Tidal Potomac and Anacostia PCB TMDL

Source Document:	Haywood, H. C., and C. Buchanan. 2007. Total maximum daily loads of polychlorinated biphenyls (PCBs) for tidal portions of the Potomac and Anacostia rivers in the District of Columbia, Maryland, and Virginia. Interstate Commission on the Potomac River Basin. ICPRB Report 07-7. Rockville, MD.
Water Body Type:	Tidal stream reaches of the Potomac River and Anacostia River
Pollutant:	Polychlorinated biphenyls (PCBs)
Designated Uses:	Fish consumption
Size of Water Body:	117 miles
Size of Watershed:	2,537 square miles
Water Quality Standards:	Water quality criteria and fish tissue standards
Indicators:	Total PCBs
Analytical Approach:	A linked hydrodynamic and PCB transport and fate model (PotPCB) was built and calibrated to existing data

Introduction

The U.S. Environmental Protection Agency (EPA) approved the PCB Total Maximum Daily Load (TMDL) for the tidal portions of the Potomac and Anacostia rivers in 2007 (Figure 1). 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.

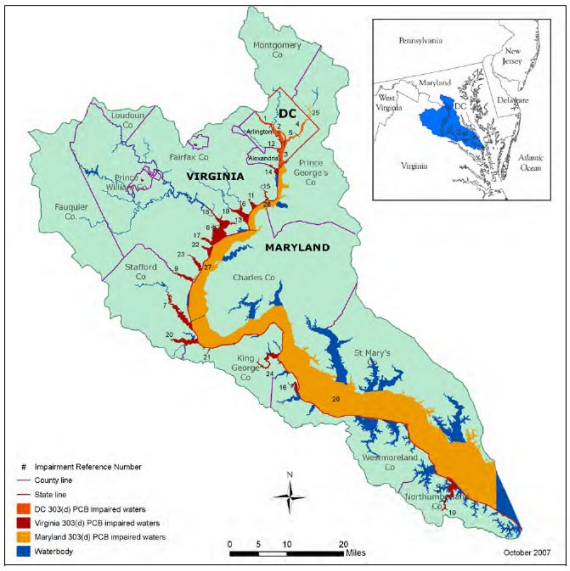

Figure 1. PCB Potomac River and Anacostia River watersheds
Source: Haywood and Buchanan 2007.

Problem Identification and Basis for Listing

Primarily, segments in all three jurisdictions were listed on the basis of fish tissue data. Ambient water column and fish tissue data collected from 2002 to 2007 showed that the existing PCB water quality criteria were not protective of fish tissue concentrations in the tidal Potomac and Anacostia rivers. For the TMDL, target water column concentrations were calculated, using EPA-recommended methods, to be protective of fish tissue concentrations.

County-specific listed segments include:

- Tidal Anacostia – segment 25
- Potomac River Upper – segment 28

Applicable Data

Historical water quality data used to characterize the impairment and support modeling are discussed on page 8 of the TMDL and in Appendix A. Because of advances in laboratory analysis techniques, much of the data analyzed before 2000 had limited value for

the TMDL, which focused on data collected since 1999. The master data set (1999–2007) was used to characterize tributary input loads and ambient PCB levels in the estuary. The data set has 270 water samples, 250 sediment samples, and 350 fish tissue samples.

Sources

Major source categories modeled are as follows:

- Non-tidal Potomac at Chain Bridge
- Lower Basin Tributaries – that portion of the Potomac River watershed that contributes to the tidal waters, and excludes the watershed above Chain Bridge. The tributaries are the 17 streams in the lower basin defined in the Chesapeake Bay Watershed Model (WM5) as tributaries.
- Direct Drainage – that part of the lower basin watershed that is not in a WM5-defined tributary. Direct drainage areas are located adjacent to the Potomac and Anacostia rivers.
- Wastewater Treatment Plant (WWTP)
- Combined Sewer Overflow (CSO)
- Atmospheric Deposition – directly deposited on water surface
- Contaminated Sites – those sites that have been identified as contaminated by PCBs, some of which have been remediated.
- Margin of safety – 5 percent to all sources except WWTP.

State and federal properties were not explicitly considered in the TMDL.

