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

Mr. Matthew Rowe, Assistant Director
Water and Science Administration
Maryland Department of the Environment
1800 Washington Boulevard., Suite 540
Baltimore, Maryland 21230-1718

JUL 02 2018

Dear Mr. Rowe:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the sediment total maximum daily load (TMDL) for the non-tidal Patuxent River Middle watershed. The TMDL report, *Total Maximum Daily Load of Sediment in the Non-Tidal Patuxent River Middle Watershed, Anne Arundel, Calvert, and Prince George's Counties, Maryland,* was submitted by the Maryland Department of the Environment (MDE) to EPA for final review on June 4, 2018. 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 8-digit Patuxent River Middle watershed (MD-02131102) was originally identified in Maryland's 2002 Integrated Report as impaired for aquatic life use due to impacts to biological communities. The listing was based on the biological assessment methodology, which uses aquatic health scores. In the 2014 Integrated Report and as a result of a biological stressor identification analysis report prepared by MDE, the 2002 aquatic life use impairment (biological listing) for the non-tidal Maryland 8-digit Patuxent River Middle watershed was refined to identify the pollutant of concern, and the watershed was listed as impaired by total suspended solids (TSS) and sulfates, which require TMDLs. The TMDL established herein by MDE addresses the TSS listing as identified on MDE's 2016 Section 303(d) List. TMDLs were established for the tidal streams impaired by sediment and formerly considered part of the Maryland 8-digit Patuxent River Middle watershed as part of the Chesapeake Bay sediment TMDLs established by EPA in 2010.

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 sediment TMDL for the non-tidal Patuxent River Middle watershed 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 Jillian Adair, Maryland TMDL coordinator, at 215-814-5713 or adair.jillian@epa.gov.

Sincerely,

Dominique Lueckenhoff, Acting Director
Water Protection Division

Enclosure

cc : Melissa Chatham, MDE-WSA

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

Decision Rationale
Total Maximum Daily Load of Sediment in the Non-Tidal Patuxent River Middle Watershed Anne Arundel, Calvert, and Prince George's Counties, Maryland

Dominique Lueckenhoff

Dominique Lueckenhoff, Acting Director
Water Protection Division

Date: 7/2/18

Decision Rationale
Approval of Total Maximum Daily Load of Sediment
In the Non-Tidal Patuxent River Middle Watershed,
Anne Arundel, Calvert, and Prince George's Counties, 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 (WQS). A TMDL establishes a target for the total load of a particular pollutant that a water body can assimilate and divides that load into wasteload allocations (WLAs), given to point sources, load allocations (LAs), given to nonpoint sources and natural background, and a margin of safety (MOS), which accounts for any uncertainty.

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDL for sediment in the non-tidal Patuxent River Middle watershed, which addresses the Total Suspended Solids (TSS) impairment in the non-tidal Maryland 8-Digit Patuxent River Middle watershed (MD-02131102) as identified on Maryland's 2016 Section 303(d) List. The TMDL was established to address impairments of water quality, caused by Sediment/TSS. The report, *Total Maximum Daily Load of Sediment in the Non-Tidal Patuxent River Middle Watershed, Anne Arundel, Calvert, and Prince George's Counties, Maryland,* was submitted by Maryland Department of the Environment (MDE) to EPA for final review on May 16, 2018. EPA requested one revision and the report was re-submitted for final action on June 4, 2018.

EPA's rationale is based on the TMDL Report and information in the files provided to EPA by MDE. EPA's review determined that the TMDL meets 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 WLAs and 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, the terms TSS and sediment may be used interchangeably, consistent with MDE's Biological Stressor Identification (BSID) as discussed below. All references noted in this document can be found in the TMDL report.

II. Summary

The TMDL specifically allocates the allowable sediment loading and applies only to the non-tidal, 1st-4th order streams contained in the Maryland 8-digit Patuxent River Middle watershed (MD-02131102). TMDLs were established for the tidal streams impaired by sediment and formerly

considered part of the Maryland 8-digit Patuxent River Middle watershed as part of the Chesapeake Bay sediment TMDLs established by EPA in 2010.

