UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Mr. D. Lee Currey, Director
Science Services Administration
Maryland Department of the Environment
1800 Washington Blvd., Suite 540
Baltimore, Maryland 21230-1718

MAR 16 2015

Dear Mr. Currey:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the Total Maximum Daily Load (TMDL) report, *Total Maximum Daily Loads of Polychlorinated Biphenyls in the Magothy River Mesohaline Chesapeake Bay Tidal Segment, Anne Arundel County, Maryland.* The TMDL report was submitted by the Maryland Department of the Environment (MDE) to EPA for final review on September 15, 2014, and received on September 18, 2014. The TMDL was established and submitted in accordance with Section 303(d)(1)(c) and (2) of the Clean Water Act to address impairments of water quality as identified in Maryland's Section 303(d) List.

The Magothy River Mesohaline Chesapeake Bay Tidal Segment (MD-MAGMH) was included on Maryland's 2012 Integrated Report as impaired by nutrients (1996), fecal coliform (1996), impacts to biological communities (2004), PCBs in fish tissue (2006), and fecal coliform—Deep Creek Tributary (2012). A fecal coliform TMDL for the Magothy River was approved by EPA in February 2006. The Chesapeake Bay TMDL, which was approved by the EPA in December 2010, has addressed the sediment and nutrient listings for the Magothy River. This TMDL addresses only the PCB impairment.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) be designed to attain and maintain the applicable water quality standards; (2) include a total allowable loading and as appropriate, wasteload allocations for point sources and load allocations for nonpoint sources; (3) consider the impacts of background pollutant contributions; (4) take critical stream conditions into account (the conditions when water quality is most likely to be violated); (5) consider seasonal variations; (6) include a margin of safety (which accounts for uncertainties in the relationship between pollutant loads and instream water quality); and (7) be subject to public participation. In addition, these TMDLs considered reasonable assurance that the TMDL allocations assigned to the nonpoint sources can

be reasonably met. The enclosure to this letter describes how the PCB TMDL for the Magothy River Mesohaline Chesapeake Bay Tidal Segment satisfy each of these requirements.

As you know, any new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL's wasteload allocation pursuant to 40 CFR §122.44(d)(1)(VII)(B). Please submit all such permits to EPA for review as per EPA's letter dated October 1, 1998.

If you have any questions or comments concerning this letter, please do not hesitate to contact Ms. Helene Drago, TMDL Program Manager, at 215-814-5796.

Sincerely,

Signed

Jon M. Capacasa, Director
Water Protection Division

Enclosure

cc: Melissa Chatham, MDE-SSA
Jay Sakai, MDE-WMA

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Decision Rationale
Total Maximum Daily Load of Polychlorinated Biphenyls in the Magothy River Mesohaline Chesapeake Bay Tidal Segment, Anne Arundel County, Maryland

Signed

Jon M. Capacasa, Director
Water Protection Division

Date: 3/16/15

Decision Rationale
Total Maximum Daily Loads of Polychlorinated Biphenyls in the Magothy River Mesohaline Chesapeake Bay Tidal Segment in Anne Arundel County, Maryland

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those waterbodies identified as impaired by the State where technology based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a Margin of Safety (MOS) that may be present in a waterbody without exceeding water quality standards.

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDL for total Polychlorinated Biphenyls (tPCB) in the Magothy River Mesohaline Chesapeake Bay Tidal Segment. This TMDL is established to address impairments of water quality, caused by PCBs, as identified in Maryland's 2006 (fish tissue) Section 303(d) List for water quality limited segments. The Maryland Department of the Environment (MDE) submitted the report, *Total Maximum Daily Load of Polychlorinated Biphenyls in the Magothy River Mesohaline Chesapeake Bay Tidal Segment, Anne Arundel County, Maryland,* dated July 2014, to EPA for final review on September 15, 2014.

EPA's review determined that the TMDLs meet the following seven regulatory requirements pursuant to 40 CFR Part 130:

1. The TMDL is designed to implement applicable water quality standards.
2. The TMDL includes a total allowable load as well as individual wasteload allocations (WLAs) and load allocations (LAs).
3. The TMDL considers the impacts of background pollutant contributions.
4. The TMDL considers critical environmental conditions.
5. The TMDL considers seasonal environmental variations.
6. The TMDL includes a MOS.
7. The TMDL has been subject to public participation.

In addition, this TMDL considered reasonable assurance that the TMDL allocations assigned to nonpoint sources can be reasonably met.

