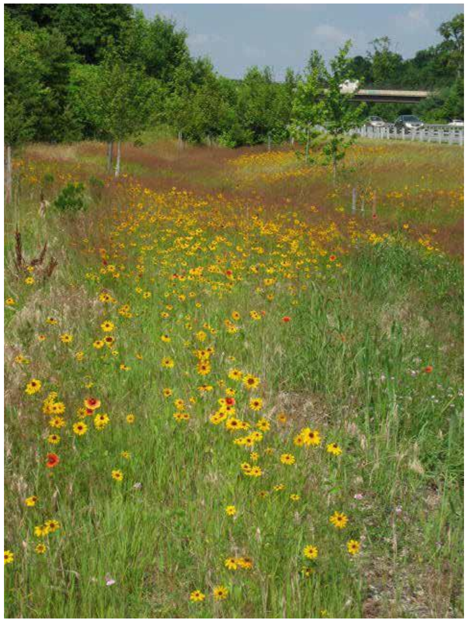
MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Bush River Oligohaline Segment PCB TMDL Implementation Plan

August 2, 2017



August 2, 2017

Mr. Raymond Bahr
Sediment, Stormwater and Dam Safety Program
Water Management Adminstration
Maryland Department of the Environment
1800 Washington Boulevard, Suite 440
Baltimore, MD 21230

Dear Mr. Bahr:

The Maryland Department of Transportation State Highway Administration (MDOT SHA) is pleased to submit this PCB TMDL Implementation Plan for the Bush River Oligohaline Segment addressing conditions under the MDOT SHA NPDES MS4 permit (11-DP-3313 MD 0068276) which took effect on October 9, 2015. This submittal covers the permit requirement to submit a coordinated TMDL implementation plan for any subsequent stormwater WLAs within one year of EPA approval.

The EPA approved the TMDL of PCBs in the Bush River Oligohaline Segment, Harford County Maryland on August 2, 2016. MDOT SHA is a member of the regulated urban stormwater sector and was assigned an aggregated WLA for this TMDL. The public comment period for this PCB TMDL Implementation Plan was held from June 28, 2017 to August 2, 2017. Notices were posted in the classified section of *The Baltimore Sun* and *The Washington Post* on June 29, 2017 and June 30, 2017, respectively. The notices provided the website were the plan could be viewed and how to comment should the reader so choose. No comments were received during the public comment period. Please find enclosed documentation confirming the posting of these notices.

If you have any questions or need additional information regarding this delivery, please contact Ms. Karen Coffman at 410-545-8407 (or via email at kcoffman@sha.state.md.us) or me at 410-545-8640 (or via email at sram@sha.state.md.us).

Sincerely,

for Sonal Ram, Director
MDOT SHA Office of Environmental Design

Enclosures: MDOT SHA Bush River Oligohaline Segment PCB TMDL Implementation Plan
The Baltimore Sun Media Group Public Review & Comment Sales Receipt
Washington Post Media classified Ad Proof

Cc: Ms. Karen Coffman, Chief, MDOT SHA OED Water Programs Division
Mr. Robert Shreeve, Deputy Director, MDOT SHA OED

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BUSH RIVER OLIGOHALINE SEGMENTSHED PCB TMDL IMPLEMENTATION PLAN

A. WATER QUALITY STANDARDS AND DESIGNATED USES

TMDLs focus on offsetting the impacts of pollutants to waterway designated uses. The Federal Clean Water Act (CWA) established requirements for each State to develop programs to address water pollution including:

- Establishment of water quality standards (WQSs);
- Implementation of water quality monitoring programs;
- Identification and reporting of impaired waters; and
- Development of maximum allowable pollutant loads that when met and not exceeded will restore WQSs to impaired waters, called TMDL documents.

WQSs are based on the concept of designating and maintaining specifically defined uses for each waterbody. **Table 1** lists the designated uses for waterways in Maryland. TMDLs are based on these uses.

One means for the EPA to enforce these standards is through the NPDES program, which regulates discharges from point sources. MDE is the delegated authority to issue NPDES discharge permits within Maryland and to develop WQSs for Maryland including the water quality criteria that define the parameters to ensure designated uses are met.

Table 1: Designated Uses in Maryland

	Use Classes							
Designated Uses	**I**	**I-P**	**II**	**II-P**	**III**	**III-P**	**IV**	**IV-P**
Growth and Propagation of Fish (not trout), other aquatic life and wildlife	✓	✓	✓	✓	✓	✓	✓	✓
Water Contact Sports	✓	✓	✓	✓	✓	✓	✓	✓
Leisure activities involving direct contact with surface water	✓	✓	✓	✓	✓	✓	✓	✓
Fishing	✓	✓	✓	✓	✓	✓	✓	✓
Agricultural Water Supply	✓	✓	✓	✓	✓	✓	✓	✓
Industrial Water Supply	✓	✓	✓	✓	✓	✓	✓	✓
Propagation and Harvesting of Shellfish			✓	✓				
Seasonal Migratory Fish Spawning and Nursery Use			✓	✓				
Seasonal Shallow-water Submerged Aquatic Vegetation Use			✓	✓				
Open-Water Fish and Shellfish Use			✓	✓				
Seasonal Deep-Water Fish and Shellfish Use			✓	✓				
Seasonal Deep-Channel Refuge Use			✓	✓				
Growth and Propagation of Trout					✓	✓		
Capable of Supporting Adult Trout for a Put and Take Fishery							✓	✓
Public Water Supply		✓		✓		✓		✓

Source: http://www.mde.maryland.gov/programs/water/TMDL/WaterQualityStandards/Pages/wqs_designated_uses.aspx

MS4 Permit Requirements

The MDOT SHA MS4 Permit requires coordination with county MS4 jurisdictions concerning watershed assessments and development of a coordinated TMDL implementation plan for each watershed that SHA has a WLA. Requirements from the MDOT SHA MS4 Permit specific to watershed assessments and coordinated TMDL implementation plans include *Part IV.E.1.* and *Part IV.E.2.b*., copied below.

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 rights-of-way and facilities, and approved stormwater WLAs to:

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

Coordinated TMDL Implementation Plans (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 the 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 implementation 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 EPA approved TMDL stormwater WLAs are not being met according to the benchmarks and*

deadlines established as part of the SHA's watershed assessments.

B. WATERSHED ASSESSMENT COORDINATION

According to the USGS (2016):

> *A watershed is an area of land where all water that falls on it and drains off it flows to a common outlet. A watershed is an area of land that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel. The word watershed is sometimes used interchangeably with drainage basin or catchment. The watershed consists of surface water--lakes, streams, reservoirs, and wetlands--and all the underlying ground water. Larger watersheds contain many smaller watersheds. Watersheds are important because the streamflow and the water quality of a river are affected by things, human-induced or not, happening in the land area "above" the river-outflow point.*

The 8-digit scale is the most common management scale for watersheds across the state, and therefore is the scale at which most of Maryland's local TMDLs are developed. In some cases, a subwatershed has its own TMDL. See **Figure 1** for an illustration of an example 8-digit watershed in Maryland.

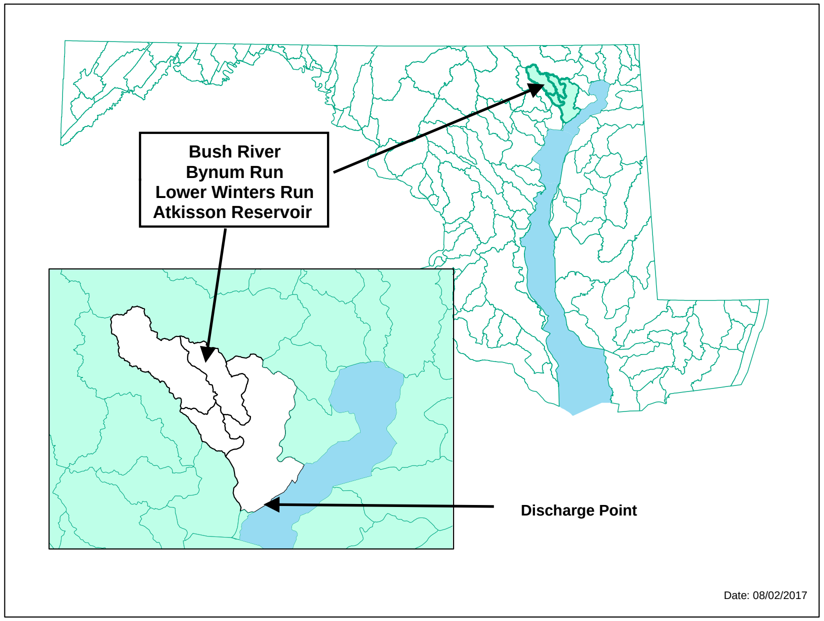

Figure 1: Maryland 8-digit Watershed Example

Segmentsheds are watersheds associated with tidal waters, which are referred to as segments. The Chesapeake Bay and its tidal tributaries are divided into 92 segments as shown in **Figure 2**. The Bush River segmentshed (BSHOH) includes four 8-digit watersheds: Bush River watershed (MD-02130701, excluding Romney Creek drainage area), Lower Winters Run (MD-02130702), Atkisson Reservoir (MD-02130703), and Bynum Run (MD-02130704).