The sediment TMDL for the non-tidal Patuxent River Middle watershed is expressed in Table 1 as an average annual load in tons per year because it was calculated so as to not cause any sediment related impacts to aquatic life. The daily loads are presented in tons per day in Table 2, the calculation of which is explained in Appendix B of the TMDL report. The TMDL is the sum of the LAs, national pollutant discharge elimination system (NPDES) Stormwater WLA, Wastewater WLA, and an implicit MOS. The LAs include nonpoint source loads generated within the non-tidal Patuxent River Middle watershed and the WLAs include point source loads generated from permitted discharges. There are 16 permitted point sources, in addition to those covered under the MDE general construction permit, in the TMDL watershed and assigned WLAs in this TMDL[1].

Table 1: Patuxent River Middle Average Annual TMDL of Sediment/TSS (ton/yr)

TMDL (ton/yr)	=	LA_{PRM}	+	NPDES Stormwater WLA_{PRM}	+	Wastewater WLA_{PRM}	+	MOS
2,617	=	2,253	+	351	+	13	+	Implicit

Table 2: Patuxent River Middle Maximum Daily Load of Sediment/TSS (ton/day)

MDL (ton/day)	=	LA_{PRM}	+	NPDES Stormwater WLA_{PRM}	+	Wastewater WLA_{PRM}	+	MOS
7.8	=	6.7	+	1	+	0.08	+	Implicit

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 Patuxent River Middle watershed is located within Anne Arundel, Calvert, and Prince George's Counties, Maryland and has a population of approximately 13,300 (US Census Bureau 2010). The watershed is associated with two assessment units in Maryland's Integrated Report: a non-tidal 8-digit watershed (02131102) and an estuary portion. As set forth in footnote 2, a separate TMDL has been established to achieve applicable water quality standards in PAXTF and other Chesapeake Bay segments, and this TMDL is limited to impairments in the non-tidal MD-02131102 segment. For simplicity, further reference in this document to the Patuxent River Middle watershed refers only to the non-tidal Maryland 8-digit watershed (02131102). The total drainage area of the Maryland 8-digit

1 The fact that the TMDL does not assign WLAs to any other sources in the watershed should not be construed as a determination by either EPA or MDE that there are no additional sources in the watershed that are subject to the NPDES program. In addition, the fact that EPA is approving this TMDL does not mean that EPA has determined whether some of the sources discussed in the TMDL, under appropriate conditions, might be subject to the NPDES program.

2 There is a sediment TMDL for the PAXTF segment of the Chesapeake Bay as part of the Chesapeake Bay TMDLs established by EPA in December 2010. The sediment allocations and reductions set forth in the Chesapeake Bay TMDLs, while applicable within the Patuxent River Middle watershed, are intended to resolve impairments in the Chesapeake Bay tidal segments, including but not limited to PAXTF, and were not intended to and do not address any impairment within the non-tidal MD-02131102 segment. The sediment allocations and reductions in this TMDL are intended to address sediment impairments within the non-tidal MD-02131102 segment.

Patuxent River Middle watershed is approximately 55,200 acres, not including water/wetlands, and the land-use distribution consists primarily of forest (65 percent), agricultural (20 percent), and urban lands (15 percent).

The Patuxent River Middle watershed was originally listed for biological impairment on the 2002 Integrated Report. The original listing was based on the biological assessment methodology, which uses aquatic health scores, consisting of the Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI). To further refine the biological listing, MDE conducted a Biological Stressor Identification (BSID) analysis, which applies a case-control, risk-based, weight-of-evidence approach to identify potential causes of biological impairment. MDE's BSID report states that the degradation of biological communities in the Patuxent River Middle watershed is strongly associated with anthropogenic impacts, channel alteration, severe erosion, high sulfates, high total phosphorus, and low acid neutralizing capacity. Overall, stressors within the sediment parameter grouping were identified as having a statistically significant association with impaired biological communities at approximately 68 percent of the sites with BIBI and/or FIBI scores significantly less than 3.0 throughout the watershed (MDE 2014b). In the 2014 Integrated Report and as a result of the BSID analysis, the 2002 aquatic life use impairment (biological listing) for the non-tidal Maryland 8-digit watershed was refined and identified the watershed as impaired by TSS and sulfates, which require TMDLs. The TMDL established herein by MDE addresses the TSS listing for the non-tidal 8-digit Patuxent River Middle (MD-02131102) as identified in MDE's 2016 Integrated Report.