II. Summary

Since the Magothy River was identified as impaired for PCBs in fish tissue, the overall objective of the tPCB TMDL is to ensure that the "fishing" designated use, which is protective of human health related to the consumption of fish, is supported. The TMDL specifically allocates the allowable total PCB (tPCB) loading to the Magothy River Mesohaline Chesapeake Bay Tidal Segment. The annual average TMDLs and maximum daily loads (MDLs) for tPCBs for the Magothy River are presented in Table 1. A list of all the NPDES regulated stormwater permits within the Magothy River watershed that could potentially convey tPCB loads to the river is presented in Table 2.

Table 1. Summary of tPCB Baseline Loads, TMDL Allocations, Maximum Daily Loads (MDLs), and Associated Load Reductions in the Magothy River

Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)	MDL (g/day)
Chesapeake Bay Mainstem Tidal Influence	3,759.0	98.7%	289.4	92.3%	1.139
Direct Atmospheric Deposition	35.9	0.9%	35.9	0.0%	0.141
Maryland Non-regulated Watershed Runoff [1]	3.3	0.1%	3.3	0.0%	0.013
Contaminated Sites	1.8	0.05%	1.8	0.0%	0.007
Nonpoint Sources	***3,800.0***	**99.8%**	**330.4**	**91.3%**	**1.300**
NPDES Regulated Stormwater [1]	7.9	0.2%	7.9	0.0%	0.031
Point Sources	***7.9***	**0.2%**	***7.9***	**0.0%**	**0.031**
MOS	-	-	17.8	-	**0.070**
Total	3,807.9	100.0%	356.1	90.6%	1.402

Notes: [1] Load applies to the direct drainage portion of the watershed only.

Table 2. NPDES Regulated Stormwater Permit Summary for the Magothy River Watershed [1]

MDE Permit	NPDES	Facility	City	County
-	MD0068276	State Highway Administration (MS4)	State-wide	All Phase I (Anne Arundel)
09-GP-0000	MDR100000	MDE General Permit to Construct	All	All
04-DP-3316	MD0068306	Anne Arundel Phase 1 MS4	County-wide	Anne Arundel
02SW1910	MDR001910	A-A Recycle & Sand, Inc.	Pasadena	Anne Arundel
02SW1584	MDR001584	Anne Arundel County School Transportation Garage	Pasadena	Anne Arundel
02SW1039	MDR001039	Chesapeake Charter, Inc.	Annapolis	Anne Arundel
02SW1932	MDR001932	Clark Auto Parts, Inc.	Pasadena	Anne Arundel
02SW1454	MDR001454	Redmonds Auto Parts	Pasadena	Anne Arundel

Note: [1] Although not listed in this table, some individual process water permits incorporate stormwater requirements and are accounted for within the NPDES Stormwater WLA, as well as additional Phase II permitted MS4s, such as military bases, hospitals, etc.

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards. The TMDL is a scientifically based strategy that considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a MOS value. The option is always available to refine the TMDL for resubmittal to EPA for approval if environmental conditions, new data, or the understanding of the natural processes change more than what was anticipated by the MOS.

III. Background

The Magothy River is a 6-mile-long tributary of the Chesapeake Bay in Anne Arundel County, Maryland with a drainage area of approximately 92.7 km^2. From its headwaters in northeast Anne Arundel County, in the vicinity of Pasadena, the river enters the Chesapeake Bay south of Gibson Island. The tidal range of the Magothy River is 0.97 feet. According to the USGS 2006 land cover data, land use in the Magothy River watershed is predominately urban. Urban land use occupies approximately 60.9% of the watershed while 21.3% is forest, 16.4% is water/wetland, and 1.4% is agriculture.

Maryland Water Quality Standards specify that all surface waters of the State shall be protected for water contact recreation, fishing, and the protection of aquatic life and wildlife (COMAR 2014a). Additionally, the surface water use designation for Magothy River is USE II-

Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting (COMAR 2014b).

The Maryland Department of the Environment (MDE) has identified the waters of the Magothy River Mesohaline Chesapeake Bay Tidal Segment (*Integrated Report* Assessment Unit ID: MD-MAGMH) on the State's 2012 Integrated Report as impaired for nutrients—nitrogen and phosphorus (1996), fecal coliform (1996), impacts to biological communities (2004), PCBs in fish tissue (2006), and fecal coliform—Deep Creek Tributary (2012). A fecal coliform TMDL for the Magothy River was approved by EPA in February 2006. The Chesapeake Bay TMDL, which was approved by the EPA in December 2010, addressed the sediment and nutrient listings for the Magothy River. The TMDL established by this report will address the total PCB (tPCB) listing for the tidal waters of the Magothy River.