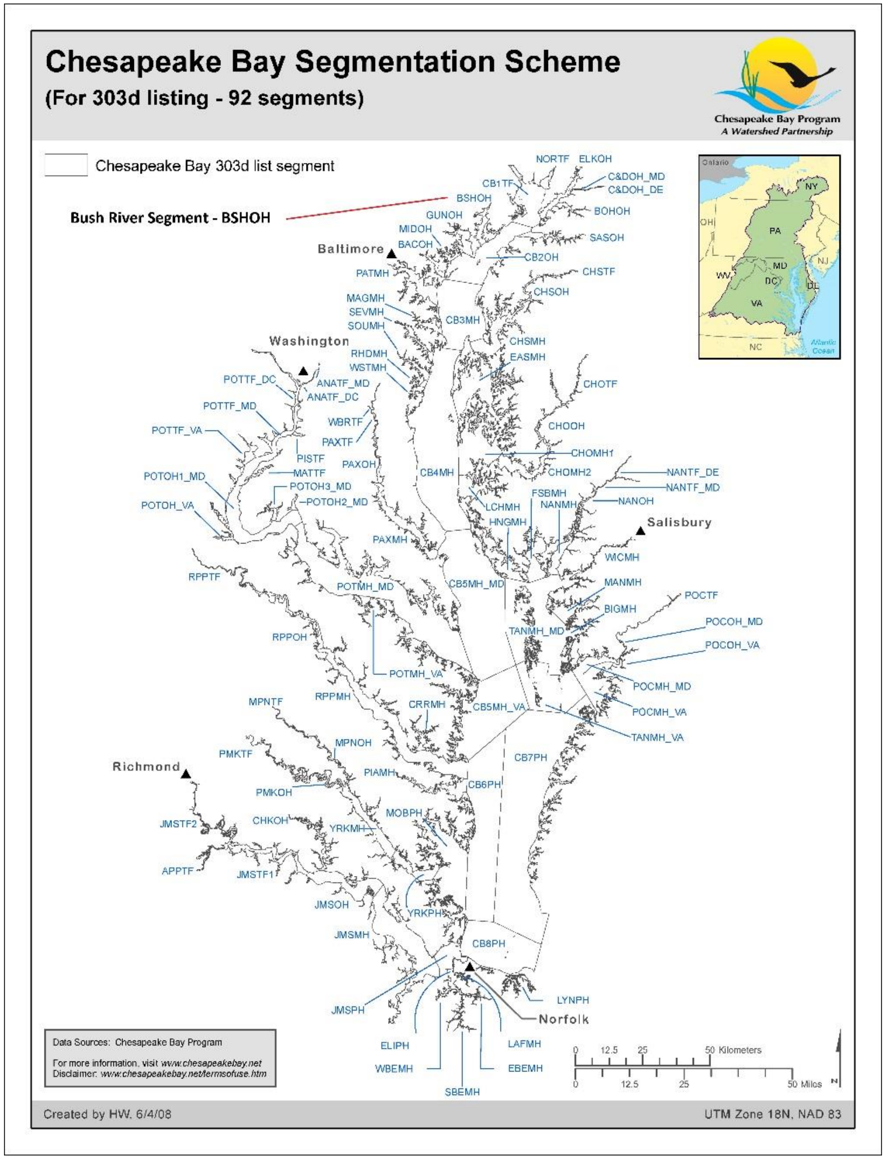

Figure 2: Chesapeake Bay 92 Segments

County Watershed Assessments

Each MS4 county is required to perform detailed assessments of local watersheds as a part of its MS4 permit requirements. These assessments determine current water quality conditions and include visual inspections; the identification and ranking of water quality problems for restoration; the prioritization and ranking of structural and non-structural improvement projects; and the setting of pollutant reduction benchmarks and deadlines that demonstrate progress toward meeting applicable WQSs. MDOT SHA is not required to duplicate this effort, but is required to coordinate with the MS4 jurisdictions to obtain and review watershed assessments. Relying on assessments performed by other jurisdictions avoids redundant analysis and places the responsibility for developing the assessments with the jurisdictions that have close connection to local communities and watershed groups.

Watershed assessment evaluations conducted by MDOT SHA focus on issues that MDOT SHA can improve through practices targeting MDOT SHA right-of-way (ROW) or infrastructure. This information is used to determine priority areas for BMP implementation and to identify potential project sites or partnership project opportunities. Summaries of these evaluations are included in this Plan under **Section F**. MDOT SHA watershed assessment evaluations focus on the following:

- Impacts to MDOT SHA infrastructure such as failing outfalls and downstream channels;
- Older developed areas with little SWM and available opportunities to install retrofits;
- Degraded streams;
- Priority watershed issues such as improvements within a drinking water reservoir, special protection areas or Tier II catchments;
- Identification of areas most in need of restoration;

- Description of preferred structural and non-structural BMPs to use within the watershed;
- Potential project sites for BMPs; and
- In watersheds with PCB TMDLs, identifying locations of any known PCB sources.

In addition to using information from the county watershed assessments, MDOT SHA also undertakes other activities to identify potential project sites and prioritize BMP implementation including:

- On-going coordination meetings with each of the MS4 counties to discuss potential partnerships with the mutual goal of improving water quality;
- Perform visual watershed inspections as described below;
- Model MDOT SHA load reductions within the watershed based on MDOT SHA land uses and ROW; and
- Maximize existing impervious treatment within new roadway projects (practical design initiative).

C. VISUAL INSPECTIONS TARGETING MDOT SHA ROW

MDOT SHA has recently developed a process to methodically review each watershed for potential restoration projects within MDOT SHA ROW to meet the load reductions for current pollutant WLAs. Although these watersheds have previously been reviewed for all practice types, this new process adds a grid system to coordinate and track efforts of many teams systematically to ensure each watershed is thoroughly assessed. This method is used to search for new stormwater control structure sites and tree sites. The watershed review process includes two phases to visually inspect each watershed and identify all structural and non-structural water quality improvement projects to be implemented.

Desktop Evaluation

Phase one is a desktop evaluation of the watershed using available county watershed assessments and MDOT SHA data. MDOT SHA has created a grid system of 1.5 mile square cells to track the progress of the visual watershed inspections, allowing prioritized areas to be targeted first. With this grid system, many spatial data sets are reviewed to determine the most effective use of each potential restoration site. The sites are documented geographically and stored in GIS. Viable sites are prioritized and those located within watersheds with the most pollutant reduction needs move forward to the second phase, which is to perform field investigations. Data reviewed includes:

- Aerial imagery;
- Street view mapping;
- Environmental features delineations such as critical area boundary, wetlands buffers, floodplain limits;
- County data such as utilities, storm drain systems, contour and topographic mapping;
- MDOT SHA ROW boundaries;
- Current MDOT SHA stormwater control and restoration practice locations; and
- Drainage area boundaries.

Figure 7 illustrates the 1.5 mile grid system for the Bush River Segementshed.

Field Investigations

Phase two is a field investigation of each viable site resulting from the watershed desktop evaluation. MDOT SHA inspects and assesses each site in the field to identify and document existing site conditions, water quality problems, and constraints. This information is used to determine potential restoration BMP types as well as estimated restoration credit quantities.

MDOT SHA will continue to prioritize visual inspections in the highest need watersheds. **Figure 3** is an example field investigation summary map that documents observations from the field analysis. A standardized field inspection form is used.

D. BENCHMARKS AND DETAILED COSTS

Benchmarks and deadlines demonstrating progress toward meeting all applicable stormwater WLAs are provided in the segmentshed discussion in **Section F**. It contains generalized cost information that includes an overall estimated cost to implement the proposed practices. Detailed costs for specific construction projects are available on SHA's website (www.roads.maryland.gov) under the Contractors Information Center.

Figure 3: Example Field Investigation Summary Map

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E. POLLUTION REDUCTION STRATEGIES

E.1. MDOT SHA TMDL Responsibilities

TMDLs define the maximum pollutant loading that can be discharged to a waterbody and still meet water quality criteria for maintaining designated uses. **Figure 4** illustrates the concept of maximum loading. The green area on the bar depicts the maximum load that maintains a healthy water environment for the pollutant under consideration. When this load is exceeded, the waterway is considered impaired as illustrated by the red portion of the bar. The example waterway needs restoration through implementation of practices to reduce the pollutant loading to or below the TMDL.

Generally, the formula for a TMDL is:

$$TMDL = \sum WLA + \sum LA + MOS$$

Where:

TMDL = total maximum daily load
WLA = wasteload allocation for point sources;
LA = load allocation for non-point sources; and
MOS = margin of safety.

