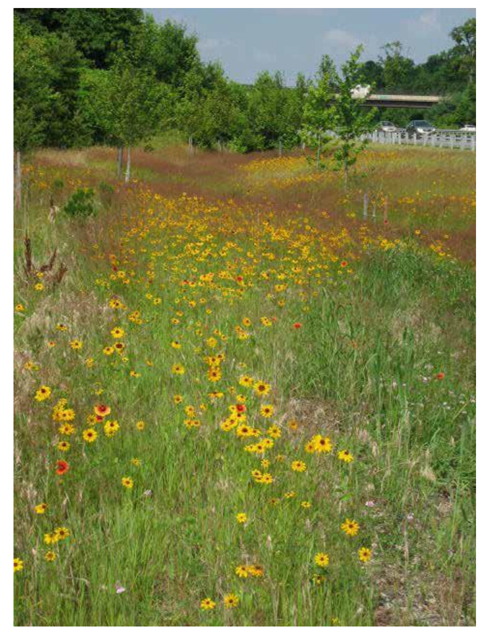
MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

Impervious Restoration and Coordinated Total Maximum Daily Load Implementation Plan

October 8, 2016 | Revised: October 9, 2018 | Revised October 9, 2019



MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

Larry Hogan
Governor

Boyd K. Rutherford
Lt. Governor

Pete K. Rahn
Secretary

Gregory Slater
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October 9, 2018

Mr. Stewart Comstock
Sediment, Stormwater and Dam Safety Program
Water and Science Administration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 440
Baltimore, MD 21230

Dear Mr. Comstock:

The Maryland Department of Transportation State Highway Administration (MDOT SHA) is pleased to submit this Interim Review Draft of the MDOT SHA *Impervious Restoration and Coordinated TMDL Implementation Plan* (Implementation Plan) addressing conditions under the MDOT SHA NPDES MS4 permit (11-DP-3313 MD 0068276) which took effect on October 9, 2015.

The initial version of this Implementation Plan was submitted to MDE on October 8, 2016. Subsequently, there were several updates that were indicated by a revised footer date. Because the October 8, 2016 version has now been completely revised with the attached version, all pages in this Interim Review Draft are dated October 9, 2018.

This Interim Review Draft addresses MDE comments on the MDOT SHA MS4 annual reports for FY16 and FY17, and the initial October 8, 2016 Implementation Plan submittal. Please note that Part II of the plan is not included in the enclosed Interim Review Draft. Rather, Part II will be included once MDOT SHA receives MDE decision on the 6/29/2018 *MDOT SHA Final Impervious Baseline Assessment*. At that point the revised Implementation Plan will be finalized and submitted to MDE as the latest Implementation Plan.

If you have any questions or need additional information regarding this delivery, please contact Mr. Travis Vance at 410-545-8623 (or via email at tvance@sha.state.md.us) or me at 410-545-8407 (or via email at kcoffman@sha.state.md.us).

Sincerely,

Karen Coffman, Chief
MDOT SHA OED Water Programs Division

Enclosure

Cc: Mr. Brian Cooper, MDE WSA SSDSP
Ms. Sonal Ram, Director, MDOT SHA OED
Mr. Kevin P. Wilsey, Deputy Director, MDOT SHA OED
Mr. Travis Vance, MDOT SHA OED WPD

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MARYLAND DEPARTMENT OF TRANSPORTATION
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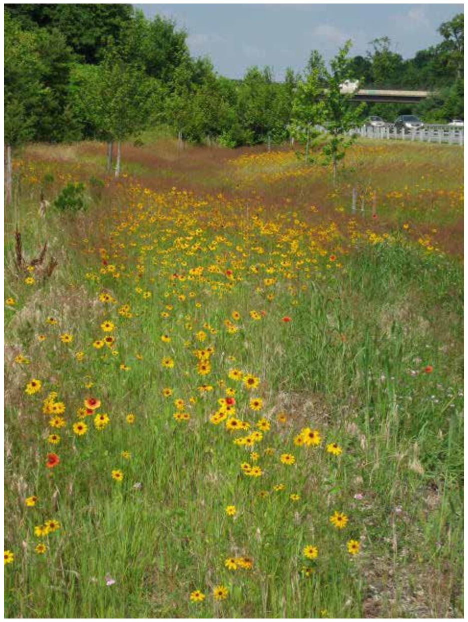
Part I

Program Introduction



I. PROGRAM INTRODUCTION

A. PURPOSE

The Maryland Department of the Environment (MDE) issues discharge permits under the National Pollutant Discharge Elimination System (NPDES) to regulate urban stormwater runoff and minimize pollutant discharges to streams, rivers, and the Chesapeake Bay. The Municipal Separate Storm Sewer System (MS4) Permit (MS4 Permit) is a discharge permit that is issued to jurisdictions of large to medium population densities that own and operate storm drain systems. The Maryland Department of Transportation State Highway Administration (MDOT SHA) is required to reduce pollutants to the maximum extent practicable (MEP) as a condition of the agency's MS4 Permit (11-DP-3313 MD0068276) that was issued on October 9, 2015.

This Implementation Plan is a required document under the MS4 Permit to establish MDOT SHA's commitment to ensure that pollutants in surface runoff draining from MDOT SHA roads and through our storm drain conveyances are minimized to meet targeted thresholds. Plans such as these play a significant role for Maryland's Chesapeake Bay Restoration program. This Implementation Plan is divided into four parts:

- **Part I, Program Introduction** provides an overview and introduction to the MDOT SHA MS4 Permit, water quality standards, Chesapeake Bay clean-up, project implementation methodologies, and brief descriptions of best management practices (BMPs);
- **Part II, Impervious Restoration and Chesapeake Bay TMDL Compliance** details the strategy, assessment, costs, and schedule to meet a 20 percent impervious surface restoration goal set in the MS4 Permit as a compliance measure to meet the Chesapeake Bay pollution "diet" or total maximum daily load (TMDL);
- **Part III, Coordinated TMDL Implementation Plan** discusses the TMDL development process in Maryland, MDOT SHA TMDL responsibilities and pollutant reductions, modeling results, and methods implemented by MDOT SHA to meet TMDL allocations; and
- **Part IV, MDOT SHA Watershed TMDL Implementation Plans** provides watershed-level detail of the Implementation Plan including summaries of county watershed assessments, visual assessments of MDOT SHA right-of-way, proposed BMPs, costs, and schedules for pollution reduction strategies in each impaired watershed that is addressed by an Environmental Protection Agency (EPA)-approved TMDL document.

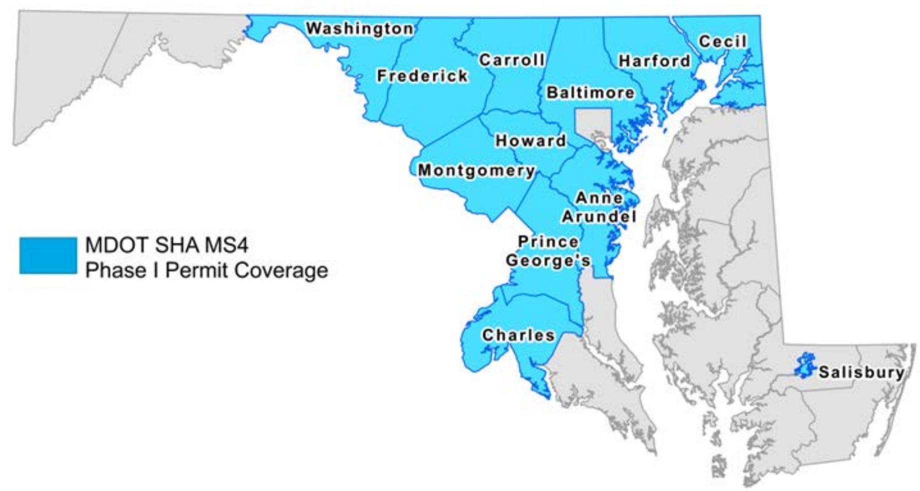


Figure 1-1: MDOT SHA MS4 Phase I Permit Coverage Area

B. SCOPE

The MDOT SHA MS4 Permit regulates stormwater discharges from storm drain systems owned or operated by MDOT SHA in Anne Arundel, Baltimore, Carroll, Cecil, Charles, Frederick, Harford, Howard, Montgomery, Prince George's, and Washington counties and the City of Salisbury. **Figure 1-1** is a map of the MDOT SHA MS4 Permit coverage area. While Baltimore City is an MS4 jurisdiction within the State of Maryland, MDOT SHA does not own right-of-way, roadways, storm drain systems, or stormwater management (SWM) facilities within the city limits; therefore, Baltimore City is not included in the MDOT SHA MS4 Permit coverage area.