PCBs do not occur naturally in the environment. Therefore, unless existing or historical anthropogenic sources are present, their natural background levels are expected to be zero. The linkage between the "fishing" designated use and PCB concentrations in the water column is via the uptake and bioaccumulation of PCBs by aquatic organisms. Humans can be exposed to PCBs via consumption of aquatic organisms, which over time have bioaccumulated PCBs.

CWA Section 303(d) and its implementing regulations require that TMDLs be developed for waterbodies identified as impaired by the State where technology based and other required controls do not provide for attainment of water quality standards. The PCB TMDL submitted by MDE is designed to allow for the attainment of the Magothy River Mesohaline Chesapeake Bay Tidal Segment's designated uses, and to ensure that there will be no PCB impacts affecting the attainment of these uses. Refer to Table 1 above for a summary of allowable loads.

Since the Magothy River was identified as impaired for PCBs in fish tissue, the overall objective of the tPCB TMDL established in this document is to ensure that the fishing designated use, which is protective of human health related to the consumption of fish, is supported. However, the TMDL will also ensure the protection of all other applicable designated uses. This objective was achieved via the use of extensive field observations and a water quality model. The tidal prism model simulates the tPCB dynamic interactions between the water column and bottom sediments within the Magothy River embayment and the Chesapeake Bay mainstem.

In 2011 and 2012, monitoring surveys were conducted by MDE to measure water column tPCB concentrations at five tidal and five non-tidal stations throughout the Magothy River and its watershed. Sediment samples were also collected at tidal stations in 2011 to characterize tPCB sediment concentrations. MDE collected 12 composite fish tissue samples for PCB analysis in the Magothy River in September 2009, September 2011, and March 2012.

As part of the analysis, both point and nonpoint sources of PCBs have been identified throughout the Magothy River watershed. Nonpoint sources of PCBs include: 1) Chesapeake Bay mainstem tidal influence, 2) direct atmospheric deposition to the river, 3) contaminated sites and 4) runoff from non-regulated watershed areas. The transport of PCBs from bottom sediments to the water column through resuspension and diffusion can also be a major source of PCBs in estuarine systems; however under the framework of this TMDL it is not considered a

source. Point sources in the Magothy River watershed only include stormwater discharges regulated under Phase I and Phases II of the NPDES stormwater program. No NPDES regulated WWTPs or industrial process water facilities were identified within the watershed.

Nonpoint sources include loads from:

Chesapeake Bay Mainstem Tidal Influence – The Magothy River embayment is highly influenced by tidal exchange of PCBs from the Chesapeake Bay mainstem. The tidal prism model, using observed tPCB concentrations measured at the mouth of the Magothy River and within the Magothy River embayment, predicts a gross tPCB input of 6,098 g/year from the bay to the river and a gross tPCB output of 2,339 g/year from the river to the bay. These loads result in a net tPCB transport of 3,759 g/year from the bay to the river. Therefore, currently the Chesapeake Bay mainstem is a major source of tPCBs to the Magothy River embayment.

Atmospheric Deposition – There is no recent study of the atmospheric deposition of PCBs to the surface of the Magothy River. Based on a Chesapeake Bay Program (CBP) 1999 study, a 1.6 $\mu g/m^2$/year tPCB depositional rate was estimated for non-urban areas and a 16.3 $\mu g/m^2$/year tPCB depositional rate was estimated for urban areas. While urban land use accounts for over 60.9% of the Magothy River watershed, the land area is comprised primarily of low and medium density residential land uses. The urban deposition rate defined in CBP's study is a result of more heavily urbanized areas comprised primarily of high density residential, industrial and commercial land uses. As a result, the non-urban depositional rate was applied to the Magothy River watershed. In addition, this rate is within the range of measurements from an extensive atmospheric deposition monitoring program conducted in the Delaware River estuary by the Delaware River Basin Commission. Loads were calculated for both, the direct atmospheric deposition to the surface of the waterbodies and for direct deposition to the drainage watershed. The direct atmospheric deposition load to the surface of the Magothy River was calculated by multiplying the total surface area of the embayment (22.4 km^2) and the deposition rate of 1.6 $\mu g/m^2$/year, resulting in a load of 35.9 g/year. Similarly, the atmospheric deposition load to the Magothy River watershed was calculated by multiplying 1.6 $\mu g/m^2$/year by the watershed area of 92.7 km^2, resulting in a load of 148 g/year. Applying the PCB pass-through efficiency estimated by Totten, et al. (2006) of approximately one percent, the atmospheric tPCB deposition load to the Magothy River, from the watershed, is approximately 1.5 g/year. This load, however, is inherently modeled as part of the non-regulated watershed runoff/NPDES Regulated Stormwater direct drainage loads described below.

