.0000	0.0000	0.0000	0.0202	0.0000	0.0000	0.0000
5	84+92	0.0788	0.0329	0.0000	0.0712	0.0000	0.0000	0.1238	0.0000	0.0372	0.0428
5	85	0.0149	0.0107	0.0000	0.0198	0.0000	0.0000	0.0246	0.0000	0.0000	0.0000
5	87	0.0236	0.0172	0.0000	0.0348	0.0000	0.0000	0.0532	0.0000	0.0079	0.0175
5	90+101	0.0942	0.0438	0.0356	0.1148	0.2104	0.4758	0.1454	0.0991	0.0998	0.1017
5	91	0.0000	0.0000	0.0000	0.0170	0.0236	0.0000	0.0000	0.0000	0.0000	0.0000
5	96	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	97	0.0225	0.0384	0.0000	0.0288	0.0000	0.0000	0.0512	0.0000	0.0106	0.0223
5	99	0.0000	0.0000	0.0209	0.0407	0.0000	0.0000	0.0863	0.0000	0.0393	0.0402
6	118+149	0.0692	0.0351	0.7262	0.1656	0.4055	0.3180	0.1887	0.0000	0.0747	0.1063
6	126+129	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	128	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	131	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	105	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0441	0.0000	0.0000	0.0000
6	134	0.0084	0.0080	0.0000	0.0000	0.0000	0.0576	0.0000	0.0000	0.0000	0.0000
6	124+135+147	0.0197	0.0123	0.0000	0.0150	0.0230	0.0000	0.0182	0.0000	0.0102	0.0151
6	138	0.0599	0.0254	0.0275	0.0527	0.0542	0.0508	0.0857	0.0000	0.0283	0.0459
6	141+179	0.0000	0.0000	0.0000	0.0148	0.0175	0.0906	0.0085	0.0000	0.0053	0.0051
6	146	0.0033	0.0013	0.0000	0.0111	0.0139	0.0553	0.0204	0.0039	0.0000	0.0059
6	151	0.0138	0.0194	0.0000	0.0187	0.0285	0.1017	0.0320	0.0000	0.0249	0.0263
6	156	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: zeroes denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-6b (Continued). PCB Congener Data - Northwest Branch of the Anacostia River - Dissolved Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)		20	27	54	38	38	24	653	181	574	1526
Cl#	Congener										
6	158	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	167	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0007	0.0000	0.0000
7	170+190	0.0000	0.0000	0.0000	0.0194	0.0257	0.0000	0.0168	0.0000	0.0000	0.0083
7	171+202	0.0000	0.0000	0.0000	0.0048	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	172	0.0000	0.0000	0.0000	0.1627	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	173	0.0000	0.0000	0.0000	0.0002	0.0016	0.0000	0.0006	0.0008	0.0007	0.0005
7	174	0.0448	0.0425	0.0025	0.0217	0.0450	0.0316	0.0124	0.0130	0.0030	0.0079
7	175	0.0361	0.0000	0.0000	0.0000	0.0000	0.4916	0.0000	0.0000	0.0000	0.0000
7	177	0.0897	0.0000	0.0000	0.0085	0.0216	0.0390	0.0102	0.0000	0.0000	0.0000
7	178	0.0884	0.0000	0.0000	0.0044	0.0150	0.0000	0.0051	0.0045	0.0053	0.0000
7	180	0.0196	0.0093	0.0106	0.0358	0.0669	0.1221	0.0345	0.0297	0.0422	0.0369
7	183	0.1506	0.0306	0.0024	0.0151	0.0296	0.0000	0.0150	0.0138	0.0171	0.0124
7	185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	187	0.0812	0.0179	0.0098	0.0450	0.0950	0.0000	0.0308	0.0273	0.0340	0.0243
7	189	0.0000	0.0000	0.0101	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	191	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	193	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	194	0.0000	0.0000	0.0000	0.0028	0.0098	0.0000	0.0000	0.0000	0.0000	0.0043
8	194	0.0000	0.0000	0.0000	0.0028	0.0098	0.0000	0.0000	0.0000	0.0000	0.0043
8	195+208	0.0000	0.0000	0.0000	0.0024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	197	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	198	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	199	0.0000	0.0000	0.0000	0.0153	0.0173	0.0000	0.0000	0.0000	0.0000	0.0000
8	200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	201	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0139	0.0162	0.0175	0.0136
8	203+196	0.0038	0.0000	0.0000	0.0177	0.0302	0.0657	0.0084	0.0093	0.0128	0.0095
8	205	0.0000	0.0000	0.0000	0.0000	0.0071	0.0000	0.0000	0.0000	0.0000	0.0000
8	205	0.0000	0.0000	0.0000	0.0000	0.0071	0.0000	0.0000	0.0000	0.0000	0.0000
9	206	0.0030	0.0000	0.0047	0.0000	0.0000	0.0000	0.0190	0.0045	0.0077	0.0063
9	207	0.0096	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: zeroes denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-7a. PCB Congener Data - Northeast Branch of the Anacostia River Particulate Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)		36	27	104	58	48	40	1256	284	1045	1407
Total Part.		0.4244	2.4074	11.1501	0.5344	2.2873	0.5222	13.2173	0.9186	14.3182	18.3631
Cl#	Congenor										
1	3	0.0000	0.0000	0.0000	0.0000	<ql	0.0000	0.0000	0.0000	0.0000	0.0000
2	11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	12+13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	4+10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	5+8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	6	0.0000	0.0000	0.0000	0.0000	<ql	0.0000	0.0000	0.0116	0.0000	0.0000
2	7+9	0.0151	0.0680	0.0000	0.0000	0.0000	0.0000	0.0000	0.0104	0.0000	0.0000
3	16+32	0.0201	<ql	0.1393	0.0000	0.0133	0.0000	0.0000	0.0000	0.0000	0.0000
3	17+15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	18	0.0000	0.0000	0.0565	0.0000	<ql	0.0000	0.0000	0.0000	0.0000	0.0000
3	19	0.0000	0.0000	0.2685	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	20+33+53	0.0854	0.0000	0.1806	0.0000	0.0000	0.0000	0.0000	0.0377	0.0000	0.0000
3	24+27	0.0000	0.0000	0.0342	0.0395	0.0178	0.0000	0.0000	0.0174	0.0000	0.0000
3	25	0.0000	0.0000	0.0000	0.0000	0.0263	0.0000	0.0000	0.0171	0.0000	0.0000
3	26	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	28+31	0.0429	0.0750	0.1503	0.0432	0.0000	0.0109	0.0000	0.0000	0.0000	0.0000
3	29	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	34	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	51	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	41+64	0.0000	0.0000	0.0893	0.0000	0.0283	0.0000	0.1693	0.0000	0.0000	0.0000
4	42	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	44	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	45	0.0000	0.0000	0.1134	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	47	0.0695	0.3942	1.0025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	48	0.0000	0.0000	0.0000	0.0000	<ql	0.0000	0.0000	0.0000	0.0000	0.0000
4	49	0.0000	0.0000	0.0000	0.0000	0.0306	0.0000	0.1616	0.0000	0.0000	0.1113
4	52	<ql	0.0000	0.0000	0.0000	0.0261	0.0193	0.3101	0.0000	0.1294	0.2616
4	55	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	56+60	0.0000	0.0000	0.0693	0.0000	0.0181	0.0183	0.0000	0.0087	0.0000	0.0000
4	58	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	63	0.0000	0.0000	0.0000	0.0000	0.0266	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: zeroes or "<ql" denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-7a (Continued). PCB Congener Data - Northeast Branch of the Anacostia River - Particulate Phase Concentrations, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)	36	27	104	58	48	40	1256	284	1045	1407
# Congener										
4 67+100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 69	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 70	<ql	0.0000	0.0637	0.0000	<ql	0.0000	0.1599	0.0086	0.0000	0.0000
4 73	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 74	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1779	0.0000	0.0000	0.0000
5 103	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5 132/153	0.0253	0.0535	0.7104	0.0744	0.0383	0.0424	0.0000	0.1390	0.0000	0.0000
5 107	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0194	0.0000	0.0223	0.0230
5 112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5 119	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5 122	<ql	<ql	0.0747	0.0000	0.0000	0.0000	0.0000	<ql	0.0000	0.0000
5 125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5 66+95	0.0000	0.1271	0.2986	0.0000	0.0000	0.0000	0.0000	0.0669	0.0000	0.0000
5 77+110	<ql	<ql	0.1173	0.0000	0.0000	0.0000	0.0584	0.0000	0.0000	0.0000
5 82	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5 84+92	0.0105	0.0000	0.1701	0.0000	0.0353	0.0000	0.2930	0.0000	0.3433	0.5406
5 85	<ql	0.0280	0.0000	0.0000	0.0000	<ql	0.0000	0.0122	0.0000	0.0000
5 87	<ql	0.0000	0.0427	0.0000	<ql	0.0000	0.0676	0.0000	0.0000	0.0000
5 90+101	0.0168	0.0287	0.3340	0.0318	0.0264	0.0154	0.8342	0.0000	0.8354	1.5114
5 91	<ql	0.0000	0.0863	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5 96	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5 97	<ql	0.0000	0.1370	0.0000	0.0000	0.0000	0.0474	0.0000	0.0000	0.0000
5 99	0.0000	1.3171	1.3312	0.0137	0.0144	0.0172	0.3915	0.0000	0.2588	0.5322
6 118+149	0.0232	0.0211	0.5403	0.0549	0.0264	0.0158	0.7051	0.0000	0.8099	0.8337
6 126+129	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6 128	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6 131	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6 105	<ql	0.0000	0.2082	0.0000	0.0375	0.0000	1.8977	0.0000	2.9415	0.4993
6 134	0.0118	0.0000	0.0000	0.0000	0.0000	0.0000	0.0457	0.0000	0.0645	0.0000
6 124+135+14	0.0000	0.0000	0.1524	0.0136	<ql	0.0000	0.3343	0.0272	0.3178	0.5652
6 138	0.0000	0.2347	0.9027	0.0601	0.0466	0.0000	0.9255	0.1100	0.6501	1.1309
6 141+179	<ql	0.0000	0.0883	<ql	<ql	<ql	0.1105	<ql	0.1276	0.2275
6 146	0.0000	0.0000	0.0195	0.0000	0.0000	0.0000	0.1962	0.0109	0.3127	0.5340