To quantify the impact of sediment on the aquatic life of non-tidal stream systems, a reference watershed TMDL approach was used, which resulted in the establishment of a *sediment loading threshold* (MDE 2006). This threshold is based on a detailed analysis of sediment loads from watersheds that are identified as supporting aquatic life (i.e., reference watersheds) based on Maryland's biological assessment methodology (Roth *et al.* 1998, 2000; Stribling *et al.* 1998; MDE 2014c). Seven reference watersheds were identified in the Coastal Plain physiographic region for use in the TMDL. To further reduce the effect of variability within the Coastal Plain physiographic region (i.e., soils, slope, etc.), the watershed sediment loads were then normalized by a constant background condition, the all forested watershed condition. The *all forested sediment load* is a modeled simulation of what the sediment load would be if the watershed were in its natural all forested state, instead of its current mixed land use, and is calculated using the Chesapeake Bay Program Phase 5.3.2 model. The *forest normalized sediment load* is calculated as the current watershed sediment load divided by the *all forested sediment load.* This new normalized term, defined as the *forest normalized sediment load,* represents how many times greater the current watershed sediment load is than the *all forested sediment load.* Reference watershed *forest normalized sediment loads* were calculated and the median (50^{th} percentile) and 75^{th} percentile of the reference watershed *forest normalized sediment loads* (also referred to as the *sediment loading threshold*) were calculated and found to be 3.9 and 4.5, respectively. The *forest normalized sediment load* for the Patuxent River Middle watershed, estimated as 5.7, was calculated to best represent current conditions. A comparison of the Patuxent River Middle watershed *forest normalized sediment loads* to the *forest normalized reference sediment load* demonstrates that the watershed exceeds the *sediment loading threshold*, indicating that it is receiving loads above the maximum allowable load that it can sustain and still meet water quality standards. This threshold is then used to determine a watershed specific sediment TMDL endpoint, which represents the maximum allowable load the waterbody can receive without causing any sediment related impacts to aquatic health.

The allowable load for the impaired watershed is calculated as the product of the *sediment loading threshold* (determined from watersheds with a healthy biological community) and the Patuxent River Middle *all forested sediment load.* It was determined that the non-tidal Maryland 8-Digit Patuxent River Middle average annual TMDL of sediment/TSS is 2,617 ton/yr (a 31% reduction from the baseline load). This TMDL consists of point and nonpoint source allocations and is comprised of a Load Allocation (LA) of 2,253 ton/yr, a NPDES Stormwater Waste Load Allocation (NPDES Stormwater WLA) of 351 ton/yr, and a Process Water Waste Load Allocation (Process Water WLA) of 13 ton/yr. See Table 1, above.

IV. Discussion of Regulatory Conditions

EPA finds that MDE has provided sufficient information to meet all seven of the basic requirements for establishing a sediment TMDL for the Patuxent River Middle watershed. EPA, therefore, approves this sediment TMDL for the non-tidal Patuxent River Middle watershed. This approval is outlined below according to the seven regulatory requirements.

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. The Patuxent River Middle watershed's nontidal tributaries are designated as Use Class I - *water contact recreation, and protection of nontidal warmwater aquatic life.*[3] This TMDL focuses primarily on the protection of the aquatic life designated use because the Integrated Report listing was based on a biological assessment of the watershed. However, the required reductions are expected to protect all designated uses of the watershed, including water contact recreation. It is understood that aquatic life is more sensitive to sediment impacts than recreation because aquatic life impacts result from continuous exposure that can affect respiration and propagation. Recreation, on the other hand, is sporadic and sediment is unlikely to pose a human health risk due to dermal contact or minimal ingestion that would occur during recreation.

The impairment of the Patuxent River Middle watershed is caused in part by an elevated sediment load beyond a level that the watershed can sustain, which causes sediment related impacts that cannot support aquatic life. The BSID analysis for the Patuxent River Middle watershed identified TSS/sediment and inorganic water chemistry parameters as stressors that impact aquatic life. Sediment load reductions are expected to result in an increase in the number of benthic sensitive species present, an increase in the available and suitable habitat for a benthic community, a possible decrease in fine sediment (fines), and improved stream habitat diversity, all of which will result in improved water quality. The sediment TMDL established herein reduces sediment loads, and subsequent effects on aquatic life in the 1st through 4th order streams in the Maryland 8-Digit non-tidal Patuxent River Middle watershed, to levels consistent with those that support the designated uses in the reference watersheds. EPA finds these are reasonable and appropriate water quality goals.

