

Harford County Chesapeake Bay Total Maximum Daily Load Restoration Plan for Nitrogen, Phosphorous, and Sediment

March 2016



Prepared for:
Harford County
Department of Public Works
212 South Bond Street
Bel Air, MD 21014



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**HARFORD COUNTY CHESAPEAKE BAY Watershed
TOTAL MAXIMUM DAILY LOAD (TMDL)
RESTORATION PLAN FOR NITROGEN,
PHOSPHOROUS, AND SEDIMENT**

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µg/L	micrograms per liter
mg/L	milligrams per liter
BEHI	bank erosion hazard index
BMP	best management practice
BSID	Biological Stress Identification
CIP	Capital Improvement Program
COMAR	Code of Maryland Regulations
CWA	Clean Water Act
DNR	Department of Natural Resources
DPW	Department of Public Works
EOS	edge of stream
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
ESD	environmental site design
GIS	geographic information system
HOA	homeowners association
HSG	Hydrologic Soil Group
MAST	Maryland Assessment Scenario Tool
MBSS	Maryland Biological Stream Survey
MDE	Maryland Department of the Environment
MOS	margin of safety
MDSHA	Maryland State Highway Administration
MS4	Municipal Separate Storm Sewer System
n.d.	no date
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	Nephelometer Turbidity Unit
SPSC	step pool storm conveyance system
SW-WLA	Stormwater-Wasteload Allocation
TMDL	Total Maximum Daily Load
TSS	total suspended solids
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WIP	Watershed Implementation Plan

EXECUTIVE SUMMARY

Harford County Department of Public Works (DPW) has developed this Chesapeake Bay Watershed Total Maximum Daily Load (TMDL) Restoration Plan for Nitrogen, Phosphorous, and Sediment (This plan or Chesapeake Bay Watershed Restoration Plan). The County's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit (11-DP-3310, MD0068268) requires the development of restoration plans for EPA approved TMDL stormwater waste load allocations (SW-WLA).

The Chesapeake Bay Watershed has an approved TMDL for nutrients and sediment established by the U.S. Environmental Protection Agency (EPA), *Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorous, and Sediment* (EPA, 2010) (TMDL Document). The Maryland Department of Environment (MDE) then sub-allocated the EPA TMDL by sub-watershed and jurisdiction (Table ES-1) as shown in subsequent Watershed Implementation Plan (WIP) documents. This restoration plan focuses on the three sub-watershed located in Harford County's portion of the Chesapeake Bay Watershed including Bush River Watershed, Northern Chesapeake Bay (CB1TF) Watershed, and Gunpowder River Watershed.

Table ES-1: Chesapeake Bay MDL SW-WLA within Harford County

Pollutant	Bush River Watershed Target Reduction⁽¹⁾	Northern Chesapeake Bay Watershed Target Reduction⁽¹⁾	Gunpowder River Target Reduction⁽¹⁾
Nitrogen	26.6%	33.8%	27.1%
Phosphorus	49.4%	49.2%	48.1%
Sediment ⁽²⁾	NA	NA	NA

(1) The reductions are in Maryland's Phase II WIP (MDE, 2012a).

(2) Maryland's Phase II WIP (MDE, 2012b) does not provide a sediment target

A TMDL is defined as the maximum pollutant load a waterbody can assimilate without exceeding the State's water quality standard for the waterbody's designated use class. The designated use classes of the rivers and tributaries in the Harford County portion of the Chesapeake Bay Watershed are Classes I, I-P, II, III, III-P, and IV-P.

In general, a TMDL is made up of two major components:

- **Wasteload Allocations (WLA)** including point sources such as NPDES MS4 regulated urban stormwater (SW-WLA), industrial facilities that have permitted stormwater discharges, and wastewater treatment plants.
- **Load Allocations (LA)** including non-point sources such as unregulated stormwater from urban, agriculture, forest and pasture.

For this plan, the Maryland Assessment Scenario Tool (MAST) was used to update the models for the baseline conditions (2010) and the current conditions (2015). MDE develops these models using Maryland Department of Planning (MDP) land use maps and MDE's map of the MS4 boundaries. The users are unable to modify this data. MDE's MS4 boundary map represents their more expansive interpretation of the regulated permit area. Part I B. of the County's MS4 permit correctly defines the MS4 Permit Area. Outside of the permit, MDE has expressed a more expansive interpretation of the regulated permit area.

The analysis within this plan is conservatively based on MDE's interpretation. However, the County expressly reserves its rights to reduce the load reduction goals for this plan to the minimum required by law. In addition, the County expressly reserves the right to make future refinements to this plan upon new or additional information consistent with an adaptive management approach or based upon financial, operational or legal considerations that impact the implementation of this plan.

MAST does allow the user to update the information for stormwater management facilities and completed watershed restoration. This information was included in the updated MAST models based on as-built plans and other references.

Three categories of restoration strategies were considered:

- **Structural Stormwater Management Strategies:** These include ESD (environmental site design) and traditional structural BMPs (best management practices) that are designed to the current MDE stormwater management standards and remove sediment through processes such as filtration and infiltration.
- **Alternative Urban Strategies:** Alternative urban strategies do not generally require detailed design and are aimed at conservation of natural resources through adoption of techniques such as tree planting, and converting existing impervious areas to pervious areas. These strategies are approved by MDE and can provide flexibility for jurisdictions to address their NPDES MS4 and TMDL goals.
- **Programmatic Strategies:** These include recommendations to enhance the County's existing programs as well as potential new programs that could be adopted by the County and may include educating residents on pollution prevention and natural resources conservation practices.

Restoration strategies were further grouped based on property ownership, ease of permitting and cost benefit as follows:

- **High Priority:** Restoration located on school or county-owned properties.
- **Medium Priority:** Restoration located on HOA (homeowners association) owned properties.
- **Low Priority:** Restoration located on commercially or industrially owned properties.

Proposed strategies were developed for each sub-watershed. These strategies were used to create proposed scenarios in MAST to determine the load reductions. Costs were also determined based on *Costs of Stormwater Management Practices in Maryland Counties* (King and Hagan, 2011).

The TMDL target load reductions for nitrogen and phosphorus can be achieved by implementing all of the proposed strategies for Bush River, 95% of all of the proposed strategies for Northern Chesapeake Bay, and 55% of all the proposed strategies for Gunpowder River. The County has flexibility to select from the various high, medium, and low priorities for structural and alternative urban BMPs. Completion of the strategies listed above to address the TMDL would cost approximately \$360 M. A summary of the model scenarios is listed below.

Table ES-2: Chesapeake Bay Loads based on Proposed Strategies

Sub-Watershed	Proposed N Load (lbs/ yr)	Proposed P Load (%)	Costs (millions)
Bush River	278,800	8,370	\$270
Northern Chesapeake Bay	171,985	4,551	\$77
Gunpowder River	57,930	2,044	\$13
Total	508,715	14,965	\$360
Target Load	542,164	15,051	

A \$10 M annual budget has been developed for the MS4 program based on a portion of projected revenues from the recordation tax as established within Harford County Resolution 15-005. Harford County estimates allocating \$8 of the budget for the implementation of this

plan. The following table lists projected expenditures and load reductions through the expiration of the County's MS4 permit in 2019 which account for 9% of the load reduction.

Table ES-3: Cost and Benefits of Implementation through 2019

Sub-watershed	Reductions N (lb)	Reductions P (lb)	Cost (millions)
Bush River	10,510	714	\$24
Northern Chesapeake Bay	12,115	453	\$7
Gunpowder River	2,991	168	\$1
Total	25,616 (9%)	1,335 (9%)	\$32

Based on spending \$8 M annually for the implementation of this plan, the Chesapeake Bay TMDL could be addressed by 2062. This is an estimated schedule based on projections for recordation tax revenues that fluctuate annually with home sales, and the ability for Harford County to secure bonds.

These projections are not a guarantee for future funding nor does this plan bind Harford County to complete proposed projects identified within this plan on the time schedule identified in this plan. This plan is intended to be updated annually to incorporate additional information as it becomes available and as a demonstration of progress towards addressing the SW-WLAs within the Chesapeake Bay Watershed.

The County notes that although a target of 2062 is provided, the pace of implementation will be driven by the maximum extent practicable (MEP) compliance standard for MS4s. Strict compliance with water quality standards and TMDL SW-WLAs is not required for MS4s. The County expressly reserves the right to extend the 2062 estimated timeframe as needed based on MEP factors, including, but not limited to, funding and operational factors impacting BMP installation. In addition, although trading is not reflected in this version of the plan, the County reserves the right to participate in any authorized trading program at its discretion, and may revise this plan accordingly.

SECTION ONE: INTRODUCTION

The Harford County Chesapeake Bay Total Maximum Daily Load (TMDL) Restoration Plan for Nitrogen, Phosphorous, and Sediment (plan), was developed by the Harford County (County) Department of Public Works (DPW) and will serve as a guidance document for the County to address the TMDLs for nutrients (nitrogen and phosphorous) and sediment in the Harford County portions of the Chesapeake Bay Watershed. The Chesapeake Bay TMDL and sub-allocations for the five major river basins were established by the Maryland Department of Environment (MDE) and were approved by the U.S. Environmental Protection Agency (EPA) in December 2010.

The Chesapeake Bay TMDL provides target loads for nitrogen, phosphorous, and sediment to the Chesapeake Bay for the 64,000 acre Chesapeake Bay Watershed which includes Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia, and the District of Columbia. To address the TMDL, each state and the District of Columbia were required to develop Watershed Implementation Plans (WIPs).

Maryland's Phase I WIP, completed by MDE in 2010, divides the Chesapeake Bay TMDL between source sectors including agriculture, waste water treatment, septic systems, and stormwater. The plan also discusses the State's strategies to address their targets for the TMDL. Maryland's Phase II WIP, completed by MDE in 2012, further divides the source sector TMDL targets by County.

On December 30, 2014, MDE reissued the Phase I National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit to the County. The permit has several new requirements including stringent stormwater management criteria, implementation of strategies to reduce litter and floatables, and development of restoration plans. Part IV.E.2.b of the reissued NPDES MS4 permit requires the County to develop the restoration plans to address stormwater wasteload allocations (SW-WLAs) for the waterbodies in the County that have EPA-approved TMDLs. Attachment B of the County's NPDES MS4 permit lists eight waterbodies in the County that have TMDLs for various impairments. Table 1-1 lists the waterbodies, type of TMDL, and the impairment.

This plan only addresses the Chesapeake Bay TMDL and includes restoration strategies for the major basins in Harford County including, Bush River, Northern Chesapeake Bay (CB1TF), and Gunpowder River (Figure 1-1)

Table 1-1: EPA-Approved TMDLs in Harford County

Type of TMDL	Watershed	Impairment
Local	Bynum Run	Sediment
	Swan Creek	Nutrients
	Loch Raven Reservoir (Non-Tidal)	Bacteria
	Loch Raven Reservoir	Mercury
	Loch Raven Reservoir	Nutrients and Sediment
Chesapeake Bay	Bush River Oligohaline	Nutrients and Sediment
	Gunpowder River Oligohaline	Nutrients and Sediment
	Chesapeake Bay Mainstem 1 Tidal Fresh	Nutrients and Sediment
	Chesapeake Bay Mainstem 2 Oligohaline	Nutrients and Sediment

1.1 MDE-DESIGNATED USE OF SURFACE WATERS

MDE has classified the waterbodies in the State including streams, impoundments, and tidal waters based on their designated use [Code of Maryland Regulations (COMAR) Section 26.08.02.08]. Table 1-2 identifies the use classes designated by MDE for surface waters.

Table 1-2: MDE-Designated Use Classes for Surface Waters

Use Class	Designated Use
I	Swimming, boating, fishing and other activities involving water contact, protection of aquatic life and wildlife (basic water use)
I-P	All basic water use and public water supply
II	All basic water uses and support estuarine and marine aquatic life and shellfish harvesting
II-P	All Use II and public water supply
III	All basic water uses and shellfish harvesting and propagation and growth of natural trout waters
III-P	All Use III and public water supply
IV	All basic water uses and recreational trout waters
IV-P	All Use IV and public water supply

Source: MDE (n.d.-a)

Figure 1-2 shows the MDE-designated use classes for the surface waters and impoundments in Harford County.

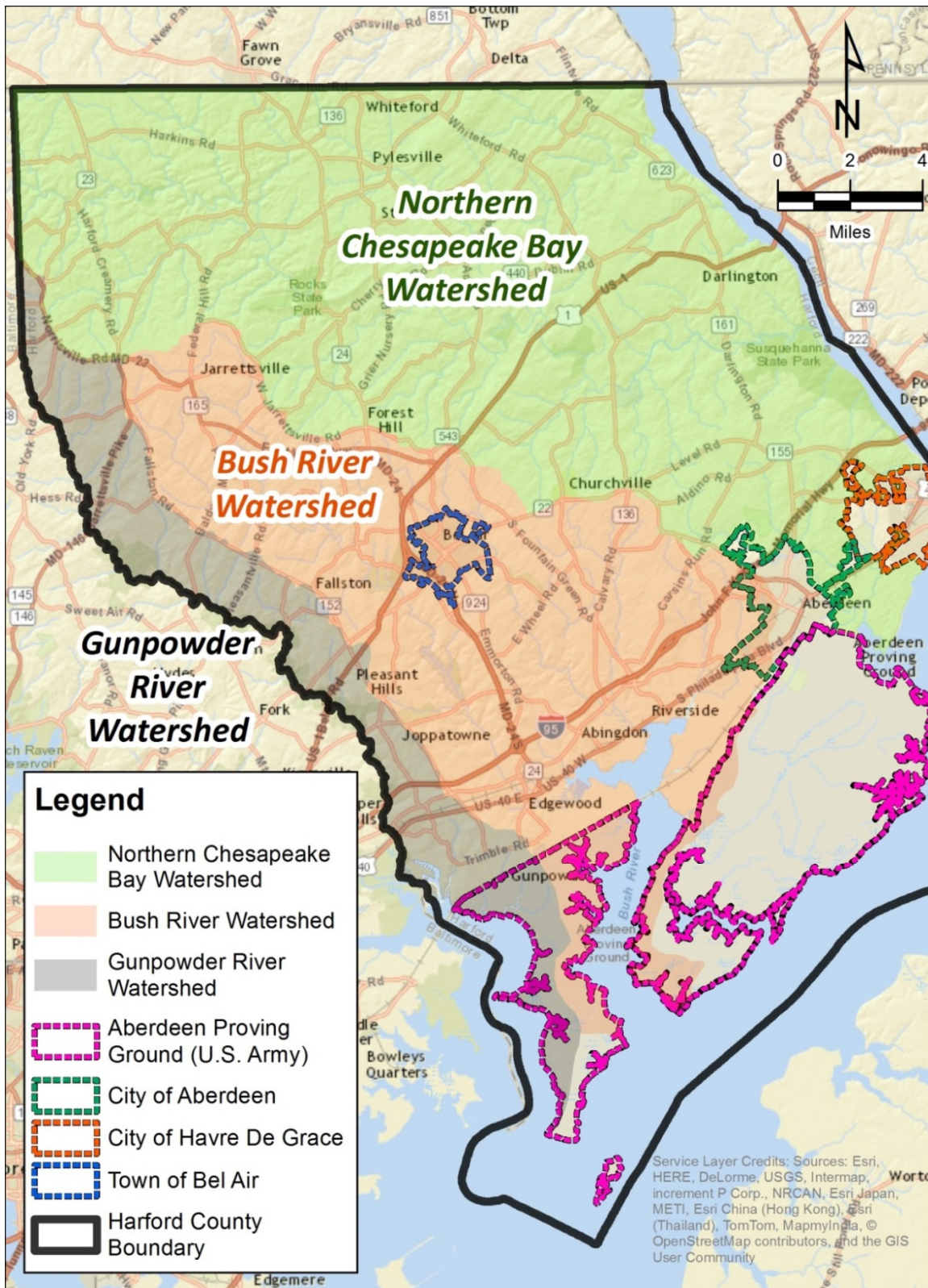


Figure 1-1: Location of the three watersheds in the Harford County portion of the Chesapeake Bay Watershed