Notes: zeroes or "<ql" denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-7a (Continued). PCB Congener Data - Northeast Branch of the Anacostia River - Particulate Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)		36	27	104	58	48	40	1256	284	1045	1407
Cl#	Congenor										
6	151	<ql	<ql	0.2546	0.0197	0.0142	0.0190	0.4234	0.0000	0.5208	0.9076
6	156	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	158	0.0000	0.0000	0.1487	0.0000	0.0000	<ql	0.0000	0.0199	0.0000	0.0000
6	167	0.0000	0.0000	0.0040	0.0000	<ql	<ql	0.0084	<ql	0.0093	0.0146
7	170+190	0.0000	0.0000	0.3435	0.0000	0.6492	0.3141	0.4058	0.1344	0.2244	0.3114
7	171+202	0.0000	0.0000	0.2437	0.0000	<ql	0.0000	0.2862	0.0250	0.0989	0.2915
7	172	0.0000	0.0000	0.1294	0.0000	1.1539	0.0000	0.0000	0.0000	0.0000	0.0000
7	173	0.0000	0.0000	0.0000	0.0000	0.0000	<ql	<ql	<ql	<ql	0.0121
7	174	0.0187	0.0180	0.3055	0.0258	0.0112	<ql	0.3922	0.0286	0.3132	0.5384
7	175	0.0152	0.0000	0.0492	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1185
7	177	0.0000	0.0000	0.2904	0.0250	<ql	0.0000	0.2181	0.0175	0.1006	0.2595
7	178	0.0000	0.0000	0.0709	0.0000	<ql	<ql	0.1081	0.0076	0.1857	0.3539
7	180	0.0000	0.0134	0.5875	0.0479	0.0202	0.0212	1.4476	0.0784	1.9786	3.2942
7	183	0.0476	0.0287	0.1613	0.0112	0.0101	<ql	0.3025	0.0177	0.4531	0.8497
7	185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	187	0.0224	<ql	0.2449	0.0243	0.0164	0.0185	0.5520	0.0415	0.8148	1.4883
7	189	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0486	0.0000
7	191	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	193	0.0000	0.0000	0.0330	0.0000	0.0000	0.0000	0.0000	<ql	0.0928	0.1586
8	194	0.0000	0.0000	0.2283	0.0113	<ql	<ql	0.2994	0.0163	0.3932	0.5439
8	195+208	<ql	0.0000	0.2154	0.0000	0.0000	0.0000	0.1200	0.0105	0.0829	0.1541
8	197	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	198	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	199	<ql	0.0000	0.0515	0.0000	0.0000	0.0000	0.0722	<ql	0.0911	0.1370
8	200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	201	0.0000	0.0000	0.1668	0.0207	<ql	<ql	1.2753	0.0207	1.5689	1.2304
8	203+196	<ql	0.0000	0.2405	0.0173	<ql	0.0102	0.4008	0.0227	0.5279	0.9286
8	205	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	206	<ql	0.0350	0.0739	<ql	0.0187	0.0097	0.1821	0.0162	0.1697	0.2820
9	207	<ql	<ql	0.0431	0.0000	<ql	0.0000	0.0000	<ql	0.0000	0.0393

