Guidance for Developing Local Nutrient and Sediment TMDL (Total Maximum Daily Load) Stormwater Wasteload Allocation (SW-WLA) Watershed Implementation Plans (WIPs)

MARYLAND

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March 2022

Glossary

BMP	Best Management Practice
BSID	Biological Stressor Identification
CAST	Chesapeake Assessment Scenario Tool
CBP	Chesapeake Bay Program
CBT	Chesapeake Bay Trust
Chla	Chlorophyll a
COMAR	Code of Maryland Regulations
CSN	Chesapeake Stormwater Network
CWA	Clean Water Act
DNR	Department of Natural Resources
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
ESD	Environmental Site Design
IWPP	Program formerly known as the Integrated Water Planning Program
MBSS	Maryland Biological Stream Survey
MDE	Maryland Department of the Environment
MDP	Maryland Department of Planning
MS4	Municipal Separate Storm Sewer System
PFA	Priority Funding Area
SAV	Submerged Aquatic Vegetation
SSDS	Sediment, Stormwater, and Dam Safety
STB	Stream Bed and Bank
SWM	Stormwater Management
SW-WLA	Stormwater Wasteload Allocation
TIPP	TMDL Implementation Progress and Planning (tool)
TMDL	Total Maximum Daily Load
TWP	Targeted Watershed Program
WIP	Watershed Implementation Plan
WLA	Waste Load Allocation
WPRPP	Watershed Protection, Restoration, and Planning Program

Section 1: Introduction

This document provides guidance to Phase I Municipal Separate Storm Sewer System (MS4) jurisdictions to fulfill the requirements of their permit related to the development and maintenance of Stormwater Wasteload Allocation (SW-WLA) Watershed Implementation Plans (WIPs) for Nutrient and Sediment Total Maximum Daily Loads (TMDLs) in Maryland. However, the principles and recommendations outlined in this document can generally be applied across all watersheds in the State. The goal of these TMDLs and their associated implementation plans is to provide adequate habitat conditions supportive of aquatic life in both non-tidal and tidal systems. Nutrient TMDLs for many impoundments address drinking water quality endpoints. Additional guidance related to TMDL implementation in drinking water designated watersheds will be forthcoming. The principles, strategies, and mechanisms outlined in this document for implementing Nutrient and Sediment TMDL SW-WLAs have applications, whether or not the endpoints are protection of aquatic life or protection of water supply designated uses.

Adaptive management and collaboration are integral to the development of an effective WIP. Maryland Department of the Environment's (MDE's) General Guidance for Local TMDL Watershed Implementation Plans (WIPs) provides further details regarding the adaptive management process and collaboration along with guidance for the overall planning framework for permit required implementation plans. In addition to outlining specific strategies for reducing nutrient and sediment loads and modeling procedures for estimating nutrient and sediment load reductions, this document also provides guidance related to other aspects of nutrient and sediment watershed implementation plan development such as monitoring.

This document accompanies the TMDL Implementation Progress and Planning (TIPP) tool, which assists jurisdictions in meeting their permit requirements (MDE 2021e). This tool provides a simplified, transparent calculation of nutrient and sediment load reductions that enables Maryland's jurisdictions to use variable implementation strategies and provides an assessment of progress toward meeting Chesapeake Bay and local TMDL goals. MDE requires jurisdictions to use this tool for consistency among load reduction calculation methodologies and ease of reporting progress. Furthermore, prioritizing spatial evaluation to determine streams and subwatersheds that are best for BMP implementation along with use of the TIPP tool will lead to more effective load reduction efforts.

This document will be updated when additional information becomes available, either due to lessons learned from successful monitoring and implementation efforts or advances in science. This document is intended to guide planners through the implementation process and streamline progress reporting. Those using this document should coordinate directly with the Watershed Protection, Restoration, and Planning Program (WPRPP) at MDE (formerly known as IWPP), so that feedback can be integrated into this guidance.

MDE's previously published Guidance for Developing Stormwater Wasteload Allocation Implementation Plans for Nutrient and Sediment Total Maximum Daily Loads outlines basic principles for Nutrient and Sediment TMDL implementation planning in Maryland that still apply unless stated otherwise in this document. For example, using TMDL reduction percentages instead of absolute load reductions when using a different modeling system than the model used to develop the TMDL. This current document should be viewed as additional information rather than a complete revision to the original guidance document published in 2014.

