

Patuxent River Mesohaline, Oligohaline and Tidal Fresh Chesapeake Bay Segments PCB TMDL

Source Document: MDE (Maryland Department of the Environment). 2017. *Total Maximum Daily Loads of Polychlorinated Biphenyls in the Patuxent River Mesohaline, Oligohaline and Tidal Fresh Chesapeake Bay Segments*. Final, Document Version August 2017.

Water Body Type: Tidal segments of the Patuxent River

Pollutant: Polychlorinated biphenyls (PCBs)

Designated Uses: Use II – Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting

Size of Watershed: Patuxent River Mesohaline – 471 square kilometers
 Patuxent River Oligohaline – 299 square kilometers
 Patuxent River Tidal Fresh – 1,505 square kilometers

Water Quality Standards: Human Health – 0.64 ng/L Total PCB
 Fish tissue threshold 39 ng/g

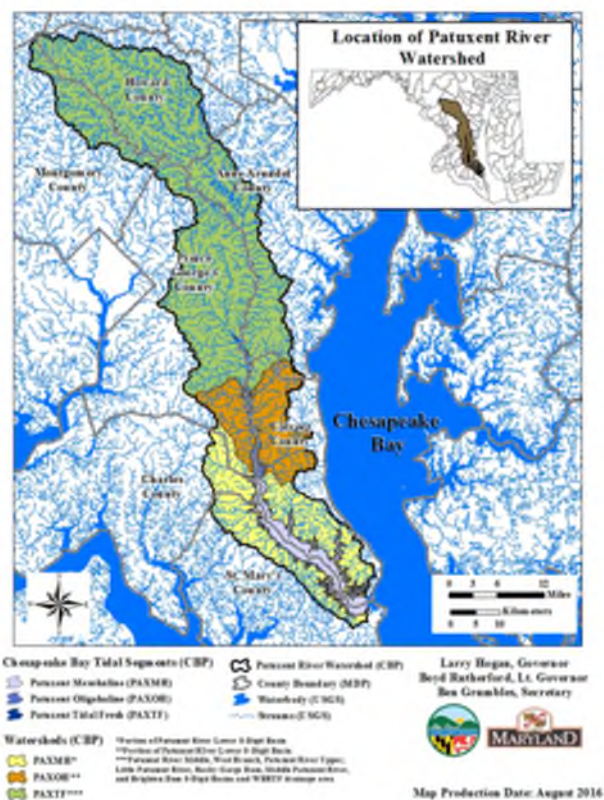
Indicators: Total PCBs

Analytical Approach: A tidally-averaged multi-segment one-dimensional transport model was applied to simulate the tPCB dynamic interactions between the water column and bottom sediments.

Date Approved: September 19, 2017

Patuxent River Tidal Fresh (PAXTF). PAXMH and PAXOH were listed in Maryland’s 2014 Integrated Report as impaired by PCBs. PAXTF was not included in the 2014 Integrated Report but was also found to be impaired by PCBs and was listed in the 2016 Integrated Report (Figure 1). Maryland defines the waters of the Patuxent River Area (basin code 021311) as fresh water above the boundary between the PAXMH and PAXOH tidal segments. Therefore, the PAXMH is considered a saltwater tidal segment while PAXOH and PAXTF are fresh water tidal segments.

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.



Source: MDE 2017.
 Figure 1. PAXTF, PAXOH and PAXMH watersheds.

Introduction

These Total Maximum Daily Loads (TMDLs) were developed to address the PCB impairments in the tidal segments of the Patuxent River Mesohaline (PAXMH), the Patuxent River Oligohaline (PAXOH) and the

Problem Identification and Basis for Listing

Water column tPCB data collected at eight stations within the tidal segments and six non-tidal stations throughout the PAXMH, PAXOH, and PAXTF watersheds in 2013

and 2014 demonstrated that the human health criterion (0.64 ng/L) was exceeded in all three segments (Table 2).

Fish tissue data collected between 2009 and 2015 showed mean tPCB concentrations above the fish tissue threshold (39 ng/g) for white perch in the PAXMH tidal segment, channel catfish in the PAXOH tidal segment and white perch and channel catfish in the PAXTF segment. Appendix G of the TMDL report provides detailed information regarding the PCB data collected to confirm the impairment and support the TMDL development.

Table 2. Mean tPCB levels from water column monitoring data

Tributary	Station Type	Mean tPCB (ng/L)
PAXMH	Tidal	1.0
	Non-tidal	1.0
PAXOH	Tidal	3.3
	Non-tidal	1.6
PAXTF	Tidal	4.4
	Non-tidal	3.7

Source: MDE 2017.

Note: tPCB = total PCB.