Notes: zeroes or "<ql" denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-7b. PCB Congener Data - Northwest Branch of the Anacostia River - Particulate Phase Concentrations, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)	20	27	54	38	38	24	653	181	574	1526
Total Part.	0.2234	4.6514	1.0834	0.0000	0.6674	0.7272	28.3829	2.4077	7.2256	3.4771
Cl# Congenor										
1 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2 11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2 12+13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2 4+10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2 5+8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2 6	0.0000	0.0000	0.0462	0.0000	0.0000	0.0000	0.0000	0.0106	0.0000	0.0000
2 7+9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3 16+32	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4682	0.0000	0.0000	0.0000
3 17+15	0.0000	0.0689	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3 18	0.0000	0.1086	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3 19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3 20+33+53	0.0000	0.6371	0.0000	0.0000	0.0000	0.0000	0.0000	0.0088	0.0000	0.0000
3 24+27	0.0000	0.0000	0.0716	0.0000	0.0000	0.0000	0.0000	0.0179	0.0000	0.0000
3 25	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3 26	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3 28+31	0.0000	0.3008	0.0000	0.0000	0.0000	0.0000	0.9617	0.0000	0.0000	0.0000
3 29	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3 34	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3 35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3 51	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 41+64	0.0000	0.2165	0.0158	0.0000	<ql	0.0000	0.6547	0.0000	0.0000	0.0000
4 42	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 44	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 45	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 47	0.0000	0.3294	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 48	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 49	0.0000	0.1943	0.0000	0.0000	0.0000	0.0000	0.6155	0.0000	0.0000	0.0000
4 52	0.0000	0.0000	0.0000	0.0000	<ql	0.0115	0.0000	0.0000	0.3392	0.0000
4 55	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 56+60	0.0000	0.3023	0.0000	<ql	<ql	0.0107	0.0000	0.0105	0.0000	0.0000
4 58	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4 63	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: zeroes or "<ql" denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-7b (Continued). PCB Congener Data - Northwest Branch of the Anacostia River - Particulate Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)		20	27	54	38	38	24	653	181	574	1526
Cl#	Congenor										
4	67+100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0139	0.0000	0.0000
4	69	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	70	<ql	0.2264	0.0000	0.0000	<ql	0.0000	1.3972	0.0056	0.0000	0.0000
4	73	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	74	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.7757	0.0000	0.0000	0.0000
5	103	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	132/153	0.0537	0.0000	0.3927	0.0000	0.0282	0.0225	0.0000	0.1659	0.0000	0.0000
5	107	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0170	0.0000	0.0223	0.0000
5	112	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	119	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	122	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	<ql	0.0000	0.0000
5	125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	66+95	0.0000	0.2857	0.0000	0.0000	0.0131	0.0000	0.0000	0.0537	0.0000	0.0000
5	77+110	0.0000	0.0746	0.0000	0.0000	<ql	0.0000	0.9907	0.0000	0.0000	0.0000
5	82	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	84+92	0.0000	0.1750	0.0000	0.0000	0.0000	0.0000	1.3091	0.0000	0.2620	0.0225
5	85	0.0000	0.0000	0.0000	<ql	<ql	0.0000	0.3982	<ql	0.0000	0.0000
5	87	0.0000	0.0864	0.0000	0.0000	<ql	0.0000	0.7952	0.0000	0.0000	0.0000
5	90+101	0.0085	0.0000	0.0000	0.0000	0.0147	0.0150	2.7925	0.0000	0.6593	0.1028
5	91	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2610	0.0000	0.0000	0.0000
5	96	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	97	0.0000	0.3579	0.0000	0.0000	0.0000	0.0000	0.6832	0.0000	0.0000	0.0000
5	99	0.0000	0.0000	0.0000	0.0000	<ql	0.0094	0.0000	0.0000	0.4333	0.0528
6	118+149	0.0000	0.1695	0.0685	0.0000	0.0433	0.0276	0.6162	0.0000	0.8105	0.0509
6	126+129	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	128	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	131	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	105	0.0000	0.0000	0.0000	0.0000	0.0276	0.0220	2.8192	0.1623	0.9990	0.1565
6	134	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2499	0.0000	0.0000	0.0000
6	124+135+1	0.0000	0.0000	0.0109	0.0000	0.0000	0.0000	0.8977	0.0000	0.1840	0.0245
6	138	0.0000	0.1649	0.0000	0.0000	0.0000	0.0236	0.0000	0.1257	0.4396	0.0584
6	141+179	0.0000	0.0000	0.0000	0.0000	<ql	<ql	0.4360	<ql	0.0000	0.0000
6	146	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.6346	0.0000	0.1191	0.0308
6	151	0.0119	0.1275	0.0000	0.0000	<ql	<ql	0.4980	0.0000	0.1517	0.0286
6	156	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes: zeroes or "<ql" denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-7b (Continued). PCB Congener Data - Northwest Branch of the Anacostia River - Particulate Phase Concentrations, ng/L