Section 2: Implementation Plan Requirements

The objective of Maryland's Nutrient and Sediment TMDLs and their associated implementation plans is to ensure that watershed nutrient and sediment loads are at a level to support aquatic life. The numeric criteria for dissolved oxygen (DO) concentrations ensure that watershed loading of nutrients are supportive of aquatic life. These criteria serve as the endpoints for tidal Nutrient TMDLs and some impoundment Nutrient TMDLs. The numeric criteria for SAV restoration goals and water clarity ensure that watershed sediment loads are supportive of aquatic life. These criteria serve as endpoints for tidal Sediment TMDLs. Currently in Maryland, there are no specific numeric criteria that quantify the impact of sediment or nutrients on the aquatic life of nontidal streams. MDE's Biological Stressor Identification (BSID) methodology is applied to determine and monitor whether aquatic life is impacted by elevated nutrient and sediment loads. Nutrient TMDLs for many surface water impoundments also address numeric Chlorophyll a (Chla) endpoints supportive of drinking water designated uses.

Watershed planners developing Nutrient and Sediment TMDL implementation plans should be familiar with the relevant sections from the Code of Maryland Regulations (COMAR) to ensure that their implementation plans address the appropriate water quality goals.

- COMAR 26.08.02.02 – Designated use descriptions
    - Nontidal TP and TSS TMDLs are subject to Use Class I: protection of aquatic life.
    - Tidal Nutrient and Sediment TMDLs are subject to Use Class II: support of estuarine and marine aquatic life.
    - Impoundment TP and TSS TMDLs are subject to Use Class I: water contact recreation and Use Class P: public water supply.
- COMAR 26.08.02.03-3 – Water quality criteria specific to designated uses. Nontidal nutrient and sediment TMDLs address the narrative criteria for Use Class I waters for the "protection of aquatic life". Tidal nutrient and sediment TMDLs address the numeric criterion specified in COMAR 26.08.02.03-3C. Impoundment TP TMDLs address either the narrative criteria for the "protection of aquatic life" or the numeric criterion for Use Class P waters specified in COMAR 26.08.02.03-3H (mean Chlorophyll a < 10 ug/L and 90th percentile < 30 ug/L from May 1st thru September 30th).
- COMAR 26.08.02.08 – Stream segment use designations

All Phase I MS4 SW-WLA WIPs are subject to the permit requirements outlined in the Legal Requirements section of MDE's General Guidance document as well as required to include the primary elements listed under the "Required Elements of all WIPs" subheading in the "Fundamentals" section. Jurisdictions are required to compile and analyze spatial data to inform a targeted implementation approach, and use the TIPP tool to model percent progress toward the TMDL target as well as proposed future BMP implementation. The adaptive and iterative revision of suites of BMPs proposed in the TIPP tool is expected and encouraged.

Section 3: Introduction to TIPP

For the purposes of meeting Phase I MS4 permit implementation planning and reporting requirements for applicable Nutrient and Sediment TMDLs, jurisdictions are required to use the TMDL Implementation Progress and Planning (TIPP) tool as their predictive implementation model. This model should outline planned strategies for meeting nutrient and sediment loading targets with associated timelines for implementation. This model should be used as part of a set of tools and data (see Section 4 for additional data sources to consider) in jurisdictional planning efforts. The tool will inform MDE as to what suite of practices have and will be implemented to meet loading targets, while the other tools and data in Section 4 dictate where those practices will be implemented.

The Chesapeake Bay Model has been recently updated from Phase 5 to Phase 6, causing a significant discrepancy in how loads are attributed. A majority of TMDLs were developed using the Phase 5 Chesapeake Bay Model in which the total unit loads per load source reflect inputs from both terrestrial loads (i.e. over land) and stream bed and bank (STB) loads. However, the total unit loads per load source in the Phase 6 Model only reflect terrestrial loads. Therefore, to ensure consistency in the percent progress between the two models, MDE estimated a total unit load, which is the sum of the load source's terrestrial load and STB load attributed to that load source. These loads were determined using Chesapeake Bay Phase 6 CAST-2017d Watershed Model No Action scenario loading rates with disaggregated STB loads and are included in the TIPP tool at the county-8 digit and Chesapeake Bay Segment watershed scale (MDE 2021e). No Action scenarios in the Chesapeake Bay Phase 6 CAST-2017d Watershed Model do not include BMPs.