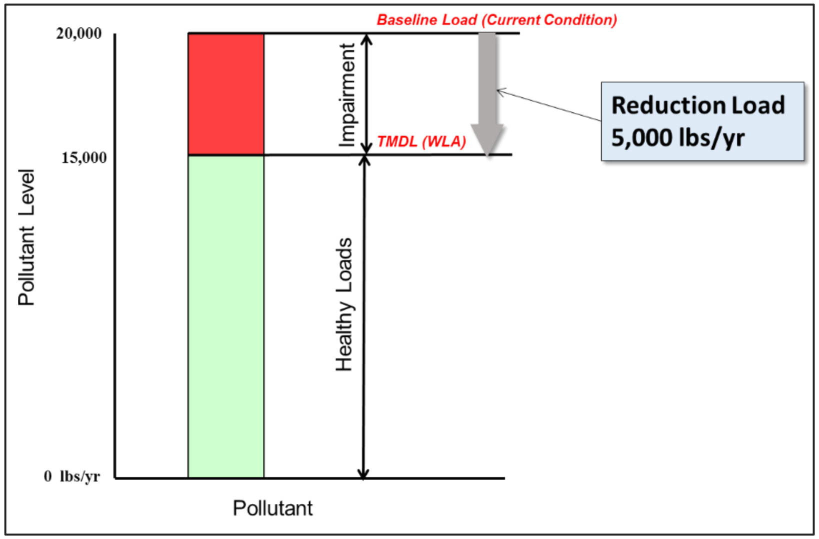

Figure 4: Example TMDL and Reduction Requirement

Pollutants for MDOT SHA Focus

Upon issuance of the MS4 Permit, MDOT SHA was named in TMDLs for five different pollutants within the MS4 coverage area including

- Bacteria,
- PCBs,
- Phosphorus,
- Sediment, and
- Trash.

The MDOT SHA MS4 Permit covers eleven Maryland counties that cross 84 8-digit watersheds representing larger rivers or streams. There are 43 EPA-approved TMDL documents that assign MDOT SHA to either an individual WLA or an aggregate WLA. Each watershed may be covered by one or more TMDL documents, so there is not a direct correlation between the number of TMDL documents and the number of watersheds affected.

Figure 5 shows a map of MDOT SHA TMDL responsibilities by watershed. **Table 2** on the following page summarizes MDOT SHA's PCB reduction requirement and projected progress in meeting the pollution reduction wasteload target within Bush River Oligohaline segmentshed by the listed end date. There are instances where the projected modeled percent reduction does not equal the target percent reduction by the end date listed. In these cases, discussion is added to the reduction strategy **Section E** to analyze the conditions that preclude MDOT SHA from meeting the target reductions with currently available modeling methods, loading, reduction efficiencies, or practices.

Lists of proposed practices and costs to achieve the required reductions are included in **Section F**.

Modeling Parameters

MDE requires that pollutant modeling follow the guidance in MDE 2014a and if other methods are employed, they must be approved by MDE. MDOT SHA developed a restoration modeling protocol that describes the methods used for modeling pollutant load reductions for local TMDLs with MDOT SHA responsibility. This protocol was submitted to MDE as an appendix with the MDOT SHA MS4 2016 Annual Report. Once approved, this protocol will be available on the MDOT SHA website.

Different modeling methods are used depending upon the pollutants and current reduction practices in use. Brief descriptions of modeling methods are included in the following section, but the MDOT SHA restoration modeling protocol should be consulted for a more detailed explanation.

Aggregated Loads

WLAs may be assigned to each MS4 jurisdiction separately or as an aggregated WLA for all urban stormwater MS4 permittees that combines them into one required allocation and reduction target. The modeling approach developed by MDOT SHA uses MDOT SHA data (both impervious and pervious land as well as BMPs built before the TMDL baseline year, also know as baseline BMPs) to calculate baseline loads and calibrated reduction targets. Following this approach, disaggregation is done for each TMDL.

Available Reduction Practices

MDOT SHA reserves the right to implement new BMPs, activities, and other practices that are not currently available to achieve local TMDL load reduction requirements. In the future, expert panels may be convened to study the effectiveness of new or modified BMPs on pollutants. MDOT SHA will modify reduction strategies as necessary based on new, approved treatment guidance, and will include revised strategies in updates to this implementation plan.

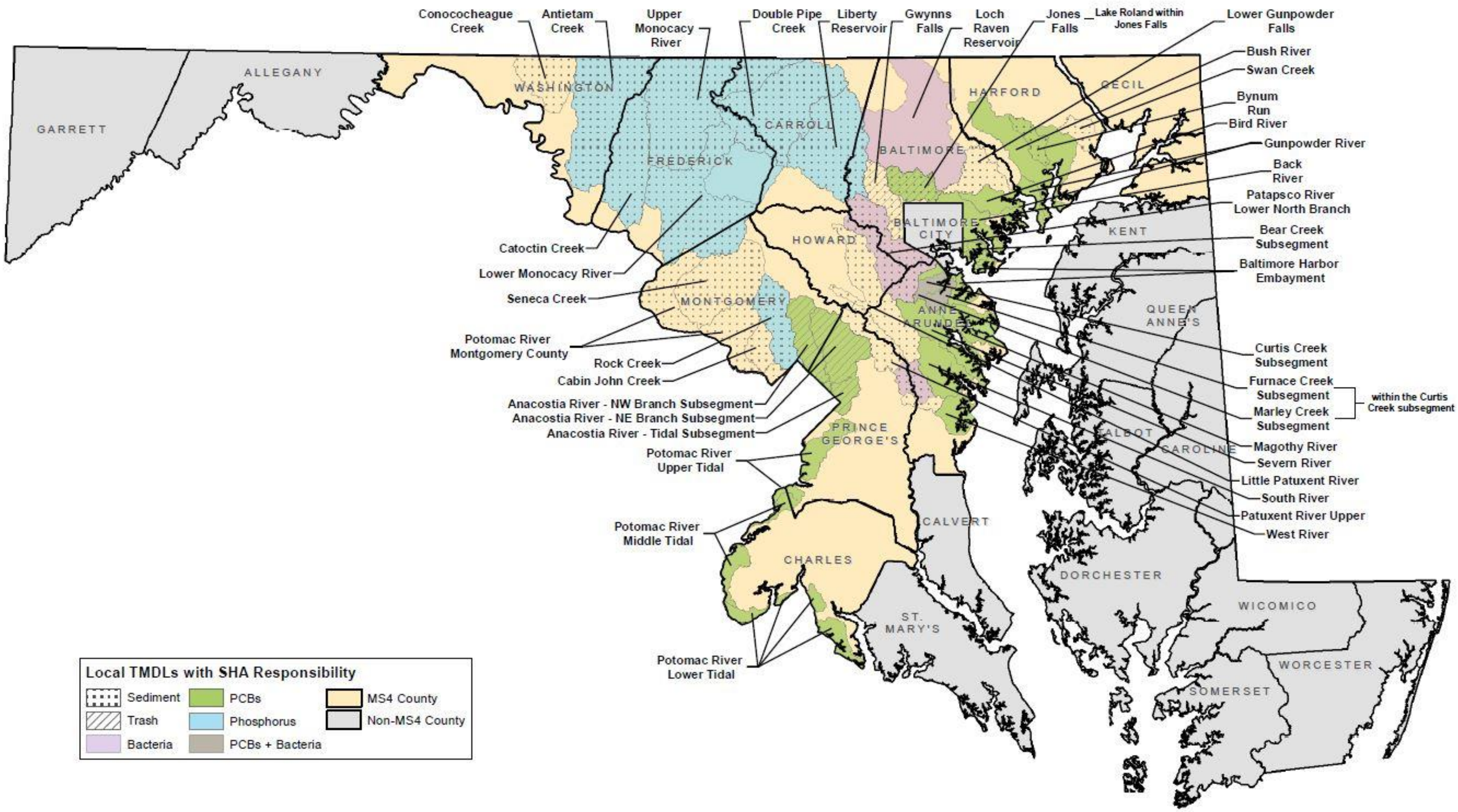

Figure 5: MDOT SHA TMDL Responsibilities in Local Watersheds

Table 2: MDOT SHA Bush River Oligohaline Segmentshed PCB Modeling Results														
Watershed Name	Watershed Number	County	Pollutant	EPA Approval Date	WLA Type	Baseline Year	Unit	MDOT SHA Baseline Load	MDOT SHA % Reduction Target	MDOT SHA Reduction Target	MDOT SHA WLA	Projected Reduction to be Achieved	Projected Reduction to be Achieved as a % of Baseline Load	Target Year
Bush River Oligohaline	MD-BSHOH-02130701	HA	PCBs	08/02/2016	Aggregate by County	2010	g/yr.	11.3	62.0%	7.0	4.3	0.5	4.5%	2050

E.2 PCB Pollution Reduction Strategy

E.2.a. PCB TMDLs Affecting MDOT SHA

There are 13 EPA-approved PCB TMDLs with MDOT SHA responsibility that MDOT SHA has already addressed in previous implementation plans**.** The following is a list of TMDL documents for PCBs with MDOT SHA responsibility that are addressed with this plan:

- *Total Maximum Daily Load of Polychlorinated Biphenyls in the Bush River Oligohaline Segment, Harford County, Maryland, approved by EPA August 2, 2016*

In **Table 2** the MDOT SHA reduction target for the Bush River Segmentshed PCB TMDL is 62%, or 7.0 g/yr. The segmentshed can safely receive 4.3 grams of PCB by MDOT SHA on a yearly basis without being considered impaired. Currently, it is calculated that SHA is responsible for introducing 11.3 grams per year of PCBs into the segmentshed per the MDE TMDL document as a MS4 permittee. Thus, according to the definition of the TMDL, MDOT SHA has to reduce its load by 7.0 grams to meet its healthy load, WLA, of 4.3 grams per year. MDOT SHA's reduction target is found by multiplying the MDOT SHA baseline load by the MDOT SHA Reduction target percent. The MDOT SHA WLA is found by subtracting the MDOT SHA baseline load by the MDOT SHA target load. The projected reduction achieved is found by modeling the PCB load reduction that will be experienced by the construction of current and future BMPs in the Bush River Oligohaline Segmentshed. These BMPs are either currently under construction or are planned to be constructed in the future. It is estimated that these future BMPs will reduce PBC loading by 0.5 gram to the segmentshed. The reduction to be achieved expressed as a percent is found by dividing the projected reduction to be achieved by the MDOT SHA Baseline Load.