Contaminated Sites – 'Contaminated sites' refer to areas with known PCB soil contamination, as documented by state or federal hazardous waste cleanup programs (i.e., state or federal Superfund programs). Three contaminated sites have been identified within the direct drainage area of the Magothy River watershed. The sites have been identified with PCB soil concentrations at or above method detection levels, as determined via soil sample results contained within MDE Land Management Administration's (LMA) contaminated site survey and investigation records. The median tPCB concentration of the site samples was multiplied by the soil loss rate, which is a function of soil type, pervious area, and land cover, to estimate the tPCB edge of field (EOF) load. A sediment delivery ratio was applied to calculate the final edge-of-

stream (EOS) load. The contaminated site tPCB baseline load is estimated to be 1.82 g/year.

Non-Regulated Watershed Runoff – The non-regulated watershed runoff tPCB load corresponds to the non-urbanized areas (*i.e.*, primarily forest and wetland areas) of the watershed. MDE collected water column samples for PCB analysis at three non-tidal watershed monitoring stations and two stormwater monitoring stations in the Magothy River during May, July, October, and November of 2011 and March 2012. The mean measured tPCB concentration was calculated by averaging all the concentration data for the monitoring stations. The flow from the Magothy River watershed was calculated by dividing its nearest USGS gage (USGS 01589795) mean flow by the USGS station drainage area, and multiplying this quotient by the watershed area. The Magothy River watershed baseline tPCB loading was calculated by multiplying the average watershed flow (25.92 ft^3/sec) and mean measured tPCB concentration (0.561 ng/L), resulting in an annual loading rate of 13.0 g/year. As mentioned above, about 1.5 g/year of the Magothy River watershed's baseline load is attributed to atmospheric deposition to the land surface of the direct drainage, and is inherently captured within the total watershed tPCB baseline load of 13.0 g/year. The non-regulated watershed runoff tPCB baseline load was estimated by multiplying the percentage of non-urban land use (39.1%) within the watershed by the total watershed baseline load (13.0 g/year). As all three contaminated sites (A.S. Pearman, Green Valley Road site and Woods Road site) are located within the non-urbanized area, their total tPCB load (1.8 g/year) is subtracted from the Magothy River total load, resulting in a non-regulated watershed runoff tPCB baseline load of 3.3 g/year.

Resuspension and Diffusion from Bottom Sediments – The tidal prism model, applying observed tPCB concentrations in the water column and sediment, predicts a gross tPCB load of 3,345 g/year from resuspension and diffusion and 3,141 g/year from settling. This results in a net tPCB transport of 204 g/year from the bottom sediment of the Magothy River to the water column under baseline conditions. Even though resuspension and diffusion from bottom sediments serves as a source of PCBs to the water column, the load contribution is resultant from other point and nonpoint source inputs (both historic and current) and is not considered to be a directly controllable (reducible) source. Therefore, it was not assigned a baseline load or allocation.

Point sources include loads from:

NPDES Regulated Stormwater – MDE estimates pollutant loads from NPDES regulated stormwater areas based on urban land use within a given watershed. The 2006 USGS spatial land cover, which was used to develop CBP's Phase 5.3.2 watershed model land use, was applied in this TMDL to estimate the NPDES Regulated Stormwater tPCB baseline load. The Magothy River watershed is entirely located within Anne Arundel County, Maryland. The NPDES stormwater permits within the watershed include: (i) the area covered under Anne Arundel County's Phase I jurisdictional MS4 permit, (ii) the State Highway Administration's Phase I MS4 permit, (iii) state and federal general Phase II MS4's, (iv) industrial facilities permitted for stormwater discharges, and (v) construction sites.

The NPDES regulated stormwater tPCB baseline load of 7.9 g/year was estimated by multiplying the percentage of urban land use (60.9%) within the direct drainage by the total direct drainage tPCB baseline load (13.0 g/yr).