MDE requires the use of TIPP to ensure consistency among load reduction calculation methods and results of the tool to accompany submissions of SW-WLA Implementation Plans. The tool focuses on the transparent calculation of nutrient and sediment load reductions at various points in the watershed planning process. This allows users to recalculate baseline loads using updated values, and subsequently assess current progress and future BMP implementation for both local and the Chesapeake Bay TMDLs. A video demo of the tool, FAQ, and land use-related resources are available on MDE's TMDL Stormwater Implementation Resources webpage.

Alternative models may be employed for planning and subsequent progress reporting to MDE, if local permitted jurisdictions have specific needs. If a model other than TIPP is selected, permitted jurisdictions need to ensure that inputs such as land-use loading rates and BMP load reductions are consistent with those used in TIPP as well as use target reduction percentages taken from applicable TMDLs. Furthermore, alternative models should also be transparent, allowing access to fully review load reduction formulas, and enable loading outputs by specific management strategies. Before accepting a jurisdiction's use of an alternative model, MDE will require supporting documentation that demonstrates that the alternative model output is identical to TIPP. MDE requires that jurisdictions reach out if they decide to use an alternative model.

Section 4: Compiling Data for Targeted Implementation

The following section outlines key datasets that should be used prior to using TIPP to identify specific sources of nutrient and sediment loads, and locations of impaired waterbodies, in a watershed. Use of these datasets, or parallel alternative datasets, will ensure both a comprehensive and targeted approach to implementation. An important step in the development of any TMDL watershed implementation plan is the assessment of all available data to characterize relevant sources of impairment and resources of interest in the watershed, as well as pinpoint any data gaps that may be filled by further monitoring, research, or data collection. Required items have been identified as such. These items generally correspond to data that is necessary for input into TIPP or readily available to each jurisdiction. TIPP, or an approved alternative, will enable jurisdictions to assess the nutrient and sediment loading impact of planned management strategies, while the datasets outlined below will allow jurisdictions to plan where those management strategies should be placed on the landscape.

- Land use data (**Required**) – Two recent land use datasets include MDE's reclassified Chesapeake Conservancy land cover data and Maryland Department of Planning's (MDP) land use data (MDE 2021b, MDP 2021). While the Chesapeake Conservancy dataset is higher resolution, both datasets provide useful characterization. For example, MDP's dataset may be used to classify area by land use (i.e., low to high density residential, commercial, industrial) or land cover (i.e., agricultural, forest), and the Chesapeake Conservancy data may be used for a higher resolution classification of natural land cover types (i.e., shrubland, tree canopy). These data can help identify where likely sources of nutrient and sediment loads are in a watershed as well as provide the information necessary for BMP selection and location.

- Phase I MS4 geodatabase (**Required**) – Existing BMPs and Stormwater Management (SWM) facilities should be recorded using spatially based data layers. These data layers can help identify where nutrient and sediment loads are being mitigated and they can be combined with monitoring data to allow jurisdictions to adaptively manage the watershed by evaluating implementation effectiveness.

- MBSS database (**Required**) – Maryland DNR's sampling program provides an assessment of the current condition of biological resources, habitat, and water quality (all endpoints of Maryland's Nutrient and Sediment TMDLs) in a watershed's streams and rivers (MD DNR 2021). These data indicate where aquatic life resources are degraded or in-tact as well as where resources are impacted by both nutrient and sediment impacts to habitat quality. Many jurisdictions collect their own biological and habitat monitoring data using similar procedures and protocols as MBSS. This data can and should be used in place of, or in addition to, the State's MBSS database. MBSS data also indicate where resources are of high quality, e.g., Tier II antidegradation waters.

- Tier II waters (**Required**) – should be considered areas where development needs to be deprioritized, and if there are significant sources of nutrient and sediment loads, where restoration should be prioritized. "Deprioritized" means that development should be directed elsewhere, unless the area is considered a Priority Funding Area (PFA), Enterprise Zone, or some equivalent designated growth area. MDE provides specific delineations of these stream segments and their watersheds.

- Other Monitoring Databases (**Recommended**) – These can include, but are not limited to, Maryland DNR's Core/Trend monitoring program and the United States Geological Survey's (USGS) Nontidal Monitoring Network. Both provide specific information regarding not only biological resources in larger order rivers/streams in a watershed, but also nutrient/sediment loads and concentrations, which can help focus planning efforts.
- Local Data (**Recommended**) - Where applicable and available, local data regarding the chemical, biological, and physical condition of the water resources within a jurisdiction should be used to target implementation efforts. For instance, many jurisdictions have assessed the degree of stream bed and bank erosion of stream reaches within their boundaries. Data that can indicate where sediment export is high within a watershed, and therefore where both upland and in-stream management practices should be located should be employed.