Three dates are shown: the EPA approval date, the baseline year set by MDE, and the Target Year. The baseline year published on the MDE Data Center will be used for MDOT SHA's implementation planning. This usually correlates to the time-period when monitoring data was collected for MDE's TMDL analysis. The Target Year is the year MDOT SHA proposes to meet the WLA.

E.2.b. PCB Sources

The objective to establish a TMDL for PCBs is to ensure that the designated use is protected in each of the impaired waterbodies. Monitoring to identify the impairment may have been performed in the water column, in sediments, or in fish tissue depending on whether the impairment was for water contact recreation or fish consumption.

PCBs do not occur naturally in the environment. Therefore, unless existing or historical anthropogenic sources are present, their natural background levels are expected to be zero. Although PCBs are no longer manufactured in the United States, they are still being released to the environment via accidental fires, leaks, or spills from PCB-containing equipment; potential leaks from hazardous waste sites that contain PCBs; illegal or improper dumping; and disposal of PCB-containing products into landfills not designed to handle hazardous waste. Once in the environment, PCBs do not readily break down and tend to cycle between various environmental media such as air, water, and soil.

Sources are not identified in detail, either by land use or other breakdowns. Two non-point sources are related to the waterbody itself: resuspension and diffusion from bottom sediments and tidal exchange with the Bay. Transport of PCBs from bottom sediments to the water column through resuspension and diffusion can be a source of PCBs; however, within the TMDLs it is considered internal loading and not assigned a baseline load or allocation. Tidal influences from the Bay or other tidewater can be either a source or sink. For the Magothy, Severn, South and West and Rhodes River TMDLs, the Bay tidal influence is the single major source of PCBs. Similarly, for Bird River, Bush River, and Gunpowder River, the tidal portions are a PCB source. Baltimore Harbor, Back River, and the Anacostia, on the other hand, export more PCBs to the Bay than they receive.

There are three diffuse watershed sources including atmospheric deposition, non-regulated watershed runoff, and NPDES regulated stormwater. Also, there are four discrete sources: contaminated sites, WWTP facilities, industrial process water and Dredged Material Containment Facilities (DMCF), which are described by name in the TMDL. **Table 3** shows which sources are described in the thirteen PCB TMDLs with MDOT SHA responsibility.

For PCBs, studies have shown the largest sources impacting stormwater are building demolition, building remodeling, and old industrial areas. The main pathways are runoff, wheel and foot tracking, and dust dispersion from industrial areas (San Francisco Estuary Institute [SFEI], 2010).

Table 3: PCB Sources in Each TMDL

Source	Contaminant	TMDL Watershed											
		Baltimore Harbor	Back River	Bird River	Bush River	Gunpowder River	Tidal Potomac/ Anacostia River	Non-Tidal Anacostia River	Lake Roland	Magothy River	Severn River	South River	West & Rhodes River
Non-Point Sources	Upstream Tributaries					✓	✓						
	Chesapeake Bay or Other Tidal Influence			✓	✓	✓				✓	✓	✓	✓
	Atmospheric Deposition	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
	Non-regulated Watershed Runoff	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Contaminated Sites	✓	✓		✓		✓	✓	✓	✓			
Point Sources	Municipal WWTP and CSO	✓	✓		✓		✓	✓	✓		✓	✓	✓
	Industrial Process Water	✓			✓	✓							
	DMCF	✓											
	NPDES Regulated Stormwater	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Significance for MDOT SHA

MDOT SHA roadways pass through or are near areas that contain facilities or industries that may contribute PCBs to the environment. Two of the controllable sources in **Table 3** appear to fall under MDOT SHA's responsibility: contaminated sites and NPDES-regulated stormwater. MDOT SHA has conducted research on our industrial sites and to date has not discovered any legacy PCB contamination. Thus, MDOT SHA is left with stormwater as the only source to be addressed. MDOT SHA does not plan to complete a comprehensive investigation of all MDOT SHA's ROW, but a method is being researched to identify outfalls that have PCB discharging in stormwater to identify potential source drainage area. Once these areas are narrowed down, sources of PCBs can be tracked, documented, and methods to remediate developed.

E.2.c. MDOT SHA PCB Modeling Methods

MDOT SHA's modeling focuses on runoff loads and reductions from stormwater BMPs. The approach to modeling PCB reductions is based on the results of a literature review of PCB sources and treatment.

Two documents from the CBP discuss PCB sources, pathways, and treatment. (Schueler and Youngk, 2015) summarized research nationwide. They reported that PCB sampling in San Francisco Bay showed urban stormwater was the dominant pathway for PCBs to enter the Bay. The Chesapeake Bay *Toxic Contaminants Policy and Prevention Outcome* (CBP, 2015) also concluded that stormwater was a significant pathway for both particulate and dissolved PCBs. Land use is also a factor.

Baseline Loading for PCBs

Loads discussed in the PCB TMDLs are based on monitoring the impaired waterbody. Watershed loads were estimated by deriving concentrations from the monitoring data and multiplying these by estimated flow rates to the impaired waterbody. Thus, the loads reported in the TMDL do not account for fate and transport from the watershed.

While PCBs can exist in stormwater in both dissolved and particulate forms, they are generally insoluble in water. Lighter compounds may dissolve and subsequently volatize to the air and heavier compounds bind to sediment. Schueler and Youngk (2015) discussed research indicating that a large portion of the PCB load was attached to sediment, including a sampling study in the Susquehanna River basin that showed 75 percent of PCB loads were associated with particulates. CBP (2015) concluded that contaminated soils were a predominant source of PCBs in stormwater. Both these reports and others (Gilbreath et al., 2012) found that runoff from older industrial areas tended to have a higher concentration of PCBs in runoff and in sediments.

Given the understanding that removal of contaminated sediment from stormwater can be an effective method of reducing the PCB loads, the modeling approach will be to focus on stormwater BMPs that treat sediment. The basis of the modeling will be Total Suspended Solids (TSS) loading rates based on MAST (2016) and reduction calculation based on MDE (2014a). This approach has also been documented by Interstate Commission on the Potomac River Basin (ICPRB) in the Tidal Potomac PCB TMDL.

To estimate the amount of PCBs in sediment from runoff, sampling data from bottom sediments reported in MDE's TMDL documents were used. Six of the thirteen TMDLs provide sufficient information on sediment concentrations to estimate an average value by watershed. No sediment data was reported in the TMDL for the Anacostia River Northeast and Northwest Branch. In lieu of this, data from the Tidal Potomac TMDL for Anacostia will be used.

For MDOT SHA modeling, baseline loads have been calculated in two steps: first, to model the untreated load, and next, to apply treatment as of the baseline year for each TMDL. Untreated baseline loads were modeled by multiplying MDOT SHA pervious and impervious acres by land-river segment using MDOT SHA spatial data with loading rates calculated at the land-river segment scale from a No-BMP scenario in MAST. Loading rates are described in further detail below. Load reductions from baseline BMPs were calculated from MDOT SHA database information, then applied to the untreated load to determine treated baseline load. All loads and load reductions for PCB TMDLs were first modeled in TSS EOS-lbs/yr. and then converted to TSS EOS-g/yr. and then multiplied by the average sediment PCB concentration from the TMDL document to calculate loads and load reductions in PCB g/yr.

PCB Pollutant Loading Rates by Land Use

Loading rates for TSS have been calculated at the most detailed level feasible: the land-river segments from the Chesapeake Bay model / MAST v5.3.2. Untreated loads and acres, per land-river segment, were derived from a No BMPs scenario in MAST at the Maryland statewide geographic scale using 2010 conditions. With the No-BMP scenario, loading rates for each MDOT SHA land use will stay constant for different baseline years, so these values will be valid for both the Bay TMDL and local TMDL analyses.

PCB Reduction Requirements

The model uses a percent reduction target for MDOT SHA published in the TMDL document. The percent reduction target is compared to the projected reduction to be achieved modeled from the implementation of restoration BMPs. This method assumes that like sediment, PCB is a conservative pollutant, and that loads exported from the watershed will approximate the loads in the waterbody, without significant loss or degradation in transport.