Date		9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type		NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)		20	27	54	38	38	24	653	181	574	1526
Cl#	Congenor										
6	158	0.0000	0.0000	0.0000	0.0000	0.0000	0.0145	0.0000	0.0386	0.0000	0.0000
6	167	0.0000	0.0000	<ql	0.0000	<ql	0.0000	0.0000	<ql	0.0000	0.0015
7	170+190	0.0000	0.0000	0.0000	0.0000	0.4984	0.5491	1.1864	0.4112	0.0000	0.0156
7	171+202	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.1092	0.0234	0.0000	0.0000
7	172	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.1257	0.0000	0.0000
7	173	<ql	0.0000	<ql	0.0000	<ql	0.0000	0.0000	<ql	0.0000	<ql
7	174	0.0178	0.2102	0.0108	0.0000	0.0114	<ql	0.7763	0.0243	0.1229	0.1214
7	175	0.0106	0.0589	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	177	0.0000	0.0000	0.0000	0.0000	<ql	0.0000	0.3724	0.0137	0.0000	0.0219
7	178	<ql	0.0000	0.0255	0.0000	0.0000	0.0000	0.1392	<ql	0.0512	0.1006
7	180	0.0307	0.0284	0.1692	<ql	0.0154	0.0105	1.5518	0.0674	0.5016	0.0000
7	183	0.0124	0.0000	0.0453	0.0000	<ql	<ql	0.5216	0.0177	0.0971	0.1937
7	185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	187	0.0322	0.0000	0.0991	0.0000	0.0154	0.0110	0.8535	0.0357	0.2270	0.4642
7	189	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	191	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	193	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	194	<ql	0.0000	0.0245	0.0000	0.0000	0.0000	0.2340	0.0144	0.1157	0.1665
8	195+208	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0091	0.0000	0.0334
8	197	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	198	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.3115
8	199	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	<ql	0.0000	0.0530
8	200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	201	0.0181	0.0843	0.0439	<ql	<ql	<ql	2.9058	0.0251	1.4737	0.2457
8	203+196	0.0273	0.1530	0.0594	0.0000	<ql	<ql	0.4614	0.0262	0.2167	0.2203
8	205	0.0000	0.2910	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	206	0.0112	0.0868	0.0894	<ql	<ql	0.0116	0.0000	0.0226	0.2557	0.2944
9	207	0.0000	0.0499	0.0170	0.0000	0.0000	0.0000	0.0000	<ql	0.0373	0.0347

Notes: zeroes or "<ql" denote values below the quantitation limit.