The above core datasets should be integrated into the development of Nutrient and Sediment TMDL watershed implementation plans to ultimately determine the location and type of BMPs to be input into TIPP. As stated previously, this is not a comprehensive list. There are many other datasets and sources that can help identify potential sources across the landscape or resources that are specifically impacted by elevated nutrient and sediment loads such as sediment fingerprinting analysis. This methodology identifies and apportions sediment sources, thereby indicating where to prioritize implementing sediment reduction BMPs (Gellis and Gorman Sanisaca 2018). Other potential dataset examples include: fertilizer application rates/amounts, streambank erosion assessments, turbidity monitoring, etc.

Section 5: Implementation and BMPs

There are an extensive number of resources providing recommendations and detailing the effectiveness of BMPs designed to reduce nutrient and sediment loads. Locations available for implementation, funding, load reductions required, and watershed-specific constraints are factors to consider when developing strategies and siting restoration to meet Nutrient and Sediment TMDL endpoints. BMPs that are efficient and consider operations as a component of sustainability will be the most effective over the long-term.

MDE recommends first assessing existing BMPs for upgrade opportunities prior to identifying new BMPs to implement within the watershed. It can be more cost effective to retrofit an existing and underperforming BMP rather than to install new practices. The Chesapeake Stormwater Network's (CSN) expert panel on urban stormwater retrofits provides more detailed information and recommendations (CSN 2015). The decision to retrofit existing BMPs versus new BMP installation should be informed by the spatially based planning referenced earlier in this document.

Urban BMPs can be grouped into the following categories: stormwater management and alternative practices. Stormwater management practices include all structural, non-structural, and environmental site design (ESD) BMPs described in MDE's Stormwater Design Manual Chapters 3 and 5, and include practices such as ponds, wetlands, infiltration, and filtration practices (MDE 2021c). Alternative practices include street sweeping, storm drain cleaning, stream restoration, shoreline management, urban nutrient management, and land use conversion. MDE recommends reviewing the Chesapeake Bay Program's (CBP) *Quick Reference Guide for Best Management Practices* and CSN's various CBP approved expert panels for more detailed information on these BMP types and their approved efficiencies (CSN 2021).

The Chesapeake Assessment Scenario Tool (CAST) has multiple resources detailing the various BMPs that provide nutrient and sediment load reductions. These include:

- CAST - Source Data
- Expert Panel Reports and BMP Reference Guides

MDE encourages and has incentivized comprehensive approaches to watershed restoration. Despite the potential benefits of stream restoration, MDE cautions stakeholders in relying solely on this practice to meet water quality goals. Instead, MDE recommends using a combination of both upland and in-stream practices. Upland practices include stormwater management retrofits, reforestation, tree planting, forested and grass stream buffers, urban soil restoration, etc. Due to the ongoing nature of BMP research, comprehensive watershed planning provides the most efficient setup for effective adaptive management. As it specifically relates to stream restoration, MDE recommends that the practice should not be implemented without prior consideration to exacerbating stressors upstream of a given project, and after evaluating the individual return on investment of the project in-terms of the potential for biological uplift. These considerations are reflected in MDE's project permitting processes (USACE 2019).

Determining what, where, and how many practices are implemented should be determined through a comprehensive watershed planning effort that utilizes an adaptive management framework. While spatial planning drives site and BMP selection, the use of TIPP modeling scenarios and monitoring data provide valuable information to reevaluate and improve the plan's effectiveness. More detailed information on adaptive management strategies can be found in MDE's General Guidance for Local TMDL Watershed Implementation Plans (MDE 2021a).

Section 6: Monitoring

Monitoring is crucial for the success of any implementation planning process. Pre- and post-implementation monitoring is necessary for identifying trends and evaluating the effectiveness of management actions. The primary objectives of monitoring associated with the implementation process are to: define the status of (1) water quality, and (2) ecological resources within the watershed by comparing monitoring data to water quality criteria, identifying sources of a given stressor/pollutant, evaluating BMP effectiveness, and defining long-term trends. Analysis of monitoring data should track progress at a variety of scales: immediately downstream of BMPs, intermediate distances downstream of BMPs, and at sub-basin/watershed scales (Jaber, Rasmussen, and Lucas 2019, O'Hanlon 2018). While model data can inform planning and help demonstrate implementation progress, ultimately TMDL attainment is determined via monitoring. Required predictive models (i.e., TIPP) will enable MDE to assess expected progress towards SW-WLAs; however, only monitoring data will enable MDE and jurisdictions to demonstrate real progress. Further, progress is assessed via the comparison of observed water quality monitoring data to the established criterion, whether at the TMDL watershed scale or subwatershed scale (where pollutant sources can be more homogenous). The applicable water quality criterion for Nutrient and Sediment TMDLs is described in Section 2.