Reduction Modeling

The model is based on an Excel spreadsheet, using data derived from MAST and MDOT SHA's stormwater geodatabases. The modeling approach focuses on stormwater BMPs that treat sediment. BMP removal rates for structural and ESD stormwater controls (ESD/Runoff Reduction [RR] and Stormwater Treatment [ST] practices) and alternative BMPs (catch basin cleaning) have been implemented following MDE (2014a). For determining BMP efficiencies using MDE (2014a), the model uses the actual treatment and P_E for each BMP to calculate the sediment reduced for each ESD/RR BMP in the watershed.

The model determines sediment reductions achieved by each type of practice and then multiplies the sediment reductions by a PCB concentration to determine the PCB reduction. Sediment reduction computations vary depending upon the type of restoration practice planned: stormwater control structures or inlet cleaning. Steps for determining sediment reductions for stormwater controls include:

- Sediment loading within the drainage area is determined by identifying the MAST land-river segment containing the BMP and recording the loading rate for MDOT SHA pervious and impervious land use. (MAST, 2016);
- TSS removal rates from the database are stored with each BMP, based on its type;
- Load removal (lb/ac/yr) is calculated for pervious and impervious area by multiplying land use loading rate by TSS removal rate; and
- TSS removed (lb/yr) is calculated by multiplying load removal by pervious and impervious area within the BMP drainage area.

Steps for determining sediment reductions for catch basin cleaning include:

- GIS analysis of the area of MDOT SHA ROW within each shop boundary within each TMDL watershed;
- Fraction of ROW area in the TMDL watershed within each shop boundary;
- Lookup of dry weight of material collected from each shop;
- Calculation of material collected within the TMDL watershed by multiplying fraction of TMDL ROW by the total material collected; and
- Calculate TSS pounds removed using parameter from MDE Guidance (MDE, 2014a).

Computing PCB loads removed based on the sediment removal calculated in the previous steps includes:

- Add stormwater BMP and inlet cleaning pounds removed to find total sediment removed in each TMDL watershed and convert to grams;
- Multiply by PCB concentration factor of 80 ng/g (Schueler and Youngk, 2015) to find PCB load removed; and
- Multiply by 50% to account for inconsistency in BMP removal (results are in g/yr).

E.2.d. PCB Reduction Strategies

MDOT SHA will implement an evolving management process that relies on four main PCB reducing efforts. The first strategy will be source tracking and elimination. The second effort will be to track PCBs reduction achieved from ongoing impervious restoration efforts for MDOT SHA's MS4 permit. MDOT SHA will develop a monitoring and evaluation plan to study the effects of natural attenuation in our PCB TMDL watersheds. Lastly, partnering efforts to reduce PCB concentrations in the local watersheds will be explored with other jurisdictions where it is perceived to be mutually beneficial for both parties.

Stormwater BMP Reduction Modeling

As a byproduct of meeting the impervious surface restoration required under the existing MS4 permit, many of the BMPs used to reduce sediment will provide a secondary benefit in removing PCBs associated with sediments.

The modeling results in **Table 2** show that minimal reductions are achieved through stormwater BMPs in the watershed. Based on these results, MDOT SHA has concluded that source tracking and elimination may be a more effective way of achieving PCB load reductions.

Source Targeting and Elimination

According to MDE's main reports for PCB TMDLs, it's noted that an effective way to meet the WLA is to implement a PCB source targeting and elimination effort.

MDOT SHA will develop a protocol describing the process to implement steps that target a PCB source in the ROW. This protocol will also explain how MDOT SHA will evaluate feasibility of source elimination.

Monitoring and Evaluation Plan

MDOT SHA will continue to review MDE documentation of declining PCB concentrations in the local watersheds due to natural attenuation. This process will involve obtaining PCB concentration data directly from MDE and or other approved sources.

Partnering Efforts

MDOT SHA will implement partnering with other local jurisdictions to ensure that PCB WLAs are met. However, at this time it has not been determined what this effort will entail. There may be a possibility to work with another agency on a public education campaign or contribute effort or money to a PCB cleanup effort in a watershed in which there is an MDOT SHA responsibility. It is anticipated that an overall reduction of PCBs released in the watershed will have a positive load reduction on MDOT SHA's WLA reduction goals.

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F. BUSH RIVER SEGMENTSHED IMPLEMENTATION PLAN

F.1. Segmentshed Description

Areas draining to the Bush River Oligohaline Segment will be referred to as the Bush River segmentshed. The Bush River Oligohaline Segment will be hereinafter referred to as the Bush River. The Bush River is an estuary that extends south from the community of Riverside for approximately nine miles to the Chesapeake Bay. Three 8-digit watersheds compose the Bush River segmentshed: Winters Run watershed (the Atkisson Reservoir watershed and the Lower Winters Run watershed are collectively known as the Winters Run watershed), Bynum Run watershed, and Bush River watershed (excludes the Romney Creek drainage area). The Bush River segmentshed is located entirely within Harford County, Maryland and encompasses approximately 130 square miles. Tributaries of the Bush River segmentshed include Winters Run, Bynum Run, Broad Run, James Run, Grays Run, and Cranberry Run.

There are 228 centerline miles of MDOT SHA roadway located within the Bush River segmentshed. The associated ROW encompasses 1,843 acres, of which 796 are impervious. MDOT SHA facilities located within the Bush River segmentshed consist of two salt storage facilities and eight park and ride facilities. See **Figure 6** for a map of MDOT SHA facilities with the Bush River segmentshed.

F.2. MDOT SHA TMDLs within Bush River Segmentshed

TMDLs requiring reduction by MDOT SHA include sediment (TSS) and PCBs (MDE, 2011c; MDE, 2016a). Sediment is to be reduced by 22.9 percent in the Bynum Run Watershed. PCBs must be reduced by 62 percent as shown in **Table 2** in the Bush River segmentshed.

F.3. MDOT SHA Visual Inventory of ROW

The MS4 permit requires MDOT SHA to perform visual assessments. **Section C** describes the MDOT SHA visual assessment process. The implementation teams are currently evaluating grids in the segmentshed and will continue to do so until all are completed and accepted. The grid-tracking tool was developed to help teams efficiently search each watershed on a 1.5 x 1.5-square-mile system as shown in **Figure 7**. Planning efforts will continue and will be centered on areas with local TMDL needs that have been identified using the site search grid-tracking tool.

Many of the grids awaiting review have little potential for additional restoration due to minimal ROW along residential and wooded areas, which limits the ability to purchase ROW for the construction of a new BMP. Additionally, many MDOT SHA impervious areas within these grids are already treated by MDOT SHA BMPs. The current results of this ongoing grid search are as follows:

92 Total Grids:

- 26 fully reviewed;
- 56 partially reviewed – in progress; and
- 10 awaiting review (10 percent of total grids).

The new stormwater site search resulted in a pool of potential sites comprised of the following:

- 1,097 locations identified as possible candidates for new stormwater BMPs;
- 9 facilities are currently under concept for design;
- 930 facilities have been recommended for restoration after the completion of a preliminary desktop assessment; and
- 128 facilities remain on hold due to roadway construction projects.