MDOT SHA also owns and maintains many maintenance shops and facilities that are regulated by the Maryland General Permit for Discharges from Stormwater Associated with Industrial Activities (12-SW) (MDE, 2014a). Activities and practices to comply with the 20 percent impervious restoration requirements for 12-SW industrial properties owned by MDOT SHA are included in implementation activities under the MS4 Permit. Therefore, MDOT SHA 12-SW maintenance shops and facilities located within the MDOT SHA MS4 coverage area are included in this Implementation Plan. Other 12-SW requirements are addressed and reported separately.

C. BACKGROUND

C.1. Surface Water Quality Standards

The Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA), requires the State to develop water quality standards (WQSs) for Maryland waters, to monitor water quality conditions relative to these standards, and to identify and document water bodies that do not meet WQSs. Results are reported every other year in MDE's Integrated Report (IR) of Surface Water Quality, which is submitted to the EPA (MDE, 2018). The IR includes water quality assessments and lists of impaired waterbodies (formally known as the "303(d) List").

TMDLs are a tool for implementing State WQSs, and they are based on the relationship between pollution sources and in-stream water quality conditions. A TMDL establishes the maximum amount of an impairing substance or stressor that a water body can assimilate and still meet WQSs. The TMDL allocates that load among several pollutant contributors. Contributors can include point sources, such as sewage treatment plants or regulated municipal storm sewers, and non-point sources such as runoff from agricultural land. The EPA approves TMDLs.

C.2. Chesapeake Bay TMDL Requirements

The Chesapeake Bay is a national treasure constituting the largest estuary in the United States and one of the largest and most biologically productive estuaries in the world. The Bay has a 64,000 square mile watershed (See **Figure 1-2**) that includes Maryland, Virginia, Pennsylvania, Delaware, West Virginia, New York, and the District of Columbia (DC). Pollution from surface stormwater runoff and other sources that discharge to the Bay has become a serious threat to the ecologic health of the Bay and prevents the attainment of State WQSs for dissolved oxygen (DO), water clarity, and chlorophyll. The pollutants that are largely responsible for impairing the Bay are sediment and the nutrients nitrogen and phosphorus.

In 2010, the EPA developed a nutrient and sediment pollution "diet" or TMDL for the Bay in coordination with the watershed States and DC. As a partner in this effort, MDE played a key role in the development of the Bay TMDL and the Maryland Watershed Implementation Plans (WIPs).

The TMDL and WIPs address impairments for tidal segments of the Bay by setting thresholds or allocations for nitrogen, phosphorus, and sediment. These allocations are split between several pollutant sources (also referred to as sectors) including agriculture, urban stormwater, septic, wastewater, and others.

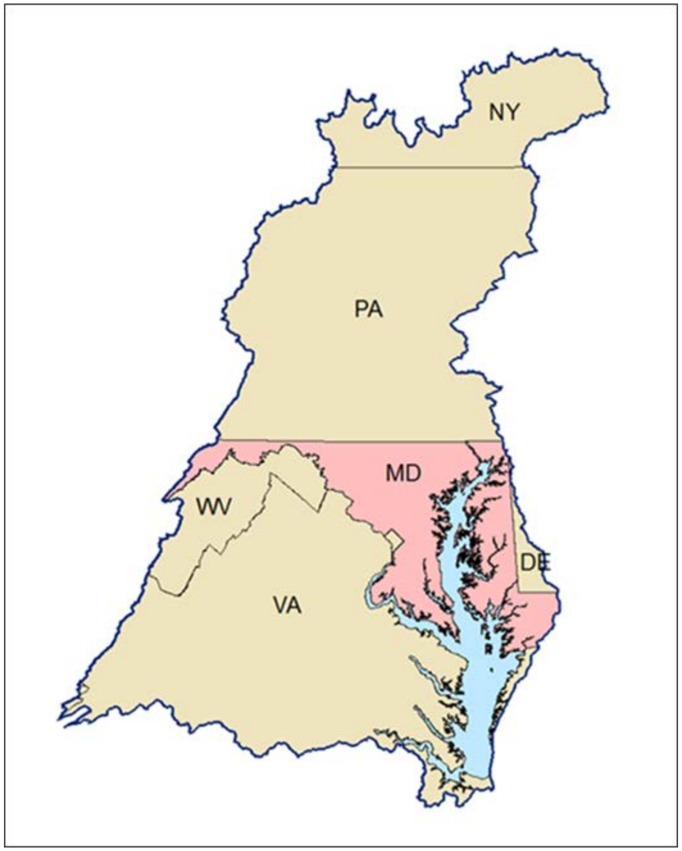


Figure 1-2: Chesapeake Bay Watershed

MDOT SHA is included within the urban stormwater sector, and Bay requirements for this sector are tied to the MS4 Permit through impervious restoration requirements, which are discussed below in **Section D, MS4 Permit Requirements** and in **Part II.A Urbanization and Impervious Surface Restoration** of this Plan.

EPA has instituted accountability measures to ensure clean-up commitments are met by each State, including short and long-term benchmarks, a tracking and accountability system for activities, and federal contingency actions that can be employed if necessary to promote progress. The Bay TMDL is designed to ensure that all pollution control measures needed to fully restore the Bay and its tidal rivers are in place by 2025, with at least 60 percent of the actions completed by 2017.

C.3. Local Watershed TMDL Requirements

In addition to the Bay TMDL, TMDLs are also developed for tidal and non-tidal waterways throughout Maryland. These 'local' TMDLs are also based on State WQSs, and approved by EPA. TMDLs are enforced through NPDES discharge permits, including MS4 permits. Because MDOT SHA is an MS4 permittee and designated a point source discharger, MDOT SHA is required to meet local wasteload allocations (WLAs) for EPA approved TMDLs. **Figure 1-3** and **Table 1-1** on the following pages display and list the current TMDLs for MDOT SHA compliance. The pollutants covered by these TMDLs include nutrients, sediment, bacteria, polychlorinated biphenyls (PCBs), and trash. MDOT SHA plans to meet local TMDLs are provided in **Part III, Coordinated TMDL Implementation Plan** and **Part IV, MDOT SHA Watershed TMDL Implementation Plans**.