A tidal prism model that incorporates the influences of both fresh water discharge and tidal flushing was used to simulate the dynamic interactions between the water column and bottom sediments within the Magothy River embayment and the Chesapeake Bay mainstem. The observed average tPCB concentrations in the water column and sediment were used to characterize the initial model conditions. As a conservative estimation, this study assumes a PCB attenuation rate of 5.0% per year at the boundary between the Magothy River and the Chesapeake Bay mainstem. Assuming that the tPCB concentrations in the Chesapeake Bay mainstem will continue to decline at the above rate, the water column and sediment tPCB TMDL endpoints will be met after 15,845 days (about 43.4 years) thus meeting the "fishing" designated use in the Magothy River embayment. A reduction to model inputs for freshwater discharge (i.e., tPCB watershed load) and atmospheric deposition is not required as it will only reduce the time it takes to achieve the TMDL endpoints by 579 days (1.6 years).

IV. Discussion of Regulatory Conditions

EPA finds that MDE has provided sufficient information to meet all of the seven basic requirements for establishing a PCB TMDL for the Magothy River watershed. Additionally, MDE provided reasonable assurance that the TMDL can be met. EPA's approval is outlined according to the regulatory requirements listed below.

1) The TMDLs are designed to implement applicable water quality standards.

Water Quality Standards consist of three components: designated and existing uses; narrative and/or numerical water quality criteria necessary to support those uses; and an anti-degradation statement. Maryland Water Quality Standards specify that all surface waters of the State shall be protected for water contact recreation, fishing, and the protection of aquatic life (COMAR Title 26 Subtitle 08, Chapter 2). Additionally, the surface water use designation for Magothy River is USE II - *Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting*. There are no "high quality", or Tier II, stream segments located within the direct drainage portions of the Magothy River.

The State of Maryland has adopted three separate water column tPCB criteria: a criterion for the protection of human health associated with the consumption of PCB contaminated fish, as well as fresh water (14ng/L) and salt water (30ng/L) chronic tPCB criteria for the protection of aquatic life. As the Magothy River is a tidal system, the saltwater aquatic chronic criterion is applied for assessing these waters. The Maryland human health tPCB criterion is set at 0.64 ng/L, or ppt. The mean water column tPCB concentration in the Magothy River exceeds the human health criteria of 0.64 ng/L; however, none of the water column samples exceed the fresh and salt water chronic aquatic life tPCB criterion of 14ng/L and 30 ng/L, respectively.

In addition to the water column criteria, fish tissue monitoring data can serve as an

indicator of PCB water quality conditions. The Maryland fish tissue monitoring data is used to issue fish consumption advisories/recommendations and determine whether Maryland waterbodies are meeting the "fishing" designated use. Currently Maryland applies a tPCB fish tissue listing threshold of 39 ng/g. When tPCB fish tissue concentrations exceed this threshold, the waterbody is listed as impaired for PCBs in fish tissue in Maryland's Integrated Report as it is not supportive of the "fishing" designated use. The tPCB concentrations for 7 out of 12 fish tissue composite samples (several species of fish including brown bullhead catfish, white perch, yellow perch, spot, and pumpkinseed sunfish were collected) exceed the listing threshold, demonstrating that a PCB impairment exists within the Magothy River.

Since the overall objective of the tPCB TMDL for the Magothy River is to ensure the support of the "fishing" designated use, the tPCB fish tissue listing threshold (39 ng/g) was translated into an associated water column tPCB threshold concentration to apply within this analysis as the water column TMDL endpoint. This was accomplished using the Adjusted Total Bioaccumulation Factor (Adj-tBAF) of 94,881 L/kg for the Magothy River. A total Bioaccumulation Factor (tBAF) is calculated per fish species, and subsequently the tBAFs are normalized by the median species lipid content and median dissolved tPCB water column concentration in the species home range to produce the Adj-tBAF per species. The most environmentally conservative of the Adj-tBAFs is then selected to calculate the water column TMDL endpoint tPCB concentration. This final water column tPCB concentration was subsequently compared to the water column tPCB criteria concentrations, to ensure that all applicable criteria would be attained. Based on this analysis, the water column tPCB concentration of 0.41 ng/L, derived from the tPCB fish tissue listing threshold, was selected as the TMDL endpoint for the Magothy River. This concentration is more stringent than both the human health water column tPCB criterion of 0.64 ng/L, and the fresh and saltwater chronic aquatic life tPCB criteria of 14ng/L and 30 ng/L, respectively.