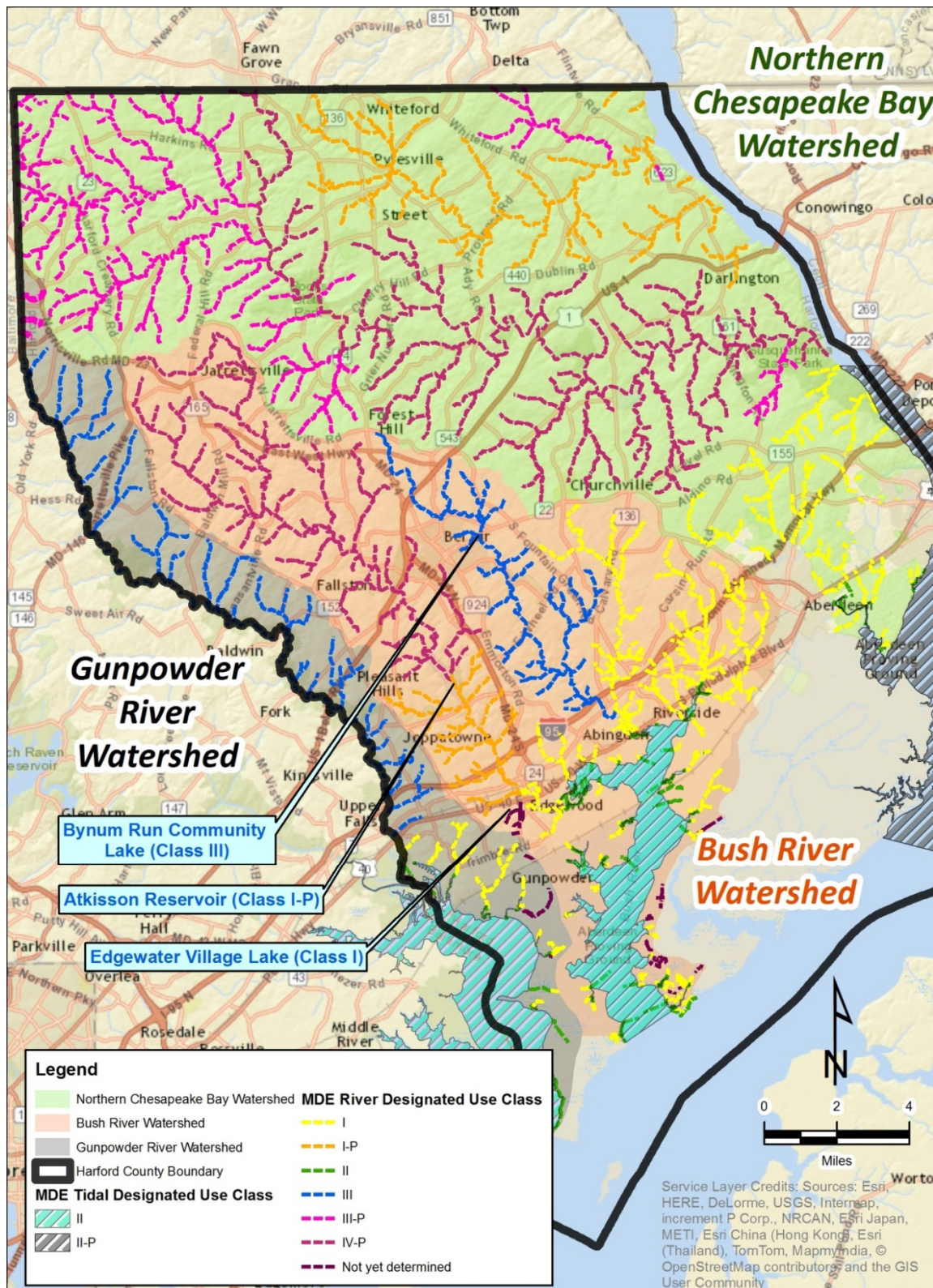


Figure 1-2: MDE-designated use classes of surface waters in the watersheds in the Harford County portion of the Chesapeake Bay Watershed

1.2 DEVELOPMENT OF TMDL FOR CHESAPEAKE BAY

A TMDL is a calculation of the maximum amount of a pollutant a waterbody can receive and still meet the State water quality standards and designated uses. TMDLs are generally developed using pollutant load models or mathematical models that are calibrated using monitoring data.

In general, a TMDL is made up of two major components:

- Wasteload allocation (WLA) includes permitted point sources such as NPDES MS4-regulated urban stormwater (referred to as SW-WLAs), industrial facilities, and waste water treatment plants.
- Load allocation (LA) includes nonpoint sources such as unregulated stormwater from urban, agricultural, forested, and pasture areas.

In addition to these two components, TMDLs also include Margin of Safety (MOS), which accounts for any uncertainty in the TMDL analyses. A TMDL can be represented using the following equation:

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

Total Maximum Daily Load
= Sum of Load Allocations + Sum of Waste Load Allocations
+ Margin of Safety

The Chesapeake Bay Watershed has been impaired by nitrogen, phosphorus, and sediment for the past 25 years (EPA, 2010). The Clean Water Act (CWA) requires States to manage pollutant loads into the Bay, and Executive Order 13508, “Chesapeake Bay Protection and Restoration,” issued May 12, 2009, ordered the Federal Government to set guidelines to address the pollutant loads. To address the concerns about the nutrient and sediment loads in the Chesapeake Bay Watershed and to address the requirements of the CWA, the EPA established TMDLs for nitrogen, phosphorus, and sediment impairments in December 2010.

According to the published TMDL document for nutrient and sediment impairments for the Chesapeake Bay Watershed, loads were calculated using the edge-of-stream (EOS) calibration target loading rates from the Chesapeake Bay Program (CBP) Phase 5.2 Watershed Model. Watershed-specific variables were used to calculate nutrient and sediment loads from non-point sources as well as point sources.

1.3 SOURCES OF NUTRIENT AND SEDIMENT IMPAIRMENTS

MDE (2012a) quantified nitrogen, phosphorous, and sediment loads from point and nonpoint sources in the watersheds.

1.3.1 Point Sources

Eleven (11) NPDES permittees were identified (Table 1-3) within the TMDL document including Harford County MS4 permit.

Table 1-3: Point Sources in the Chesapeake Bay Watershed

Point Source Jurisdiction	Permit Type
Harford County	NPDES Phase I
City of Aberdeen	NPDES Phase II
City of Havre de Grace	NPDES Phase II
Town of Bel Air	NPDES Phase II
State of Maryland	NPDES Phase II
MDSHA	NPDES Phase I
Aberdeen Proving Ground	NPDES State and Federal Small MS4
Town of Bel Air	NPDES MS4 Phase II
Regulated Industrial Sites	General Permit for Stormwater Discharges Associated with Industrial Activities (12-SW)
Regulated Extractive Sites	General Permit for Discharges from Mineral Quarries, Borrow Pits, and Concrete and Asphalt Plants (10-MM)
Regulated Construction Sites	General Permit for Stormwater Discharges Associated with Construction Activity (MDRC)

MDSHA = Maryland State Highway Administration

MS4 = Municipal Separate Storm Sewer System

NPDES = National Pollutant Discharge Elimination System

1.3.2 Non-Point Sources

Non-point sources of nutrient and sediment loads include sources not included in the point source such as agriculture, atmospheric deposition, forest, septic systems and wildlife.

Not all urban stormwater sources are regulated through the County's MS4 permit. Unregulated urban stormwater should be included as a non-point source. As discussed below MDE has expanded its interpretation of the County's permit area.

1.4 TMDL TARGETS FOR HARFORD COUNTY SW-WLA

EPA established target loads for nitrogen and phosphorus for the Chesapeake Bay TMDL and further allocated these targets for the five major basins in Maryland including Susquehanna, Eastern Shore, Western Shore, Patuxent, and Potomac. Within the Phase II WIP, “Maryland further sub-allocated the Final Target loads by county-geographic area and by source sector using an equity-based allocation process consistent with the process used in the Phase I WIP”. These sub-allocations, are available on MDE’s TMDL Data Center website at <http://www.mde.state.md.us/programs/Water/TMDL/DataCenter>. Within the TMDL Data Center is a search specifically for SW-WLAs which generates the Chesapeake Bay TMDL targets for the Bush River, Northern Chesapeake Bay, and Gunpowder River watersheds Table 1-4. Maryland did not sub-allocate TMDL targets for sediment.

Table 1-4: Chesapeake Bay MDL SW-WLA within Harford County

Pollutant	Bush River Watershed Target Reduction⁽¹⁾	Northern Chesapeake Bay Watershed Target Reduction⁽¹⁾	Gunpowder River Target Reduction⁽¹⁾
Nitrogen	26.6%	33.8%	27.1%
Phosphorus	49.4%	49.2%	48.1%
Sediment ⁽²⁾	NA	NA	NA

(1) The reductions are in Maryland's Phase II WIP (MDE, 2012a).

(2) Maryland's Phase II WIP (MDE, 2012b) does not provide a sediment target

The source sector sub-allocations developed by MDE are based on Maryland Department of Planning (MDP) land use maps and MDE’s map of the MS4 boundaries. MDE’s map of Harford County’s MS4 permit area is available on MDE’s TMDL Data Center website at <http://www.mde.state.md.us/programs/Water/TMDL/DataCenter/Pages/>. The analysis within this plan is conservatively based on MDE’s interpretation of the County’s permit area in documents external to the County’s current MS4 permit. Part I.B of the County’s MS4 permit correctly defines the MS4 permit area. All rights noted above are reserved. The County expressly reserves its rights to reduce the target reductions for this plan to the minimum required by law.

MDE developed a web-based tool, the Maryland Assessment Scenario Tool (MAST), to allow users to create various restoration scenarios with outputs that are comparable to the Bay Watershed Model used to develop the TMDL. MAST was used to develop this plan because it is recommended by MDE (MDE, 2014a) for NPDES MS4 permittees for developing restoration plans.

MAST allows updates to the stormwater BMPs included in MDE's baseline conditions (2010), and current conditions (2015) scenarios. For this plan, stormwater as-built plans were reviewed to verify drainage areas and impervious areas managed. Stormwater BMP data in MAST was adjusted based on the as-built reviews. Only BMPs completed between January 1, 2002, and December 31, 2014 were included in the scenarios. BMPs constructed prior to the 2002 MDE stormwater management standards were assumed to provide no control and were not included.

MAST does not allow updates to the MDP land use maps or MDE's MS4 boundary map.

1.5 REQUIREMENTS OF A TMDL RESTORATION PLAN

A TMDL restoration plan identifies various water quality improvement strategies that a local jurisdiction may implement to reduce loadings of a particular pollutant in a specific impaired watershed. The graphic summarizes MDE's requirements for restoration plans as outlined within the County's MS4 permit. The County reserves the right to make arguments regarding the legality of the plan requirements notwithstanding their presentation in this plan.

The primary objective of this TMDL restoration plan is to recommend a wide array of structural, non-structural, and management strategies that could be implemented at the watershed-scale level to address the TMDL.

The analysis is conservatively developed to address the Chesapeake Bay TMDL based on the sub-allocation calculated by MDE and listed in Table 1-4.



1.6 GOALS OF THE CHESAPEAKE BAY RESTORATION PLAN

The goals for the Chesapeake Bay Nutrient and Sediment TMDL Restoration Plan include:

- Baseline Load Conditions Scenario (2010) – Update MDE's baseline load conditions scenario for nitrogen, phosphorous, and sediment based on updated BMP data for BMPs constructed between January 1, 2002 through 2009 and completed watershed restoration projects.
- Target Loads – Adjust the target loads for nitrogen and phosphorus based on the updated baseline loads conditions and the target percent reduction established by MDE.

- Current Load Conditions Scenario (2015) – Update MDE’s current load conditions scenario for nitrogen, phosphorous, and sediment based on updated BMP data for BMPs constructed between January 1, 2002 through 2015 and completed watershed restoration projects.
- Proposed Restoration Strategies – Propose restoration measures, implementation costs, schedules, and monitoring to address the Chesapeake Bay TMDL.
- Proposed Load Conditions Scenario – Quantify the nitrogen, phosphorus, and sediment load reductions achieved from the proposed restoration measures.
- Proposed Impervious Acres Treated – Estimate the equivalent impervious acres treated for the proposed conditions.

SECTION TWO: BUSH RIVER WATERSHED CHARACTERIZATION

This section summarizes the general conditions of the Bush River Watershed and the changes in the watershed conditions from the baseline year (2010) to the current year (2015). The Bush River Watershed was characterized using County-provided geographic information system (GIS) data, Maryland Assessment Scenario Tool (MAST) output, and previous studies.

