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

OCT 0 3 2016

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

Dear Mr. Lee Currey:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the Total Maximum Daily Load (TMDL) report, *Total Maximum Daily Load of Polychlorinated Biphenyls in the Gunpowder River and Bird River Subsegments of the Gunpowder River Oligohaline Segment, Baltimore County and Harford County, Maryland.* The TMDL report was submitted by the Maryland Department of the Environment (MDE) to EPA for final review on October 30, 2015, and received on November 3, 2015. 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 Maryland Department of the Environment (MDE) has identified the waters of the Gunpowder River (Integrated Report Assessment Unit ID: MD-GUNOH-02130801) and the Bird River (Integrated Report Assessment Unit ID: MD-GUNOH-02130803) on the State's 2014 Integrated Report as impaired by PCBs in fish tissue (2006 and 2008, respectively) (MDE 2014). The Chesapeake Bay nutrient and sediment TMDLs, which were approved by the EPA on December 29, 2010, addressed sediment and nutrients listings for the Gunpowder River and the Bird Rivers. A water quality analysis of eutrophication for the tidal Bird River was approved by EPA in 2005. The Gunpowder River and Bird River TMDLs established by MDE will address the total PCB (tPCB) listings for the Gunpowder River and Bird River.

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 tPCB TMDL for the Gunpowder River and Bird River Subsegment of the Gunpowder River Oligohaline Segment satisfies 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 me, or your staff may contact Angie Garcia at 215-814-3199.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

cc: Melissa Chatham, MDE-SSA
Lynn Buhl, MDE-WMA

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Decision Rationale
Total Maximum Daily Load of Polychlorinated Biphenyls in the Gunpowder River and Bird River Subsegments of the Gunpowder River Oligohaline Segment, Baltimore County and Harford County, Maryland

Jon M. Capacasa, Director
Water Protection Division

Date: 10/3/16

Decision Rationale
Total Maximum Daily Load of Polychlorinated Biphenyls in the Gunpowder River and Bird River Subsegments of the Gunpowder River Oligohaline Segment, Baltimore County and Harford 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 Gunpowder River and Bird River Subsegments of the Gunpowder River Oligohaline Segment. This TMDL is established to address impairments of water quality, caused by PCBs, as identified in Maryland's 2014 Integrated Report (fish tissue 2006 and 2008). The Maryland Department of the Environment (MDE) submitted the report, *Total Maximum Daily Load of Polychlorinated Biphenyls in the Gunpowder River and Bird River Subsegments of the Gunpowder River Oligohaline Segment, Baltimore County and Harford County, Maryland,* dated October 2015, to EPA for final review on October 30, 2015, and was received on November 3, 2015.

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.

From this point forward, all references in this rationale can be found in the TMDL report, *Total Maximum Daily Load of Polychlorinated Biphenyls in the Gunpowder River and Bird River Subsegments of the Gunpowder River Oligohaline Segment, Baltimore County and Harford County,* unless otherwise noted.

II. Summary

Since the Gunpowder River and Bird River Subsegments of the Gunpowder River Oligohaline Segment were identified as impaired for PCBs in fish tissue, the overall objective of the tPCB TMDLs established in this document is to ensure that the "fishing" designated use, which is protective of human health related to the consumption of fish, in both rivers, is supported. However, this TMDL will also ensure the protection of all other applicable designated uses. The TMDL specifically allocates the allowable tPCB loading to the Gunpowder River and Bird River. The annual average TMDLs and maximum daily loads (MDLs) for tPCBs for the Gunpowder River and Bird River are presented in Table 1 and 2 below, respectively. A list of the permitted industrial facility within the Gunpowder River watershed that potentially conveys tPCB loads to the river is presented in Table 3 below. In addition, individual NPDES regulated stormwater permits in the Gunpowder River and Bird River watersheds are included in Table 4 and 5 below.

Table 1. Summary of tPCB Baseline Loads, TMDL Allocations, Load Reductions, and MDLs in the Gunpowder River

Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)	MDL (g/day)
Chesapeake Bay Mainstem Influence	34.0	12.4%	1.25	96%	0.004
Discharge from Gunpowder Falls and Little Gunpowder Falls	0.2	0.1%	0.20	0%	0.001
Direct Atmospheric Deposition to Gunpowder River and Bird River	65.5	23.9%	65.50	0%	0.226
Maryland Non-regulated Watershed Runoff from Gunpowder and Bird watersheds	9.6	3.5%	9.60	0%	0.033
Nonpoint Sources	***109.3***	***40.0%***	***76.55***	***30%***	***0.264***
C.P. Crane Generating Station Discharge[1]	155.0	56.6%	5.74	96%	0.049
NPDES Regulated Stormwater from Gunpowder And Bird Watersheds[2]	9.3	3.4%	9.30	0%	0.032
Point Sources	***164.3***	***60.0%***	***15.04***	***91%***	***0.081***
MOS	-	-	4.82		0.017
Total	**273.6**	**100.0%**	**96.41**	**65%**	**0.361**

[1] This TMDL load was calculated based on the same annual rate of decrease in PCB concentrations and time period values that were applied in estimating the TMDL load for the Chesapeake Bay Mainstem Influence. See Section 5.4.2 of the TMDL report.