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3 Tidal tributaries and the Patuxent River Middle mainstem are designated Use Class II - *support of estuarine and marine aquatic life and shellfish harvesting* (COMAR 2016a, b, c).

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 sediment TMDL was developed to address the sediment listings for the 1st through 4th order tributaries in the Maryland 8-Digit non-tidal Patuxent River Middle watershed and is consistent with 40 CFR §130.2(i) because the total loads provided by MDE equal the sum of the WLAs for point sources and the land-based LAs for nonpoint sources.

In the TMDL calculation, the allowable load for the impaired watershed is calculated as the product of the *sediment loading threshold* (determined from watersheds with a healthy biological community) and the Patuxent River Middle all *forested sediment load* (see Section 4.2 of the TMDL report). The resulting load is considered the maximum allowable load the watershed can sustain and support aquatic life. The sediment TMDL for the Patuxent River Middle watershed was calculated to be 2,617 ton/yr. The sediment TMDL and allocations are presented as mass loading rates of tons per year for the average annual load and tons per day for the maximum daily load.

Expressing TMDLs as annual average and maximum daily mass loading rates 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, toxicity, or other appropriate measure.* The annual average sediment loads are presented in Table 1 and the maximum daily sediment loads are presented in Table 2, above. The Patuxent River Middle Baseline Load and TMDL are presented in Table 3.

Table 3: Patuxent River Middle Baseline Load, TMDL, and Total Reduction Percentage

Baseline Load (ton/yr)	TMDL (ton/yr)	Total Reduction (%)
3,806	2,617	31

Load Allocations

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 TMDL summary in Table 1, above, contains the LA for the Patuxent River Middle watershed.

As indicated above, the computational framework chosen for the Patuxent River Middle sediment TMDL was the CBP P5.3.2 watershed model 2009 Progress Scenario EOS sediment loads. Individual land-use EOS loads are calculated within the CBP P5.3.2 watershed model as a product of the land use area, land use target edge-of-field (EOF) loading rate, and loss from the EOF to the main channel (i.e., sediment delivery factor). For the 2009 Progress Scenario, Best Management Practice (BMP) data and reduction efficiencies are then subsequently applied to produce the final EOS loads.

In order to attain the TMDL loading cap calculated for the watershed, reductions were applied to

the predominant sources (i.e., significant contributors of sediment to the stream system). If only these predominant sources are controlled, the TMDL can be achieved in the most effective, efficient, and equitable manner. Individual LAs for these nonpoint land-use sectors were calculated using the allocation methodology in the Maryland Phase I WIP (MDE 2010). The allocations were calculated by applying equal reductions to the reducible loads of all sectors. The reducible load is defined as the difference between the No Action (NA) scenario and the "Everything, Everyone, Everywhere" (E3) scenario. The NA scenario represents current land-uses without any sediment controls applied, while the E3 scenario represents the application of all possible BMPs and control technologies to current land-use.

Land uses that contributed less than one percent of the total load were not reduced as they would produce no discernible reductions. In the Patuxent River Middle watershed, pasture, crop, nursery, and unregulated urban land were identified as predominant nonpoint sources of sediment and assigned reductions. Additionally, forest was not assigned reductions, as it represents the most natural condition in the watershed. Table 4 provides allocations of the nonpoint source sediment loads in the Patuxent River Middle Watershed.

Table 4: Patuxent River Middle Sediment TMDL Allocation by Nonpoint Source Category (tons/year)

General Land Use	Detailed Land-Use	Baseline Load	LA	Reduction
Forest	Forest	430	430	0%
	Harvested Forest	32	32	0%
AFOs	Animal Feeding Operations	7	7	0%
Pasture	Pasture	132	115	13%
Crop	Crop	2,368	1,569	34%
Nursery	Nursery	73	59	19%
Unregulated urban	Unregulated urban	90	41	54%
Total		**3,132**	**2,253**	**28%**

Note: [1]The source categories represent aggregates of multiple sources (e.g., crop is an aggregate of high till, low till, and hay).

Wasteload Allocations

WLAs have been calculated for NPDES regulated individual industrial permits, individual municipal permits, individual and general MS4 permits, general mining permits, general industrial stormwater permits, and the general permit for stormwater discharges from construction sites in the Patuxent River Middle watershed. The permits can be grouped into two categories, wastewater and stormwater. The WLAs and NPDES stormwater permits are provided in Tables 5 – 7.

