Anacostia River Nutrients and BOD TMDL

Source Document:	MDE and DDOE (Maryland Department of the Environment and District Department of the Environment). 2008. Total Maximum Daily Loads of Nutrients/Biochemical Oxygen Demand for the Anacostia River Basin, Montgomery and Prince George's Counties, Maryland and The District of Columbia. Document Version April 25, 2008.
Water Body Type:	Tidal and non-tidal portions of Anacostia River watershed
Pollutant:	Biochemical oxygen demand (BOD), total nitrogen (TN), and total phosphorus (TP)
Designated Uses:	Use I-P – Water Contact Recreation, Protection of Aquatic Life and Public Drinking Supply; Use II – Tidal Waters: Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting; Use III – Natural Trout Waters; and Use IV – Recreational Trout Waters
Size of Watershed:	173 square miles (84 percent in Maryland)
Water Quality Standards:	**Dissolved oxygen (DO)**: See Table 21 of report **Chlorophyll *a***: July 1–September 30 average concentration ≤ 25 µg/L **Secchi depth:** Growing season (April 1–October 30) 3-year median Secchi depth not less than 0.8 meters
Analytical Approach:	Tidal Anacostia Model/Water Analysis Simulation Program (TAM/WASP) with other methods used for various sources and tributaries
Date Approved:	Approved June 5, 2008

Introduction

The Total Maximum Daily Load (TMDL) analysis for the Anacostia River watershed (Figure 1) addresses the BOD, TN, and TP loads on an annual average basis.

This fact sheet provides summary data related to the TMDL and includes specific information related to allocations made for Prince George's County, Maryland, regulated stormwater sources.

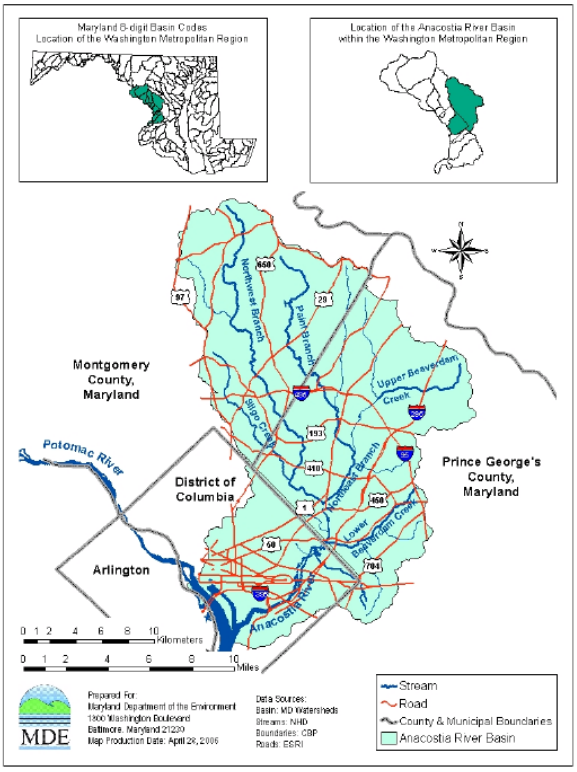

Figure 1. Location of Anacostia River watershed

Source: MDE and DDOE 2007.

Problem Identification and Basis for Listing

Water quality impacts from nutrients and BOD tend to occur in the tidal Anacostia. The Chesapeake Bay Program provides the framework against which constituents such as nutrients, sediment, DO, and chlorophyll *a* concentration are measured to determine the health of the Chesapeake Bay and its tributaries. Monitoring data showed violations of minimum DO concentrations, clarity standards, and chlorophyll *a*

concentrations. For non-tidal waters, the 1993–1995 Maryland Water Quality Inventory provided the original narrative basis for the listing, indicating that erosion, sediment, and high levels of bacteria were the primary causes of impaired water quality in the non-tidal portions of the watershed. Whereas high levels of nutrients, chlorophyll *a*, and turbidity were said to characterize the tidal portion of the river at station ANA0082. Data collected more recently to the TMDL analysis indicated that in non-tidal portions of the watershed, DO and chlorophyll *a* concentrations were not problematic. As a result, reductions in nutrients and BOD were driven by levels required to meet standards in the tidal portions of the Anacostia River.