[2] See Table 4and 5 below for a list of NPDES Regulated Stormwater Permits.

Table 2. Summary of tPCB Baseline Loads, TMDL Allocations, Load Reductions, and MDLs in the Bird River

Source	Baseline Load (g/year)	Baseline Load (%)	TMDL (g/year)	Load Reduction (%)	MDL (g/day)
Gunpowder River Influence	49.2	74.9%	5.02	90%	0.017
Direct Atmospheric Deposition	6.4	9.7%	1.92	70%	0.007
Maryland Non-regulated Watershed Runoff	3.7	5.6%	1.11	70%	0.004
Nonpoint Sources	***59.3***	***90.3%***	***8.05***	***86%***	***0.028***
NPDES Regulated Stormwater[1]	6.4	9.7%	1.92	70%	0.007
Point Sources	***6.4***	***9.7%***	***1.92***	***70%***	***0.007***
MOS	-	-	0.52		0.002
Total	**65.7**	**100.0%**	**10.49**	**84%**	**0.036**

Note:

[1] See Table 5 below for a list of NPDES Regulated Stormwater Permits for the Bird River.

Table 3. Summary of Industrial Facility tPCB Baseline Loads

Facility Name	NPDES #	Average Concentration (ng/L)	Average Flow (MGD)	tPCB Baseline Load (g/year)
C.P. Crane Generating Station	MD0001511	0.432	259	155

Table 4. NPDES Regulated Stormwater Permit Summary for the Gunpowder River[1]

MDE Permit	NPDES	Facility	County
11-DP-3313	MD0068276	State Highway Administration(MS4)	All Phase I (Baltimore, Harford)
14GP	MDRC	MDE General Permit to Construct	All
11-DP-3317	MD0068314	Baltimore County Phase I MS4	Baltimore
11-DP-3310	MD0068268	Harford County Phase I MS4	Harford
10-MA-9321	MDG999321	Baltimore Boating Center, Llc	Baltimore
12-SW-1498	MDR001498	C. D. Thomas Company, Inc.	Baltimore
11-HT-5066	MDG675066	C.P. Crane Generating Station	Baltimore
12-SW-1776	MDR001776	Doug's Auto Recycling, Inc.	Baltimore
12-SW-0399	MDR000399	Harford County Resource Recovery Facility	Harford
10-MM-9710	MDG499710	Lafarge Mid-Atlantic Joppa Ready Mix	Harford

10-MA-9337	MDG999337	Long Beach Marina Llc/bulkhead And Pier	Baltimore
12-SI-6424	MDG766424	Magnolia Middle School	Harford
10-MA-9306	MDG999306	Marinemax Northeast. Llc	Harford
12-SI-6302	MDG766302	Porters Seneca Park Marina	Baltimore
10-MA-9117	MDG999117	Seneca River Boat Yard	Baltimore
10-NE-1355	MDR001355	Schneider Property, LLC - Glen Arm	Baltimore
12-SR-1831	MDR001831	Wirtz & Daughters, Inc.	Baltimore

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.

Table 5. NPDES Regulated Stormwater Permit Summary for the Bird River[1]

MDE Permit	NPDES	Facility	County
11-DP-3313	MD0068276	State Highway Administration(MS4)	All Phase I (Baltimore, Harford)
14GP	MDRC	MDE General Permit to Construct	All
11-DP-3317	MD0068314	Baltimore County Phase I MS4	Baltimore
02-SW-0498	MDR000498	Bonsal American	Baltimore
12-SI-6480	MDG766480	Canterbury Apartments	Baltimore
12-SI-6565	MDG766565	Chapel Valley Apartments	Baltimore
12-SI-6650	MDG766650	Commons at Whitemarsh Apartments	Baltimore
12-SI-6649	MDG766649	Commons at Whitemarsh Townhomes	Baltimore
12-SI-7061	MDG767061	Crossings at White Marsh A	Baltimore
12-SI-7062	MDG767062	Crossings at White Marsh B	Baltimore
10-MM-8003	MDG498003	Days Cove Rubble Landfill-Lateral Expansion	Baltimore
12-SW-0108	MDR000108	Eastern Sanitary Landfill Solid Waste Management Facility	Baltimore
12-SI-7027	MDG767027	Fox Hall Apartments	Baltimore
12-SI-6516	MDG766516	Freestate Swim Club, Inc.	Baltimore
02-SW-1408	MDR001408	General Motors Llc Baltimore Transmission	Baltimore
11-HT-5094	MDG675094	General Motors Llc Baltimore Transmission	Baltimore
10-MM-8002	MDG498002	Honeygo Run Rubble Landfill	Baltimore
12-SR-0792	MDR000792	J. Gibson Mcilvain Company	Baltimore
02-SW-2231	MDR002231	North Point Transportation Facility	Baltimore
10-MM-0361	MDG490361	Potts & Callahan - Cyprus Mines	Baltimore

12-SI-7083	MDG767083	Residence Inn White Marsh	Baltimore
12-NE-1601o	MDR001601	Roebuck Printing, Inc.	Baltimore
12-SI-6691	MDG766691	White Marsh Swim Club	Baltimore
12-SI-6711A	MDG766711	Woodcroft Swimming Club, LLC	Baltimore

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 Gunpowder River is a 6.8-mile-long (10.9 km) tidal inlet on the western side of the Chesapeake Bay in Baltimore and Harford Counties, Maryland. It is formed by the convergence of two freshwater rivers, Gunpowder Falls and Little Gunpowder Falls. The direct drainage area of the Gunpowder River is approximately 50.8 square kilometers (km^2). The Bird River is located in Baltimore County, Maryland in the upstream tidal portion of the Gunpowder River watershed and flows east into the Gunpowder River. The Bird River is approximately 7 miles in length with a watershed area of approximately 66.9 square kilometers (km^2).