Similarly, the tPCB fish tissue listing threshold was also translated into an associated tPCB sediment concentration to provide a sediment TMDL endpoint that is protective of the "fishing" designated use within the Magothy River. This was accomplished using the Adjusted Sediment Bioaccumulation Factor (Adj-SediBAF) of 19.76 (unitless) for the Magothy River. A Sediment Bioaccumulation Factor (SediBAF) is calculated per fish species, and subsequently the SediBAFs are normalized by the median species lipid content and median organic carbon tPCB sediment concentration in the species home range to produce the Adj-SediBAF per species. The most environmentally conservative of the Adj-SediBAFs is then selected to calculate the sediment TMDL endpoint tPCB concentration. Based on this analysis, the tPCB level of 1.97 ng/g, derived from the fish tissue listing threshold, is set as the sediment TMDL endpoint.

EPA believes these are reasonable and appropriate water quality goals.

2) *The TMDLs include a total allowable load as well as individual wasteload allocations and load allocations.*

Total Allowable Load

EPA regulations at 40 CFR §130.2(i) state *that the total allowable load shall be the sum of individual WLAs for point sources, LAs for nonpoint sources, and natural background concentrations*. The TMDL for tPCBs for the Magothy River are consistent with 40 CFR §130.2(i), because the total loads provided by MDE equal the sum of the individual WLAs for point sources and the land-based LAs for nonpoint sources.

The allowable load was determined by first estimating a baseline load calculated from model-estimated tPCB loads from point and nonpoint sources using monitoring data. The tidal prism model developed for simulating ambient sediment and water column tPCB concentrations was used to determine the specific load reductions that would result in simulated tPCB concentrations in the sediment and water column that meet the TMDL endpoints. The allowable load was calculated as 356.1 g/year for the Magothy River.

This load is considered the maximum allowable load the watershed can assimilate and still attain water quality standards. The allowable load was reported in units of grams/year for the average annual load and in grams/day for the maximum daily load. Expressing TMDLs using these units is consistent with Federal regulations at 40 CFR §130.2(i), which states that *TMDLs can be expressed in terms of either mass per time, or other appropriate measure*. The average annual and maximum daily tPCB TMDLs are presented in Table 1.

Attainment of the site-specific tPCB water quality TMDL endpoints is expected to take place over time as the Chesapeake Bay mainstem tPCB concentrations continue to decline, which also results in the natural attenuation of tPCB levels in the legacy sediments (i.e., the covering of contaminated sediments with newer, less contaminated materials, flushing of sediments during periods of high stream flow, and biodegradation). Assuming that the tPCB concentrations in the Chesapeake Bay mainstem will continue to decline, at or above the current rate of 5% per year, the water column and sediment tPCB TMDL endpoints will be met after 15,845 days (about 43.4 years) thus meeting the "fishing" designated use in the Magothy River embayment. When the TMDL endpoints are met, the tPCB load from the Chesapeake Bay mainstem will be reduced by about 92.3% including an explicit 5% Margin of Safety. At that time, the total annual load to the Magothy River will be reduced by 90.6% from its baseline load.

Load Allocations

The TMDL summary in Table 1 contains the LAs for the Magothy River. According to Federal regulations at 40 CFR §130.2(g), LAs are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loadings should be distinguished.

The two primary sources of tPCB baseline loads resulting in the PCB impairment in the Magothy River embayment are 1) the Chesapeake Bay mainstem tidal influence and 2) resuspension and diffusion from the bottom sediments. However, the loads from resuspension

and diffusion from bottom sediments are not considered to be directly controllable (reducible) loads. Furthermore, these loads are considered an internal load within the modeling framework of the TMDL and are thus not assigned a tPCB baseline load or TMDL allocation.

The model results show that in order to meet the "fishing" designated use in the Magothy River, a tPCB load reduction of 91.3% is required from nonpoint sources to achieve the TMDL. Given that the baseline loads for atmospheric deposition, non-regulated watershed runoff, and contaminated sites constitute a relatively small percentage of the total tPCB baseline load (1.1%), these nonpoint sources were not subjected to any load reductions. The tidal influence from the Chesapeake Bay mainstem is one of the largest sources of PCBs to the embayment under current conditions and is therefore allocated 289.4 g/L, equivalent to a tPCB load reduction of 92.3%.

Wasteload Allocations

There are 8 permitted point sources within the Magothy River watershed that could potentially convey tPCBs loads to the Magothy River Mesohaline Chesapeake Bay Tidal Segment. These point sources, which are included in the WLAs, are stormwater discharges regulated under Phase I and Phases II of the NPDES stormwater program. No NPDES regulated WWTPs or industrial process water facilities were identified within the watershed.