The wastewater category includes those loads generated by continuous discharge sources whose permits have TSS limits (i.e., contributors to the watershed sediment load). Other permits within the wastewater category that do not meet these conditions are considered *de minimis* in terms of the total watershed sediment load. There are two industrial and four municipal wastewater facilities within the Patuxent River Middle watershed that contribute to the overall sediment load. The WLAs for the facilities are calculated based on the TSS limits and corresponding flow information (Table 5).

The stormwater category includes all NPDES regulated stormwater discharges, both general and individual. In the Patuxent River Middle watershed, these include the Anne Arundel and Prince George's County Phase I MS4 permits, the Phase I State Highway Administration (SHA) MS4 permit, and other general Phase II NPDES stormwater permits. See Table 7, below. These stormwater permits make use of Best Management Practices (BMPs) and do not include numeric TSS limits. In the absence of numeric TSS limits, the baseline loads for these NPDES regulated stormwater discharges are calculated using the urban land-use EOS loads as calculated within the CBP P5.3.2 watershed model. The associated WLAs are calculated by applying reductions to the urban land use.

Individual WLAs have been calculated for the Anne Arundel and Prince George's County Phase I MS4 permits and the SHA Phase I MS4 permit. An aggregate WLA has been calculated for the other other NPDES stormwater permits, including general MS4s, all industrial facilities permitted for stormwater discharges, and general construction permits. This aggregate WLA is referred to as the "Other NPDES regulated stormwater" WLA. See Table 6, below.

In order to calculate the NPDES stormwater WLA, MDE further refined the CBP P5.3.2 urban land-use. For any given watershed, the refined CBP P5.3.2 land-use contains the specific level of detail needed to determine individual WLAs for Phase I MS4s, the State Highway Administration (SHA) Phase I MS4, and Phase II county MS4s, and an aggregate WLA for "Other NPDES Regulated Stormwater" entities.

Table 5: Patuxent River Middle Sediment TMDL Wastewater Point Source WLAs

Facility Name	NPDES #	Permit Type	Baseline Load (ton/yr)	WLA (ton/yr)	Reduction (%)	MDL (ton/day)
Brandywine Flyash Site	MD0054836	Industrial	3	3	0	0.02
Harwood Landfill, Inc.	MD0066087	Industrial	7	7	0	0.04
Boones MHP	MD0050903	Municipal	1	1	0	0.008
Tracey's Elementary School	MD0069582	Municipal	0.2	0.2	0	0.002
Lyons Creek Mobile Home Park WWTP	MD0053511	Municipal	1	1	0	0.009
NVA Properties, LLC	MD0052680	Municipal	0.5	0.5	0	0.004

Table 6: Patuxent River Middle Sediment TMDL Allocations for NPDES Regulated Stormwater WLAs

NPDES Regulated Stormwater Sector	NPDES #	Baseline Load (ton/yr)	WLA (ton/year)	WLA (ton/day)	Reduction (%)
Anne Arundel County Phase I MS4	MD0068306	162	71	0.2	56
Prince George's County Phase I MS4	MD0068284	158	69	0.2	56
SHA Phase I MS4	MD0068276	51	22	0.06	56
"Other NPDES Regulated Stormwater"[1]	N/A	290	189	0.54	35
Total		**661**	**351**	**1**	**47**

Note: [1]See Table 7 below for a list of NPDES Stormwater Permits that identifies the "Other NPDES Regulated Stormwater" permits.

Table 7: Patuxent River Middle Watershed NPDES Stormwater Permits

NPDES Permit #	Facility Name	NPDES Regulated Stormwater WLA Sector
MD0068306	Anne Arundel County	County Phase I MS4
MD0068284	Prince George's County	County Phase I MS4
MD0068276	State Highway Administration (SHA)	SHA Phase I MS4
MDG498042	Brandywine Ent/cross Trails Operation/	Other NPDES Regulated Stormwater
MDG490170	Lee Pit # 1	Other NPDES Regulated Stormwater
MDG499725	Reliable Contracting – Asphalt Plant	Other NPDES Regulated Stormwater
MDG493000	Rockhill Sand and Gravel Corp. / Gudelsky Materials	Other NPDES Regulated Stormwater
MDR003258	Brandywine Flash Site	Other NPDES Regulated Stormwater
MDR001841	City of Laurel DPW Maintenance Facility	Other NPDES Regulated Stormwater
MDR001750	Insurance Auto Auctions, Inc	Other NPDES Regulated Stormwater
MDRC[1]	MDE General Permit to Construct	Other NPDES Regulated Stormwater

Note: [1]Permit does not have a state issued NPDES number.