According to the United States Geological Survey's (USGS) 2006 land cover data (USGS 2014), which was specifically developed to be applied within the Chesapeake Bay Program's (CBP) Phase 5.3.2 watershed model, urban land occupies approximately 35.3% of the land area in the Gunpowder River watershed, while 25.8% is forest, 34.6% is water/wetland, and 4.3% is agriculture. In the Bird River watershed, urban land occupies approximately 63.5% of the watershed, while 21.7% is forest, 9.4% is water/wetland, and 5.4% 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). The designated uses of the waters of the Gunpowder River and the Bird River are Use II – *Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting* (COMAR 2014b). There are no "high quality", or Tier II, stream segments (Benthic Index of Biotic Integrity [BIBI] and Fish Index of Biotic Integrity [FIBI] aquatic life assessment scores > 4 [scale 1-5]) located within the direct drainage portions of either the Gunpowder or the Bird River.

MDE has identified the waters of the Gunpowder River (Integrated Report Assessment Unit ID: MD-GUNOH-02130801) and the Bird River (Integrated Report Assessment Unit ID: MD-GUNOH-02130803) on the State's 2014 Integrated Report as impaired by PCBs in fish tissue (2006 and 2008, respectively) (MDE 2014). The Chesapeake Bay nutrient and sediment TMDLs, which were approved by the EPA on December 29, 2010, addressed sediment and nutrients listings for the Gunpowder River and the Bird Rivers. A water quality analysis of

eutrophication for the tidal Bird River was approved by EPA in 2005. The Gunpowder River and Bird River TMDLs established by MDE will address the total PCB (tPCB) listings for the Gunpowder River and Bird River.

PCBs do not occur naturally in the environment. Therefore, unless MDE identifies existing or historical anthropogenic sources, natural background levels of PCBs 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 controls do not provide for attainment of water quality standards. The tPCB TMDL submitted by MDE is designed to allow for the attainment of the Gunpowder River and the Bird River subsegments of the Gunpowder River Oligohaline Segment's designated uses, and to ensure that there will be no PCB impacts affecting the attainment of these uses. Refer to Table 1 and 2 above for a summary of allowable loads.

Since the Gunpowder River and Bird River were identified as impaired for PCBs in fish tissue, the overall objective of the tPCB TMDLs established in this document is to ensure that the "fishing" designated use, which is protective of human health related to the consumption of fish, in both rivers, is supported. However, this TMDL will also ensure the protection of all other applicable designated uses. This objective was achieved via the use of field observations and a multi-segment water quality model. The model incorporates the influences of tide, atmospheric deposition, freshwater inputs, and exchanges between the water column and bottom sediments, thereby representing realistic dynamic transport within the area.

In 2012 and 2013, monitoring surveys were conducted by MDE to measure water column tPCB concentrations in the Gunpowder and Bird Rivers. Tidal monitoring was conducted at five stations in the Gunpowder River and two stations in the Bird River. One of the tidal stations was located at the boundary between the Gunpowder River and the main stem of the Chesapeake Bay, to evaluate the tidal influences from the Bay. Sediment samples were also collected at each tidal station, including the boundary station, to characterize tPCB sediment concentrations. Non-tidal water column monitoring was conducted concurrently with the tidal monitoring at one stations in the direct drainage watershed of Gunpowder River and four non-tidal stations in the Bird River watershed. These data were required to estimate loadings from the watersheds. Water column tPCB data were also taken from two non-tidal stations in the Little Gunpowder Falls and Lower Gunpowder Falls to characterize upstream loads from these rivers.

In addition, MDE collected 12 fish tissue composite samples (60 total fish) for PCB analysis in the Gunpowder River in May, 2012 and April 2013 and 8 fish tissues composite samples in the Bird River in May, 2012 and May, 2013. The tPCB concentrations for 8 out of 12 samples in the Gunpowder River and all of the samples in the Bird River exceeded the listing threshold, demonstrating that a PCB impairment exists within the rivers.