2.1 WATERSHED DESCRIPTION

Bush River Watershed lies entirely in Harford County and includes the Town of Bel Air and a portion of the City of Aberdeen, both of which are Phase II NPDES MS4 communities. The watershed also includes a portion of the Aberdeen Proving Ground, which is a Phase II NPDES Federal Small MS4 permitted by the U.S. Department of the Army. There are also state-owned properties and industrial facilities located within the watershed.

Bush River Watershed begins near the intersection of Norrisville Road and Jarrettsville Pike and extends southeast to the confluence of the Bush River and the Chesapeake Bay. The watershed is bounded on the west by Fallston Road, Old Fallston Road, and Mountain Road and bounded on the northeast by East Churchville Road and Churchville Road.

Bush River Watershed is the most urban watershed in the County. Most of the County's designated development envelope is located within this watershed. The development envelope spans north to south from Forest Hill to Edgewood along MD Route 24 and east to west from Joppa to Aberdeen along US Route 40.

The major tributaries to the Bush River are Otter Point Creek, Church Creek and Bynum Creek. Their tributaries include Winters Run, Bynum Run, James Run, and Grays Run. Figure 2-1 shows the location of the Bush River Watershed within Harford County.

2.2 PHYSIOGRAPHY AND SOILS

The Bush River Watershed is primarily in the Piedmont Plateau province. This region of the watershed is characterized by crystalline igneous and metamorphic rocks of possible volcanic origin (MGS, 2015). Most piedmont streams are characterized by moderate slopes with gravel and sand as bedrock material. Gravel and sand are resistant to erosion to some degree.

The portion of the watershed that is south of Interstate 95 is in the Atlantic Coastal Plain province, which is composed primarily of gravel, sand, silt, and clay. Streams in coastal zones have lower slopes compared to the streams in piedmont region and the bedrock in them is

made of sediment layers, which are easily eroded and can contribute to sediment loads (Maryland DNR, 2005).

The soil data available for Harford County on the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) website were used to evaluate the soil conditions in the Bush River Watershed. NRCS classifies soils into four Hydrologic Soil Groups (HSGs) (A, B, C, and D) depending on factors such as runoff potential, soil texture, and infiltration rates. HSGs A and B generally have sandy, loamy, and silt textures and have high infiltration rates. HSGs C and D have clay content and have low infiltration rates and high runoff potential. Erodibility of soils increases with an increase in silt and sand content. Soils with clay content are more stable and less susceptible to erosion because of the binding nature of the clay. Clay bonds with organic matter, resulting in a more stable soil structure (MDE, 2011).

The majority of the soils in the Bush River Watershed are HSG B (53 percent), which are erodible, and therefore may contribute to some sediment load in the watershed. Table 2-1 provides the distribution of the HSGs in the watershed by percentage. Figure 2-1 shows the physiographic regions in the watershed and the distribution of HSGs in the watershed.

Table 2-1: Hydrologic Soil Group Distribution in the Bush River Watershed

Hydrologic Soil Group	Percent (%)
A	2%
B	58%
C	25%
D	15%
Total	100%

2.3 WATER QUALITY CONDITIONS

Previous studies conducted in the Bush River Watershed that evaluated the nutrient and sediment conditions in the streams in the watershed were reviewed to analyze the health of the streams over the years. The review included eight studies from 1999 to 2014 that describe conditions in the Bush River Watershed or its subwatersheds. Table 2-2 summarizes the studies.

Bush River Watershed Characterization

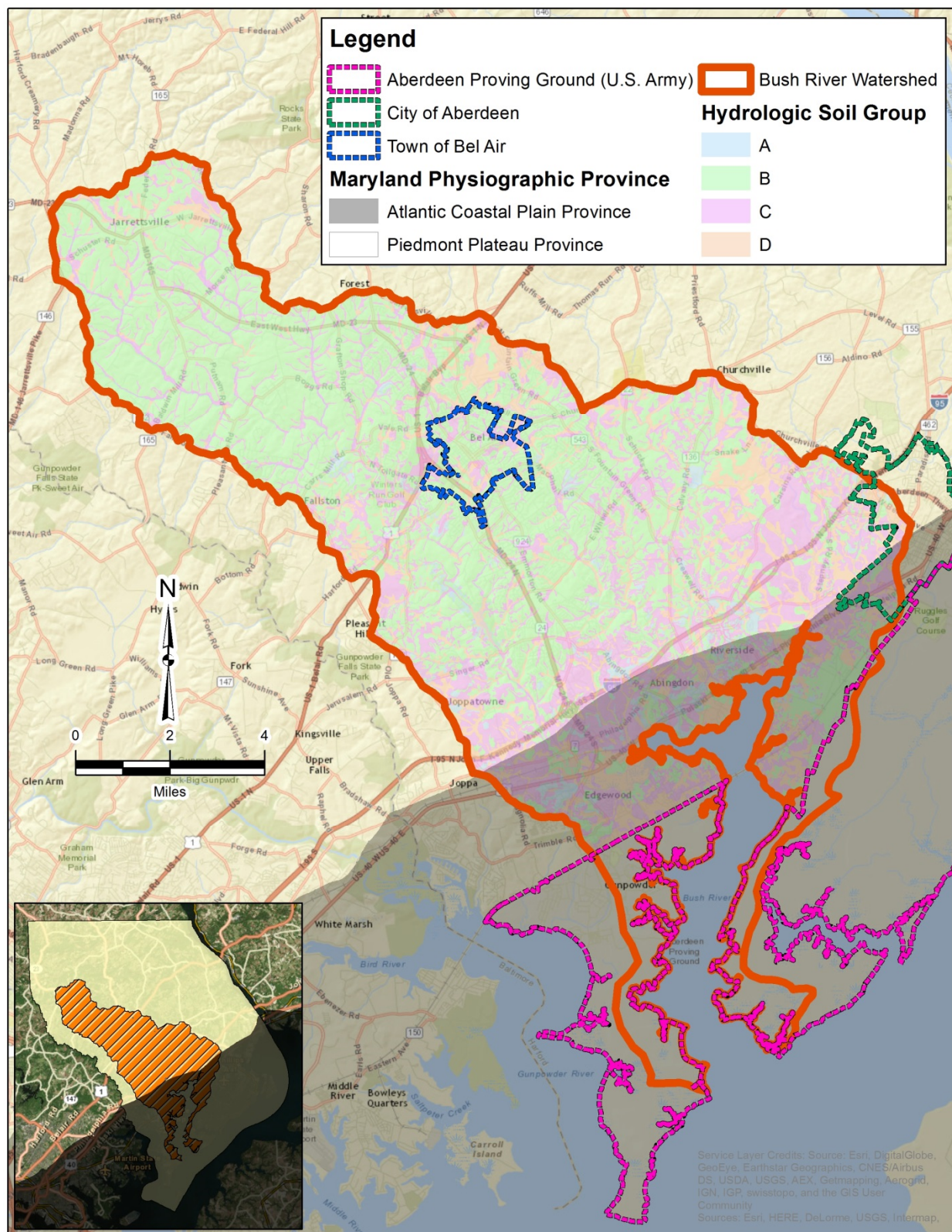


Figure 2-1: Physiographic setting and Hydrologic Soil Group in the Bush River Watershed

Bush River Watershed Characterization

Table 2-2: Water Quality Assessments in the Bush River Watershed

Study	Year	Type of Water Quality Assessment Performed	Physical Characteristics Assessed
<i>Small Watershed Action Plan for Declaration Run and Riverside Small Watersheds</i> (Harford County, 2014)	2014	Water quality assessment of 10 reaches within the watersheds	• MBSS habitat assessment • BEHI assessment
<i>Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring</i> (Harford County, 2012b)	2012	Water quality assessment at four stations (lab testing and water quantity at only two stations) within the watershed	• Geomorphic survey • Biologic survey • Fish survey • BEHI • Water quality (e.g., dissolved oxygen, total phosphorus, nitrate, and TSS)
<i>Plumtree Run Watershed Small Watershed Action Plan</i> (Harford County, 2011)	2011	Stream assessment for over 8 miles of stream length within the watershed	Qualitative stream assessment
<i>Wheel Creek Watershed Assessment</i> (Harford County, 2008)	2008	Stream assessment for over 31 reaches within the watershed	Qualitative stream assessment
<i>Bush River Watershed Management Plan</i> (Harford County, 2003)	2003	Consolidation of existing stream monitoring data, with some in-stream habitat surveys in the watershed.	• Management classification revision (for 19 subwatersheds) • Rapid bio-assessment protocol for habitat evaluation (20 locations in 8 of the subwatersheds)
<i>Findings and Recommendations Report – Engineering Study for Bynum Run Watershed</i> (Harford County, 1999)	1999	Water quality assessment including sampling, survey, and habitat assessment at 23 sites throughout the watershed.	• pH • Dissolved oxygen • Conductivity • TSS • Turbidity • Temperature • Macroinvertebrate sampling • Physical characteristics
<i>Watershed Report for Biological Impairment of the Bush River Watershed in Harford County, Maryland: Biological Stress Identification Analysis Results and Interpretation</i> (MDE, 2013)	2013	BSID analysis for the Bush River Watershed ⁽¹⁾ using three principal dataset sites in the watershed.	BSID analysis was conducted using the Maryland DNR MBSS data
<i>Watershed Report for Biological Impairment of the Bynum River Watershed in Harford County, Maryland: Biological Stress Identification Analysis Results and Interpretation</i> (MDE, 2012b)	2012	BSID analysis for the Bynum Run Watershed using data from 10 stations in the watershed	The BSID analysis was conducted using the Maryland DNR's MBSS data.

2.4 STORMWATER MANAGEMENT

Most areas developed prior to 1985 have no stormwater management associated with them because they were constructed before the State's stormwater management regulations were adopted.

Between 1985 and 2002, stormwater management in many jurisdictions in Maryland including Harford County, regulated only stormwater quantity. The stormwater management practices were designed to collect stormwater runoff from their drainage areas and release it at a controlled rate, providing limited water quality management.

In 2002, MDE required all jurisdictions to begin regulating stormwater quality management and increase stormwater quantity management. Stormwater management practices that provide quality treatment are designed to collect and treat rainfall through a combination of organic and inorganic filtering media such as sand, soil, gravel, and plants. Stormwater management practices that provide increased quantity management are designed to reduce stream bank erosion.

2.4.1 Structural Stormwater Controls

The 2015 County GIS data contain 917 existing BMPs in the Bush River Watershed, 593 meet the 2002 MDE design standards. Figure 2-2 provides the distribution of the BMPs implemented from 2002 to 2015 and Table 2-3 provides a summary of the BMPs implemented by BMP era. Approximately 12,445 acres of the Harford County portion of the Bush River Watershed are managed by BMPs (3,080 acres are treated by BMPs that meet the 2002 MDE standards). The County continues to compile and refine historic BMP data that will be incorporated into future plan updates.

2.4.2 Non-Structural Stormwater Controls

In 2002 MDE also approved the use of non-structural stormwater controls. These controls include disconnection of rooftop runoff, disconnection of non-roof top runoff, and sheetflow to conservation areas. Harford County has not inventoried non-structural stormwater controls. Therefore, non-structural stormwater controls are not included in this plan. The inclusion of this information into the plan will provide additional load reductions. The County will compile this historic data and incorporate the data into future updates to this plan.

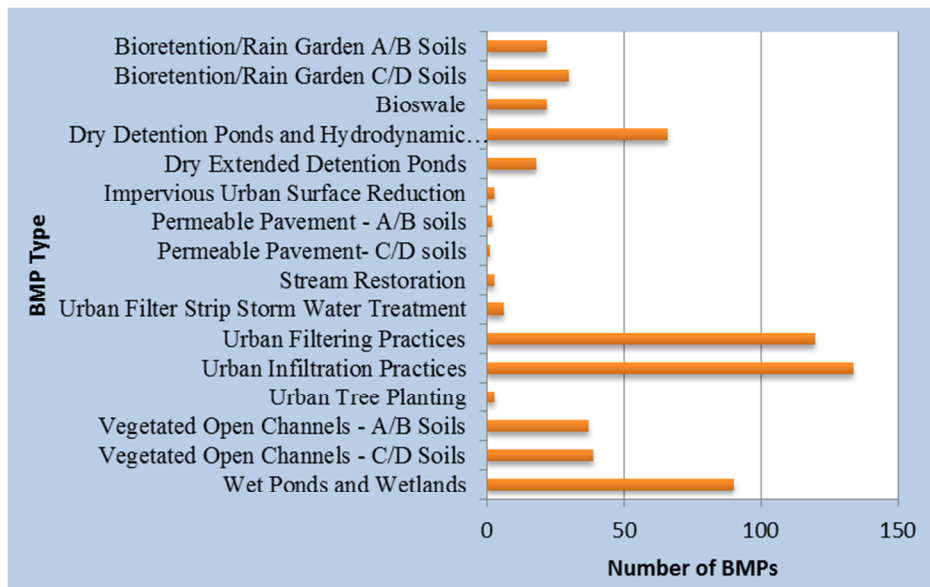


Figure 2-2: Distribution of BMPs in Bush River Watershed from County GIS data that meet 2002 MDE design standards (implemented 2002 to 2015)

Table 2-3: Structural Stormwater Controls in the Bush River Watershed

Stormwater Management Era	Number of BMPs	Area Managed (acres)
1985-2001 ⁽¹⁾	324	9,365
2002-2009	266	1,771
2010-2015	327	1,309
Total	917	12,445

(1) According to MDE guidance, 1985-era BMPs do not provide adequate water quality treatment of runoff (MDE, 2014c).

2.5 ASSESSMENT OF NUTRIENT AND SEDIMENT LOADS

Nitrogen, phosphorus, and sediment loads were updated for the TMDL baseline conditions (2010) and the current conditions (2015) using MAST.

2.5.1 Updated Baseline Conditions (2010) Scenario

Table 2-4 lists the distribution of urban land from MAST for the Bush River Watershed in 2010. The user is unable to make modifications to this data.

Table 2-4: Urban Land in Updated Baseline Conditions (2010) Scenario

Urban Land	Impervious Area (acres)	Pervious Area (acres)	Total Area (acres)
County Phase I MS4	5,773	25,228	31,001
Federal	173	760	933
Municipal Phase II MS4	1,020	1,964	2,984
Regulated Industrial Facility	60	109	169
MDSHA Phase I/II MS4	752	1,508	2,260
State Phase II MS4	25	114	139
Nonregulated extractive	–	104	104
Regulated construction	–	–	708
Regulated extractive	–	29	29
Total	7,803	29,816	38,327

Source: Urban Land use from the Maryland Assessment Scenario Tool (MAST) (CBP, 2010b).