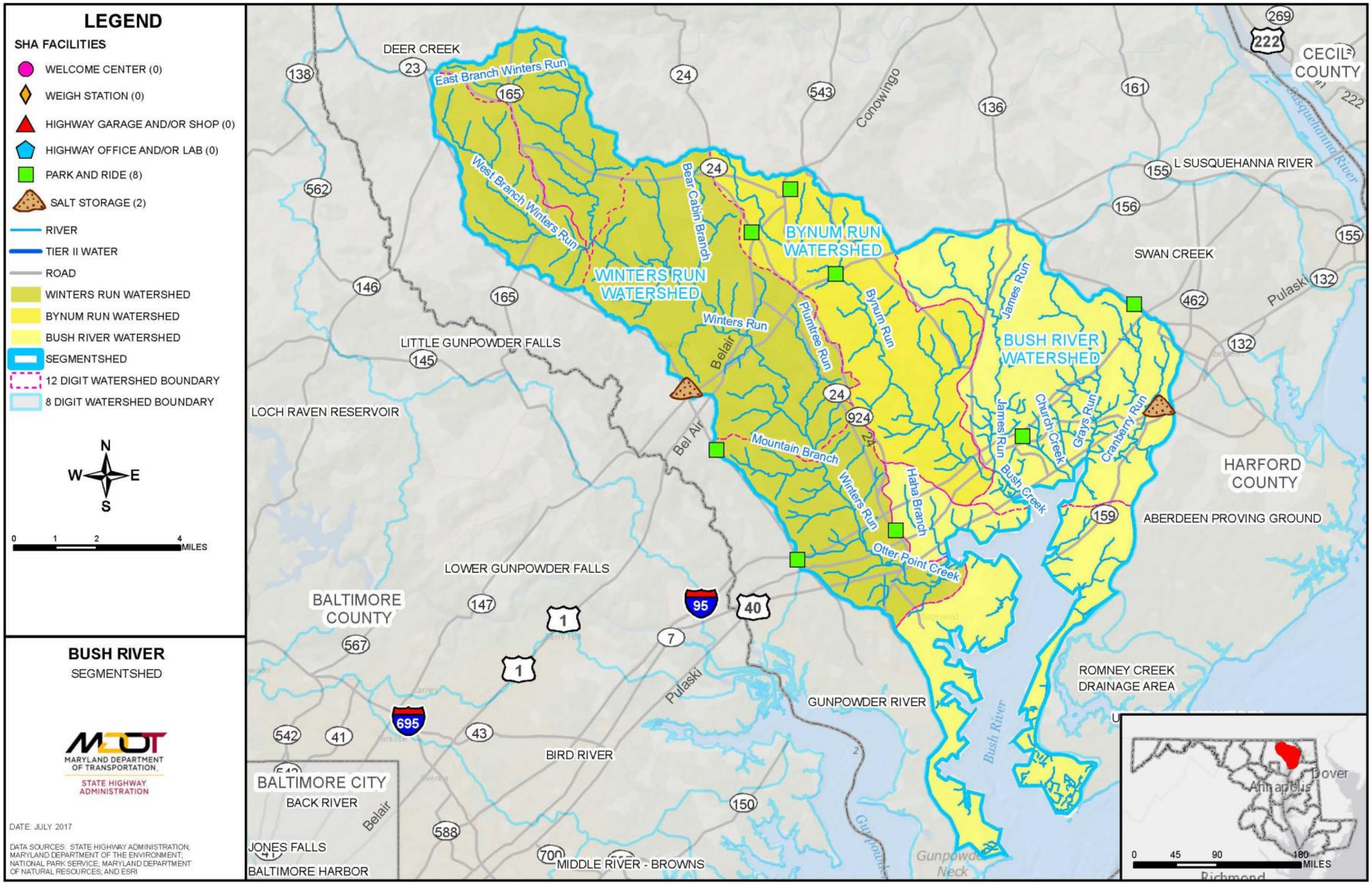

Figure 6: Bush River Segmentshed

The tree planting site search teams investigated 900 acres of MDOT SHA owned pervious area. The ongoing site search resulted in a pool of potential sites comprised of the following:

- 28 acres are undergoing design and may be planted in the near future; and
- 56 acres of tree planting have been identified as potential for further investigation.

The stream restoration site search teams investigated 44,650 linear feet of stream channel for restoration opportunities. The site search resulted in the following:

- 3,000 linear feet are undergoing concept design and may be candidates for restoration in the near future; and
- 3,500 linear feet recommended for future restoration potential.

Teams will continue to pursue the most viable and cost-effective BMPs that are currently within the existing pool of sites based on site feasibility.

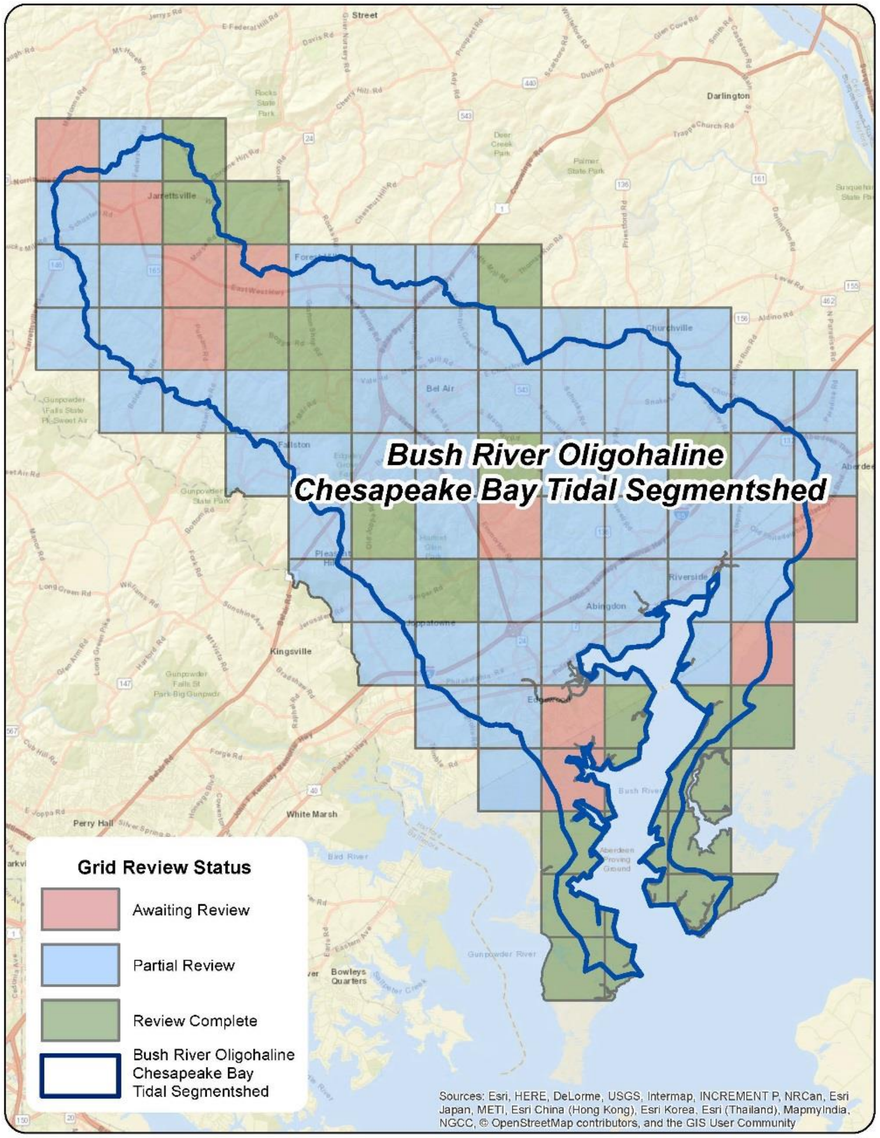

Figure 7: Bush River Segmentshed Site Search Grids

F.4. Summary of County Assessment Review

The designated use of the waters of the Bush River (8-digit Basin Code: 02130701) is Use II – Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting (MDE, 2016a). Waters within the Bush River segmentshed are subject to the following impairments as noted on MDE's 303(d) List:

- Channelization;
- Chlorides;
- Lack of Riparian Buffer;
- Mercury in Fish Tissue;
- Nitrogen (Total);
- PCB in Fish Tissue;
- Phosphorus (Total);
- Sedimentation/Siltation;
- Sulfates;
- Temperature, water; and
- TSS.

Prepared by the Center for Watershed Protection (CWP) for the Harford County Department of Public Works, the 2003 *Bush River Watershed Management Plan* (WAMP) (hereinafter referred to as the "Bush River WAMP") serves as Harford County's assessment of the Bush River segmentshed (CWP, 2003). While the Bush River WAMP contained analysis on all three 8-digit watersheds (Winters Run, Bynum Run, and Bush River) within the Bush River segmentshed, the study area did not extend along the Bush River to the Chesapeake Bay.

The Bush River WAMP was developed using a watershed "vulnerability analysis," a tool that is often used when assessing large watersheds. The vulnerability analysis is designed to identify subwatersheds that are most vulnerable to current and future land development and management problems. Accordingly, the CWP worked with Harford County staff to delineate the study area into 19 subwatersheds for analysis and assessment. The delineations generally aligned with distinct land uses within the study area. This method was particularly helpful because the area serves a wide range of diverse land uses such as urban, agriculture, forest, and wetlands. The complexity of the Bush River segmentshed is further evidenced by its location within two Maryland physiographic regions (Piedmont Plateau and Coastal Plain), its inclusion of both tidal and non-tidal waters, and its susceptibility to development pressures. Overall, the Bush River segmentshed impairments generally involve excess nutrients, poor habitat quality, and channel instability.

Regarding the impact of development, the Bush River WAMP emphasized the impact of increased development and urbanization on the area, noting that a significant portion is within the "development envelope." The "development envelope" refers to Harford County's highly developed residential and industrial area that follows the Route 40/I-95 corridor and extends northward to include the Route 24/Bel Air corridor. According to the Bush River WAMP, an increase in development will exacerbate current problems such as the delivery of large amounts of sediment, nutrients, and bacteria from the Winters Run and Bynum Run tributaries to Bush River. Because urbanization and development is expected to increase, a main goal of the Bush River WAMP is to identify which subwatersheds should be evaluated for protection against future development.

Of the 19 subwatersheds within the Bush River WAMP study area, nine are in the Winters Run watershed (West Branch, East Branch, Bear Cabin, Upper Winters Direct Drainage [DD], Middle Winters DD, Lower Winters DD, Mountain Branch, Plumtree Run, Otter Point DD), four are in the Bynum Run watershed (Upper Bynum, Middle Bynum, Lower Bynum, Little East Bynum), and six are in the Bush River watershed (James Run, Grays Run, Cranberry Run, Church Creek DD, Bush Creek DD, Haha Branch).