Federal regulations at 40 CFR §122.44(d)(1)(vii)(B) require that, for a 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 the assumptions and requirements of WLAs established for that point source. It is 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 TMDLs are consistent with the regulations and requirements of 40 CFR Part 130.

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

The TMDL considers the impact of background pollutants by considering the sediment load from natural sources such as forested land. The CBP P5.3.2 model also considers background pollutant contributions by incorporating all land uses.

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 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[4]. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable worst-case scenario condition.

The biological monitoring data used to determine the reference watersheds reflect the impacts of stressors (i.e., sediment impacts to stream biota) over the course of time and therefore depict a long-term average stream condition (i.e., captures all high and low flow events). Since the TMDL endpoint is based on the median of forest normalized loads from watersheds assessed as having good biological conditions (i.e., passing Maryland's biological assessment), by the nature of the biological data described above, it must inherently include the critical conditions of the reference watersheds. Therefore, since the TMDL reduces the watershed sediment load to a level compatible with that of the reference watersheds, critical conditions are inherently addressed. Moreover, the sediment loading rates used in the TMDL were determined using the CBP P5.3.2 model, which is a continuous simulation model with a simulation period 1991-2000, based on Hydrological Simulation Program Fortran (HSPF) model, thereby addressing annual changes in hydrology and capturing wet, average, and dry years

5. *The TMDLs consider seasonal environmental variations.*

This TMDL accounts for seasonality through various methods. It is implicitly included through the use of the biological monitoring data since it reflects the impacts of stressors over time, as described above. Also, the MBSS dataset included benthic sampling in the spring (March 1 - April 30) and fish sampling in the summer (June 1 - September 30). Benthic sampling in the spring allows for the most accurate assessment of the benthic population, and therefore provides an excellent means of assessing the anthropogenic effects of sediment impacts on the benthic community. Fish sampling is conducted in the summer when low flow conditions significantly limit the physical habitat of the fish community, and it is also most reflective of the effects of anthropogenic stressors. Moreover, the sediment loading rates used in the TMDL were determined using the CBP P5.3.2 model, which is a continuous simulation model with a simulation period 1991-2000, based on Hydrological Simulation Program Fortran (HSPF) model, thereby addressing annual changes in hydrology and capturing wet, average, and dry years.

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 and explicit term, and the other approach is to incorporate the MOS implicitly as part of the design conditions. MDE has adopted an implicit MOS for this TMDL. The reference watershed forest normalized EOS loads were chosen in a conservative manner. Analysis of the reference group forest normalized sediment loads

[4] EPA memorandum regarding 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.

indicates that the 75th percentile of the reference watersheds is a value of 4.5 and the median value is 3.9. Achieving a 75th percentile forest normalized sediment load would assure that the watershed falls within the range of unimpaired watersheds. However, for this analysis, the forest normalized reference sediment load (also referred to as the sediment loading threshold) was set at the median value of 3.9 (Currey et al. 2006). Use of the median as the threshold creates an environmentally conservative estimate, and results in an implicit MOS.

7. The TMDLs have been subject to public participation.

MDE provided an opportunity for public review and comment on the sediment TMDL for the Patuxent River Middle watershed. The public review and comment period was open from March 14, 2018, through April 12, 2018. MDE received one set of written comments from EPA and provided a comment response document that adequately addressed those comments.

In reaching our conclusions on approving the sediment TMDL for the Patuxent River Middle watershed, EPA appropriately considered information on the endangered and threatened species and their critical habitat in Maryland's waters identified by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS).

V. Discussion of Reasonable Assurance

When EPA establishes or approves a TMDL that allocates pollutant loads to both point and nonpoint sources, EPA considers whether there is a "reasonable assurance" that the point and nonpoint source loadings can be achieved and applicable water quality standards will be attained. WLAs will be implemented through the NPDES permit process. According to 40 CFR §122.44(d)(1)(vii)(B), the effluent limitations for a 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.