The *NPDES 2020 MS4 Monitoring Guidelines* should be used as an example of how to develop monitoring study designs related to TMDL implementation planning (watershed status and characterization, BMP effectiveness, and trends) that take into account cost considerations (MDE 2020). However, it should be noted that the requirements and guidelines do not represent ideal monitoring strategies relative to detecting an impact from restoration. The Phase I MS4 permit monitoring requirements and associated guidelines specify the minimum monitoring strategy that should be employed as part of the TMDL implementation planning process. An example of the minnial nature of these guidelines relates to BMP effectiveness; a higher temporal resolution of storm sampling would be ideal for detecting the effects of restoration in conjunction with multiple control watersheds, as noted in Liang et al. 2019. The guidelines describe two types of monitoring:

1. BMP Effectiveness Monitoring - physical, chemical, and biological monitoring that includes both outfall, and in-stream sampling. Monitoring locations are chosen by considering the density of proposed restoration BMPs and periods of continuous data collection or clustering samples during certain times of the year to increase the probability of detecting changes in conditions. Ideal study designs include at least one large BMPs, pre- and post-implementation monitoring, and limited development in the watershed during and post-implementation.

2. Watershed Assessment Monitoring - biological, bacterial, and conductivity monitoring to assess overall health of biological communities in a watershed. In this case, the biological monitoring component is most applicable to nutrient and sediment TMDL implementation plans.

Furthermore, for more detailed information on the monitoring techniques mentioned above, MDE recommends reviewing EPA's manual of *Urban Stormwater BMP Performance Monitoring* (US EPA 2002).

The applicable monitoring parameters in the guidelines related to nutrient and sediment concentration and load estimation include:

- Nitrogen: NO2/3, NH3/4, and TN
- Phosphorus: PO4 and TP
- Sediment: TSS and monumented channel cross sections
- All: Discharge (flow)

The following parameters are required by the guidelines and are indicative of elevated nutrient and sediment load impacts:

- Sediment: In-stream habitat assessments using MBSS protocols
- All: In-stream biological assessments using MBSS protocols

In addition to the parameters outlined within the monitoring guidelines, MDE also recommends collecting these additional parameters related to nutrient TMDL impacts, which will also allow for assessment of water quality criteria, where applicable:

- Dissolved Oxygen (DO)
- Chlorophyll a (Chla)

As it relates to the types of monitoring mentioned above, MDE recommends the following general monitoring techniques:

- BMP Effectiveness Monitoring

    - Post-implementation monitoring for a period of at least 3-5 years (Gellis, Fitzpatrick, and Schubauer-Berigan 2016). As mentioned above, the longer the post implementation monitoring is conducted, the greater the chance of detecting a sizable impact from restoration. This also depends on the magnitude of the actual change in the parameter due to the management or restoration activity. MDE recommends expanded time frames for post-implementation monitoring if possible in areas prone to climate change effects, since climate change impacts only increase the degree of natural variability. Climate change effects include changes in rainfall that result in more floods, droughts, or an increase in rain intensity.

    - A paired watershed approach, which uses a nearby watershed that is similar in size, weather patterns, land use, and geologic setting as a reference point helps quantify the effectiveness of management practices and should be used when possible (Gellis, Fitzpatrick, and Schubauer-Berigan 2016).

    - Sampling of both base and storm flow as well as the occasional grab sample when continuous monitoring is not possible (O'Hanlon 2018).