As part of the analysis, both point and nonpoint sources of PCBs have been identified throughout the Gunpowder River and Bird River watersheds. Nonpoint sources of PCBs in the Gunpowder River include: 1) Chesapeake Bay mainstem tidal influence, 2) inputs from Gunpowder Falls and Little Gunpowder Falls (outside of the direct drainage area), 3) direct atmospheric deposition to the river, and 4) runoff from non-regulated areas within the Gunpowder River and Bird River watersheds. Non-point sources of PCBs in the Bird River watershed include: 1) loads from tidal exchange with the Gunpowder River, 2) direct atmospheric deposition to the Bird River, and 3) runoff from non-regulated areas of the Bird River watershed. 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 Gunpowder River watershed include NPDES-regulated industrial process water facilities and stormwater discharges regulated under Phase I and Phase II of the NPDES stormwater program. Point sources in the Bird River watershed include stormwater discharges regulated under Phase I and Phase II of the NPDES stormwater program.

Nonpoint sources include loads from:

Chesapeake Bay Mainstem Tidal Influence – The water quality model, applying the observed tPCB concentrations measured near the mouth of the Gunpowder River, predicts a gross tPCB input of 34 g/year from the Chesapeake Bay to the Gunpowder River and a gross tPCB output of 223 g/year from the Gunpowder River to the Bay. These loads result in a net tPCB transport of 189 g/year from the Gunpowder River to the Bay.

Exchanges between the Gunpowder River and the Bird River – The Bird River flows into the upstream portion of the Gunpowder River. The water quality model simulates the Bird River and the Gunpowder River as one system. Applying the observed tPCB concentrations, the model predict a gross tPCB load of 49 g/year from the Gunpowder River to the Bird River and a gross tPCB load of 143 g/year from the Bird River to the Gunpowder River. For the Gunpowder TMDL, loads from the exchange with the Bird River will be incorporated as explicit loads from the Bird River watershed runoff and direct atmospheric deposition to the Bird River surface, so loads from this boundary will not be included in the equation.

Inputs from the Gunpowder Falls and Little Gunpowder Falls – Gunpowder Falls and Little Gunpowder Falls flow directly into the upstream section of the Gunpowder River. Based on the flow and measured tPCB concentrations at these two rivers, their combined baseline tPCB loads are estimated to be 0.24 g/year. This upstream load estimate represents an aggregate loading from all potential source sectors including urban stormwater, agriculture, and wastewater treatment plants (WWTPs).

Atmospheric Deposition – There is no recent study of the atmospheric deposition of PCBs to the surface of the Gunpowder River and the Bird River. Based on a Chesapeake Bay Program (CBP) 1999 study, a 16.3 $\mu g/m^2$/year tPCB depositional rate was estimated for urban areas and a 1.6 $\mu g/m^2$/year tPCB depositional rate was estimated for non-urban areas. In the Delaware River

estuary, an extensive atmospheric deposition monitoring program conducted by the Delaware River Basin Commission (DRBC) found PCB deposition rates ranging from 1.3 (non-urban) to 17.5 (urban) $\mu g/m^2$/year of tPCBs (DRBC 2003).

While urban land use accounts for 35.3% of the Gunpowder River watershed and 63.5% of the Bird River watershed, both areas are comprised of low and medium density residential land uses. Therefore, the 1.6 $\mu g/m^2$/year tPCB depositional rate for non-urban areas resultant from CBP's 1999 study were applied in the Gunpowder and Bird River watersheds. The atmospheric deposition load to the direct watershed can be calculated by multiplying 1.6 $\mu g/m2$/year by the Gunpowder River watershed area of 50.8 km^2 and the Bird River watershed area of 66.9 km^2, which results in a load of 81 g/year for the Gunpowder River and a load of 107 g/year for the Bird River. However, according to Totten et al. (2006), only a portion of the atmospherically deposited tPCB load to the terrestrial part of the watershed is expected to be delivered to the embayment. Applying the PCB pass-through efficiency estimated by Totten et al. (2006) for the Delaware River watershed of approximately 1%, the atmospheric deposition load to the Gunpowder River and the Bird River from the watershed is approximately 0.8 g/year and 1 g/year, respectively. This load is accounted for within the loading from the watershed and is inherently modeled as part of the non-regulated watershed runoff and the NPDES Regulated Stormwater loads described below.

Similarly, the direct atmospheric deposition load to the surface of the Gunpowder River of 59.1 g/year was calculated by multiplying the surface area of the river (36.9 km^2) and the deposition rate of 1.6 $\mu g/m^2$/year. The direct atmospheric deposition load to the surface of the Bird River of 6.4 g/year was calculated by multiplying the surface area of the river (4 km^2) and the deposition rate of 1.6 $\mu g/m^2$/year.

Non-Regulated Watershed Runoff – The non-regulated watershed runoff tPCB load corresponds to the non-urbanized areas (*i.e.*, primarily forest, agricultural and wetland areas) of the watershed. To calculate total baseline watershed loads, MDE collected water column samples for PCB analysis at one non-tidal monitoring stations in the Gunpowder River and four non-tidal watershed monitoring stations in the Bird River. To calculate the watershed flow, the daily flow rates from October 1, 1998 through September 30, 2013 at the nearest two USGS stations located at White Marsh Run (USGS 01585100) and Honeygo Run (USGS 01585104) in the Bird River watershed were averaged. The unit flow from the Gunpowder River and the Bird River watersheds was the average unit flow of the above two USGS stations. The flow from each subwatershed of the Gunpowder River and the Bird River watersheds was calculated by multiplying the unit flow by the subwatershed area. The Gunpowder River watershed baseline tPCB loading (8.9 g/year) is the sum of loads from each subwatershed calculated by multiplying the subwatershed flow with the average of the measured tPCB concentration (0.29 ng/L) at the non-tidal station located at the Gunpowder River watershed. Similarly, the Bird River watershed baseline tPCB loading (10.1 g/year) is calculated by multiplying the watershed flow with the mean measured tPCB concentration (0.25 ng/L). As mentioned above, about 0.8 g/year of the Gunpowder River watershed's baseline load and 1 g/year of the Bird River watershed's baseline load are attributed to atmospheric deposition to the land surface of the direct drainage, and are

inherently captured within the total watershed tPCB baseline loads of 8.9 g/year and 10.1 g/year, respectively.