Applicable Data

The models were calibrated for 1995–2003, the most recent period for which observed data was available for developing the sediment TMDLs. DDOE restarted sampling for chlorophyll *a* in 1999.

Sources

Nutrients and BOD are attributed to stormwater runoff, subsurface drainage, erosion and in-stream scour, industrial and municipal point sources, and combined sewer overflows.

Technical Approach

The TMDL for the tidal Anacostia River watershed was developed using the TAM/WASP modeling application to simulate hydrodynamics, with additional modules to simulate sediment transport and sediment oxygen demand. Loadings from the tributary watersheds of the Northeast Branch (NEB), Northwest Branch (NWB), Lower Beaverdam Creek (LBC), and Watts Branch were determined from a combination of U.S. Geological Survey's ESTIMATOR and Hydrological Simulation Program—FORTRAN (HSPF) models. More specifically, upstream loads from NEB and NWB were determined by ESTIMATOR; four loads from LBC and Watts Branch were determined by HSFP models; and five loads from smaller tributaries and direct drainage are based on simulated Watts Branch flows and average event mean concentrations from the jurisdictions' water quality monitoring for their municipal separate storm sewer system (MS4) permits.

For storm sewers drainage and direct drainage areas to the tidal Anacostia River in Maryland and the District, flows were estimated based on the Watts Branch HSPF model. Loads were determined using model flows and Anacostia River watershed average event mean concentrations of stormwater monitoring data collected under the MS4 program.

Daily nutrient and BOD loads from the HSPF (and other) models were used to drive eutrophication, DO dynamics, and light extinction in WASP.

Allocations

The baseline scenario represents actual loads over the period from 1995–1997. The TMDL scenario represents the maximum nutrients and BOD loads such that standards are met. The Point Sources Technical Memorandum (MDE and DDOE 2008) developed in conjunction with the TMDL provides the annual allocations for TP, TN, and BOD for County sources (see table below).

Table 1. Annual allocations to Prince George's County point sources

Point Source	Permit Number	BOD (lbs/year)	TN (lbs/year)	TP (lbs/year)
Non-tidal				
MS4 – NWB	MD0068284	55,234	9,065	1,388
SW-NWB		9,784	1,193	204
MS4 – NEB	MD0068284	226,639	25,116	3,461
SW-NEB		101,158	10,311	893
MS4 – LBC	MD0068284	109,434	11,598	1,485
Other MD SW-LBC		18,946	1,625	140
MS4–Watts Branch	MD0068284	12,765	1,490	199
Other MD SW-Watts		1,147	97	8
Tidal				
Prince George's County MS4 – Tidal	MD0068284	62,613	4,173	433
Other Maryland SW-Tidal		13,963	1,172	88

Source: MDE and DDOE 2007.
Note: SW = stormwater.

No baseline loads are given for MS4 sources. Summary tables of the TMDLs begin on page 42 of the TMDL report. For Maryland, only load allocation and wasteload allocation are presented. (No source-specific breakdown is provided.)

The final average annual BOD TMDL for all Maryland and District non-tidal and tidal waters of the Anacostia River is 1,491,715 lbs/year. The loading cap constitutes a 61 percent overall reduction of BOD from the

baseline loads determined for the TMDL analysis period, 1995–1997.

The final average annual nitrogen TMDL for all Maryland and District non-tidal and tidal waters of the Anacostia River is 196,788 lbs/year. The loading cap constitutes a 79 percent overall reduction of nitrogen from the baseline loads determined for the TMDL analysis period, 1995–1997.

The final average annual phosphorus TMDL for all Maryland and District non-tidal and tidal waters of the Anacostia River is 20,757 lbs/year. The loading cap constitutes an 80 percent overall reduction of phosphorus from the baseline loads determined for the TMDL analysis period, 1995–1997.

References

MDE and DDOE (Maryland Department of the Environment and District Department of the Environment). 2008. Technical Memorandum: Significant Biochemical Oxygen Demand, Nitrogen, and Phosphorus Point Sources in the Anacostia River Watershed.

Mandel, R., S. Kim, A. Nagel, J. Palmer, C. Schultz, and K. Brubaker. 2008. The TAM/WASP Modeling Framework for Development of Nutrient and BOD TMDLs in the Tidal Anacostia River.