- Watershed Assessment Monitoring
    - Identifying “hot spots” and sources of pollutants within the watershed using watershed characterization and general reconnaissance to provide the most beneficial monitoring results (Gellis, Fitzpatrick, and Schubauer-Berigan 2016, O'Hanlon 2018). For instance, as part of Maryland’s Targeted Watershed Program (TWP) under its CWA Section 319 Nonpoint Source Management umbrella, nutrient synoptic monitoring is used as a screening tool to support more focused and efficient use of monitoring resources and BMP implementation to address nonpoint source contaminants (Jaber, Rasmussen, and Lucas 2019). See Appendix E in Maryland’s 319 Nonpoint Source Program Annual Report for more information about the TWP (MDE 2021d). In addition, probabilistic randomized sampling, such as the MBSS Program, while primarily used for assessing the status of water quality and biological resources in a watershed, can also be helpful in identifying sources of a given pollutant or stressor and prioritizing specific subwatersheds for management.
    - Pre-implementation monitoring for a period of at least 3-5 years ensures strong baselines and the opportunity for pollutant characterization (Gellis, Fitzpatrick, and Schubauer-Berigan 2016). The longer pre-implementation monitoring is conducted, the greater the chance of detecting a sizable impact from a management or restoration activity, since more natural variability will be captured (Jepsen and Caraco 2020).
- Trend Monitoring
    - Fixed monitoring stations (both spatially and temporally) are ideal for establishing long-term trends within a sub-basin or watershed. For instance, USGS operates the Chesapeake Bay Nontidal Monitoring Network. The monitoring program consists of fixed monitoring stations throughout the Chesapeake Bay watershed, where routine samples are collected monthly using the same sampling protocols for the purposes of establishing long-term trends in nutrient and sediment loads and concentrations (CBP 2021).

Section 7. Reporting Progress

MDE requests tracking and reporting of progress with annual submittal of the following modeled data:

- Current progress BMP scenario in TIPP
- Documentation of pollutant load reductions per BMP type in TIPP
- Overall progress reduction percentage
- Monitoring trends

This information should be submitted to MDE by a Phase I MS4 jurisdiction via its required annual reporting. MDE prefers that jurisdictions submit progress data in spreadsheet format via TIPP along with any supplemental information used to determine final reduction percentages, e.g., calculations done outside of the model.

When an implementation plan is first developed, jurisdictions are required to submit their baseline, current progress, and implementation scenarios (including any milestone goals) to MDE via TIPP. Subsequently, progress scenarios are to be revised and submitted annually, along with any revisions or updates to the baseline or future implementation scenarios. For example, if a jurisdiction updates the impervious cover acres in its baseline scenario due to the incorporation of more accurate mapped data, the baseline TMDL scenario should be revised and updated as well.

The reporting of monitoring data is important to MDE's efforts to compile watershed-specific information and ultimately evaluate the effectiveness of management actions. This information will provide further guidance on how to develop a successful watershed implementation plan. Jurisdictions are already required to submit monitoring data pertinent to Nutrient and Sediment TMDL implementation plans via their required Phase I MS4 geodatabase reporting, e.g., MBSS style habitat assessments and biological monitoring. Any additional monitoring data that is collected should be submitted via a jurisdiction's annual reporting in spreadsheet format and be geolocated with latitude and longitude coordinates for ease-of-entry into GIS programs. MDE requires the use of standardized templates for reporting chemical data. Jurisdictions that are collecting data pertinent to Nutrient and sSediment TMDL planning that is beyond permit requirements should contact MDE WPRPP regarding the standardized formats for reporting.

The map package or geodatabase files that jurisdictions submit to MDE IWPP and MDE Sediment, Stormwater, and Dam Safety (SSDS) should have an implementation data layer that delineates focal areas for restoration rooted in the datasets listed in Section 3. MDE is also requesting that jurisdictions submit any spatially based data layers used in its planning efforts that the State may not have access to. All submitted data should be consistent with Maryland's MD iMap Data Submission Policy. While these areas represent the focal areas for restoration, the State recognizes that opportunities for implementation in these areas can be hindered by land owner cooperation, costs, etc. Other information, such as narrative documents (e.g. programmatic actions with yet to be determined quantitative components) should be submitted as part of a jurisdiction's MS4 annual report.

Section 8: Partnerships/Stakeholder Engagement

Coordination with non-governmental organizations is recommended to increase funding for work, share information, and maximize pollution reduction achievements. This increases the awareness regarding the natural history and science that is necessary to showcase high value water resources across Maryland 's jurisdictions, which in turn will increase meaningful constituent involvement in resource conservation.

MDE recommends the Chesapeake Bay Trust Restoration Research Award program, which was established to quantify the effectiveness of water quality restoration efforts in the Chesapeake Bay watershed. This grant award program pools financial resources among several participants to answer key research questions. In the next generation Phase I MS4 permit, jurisdictions will be allowed to contribute money to this award program and participate in the Pooled Monitoring Advisory Committee to meet certain permit monitoring requirements. (CBT 2021).

More information on partnerships and stakeholder engagement can be found in MDE's General Guidance for Local TMDL Watershed Implementation Plans (MDE 2021a).

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