As previously discussed, the non-regulated watershed runoff tPCB load only corresponds to the non-urbanized areas (i.e., primarily forest and agricultural areas) within the direct drainage portion of the Gunpowder River and the Bird River watersheds. The loads associated with the urbanized area of the Gunpowder River and the Bird River watersheds represent the NPDES Regulated Stormwater tPCB baseline loads. The non-regulated watershed runoff tPCB baseline loads were estimated by multiplying the percentage of non-urban land use within the direct drainage portion of the watersheds by the total direct drainage watershed tPCB baseline loads for the Gunpowder River and the Bird River. The non-regulated watershed runoff tPCB baseline loads for the Gunpowder River and the Bird River watersheds are 5.9 g/year and 3.7 g/year, respectively.

Resuspension and Diffusion from Bottom Sediments – The water quality model, applying observed tPCB concentrations in the water column and sediment, predicts a net tPCB load of 2,457 g/year and 303 g/year from bottom sediment to the water column through resuspension and diffusion in the Gunpowder River and the Bird River, respectively. This load contribution is resultant from other point and nonpoint source inputs (both historic and current). The water quality model developed for this TMDL simulates conditions within the water column and sediment as a single system. Therefore exchanges between the sediment and water column are considered internal loading and is not assigned a baseline load or allocation.

Point sources include loads from:

Industrial Process Water Facilities – Three industrial process water facility discharges were identified within the Gunpowder River watershed and one industrial process water facility discharge was identified within the Bird River watershed. Two facilities in the Gunpowder River watershed and the one facility in the Bird River watershed were identified as having no potential to discharge PCBs. Therefore these three facilities were not assigned a baseline load or allocation within this TMDL. C.P. Crane Generating Station (NPDES # MD0001511) has an SIC code (4911) defined in Virginia's guidance as having potential to discharge PCBs. This facility is a power plant with cooling system that intakes water from Seneca Creek and discharges water into Saltpeter Creek (a tidal tributary of the Gunpowder River and part of the GUNOH model domain unit). Based on Discharge Monitoring Reports (DMRs) from October 1, 2010 to September 30, 2014, the facility discharged an average of 259 MGD. A baseline PCB concentration of 0.432 ng/L was assigned to this facility, based on the tPCB data at the monitoring station located in Seneca Creek, yielding a baseline load of 155 g/yr.

NPDES Regulated Stormwater – MDE estimates pollutant loads from NPDES regulated stormwater areas based on urban land use classification 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 Gunpowder River watershed is located in Baltimore and Harford Counties, Maryland. The NPDES stormwater permits within the watershed include: (i) the area covered under

Baltimore County's and Harford County's Phase I jurisdictional MS4 permit, (ii) the State Highway Administration's Phase I MS4 permit, (iii) industrial facilities permitted for stormwater discharges, and (iv) MDE general permit to construction sites (see Table 4, above). The load for all NPDES Stormwater permittees is presented as an aggregate load. The Bird River watershed is entirely located within Baltimore County, Maryland. The NPDES stormwater permits within the watershed include: (i) the area covered under Baltimore County's Phase I jurisdictional MS4 permit, (ii) the State Highway Administration's Phase I MS4 permit, (iii) industrial facilities permitted for stormwater discharges, and (iv) MDE general permit to construction sites (see Table 5, above).

The NPDES regulated stormwater tPCB baseline loads of the two watersheds (2.9 g/year for the Gunpowder River and 6.4 g/year for the Bird River) were estimated by multiplying the percentages of urban land use in each county within the direct drainage portion of the watersheds by the total direct drainage watershed tPCB baseline loads.

A tidally-averaged multi-segment one-dimensional transport model was applied to simulate the tPCB dynamic interactions between the water column and bottom sediments within the Bird River, the Gunpowder River and the Chesapeake Bay. The Bird River and the Gunpowder River were modeled as one system as they are hydrodynamically connected to each other. The tidal system was divided into six segments and the watershed was also divided into six subwatersheds. The observed average tPCB concentrations in each segment were used as the model input representing baseline conditions. Based on the study of Ko and Baker (2004), on average the tPCB concentrations in the Upper Chesapeake Bay are decreasing at a rate of 6.5% per year. All other inputs (i.e., fresh water inputs, tidal exchange rates, sediment and water column exchange rates, atmosphere deposition, and burial rate) were kept constant.