Total PCBs calculated using zeroes for BQL values (true values may be higher).

Table A-8a. PAH Data - Northeast Branch of the Anacostia River
Dissolved Phase Concentration, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)	36	27	104	58	48	40	1256	284	1045	1407
PAH homologue										
Naphthalene	0.182	10.412	15.005	16.216	<ql	<ql	<ql	8.714	4.239	5.201
Naphthalene, 2-meth	0.579	3.660	8.183	16.458	0.767	0.767	1.781	4.441	2.985	1.094
Naphthalene, 2,6-di	0.201	0.575	3.228	7.750	1.149	1.149	7.643	2.512	2.087	1.506
Acenaphthylene	<ql	1.000	0.797	1.838	0.747	0.747	0.603	0.570	0.811	0.813
Acenaphthene	0.116	1.369	1.941	2.165	1.285	1.285	3.980	16.717	16.675	2.004
Fluorene	0.475	1.580	3.276	4.922	2.906	2.906	10.884	50.260	25.631	1.740
Phenanthrene	2.237	3.092	13.354	14.180	6.406	6.406	13.993	134.935	42.587	3.227
Fluoranthene	15.245	8.327	39.231	11.883	12.562	12.562	48.295	98.308	67.520	14.649
Pyrene	7.747	2.931	0.139	8.375	12.945	12.945	30.357	73.434	59.001	17.254
Benz[a]anthracene	2.488	5.158	3.986	2.350	3.177	3.177	4.528	9.212	2.200	nd
Chrysene	1.787	1.003	2.550	1.400	4.348	4.348	7.894	12.135	10.296	3.511
Benzo[j]fluoranthene	0.283	<ql	0.734	1.666	2.315	2.315	3.505	2.903	1.131	1.377
Benzo[k]fluoranthene	0.613	0.855	1.202	0.501	0.867	0.867	1.582	2.635	1.675	<ql
Benzo[a]pyrene	nd	3.005	2.890	1.814	2.268	2.268	3.903	0.618	<ql	1.200
Perylene	nd	4.707	3.865	0.826	1.224	1.224	1.255	1.915	3.437	<ql
Indeno[1,2,3-cd]pyrene	1.010	nd	2.102	2.278	2.665	2.665	3.647	2.110	2.946	1.527
Dibenz[a,h]anthracene	1.024	nd	nd	1.860	2.157	2.157	2.804	1.037	1.951	0.149
Benzo[ghi]perylene	0.955	1.860	2.076	0.205	0.233	0.233	0.914	0.513	0.394	1.414
total-PAH	34.942	49.536	104.560	96.689	58.020	58.020	147.570	422.969	245.566	56.666

Notes: "nd" or "<ql" denote values below the quantitation limit.
Total PAHs calculated using zeroes for BQL values (true values may be higher).

Table A-8b. PAH Data - Northwest Branch of the Anacostia River
Dissolved Phase Concentration, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)	20	27	54	38	38	24	653	181	574	1526
PAH homologue										
Naphthalene	0.051	14.352	12.541	7.078	<ql	<ql	<ql	4.982	2.157	2.848
Naphthalene, 2-meth	0.399	62.651	10.063	11.892	2.808	0.761	0.882	3.574	1.104	1.149
Naphthalene, 2,6-di	0.098	74.232	4.635	9.009	13.885	4.732	16.821	0.838	1.486	1.465
Acenaphthylene	nd	0.300	0.870	1.898	0.495	0.226	0.971	0.330	0.779	0.770
Acenaphthene	<ql	9.596	1.095	1.601	3.966	0.769	8.994	1.488	2.049	1.554
Fluorene	0.350	28.638	2.673	5.242	14.675	10.900	23.326	3.280	1.762	1.441
Phenanthrene	0.524	34.915	7.219	13.830	23.145	15.293	12.716	10.826	2.852	nd
Fluoranthene	6.347	58.401	31.212	11.878	20.786	12.692	71.910	39.717	18.657	10.195
Pyrene	4.629	15.761	6.780	8.562	23.697	15.369	55.156	38.597	18.415	12.970
Benz[a]anthracene	3.735	8.855	6.167	2.108	2.671	2.435	7.765	2.039	0.720	0.761
Chrysene	4.415	14.602	2.014	1.518	6.306	3.471	8.785	7.483	4.304	2.204
Benzo[j]fluoranthene	0.416	4.553	0.345	1.285	2.019	1.502	5.828	1.690	0.755	1.295
Benzo[k]fluoranthene	1.139	5.544	1.246	0.345	0.980	0.564	2.453	0.905	<ql	<ql
Benzo[a]pyrene	2.716	6.564	4.335	1.465	2.124	1.485	6.652	<ql	1.291	1.555
Perylene	3.204	4.936	5.143	0.925	0.881	0.868	1.999	1.687	<ql	<ql
Indeno[1,2,3-cd]pyren	1.610	3.392	2.513	1.757	1.892	1.744	6.020	1.698	1.267	1.639
Dibenz[a,h]anthracene	1.608	2.760	nd	1.444	1.465	nd	4.599	1.021	0.079	0.178
Benzo[ghi]perylene	1.531	3.039	2.367	0.156	0.319	0.120	1.465	0.130	1.355	1.617
total-PAH	32.772	353.089	101.218	81.994	122.114	72.930	236.340	120.284	59.032	41.642

Notes: "nd" or "<ql" denote values below the quantitation limit.
Total PAHs calculated using zeroes for BQL values (true values may be higher).