Appendix A of the TMDL document details how external loads were calculated.

Technical Approach

The Potomac PCB (PotPCB) model developed for this TMDL by LimnoTech is a coupled, hydrodynamic, salinity, sorbent dynamics, and PCB mass balance model for the tidal portions of the Potomac and Anacostia rivers. The PotPCB model provides daily PCB water column and sediment concentrations in each of 257 segments. The median daily concentration in the final year, or the maximum 30-day average for the District of Columbia (see below), represents the predicted water column and sediment concentrations for a loading scenario.

Baseline Scenario in the POTPCB model is run with 2005 flows and 2005 loads from all sources. The 2005 hydrologic year also is used for the TMDL Scenario, except for WWTPs and for the District CSO system.

Development of External Source Loads

To characterize external sources, output from the Chesapeake Bay Watershed Model (WM5) was used to estimate daily flows and the associated loads from 17 lower basin tributaries and from direct drainage areas. While the overall load for each tributary is accounted for in this study, specific sources within watersheds are not characterized.

Daily PCB loading data were not available to use in the PotPCB model. PCB loads for tributaries and direct drainages were developed on the basis of monitoring data in which the relationship between total suspended solids (TSS) and PCBs was determined. Using the WM5 model predictions of flow and TSS along with the monitoring-derived relationship between TSS and PCB, daily PBC concentrations were developed for modeling.

Modeled Landuse Loading Rates

To calculate municipal separate storm sewer system (MS4)-specific allocation totals, understanding the modeled land use loading rates for urban land uses would be helpful. However, the TMDL document does not provide loading rate information at urban land use levels. The most specific loading rate information is provided in Appendix A, which gives the PCB^{+3} and total PCB loading rates in grams/yr for the direct drainages, which are the only drainage basins in the modeling that pertain to MS4 areas. Loading rates in Table 1 are taken from Appendix A.

Table 1. PCB Model loading rates

Source Category	PCB^{+3} (g / yr)	Total PCB (g / yr)
Direct Drainages	4,976	5,409

Source: Haywood and Buchanan 2007.

Allocations

Allocations were made at the impaired segment level. Table 2 is excerpted from Table 12 of the TMDL document, which provides direct drainage loads by watershed code.

Table 2. Prince George's County TMDL direct drainage loads by watershed

Impairment ref #	Watershed code	Baseline (g/yr)		TMDL (g/yr)		Percent reduction
		tPCB MS4	tPCB NPS LA	tPCB MS4 WLA	tPCB NPS LA	
3, 4, 5, 25	4810	2,980	54.3	1.94	0.0353	99.9%
3	4960	92.6	11.2	0.88	0.107	99.0%
28	4961	96	24.7	0.912	0.235	99.0%
3, 28	4980	28.4	13.5	8.72	4.15	69.3%
28	5060	6.95	5.24	6.6	4.97	5.0%
28	5061	1.16	1.94	1.1	1.84	5.0%
28	5290	0.451	2.49	0.348	1.92	22.9%
27	5390	0.0678	0.615	0.0644	0.584	5.0%
	Total	3,210	114	20.6	13.8	99.0%

Source: Haywood and Buchanan 2007.

Note: tPCB = total PCB; LA = load allocation; WLA = wasteload allocation.

The TMDL document also presents allocations for Maryland segments by state 8-digit hydrologic unit code. A geographic information system exercise will be needed to determine what portion of the allocated load is applicable to the County by identifying what portions of the County's MS4s are within the direct drain watersheds of the Chesapeake Bay Watershed Model (WM5). (See the Watershed Codes above in Table 2.)

Loads for the regulated National Pollutant Discharge Elimination System (NPDES) stormwater system were expressed as a single stormwater wasteload allocation (WLA) for each impaired water body. The stormwater WLAs are calculated for and apply to the direct drainage areas covered by a NPDES stormwater permit. For these areas, the stormwater WLA was derived by multiplying the direct drainage PCB load for the TMDL scenario in each WM5 "riverseg-landseg" area (the smallest watershed area defined in WM5) by its percent of developed land.

Additional tables in the report provide allocations for various portions of the TMDL equation and for various geographic scales. The TMDL document lists the MS4s in Maryland. Allocations are not specified at this level.