To determine what percent reduction of the total load is necessary for the Gunpowder River and Bird River to meet its water quality and sediment TMDL endpoints, different model scenario runs were conducted (See Appendix D of the TMDL report). Assuming a 6.5% annual decrease in the Chesapeake Bay boundary water column concentration due to natural attenuation, it will take approximately 49 years for the Gunpowder River to meet the TMDL endpoints and thus be supportive of its designated use. In this scenario, the water column endpoint will be met before the sediment endpoint. A second scenario was run, simulating a 100% reduction to the watershed load, including non-point and point sources and atmospheric deposition along with natural attenuation in the Chesapeake Bay mainstem. The results indicated that with a 100% reduction in watershed loads, it will take approximately five years less to meet the TMDL endpoints (44 years, instead of 49) than it would with no watershed reduction (Figure 10). Based on these scenario results, it was determined that a reduction from the watershed load is not critical for meeting the TMDL endpoints in the Gunpowder River. For the Bird River, a scenario was run with natural attenuation and no watershed reduction, which did not meet the TMDL endpoints, demonstrating that watershed reductions are necessary for meeting the TMDL in this system. Based on these results, a reduction of 70% of baseline loads from the Bird River watersheds and from direct atmospheric deposition to the river surface, was applied in order to achieve the TMDL. Assuming the 6.5% annual reduction in loads from the Bay, it will take approximately 93 years (33,886 days) for the Bird River to meet the TMDL endpoints and thus

be supportive of its designated use (Figure 11). The model results show that the sediment endpoint will be reached before the water column endpoint.

The dominant tPCB sources to the water column of the Bush River are from sediment. However, under the framework of this TMDL, the tPCB loads from sediment are considered to be internal source, therefore no baseline or load allocation is assigned to this load. Attainment of the site-specific tPCB water quality TMDL endpoints is expected to take place over time as watershed reductions are implemented and the Chesapeake Bay mainstem tPCB concentrations continue to decline, which also results in the natural attenuation of tPCB levels in the surface layer of the sediments (i.e., the covering of contaminated sediments with newer, less contaminated materials, flushing of sediments during periods of high stream flow, and biodegradation).

IV. Discussion of Regulatory Conditions

EPA finds that MDE has provided sufficient information to meet all of the seven basic requirements for establishing a tPCB TMDL for the Gunpowder River and Bird River subsegments of the Gunpowder River Oligohaline Segment. 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.

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). The designated use of the waters of the Gunpowder River and the Bird River is Use II – *Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting* (COMAR 2014b). There are no "high quality", or Tier II, stream segments (Benthic Index of Biotic Integrity [BIBI] and Fish Index of Biotic Integrity [FIBI] aquatic life assessment scores > 4 [scale 1-5]) located within the direct drainage portions of either the Gunpowder or the Bird River (COMAR 2014c).

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 (0.64 ng/L), as well as fresh water (14 ng/L) and salt water (30 ng/L) chronic tPCB criteria for the protection of aquatic life (COMAR 2014d; US EPA 2014a). The State defines all waters of the "Gunpowder River Area" (MD 6-Digit Code: 021308), which includes the Gunpowder River and the Bird River tidal systems, as fresh water when applying numerical toxic substance criteria, so both the human health criterion and fresh water aquatic life chronic criterion are applied in assessing their waters (COMAR 2014d; US EPA 2014a). Since the human health criterion is more stringent than the fresh water aquatic life criteria, if the human health criterion is met, all applicable water quality criteria would be satisfied. The water column mean tPCB concentrations in the Gunpowder River and the Bird River do not exceed the human health tPCB criterion, meaning that all applicable water column criteria are met in both rivers.

In addition to the water column criteria described above, fish tissue monitoring 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 (MDE 2012). MDE collected 12 fish tissue composite samples (60 total fish) for PCB analysis in the Gunpowder River in May, 2012 and April, 2013 and 8 fish tissue composite samples (40 total fish) for PCB analysis in May, 2012 and May, 2013. The tPCB concentrations for 8 out of 12 samples in the Gunpowder River and all of the samples in the Bird River exceeded the listing threshold, demonstrating that a PCB impairment exists within the rivers.

Since the overall objective of the tPCB TMDL for the Bush 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. The tPCB fish tissue listing threshold was translated into an associated tPCB water column concentration as the water quality model only simulates tPCB water column and sediment concentration and does not incorporate a food web model to predict tPCB fish tissue concentrations. This was accomplished using the Adjusted Total Bioaccumulation Factors (Adj-tBAF) of 675,050 L/kg for the Gunpowder River and 1,782,764 L/kg for the Bird River respectively, the derivation of which follows the method applied within the Potomac River tPCB TMDLs (Haywood and Buchanan, 2007). 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 their home range to produce the Adj-tBAF per species (see Appendix B for further details regarding the calculation of the Adj-tBAF). The most environmentally conservative of the Adj-tBAFs is then selected to calculate the TMDL endpoint water column concentration. This final water column tPCB concentration was then subsequently compared to the water column tPCB criteria concentrations, to ensure that all applicable criteria within the embayment would be attained. Based on this analysis, the water column tPCB concentrations of 0.06 ng/L and 0.022 ng/L, derived from the tPCB fish tissue listing threshold, are selected as the TMDL endpoints for the Gunpowder River and the Bird River respectively. These endpoints are more stringent than the value of 0.64 ng/L for human health and the freshwater chronic aquatic life tPCB criterion of 14 ng/L.