MDSHA = Maryland State Highway Administration, MS4 = Municipal Separate Storm Sewer System

Table 2-5 lists the BMPs included in the updated baseline conditions (2010) scenario, along with the drainage area and impervious area based on as-built plan reviews. This scenario includes BMPs completed between January 1, 2002, and December 31, 2009. BMPs constructed prior to the 2002 MDE stormwater management standards were assumed to provide no control and were not included in this scenario.

Table 2-5: BMPs in Updated Baseline Conditions (2010) Scenario

BMP Type	Number of BMPs	Drainage Area (acres)	Impervious Area (acres)
Bioretention/Rain Garden A/B Soils, no underdrain	6	10.2	2.2
Bioretention/Rain Garden C/D Soils, underdrain	9	16.8	3.3
Bioswale	2	2.9	1.7
Dry Detention Ponds and Hydrodynamic Structures	47	409.6	111.8
Urban Filter Strip Storm Water Treatment	1	0.0	0.0
Urban Filtering Practices	63	156.6	69.4
Urban Infiltration Practices w/o Sand	44	26.1	8.3
Vegetated Open Channels – A/B Soils, no underdrain	19	45.5	6.4
Vegetated Open Channels – C/D Soils, no underdrain	27	23.6	14.0
Wet Ponds and Wetlands	48	1,079.6	362.5
Total	266	1,771	580

Also included in this scenario are restoration projects completed through 2009 including one stormwater retrofit, three new bioretention, and two stream restorations.

The results of the updated baseline conditions (2010) scenario are listed in Table 2-6.

Table 2-6: Loads from Updated Baseline Conditions (2010) Scenario

Land Use	Area (acres)	Nitrogen Loads (lbs/year)	Phosphorous Loads (lbs/year)	Sediment Loads (tons/year)
County Phase I MS4 Impervious Area	5,770	86,400	8,850	4,070
County Phase I MS4 Pervious Area	25,230	303,350	7,720	3,580
Total	31,000	389,750	16,570	7,650

lbs = pounds

2.5.2 Target Loads

According to MDE's TMDL Data Center, WLA search, Harford County's stormwater WLA for the Chesapeake Bay TMDL for the Bush River Segment are reductions from baseline (2010) for nitrogen (26.6%) and phosphorus (49.4%). Applying these percentages to the update baseline conditions (2010) produces the target loads for the TMDL shown in Table 2-7.

Table 2-7: Target Loads from Updated Baseline Conditions (2010) Scenario

Pollutant	Target Reduction ⁽¹⁾	Updated Baseline (2010) Load	Target Load
Nitrogen	26.6%	389,750 lbs/year	286,080 lbs/year
Phosphorous	49.4%	16,570 lbs/year	8,380 lbs/year

(1) Reductions from 2009 progress towards Maryland's Phase II WIP Targets, (MDE, 2012a), <http://www.mde.state.md.us/programs/Water/TMDL/DataCenter>

2.5.3 Updated Current Conditions (2015) Scenario

Table 2-8 lists the distribution of urban land from MAST for the Bush River Watershed in 2015. Between 2010 and 2015, the County Phase 1 MS4 (as delineated by MDE) increased by 200 impervious acres and 780 pervious acres. The user is unable to make modifications to this data.

Table 2-8: Urban Land in Updated Current Conditions (2015) Scenario

Urban Land	Impervious Area (acres)	Pervious Area (acres)	Total Area (acres)
County Phase I MS4	5,970	26,010	31,980
Federal	170	760	930
Municipal Phase II MS4	1,020	1,960	2,980
Regulated Industrial Facility	60	110	170
MDSHA Phase I/II MS4	750	1,510	2,260
State Phase II MS4	20	110	140
Nonregulated extractive	—	100	100
Regulated construction	—	—	740
Regulated extractive	—	30	30
Total	8,000	30,600	39,340

Source: Urban Land use from the Maryland Assessment Scenario Tool (MAST) (CBP, 2015b).

MDSHA = Maryland State Highway Administration, MS4 = Municipal Separate Storm Sewer System

Similar to the updated baseline conditions (2010) scenario the BMP data in MAST was adjusted based on the as-built reviews. The BMPs include those in the updated baseline (2010) scenario and the additional BMPs constructed between January 2010 and January 2015. BMPs constructed prior to the 2002 MDE stormwater management standards were assumed to provide no control and were not included in this scenario. Table 2-9 lists the BMPs included in the updated current conditions (2015) scenario, along with the drainage area and impervious area.

Table 2-9: BMPs in Updated Current Conditions (2015) Scenario

BMP Type	Number of BMPs	Drainage Area (acres)	Impervious Area (acres)
Bioretention/Rain Garden A/B Soils, no underdrain	22	18.9	8.5
Bioretention/Rain Garden C/D Soils, underdrain	30	43.8	11.6
Bioswale	22	15.8	7.1
Dry Detention Ponds and Hydrodynamic Structures	66	525.7	155.0
Dry Extended Detention Ponds	18	116.7	22.4
Impervious Urban Surface Reduction	3	1.7	1.6
Permeable Pavement without Sand – A/B soils, no underdrain	2	0.5	0.1
Permeable Pavement without Sand – C/D soils, underdrain	1	0.9	0.6
Urban Filter Strip Storm Water Treatment	6	0.9	0.4
Urban Filtering Practices	120	304.7	124.5
Urban Infiltration Practices without Sand	134	187.0	123.1
Urban Tree Planting	3	9.9	0.0
Vegetated Open Channels – A/B Soils, no underdrain	37	64.3	11.3
Vegetated Open Channels – C/D Soils, no underdrain	39	34.1	19.4
Wet Ponds and Wetlands	90	1,755.0	607.1
Total	593	3,080	1,093

BMP = best management practice

Also included in this scenario are restoration projects completed between 2010 and 2015 including two stormwater retrofits, one new bioretention, and three stream restorations.

The results of the updated current conditions (2010) scenario are listed in Table 2-10

Table 2-10: Loads from Updated Current Conditions (2015) Scenario

Land Use	Area (acres)	Nitrogen Loads (lbs/year)	Phosphorous Loads (lbs/year)	Sediment Loads (tons/year)
County Phase I MS4 Impervious Area	5,970	86,510	8,550	3,900
County Phase I MS4 Pervious Area	26,010	310,580	7,860	3,440
Total	31,980	397,090	16,410	7,340

Progress towards addressing the Chesapeake Bay TMDL for Bush River Watershed is listed in Table 2-11. Additional reductions in nitrogen (111,010 lbs/year) and phosphorus (8,030 lbs/year) are necessary to address the Chesapeake Bay TMDL.

Table 2-11: Bush River Watershed Progress (2015)

Pollutant	Update Current Conditions (2015) Load (lbs/year)	Target Load (lbs/year)	Target Reduction (lbs/year)
Nitrogen	397,090	286,080	111,010
Phosphorous	16,410 l	8,380	8,030

SECTION THREE: BUSH RIVER RESTORATION STRATEGIES

This section describes the proposed restoration strategies to address the Chesapeake Bay TMDL for nitrogen and phosphorous in the Bush River Watershed. Although specific reduction targets are not provided for sediments in Maryland's Phase II WIP (MDE, 2012a) the reductions from proposed restoration practices were included in this plan. The proposed strategies were developed using existing County GIS data, reports such as the *Bush River Watershed Management Plan* (Harford County, 2003), the County's Capital Improvement Program (CIP), the *Accounting Document for Stormwater Wasteload Allocations and Impervious Area Credits* (MDE, 2014b) and other relevant data and resources. This section also includes the planning-level implementation costs for the proposed restoration projects and the potential load reductions that were estimated using MAST. The proposed strategies can be broadly categorized as follows:

- **Structural Stormwater Management Strategies:** These include retrofits to existing BMPs or new BMPs that are designed to the current MDE standards to collect and treat stormwater runoff to remove pollutants through processes such as filtration and infiltration. The proposed BMPs include both ESD and traditional structural practices.
- **Alternative Urban Strategies:** Alternative urban strategies generally do not require detailed design like structural BMPs and are aimed at conservation of natural resources through techniques such as tree planting, forest buffers, nutrient management plans, and converting existing impervious areas to pervious areas. These strategies are approved by MDE and provide flexibility for jurisdictions in addressing TMDLs.

3.1 STRUCTURAL STORMWATER MANAGEMENT STRATEGIES

Structural strategies were developed using previously identified projects listed within completed small watershed assessment plans, and additional projects identified using the County GIS data including BMP retrofits and new structural BMPs

The *Bynum Run Watershed TMDL Restoration Plan for Sediment* (Harford County, 2016) was prepared concurrently with this plan. Bynum Run is located within the Bush River Watershed so restoration strategies from the Bynum Run Plan are included as restoration strategies for this Plan.

3.1.1 Previously Identified Projects

Harford County has completed the following watershed assessments and management plans for the Bush River Watershed which includes concept-level design of proposed BMPs:

- *Findings and Recommendations Report – Engineering Study for Bynum Run Watershed* (Harford County, 1999)

- *Bush River Watershed Management Plan* (Harford County, 2003)
- *Wheel Creek Watershed Assessment* (Harford County, 2008)
- *Plumtree Run Watershed Small Watershed Action Plan* (Harford County, 2011)
- *Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring* (Harford County, 2012b)
- *Small Watershed Action Plan for Declaration Run and Riverside Small Watersheds* (Harford County, 2014)

For proposed projects in the *Bush River Watershed Management Plan* (Harford County, 2003) that overlapped with proposed projects in the more recent studies such as the *Wheel Creek Watershed Assessment* (Harford County, 2008), the latter were incorporated into this plan. Several of the proposed projects in the *Plumtree Run Watershed Small Watershed Action Plan* (Harford County, 2011) were in the Bel Air MS4 area and were therefore excluded from this plan. Proposed projects on MDSHA property were also omitted. A total of 82 BMPs identified from studies listed above, including over 7 miles of stream restoration were included in this restoration plan.

3.1.2 Additional Proposed Projects

Structural BMP Retrofits

In addition to the proposed structural BMPs from the existing watershed studies, 233 additional retrofits were identified using methods discussed below.

New Structural BMPs

Proposed new structural BMPs were identified by analyzing school-owned properties, county-owned properties, county road rights-of-way, and outfalls adjacent to school properties, county-owned properties community-owned properties such as community open space, churches and institutions. The methods used to identify these new BMPs using County-GIS is discussed below.

The proposed new structural BMPs are as follows:

- **School-Owned Properties and County-Owned Properties:** Fifty-three (53) structural BMPs were identified on school-owned property or county-owned property. Proposed practices focus on diverting runoff from impervious surfaces to filtering practices such as tree box filters, rain gardens, micro-bioreentions, bioreentions, and sand filters. There is a combination of 3,700 acres of school-owned property and county-owned property within the Bush River Watershed including parcels in the Town of Bel Air and the City of Aberdeen.

- **County Rights-of-Way:** Eighty (80) county rights-of-way were identified where filters could be implemented to capture and treat stormwater runoff. A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented to treat runoff in the county rights-of-way where sufficient space is available. All of these practices are classified as bioretentions in MAST, so the focus was on county rights-of-way where the predominant soil type was HSG A or B, both of which receive substantially higher reductions than bioretentions with HSG C or D soils. Restoration projects within the county rights-of-way will be considered in combination with future road improvement projects in the watershed.
- **Outfalls on or Adjacent to School-owned, County-owned or Community-owned Properties:** One-hundred fifty five (155) outfalls were identified as locations where a BMP could be constructed to capture and treat stormwater runoff. Storm drain outfalls that convey flows directly to the streams were evaluated for potential retrofit opportunities. There are over 3,200 county maintained outfalls in the Bush River Watershed, including approximately 900 on or adjacent to school-owned, county-owned or community-owned properties. Structural BMPs were proposed at or upstream of the outfalls to intercept runoff prior to entering storm drain inlets at locations with no upstream water quality treatment and with sufficient space. The most common proposed BMPs at existing outfalls were SPSCs. Filters (i.e., bioretentions and sand filters). The most common BMPs proposed upstream of existing outfalls were a combination of bioretentions, micro-bioretentions, and tree box filters at existing inlets.

Methods used to select new BMPs

A desktop analysis using aerial imagery, and County GIS data for parcels, topography, and existing infrastructure was completed for each existing or proposed new BMP to determine the most appropriate type of structural BMP. The County GIS data was also used to estimate drainage areas and impervious areas. The Chesapeake Bay Program removal efficiencies show that infiltration practices provide the greatest nutrient reductions, followed by bioretentions on A or B soils, filtration practices (e.g., sand filter), bioretentions on C or D soils, and wet pond retrofits. Table 3-1 summarizes the initial protocol for selecting the type of BMP for retrofitting existing practices.

Table 3-1: Protocol for pre-2002 BMP Retrofits

Existing Practice	Drainage Area (acres)	Hydrologic Soil Group	Proposed Practice	Proposed Number
Dry ponds and extended detention dry ponds	Less than 5	A or B	Infiltration Basin or Bioretention	15
Dry ponds and extended detention dry ponds	Less than 5	C or D	Sand Filter	18
Dry ponds and extended detention dry ponds	5 to 10	A or B	Infiltration Basin	8
Dry ponds and extended detention dry ponds	5 to 10	C or D	Sand Filter	36
Any dry or wet pond	Greater than 10	Any	MS4 Permit-Required Stormwater Retrofit	156

MS4 = Municipal Separate Storm Sewer System

3.1.3 New and Retrofit Projects Summary

Figure 3-1 provides the locations of the previously identified BMPs (in-progress structural BMPs), additional BMP retrofits and proposed new BMPs.

Table 3-2 summarizes the proposed new and retrofit structural BMPs including the project type, anticipated drainage area, anticipated impervious area and implementation level costs. Table 3-3 provides a similar summary for the proposed stream restoration projects mostly identified from the watershed assessments. Planning-level cost estimates were based on the *Cost of Stormwater Management Practices in Maryland Counties* (King and Hagan, 2011). A 35 percent contingency was added to account for an increase in construction costs since publication of the document.