Implementation of the non-tidal Patuxent River Middle watershed sediment TMDL is expected to occur in parallel with implementation efforts to meet sediment target loads consistent with the 2010 Chesapeake Bay TMDLs. While the objectives of the two efforts differ, with the 2010 Bay TMDLs focused on tidal water quality and this TMDL targeting biological integrity in non-tidal streams, many of the sediment reductions achieved through implementation activities should result in progress toward both goals. The strategies for implementing the 2010 Bay TMDLs are described in Maryland's Phase I WIP (MDE 2010) and Phase II WIP (MDE 2012). The WIPs are the centerpieces of the state's "reasonable assurance" of implementation for the 2010 Bay TMDLs, and the strategies encompass a host of BMPs, pollution controls and other actions for all source sectors that cumulatively will result in meeting the state's 2025 targets. In particular, the implementation of practices to reduce sediment loadings from the urban stormwater sectors should result in decreased loads to the Patuxent River Middle watershed's non-tidal streams.

MDE published the Final Determination to Issue Stormwater Permit to Anne Arundel County in February 2014 and Prince George's County in January 2014. The permit states, "By regulation at 40 CFR §122.44, BMPs and programs implemented pursuant to this permit must be consistent with applicable WLAs developed under EPA approved TMDLs." Section IV.E. of the permit details requirements for Restoration Plans and Total Maximum Daily Loads. Within one year of permit issuance, the permittee is required to submit an implementation plan for each stormwater WLA

approved by EPA prior to the effective date of the permit. For TMDLs approved after the permit, implementation plans are due within one year of USEPA approval of the TMDL. Implementation plans should include the following: a detailed implementation schedule, the final date for meeting applicable WLAs, a detailed cost estimate for all elements of the plan, a system that evaluates and tracks implementation through monitoring or modeling to document progress towards meeting established benchmarks, deadlines, and stormwater WLAs, and a public participation program. An annual TMDL assessment report shall also be submitted to MDE. Stormwater retrofits can address both water quality and quantity. Examples of these retrofits include the reduction of impervious surfaces, modification of existing or installation of new stormwater structural practices, increased urban tree canopy, and stream restoration projects.

Generally speaking, urban areas that do not have NPDES permits do not have mandatory restoration requirements and restoration activities are largely voluntary. The State makes several efforts to encourage jurisdictions to conduct voluntary activities by providing technical assistance and funding opportunities to guide and support local actions. Several Maryland nonpoint source management programs address urban nonpoint sources, including Maryland Bay-Wise Program, Maryland Green Schools Awards, and the SMART Homeowner Reporting Program. Additionally, MDE is conducting outreach to non-MS4 jurisdictions regarding stormwater management requirements and retrofit BMPs. Funding sources for urban nonpoint source pollutants include: Federal 319(h) grants, Chesapeake and Atlantic Coastal Bays Trust Fund, and the State Revolving Loan Fund.

In agricultural areas, comprehensive soil conservation plans can be developed that meet criteria of the USDA-NRCS Field Office Technical Guide (USDA 1983). Soil conservation plans help control erosion by modifying cultural practices or structural practices. The reduction percentage attributed to cultural practices is determined based on changes in land-use, while structural practices have a reduction percentage of up to 25%. In addition, sediment loadings from livestock can be controlled via stream fencing and rotational grazing. Sediment reduction efficiencies of methods applicable to pasture land-use range from 40% to 75% (USEPA 2004). Lastly, riparian buffers can reduce the effect of agricultural sediment sources through trapping and filtering. In response to the WIP and the increased responsibility for local governments to achieve nutrient and sediment reduction goals, Maryland has continued to increase funding in the Chesapeake and Atlantic Coastal Bays Trust Fund. Some other examples of programs that can provide funding for local governments and agricultural sources include the Federal Nonpoint Source Management Program (§ 319 of the Clean Water Act), the Buffer Incentive Program (BIP), the State Water Quality Revolving Loan Fund and the Maryland Agricultural Water Quality Cost-Share Program.

In summary, through the use of the aforementioned funding mechanisms and BMPs, there is reasonable assurance that this TMDL can be implemented. For specific details about implementation and funding programs discussed here, refer to Section 5.0 of the TMDL report.