Similarly, in order to establish a tPCB TMDL endpoint for the sediment in the river, a target tPCB sediment concentration was derived from the tPCB fish tissue listing threshold, as the water quality model only simulates tPCB sediment concentrations and not tPCB fish tissue concentrations. This was done using the Adjusted Sediment Bioaccumulation Factor (Adj-SediBAF) of 24.92 (unitless) for the Gunpowder River and 34.45 (unitless) for the Bird River, respectively, the derivation of which follows the method applied within the Potomac River tPCB TMDLs (Haywood and Buchanan 2007). Similar to the calculation of the water column Adj-tBAF, 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 their home range to produce the Adj-SediBAF per species. Based on this analysis, the tPCB levels of 1.56 ng/g and 1.13 ng/g derived from the fish tissue listing threshold are set as the sediment TMDL endpoints in the Gunpowder River and the Bird River, respectively.

The CWA requires TMDLs to be protective of all the designated uses applicable to a particular waterbody. In addition to the "fishing" designated use, the TMDL is also supportive of the other applicable designated uses within the impaired waters including "marine and estuarine aquatic life", "shellfish harvesting", and "water contact recreation". The water column endpoint tPCB concentrations that are used in the Gunpowder River and Bird River tPCB analysis are more stringent than Maryland's freshwater aquatic life chronic criterion tPCB water column concentration. This indicates that the TMDLs are protective of the "aquatic life" designated use, specifically the protection of "marine and estuarine aquatic life and shellfish harvesting". The designated use for "water contact recreation" is not associated with any potential human health risks due to PCB dermal exposure.

EPA finds 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 *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 Gunpowder River and Bird River subsegments of the Gunpowder River Oligohaline Segment 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 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 tidally averaged multi-segment one-dimensional transport 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 96.41 g/year for the Gunpowder River and 10.49 g/year for the Bird 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 per year for the average annual load and in grams per 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 and Table 2 above.

Attainment of the site-specific tPCB water quality TMDL endpoints is expected to take place over time as watershed reductions are implemented and the Chesapeake Bay mainstem tPCB concentrations continue to decline, which also results in the natural attenuation of tPCB levels in the surface layer of the sediments (i.e., the covering of contaminated sediments with newer, less contaminated materials, flushing of sediments during periods of high stream flow, and biodegradation). According to the resultant TMDL scenario and assuming that the tPCB concentrations in the Chesapeake Bay mainstem will continue to decline, at or above the current rate of 6.5% per year, the Gunpowder River will achieve the sediment and water column TMDL endpoint tPCB concentrations in 49 years without any load reductions from the either Gunpowder River or Bird River watersheds. Alternatively, the Bird River requires a load reduction of 70% from point and non-point source categories in order to meet the TMDL endpoint tPCB concentrations in 93 years if natural attenuation in the Chesapeake Bay mainstem occurs at or above the rate of 6.5% per year.

Load Allocations

The TMDL summaries in Table 1 and Table 2 contain the LAs for the Gunpowder River and Bird River, respectively. 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 nonpoint sources of tPCBs identified in the Gunpowder River watershed include the Chesapeake Bay mainstem tidal influence, inputs from Gunpowder Falls and Little Gunpowder Falls, direct atmospheric deposition to the river, and runoff from non-regulated areas within the Gunpowder and Bird River watersheds. Non-point sources of PCBs in the Bird River watershed include loads from tidal exchange with the Gunpowder River, direct atmospheric deposition to the Bird River, and runoff from non-regulated areas of the Bird River watershed. 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 and thus not assigned a tPCB baseline load or TMDL allocation. Point Sources in the Gunpowder River watershed include NPDES-regulated industrial process water facilities and stormwater discharges regulated under Phase I and Phase II of the NPDES stormwater program. Point sources in the Bird River watershed include stormwater discharges regulated under Phase I and Phase II of the NPDES stormwater program.

Model simulation results show that both the water column and sediment tPCB targets in the Gunpowder River will be met in about 49 years when loads from the Chesapeake Bay maintstem are reduced by 96% through natural attenuation, requiring no other reductions in baseline loads from the Gunpowder or Bird River watersheds. For the Bird River, model simulation results show that both water column and sediment tPCB targets will be met in about 93 years with natural attenuation and a tPCB load reduction of 70% from the Bird River direct drainage.

Wasteload Allocations

As mentioned above, there are numerous permitted point sources within the Gunpowder River watershed that could potentially convey PCBs to the Gunpowder River Oligohaline Segment. Point Sources include one industrial process water facility and 17 stormwater discharges regulated under Phase I and Phase II of the NPDES stormwater program, industrial facilities permitted for stormwater discharges, and construction sites. There are two other industrial process water facilities in this watershed which have been determined to have no potential to discharge PCBs and are therefore not assigned baseline or wasteload allocations. In the Bird River watershed, there are 24 stormwater discharges regulated under Phase I and Phase II of the NPDES stormwater program, industrial facilities permitted for stormwater discharges, and construction sites, which have potential to convey PCBs to the Bird River. There is one industrial process water facility in this watershed which has been determined to have no potential to discharge PCBs and is therefore not assigned baseline or wasteload allocations.