Table A-9a. PAH Data - Northeast Branch of the Anacostia River
Particulate Phase Concentration, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)	36	27	104	58	48	40	1256	284	1045	1407
PAH homologue										
Naphthalene	<ql	nd	<ql	nd	0.267	0.338	4.770	0.388	3.900	5.182
Naphthalene, 2-meth	nd	nd	0.216	0.216	0.168	0.144	5.921	0.285	4.130	4.652
Naphthalene, 2,6-di	nd	nd	nd	0.619	<ql	<ql	4.216	0.224	3.023	2.858
Acenaphthylene	nd	nd	<ql	0.391	0.134	0.122	2.575	0.247	3.034	3.235
Acenaphthene	nd	nd	<ql	0.396	<ql	<ql	8.196	0.749	9.089	6.256
Fluorene	nd	nd	1.393	0.546	<ql	<ql	14.423	1.597	14.523	8.497
Phenanthrene	0.215	nd	20.104	4.432	0.923	<ql	275.899	32.822	278.027	182.014
Fluoranthene	12.175	4.187	274.762	19.508	4.984	2.282	699.446	88.537	783.634	540.637
Pyrene	1.461	0.415	11.936	12.614	1.015	<ql	371.877	89.433	546.024	338.896
Benz[a]anthracene	4.279	7.182	78.393	3.895	0.299	nd	178.127	51.023	278.358	167.182
Chrysene	4.144	1.965	116.715	10.073	4.780	3.108	434.325	50.788	702.772	539.534
Benzo[j]fluoranthene	3.320	1.065	100.102	7.824	4.487	0.296	359.962	45.154	18.611	7.484
Benzo[k]fluoranthene	3.255	2.215	85.944	4.432	0.728	0.815	95.518	20.914	810.638	302.258
Benzo[a]pyrene	3.033	4.640	80.112	5.941	0.981	<ql	295.162	61.709	371.886	289.844
Perylene	2.288	6.454	23.846	1.037	2.006	1.779	47.207	14.515	91.258	63.706
Indeno[1,2,3-cd]pyrene	2.788	3.667	75.246	4.703	2.884	nd	39.877	22.891	232.455	4.662
Dibenz[a,h]anthracene	1.303	3.312	19.381	1.132	nd	nd	29.384	6.572	56.537	6.889
Benzo[ghi]perylene	2.414	3.522	71.156	9.134	1.741	0.731	157.445	40.245	293.620	214.382
total-PAH	40.675	38.624	959.306	86.893	25.397	9.616	3024.329	528.093	4501.515	2688.168

Notes: "nd" or "<ql" denote values below the quantitation limit.

Total PAHs calculated using zeroes for BQL values (true values may be higher).

Table A-9b. PAH Data - Northwest Branch of the Anacostia River
Particulate Phase Concentration, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)	20	27	54	38	38	24	653	181	574	1526
PAH homologue										
Naphthalene	0.355	nd	1.212	nd	0.285	0.259	21.638	0.373	4.300	12.285
Naphthalene, 2-meth	0.309	nd	2.265	0.150	0.179	0.172	21.423	0.348	4.849	10.304
Naphthalene, 2,6-di	0.207	nd	0.685	0.576	<ql	<ql	37.297	0.158	2.886	5.184
Acenaphthylene	0.307	0.065	1.890	0.357	0.158	0.129	14.475	0.274	4.287	9.826
Acenaphthene	<ql	<ql	1.965	0.355	<ql	<ql	40.730	0.046	11.150	18.740
Fluorene	<ql	1.271	4.855	0.483	<ql	<ql	81.040	0.191	18.279	28.556
Phenanthrene	6.432	20.858	104.074	2.883	1.704	<ql	879.020	9.171	378.919	586.444
Fluoranthene	19.803	317.342	313.708	7.501	7.823	2.764	2603.849	36.615	1231.307	1588.668
Pyrene	21.452	201.153	267.228	5.631	4.057	1.098	958.426	36.916	668.567	740.175
Benz[a]anthracene	3.149	124.928	84.981	1.406	1.410	0.198	632.883	15.055	362.814	502.051
Chrysene	10.827	205.599	164.646	3.120	7.240	3.863	1579.290	26.828	1227.979	1694.230
Benzo[j]fluoranthene	3.528	30.321	2.329	1.027	5.720	2.374	20.728	18.807	21.499	24.565
Benzo[k]fluoranthene	0.641	190.999	54.250	1.400	4.098	1.232	8.170	10.615	1377.871	1555.661
Benzo[a]pyrene	2.633	142.598	<ql	2.589	1.926	0.409	903.557	15.804	592.941	745.064
Perylene	3.784	29.710	37.934	0.170	2.116	1.815	601.046	5.369	479.107	564.518
Indeno[1,2,3-cd]pyrene	nd	133.929	10.388	0.939	4.678	2.566	108.833	8.668	377.026	86.088
Dibenz[a,h]anthracene	nd	33.439	2.132	0.172	1.518	1.155	42.919	2.510	97.532	51.127
Benzo[ghi]perylene	8.281	138.604	119.869	3.031	3.225	1.345	402.300	18.765	419.946	381.886
total-PAH	81.707	1570.817	1174.410	31.791	46.137	19.379	8957.625	206.514	7281.256	8605.373