The NPDES Regulated Stormwater WLA is 7.9 g/year for the Magothy River watershed. Point source loads only account for 0.2% of the total tPCB baseline load. If these loads were reduced by 100% it would only reduce the time necessary to achieve the water column and sediment tPCB TMDL endpoints by 579 days (1.6 years). Therefore, no reductions to these loads are necessary in order to achieve the TMDL.

Federal regulations at 40 CFR §122.44(d)(1)(vii)(B) require that, for an NPDES permit for an individual point source, the effluent limitations must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA. There is no express or implied statutory requirement that effluent limitations in NPDES permits necessarily be expressed in daily terms. The CWA definition of "effluent limitation" is quite broad (effluent limitation is "any restriction on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources..." See CWA 502(11). Unlike the CWA's definition of TMDL, the CWA definition of "effluent limitation" does not contain a "daily" temporal restriction. NPDES permit regulations do not require that effluent limits in permits be expressed as maximum daily limits or even as numeric limitations in all circumstances, and such discretion exists regardless of the time increment chosen to express the TMDL. For further guidance, refer to Benjamin H. Grumbles memo (November 15, 2006) titled *Establishing TMDL Daily Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015 (April 25, 2006) and implications for NPDES Permits.*

EPA has authority to object to the issuance of an NPDES permit that is inconsistent with WLAs established for that point source. It is also expected that MDE will require periodic monitoring of the point source(s) through the NPDES permit process, in order to monitor and

determine compliance with the TMDL's WLAs. Based on the foregoing, EPA has determined that the TMDL is consistent with the regulations and requirements of 40 CFR Part 130.

3) The TMDLs consider the impacts of background pollutant contributions.

PCBs do not occur naturally in the environment. Therefore, unless existing or historical anthropogenic sources are present, their natural background levels are expected to be zero. The TMDL considers the impact of background pollutants by considering land uses within the direct drainage portions of the Magothy River watershed.

4) The TMDLs consider critical environmental conditions.

EPA regulations at 40 CFR § 130.7(c)(1) require TMDLs to account for critical conditions for stream flow, loading, and water quality parameters. The intent of the regulations is to ensure that: (1) the TMDLs are protective of human health, and (2) the water quality of the waterbodies is protected during the times when they are most vulnerable. Critical condition are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[1]. Critical conditions are a combination of environmental factor (e.g. flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical condition in the waterbody, an attempt is made to use a reasonable worst-case scenario condition.

The TMDL is protective of human health at all times; thus it implicitly accounts for seasonal variations as well as critical conditions. Bioaccumulation of PCBs in fish is driven by long-term exposure through respiration, dermal contact, and consumption of lower order trophic level organisms. The critical condition defined by acute exposure to temporary fluctuations in PCB water column concentrations during storm events is not a significant pathway for uptake of PCBs. Since PCB levels in fish tissue become elevated due to long-term exposure, it has been determined that the selection of the annual average tPCB water column and sediment concentrations for comparison to the endpoints applied within the TMDL, adequately considers the impact of critical conditions on the "fishing" designate use in the Magothy River watershed.

5) The TMDLs consider seasonal environmental variations.

The TMDL is protective of human health at all times; thus it implicitly accounts for seasonal variations. Monitoring of PCBs was conducted on a quarterly basis to account for seasonal variation in establishing the baseline condition for ambient water quality in the Magothy River and estimation of watershed loadings. Since PCB levels in fish tissue become elevated due to long-term exposure, it has been determined that the selection of the annual average tPCB water column and sediment concentrations for comparison to the endpoints applied within the TMDL, adequately considers the impact of seasonal variations on the "fishing" designate use in the Magothy River watershed.

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[1] EPA memorandum regarding EPA Actions to Support High Quality TMDLs fom Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

6) The TMDLs include a Margin of Safety.

The requirement for a MOS is intended to add a level of conservatism to the modeling process in order to account for uncertainty. Based on EPA guidance, the MOS can be achieved through two approaches. One approach is to reserve a portion of the loading capacity as a separate term (i.e. explicit), and the other approach is to incorporate the MOS as part of the design conditions (i.e. implicit).

Uncertainty within the model framework included the estimated rate of decline in tPCB concentrations within the Chesapeake Bay mainstem as well as the initial condition of mean tPCB concentrations that was selected for the model. In order to account for these uncertainties, MDE applied an explicit MOS of 5%.

7) The TMDLs have been subject to public participation.

MDE provided an opportunity for public review and comment on the PCB TMDL for the Magothy River Mesohaline Chesapeake Bay Tidal Segment. The public review and comment period was open from August 5, 2014 through September 3, 2014. Copies of the draft document were placed in the Anne Arundel County Public Library – Annapolis Area Branch and Severna Park Branch. The draft document was also available on the internet. MDE received no written comments during the comment period.