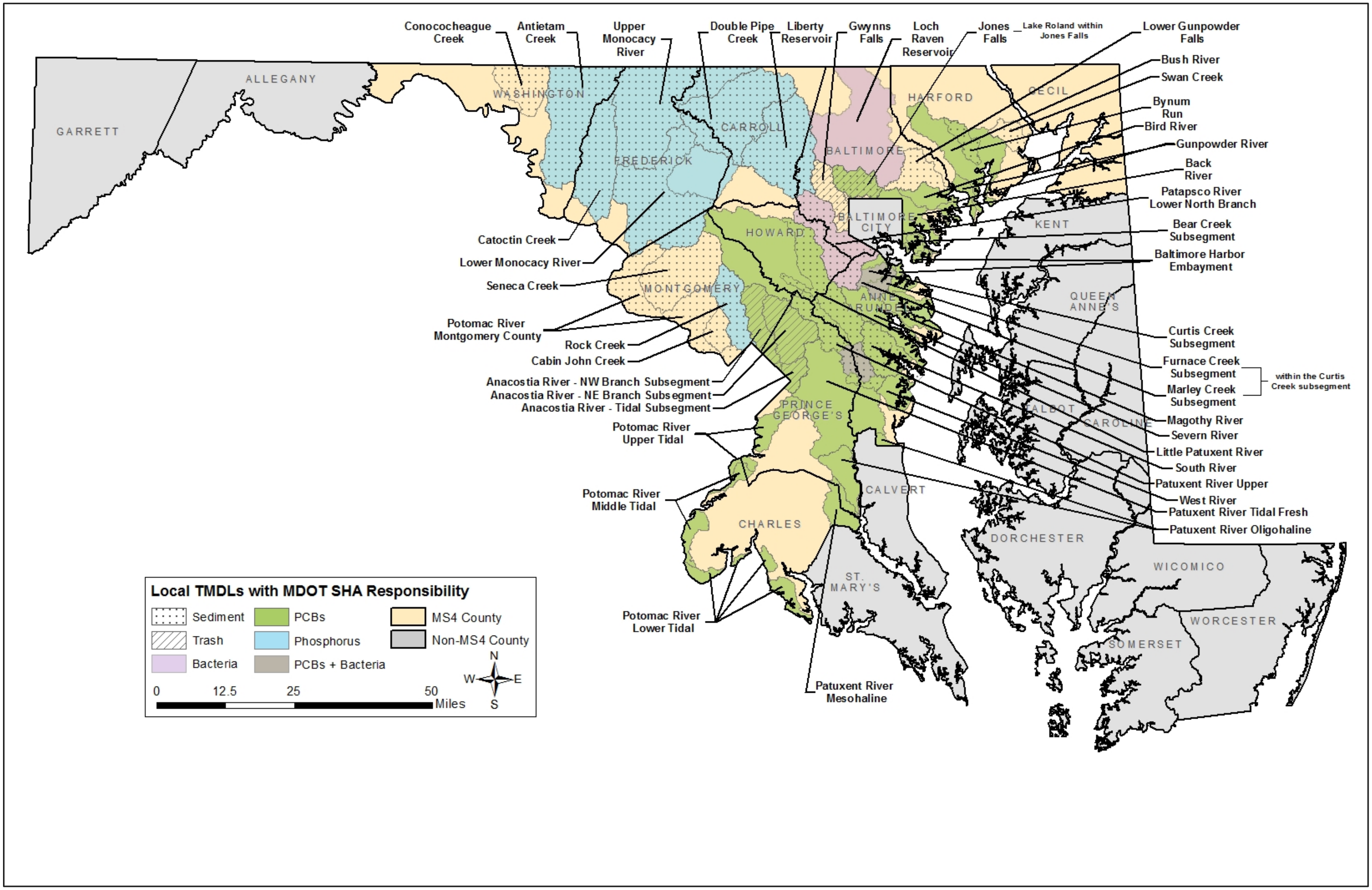


Figure 1-3: Watersheds with MDOT SHA TMDL Wasteload Reduction Requirements

Table 1-1: Maryland 8-Digit Watersheds with TMDLs and MDOT SHA Responsibility

Watershed Name	MD Basin Code/ Assessment Unit ID	Pollutant				
		Bacteria	PCBs	Phosphorus	Sediment	Trash
Anacostia River	02140205		✓			✓
Antietam Creek	02140502			✓	✓	
Back River Oligohaline Tidal	MD-BACOH		✓			
Baltimore Harbor	02130903					
• **Baltimore Harbor**	02130903 - EMBAYMENT		✓			
• **Bear Creek Subwatershed**	02130903 MD-PATMH-BEAR-CREEK		✓			
• **Curtis Creek/Bay Subwatershed**	02130903 MD-PATMH-CURTIS_BAY_CREEK		✓			
• **Furnace Creek Subwatershed**	02130903 MD-PATMH-FURNACE_CREEK	✓				
• **Marley Creek Subwatershed**	02130903 MD-PATMH-MARLEY_CREEK	✓				
Bush River Oligohaline Segmentshed	MD-BSHOH-02130701		✓			
Bynum Run	02130704				✓	
Cabin John Creek	02140207				✓	
Catoctin Creek	02140305			✓	✓	
Conococheague Creek	02140504				✓	
Double Pipe Creek	02140304			✓	✓	

Table 1-1: Maryland 8-Digit Watersheds with TMDLs and MDOT SHA Responsibility						
Watershed Name	MD Basin Code/ Assessment Unit ID	Pollutant				
		Bacteria	PCBs	Phosphorus	Sediment	Trash
Gunpowder River Oligohaline Segmentshed	02130801, 02130803					
• **Gunpowder River**	02130801 MD-GUNOH		✓			
• **Bird River**	02130803 MD-GUNOH		✓			
Gwynns Falls	02130905				✓	✓
Jones Falls	02130904				✓	✓
• **Lake Roland Subwatershed**	MD-02130904-Lake_Roland		✓			
Liberty Reservoir	02130907			✓	✓	
Little Patuxent River	02131105				✓	
Loch Raven Reservoir	02130805	✓				
Lower Gunpowder Falls	02130802				✓	
Lower Monocacy River	02140302			✓	✓	
Magothy River	MD-MAGMH-02131001		✓			
Patapsco River LN Branch	02130906	✓			✓	
Patuxent River Tidal Segmentsheds	02131101, 02131102					
• **Patuxent Mesohaline**	02131101 PAXMH		✓			
• **Patuxent Oligohaline**	02131101 PAXOH		✓			
• **Patuxent Tidal Fresh**	02131102 PAXTF		✓			

Table 1-1: Maryland 8-Digit Watersheds with TMDLs and MDOT SHA Responsibility

Watershed Name	MD Basin Code/ Assessment Unit ID	Pollutant				
		Bacteria	PCBs	Phosphorus	Sediment	Trash
Patuxent River Upper	02131104	✓			✓	
Potomac River MO County	02140202				✓	
Potomac River Lower Tidal	02140101		✓			
Potomac River Middle Tidal	02140102		✓			
Potomac River Upper Tidal	02140201		✓			
Rock Creek	02140206			✓	✓	
Seneca Creek	02140208				✓	
Severn River Mesohaline	MD-SEVMH-02131002		✓			
South River	02131003				✓	
South River Mesohaline	MD-SOUMH-02131003		✓			
Swan Creek	02130706				✓	
Upper Monocacy River	02140303			✓	✓	
West and Rhode Rivers Mesohaline	MD-WST-RHDMH-02131004		✓			
Note: See Table 3-2 for details on MDOT SHA WLAs, reduction requirements, and implementation plan modeling results.						

D. MDOT SHA MS4 PERMIT REQUIREMENTS

Requirements in the MDOT SHA MS4 Permit that pertain to this Implementation Plan are listed below and taken directly from Part IV.E. of the Permit:

Restoration Plans and Total Maximum Daily Loads (Permit Part IV.E.)

In compliance with §402(p)(3)(B)(iii) of the CWA, MS4 Permits must require stormwater controls to reduce the discharge of pollutants to the MEP. 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. In pursuit of these goals, SHA shall coordinate watershed assessments with surrounding jurisdictions and annually report on restoration plans, opportunities for public participation, and TMDL compliance status to MDE. As required below, watershed assessments and restoration plans shall include a thorough discussion of water quality analysis findings based on coordination with surrounding jurisdictions, TMDL documents and other resources when available, identification of water quality improvement opportunities, and a schedule for BMP and programmatic implementation to meet stormwater WLAs included in EPA approved TMDLs. SHA shall address both specific WLAs and target loads when SHA is part of larger aggregate loads. A list of EPA approved TMDLs for SHA in the permit area is included in Attachment B of the permit.

Watershed Assessments (Permit Part IV.E.1.)

SHA shall coordinate watershed assessments with surrounding jurisdictions, which shall include, but not be limited to the evaluation of available State and county watershed assessments, SHA data, visual watershed inspections targeting SHA ROW and facilities, and approved stormwater WLAs to:

- *Determine current water quality conditions;*
- *Include the results of visual inspections targeting SHA ROW and facilities conducted in areas identified as priority for restoration;*
- *Identify and rank water quality problems for restoration associated with SHA ROW and facilities;*
- *Achieve water quality goals by identifying all structural and nonstructural water quality improvement projects to be implemented using the watershed assessments established; and*
- *Specify pollutant load reduction benchmarks and deadlines that demonstrate progress toward meeting all applicable stormwater WLAs.*

Restoration Plans (Permit Part IV.E.2.a.)

Within one year of permit issuance, SHA shall submit an impervious surface area assessment consistent with the methods described in the MDE document "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, Guidance for National Pollutant Discharge Elimination System Stormwater Permits" (MDE, August 2014 or subsequent versions). Upon approval by MDE, this impervious surface area assessment shall serve as the baseline for the restoration efforts required in this permit.

By the end of this permit term, SHA shall commence and complete the implementation of restoration efforts for twenty percent of SHA's impervious surface area consistent with the methodology described in the MDE document cited in PART IV.E.2.a. that has not already been restored to the MEP. Equivalent acres restored of impervious surfaces, through new retrofits or the retrofit of pre-2002 structural BMPs, shall be based upon the treatment of the WQv [Water Quality Volume] *criteria and associated list of practices defined in the 2000 Maryland Stormwater Design Manual. For alternate BMPs, the basis for calculation of equivalent impervious acres restored is based upon the pollutant loads from forested cover.*

Coordinated TMDL Implementation Plan (Permit Part IV.E.2.b.)

Within one year of permit issuance, a coordinated TMDL implementation plan shall be submitted to MDE for approval that addresses all EPA approved stormwater WLAs (prior to the effective date of the permit) and requirements of Part VI.A., Chesapeake Bay Restoration by 2025 for SHA's storm sewer system. Both specific WLAs and aggregate WLAs which SHA is a part of shall be addressed in the TMDL implementation plans. Any subsequent stormwater WLAs for SHA's storm sewer system shall be addressed by the coordinated TMDL implementation plan within one year of EPA approval. Upon approval by MDE, this implementation plan will be enforceable under this permit. As part of the coordinated TMDL implementation plan, SHA shall:

- *Include a final date for meeting applicable WLAs and a detailed schedule for implementing all structural and nonstructural water quality improvement projects, enhanced stormwater management programs, and alternative stormwater control initiatives necessary for meeting applicable WLAs;*
- *Provide detailed cost estimates for individual projects, programs, controls, and plan implementation;*
- *Evaluate and track the execution of the coordinated implementation plan through monitoring or modeling to document the progress toward meeting established benchmarks, deadlines, and stormwater WLAs; and*
- *Develop an ongoing, iterative process that continuously implements structural and nonstructural restoration projects, program enhancements, new and additional programs, and alternative BMPs where the EPA-approved TMDL stormwater WLAs are not being met according to the benchmarks and deadlines established as part of SHA's watershed assessments.*

Public Participation (Permit Part IV.E.3.)