Appendix A provides a list of the proposed projects including a unique project ID, project name, project location, proposed project type, planning level area treated, and notes. Because the SPSCs are not included in MAST, they were input as bioretentions per MDE guidance (MDE, 2014c and Anne Arundel County, 2012). Approximately 579 proposed new and retrofit BMPs are traditional BMPs or ESD practices, and 24 are proposed stream restoration projects.

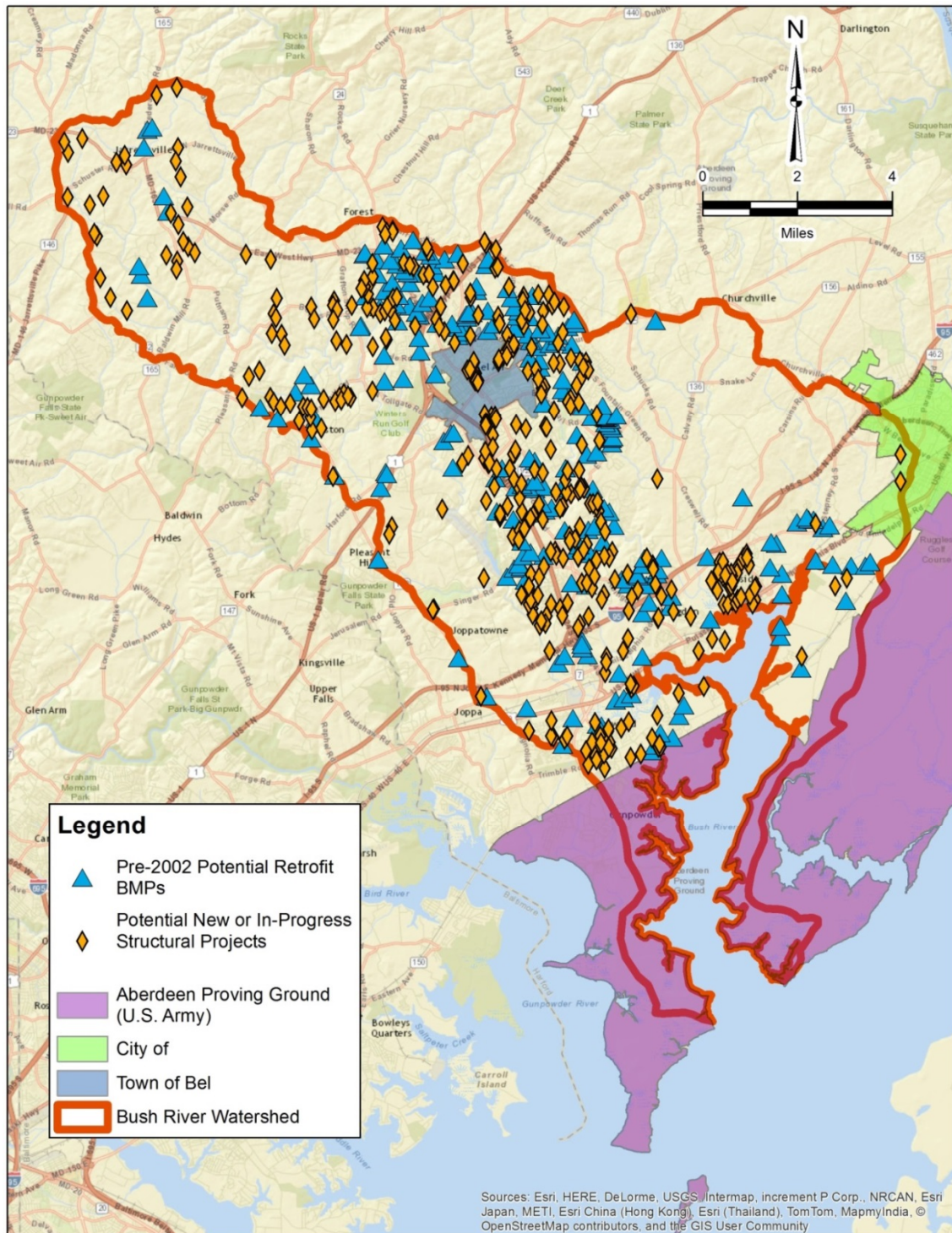


Figure 3-1: Locations of Proposed BMPs in Bush River Watershed

Table 3-2: Proposed New and Retrofit Structural Restoration Projects in Bush River Watershed

Proposed Structural BMP	Number of BMPs	Drainage Area (acres)	Impervious Area (Acres)	Planning-Level Implementation Cost
Bioretention/Rain Garden A/B Soils, no underdrain	182	1,440	447	\$110,770,500
Bioretention/Rain Garden C/D Soils, underdrain	88	481	191	\$47,389,300
Bioswale	6	20	9	\$521,400
Impervious Urban Surface Reduction	1	1	1	\$74,100
MS4 Permit-Required Stormwater Retrofit	160	4,160	862	\$74,514,000
Permeable Pavement without Sand – A/B soils, no underdrain	5	3	2	\$793,900
Permeable Pavement without Sand – C/D soils, underdrain	4	2	2	\$579,300
Urban Filter Strip Storm Water Treatment	6	10	7	\$222,500
Urban Filtering Practices	75	391	102	\$6,716,300
Urban Infiltration Practices without Sand	20	109	26	\$2,150,600
Vegetated Open Channels – A/B Soils, no underdrain	1	3	1	\$24,300
Vegetated Open Channels – C/D Soils, no underdrain	2	10	3	\$93,000
Wet Ponds and Wetlands	29	1,000	398	\$12,950,100
Total	579	7,629	2,050	\$256,799,300

Table 3-3: Proposed Stream Restoration Projects in Bush River Watershed

Number of Projects	Length of Stream Restoration (feet)	Equivalent Impervious Acres	Planning-Level Implementation Cost
24	45,700	457	\$10,306,000

3.2 ALTERNATIVE STORMWATER MANAGEMENT STRATEGIES

MDE-approved alternative urban BMPs are important tools for the County to achieve nitrogen, phosphorus, and sediment load reductions. The County has already adopted some of these strategies. Expansion or modification of these strategies is proposed to receive credit from MDE as an approved alternative urban BMPs. Appendix B shows the approximate locations of the alternative urban BMPs.

The alternative urban BMPs are as follows:

- **Management Plans for Existing Forest Buffers:** Riparian areas that are at least 35 feet wide on one side of a stream and managed to promote filtering of runoff receive credit

from MDE as an alternative urban BMP. Many of the streams in the Bush River Watershed have at least 35 feet of forest buffers and could be eligible for credit by creating management plans and a GIS database of the existing buffers. To receive credits from MDE for tree buffers, a survival rate of at least 100 trees per acre is necessary, and 50 percent of the trees must be at least 2 inches in diameter and have a 4.5-foot-tall trunk. For this plan, a maximum buffer width of 150 feet was assumed, only areas covered by the existing vegetation GIS layer were considered, and distance was taken from the stream centerline. Approximately 4,200 acres of existing forest buffers were identified.

Projected reductions are as follows: nitrogen of 60,500 lbs/year, phosphorus of 2,100 lbs/year, and sediment in 715 tons/year. Planning-level implementation costs of \$220,000 are estimated to create management plans including a GIS dataset of the management areas based on the MAST nutrient management plan capital cost estimates per acre.

- **Tree Planting and Management Plans for New Forest Buffers:** There is potential to extend existing forest buffers or implement new forest buffers on County properties and community properties (HOAs, churches, or institutions). This strategy would involve both planting trees and creating management plans for the new buffers. Approximately 400 acres of potential new buffers were identified on County property, and an additional 210 acres were identified on community properties. The practice would result in a reduction of nitrogen of 11,000 lbs/year, a reduction of phosphorus of 310 lbs/year, a reduction of sediment of 110 tons/year, and credit from MDE for treating 153 equivalent impervious acres. Planning-level implementation costs of \$5.4 million are estimated. The tree planting cost estimates for this strategy are based on recent capital improvement tree planting projects with a contingency of 30 percent. The forest buffer management plan cost estimates are based on MAST nutrient management plan capital cost estimates per acre.
- **Urban Tree Planting:** The County is already implementing tree planting as part of its watershed restoration program on schools and county-owned properties. As an expansion to this program, additional properties with available open area for tree planting were identified.. Approximately 100 acres of open area are available for tree planting. To receive credits from MDE for tree planting, a survival rate of at least 100 trees per acre is necessary, and 50 percent of the trees must be at least 2 inches in diameter and have a 4.5-foot-tall trunk. It would result in a reduction of nitrogen of 1,300 lbs/year, a reduction of phosphorus of 30 lbs/year, a reduction of sediment of 10 tons/year, and credit from MDE for treating 37 equivalent impervious acres. Planning-

level implementation costs of \$1.3 million are estimated for this strategy based on recent capital improvement tree planting projects with a contingency of 30 percent.

- **Nutrient Management Plan High-Risk Lawns:** The County currently provides urban nutrient management on County properties. To receive credit for this practice, site-specific nutrient management plans are required that describe how major nutrients are managed to protect water quality. These plans must be updated every 3 years to continue to receive credit. According to the Chesapeake Bay Program (2015) and the Chesapeake Stormwater Network (Schueler and Lane, 2013), lawns that receive significant traffic are considered high-risk lawns; therefore, lawns in parks and schools can be considered high-risk lawns. Nutrient management plans for high-risk lawns provide substantially higher nutrient reductions than plans for unknown risk lawns and low-risk lawns. Applying such plans to the approximately 1,800 acres of lawn on County parks and school properties would result in a reduction of nitrogen of 3,700 lbs/year, and a reduction of phosphorus of 40 lbs/year. Planning-level implementation costs of \$95,000 are estimated for this strategy based on the MAST capital cost estimates per acre.
- **Nutrient Management Plan Unknown Risk Lawns:** Nutrient management plans could also be applied to unknown risk lawns on County properties or community properties (HOAs, churches, or institutions) or within the County rights-of-way. Nutrient management plans could be provided for approximately 400 acres of County lawns of unknown risk, approximately 1,700 acres of community lawns, and approximately 1,700 acres of County right-of-way lawns. This strategy would result in a reduction of nitrogen of 3,600 lbs/year and a reduction of phosphorus of 40 lbs/year. Planning-level implementation costs of \$204,000 are estimated for this strategy based on the MAST capital cost estimates per acre.
- **Street Sweeping:** The County currently conducts annual street sweeping on county-owned roads using mechanical sweepers. To receive credits for this practice, the street sweeping program needs to be expanded to twice a month. According to the guidance in *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014c), regenerative vacuum sweepers provide greater nutrient reductions than mechanical sweepers do. The Bush River Watershed has approximately 525 miles of county-owned roads, and implementation of mechanical street sweeping twice a month would result in a reduction of nitrogen of 700 lbs/year, a reduction of phosphorus of 60 lbs/year, a reduction of sediment of 80 tons/year, and credit from MDE for treating 133 equivalent impervious acres. This alternative urban strategy is not recommended at this time because the County does not currently plan to expand its street sweeping program, but the strategy would be considered as a future restoration option. Planning-level

implementation costs of \$15,600,000 are estimated for this strategy based on (King and Hagan (2011). A contingency of 35 percent was applied to account for increases in implementation costs since 2011.

- **Catch Basin Cleaning:** There are approximately 12,000 storm drain inlets in the Harford County portion of the Bush River Watershed. The current County program schedules catch basins and storm drain inlets cleaning to remove sediment and debris once every 3 years. If the program is expanded to increase the frequency of the catch basin cleaning so the catch basins and storm drain inlets are routinely maintained, the program could qualify for MDE credit as an alternative urban BMP. According to the guidance in *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014c), credits for catch basin cleaning are based on the weight of material that is collected. A nitrogen reduction of 3.5 pounds, a phosphorus reduction of 1.4 pounds, and a sediment reduction of 420 pounds are credited for every ton of material collected. This alternative urban strategy is not recommended at this time because the County does not currently plan to expand its catch basin cleaning program, but the strategy could be considered as a future restoration option to be re-evaluated once all the restoration options are exhausted. A planning-level implementation cost of approximately \$14.00 per catch basin is estimated based on *Stormwater O&M Fact Sheet-Catch Basin Cleaning* (EPA, 1999). A contingency of 35 percent was added to the cost of catch basin cleaning in EPA (1999) to account for the increase in implementation cost since 1999.

3.3 PROJECT PRIORITIZATION

The proposed structural projects were prioritized based primarily on property ownership. The prioritization provides a framework for selecting projects and assists with the selection of a timeline for project implementation. Projects were prioritized as high, medium, or low as follows:

- **High Priority:** All projects on county-owned property are considered a high priority over privately-owned property. Proposed projects from the watershed studies with existing concept-level design are also high priority.
- **Medium Priority:** Projects on community-owned properties (HOAs, churches, or institutions) are considered medium priority projects. The County has established relationships with the various community groups throughout Harford County (particularly HOAs) through implementation of stormwater management projects and public education and outreach. Because it is generally feasible to implement new and retrofit projects on community-owned areas through agreements, the proposed restoration strategies on community-owned properties were given a medium priority.

- **Low Priority:** Projects on privately owned properties (e.g., commercial and industrial areas) were given low priority. It is typically more difficult for the County to implement stormwater management projects on private properties than on county-owned or community-owned properties because of the individual agreements that are required for construction and maintenance. Projects on county-owned rights-of-way are also categorized as low priority.

3.4 NUTRIENT AND SEDIMENT LOAD REDUCTIONS

The proposed structural stormwater BMPs and alternative urban BMPs were added to the Bush River Watershed Current Load Conditions (2015) Scenario in MAST to create the proposed conditions scenario. Using the proposed low, medium and high priority projects, the reductions listed in Table 3-4 could be achieved. These proposed projects exceed the required target loads, but the target loads cannot be met if only the medium and high priority projects are implemented (Table 3-5).

Table 3-4: Effectiveness of All Proposed Projects for Bush River Watershed

Pollutant	Target Reduction	Proposed Reduction	Target Load (lbs/year)	Proposed Load (lbs/year)
Nitrogen	26.6%	28.5%	286,080	278,800
Phosphorous	49.4%	49.5%	8,380	8,370
Sediment	Not applicable	46.1%	Not applicable	3,670

Table 3-5: Effectiveness of Combinations of Proposed Project for Bush River Watershed

Pollutant	Target Reduction ⁽²⁾	High Priority Projects	High and Medium Priority Projects	High, Medium, and Low Priority Projects
Nitrogen	26.6%	18.9%	24.1%	28.5%
Phosphorous	49.4%	37.8%	43.9%	49.5%
Sediment	Not provided	30.9%	39.4%	46.1%

SECTION FOUR: NORTHERN CHESAPEAKE BAY WATERSHED CHARACTERIZATION

This section summarizes the general conditions of the Northern Chesapeake Bay Watershed (CB1TF) within Harford County and the changes in the watershed conditions from the baseline year (2010) to the current year (2015). The Northern Chesapeake Bay Watershed was characterized using County provided geographic information system (GIS) data, Maryland Assessment Scenario Tool (MAST), and previous studies.