Applicable Data

Historical water quality data and fish tissue monitoring data were used to characterize the impairment and support modeling in the TMDL and are presented in Appendix G. The fish tissue tPCB listing threshold concentration was translated into associated water column and sediment tPCB threshold concentrations to provide a TMDL endpoint, as the water quality model only simulates water column and sediment tPCB concentrations and does not incorporate a food web model to predict fish tissue tPCB concentrations. This was accomplished using Adjusted Total Bioaccumulation Factors (Adj-tBAFs) and Adjusted Sediment Bioaccumulation Factors (Adj-SediBAFs).

Sources

The PAXMH, PAXOH and PAXTF tidal segments PCB TMDL provides baseline and allocated loads (Table 3).

Table 3. PAXMH, PAXOH and PAXTF PCB TMDL allocations

Tributary	Baseline (g/yr)	Allocation (g/yr)
PAXMH	293.6	293.6
PAXOH	98.1	98.1
PAXTF	1,712.9	80.7

Source: MDE 2017.

The TMDL further subdivides the allocations among the following sources:

- WWTPs
- Contaminated sites
 - 1 in PAXTF drainage
- Regulated stormwater
 - Phase I and II municipal separate storm sewer systems (MS4s)
 - Phase I State Highway Administration MS4
 - Industrial stormwater discharges
 - Construction sites
- Nonregulated stormwater
- Atmospheric deposition

Baseline loads for NPDES regulated stormwater were based on the 2006 USGS spatial land cover used to develop CBP's Phase 5.3.2 watershed model land use and the observed average tPCB concentrations in the sediment and water column (in Appendix G of the TMDL report) in each segment. The percentage of regulated urban land use area within the regulated county portions of the PAXMH, PAXOH, and PAXTF watersheds were multiplied by the corresponding county portions of the watershed tPCB baseline loads.

Loads associated with resuspension and diffusion from sediments, and tidal influences from the Chesapeake Bay mainstem are not considered to be directly controllable (reducible) within the framework of the TMDL and are not assigned baseline loads or allocations. It was also determined that the industrial process water facility does not contribute additional PCBs to the system and, therefore, is not assigned a baseline load or allocation within this TMDL.

Technical Approach

A tidally-averaged multi-segment one-dimensional transport model was applied to simulate the PCB interactions between the water column and bottom sediments within the PAXMH, PAXOH, and PAXTF tidal segments and the Chesapeake Bay. The dominant processes affecting the transport of PCBs throughout the water column include: dispersion induced by tide and concentration gradient between the Bay and the

embayment, fresh water discharge from upstream rivers and adjacent watershed, atmospheric exchange due to volatilization and deposition, and exchange with the bottom sediments. The dominant processes affecting the transport of PCBs in the bottom sediments include burial to deeper inactive layers and the exchange with the water column. A technical description of the model is presented in Appendix D of the TMDL report.

Model reduction scenarios were run with incremental increases in total load reduction to determine the TMDL in which the PAXMH, PAXOH and PAXTF tidal segments meet the water quality and sediment tPCB TMDL endpoints. The model demonstrated that reductions of the baseline loads from all source categories to the PAXTF tidal segment are required to achieve the TMDL. The reductions to the PAXTF tidal segment resulted in the water column and sediment tPCB TMDL endpoints being met for all tidal segments. No load reductions are required in the PAXMH and PAXOH tidal segments.

Allocations

The Patuxent River Mesohaline, Oligohaline and Tidal Fresh Chesapeake Bay segments PCB TMDL allocations are presented for each segment (PAXMH, PAXOH and PAXTF), with county-specific allocations for NPDES regulated stormwater. The regulated stormwater allocation refers to all known NPDES stormwater dischargers within the county’s portions of the PAXMH, PAXOH and PAXTF drainages (identified in Appendix F). Portions of all three segments are in Prince George’s County. The nonpoint source allocations are not broken out by county. The only known contaminated site is located in Prince George’s County; however, the baseline load from the contaminated site is considered insignificant (less than 0.01% of the total baseline load) and no reductions are assigned.

Table 4 shows the regulated stormwater baseline load and the regulated stormwater TMDL allocations for Prince George’s County. The loads for all NPDES stormwater permittees are presented as an aggregate under the MS4 counties within the PAXMH, PAXOH, and PAXTF watersheds. For implementation of the county’s MS4 allocations, additional analysis will be needed to calculate the county’s Phase I MS4 portion of the regulated stormwater allocation, which includes county, state, industrial, and construction allocations. The county’s MS4 load could be calculated if the areas covered by construction and industrial stormwater permits and the State Highway Administration permit are identified and subtracted from the total Phase I MS4 area and applying the formula for stormwater loads and runoff. This TMDL

includes a 5% explicit margin of safety (MOS) to account for uncertainty in load estimation methods.

Table 4. PAXMH, PAXOH and PAXTF PCB TMDL – Prince George’s County MS4 baseline and WLAs

Regulated Stormwater Loads	Baseline (g/yr)	TMDL (g/yr)	% Reduction
PAXMH	0.6	0.6	0
PAXOH	1.4	1.4	0
PAXTF	154.6	0.1	99.9

Source: MDE 2017.

Reference

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