SHA shall provide opportunity to the public regarding the development of its coordinated TMDL implementation plan by allowing for public participation, soliciting input, and incorporating any relevant ideas and program improvements that can aid in achieving TMDLs and water quality standards according to the actions below. SHA shall provide:

- *Notice in a regional newspaper and on SHA's website outlining how the public may obtain information on the development of the coordinated TMDL implementation plan and opportunities for comment;*
- *Procedures for providing copies of the coordinated TMDL implementation plan to interested parties upon request;*

- *A minimum 30-day comment period before finalizing the coordinated TMDL implementation plan; and*
- *A summary in each annual report of how SHA addressed or will address any material comment received from the public.*

In response to this public participation requirement, MDOT SHA posted a draft of the Plan on its website on August 1, 2016. The 30-day public comment period ended on August 31. A summary of comments received was included in the 2016 MDOT SHA MS4 annual report submitted to MDE in October. The annual report was posted on the MDOT SHA MS4 Permit webpage accessed from the link below:

http://www.roads.maryland.gov/Index.aspx?pageid=336

Subsequent to the 2016 version of this Implementation Plan, additional TMDLs were issued by MDE and MDOT SHA developed individual implementation plans, placed each one on 30-day public notice, and delivered them to MDE within a year of TMDL issuance. Those individual plans have been integrated into this updated version of the MDOT SHA Implementation Plan under **Part IV, MDOT SHA Watershed TMDL Implementation Plans**.

E. PROJECT IMPLEMENTATION METHODOLOGIES

E.1. Regulatory Guidance and Permitting

Compliance efforts for impervious restoration, the Bay TMDL, and local TMDLs are included in this Plan. Because of these multiple areas of compliance (MS4 and separate TMDLs), accounting for progress can be complicated. The MS4 impervious restoration and Chesapeake Bay TMDL compliance can be handled with the same set of practices that reduce nitrogen, phosphorus, and sediment for local TMDLs. Other local TMDLs require reductions of trash, PCBs, and bacteria, and these pollutants call for different strategies. Guidance for preparing implementation plans has been developed by MDE and the Chesapeake Bay Program (CBP) and is listed below.

MDE TMDL Data Center Guidance

The following guidance is available on the MDE TMDL Data Center website:

- MDE Recommendations for Addressing the PCB SW-WLA, MDE, July 2013;
- Guidance for Developing a Stormwater Wasteload Allocation Implementation Plan for Bacteria Total Maximum Daily Loads, MDE, May 2014;
- Guidance for Developing Stormwater Wasteload Allocation Implementation Plans for Trash/Debris Total Maximum Daily Loads, MDE, May 2014;
- Trash Monitoring Guidance, MDE, July 2014;
- Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated, MDE, August 2014;
- General Guidance for Developing a Stormwater Wasteload Allocation (SW-WLA) Implementation Plan, MDE, October 2014;
- Guidance for Developing Stormwater Wasteload Allocation Implementation Plans for Nutrient and Sediment Total Maximum Daily Loads, MDE, November 2014; and
- Optional Worksheet for MS4 Stormwater WLA Implementation Planning Spreadsheet, MDE, June 2015.

Chesapeake Bay Program (CBP) Guidance

The following guidance is approved by the CBP and is available on the Chesapeake Stormwater Network (CSN) website:

- Recommendations of the Expert Panel to Define Removal Rates for Urban Nutrient Management, CBP Urban Stormwater Work Group (USWG), Watershed Technical Work Group (WTWG) and Water Quality Goal Implementation Team (WQGIT), March 2013;
- Recommendations of the Expert Panel to Define Removal Rates for Erosion and Sediment Control Practices, CBP USWG, WTWG, and WQGIT, April 2014;
- Recommendations of the Expert Panel to Define Removal Rates for Urban Filter Strips and Stream Buffer Upgrade Practices, CBP USWG, WTWG, and WQGIT, June 2014;
- Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects, CBP USWG, WTWG, and WQGIT, September 2014;
- Recommendations of the Expert Panel to Define Removal Rates for the Elimination of Discovered Nutrient Discharges from Grey Infrastructure, CBP USWG, WTWG, and WQGIT, November 2014;
- Recommendations of the Expert Panel to Define Removal Rates for New State Stormwater Performance Standards, CBP USWG, WTWG, WQGIT, January 2015;
- Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects, CBP USWG, WTWG, WQGIT, January 2015;
- Potential Benefits of Nutrient and Sediment Practices to Reduce Toxic Contaminants in the Chesapeake Bay Watershed, Part 1: Removal of Urban Toxic Contaminants, CBP Toxic Contaminants Workgroup (TCW), December 2015;
- Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices, CBP, May 2016;
- Recommendations of the Expert Panel to Define Removal Rates for Floating Treatment Wetlands in Existing Wet Ponds, CBP USWG, July 2016; and
- Recommendations of the Expert Panel to Define Removal Rates for Shoreline management projects, CBP USWG, WTWG, and WQGIT, June 2017.

Permits for Construction Projects

Permits or other authorizations for construction projects are obtained following standard practices to comply with all State and federal laws. General permits are pursued when possible. Permits include:

- National Environmental Policy Act (NEPA)/Maryland Environmental Policy Act (MEPA) clearances that also include Section 106 cultural resources;
- Maryland SWM and Erosion and Sediment Control Approvals;
- Maryland Reforestation Law, Roadside Tree Law, and Forest Conservation Act;
- Maryland Aviation Administration (MAA) for projects within airport clear zones;
- Critical Area Commission;
- Maryland Dam Safety for thermal impacts related to construction in Use III waters and certain stormwater embankments;
- Maryland and Federal Wetland and Waterways for impacts to US waters and wetlands;

- US Army Corps of Engineers (USACE) Chesapeake Bay Total Maximum Daily Load Regional General Permit (Bay TMDL RGP); USACE, July 2015; and
- Others as needed.

E.2. Urban Sector Focus

MDE has specified that at least half of the 20 percent impervious restoration should be within the urban sector. This means that at least 10 percent of the impervious restoration must be provided by practices that treat MDOT SHA impervious surface runoff directly or are placed within urban land areas if outside MDOT SHA right-of-way.

In the Maryland WIP I, the urban sector is required to meet MS4 impervious treatment as the method to address Bay restoration. For purposes of complying with the MS4 Permit, MDE considers all lands within MDOT SHA ROW as urban. Under this definition, MDOT SHA roads that traverse agricultural, forested, or rural areas are considered urban areas.

In accordance with this MDE policy for urban sector focus, MDOT SHA plans to provide impervious restoration to at least 10 percent of the untreated impervious area within MDOT SHA ROW or urban land use areas as defined by the 2010 Maryland Department of Planning (MDP) land use/land cover classification definitions (MDP, 2010). These classifications include:

11 Low-density residential
12 Medium-density residential
13 High-density residential
14 Commercial
15 Industrial
16 Institutional
17 Extractive
18 Open urban land
191 Large lot subdivision (agriculture)
192 Large lot subdivision (forest)
80 Transportation

E.3. Watershed Focus

When investigating areas that are suitable for restoration practices, MDOT SHA focuses on impaired watersheds that are regulated under EPA-approved TMDLs. Impervious restoration practices or activities located in areas with local TMDL coverage can also be credited towards the 20 percent MS4 impervious restoration requirement and Chesapeake Bay pollutant reductions. Because restoration practices in these watersheds comply with multiple water quality initiatives, increased efficiency in utilizing resources such as funding and staffing as well as meeting timeframes for compliance can be achieved.

Besides focusing on impaired watersheds, MDOT SHA also recognizes the value of the anti-degradation policy defined in the CWA and Maryland law. This policy seeks to maintain high quality waters in good condition and to discourage activities that will cause them to degrade. Within Maryland, many Tier II (high quality) catchments have been designated but there are currently no Tier III (waters of national significance) designations. MDOT SHA uses GIS data that includes high quality waters when performing site searches and, if opportunities exist, targets these areas with restoration practices.

Input from counties is also sought regularly and in instances when a local jurisdiction requests MDOT SHA to focus on certain watersheds, MDOT SHA works with the jurisdiction to develop agreements under which the implementation of appropriate practices can be undertaken as a partnership. In most instances, these would be watersheds with an EPA-approved TMDL in place, but they could also be watersheds of other local significance.

E.4. Partnerships

MDOT SHA is unique among the MS4s in that our lands and roadways are present in most counties and municipalities in Maryland. Likewise, State roads traverse most watersheds. It cannot be denied that MDOT SHA has a significant presence throughout Maryland, but that presence is not accompanied with a governance role in local communities. Officials associated with municipalities and counties can provide much insight and value when engaging the public, when seeking to understand local environmental and water quality concerns, or when developing projects within their jurisdictions.

MDOT SHA has an established outreach program tasked with coordinating pollution reduction and other MS4 activities with other MS4 municipalities and counties. The purpose is to establish a cooperative relationship that will provide mutual benefit for both entities and the constituents or customers they serve. This coordination is important to ensure that local officials are informed and can provide input on MDOT SHA's planned restoration activities.