4.1 WATERSHED DESCRIPTION

Northern Chesapeake Bay Watershed is located in Maryland and Pennsylvania. The upstream extent of the watershed is located near Red Lion, Pennsylvania. The Maryland portion of the Northern Chesapeake Bay watershed is located in the northeastern most portion of Harford County to the west of the Susquehanna River, which separates Harford and Cecil Counties. The Maryland portion of the watershed gathers drainage from Baltimore, Harford, and Cecil counties. This plan discusses the portion of the watershed within Harford County, Maryland.

The Northern Chesapeake Bay watershed comprises over 50% of the land area in the County. It is mostly rural in nature and located predominately outside of the County development envelope. Urban development is mostly low density and agricultural residential serviced by well and septic. There are more densely developed areas in the City of Havre de Grace, the City of Aberdeen and Aberdeen Proving Grounds (APG) within the watershed; however for this TMDL restoration plan, these areas were excluded since they have their own Phase II NPDES MS4 Permits.

The three largest tributaries to the Northern Chesapeake Bay Watershed are Deer Creek, Broad Creek, and Swan Creek. Deer Creek is a designated State Scenic River. Figure 4-1 shows the location of the Northern Chesapeake Bay Watershed within Harford County.

4.2 PHYSIOGRAPHY AND SOILS

The Northern Chesapeake Bay Watershed is primarily in the Piedmont Plateau province, which is approximately all territory north and northwest of Interstate 95. The watershed is located in the Piedmont Upland section where there are a variety of metamorphic rocks that include but are not limited to schist, phyllite, quartzite, metagraywackes, and gneisses. The portion of the watershed south of Interstate 95 is located in the Atlantic Coastal Plain region, which is primarily comprised of gravel, sand, silt and clay. This area has the characteristics of sedimentary beds from estuarine deposition.

The soils data available for Harford County on the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) website was used to evaluate the soil conditions in the Northern Chesapeake Bay watershed. NRCS classifies soils into four Hydrologic Soil Groups (HSG) (A, B, C, and D) depending on several factors such as runoff potential, soil texture

and infiltration rates. Hydrologic groups A and B generally have sandy, loamy and silt textures and therefore they have high infiltration rates. Higher infiltration rates make bioretention and other green infrastructure practices more feasible. Hydrologic groups C and D have clay content and as a result have low infiltration rates and high runoff potential. Erodibility of soils increases with increase in silt and sand content. Soils with clay content are more stable and less susceptible to erosion due to the binding nature of the clay. Clay bonds organic matters resulting in a more stable soil structure. Increasing erodibility of soils causes an increase in sediment loads to receiving waters which becomes important in regards to the Chesapeake Bay TMDL.

The Northern Chesapeake Bay watershed consists primarily of B and C soils as shown in Table 4-1. Figure 2-1 shows the hydrologic soil groups of the entire Northern Chesapeake Bay on a geospatial scale.

Table 4-1: Hydrologic Soil Group Distribution in Northern Chesapeake Bay Watershed

Hydrologic Soil Group	Percent (%)
A	1
B	69
C	20
D	10
Total	100

4.3 WATER QUALITY CONDITIONS

Previous studies conducted in the Northern Chesapeake Bay Watershed that evaluated the nutrient and sediment conditions in the streams in the watershed were reviewed to analyze the health of the streams over the years. The review included three studies including the Deer Creek Watershed Restoration Action Strategy (Harford County, 2005), BSID for Swan Creek (MDE) and *Water Quality of Lower Deer Creek, Harford County, MD, Home of the Federally Endangered Maryland Darter* (U.S. Fish and Wildlife Service, 1990).

Northern Chesapeake Bay Watershed Characterization

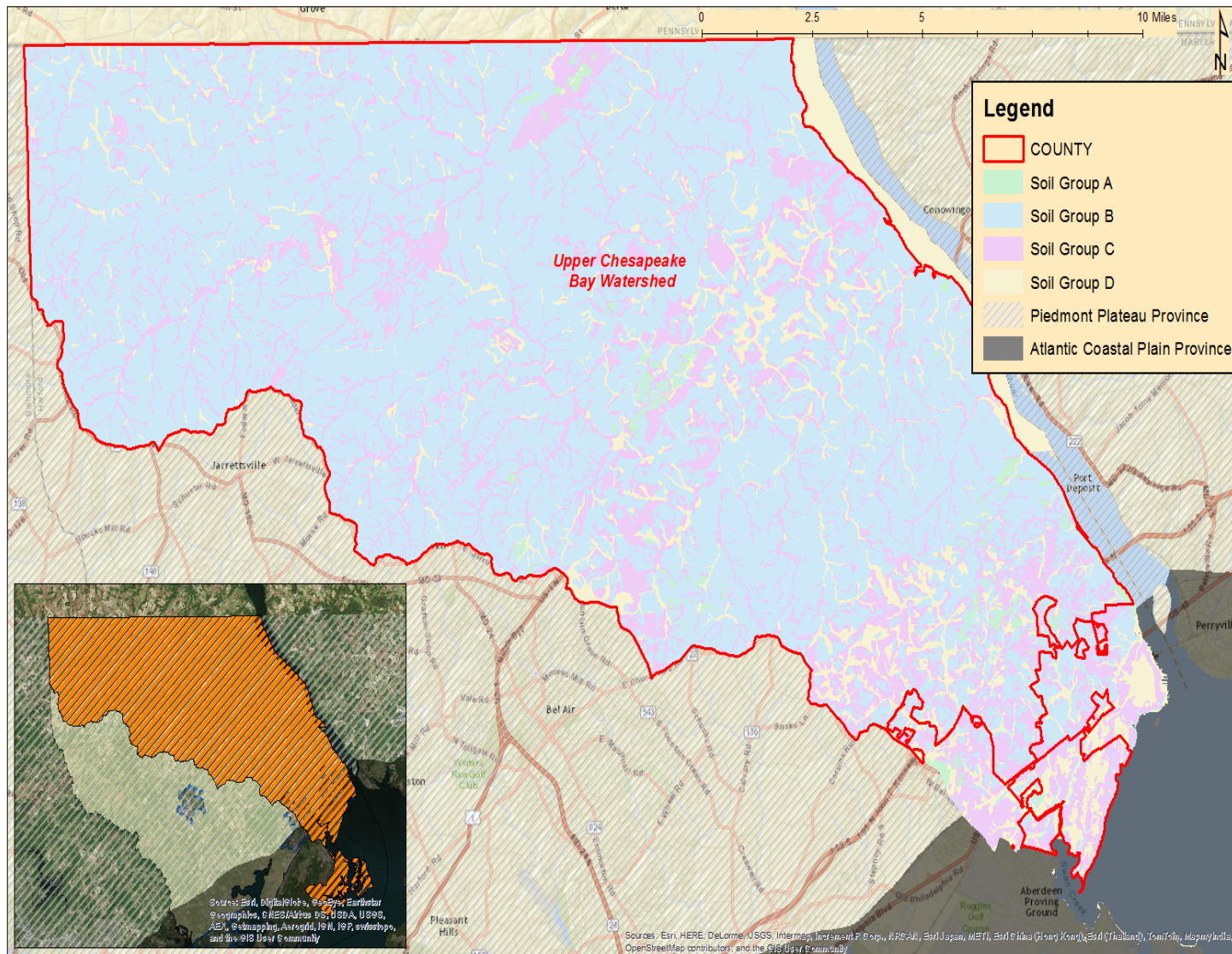


Figure 4-1: Physiographic Setting and Hydrologic Soil Group Distribution in Northern Chesapeake Bay watershed

4.4 STORMWATER MANAGEMENT

Most areas developed prior to 1985 have no stormwater management associated with them because they were constructed before the State's stormwater management regulations were adopted.

Between 1985 and 2002, stormwater management in many jurisdictions in Maryland including Harford County, regulated only stormwater quantity. The stormwater management practices were designed to collect stormwater runoff from their drainage areas and release it at a controlled rate, providing limited water quality management. During this era state regulations included exemptions from stormwater management for large residential lots.

In 2002, MDE required all jurisdictions to begin regulating stormwater quality management and increase stormwater quantity management. Stormwater management practices that provide quality treatment are designed to collect and treat rainfall through a combination of organic and inorganic filtering media such as sand, soil, gravel, and plants. Stormwater management practices that provide increased quantity management are designed to reduce stream bank erosion. Beginning in 2002, large residential lots were no longer exempt from stormwater management regulations.

4.4.1 Structural Stormwater Controls

The 2015 County data contain 177 existing BMPs located in the Northern Chesapeake Bay Watershed, 106 which meet the 2002 MDE design standards. Figure 4-2 provides the distribution of the BMPs implement form 2002 to 2015 and Table 6-3 provides a summary of the BMPs implemented by era.. Approximately 1,200 acres drain to these BMPs. The County continues to compile and refine historic BMP data that will be incorporated into future plan updates.

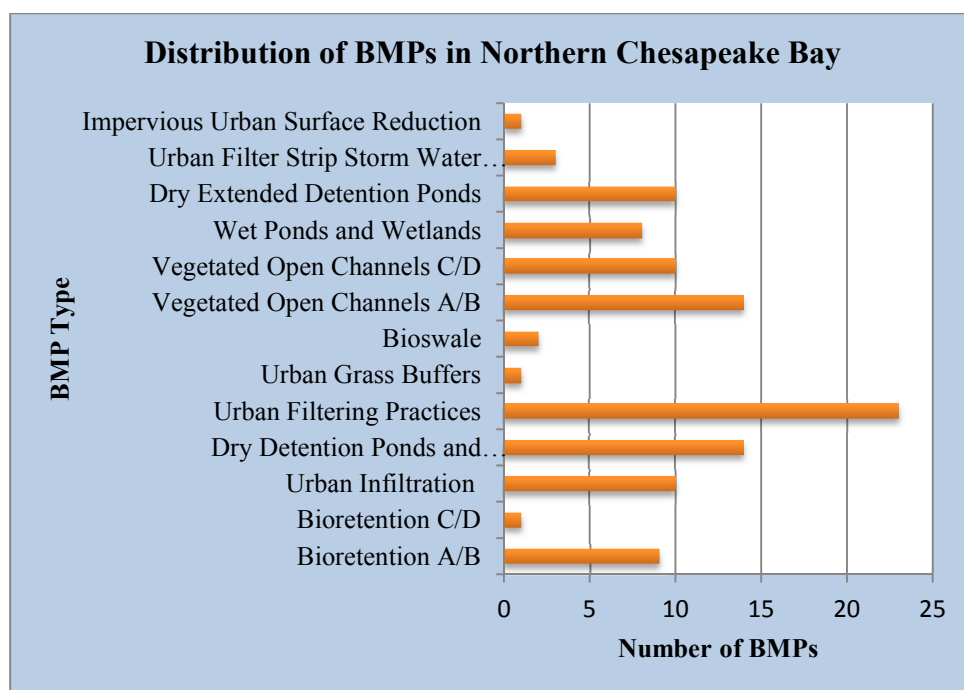


Figure 4-2: Distribution of BMPs in Northern Chesapeake Bay Watershed from County GIS Data that meet 2002 MDE Design Standards (Implemented 2002 to 2015)

Table 4-2: Structural Stormwater Controls in the Northern Chesapeake Bay Watershed

Stormwater Management Era	Number of BMPs	Drainage Area (acres)
1985-2001 ¹	71	848
2002-2009	65	208
2010-2015	41	92
Total	177	1,147

¹According to MDE guidance 1985 era BMPs do not provide adequate water quality treatment of runoff (MDE, 2014c).

4.4.2 Non-structural Stormwater Controls

In 2002 MDE also approved the use of non-structural stormwater controls. These controls include disconnection of rooftop runoff, disconnection of non-roof top runoff, and sheetflow to conservation areas. Harford County has not inventoried non-structural stormwater controls. Therefore, non-structural stormwater controls are not included in the baseline or current conditions scenarios. The inclusion of this information into the plan will provide additional load reductions. The County will compile this historic data and incorporate the data into future updates to this plan.

4.5 ASSESSMENT OF NUTRIENT AND SEDIMENT LOADS

Nitrogen, phosphorus, and sediment loads were updated for the TMDL baseline conditions (2010) and the current conditions (2015) using MAST.

4.5.1 Updated Baseline Conditions (2010) Scenario

Table 4-3 lists the distribution of urban land from MAST for the Bush River Watershed in 2010. The user is unable to make modifications to this data.

Table 4-3: Urban Land in Updated Baseline Conditions (2010) Scenario

Urban Land Use	Impervious Area (acres)	Pervious Area (acres)	Total Area (acres)
County Phase I MS4	3,064	14,741	17,805
Federal	250	1195	1,445
Municipal Phase II MS4	1,291	3,559	4,850
Regulated Industrial Facility	40	95	135
SHA Phase I/II MS4	476	1183	1,659
State Phase II MS4	28	173	201
Nonregulated extractive	–	119	119
Regulated construction	–	–	680
Regulated extractive	–	–	0
Total	5,149	21,065	26,894

Source: Urban Land use from the Maryland Assessment Scenario Tool (MAST) using 2015 Land Use Data (CBP, 2015b).

MDSHA = Maryland State Highway Administration

MS4 = Municipal Separate Storm Sewer System

Table 4-43 lists the BMPs included in the updated baseline conditions (2010) scenario, along with the drainage area and impervious area based on as-built plan reviews. This scenario includes BMPs completed between January 1, 2002, and December 31, 2009. BMPs constructed prior to the 2002 MDE stormwater management standards were assumed to provide no control and were not included in this scenario.