V. Discussion of Reasonable Assurance

EPA requires that there be a reasonable assurance that the TMDL can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR §122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA. Furthermore, EPA has the authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Since PCBs are no longer manufactured and their use has been substantially restricted, it is reasonable to expect that with time PCB concentration in the aquatic environment will decline. As previously applied in other PCB TMDLs developed by Maryland in the Chesapeake Bay region, it is assumed that the tPCB concentrations in the Chesapeake Bay mainstem are decreasing at a rate of 5% per year. Given this rate of decline, the tPCB levels in the Magothy River embayment are expected to decline over time due to natural attenuation, such as the burial of contaminated sediments with newer, cleaner materials and through biodegradation.

A new Chesapeake Bay Watershed Agreement was signed on June 16, 2014 which includes goals and outcomes for toxic contaminants including PCBs (CBP 2014). The toxic contaminant goal is to "ensure that the Bay and its rivers are free of effects of toxic contaminants on living resources and human health." Implementation of the toxic contaminant goal and outcomes under the new Bay agreement as well as discovering and minimizing any existing PCB

land sources throughout the Chesapeake Bay watershed via future TMDL development and implementation efforts could further help to meet water quality goals in the Magothy River.

One alternative for reducing the tPCB concentrations in the water column that MDE may consider is removal of PCB-contaminated systems (i.e., dredging). However, when considering dredging as an option, the risk versus benefit must be weighted as the removal of contaminated sediment may potentially damage the habitat and health of existing benthic and fish communities.

Under certain conditions, EPA's NPDES regulations allow the use of non-numeric, Best Management Practices (BMP) water quality based effluent limits (WQBELs). BMP WQBELs can be used where "numeric effluent limitations are infeasible; or the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA" (CFR 2014c). For example, MDE's Phase I MS4 permits require restoration targets for impervious surfaces (*i.e.*, restore 10% or 20% of a jurisdiction's total impervious cover with no stormwater management/BMPs), and these restoration efforts have known total suspended solids (TSS) reduction efficiencies. Since PCBs are known to adsorb to sediments and their concentrations correlate with TSS concentrations, the significant restoration requirements in the MS4 permits, which will lead to a reduction in sediment loads entering the Magothy River, will also contribute toward tPCB load reductions and meeting PCB water quality goals. Implementation of similar restoration measures within upstream jurisdictions would also contribute additional reductions to PCB loadings from the Chesapeake Bay mainstem and provide progress towards achieving the TMDL. Other BMPs that focus on PCB source tracking and elimination at the source rather than end-of-pipe controls are also warranted.

Where necessary, the source characterization efforts will be followed with pollution minimization and reduction measures that will include BMPs for reducing runoff from urban areas, identification and termination of ongoing sources (*e.g.*, industrial uses of equipment that contain PCBs), etc. The identified NPDES regulated stormwater control agency permits will be expected to be consistent with the WLAs presented in this report. Numerous stormwater dischargers are located in the watershed including Municipal Phase I MS4, the SHA Phase I MS4, industrial facilities, State and Federal Phase II MS4s, and any construction activities on area greater than 1 acre.

An example of one jurisdiction with a PCB TMDL implementation plan is Montgomery County. The current Montgomery County Phase I MS4 permit requires that the jurisdiction develop implementation plans to meet its assigned NPDES Regulated Stormwater WLAs. In this TMDL, because its load was estimated at only 0.2% of the total PCB baseline load, the Anne Arundel County Phase I MS4 permit was not assigned a reduction and therefore no PCB implementation plan will be required. Development of implementation plans by regulated stormwater dischargers within jurisdictions discharging to tidal waters north of the Magothy River would contribute additional reductions to PCB loadings from the Chesapeake Bay and provide progress towards achieving this TMDL.

Given that the contaminated site baseline load constitutes a relatively small percentage of

the total baseline load (0.05%) for the Magothy River watershed and no reduction is required to meet the TMDL, further remediation of these sites will also not be required.

PCBs are still being released to the environment via accidental fires, leaks, disposal of PCB containing products, etc. Therefore, MDE will continue to periodically monitor and evaluate concentrations of contaminants in recreationally caught fish, shellfish, and crabs throughout Maryland. MDE will use these monitoring programs to evaluate progress towards meeting the "fishing" designated use in the Magothy River embayment.

For more details about Reasonable Assurance for this TMDL refer to Section 6.0 of the TMDL report.