This outreach program also extends to other governmental MS4 and non-MS4 agencies, such as the United States Geological Survey (USGS), the United State Fish and Wildlife Service (USFWS), and the Maryland Environmental Trust (MET). Partnerships with agencies such as these leverage unique research and analytical capabilities, alternative contracting methods, and conservation land holdings and easements.

Various mechanisms are employed to foster these partnerships ranging from formally executed agreements to meetings documented by minutes to quick emails following up on daily project related issues.

E.5. Redevelopment Credit

MDE defines 'redevelopment' as development projects where 40 percent or greater of the project site is existing impervious surfaces. Projects were existing impervious surfaces are less then 40 percent are 'new development'. According to the MDE stormwater regulations, both these designations carry a requirement to provide water quality treatment for runoff from existing impervious surfaces. For redevelopment, the requirement is 50 percent of the existing impervious surfaces and for new development the requirement is 100 percent. Practices that are implemented in order to meet this requirement are identified as being eligible to be included in MS4 impervious accounting as either baseline treatment or impervious restoration credit.

As MDOT SHA modifies or expands the existing roadway network to improve safety and mobility, SWM practices are implemented or upgraded to treat runoff from existing, untreated roadway segments to meet current SWM standards. Through negotiations with MDE relative to MDOT SHA development projects, redevelopment credit also includes both reconstructed impervious areas and impervious area removal. For further discussion of redevelopment credit, see **Part II.B.2., Baseline Runoff Treatment Assessment**.

E.6. Existing Grass Channel Inventory

Many MDOT SHA roadways drain to open channel grass swales that convey stormwater runoff from the roadway to storm drains or downstream waterways. See **Figure 1-4** for an example of a grass swale along the I-70 median in Baltimore County. MDE recognizes that certain of these existing channels effectively reduce pollutants in runoff and approved the *MDOT SHA Existing Water Quality Grass Swale Identification Protocol* in May 2016 (MDOT SHA, 2016). This document details a procedure to identify and evaluate existing grass swales against the MDE stormwater criteria for the open channel BMP. A full inventory and analysis of existing grass swales along MDOT SHA rights-of-way and within the MS4 coverage area has been completed. This analysis has been used to calculate actual levels of treatment currently being provided for both pollutant reductions and impervious restoration acreages and qualifying swales have been documented as spatial features within the MDOT SHA NPDES database. For further discussion describing how this analysis was included in the MDOT SHA baseline impervious calculation, refer to **Part II.B.2., Baseline Runoff Treatment Assessment**.

Figure 1-4: Existing Grass Channel along Median of I-70 in Baltimore County

E.7. Nutrient Credit Trading Program

The Maryland Department of Agriculture (MDA) and MDE are partnering to establish a nutrient credit trading and offset program. Although the program is currently under development, principles and draft guidance are available. Under this approach, sectors are given the flexibility to meet their load limits by purchasing credits or offsets generated from load reductions elsewhere. MS4s would be allowed to purchase credits at market rate and enter into cross-sector trading agreements to meet up to half of their impervious surface area treatment required under the MS4 Permit conditions. Cross-sector trading will include point source and non-point sources. For example, transactions can occur between two point sources such as Waste Water Treatment Plants (WWTP) and regulated MS4 jurisdictions, or between a point source and non-point source such as regulated MS4 jurisdictions and agricultural operations.

Trading is proposed to be allowed for MS4 restoration credits within three geographic regions called Maryland Trading Regions (see **Figure 1-5**):

- Potomac River Basin;
- Patuxent River Basin; and
- A combination of the remaining Susquehanna River Basin, Eastern Shore, and Western Shore.

Once the trading program and guidance are finalized, MDOT SHA intends to utilize this program as another practice to meet restoration requirements. For example, in areas where opportunities to implement traditional nutrient and sediment reduction strategies are limited, MDOT SHA anticipates the ability to utilize credit trading.

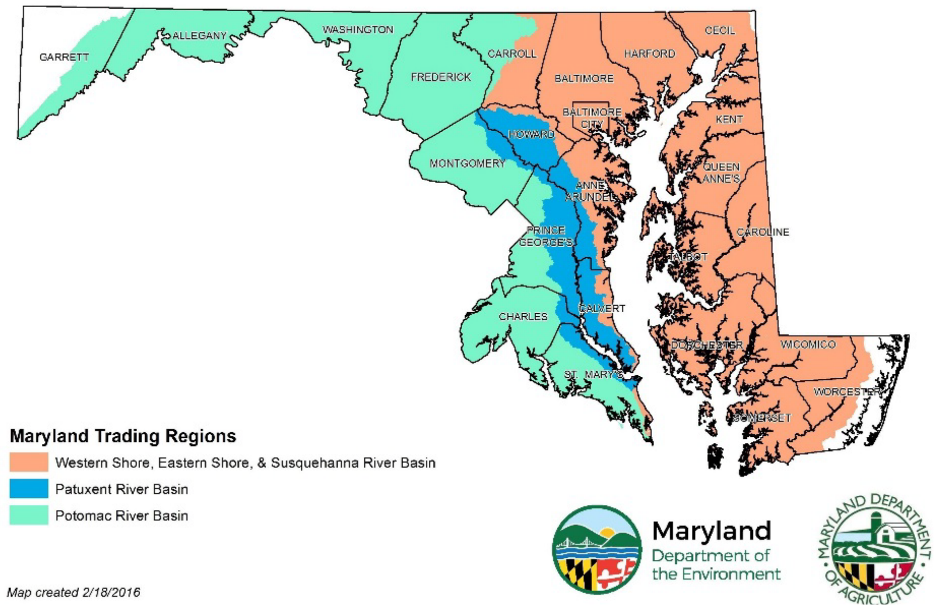


Figure 1-5: Proposed Maryland Trading Regions
(MDA & MDE, 2016)

E.8. Research

Through established statewide research funding, MDOT SHA can explore practices that will provide the most effective use of resources. Some current practices under study include outfall stabilization crediting for nutrient removal, methods to measure pollutant removal from inlet cleaning and street sweeping, and determining effectiveness of stormwater control practices in removing bacteria and other toxic contaminants such as PCBs.

E.9. Program Funding

MDOT SHA ensures the MS4 impervious restoration and TMDL implementation plan activities are adequately funded. Projected allocations and costs for impervious restoration are discussed in **Part II, Impervious Restoration Plan and Chesapeake Bay TMDL Compliance** and projected costs for local TMDL implementation are discussed in **Parts III, Coordinated TMDL Implementation Plan** and **Part IV, MDOT SHA Watershed TMDL Implementation Plans**.

F. RESTORATION PRACTICE DESCRIPTIONS

This section describes the practices used to meet impervious restoration goals and TMDL pollutant reductions. **Part II** and **Part III** detail how these practices are or will be combined in implementing restoration and TMDL reduction strategies. Current restoration practices are taken from MDE's *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014b) and the CBP technical workgroup protocols. As new practices are developed, MDOT SHA will consider potential to implement them.

For the most efficient treatment or offset of stormwater pollution, combinations of currently approved measures are being implemented. The MDOT SHA right-of-way has been reviewed using geographic information system (GIS) analysis and a myriad of base data to determine the best combination of treatment strategies along any given roadway corridor with the goal of maximizing the use of MDOT SHA owned properties. Additionally, MDOT SHA is partnering with local MS4 municipalities and counties, other governmental agencies, and private organizations to implement projects outside of MDOT SHA right-of-way.

F.1. Design, Inspection & Maintenance Standards

A variety of restoration practices are being employed. Some practices produce reductions through an annually conducted operations activity such as street sweeping, inlet cleaning, or educational outreach. Others, such as structural stormwater controls and tree planting, are permanent, built practices and are designed and constructed to certain standards. MDOT SHA adheres to the following standards for constructed practices:

- MDE 2000 Maryland Stormwater Design Manual and updates;
- MDE 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control and updates;
- Specifications for Performing Landscaping Activities for the Maryland Aviation Administration;
- American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide;
- MDOT SHA Book of Standards for Highway & Incidental Structures;
- MDOT SHA Standard Specifications for Construction Materials;
- MDOT SHA Highway Drainage Manual;
- MDOT SHA Stormwater Management Site Development Criteria Manual; and
- MDOT SHA Landscape Design Guide.

Built restoration practices are required to be inspected every three years and necessary maintenance or remediation efforts undertaken in order to ensure optimal pollutant removal and to continue to receive credit against the 20 percent impervious restoration and pollutant load reductions. Also, the Bay Program requires that pollutant removal credits be renewed at established timeframes for certain practices and inspections serve as confirmation of practice functionality. SHA has developed inspection and maintenance manuals for structural stormwater controls and tree sites. A geodatabase is used to track inspection timeframes, maintenance or remediation requirements, and completion dates.

