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

SEP 28 2017

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

Dear Mr. Currey:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the sediment TMDL for the non-tidal South River watershed. The TMDL report, *Total Maximum Daily Load of Sediment in the Non-tidal South River Watershed, Anne Arundel County, Maryland,* was submitted by the Maryland Department of the Environment (MDE) to EPA for final review on September 13, 2017. 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 MD 8-digit South River watershed (MD-02131003) 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. As a result of a biological stressor identification analysis report prepared by MDE, the 2002 aquatic life use impairment (biological listing) for this non-tidal MD 8-digit watershed was refined and identified the watershed as impaired by TSS/sediment and chlorides, which require a TMDL, and a lack of riparian buffer. The TMDL established herein by MDE addresses the TSS/Sediment listing as identified on MDE's 2014 Section 303(d) List.

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/TSS TMDL for the non-tidal South River 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.

Sincerely,

Signed

Kate McManus, Acting Director
Water Protection Division

Enclosure

cc : Melissa Chatham, MDE-WSA

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

Decision Rationale
Total Maximum Daily Load of Sediment in the Non-tidal South River Watershed Anne Arundel County, Maryland

Signed

Kate McManus, Acting Director
Water Protection Division

Date: 9/28/17

Decision Rationale
Approval of Total Maximum Daily Load of Sediment
In the Non-tidal South River Watershed,
Anne Arundel County, Maryland

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those waterbodies identified as impaired by the State where technology-based and other controls will not provide for attainment of water quality standards (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 South River Watershed. The TMDL was established to address impairments of water quality, caused by Sediment/Total Suspended Sediment (TSS), as identified in Maryland's 2014 Section 303(d) List. The Maryland Department of the Environment (MDE) submitted the report, *Total Maximum Daily Load of Sediment in the Non-tidal South River Watershed, Anne Arundel County, Maryland,* to EPA for final review on September 13, 2017. The TMDL in this report addresses the Sediment/TSS impairment in the MD 8-Digit South River Watershed (MD-02131003) (South River Watershed) as identified on Maryland's 2014 Section 303(d) List.

EPA's rationale is based on the TMDL Report and information in the computer 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.

II. Summary

The TMDL specifically allocates the allowable sediment loading and applies only to the non-tidal, 1st-4th order streams contained in the MD 8-digit South River watershed (MD-

02131003). The tidal streams impaired by sediment in the South River watershed were addressed by the Chesapeake Bay sediment TMDLs established by EPA in 2010. There are six permitted point sources, in addition to those covered under the MDE general construction permit, in the TMDL watershed and assigned WLAs. 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 National Pollutant Discharge Elimination System (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. The sediment TMDL is presented as an average annual load in tons per year because it was calculated so as to not cause any sediment related impacts to aquatic health. The daily loads are presented in tons per day. The calculation of the daily loads is explained in Appendix B of the TMDL report. The average annual MD 8-Digit Non-tidal South River Watershed TMDL is summarized in Table 1. The TMDL is the sum of the LAs, NPDES Stormwater WLA, Waste Water WLA, and implicit MOS. The LAs include nonpoint source loads generated within the South River watershed. The daily load is presented in Table 2. WLAs for permitted point sources are provided in Tables 3 and 4, while the NPDES stormwater permits are displayed in Table 5.

Table 1: South River Watershed Average Annual TMDL of Sediment/TSS (ton/yr)

TMDL (ton/yr)	=	LA_{SR}	+	NPDES Stormwater WLA_{SR}	+	Waste Water WLA_{SR}	+	MOS
1,546	=	495	+	1,050	+	1	+	Implicit

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

MDL (ton/day)	=	LA_{SR}	+	NPDES Stormwater WLA_{SR}	+	Waste Water WLA_{SR}	+	MOS
13.3	=	4.2	+	9.1	+	0.0085	+	Implicit