The existing data, impervious cover calculations, and several field verifications (evaluations of stream habitat, contiguous forest, and wetlands) determined that there are four different subwatershed types (also known as subwatershed “management categories”) within the Bush River segmentshed: 1) Sensitive, 2) Impacted, 3) Rurally Impacted, and 4) Impacted Special Resource. The Bush River WAMP provided the following definitions for these four subwatershed types/management categories (CWP, 2003):

- **Sensitive:** Subwatersheds that have an impervious cover of 0 to 10 percent. Streams in these subwatersheds are of high quality (i.e., stable channels, excellent habitat structure, good to excellent water quality, diverse communities of aquatic species). The primary goal for these subwatersheds is to maintain predevelopment stream biodiversity and channel stability.

- **Impacted:** Subwatersheds that have an impervious cover ranging from 11 to 25 percent and show obvious signs of degradation due to watershed urbanization. Greater storm flows have started to alter stream geometry and both erosion and channel widening are readily apparent. Stream banks are unstable and there is noticeably less physical habitat and biodiversity in the streams.

- **Rurally Impacted:** Subwatersheds that have an impervious cover of 0 to 10 percent, but may have a degraded riparian zone and isolated stream bank erosion due to livestock access and grazing/cropping practices. The streams, however, tend to recover once the riparian management improves.

- **Impacted Special Resource:** Subwatersheds that have an impervious cover ranging from 11 to 25 percent, but also have notable natural resource areas such as tidal waters, contiguous forest, and high quality wetlands. The primary goal for these subwatersheds is to maintain the present status of these significant natural resource areas through conservation, restoration, and stormwater retrofits.

When these definitions were applied to the 19 subwatersheds, the three watersheds within the Bush River segmentshed contained the following subwatershed types/management categories:

The Winters Run watershed had:

- 4 Sensitive subwatersheds (East Branch, Bear Cabin, Upper Winters DD, Mountain Branch);
- 3 Impacted subwatersheds (Middle Winters DD, Lower Winters DD, Plumtree Run);
- 1 Rurally Impacted subwatershed (West Branch); and
- 1 Impacted Special Resource subwatershed (Otter Point DD).

The Bynum Run watershed had:

- 3 Impacted subwatersheds (Upper Bynum, Middle Bynum, Lower Bynum); and
- 1 Rurally Impacted subwatershed (Little East Bynum).

The Bush River watershed had:

- 2 Sensitive subwatersheds (Grays Run, James Run);
- 1 Impacted subwatershed (Cranberry Run); and
- 3 Impacted Special Resource subwatersheds (Church Creek DD, Bush Creek DD, Haha Branch).

After all types/management categories were determined, the subwatersheds were prioritized. Priority was given to the most vulnerable subwatersheds so that Harford County can concentrate its resources on the subwatersheds that need immediate restoration and/or preservation actions. Out of the 19 subwatersheds, 10 priority subwatersheds were identified by the County: Grays Run, Little East Bynum, West Branch, Middle Bynum, Lower Bynum, Plumtree Run, Otter Point DD, Church Creek DD, Bush Creek DD, and Haha Branch (See **Table 4**). **Table 5** presents County-suggested BMPs for the entire Bush River segmentshed.

Table 4: County Identified Priority Areas for Treatment

Subwatershed Management Category	Priority Subwatershed	Watershed (within the Bush River Segmentshed)
Sensitive	Grays Run	Bush River
Impacted	Middle Bynum	Bynum Run
	Lower Bynum	Bynum Run
	Plumtree Run	Winters Run
Rurally Impacted	West Branch	Winters Run
	Little East Bynum	Bynum Run
Impacted Special Resource	Otter Point DD	Winters Run
	Bush Creek DD	Bush River
	Church Creek DD	Bush River
	Haha Branch	Bush River

Source: CWP (2003)

Table 5: County Suggested BMPs for the Bush River Segmentshed	
Subwatershed Management Category	**Recommendation**
Sensitive	Preserve Contiguous Forests in all Sensitive Subwatersheds
Sensitive	Enhance Existing Riparian Buffer in all Sensitive Subwatersheds
Sensitive	Grays Run Contiguous Forest Preservation
Sensitive	Grays Run Stream Buffer Enhancement
Sensitive	Maintain Grays Run Sensitive Status
Sensitive	Field Verify and Prioritize Contiguous Forest Areas for Preservation
Impacted	Educate Residents on Watershed Stewardship in Impacted Subwatersheds
Impacted	Implement Stormwater Retrofits in Impacted Subwatersheds
Impacted	Conduct Stream Clean-ups in Lower and Middle Bynum
Impacted	Preserve Contiguous Forest in Lower Winters DD and Cranberry Run
Impacted	Investigate Other Stormwater Retrofit Opportunities in Impacted Subwatersheds
Rurally Impacted	Preserve Farmlands in Rurally Impacted Subwatersheds
Rurally Impacted	Restore Riparian Buffer in Rurally Impacted Subwatersheds
Rurally Impacted	Reduce Livestock Access in Little East Bynum
Rurally Impacted	Agricultural Practices Assessment in Rurally Impacted Subwatersheds
Rurally Impacted	Septic System Education in Rurally Impacted Subwatersheds
Impacted Special Resource	Preserve Large Wetland Tracts in Impacted Special Resource Subwatersheds
Impacted Special Resource	Implement Stormwater Retrofits in Impacted Special Resource Subwatersheds
Impacted Special Resource	Streambank Stabilization in Haha and Otter Point Subwatersheds
Impacted Special Resource	Develop a Heightened Plan Review in Impacted Special Resource Subwatersheds
Watershed-Wide	Establish an Implementation Committee
Watershed-Wide	Foster the Development of Bush River Watershed Association
Watershed-Wide	Create Watershed Stewardship Website
Watershed-Wide	Implement Recommendations of Harford County Site Planning Roundtable
Watershed-Wide	Establish an Adopt-a-Pond Program
Watershed-Wide	Improve ESC Implementation, Inspection, and Enforcement

Source: CWP (2003) (Recommendations reprinted from Table E1 in CWP (2003))

F.5. MDOT SHA Pollutant Reduction Strategies

Proposed practices to meet the PCB reduction in the Bush River segmentshed are shown in **Table 6**. Projected PCB reductions using these practices are described in **Section E** and shown in **Table 2**. Three timeframes are included in the table below:

- BMPs built before the TMDL baseline. In this case, the baseline is 2010;
- BMPs built after the baseline through fiscal year 2017; and
- BMPs built after fiscal year 2017 through 2050, the projected target date. MDOT SHA will accomplish the projected reduction to be achieved as a percent of the baseline load presented in **Table 2**. The reduction is not expected to meet MDE's 62% load reduction requirement. BMPs identified in this current plan will only achieve 4.5% of the reduction requirement. Through strategies discussed in section E.2.d. MDOT SHA will increase this expected reduction.

Estimated Capital Budget costs to design and construct practices within the Bush River segmentshed total $ 39,464,000. These projected costs are based on an average cost per impervious acre treated that is derived from cost history for a group of completed projects for each BMP category.

Figure 8 shows a map of MDOT SHA's restoration practices in the segmentshed and includes those that are under design or construction. Inlet cleaning is not reflected on this map.

Table 6: MDOT SHA Bush River Segmentshed PCB BMP Implementation

BMP[1]	Unit	Baseline (Before 2010)	Restoration BMPs		Cost
			Progress (2010 – FY17)	Future (After FY17)	
New Stormwater	drainage area acres	186.3	25.1	32.8	$34,901,000
Retrofit	drainage area acres			242.2	$4,563,000
Inlet Cleaning[2]	Tons			43.0	$245,000

[1] Tree planting, outfall stabilization, and stream restoration BMPs do not contribute to PCB load reductions; therefore, these practices are not included in this table.

[2] Inlet cleaning is an annual practice.