F.2. Alternative Practices

MDE recognizes that not all the impervious restoration and load reductions can be accomplished by building new or upgrading existing structural stormwater controls and allows for construction of alternative practices that are effective at offsetting the pollutant loads generated by impervious surfaces without treating stormwater runoff directly. These alternative practices are assigned impervious treatment equivalencies that calibrate the effectiveness of these practices against equivalent reductions in loading rates from urban land use. MDE (2014b, p. 19, Table 7) has provided a list of acceptable alternative practices. Accordingly, the alternative practices currently used by SHA include tree planting, stream restoration, catch basin cleaning, street sweeping, and outfall stabilization. Other types of alternative practices may be employed in the future.

F.3. Categories of Practices

Restoration practices can also be organized into four categories: structural stormwater controls, land use changes, environmental restoration, and source controls. These categories are helpful in understanding the mechanisms for pollutant removal. Each category is defined below and detailed descriptions of practices and how they are being used by SHA are included in **Sections F.4** through **F.7**.

Structural Stormwater Controls

Structural stormwater (SW) controls are engineered practices that receive stormwater runoff from developed areas and, using a variety of mechanisms, reduce pollutants and slow runoff velocities to minimize impacts when discharged to downstream waterways. They are engineered to optimize pollutant removal and are designed and built under standards contained in the *2000 Maryland Stormwater Design Manual* (MDE, 2009a). Structural SW controls are discussed in **Section F.4**.

Land Use Changes

Land use change practices reduce pollutants by replacing existing land cover that generates high levels of pollutants with one that generates lower levels. This will provide an overall decrease in pollutants without capturing and treating stormwater runoff directly. Examples of land use changes are planting trees or removing impervious pavement. Land use change BMPs are discussed in **Section F.5**.

Environmental Restoration

Environmental restoration aims to counteract the effects of urbanization on natural stream channels. Urbanization with increased impervious surfaces, reduced tree canopy, and straightened, steepened and less permeable runoff conveyances changes the characteristics of stormwater runoff by increasing volumes and duration of flows. Tributaries, streams, and rivers conveying these flows can be impacted by one or more of the following problems: flooding, increased erosion of banks, deeper channel bottoms, changes in channel configuration and location, loss of aquatic habitat and species, and loss of wetlands as floodplains become dryer. Activities that restore natural channels establish equilibrium between the flowing water, structure and configuration of channels, and species and habitat. Environmental restoration practices include stream restoration, wetland restoration, and outfall stabilization and are discussed in **Section F.6**.

Source Controls

Source controls remove pollutants before they reach waterways and include methods to reduce the generation of pollutants such as recycling/reuse efforts or educational campaigns. They also include physically capturing and removing pollutants for disposal elsewhere, typically in landfills. Catch basin cleaning and street sweeping are examples and are discussed in **Section F.7**.

F.4. Structural Stormwater Controls

Grass Swales

Grass swales are grass-lined channels that convey stormwater draining from roadways towards discharge points or outfalls. They are designed to certain cross-sectional geometries, longitudinal profiles, and side slopes in order to control the rate and depth at which stormwater flows through the swale. Pollutant reductions are achieved through vegetative filtering, sedimentation, and biological uptake. Swales can attenuate larger flows by slowing and infiltrating runoff during flows. They are typically located within roadway median areas or along roadsides. See **Figure 1-6** for an example of a grass swale.

Figure 1-6: Grass Swale Example along MD 220 in Washington County

Bioswales

Bioswales are structural swales designed with a multi-tier filtration system consisting of filter media, transition, and drainage layers working in combination to remove pollutants. Bioswales use an engineered soil filter media that is very porous and consists of sand, soil and organic matter such as mulch or compost. Stormwater flows onto the surface of the facility and as it seeps through the media, it is filtered. Plants within the facility also provide treatment through biological processes associated with the root systems and uptake of water and nutrients. The process removes sediment, as well as nitrogen and phosphorus. Bioswales can also attenuate flows by storing and infiltrating stormwater runoff to the ground below. They are viable in all soil types (based on USGS Hydrologic Soil classifications); however, underdrain systems are required in soils with low infiltration rates (typically hydraulic soil groups C & D). They can be used in areas with lower infiltration rates if an underdrain is also used. See **Figure 1-7** for an example bioswale under construction.

Figure 1-7: Bioswale during construction along MD 214 in Prince George's County

Wet Swales

Wet swales are structural swales that can be used in poorly drained soil types and are ideal for treating highway runoff in low-lying, flat terrain with high groundwater. Wet swales often intercept shallow groundwater to maintain a wetland plant community. Check dams are placed within the swale to help promote saturated soil or shallow standing water conditions and to temporarily store runoff before returning the treated stormwater to the conveyance system. The saturated soil and wetland vegetation provide an ideal environment for gravitational settling, biological uptake, and microbial activity.

Submerged Gravel Wetlands

Submerged gravel wetlands (SGW) are "flow through" filters that use wetland plants, a soil layer, and a gravel chamber to provide water quality treatment. Stormwater runoff draining to an SGW is treated primarily through filtration, but also sedimentation, physical and chemical sorption, microbially mediated transformation, uptake, and attenuation. Stormwater flows to the pretreatment forebay, where sedimentation occurs first; the pretreated runoff is then stored on the surface of the wetland. Filtration, sorption, and transformation occur as the stormwater travels through the wetland vegetation, soil layer, and/or gravel chimneys and passes through the gravel substrate that hosts a microbe-rich environment. While some uptake occurs in the wetland vegetation, most of the treatment is within the gravel substrate. To sustain the microbes and the wetland plants, the gravel substrate and soil layers must remain wet between storm events. For this reason, SGWs are used typically in poorly draining soils (typically hydraulic soil groups C & D) and/or areas of high ground water. See **Figure 1-8** for an example of an SGW.

Figure 1-8: Submerged Gravel Wetland in Silver Spring, Montgomery County, MD

Surface Sand Filters

Surface sand filters are practices that capture and temporarily store runoff and pass it through a filter bed of sand media. Filtered stormwater is either returned to the conveyance system or partially infiltrated into the soil. Surface sand filter facilities are versatile and may be adapted for use almost anywhere. Facilities can be located in poorly draining soils with the use of an underdrain system to discharge the treated runoff to a conveyance system. See **Figure 1-9** for an example of a surface sand filter.

Figure 1-9: Surface Sand Filter along MD 355 in Montgomery County

Bioretention and Micro-Bioretention Facilities

Bioretention systems use very porous media consisting of sand, soil, and organic matter such as mulch or compost for filtering stormwater runoff. Stormwater flows onto the surface of the facility and as it seeps through the media, it is filtered. Plants within the facility also provide treatment through biological processes associated with the root systems and uptake of water and nutrients. Bioretention facilities are versatile and may be adapted for use anywhere there is landscaping, although maintenance considerations prohibit their use in certain contexts.

Filtered stormwater is either returned to the conveyance system or partially infiltrated into the soil. Facilities may use underdrains to discharge the treated runoff to storm drain systems, though underdrains are not necessary in well-drained soils.

The specific facility type, bioretention or micro-bioretention, is determined based on the size of the area draining to the facility. Micro-bioretention facilities are typically limited to a half acre drainage area and are typically used in smaller landscaped areas. If properly maintained, micro-bioretention facilities can provide water quality treatment while adding aesthetic value to the site. See **Figure 1-10** for an example of a bioretention facility.

Figure 1-10: Bioretention Facility at MD 139 in Baltimore County

Rain Gardens

Rain gardens are shallow, planted depressional areas designed to infiltrate stormwater into the soil. This is an effective method to remove pollutants and recharge groundwater supplies. Soil requirements are an important factor when planning to implement this strategy. Soils must have high infiltration capabilities, low groundwater tables, and be located within a relatively flat area. Also, they must not be located within areas of karst topography, which are areas geologically characterized by soluble bedrock, such as limestone. Water infiltrating into the ground in these areas can dissolve bedrock and increase the potential of causing sink holes.

Infiltration Trenches

Infiltration trenches are relatively deep linear trenches designed to capture and infiltrate a certain amount of runoff volume based on the size of the area draining to them. They are limited by certain infiltration capabilities of the underlying soils and restrictions in karst topography. These trenches are sized to hold the runoff while allowing infiltration into the native soils over a prescribed period of time. They are filled with stone and the sides are lined with geotextile to prevent soils along the sides of the trench from migrating to the bottom and clogging them with fine sediments that will prevent water from infiltrating. SHA uses this practice when space is limited and the right soils are underlying the area. See **Figure 1-11** for an example of an infiltration trench.

Figure 1-11: Infiltration Trench along US 113 in Worcester County

Wet Ponds and Wetlands

Using permanent pools of water to reduce pollutants in stormwater runoff has been a long standing treatment method in Maryland. Recent SWM practices that encourage infiltration to native soils and emulate natural flow patterns prior to urban development have been determined to be more effective at removing pollutants. For this reason, SHA only uses wet pond and surface wetland facilities when necessary due to site constraints such as high ground water and/or large drainage areas.