Northern Chesapeake Bay Watershed Characterization

Table 4-43: BMPs in Updated Baseline Conditions (2010) Scenario

BMP Type	Number of BMPs	Drainage Area (acres)	Impervious Area (acres)
Bioretention A/B	4	6.4	2.1
Bioretention C/D	1	1.5	0.7
Dry Detention Ponds and Hydrodynamic Structures	10	21.0	10.2
Dry Extended Detention Ponds	8	61.1	9.3
Impervious Urban Surface Reduction	1	0.1	0.1
Urban Filtering Practices	16	30.9	10.4
Urban Filter Strip Storm Water Treatment	2	0.5	0.5
Urban Infiltration	2	11.7	3.1
Vegetated Open Channels A/B	10	21.7	5.1
Vegetated Open Channels C/D	7	5.7	1.1
Wet Ponds and Wetlands	4	47.4	14.1
Total	65	207.9	56.7

Also included in this scenario are restoration projects completed through 2009 including three new stormwater practices, and one stream restoration.

The results of the updated baseline conditions (2010) scenario are listed in Table 4-5.

Table 4-5: Updated Baseline Conditions (2010) Loads

Land Use	Area (acres)	Nitrogen Loads (lbs/year)	Phosphorous Loads (lbs/year)	Sediment Loads (tons/year)
County Phase I MS4 Impervious Area	3,064	63,346	4,575	2,861
County Phase I MS4 Pervious Area	14,741	224,923	4,462	1,905
Total	17,805¹	288,269	9,037	4,767

¹The County has 19,144 acres of land compared to the above value of 17,805 acres. This change in area is justified by an increase in County-regulated area between 2010 and 2015 of 1,339 acres.

4.5.2 Target Loads

According to MDE's TMDL Data Center, WLA search, Harford County's stormwater WLA for the Chesapeake Bay TMDL for the North Chesapeake Bay Segment are reductions from baseline (2010) for nitrogen (33.8%) and phosphorus (49.2%). Applying these percentages to the update baseline conditions (2010) produces the target loads for the TMDL shown in Table 4-6.

Table 4-6: Target Loads from Updated Baseline Conditions (201) Scenario

Pollutant	Target Reduction ¹	Updated Baseline (2010) Load (lbs/year)	Target Load (lbs/year)
Nitrogen	33.8%	288,269	190,834
Phosphorous	49.2%	9,037	4,591

¹ Target reductions taken directly from the Maryland Phase II WIP.

4.5.3 Updated Current Conditions (2015) Scenario

Table 4-7 the distribution of urban land from MAST for the Northern Chesapeake Bay Watershed in 2015. Between 2010 and 2015, the County Phase 1 MS4 (as delineated by MDE) increased by 189 impervious acres and 1,150 pervious acres. The user is unable to make modifications to this data.

Table 4-7: Urban Land in Updated Current Conditions (2015) Scenario

Urban Land Use	Impervious Area (acres)	Pervious Area (acres)	Total Area (acres)
County Phase I MS4	3,253	15,891	19,144
Federal	249	1,195	1,444
Municipal Phase II MS4	1,291	3,559	4,850
Regulated Industrial Facility	40	95	135
SHA Phase I/II MS4	476	1,183	1,659
State Phase II MS4	28	173	201
Nonregulated extractive	-	119	119
Regulated construction	-	-	392
Regulated extractive	-	-	-
Total	5,337	22,215	27,944

Source: Urban Land use from the Maryland Assessment Scenario Tool (MAST) using 2015 Land Use Data (CBP, 2015b).

MDSHA = Maryland State Highway Administration

MS4 = Municipal Separate Storm Sewer System

Similar to the updated baseline conditions (2010) scenario the BMP data in MAST was adjusted based on the as-built reviews. The BMPs include those in the updated baseline (2010) scenario and the additional BMPs constructed between January 2010 and January 2015. BMPs constructed prior to the 2002 MDE stormwater management standards were assumed to provide no control and were not included in this scenario. Table 4- lists the BMPs included in the updated current conditions (2015) scenario, along with the drainage area and impervious area.

Northern Chesapeake Bay Watershed Characterization

Table 4-8: BMPs in Updated Current Load Conditions (2015) Scenario

BMP Type	# of BMPs	Total Drainage Area Treated (acres)	Total Impervious Area Managed (acres)
Bioretention A/B	9	9.5	2.1
Bioretention C/D	1	1.5	0.7
Bioswale		0.8	0.5
Dry Detention Ponds and Hydrodynamic Structures	14	30.2	11.3
Dry Extended Detention Ponds	10	63.3	10.4
Impervious Urban Surface Reduction	1	0.1	0.1
Urban Filtering Practices	23	51.3	19.6
Urban Filter Strip Storm Water Treatment	3	0.8	0.8
Urban Grass Buffers	1	1.5	0.1
Urban Infiltration	10	23.7	8.6
Vegetated Open Channels A/B	14	30.0	5.1
Vegetated Open Channels C/D	10	30.8	1.1
Wet Ponds and Wetlands	8	56.5	28.1
Total	106	299.9	88.5

Also included in this scenario are restoration projects completed between 2010 and 2015 including one stormwater retrofit and two new bioretentions.

The results of the updated current conditions (2010) scenario are listed in Table 4-9 .

Table 4-9: Updated Current Conditions (2015) Scenario

Land Use	Area (acres)	Nitrogen Loads (lbs/year)	Phosphorous Loads (lbs/year)	Sediment Loads (ton/year)
County Phase I MS4 Impervious Area	3,253	66,710	4,839	2,982
County Phase I MS4 Pervious Area	15,891	241,622	4,806	2,042
Total	19,144	308,332	9,645	5,024

Progress towards addressing the Chesapeake Bay TMDL for Northern Chesapeake Bay Watershed is listed in Table 4-10. Additional reductions in nitrogen (117,498 lbs/year) and phosphorus (5,054 lbs/ year) are necessary to address the Chesapeake Bay TMDL.

Northern Chesapeake Bay Watershed Characterization

Table 4-10: Northern Chesapeake Bay Watershed Progress (2015)

Pollutant	Updated Current Conditions (2015) Load	Target Load	Target Reduction
Nitrogen	308,332 lbs/yr	190,834 lbs/yr	117,498 lbs/yr
Phosphorous	9,645 lbs/yr	4,591 lbs/yr	5,054 lbs/yr

Notes: * Per Maryland's Phase II WIP, if TP target is met, TSS target will be met

SECTION FIVE: NORTHERN CHESAPEAKE BAY WATERSHED RESTORATION STRATEGIES

This section describes the proposed restoration strategies to address the Chesapeake Bay TMDL for nitrogen and phosphorous in the Bush River Watershed. Although specific reduction targets are not provided for sediments in Maryland's Phase II WIP (MDE, 2012a) the reductions from proposed restoration practices were included in this plan. The proposed strategies were developed using existing County GIS data, reports such as *Deer Creek Watershed Restoration Action Strategy* (Harford County, 2007), the County's Capital Improvement Program (CIP), the *Accounting Document for Stormwater Wasteload Allocations and Impervious Area Credits* (MDE, 2014b) and other relevant data and resources. This section also includes the planning-level implementation costs for the proposed restoration projects and the potential load reductions that were estimated using MAST. The proposed strategies can be broadly categorized as follows:

- **Structural Stormwater Management Strategies:** These include retrofits to existing BMPs or new BMPs that are designed to the current MDE standards to collect and treat stormwater runoff to remove pollutants through processes such as filtration and infiltration. The proposed BMPs include both ESD and traditional structural practices.
- **Alternative Urban Strategies:** Alternative urban strategies generally do not require detailed design like structural BMPs and are aimed at conservation of natural resources through techniques such as tree planting, forest buffers, nutrient management plans, and converting existing impervious areas to pervious areas. These strategies are approved by MDE and provide flexibility for jurisdictions in addressing TMDLs.

5.1 STRUCTURAL STORMWATER MANAGEMENT STRATEGIES

Structural strategies were developed using previously identified projects listed within completed small watershed assessment plans, and additional projects identified using the County GIS data including BMP retrofits and new structural BMPs

5.1.1 Previously Identified Projects

Harford County has completed the following watershed assessments and management plans for the Northern Chesapeake Bay Watershed that include concept-level design of proposed BMPs:

- *Deer Creek Watershed Restoration Action Strategy* (Harford County, 2007)
- *Land Techniques to Improve Water Quality on County-Owned Property* (Harford County, 2012)

A total of 50 BMPs identified from studies listed above were included in this restoration plan.

5.1.2 Additional Proposed Projects

Structural BMP Retrofits

In addition to the proposed structural BMPs from the existing watershed studies, 65 additional retrofits were identified using methods discussed below.

New Structural BMPs

Proposed new structural BMPs were identified by analyzing school-owned properties, county-owned properties, county road rights-of-way, and outfalls adjacent to school properties, county-owned properties community-owned properties such as community open space, churches and institutions. The methods used to identify these new BMPs using County-GIS is discussed below.

The proposed new structural BMPs are as follows:

- **School-Owned Properties and County-Owned Properties:** Structural BMPs were identified on school-owned property or county-owned property. Proposed practices focus on diverting runoff from impervious surfaces to filtering practices such as tree box filters, rain gardens, micro-bioretentions, bioretentions, and sand filters. There is a combination of 3,380 acres of school-owned property and county-owned property within the Northern Chesapeake Bay Watershed including parcels in the City of Havre de Grace and the City of Aberdeen.
- **County Rights-of-Way:** County rights-of-way were identified where filters could be implemented to capture and treat stormwater runoff. A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented to treat runoff in the county rights-of-way where sufficient space is available. All of these practices are classified as bioretentions in MAST, so the focus was on county rights-of-way where the predominant soil type was HSG A or B, both of which receive substantially higher reductions than bioretentions with HSG C or D soils. Restoration projects within the county rights-of-way will be considered in combination with future road improvement projects in the watershed.
- **Outfalls on or Adjacent to School-owned, County-owned or Community-owned Properties:** Outfalls were identified as locations where a BMP could be constructed to capture and treat stormwater runoff. Storm drain outfalls that convey flows directly to the streams were evaluated for potential retrofit opportunities. There are over 510 county maintained outfalls in the Northern Chesapeake Bay Watershed. Structural BMPs were proposed at or upstream of the outfalls to intercept runoff prior to entering storm drain inlets at locations with no upstream water quality treatment and with sufficient space. The most common proposed BMPs at existing outfalls were SPSCs. Filters (i.e., bioretentions and sand filters). The most common BMPs proposed upstream of existing

outfalls were a combination of bioretentions, micro-bioretentions, and tree box filters at existing inlets.

Methods used to select new BMPs

A desktop analysis using aerial imagery, and County GIS data for parcels, topography, and existing infrastructure was completed for each existing or proposed new BMP to determine the most appropriate type of structural BMP. The County GIS data was also used to estimate drainage areas and impervious areas. The Chesapeake Bay Program removal efficiencies show that infiltration practices provide the greatest nutrient reductions, followed by bioretentions on A or B soils, filtration practices (e.g., sand filter), bioretentions on C or D soils, and wet pond retrofits. Table 5-1 summarizes the initial protocol for selecting the type of BMP for retrofitting existing practices.

Table 5-1: Protocol for pre-2002 BMP Retrofits

Existing Practice	Drainage Area (acres)	Hydrologic Soil Group	Proposed Practice	Proposed Number
Dry ponds and extended detention dry ponds	Less than 5	A or B	Infiltration Basin or Bioretention	15
Dry ponds and extended detention dry ponds	Less than 5	C or D	Sand Filter	18
Dry ponds and extended detention dry ponds	5 to 10	A or B	Infiltration Basin	8
Dry ponds and extended detention dry ponds	5 to 10	C or D	Sand Filter	36
Any dry or wet pond	Greater than 10	Any	MS4 Permit-Required Stormwater Retrofit	156

MS4 = Municipal Separate Storm Sewer System

5.1.3 New and Retrofit Projects Summary

Figure 5-1 provides the locations of the previously identified BMPs (in-progress structural BMPs), additional BMP retrofits and proposed new BMPs.

Table 5-2 summarizes the proposed new and retrofit structural BMPs including the project type, anticipated drainage area, anticipated impervious area and implementation level costs. Table 5-3 provides a similar summary for the proposed stream restoration projects mostly identified from the watershed assessments. Planning-level cost estimates were based on the *Cost of Stormwater Management Practices in Maryland Counties* (King and Hagan, 2011). A 35 percent contingency was added to account for an increase in construction costs since publication of the document.

Northern Chesapeake Bay Watershed Restoration Strategies

Appendix C provides a list of the proposed projects including a unique project ID, project name, project location, proposed project type, planning level area treated, and notes. Because the SPSCs are not included in MAST, they were input as bioretentions per MDE guidance (MDE, 2014c and Anne Arundel County, 2012). Approximately 158 proposed new and retrofit BMPs are traditional BMPs or ESD practices, and 3 proposed stream restoration projects.