Notes: "nd" or "<ql" denote values below the quantitation limit.
Total PAHs calculated using zeroes for BQL values (true values may be higher).

Table A-10a. OC Pesticide Data - Northeast Branch of the Anacostia River
DIssolved Phase Concentration, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)	36	27	104	58	48	40	1256	284	1045	1407
OC Pesticide										
Alpha-BHC	3.971	0.542	0.416	1.342	nd	0.363	nd	0.739	0.243	0.138
Beta-BHC	0.660	0.247	0.085	0.172	0.273	nd	0.287	0.229	nd	nd
Gamma-BHC	0.711	0.262	0.175	0.313	0.449	0.387	0.466	0.389	0.280	0.153
Heptachlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Aldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Heptachlor Epoxide	0.728	0.590	0.900	0.461	0.577	0.700	0.553	1.061	0.668	0.640
Oxychlordane	0.349	0.108	0.147	0.166	0.207	0.181	nd	0.195	0.096	0.085
Endosulfan I	0.385	nd	0.307	0.306	0.467	0.230	nd	0.271	0.026	nd
cis-Chlordane	0.285	0.213	nd	nd	nd	0.230	0.267	0.548	0.221	0.265
trans-Nonachlor	0.585	0.077	0.460	0.356	0.339	0.085	0.077	0.235	0.113	0.129
Dieldrin	0.234	nd	0.179	0.173	0.222	0.945	0.490	1.441	0.273	0.446
p,p'-DDE	0.358	nd	nd	0.653	0.452	nd	nd	nd	nd	nd
o,p'-DDD	nd	nd	nd	nd	nd	0.165	nd	nd	nd	nd
Endrin	nd	0.146	nd	nd	nd	0.165	nd	nd	<ql	nd
Endosulfan II	nd	nd	nd	nd	nd	0.071	0.060	0.037	nd	nd
Endrin Aldehyde	0.225	nd	nd	nd	nd	nd	nd	nd	nd	nd
p,p'-DDD	0.125	0.034	0.039	nd	nd	nd	nd	0.253	0.088	0.063
Endosulfan Sulfate	0.301	nd	0.072	0.043	0.221	nd	0.111	0.800	nd	0.170
4,4'-DDT	0.706	nd	0.061	0.041	nd	nd	0.111	0.800	nd	0.170
Endrin Ketone	0.205	1.431	0.054	0.090	nd	3.159	2.025	5.230	1.765	1.951
Methoxychlor	0.502	0.152	0.058	0.076	0.083	0.086	0.047	0.136	nd	nd

Notes: "nd" or "<ql" denote values below the quantitation limit.

Table A-10b. OC Pesticide Data - Northwest Branch of the Anacostia River
Dissolved Phase Concentration, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)	20	27	54	38	38	24	653	181	574	1526
OC Pesticide										
Alpha-BHC	nd	nd	0.166	1.219	nd	nd	nd	0.593	0.169	0.137
Beta-BHC	nd	nd	nd	0.264	0.099	0.202	0.283	nd	nd	nd
Gamma-BHC	0.708	0.101	0.084	0.204	0.412	0.344	0.412	0.665	0.281	0.155
Heptachlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Aldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Heptachlor Epoxide	0.682	0.726	0.514	0.707	1.079	1.473	0.397	1.883	1.150	1.247
Oxychlordane	nd	nd	nd	0.196	nd	0.391	nd	nd	0.131	0.144
Endosulfan I	nd	nd	nd	nd	nd	nd	nd	0.102	nd	nd
cis-Chlordane	0.146	0.071	0.222	0.403	0.366	0.660	0.141	0.907	0.428	0.526
trans-Nonachlor	nd	nd	0.111	0.129	0.139	0.168	0.052	0.333	0.198	0.217
Dieldrin	0.261	0.155	nd	0.503	0.746	0.997	0.298	1.544	0.158	0.545
p,p'-DDE	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
o,p'-DDD	0.581	nd	nd	0.318	nd	0.056	nd	nd	nd	nd
Endrin	nd	nd	nd	nd	nd	nd	nd	<ql	nd	nd
Endosulfan II	0.164	nd	nd	nd	nd	0.160	nd	nd	nd	nd
Endrin Aldehyde	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
p,p'-DDD	0.172	0.106	nd	nd	nd	0.212	nd	nd	nd	0.057
Endosulfan Sulfate	0.067	nd	nd	nd	nd	0.244	nd	0.418	0.143	0.157
4,4'-DDT	0.067	nd	nd	nd	nd	0.244	nd	0.418	0.143	0.157
Endrin Ketone	2.782	1.159	0.932	2.461	2.743	4.705	1.300	5.851	2.489	3.048
Methoxychlor	0.196	0.037	0.025	0.145	0.106	0.128	0.038	0.059	nd	nd

Notes: "nd" or "<ql" denote values below the quantitation limit.