Table 3: South River Sediment TMDL Wastewater Point Source WLAs

Facility Name	NPDES #	Permit Type	Baseline Load (ton/yr)	WLA (ton/yr)	Reduction (%)	MDL (ton/day)
Summerhill Mobile Home Park WWTP	MD0023272	Municipal	1	1	0	0.085

Table 4: South River 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	966	698	6	28
SHA Phase I MS4	MD0068276	88	64	0.6	27
"Other NPDES Regulated Stormwater"[1]	N/A	390	288	2.5	26
Total		**1,444**	**1,050**	**9.1**	**27**

Note: [1]See Table 5 below for the list of "Other NPDES Regulated Stormwater" permits.

Table 5: South River Watershed NPDES Stormwater Permits

NPDES Permit #	Facility Name	NPDES Regulated Stormwater WLA Sector
MD0068306	Anne Arundel County	County Phase I MS4
MD0068276	State Highway Administration	SHA Phase I MS4
MDR001179[2]	Anne Arundel County Roads – Crownsville	Other NPDES Regulated Stormwater
MDR002298[2]	Anne Arundel County Roads – Davidsonville Yard	Other NPDES Regulated Stormwater
MDR001331[2]	SHA – Annapolis Shop	Other NPDES Regulated Stormwater
MDRC[1]	MDE General Permit to Construct	Other NPDES Regulated Stormwater

Note: [1]N/A: Permit does not have a NPDES number.

[2]For the industrial stormwater permits, the permit number listed is the MDE permit application number.

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 South River watershed is located entirely within central Anne Arundel County, Maryland. The watershed is located in the Coastal Plain eco-region. The South River watershed is associated with two assessment units in Maryland's Integrated Report: a non-tidal 8-digit watershed (02131003) and an estuary portion. The tidal river estuary portion is separately identified as the tidal South River Mesohaline Chesapeake Bay Segment (SOUMH). Sediment reductions are also required in the South River watershed to meet the sediment allocations assigned to the SOUMH segment as part of the Chesapeake Bay TMDLs[1], established by the EPA on December 29, 2010. The total drainage area of the Maryland 8-digit watershed is approximately 36,200 acres, not including water/wetlands. Approximately 300 acres of the watershed area is covered by water. The land-use distribution of the South River watershed consists primarily of forest (56.6%) and urban land (36.5%), with smaller amounts of crop (4.5%), pasture (1.4%), and water (0.8). The total population in the South River watershed is

[1]There is a sediment TMDL for the SOUMH 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 South River watershed, are intended to resolve impairments in the downstream Chesapeake Bay tidal segments and were not intended to and do not address any impairment within the non-tidal MD-02131003 segment. The sediment allocations and reductions in this TMDL are intended to address sediment impairments within the non-tidal MD-02131003 segment.

approximately 75,800 (US Census Bureau 2010).

There are no "high quality," or Tier II, stream segments (BIBI and FIBI aquatic life assessment scores > 4 [scale 1-5]) located within the South River watershed. Tier II segments would require the implementation of Maryland's anti-degradation policy (COMAR 2016d; MDE 2011).

MDE identified the waters of the South River watershed on the State's 2014 Integrated Report as impaired by multiple pollutants (MDE 2014a). This TMDL applies to the non-tidal 8-digit South River watershed (MD-02131003). The South River watershed was originally listed for biological impairment on the 2002 Integrated Report. That 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). MDE's Biological Stressor Identification (BSID) methodology identified TSS/sediment, instream habitat, riparian habitat, inorganic pollutants (i.e. chlorides), and low pH as stressors that impact aquatic life in the non-tidal South River watershed. As a result of the BSID analysis report, the 2002 aquatic life use impairment (biological listing) for the non-tidal MD 8-digit watershed was refined and identified the watershed as impaired by TSS/sediment and chlorides, which require a TMDL, and a lack of riparian buffer. The TMDL established herein by MDE addresses the TSS listing for the non-tidal 8-digit South River (MD-02131003) as identified in MDE's 2014 Integrated Report.