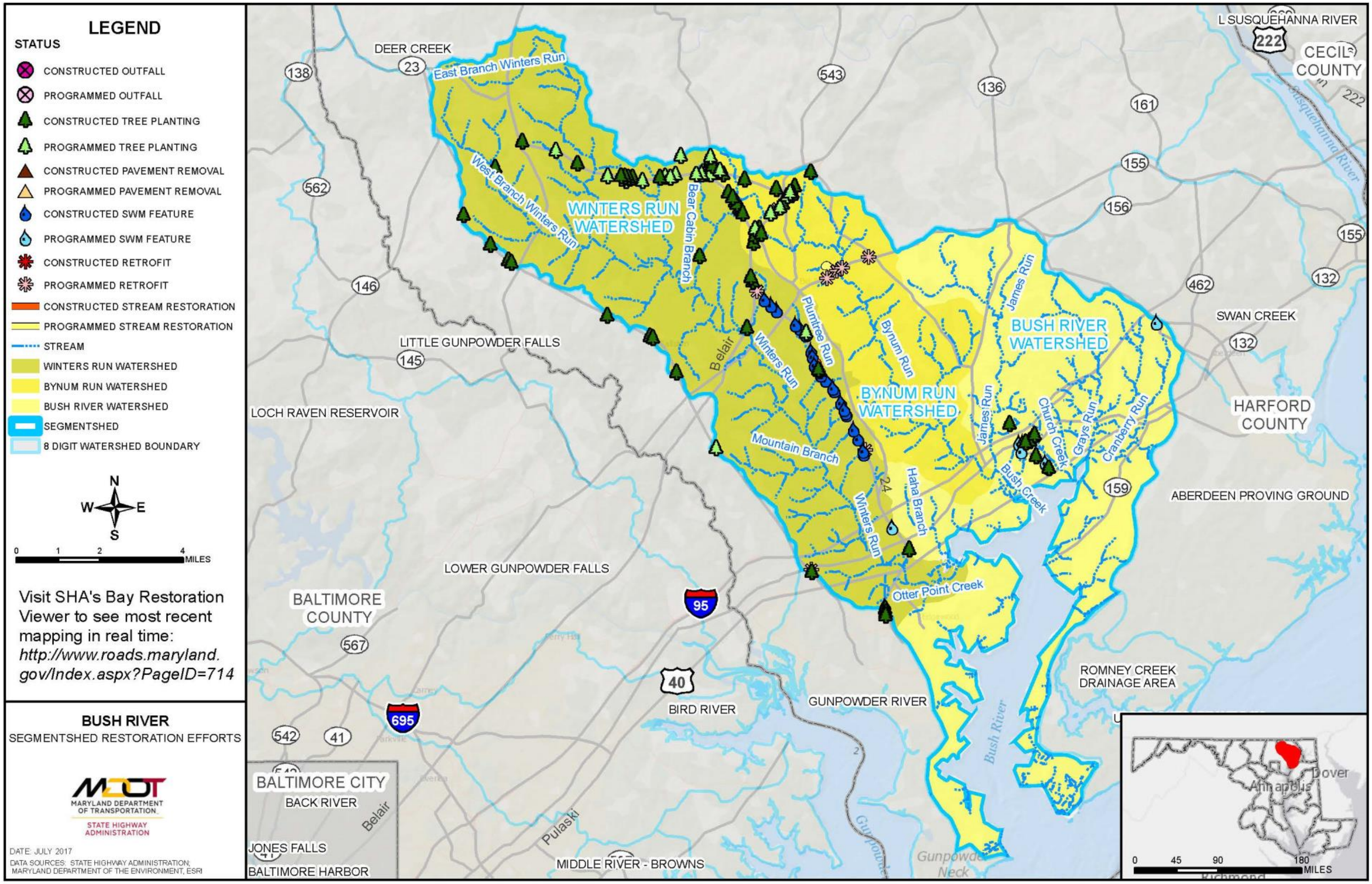

Figure 8: MDOT SHA Restoration Strategies within the Bush River Segmentshed

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ABBREVIATIONS

AA	Anne Arundel (County)
AA-DPW	Anne Arundel County, Department of Public Works
AAH	Adopt-A-Highway
AASHTO	American Association of State Highway and Transportation Officials
ac	Acre
AFB	Air Force Base
Alt	Alternative
AMT	Automated Modeling Tool
AMT, Inc.	A. Morton Thomas and Associates, Inc.
ATV	All-terrain vehicle
BA	Baltimore (County)
BARC	Beltsville Agriculture Research Center
Bay	Chesapeake Bay
BBO	Beaverdam Run, Baisman Run, and Oregon Branch Subwatersheds of the Loch Raven Reservoir Watershed
BC-DEPRM	Baltimore County, Department of Environmental Protection and Resource Management
BC-DEPS	Baltimore County, Department of Environmental Protection and Sustainability
BIBI	Benthic Index of Biotic Integrity
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
BSID	Biological Stressor Identification
BST	Bacterial Source Tracking
CAFO	Concentrated Animal Feeding Operation
CBP	Chesapeake Bay Program
CBWM	Chesapeake Bay Watershed Model
CC	Charles (County)
CC-BRM	Carroll County, Bureau of Resource Management
CC-DPGM	Charles County, Department of Planning & Growth
CCMS	Customer Care Management System
CFR	Code of Federal Regulations
CIP	Capital Improvement Project
CL	Carroll (County)
CRP	Community Reforestation Program
CSN	Chesapeake Stormwater Network
CSO	Combined Sewer Overflow
CTP	Consolidated Transportation Program
CWA	Clean Water Act
CWAPTW	Clean Water Action Plan Technical Workgroup
CWP	Center for Watershed Protection
DC	District of Columbia
DO	Dissolved Oxygen
DEL	Delivered Loads
DMCF	Dredged Material Containment Facilities
DNR	Maryland Department of Natural Resources
DRMO	Defense Reutilization and Marketing Office
ECD	Environmental Compliance Division (SHA)
E. coli	*Escherichia coli*
ED	Extended Detention
EMC	Event Mean Concentration
EMS	Environmental Management System
EOS	Edge of Stream

EPA	United States Environmental Protection Agency
EPD	Environmental Programs Division
ESC	Erosion and Sediment Control
ESD	Environmental Site Design
FC	Fecal Coliform
FC-DPW	Frederick County, Division of Public Works
FEMA	Federal Emergency Management Administration
FIB	Fecal Indicator Bacteria
FIBI	Fish Index of Biotic Integrity
FMD	Facility Maintenance Division (SHA)
FR	Frederick (County)
FY	Fiscal Year
g	gram
GIS	Geographic Information System
HA	Harford (County)
HC-DPW	Harford County, Department of Public Works
HO	Howard (County)
HUC	Hydrologic Unit Code
HWG	Horsley Witten Group, Inc.
ICPRB	Interstate Commission on the Potomac River Basin
IDDE	Illicit Discharge Detection and Elimination
ISWBMPDB	International Stormwater BMP Database
LA	Load Allocations
lbs	Pounds (weight)
LF	Linear Feet
LN	Lower North
LNB	Lower North Branch
LRE	Loch Raven East subwatershed
LJF	Lower Jones Falls (Watershed)
LU	Land Use
MAA	Maryland Aviation Administration
MAST	Maryland Assessment Scenario Tool
MC-DEP	Montgomery County, Department of Environmental Protection
MD	Maryland
MDA	Maryland Department of Agriculture
MDE	Maryland Department of the Environment
MDOT	Maryland Department of Transportation
MDP	Maryland Department of Planning
MEP	Maximum Extent Practicable
MEPA	Maryland Environmental Policy Act
MGF	Middle Gwynns Falls (Watershed)
MO	Montgomery (County)
MOS	Margin of Safety
MPR	Maximum Practicable Reduction
MS4	Municipal Separate Storm Sewer System
NBOD	Nitrogenous Biochemical Oxygen Demand
NEPA	National Environmental Policy Act
NFHL	National Flood Hazard Layer
ng	nanogram
NJF	Northeastern Jones Falls (Watershed)
NPDES	National Pollutant Discharge Elimination System
NSQD	National Stormwater Quality Database
OCRI	Office of Customer Relations and Information (SHA)
OED	Office of Environmental Design
OOM	Office of Maintenance (SHA)

OP	Orthophosphate
OPPE	Office of Preliminary Planning and Engineering
PACD	Pennsylvania Association of Conservation Districts
PB	Parsons Brinckerhoff
PCB	Polychlorinated Biphenyl
P_E	Rainfall Target Used To Size ESD Practices
PERC	Perchloroethylene
PG	Prince George's (County)
PGC-DoE	Prince George's County, Department of the Environment
RBP	Rapid Bioassessment Protocol
RGP	Regional General Permit
ROW	Right-of-Way
Reqd	Required
RR	Runoff Reduction
RSPSC	Regenerative Step Pool System Conveyance
SAH	Sponsor-A-Highway
SB	Spring Branch subwatershed
SCA	Stream Corridor Assessment
SFEI	San Francisco Estuary Institute
SGW	Submerged Gravel Wetlands
SHA	State Highway Administration
SPR	State Planning and Research
SSO	Sanitary Sewer Overflow
ST	Stormwater Treatment
SW	Stormwater
SWAP	Small Watershed Action Plan
SWM	Stormwater Management
SWS	Subwatershed
SW-WLA	Stormwater Wasteload Allocation
TBD	To Be Determined
TBR	Tidal Back River (Watershed)
TBS	To Be Specified
TCWG	Toxic Contaminants Work Group
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
tPCB	Total Polychlorinated Biphenyl
TSS	Total Suspended Solids
TWGCB	Toxics Work Group Chesapeake Bay Partnership
UBR	Upper Back River (Watershed)
UGF	Upper Gwynns Falls (Watershed)
UJF	Upper Jones Falls (Watershed)
US	United States
USACE	United States Army Corps of Engineers
USDA-NRCS	United States Department of Agriculture, Natural Resources Conservation Service
USGS	United States Geological Survey
USWG	Urban Stormwater Work Group
WA	Washington (County)
WC-DPW	Washington County, Division of Public Works
WCSCD	Washington County Soil Conservation District
WIP	Watershed Implementation Plan
WLA	Wasteload Allocation
WPD	Water Programs Division
WQLS	Water Quality Limited Segment

WQSs	Water Quality Standards
WQv	Water Quality Volume
WQGIT	Water Quality Goal Implementation Team
WRAS	Watershed Restoration Action Strategy
WTM	Watershed Treatment Model
WTWG	Watershed Technical Work Group
WWTP	Waste Water Treatment Plant
yr	Year
12-SW	Maryland General Permit for Discharges from Stormwater Associated with Industrial Activities

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