Table A-11a. OC Pesticide Data - Northeast Branch of the Anacostia River
Particulate Phase Concentration, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave. Flow (cfs)	36	27	104	58	48	40	1256	284	1045	1407
OC Pesticide										
Alpha-BHC	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Beta-BHC	nd	nd	nd	nd	0.010	0.018	nd	0.010	nd	nd
Gamma-BHC	nd	nd	nd	nd	nd	nd	nd	nd	0.033	0.053
Heptachlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Aldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Heptachlor Epoxide	0.048	nd	0.269	0.031	0.027	0.028	0.792	0.068	0.688	0.747
Oxychlordane	nd	nd	nd	0.037	nd	nd	0.475	0.054	0.348	0.412
Endosulfan I	nd	nd	0.035	0.154	0.038	nd	0.402	<ql	nd	nd
cis-Chlordane	nd	nd	0.033	nd	nd	0.059	3.097	0.203	2.195	3.104
trans-Nonachlor	<ql	nd	<ql	0.140	0.047	0.033	2.188	0.159	1.692	2.530
Dieldrin	nd	<ql	nd	0.106	0.034	nd	1.395	0.102	nd	nd
p,p'-DDE	0.024	nd	0.285	0.059	0.027	nd	nd	nd	nd	nd
o,p'-DDD	nd	nd	nd	nd	nd	nd	2.031	nd	nd	nd
Endrin	nd	nd	nd	nd	nd	nd	nd	0.093	0.207	0.584
Endosulfan II	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Endrin Aldehyde	nd	nd	nd	nd	nd	<ql	0.570	<ql	1.696	2.712
p,p'-DDD	nd	nd	nd	nd	<ql	<ql	0.896	0.154	1.327	0.699
Endosulfan Sulfate	nd	nd	0.170	0.030	nd	nd	nd	nd	0.255	0.254
4,4'-DDT	<ql	nd	0.161	nd	nd	nd	nd	nd	0.255	0.254
Endrin Ketone	nd	0.000	nd	0.017	nd	0.120	11.847	0.832	8.440	11.095
Methoxychlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	<ql

Notes: "nd" or "<ql" denote values below the quantitation limit.

Table A-11b. OC Pesticide Data - Northwest Branch of the Anacostia River
Particulate Phase Concentration, ng/L

Date	9/27/95	11/7/95	11/15/95	1/23/96	3/19/96	4/26/96	4/30/96	7/9/96	7/12/96	9/6/96
Sample Type	NS1	NS2	S1	NS2	NS3	NS4	S2	NS5	S3	S4-1
Ave Flow (cfs)	20	27	54	38	38	24	653	181	574	1526
OC Pesticide										
Alpha-BHC	nd	nd	nd	nd	nd	nd	nd	nd	0.012	nd
Beta-BHC	nd	nd	nd	<ql	nd	<ql	nd	<ql	nd	nd
Gamma-BHC	nd	nd	nd	nd	nd	nd	0.133	nd	0.064	0.040
Heptachlor	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Aldrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Heptachlor Epoxide	0.033	0.469	0.313	0.030	0.036	0.047	4.125	0.105	1.706	3.330
Oxychlordane	0.041	nd	0.308	0.018	0.028	0.025	1.091	0.069	0.821	1.684
Endosulfan I	nd	0.212	nd	nd	<ql	0.025	1.593	<ql	nd	0.073
cis-Chlordane	0.236	<ql	2.772	0.058	0.088	0.134	11.982	0.687	6.920	17.934
trans-Nonachlor	0.161	nd	2.215	0.044	0.066	0.075	8.738	0.521	4.971	12.728
Dieldrin	nd	0.182	nd	<ql	0.044	0.069	4.500	0.080	1.285	nd
p,p'-DDE	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
o,p'-DDD	nd	nd	0.913	nd	nd	nd	nd	nd	nd	nd
Endrin	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Endosulfan II	nd	0.093	nd	nd	nd	nd	0.558	nd	nd	nd
Endrin Aldehyde	0.070	nd	0.423	<ql	nd	<ql	1.187	<ql	0.433	1.392
p,p'-DDD	0.059	0.726	0.282	nd	<ql	nd	1.456	0.095	0.921	2.073
Endosulfan Sulfate	0.064	nd	<ql	nd	nd	nd	0.152	<ql	0.095	nd
4,4'-DDT	0.064	nd	<ql	nd	nd	nd	0.152	<ql	0.095	nd
Endrin Ketone	0.665	1.682	7.228	0.150	0.262	0.376	35.515	1.557	17.215	39.255
Methoxychlor	<ql	0.167	0.130	nd	<ql	nd	nd	<ql	nd	nd

Notes: "nd" or "<ql" denote values below the quantitation limit.