Stormwater wet ponds and surface wetlands are facilities that have a permanent pool or shallow wetland with deep water zones. These facilities provide water quality treatment through biological uptake from algae growing within the permanent pool/wetland areas. Wetland plants provide additional nutrient uptake, and physical and chemical treatment processes allow filtering and absorption of nutrients. Surface pond/wetlands practices are best suited for areas of high ground water and/or poorly draining soils; however, they can be used if larger drainage areas exist and impermeable liners are placed beneath the facility to ensure the permanent ponding necessary to achieve the pollutant removal is provided. See **Figure 1-12** for an example wet pond.

Figure 1-12: Wet Pond along US 113 in Worcester County

F.5. Land Use Changes

Impervious Area Removal

Impervious surfaces increase runoff because they prevent rainwater from penetrating the ground. As a result, runoff can increase water volumes in nearby streams and cause flooding and erosion. Pollutants that are deposited on impervious surfaces from vehicles or atmospheric deposition, such as gasoline, nitrogen and oil, can wash into streams. Impervious surfaces often increase the temperature of runoff which can raise stream water temperatures. These factors all lead to poor stream health.

Impervious area removal is the replacement of impervious surfaces, such as asphalt and concrete, with pervious surfaces, such as grass, meadow plants, or trees. Replacing impervious surfaces such as abandoned roadways and concrete lined ditches with permeable surfaces allows rainfall to infiltrate into the ground which reduces runoff and pollution entering downstream waterways. Grass lining in ditches also slows the flow of runoff through the ditch allowing pollutants to be filtered and settled. Generally, trees provide better infiltration and pollutant removal than grass or meadows. The type of vegetation installed will depend upon the site context, roadside safety, and sight distance requirement for motorists. See **Figure 1-13** for an example of impervious area removal.

Figure 1-13: Before and After Image of a Concrete Ditch Lining Removal along I-70 in Washington County

Tree Planting

Tree planting is an economical strategy that converts grass or meadow areas to forested land. . Forests produce less runoff than impervious, grass, or meadow areas and provide higher sorption rates of nutrients and sediment for rainwater falling on the site directly. By capturing rainfall in the canopy and bark; trees encourage rainwater to evaporate back into the air. Leaves also release moisture in a process called transpiration. Trees also absorb many pollutants through their root systems. In addition, their roots and leaf litter improve soil conditions for infiltration and can transform pollutants into less harmful substances. The roots also bind soils, preventing erosion. See **Figures 1-14** and **1-15** below for photos of recent MDOT SHA tree planting sites.

Figure 1-14: MDOT SHA Tree Planting Site at Perring Parkway and I-695 in Baltimore County

Figure 1-15: MDOT SHA Tree Planting Site along US 15 in Frederick County

F.6. Environmental Restoration

Stream Restoration

Stream restoration reestablishes the structure, function, and self-sustaining behavior of the stream system prior to disturbance. The restoration design focuses on the physical and biological components of the stream system and its watershed. Restoration includes a broad range of measures such as removing watershed disturbances that are causing stream instability; installing structures and planting vegetation to stabilize stream banks and provide habitat; and reconstructing the curves, bends and depth of channels within the stream. See **Figure 1-16** for an example of stream restoration.

Figure 1-16: MDOT SHA Stream Restoration Project at MD 139 before, during, and after Construction

Step Pool Systems

Step pool systems are applied in steep channel conditions to manage flow energy. These systems generally consist of steps or weirs constructed of rock, separated by pools that reduce flow energy between steps. Native vegetation is installed to provide additional stabilization, greater pollutant processing, shading, and habitat. In appropriate conditions, filter media and configurations that encourage greater infiltration are incorporated into the systems to provide added pollutant processing efficiency. Step pool systems may be utilized within steep stream restoration reaches or in outfall stabilization situations. See **Figure 1-17** for an example of a step pool system.

Figure 1-17: Example Step Pool System at Avalon State Park after Construction

Outfall Stabilization

Outfall stabilization repairs channels when significant erosion occurs due to increase and change in the characteristics of stormwater discharge that occurs when it discharges from one type of conveyance to another such as from a pipe to ditches, adjacent lands, or stream channels. Different methods are used to stabilize outfalls including the use of natural materials and structures, rock riprap, vegetation and matting, or stepped grade changes. The stabilization is designed to control flows for existing storm drains based on the magnitude and frequency of a flow event. See **Figure 1-18** for an example of outfall stabilization.

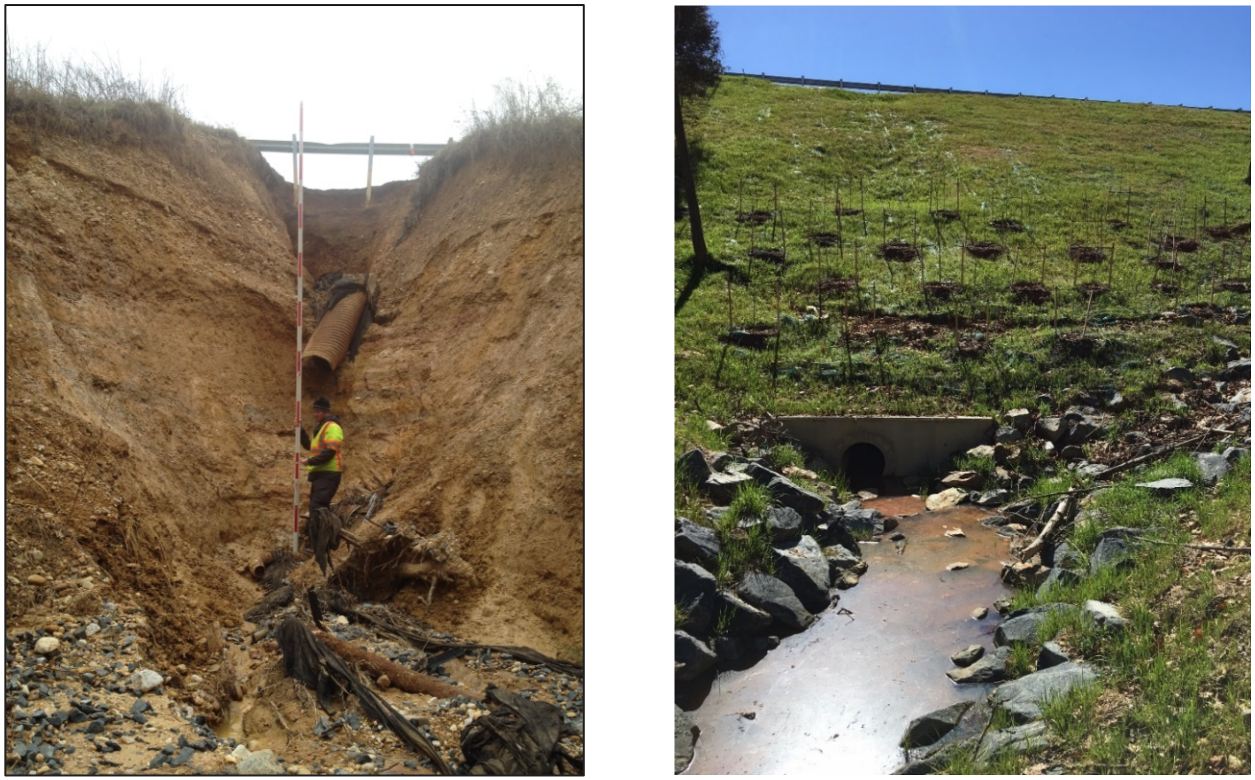


Figure 1-18: MD 210 Outfall before and after Stabilization in Anne Arundel County

F.7. Source Controls

Street Sweeping

Sweeping roadways is not only an important means to keep them clear of trash and debris, but it also results in a reduction of pollutants associated with roadway debris. This material is collected for disposal into approved landfills resulting in pollutants removed prior to entering waterways. Different types of sweeping equipment exist with different levels of effectiveness at removing debris. Sweeping prevents buildup along sections of roadway and allows for the free flow of water from the highway to enter into drainage systems. MDE's current sweeping BMP definition requires sweeping to be performed two times per month (MDE, 2014b). MDOT SHA has designated routes for this sweeping frequency which occurs from April through November. See **Figure 1-19** for an example of street sweeping.

Figure 1-19: Typical MDOT SHA Mechanical Street Sweeper

Inlet Cleaning

Inlets are grated openings in the storm drain system that capture stormwater runoff and convey it to a piped. Many inlets have depressed bottoms or chambers that capture sediment and debris preventing them from entering downstream conveyances or waterways. These catch basins must be cleaned periodically and sediment and trash make up the majority of the material that is removed. This practice ensures safer roadways by maintaining free drainage and improves water quality in by removing captured sediment and trash before it enters downstream waterways. See **Figure 1-20** for an example of inlet cleaning.