The sediment TMDL submitted by MDE ensures that watershed sediment loads are at a level that supports the Use Class I designation, which are discussed further below, for the non-tidal South River watershed (MD-02131003). Refer to Tables 1 and 2 above for a summary of allowable loads.

Currently in Maryland, there are no specific numeric criteria for suspended sediments. Therefore, to determine whether aquatic life is impacted by elevated sediment loads, MDE's BSID methodology was applied. The primary goal of the BSID analysis is to identify the most probable cause(s) for observed biological impairments throughout MD's 8-digit watersheds (MDE 2014d). The BSID analysis applies a case-control, risk-based, weight-of-evidence approach to identify potential causes of biological impairment. The risk-based approach estimates the strength of association between various stressors and an impaired biological community. The BSID analysis then identifies individual stressors as probable or unlikely causes of the poor biological conditions within a given watershed, and subsequently reviews ecological plausibility. Finally, the analysis concludes whether or not these individual stressors or groups of stressors are contributing to the impairment (MDE 2014d).

The BSID analysis determined that the biological impairment in the South River watershed is due in part to stressors within the sediment and instream habitat parameter groupings. Overall, stressors within the sediment parameter grouping were identified as having a statistically significant association with impaired biological communities at approximately 54% of the sites with BIBI and/or FIBI scores significantly less than 3.0 throughout the watershed (MDE 2014b). Therefore, since sediment is identified as a stressor to the biological communities in the South River watershed, the watershed has been listed as impaired by sediment in the Integrated Report, and a TMDL is required. The objective of the sediment TMDL established

herein is to reduce sediment loads, and their detrimental, negative effects on aquatic life in the South River watershed, to levels that support the Use Class I designation for the watershed.

The primary dataset for BSID analysis includes Maryland Department of Natural Resources (MDDNR)- Maryland Biological Stream Survey (MBSS) Round 2 and Round 3 data (collected between 2000-2009) because it provides a broad spectrum of paired data variables, which allow for a more comprehensive stressor analysis. MDDNR-MBSS Round 1 can also be used if there is limited Round 2 and 3 data. The MBSS is a robust statewide probability-based sampling survey for assessing the biological conditions of 1st through 4th order, non-tidal streams (Klauda et al. 1998; Roth et al. 2005). A total of 12 water quality monitoring stations were used to characterize the South River watershed for the purpose of this TMDL. The biological assessment was based on the combined results of MBSS Round 1 and Round 2 data, which includes ten stations. The BSID analysis used stations from MBSS Round 2 and Round 3, which includes eight stations.

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). This threshold is then used to determine a watershed specific sediment TMDL endpoint. The resulting loads are considered the maximum allowable loads the waterbody can receive without causing any sediment related impacts to aquatic health.

To use a reference watershed approach, sediment loads are estimated using the Chesapeake Bay Program Phase 5.3.2 (CBP P5.3.2) watershed model and specifically, the *edge-of-stream* (EOS) land-use sediment loads were used. The CBP P5.3.2 model was considered appropriate for this TMDL because the spatial domain of the model segmentation aggregates to the MD 8-digit watershed scale, which is consistent with the impairment listing.

The nonpoint source baseline sediment loads generated within the South River watershed are based on the EOS loads from the CBP P5.3.2 watershed model 2009 Progress Scenario. CBP P5.3.2 Progress Scenario EOS loads are calculated as the sum of individual land-use EOS loads within the watershed and represent a long-term average loading rate. 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 EOF loading rate, and loss from the EOF to the main channel. BMP data and reduction efficiencies are then subsequently applied to produce the final EOS loads. The loss from the EOF to the main channel is the *sediment delivery factor* and is defined as the ratio of the sediment load reaching a basin outlet to the total erosion within the basin. A *sediment delivery factor* is estimated for each land-use type based on the proximity of the land-use to the main channel. Thus, as the distance to the main channel increases, more sediment is stored within the watershed (i.e., *sediment delivery factor* decreases). Details of the data sources for the unit loading rates can be found in Section 2.2 of the TMDL report.