The WLA for the Gunpowder River watershed are 5.74 g/year and 9.30 g/year for the industrial process water facility and NPDES Regulated Stormwater dischargers, respectively. Point source loads account for 60.0% of the total tPCB baseline load. See discussion above on how the baseline loads were calculated. Wasteload allocations assigned to point sources in the final TMDL scenario represent a 91% reduction from the point source tPCB baseline load. The WLA for the Bird River watershed is 1.92 g/year for the NPDES Regulated Stormwater dischargers. Point source loads account for 9.7% of the total tPCB baseline load and allocations represent a 70% reduction from the point source tPCB baseline load.

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 memorandum (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.

4) The TMDLs consider critical environmental conditions.

Federal regulations require that TMDL analysis take into account the impact of critical conditions and seasonality on water quality (CFR 2015b). The intent of these requirements is to ensure that load reductions required by this TMDL, when implemented, will produce water quality conditions supportive of the designated use at all times.

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 conditions 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 for the Gunpowder River and Bird River subsegments of the Gunpowder River Oligohaline Segment 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" designated use in the Gunpowder River and Bird River.

5) The TMDLs consider seasonal environmental variations.

The TMDL for the Gunpowder River and Bird River subsegments of the Gunpowder River Oligohaline Segment 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 Gunpowder and Bird Rivers 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

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

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 Gunpowder River and Bird River.

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 into the TMDL through conservative assumptions in the analysis (i.e. implicit).

Uncertainty within the model framework used in this study includes 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 5% MOS, in order to provide an adequate and environmentally protective TMDL.

7) The TMDLs have been subject to public participation.

MDE provided an opportunity for public review and comment on the tPCB TMDL for the Gunpowder River and Bird River subsegments of the Gunpowder River Oligohaline Segment. The public comment period was open from August 20, 2015, through September 18, 2015. MDE received 13 written comments during the public comment period and adequately responded. A copy of the comment response document was included in the final TMDL submittal to EPA.

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. For nonpoint sources, MDE includes a discussion of how LAs will be implemented.

As discussed in the previous sections, the resuspension and diffusion from the bottom sediments have been identified as the major source of PCBs to the Gunpowder River and the Bird River. However, the loads from resuspension and diffusion from bottom sediments are not considered to be directly controllable (reducible) loads and are considered as internal loads within the modeling framework of the TMDL, so they are not included in the tPCB baseline load and TMDL allocation.

Based on the Ko & Baker study it is assumed that the tPCB concentrations in the Chesapeake Bay mainstem are decreasing at a rate of 6.5% per year. Given this rate of decline,

and that PCBs are no longer manufactured and their use has been substantially restricted, the tPCB levels in the Gunpowder River and Bird River are expected to decline over time due to natural attenuation through processes such as the burial of contaminated sediments with newer, cleaner materials, flushing of sediments during periods of high stream flow, and biodegradation. Model scenarios predict that with the natural attenuation of tPCB concentrations in the Chesapeake Bay mainstem and in the industrial process facility, the tPCB TMDL endpoints in both water column and sediment of the Gunpowder River embayment will be met in about 49 years. For the Bird River, the tPCB TMDL endpoints in both water column and sediment will be met in about 93 years with a 70% load reduction from the Bird River watersheds and direct atmosphere deposition to the river surface. Loads from the watershed include a non-regulated watershed source load and a NPDES-regulated stormwater load.

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 Gunpowder River and Bird 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 weighed as the removal of contaminated sediment may potentially damage the habitat and health of existing benthic and fish communities. If the PCB-contaminated sediments were removed, load reductions would still be required under the TMDL, since PCBs would continue to enter the Gunpowder and Bird Rivers from the mainstem of the Chesapeake Bay and from the Gunpowder River and Bird River watersheds. However, the removal of these sediments could also mean that water quality supportive of the "fishing" designated use would be achieved in a shorter time frame.

Additionally, 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 Gunpowder and Bird River watersheds.

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 2015c). 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 Gunpowder River and

Bird River, will also contribute toward tPCB load reductions and meeting PCB water quality goals. Implementation of similar restoration measures within other jurisdictions in the Chesapeake Bay watershed would also contribute additional reductions to PCB loadings from the Gunpowder and Bird River watersheds 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 WWTP and stormwater control agency permits will be expected to be consistent with the WLAs presented in this report. Numerous stormwater dischargers are located in the Gunpowder River and the Bird River watersheds including two Municipal Phase I MS4s, the SHA Phase I MS4, industrial facilities, and any construction activities on area greater than 1 acre.

Given the persistent nature of PCBs, the difficulty in removing them from the environment and the significant watershed load reductions necessary in order to achieve water quality goals in the Gunpowder River and the Bird River, effectiveness of the implementation effort will need to be reevaluated throughout the process to ensure progress is being made towards reaching the TMDLs. MDE also periodically monitors and evaluates 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.

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