Figure 1-20: Inlet Catch Basin Cleaning before and after

Structural Stormwater Controls

Structural stormwater controls are discussed under **F.4, Structural Stormwater Controls**, but they also act as source controls for trash and debris. Regular maintenance provides removal and disposal.

Litter Education and Outreach Program

The MDOT SHA Office of Communications (OC) and Office of Maintenance (OOM) collaborate on public education programs which include disseminating information through articles, social media, and hosting environmental awareness events at schools and civic events. The program offers materials such as coloring books, brochures, and speakers to educate the public. Other on-going public education initiatives by MDOT SHA include Keep Maryland Beautiful environmental education grants; press releases and articles; and social media using Twitter, Facebook, YouTube and Instagram.

MDOT SHA has posted a public education website that focuses on water quality initiatives. The site can be accessed at the link below and key components include:

https://www.roads.maryland.gov/Index.aspx?Pageid=48

- Proper erosion and sediment control,
- Proper disposal of vehicle fluids
- Storm drain stenciling,
- Roadside dumping,
- Litter and Trash Disposal,
- Vehicle Idling,
- Alternative modes of transportation,
- Car care, and
- Proper pet waste disposal.

Employee Recycling and Reuse Program

MDOT SHA employees lead by example, and actively seek to reduce littering and increase recycling. These recycling efforts are evaluated through the MDOT Excellerator program which includes two performance measures to track the percentage of office waste and non-office waste diverted from the landfill or incineration through recycling. The MDOT Excellerator Report is updated and shared each quarter, and is publicly available online.

Recycled office Waste Includes:

- Commingled containers (glass, metal, and plastic);
- Glass (fluorescent light tubes, mixed glass containers);
- Metals (mixed cans, and tin/steel cans);
- Paper (corrugated cardboard, mixed paper, shredded paper and newspaper);
- Plastic (mixed plastic bottles, other plastics);
- Electronics; and
- Printer cartridges

Non-Office Waste Includes:

- Lead-acid batteries (vehicle);
- Compostables (grass, leaves, brush, branches, mixed yard trimmings, food waste, and other);
- Metals (white goods - refrigerators, stoves, washing machines, dryers,
- water heaters, and air conditioners);
- Animal protein/solid fat;
- Tires;
- Antifreeze;
- Industrial fluids;
- Motor oil;
- Scrap automobiles; and
- Scrap metals.

Litter Reduction, Collection, and Disposal

MDOT SHA has many programs in place to address and control litter within MDOT SHA right-of-way. A critical aspect of MDOT SHA year-round highway maintenance is the removal of litter from roadway shoulders and drainage systems. MDOT SHA uses a multi-pronged approach to control litter utilizing state workers, contractors, inmate crews, as well as labor donated through the Sponsor-A-Highway (SAH) program and partnerships with Adopt-A-Highway (AAH) volunteers.

Instead of just picking up litter, MDOT SHA now provides our crews and volunteers with the means to separate recyclables from trash. All seven MDOT SHA Districts are currently recycling roadway litter in a formal manner. As the recycling efforts increase, the volume of waste taken to landfills continues to decrease.

MDOT SHA currently collects a substantial amount of litter and trash as described below:

- Maintenance Crew Clean-ups – Each maintenance shop is responsible to perform many routine activities including trash clean-up as well as mowing, plowing, and other activities. Trash clean-ups are performed regularly throughout the year with additional attention in the Spring and Summer mowing seasons. Spot cleaning is scheduled upon public request for hot spots close to the landfills.

- Contracted Crew Clean-ups –MDOT SHA also enters into contractual agreements for supplemental clean-ups along the right-of-way. This includes contracts with private companies as well as inmate crews contracted with various state penitentiaries. Contracts are awarded for designated roadway segments and contractors are required to pick up on a regular schedule.

- Adopt-A-Highway (AAH) – This program encourages volunteer groups (families, non-profit organizations, schools and civic organizations) to pick up litter along one to two mile stretches of non-interstate roadways four times a year for a two-year period as a community service. MDOT SHA provides each group with training, safety vests, trash bags, and tips on how to pick up trash and recyclables. The trash collected is placed in bags that are picked up by MDOT SHA maintenance crews. MDOT SHA will also place signs recognizing the organization or group at both ends of the adopted roadside.

- Sponsor-A-Highway (SAH) – This MDOT SHA corporate sponsorship program allows corporations to sponsor sections of Maryland roadways by funding contracted clean-ups for one-mile sections of roads. The sponsor enters an agreement with a maintenance provider to remove litter from the sponsored highway segment, typically an interstate roadway. The maintenance providers are responsible for removal of trash from sponsored segments of roadways.

  Each sponsor is acknowledged by a sign with a recognition panel that is placed at the beginning of the highway segment they are sponsoring. MDOT SHA does not receive any reimbursement from the sponsor or maintenance provider. MDOT SHA's primary roles are to ensure litter removal is properly performed, ensure recognition signs are installed to the Federal Highway Administration (FHWA)'s Manual on Uniform Traffic Control Devices (MUTCD) standards, manage the inventory of segments available for sponsorship, review additional areas for inclusion in the program, and approve artwork submitted for sponsor panels.

Illicit Discharge Detection and Elimination (IDDE)

Illicit discharges are defined as a dry weather flows that have measurable pollutants or pathogens. The MDOT SHA IDDE program conducts regular field screenings and sampling for a subset of our outfalls annually and also for any reported suspected illicit discharges. Sampling does not directly test for bacteria, but the testing does detect indicators of sewage. If an illicit discharge is confirmed, MDOT SHA works with local jurisdictions to disconnect the discharge from the storm drain system.

Geese/Waterfowl Prevention at Ponds

Waterfowl have been known to establish colonies at pond sites, particularly in large stormwater ponds with a permanent pool adjacent to grassy areas, or areas with attractive waterfowl habitat. As these colonies increase in size, overcrowding can result. In general, an overcrowded bird population in a pond creates high nutrient and bacteria loads from fecal material. Waterfowl are also known to carry pathogens that can be dangerous to humans. Two birds per acre of pond is a manageable number that will not result in significant property damage or water quality impairments (Clemson Cooperative Extension, 2015). Once the number of waterfowl exceed this ratio, control measures may be considered.

Generally, MDOT SHA ponds are not attractive to waterfowl because shore areas are not maintained in a lawn condition, making it difficult for the waterfowl to forage and nest. MDOT SHA inspects SWM control structures on a 3-year cycle and evidence of waterfowl infestation is taken into consideration. If a colony is identified, measures may be undertaken to eradicate the colony in cooperation with the Maryland Department of Natural Resources (DNR).

Cattle Fencing and Pasture Stream Buffers

Cows and other pasture animals with open access to streams contribute to poor water quality, stream bank degradation, and erosion. As the animals walk through the water, they pollute the stream with manure, urine, and pathogens. Cattle can also consume and trample the vegetation on stream banks as they enter and exit the channel. The decrease in stream bank vegetation and associated root systems leads to an increased amount of sediment, pesticides, nutrients, and phosphorus entering into the water (Pennsylvania Association of Conservation Districts [PACD], 2009).

Installation of fencing along streams protects stream banks, allows a natural riparian buffer to reestablish and thrive, and limits access to stream banks by farm animals. Riparian buffers are vegetated areas running parallel to a stream and they are important because they reduce and slow runoff from adjacent farm fields; reduce erosion; trap sediment, pesticides, and nutrients carried in farm field runoff; strengthen and stabilize stream banks with plant roots; and discourage farm animals from entering the stream. See **Figure 1-21** for examples of streams with and without cattle fencing.

Figure 1-21: Example of Streams with and without Cattle Fencing

MDOT SHA does not manage farm or pasture land, however, MDOT SHA may use these techniques on stream restoration projects in rural areas to protect the restoration work if there is potential for the presence of cattle or horses.

Pet Waste Disposal Stations

Bacteria and nutrient pollution can be attributed to pet feces. When pet owners do not pick up after their pets and the waste is left on a lawn or impervious surface, it washes into storm drains and nearby streams. MDOT SHA has installed pet waste collection stations at highway rest areas to encourage proper disposal of pet waste by the traveling public. See **Figure 1-22** for an example of a pet waste disposal station.

Figure 1-22: Pet Waste Disposal Station at the I-70 Eastbound Rest Area and Welcome Center

Drainage System and Waterway Clean-ups

Periodically, MDOT will host a stream clean-up where trash, litter, dumping and other forms of debris are collected and removed from stream valleys and riparian areas. Participants can be state workers, volunteers, or contracted crews and trash and debris collected is disposed of at a landfill. Increasing these types of stream clean-ups is a viable option for trash and litter TMDL reductions.

An enhancement to trash reduction can also mean the addition of trash interceptor devices at outfalls or within streams to remove trash and debris. Examples of such devices are sock traps, screen or netting traps, and in-stream interceptors. See **Figure 1-23** for an example outfall trash collection device.

Figure 1-23: Outfall Trash Sock