As stated above, a reference watershed TMDL approach was used and resulted in the establishment of a *sediment loading threshold.* Reference watersheds were determined based on Maryland's biological assessment methodology. The biological assessment methodology assesses biological impairment at the watershed scale based on the percentage of MBSS monitoring stations, translated into watershed stream miles, that have BIBI and/or FIBI scores lower than the Minimum Allowable IBI Limit (MAL). The MAL represents the threshold under which a watershed is listed as impaired for biology and is calculated based on the average annual allowable IBI value of 3.0 (on a scale of 1 to 5), the coefficient of variation of annual sentinel site results, and an assumed normal distribution. It accounts for annual variability and helps to avoid classification errors (i.e., false positives) when assessing for biological impairments (Roth *et al.* 1998, 2000; Stribling *et al.* 1998; MDE 2014c.

Comparison of watershed sediment loads to loads from reference watersheds requires that the watersheds be similar in physical and hydrological characteristics. To satisfy this requirement, MDE (2006) selected reference watersheds only from the Highland and Piedmont physiographic regions. This region is consistent with the non-coastal region that was identified in the 1998 development of FIBI and subsequently used in the development of BIBI (Roth *et al.* 1998; Stribling *et al.* 1998).

To further reduce the effect of the variability within the Coastal Plain physiographic regions (i.e., soils, slope, etc.), the watershed sediment loads were then normalized by a constant background condition, the all forested watershed condition. 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.* 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. It is calculated using the CBP P5.3.2 model. The *forest normalized sediment load* for this TMDL is calculated as the current watershed sediment load divided by the *all forested sediment load.*

Seven reference watersheds were identified in the Coastal Plain physiographic region. Reference watershed *forest normalized sediment loads* were calculated using CBP P5.3.2 watershed model 2009 Progress Scenario EOS loads. 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 median value of 3.9 was used as an environmentally conservative approach for establishing the sediment loading threshold for the TMDL.

The *forest normalized sediment load* for the South River watershed, estimated as 5.0, was also calculated using CBP P5.3.2 2009 Progress Scenario EOS loads, to best represent current conditions. A comparison of the South River 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.

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 South River *all forested sediment load.* The resulting load is considered the maximum allowable load the watershed can sustain and support aquatic life.

It was determined that the MD 8-Digit South River average annual TMDL of sediment/TSS is 1,546 ton/yr (a 22% reduction from the baseline load). This TMDL consists of point and nonpoint source allocations and is comprised of a Load Allocation (LA) of 495 ton/yr, an NPDES Stormwater Waste Load Allocation (NPDES Stormwater WLA) of 1,050 ton/yr, and a Process Water Waste Load Allocation (Process Water WLA) of 1 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 non-tidal South River watershed. EPA, therefore, approves this sediment TMDL for the South River 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 South River watershed's nontidal tributaries are designated as Use Class I - *water contact recreation, and protection of nontidal warmwater aquatic life.* Tidal tributaries and the South River mainstem are designated Use Class II - *support of estuarine and marine aquatic life and shellfish harvesting* (COMAR 2016a, b, c). Figure 1 of the TMDL report shows the different designated use classes of the South River watershed. As discussed above, the TMDL only applies to the 1st-4th order streams. 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 often avoided during times when sediment concentrations are likely to be highest (e.g. rainstorms). Sediment also poses no human health risk due to dermal contact or minimal ingestion that could occur during recreation.

The impairment of the South River watershed is caused 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 determined that the degradation of biological communities in the South River watershed is strongly associated with anthropogenic impacts, poor epifaunal substrate, marginal to poor and poor instream habitat structure, no riparian buffer, high chlorides, and low lab pH (MDE 2014b).

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 TMDL will not completely resolve the impairment to biological communities within the watershed since the BSID watershed analysis

also identifies other possible stressors impacting biological conditions (e.g. chlorides), and additional TMDL or TMDLs may be needed to address the impacts to biological communities. This impairment to aquatic life will only be fully addressed when all impairing substances identified as impacting biological communities in the watershed are reduced to levels that will meet water quality standards, as established in future TMDLs for those substances.

The sediment TMDL established herein reduces sediment loads, and subsequent effects on aquatic life in the 1st through 4th order streams in the MD 8-Digit non-tidal South River watershed, to levels that support the designated uses for the watershed. 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 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 for the South River watershed 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 South River 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. TMDL loading and associated reductions are averaged at the watershed scale and some subwatersheds may require higher reductions than others, depending on the distribution of the land-use. The sediment TMDL for the South River watershed was calculated to be 1,546 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 and maximum daily sediment loads are presented above in Tables 1 and 2, respectively.

The TMDL was developed to address the sediment listings for the 1st through 4th order tributaries in the MD 8-Digit non-tidal South River watershed.

The South River Baseline Load and TMDL are presented in Table 6.

Table 6: South River Baseline Load, TMDL, and Total Reduction Percentage

Baseline Load (ton/yr)	TMDL (ton/yr)	Total Reduction (%)
1,982	1,546	22

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 South River watershed.

As indicated above, the computational framework chosen for the South River 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 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 each nonpoint land-use sector were calculated using the allocation methodology in the MD Phase I WIP, which was designed to be equitable, effective, and consistent with water quality standards (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.

In the South River watershed, forest, harvested forest, animal feeding operations, crops, pasture, and nurseries were identified as nonpoint sources of sediment; although cropland was the only nonpoint source requiring reductions. Land uses that contributed less than 1% of the total load were not reduced as they would produce no discernible reductions. Additionally, forest was not assigned reductions, as it represents the most natural condition in the watershed. Table 7 provides one possible scenario for the allocations of the nonpoint source sediment loads in the South River Watershed.

Table 7: South River Sediment TMDL Allocation by Nonpoint Source Category (tons/year)

General Land Use	Detailed Land-Use	Baseline Load	LA	Reduction
Forest	Forest	222	222	0%
	Harvested Forest	16	16	0%
AFOs	Animal Feeding Operations	1	1	0%
Pasture	Pasture	9	9	0%
Crop	Crop	288	246	15%
Nursery	Nursery	1	1	0%

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 municipal permits, individual and general municipal separate storm sewer systems (MS4) permits, and the general permit for stormwater discharges from construction sites in the South River watershed. The permits can be grouped into two categories, waste water and stormwater. Information for the sediment WLAs in this TMDL are included in Tables 1-5, above.

The waste water category includes those loads generated by continuous discharge sources whose permits have TSS limits (i.e., contributors to the watershed sediment load). Other permits that do not meet these conditions are considered *de minimis* in terms of the total watershed sediment load. There is one Wastewater Treatment Plant (WWTP) within the South River watershed that contributes to the overall sediment load. The WLA for the wastewater permit is calculated based on its TSS limit and corresponding flow information.

The stormwater category includes all NPDES regulated stormwater discharges, both general and individual. In the South River watershed, these include the Anne Arundel County Phase I MS4 permit, the Phase I State Highway Administration (SHA) MS4 permit, and other general NPDES stormwater permits. These stormwater permits are regulated based on Best Management Practices (BMPs) and do not include TSS limits. In the absence of TSS limits, the baseline loads for these NPDES regulated stormwater discharges are calculated using the nonpoint source loads from the urban land use within the watershed. The associated WLAs are calculated by applying reductions to the urban land use.

Individual WLAs have been calculated for the Anne Arundel County Phase I MS4 permit and the SHA Phase I MS4 permit. Aggregate WLAs have been calculated for the other general NPDES stormwater permits. Other NPDES regulated stormwater permits include 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 Tables 4 and 5, above.

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 county Phase I MS4s, the State Highway Administration (SHA) Phase I MS4, and Phase II MS4s, and an aggregate WLA for "Other NPDES Regulated Stormwater" entities.

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

EPA has authority to object to the issuance of an NPDES permit that is inconsistent with WLAs established for that point source. It is 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[2]. 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

[2] 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.

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 an 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.

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 indicates that the 75th percentile of the reference watersheds is a value of 4.5 and the median value is 3.9. 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). The use of the median as the threshold creates an environmentally conservative estimate which 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 South River watershed. The public review and comment period was open from January 23, 2017, through February 21, 2017. MDE received one set of written comments and provided a comment response document that adequately addressed comments.

A letter was sent to the U.S. Fish and Wildlife Service (US FWS) pursuant to Section 7(c) of the Endangered Species Act, requesting the Service's concurrence with EPA's findings that approval of this TMDL does not adversely affect any listed endangered and threatened species, and their critical habitats.

V. Discussion of Reasonable Assurance

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

Since this TMDL is based on in-stream biological health, MDE stresses that planning of any implementation efforts related to this TMDL should give careful consideration to both sediment load reductions, and to the direct potential impacts on biological communities. The watershed cannot be delisted or classified as meeting water quality standards until it is demonstrated that the biological health of the stream system is no longer impaired by sediment. A practice that removes a modest load of TSS, but does not disturb aquatic life in the short-term, might provide more benefit to the watershed than one with the higher TSS removal potential, but with the potential to adversely impact existing aquatic life. Also, many of the implementation actions to address sediment could concurrently address the other stressors identified in the BSID report. For example, a stream restoration project that reduces sediment loads could improve epifaunal substrate and in-stream habitat. Since biological improvements will likely only be seen when multiple structural and pollutant stressors are addressed, watershed managers developing plans to address sediment should consider the effect of restoration projects on other stressors. Where possible, preference should be given to designs that address multiple stressors.

Implementation of the non-tidal South River Watershed Sediment TMDL is expected to occur in parallel with implementation efforts to meet sediment target loads consistent with the 2010 Chesapeake Bay TMDLs. The Chesapeake Bay TMDLs were established by EPA (USEPA 2010a) and are scheduled for full implementation by 2025. The Bay TMDLs require reductions of nitrogen, phosphorus, and sediment loads throughout the Bay watershed to meet water quality standards that protect the designated uses in the Bay and its tidal tributaries. The strategies for implementing the 2010 Bay TMDLs are described in Maryland's Phase I WIP (MDE 2010) and Phase II WIP (MDE 2012). In particular, the implementation of practices to reduce sediment loadings from the agricultural and urban stormwater sectors should result in decreased loads in the South River watershed's non-tidal streams. The sediment reductions for the Bay TMDLs are independent of those needed to implement any TMDLs developed to address sediment-related impairments in Maryland's non-tidal watersheds, although their reduction goals and strategies do overlap. For example, the implementation planning framework, developed by the Bay watershed jurisdictions in partnership with EPA, provides a staged approach to achieving Bay TMDL sediment reduction goals that is also applicable to the implementation of any sediment TMDLs developed for local non-tidal watersheds. In short, sediment reductions required to meet the Chesapeake Bay TMDLs will also support the

restoration and protection of local water quality.

MDE published the Final Determination to Issue Stormwater Permit to Anne Arundel County in February 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 [US]EPA approved TMDLs." Section IV.E. of the permit details requirements for Restoration Plans and Total Maximum Daily Loads. 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. Many of the practices which are described in the permittees' stormwater WLA implementation plans may also be used by the permittees as retrofits for meeting their impervious area restoration requirements.

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.

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. For more information on Maryland's implementation and funding strategies to achieve nutrient and sediment reductions throughout the State's portion of the Chesapeake Bay watershed, please see Maryland's Phase II WIP.

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 the implementation actions and funding programs discussed here, refer to Section 5.0 of the TMDL report.