Table 5-2: Proposed Structural Restoration Projects in Northern Chesapeake Bay Watershed

Proposed Structural BMP	Number of BMPs	Drainage Area (acres)	Impervious Area (Acres)	Planning Level Implementation Costs
Bioretention/raingardens – A/B soils, no underdrain	44	774.2	181.1	\$44,920,500
Bioretention/raingardens – A/B soils, underdrain	5	57.1	30.8	\$7,649,700
Bioretention/raingardens – C/D soils, underdrain	12	5.38	5.4	\$1,333,500
MS4 Permit-Required Stormwater Retrofit	24	708.9	133.7	\$11,551,800
Permeable Pavement with Sand, Veg. – C/D soils, underdrain	1	0.7	0.7	\$213,500
Urban Filtering Practices	18	87.4	59.0	\$1,876,200
Urban Filter Strip Storm Water Treatment	2	0.8	0.8	\$24,600
Urban Infiltration Practices with Sand, Veg. – A/B soils, no underdrain	13	27.8	11.7	\$969,300
Urban Tree Planting	28	269.1	-	\$2,771,820
Wet Ponds and Wetlands	11	698.5	125.2	\$4,075
Total	158	2,260.8	548.4	\$68,543,175

Table 5-3: Proposed Stream Restoration Projects in Northern Chesapeake Bay Watershed

Number of Projects	Length of Stream Restoration (feet)	Equivalent Impervious Acres	Planning-Level Implementation Cost
3	13,900	457	\$3,135,000

Northern Chesapeake Bay Watershed Restoration Strategies

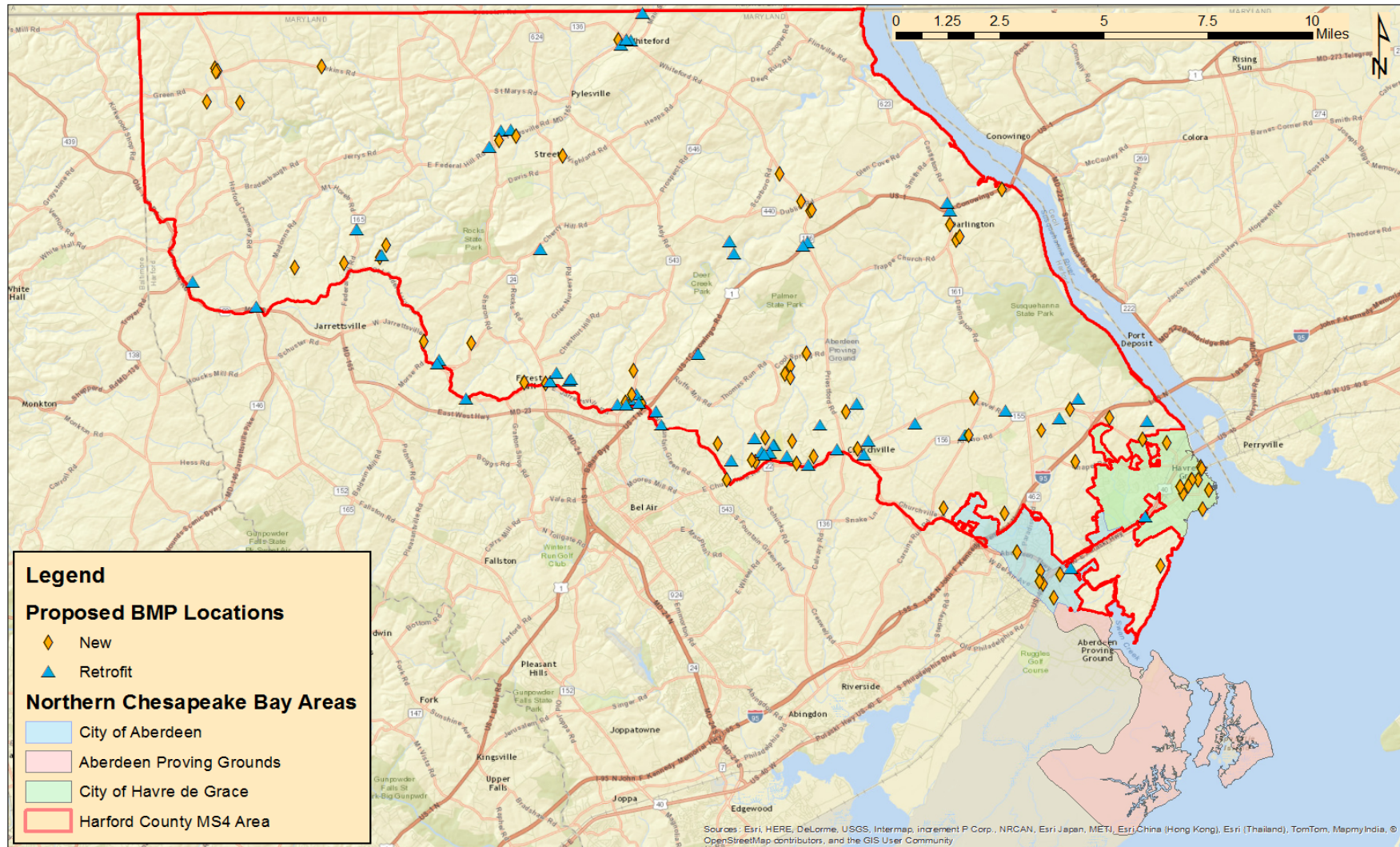


Figure 5-1: Locations of Proposed BMPs in Northern Chesapeake Bay Watershed

5.2 ALTERNATIVE STORMWATER MANAGEMENT STRATEGIES

MDE-approved alternative urban BMPs are important tools for the County to achieve nitrogen, phosphorus, and sediment load reductions. The County has already adopted some of these strategies. Expansion or modification of these strategies is proposed to receive credit from MDE as an approved alternative urban BMPs. Appendix D shows the approximate locations of the alternative urban BMPs.

The alternative urban BMPs are as follows:

- **Management Plans for Existing Forest Buffers:** Riparian areas that are at least 35 feet wide on one side of a stream and managed to promote filtering of runoff receive credit from MDE as an alternative urban BMP. Many of the streams in the Bush River Watershed have at least 35 feet of forest buffers and could be eligible for credit by creating management plans and a GIS database of the existing buffers. To receive credits from MDE for tree buffers, a survival rate of at least 100 trees per acre is necessary, and 50 percent of the trees must be at least 2 inches in diameter and have a 4.5-foot-tall trunk. For this plan, a maximum buffer width of 150 feet was assumed, only areas covered by the existing vegetation GIS layer were considered, and distance was taken from the stream centerline. Approximately 6,560 acres of existing forest buffers were identified.

Projected reductions are as follows: nitrogen of 120,290 lbs/year, phosphorus of 3,474 lbs/year, and sediment in 1,630 tons/year. Planning-level implementation costs of \$250,000 are estimated to create management plans including a GIS dataset of the management areas based on the MAST nutrient management plan capital cost estimates per acre.

- **Urban Tree Planting:** The County is already implementing tree planting as part of its watershed restoration program on schools and county-owned properties. As an expansion to this program, additional properties with available open area for tree planting were identified.. Approximately 270 acres of open area are available for tree planting. To receive credits from MDE for tree planting, a survival rate of at least 100 trees per acre is necessary, and 50 percent of the trees must be at least 2 inches in diameter and have a 4.5-foot-tall trunk. It would result in a reduction of nitrogen of 3,470 lbs/year, a reduction of phosphorus of 80 lbs/year, a reduction of sediment of 38 tons/year, and credit from MDE for treating 102.6 equivalent impervious acres. Planning-level implementation costs of \$2.8 million are estimated for this strategy based on recent capital improvement tree planting projects with a contingency of 30 percent.
- **Street Sweeping:** The County currently conducts annual street sweeping on county-owned roads using mechanical sweepers. To receive credits for this practice, the street sweeping program needs to be expanded to twice a month. According to the guidance

in *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014c), regenerative vacuum sweepers provide greater nutrient reductions than mechanical sweepers do. The Northern Chesapeake Bay Watershed has approximately 1,060 miles of county-owned roads, and implementation of mechanical street sweeping twice a month would result of sediment of 180 tons/year. This alternative urban strategy is not recommended at this time because the County does not currently plan to expand its street sweeping program, but the strategy would be considered as a future restoration option. Planning-level implementation costs of \$42,148,000 are estimated for this strategy based on (King and Hagan (2011). A contingency of 35 percent was applied to account for increases in implementation costs since 2011.

- **Catch Basin Cleaning:** There are approximately 1,000 storm drain inlets in the Northern Chesapeake Bay Watershed. The current County program schedules catch basins and storm drain inlets cleaning to remove sediment and debris once every 3 years. If the program is expanded to increase the frequency of the catch basin cleaning so the catch basins and storm drain inlets are routinely maintained, the program could qualify for MDE credit as an alternative urban BMP. According to the guidance in *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014c), credits for catch basin cleaning are based on the weight of material that is collected. A nitrogen reduction of 3.5 pounds, a phosphorus reduction of 1.4 pounds, and a sediment reduction of 420 pounds are credited for every ton of material collected. This alternative urban strategy is not recommended at this time because the County does not currently plan to expand its catch basin cleaning program, but the strategy could be considered as a future restoration option to be re-evaluated once all the restoration options are exhausted. A planning-level implementation cost of approximately \$14.00 per catch basin is estimated based on *Stormwater O&M Fact Sheet-Catch Basin Cleaning* (EPA, 1999). A contingency of 35 percent was added to the cost of catch basin cleaning in EPA (1999) to account for the increase in implementation cost since 1999.

5.3 PROJECT PRIORITIZATION

The proposed structural projects were prioritized based primarily on property ownership. The prioritization provides a framework for selecting projects and assists with the selection of a timeline for project implementation. Projects were prioritized as high, medium, or low as follows:

- **High Priority:** All projects on county-owned property are considered a high priority over privately-owned property. Proposed projects from the watershed studies with existing concept-level design are also high priority.
- **Medium Priority:** Projects on community-owned properties (HOAs, churches, or institutions) are considered medium priority projects. The County has established

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relationships with the various community groups throughout Harford County (particularly HOAs) through implementation of stormwater management projects and public education and outreach. Because it is generally feasible to implement new and retrofit projects on community-owned areas through agreements, the proposed restoration strategies on community-owned properties were given a medium priority.

- **Low Priority:** Projects on privately owned properties (e.g., commercial and industrial areas) were given low priority. It is typically more difficult for the County to implement stormwater management projects on private properties than on county-owned or community-owned properties because of the individual agreements that are required for construction and maintenance. Projects on county-owned rights-of-way are also categorized as low priority.

5.4 NUTRIENT AND SEDIMENT LOAD REDUCTIONS

The proposed structural stormwater BMPs and alternative urban BMPs were added to the Northern Chesapeake Bay Watershed Current Load Conditions (2015) Scenario in MAST to create the proposed conditions scenario. Using the proposed low, medium and high priority projects, the reductions listed in Table 5-4 could be achieved. These proposed projects exceed the required target loads, but the target loads cannot be met if only the high priority projects are implemented as listed in Table 5-5.

Table 5-4: Effectiveness of All Proposed Projects for Northern Chesapeake Bay Watershed

Pollutant	Required Reduction (%)	Proposed Reduction (%)	Target Load	Proposed Load
Nitrogen	33.8	42.8	190,834 lbs/yr	164,809 lbs/yr
Phosphorous	49.2	52.6	4,591 lbs/yr	4,283 lbs/yr
Sediment	Not applicable	50.1	Not applicable	4,757,713lbs/yr

Table 5-5: Effectiveness of Combination of Proposed Projects in Northern Chesapeake Bay Watershed

Pollutant	Required Reduction ²	High Priority Projects ³	High Priority Projects with Additional Bioretention ⁴
EOS Nitrogen	33.8%	37.8%	40.9%
EOS Phosphorous	49.2%	46.1%	49.2%
EOS Sediment	Not Provided	40.1%	43.3%

SECTION SIX: GUNPOWDER RIVER WATERSHED CHARACTERIZATION

This section summarizes the general conditions of the Gunpowder River Watershed and the changes in the watershed conditions from the baseline year (2010) to the current year (2015). The Gunpowder River Watershed was characterized using County-provided geographic information system (GIS) data, Maryland Assessment Scenario Tool (MAST) output, and previous studies.

6.1 WATERSHED DESCRIPTION

The Gunpowder River Watershed is the smallest watershed in this plan at about 29,000 acres. It begins near the intersection of Old York Rd (MD-439) and Norrisville Rd (MD-23) and runs southeast until the confluence of the Gunpowder River and the Chesapeake Bay. The watershed is bounded to the east by MD-152 (Fallston Road, Old Fallston Road, and Mountain Road); and is bounded to the west by Gunpowder Falls State Park and Baltimore County. Located in the southern tip of the Gunpowder River Watershed is the U.S. Army's Aberdeen Proving Ground, which is approximately 15% of the total watershed area. The two main Harford County tributaries to the Gunpowder River are Foster Branch and Gunpowder Falls. Figure 6-1 shows the location of the Gunpowder Watershed within Harford County.

6.2 PHYSIOGRAPHY AND SOILS

The Gunpowder River Watershed is primarily in the Piedmont Plateau region. This region of the watershed is characterized by crystalline igneous and metamorphic rocks of possible volcanic origin (MGS, 2015). Most piedmont streams are characterized by moderate slopes with gravel and sand as bedrock material. Gravel and sand are resistant to erosion to some degree.

The portion of the watershed that is southeast of Interstate 95 is in the Atlantic Coastal Plain region, which is composed primarily of gravel, sand, silt, and clay. Streams in coastal zones have lower slopes compared to the streams in piedmont region and the bedrock in them is made of sediment layers, which are easily eroded and can contribute to sediment loads (Maryland DNR, 2005).

The soil data available for Harford County on the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) website were used to evaluate the soil conditions in the Gunpowder Watershed. NRCS classifies soils into four Hydrologic Soil Groups (HSGs) (A, B, C, and D) depending on factors such as runoff potential, soil texture, and infiltration rates. HSGs A and B generally have sandy, loamy, and silt textures and have high infiltration rates. HSGs C and D have clay content and have low infiltration rates and high runoff potential. Erodibility of soils increases with an increase in silt and sand content. Soils with clay

content are more stable and less susceptible to erosion because of the binding nature of the clay. Clay bonds with organic matter, resulting in a more stable soil structure (MDE, 2011).

The majority of the soils in the Gunpowder River Watershed are HSG B (40 percent), which are erodible, and therefore may contribute to some sediment load in the watershed, closely followed by HSG D (35 percent), which have high runoff potential, and therefore the runoff may transport surface pollutants to streams. Table 6-1 provides the distribution of the HSGs in the watershed by percentage. Figure 2-1 shows the physiographic regions in the watershed and the distribution of HSGs in the watershed.

**Table 6-1: Hydrologic Soil Group Distribution
in the Gunpowder River Watershed**

Hydrologic Soil Group	Percent (%)
A	2%
B	40%
C	23%
D	35%
Total	100%

6.3 WATER QUALITY CONDITIONS

Previous studies conducted in Gunpowder River Watershed that evaluated nutrient and sediment conditions in the streams were reviewed to analyze the health of the streams over the years including the *Foster Branch Small Watershed Action Plan* (Harford, 2013).

6.4 STORMWATER MANAGEMENT

Most areas developed prior to 1985 have no stormwater management associated with them because they were constructed before the State's stormwater management regulations were adopted.

Between 1985 and 2002, stormwater management in many jurisdictions in Maryland including Harford County, regulated only stormwater quantity. The stormwater management practices were designed to collect stormwater runoff from their drainage areas and release it at a controlled rate, providing limited water quality management. During this era state regulations included exemptions from stormwater management for large residential lots.

In 2002, MDE required all jurisdictions to begin regulating stormwater quality management and increase stormwater quantity management. Stormwater management practices that provide quality treatment are designed to collect and treat rainfall through a combination of organic and inorganic filtering media such as sand, soil, gravel, and plants. Stormwater management practices that provide increased quantity management are designed to reduce stream bank erosion. Beginning in 2002, large residential lots were no longer exempt from stormwater management regulations.

Gunpowder River Watershed Characterization

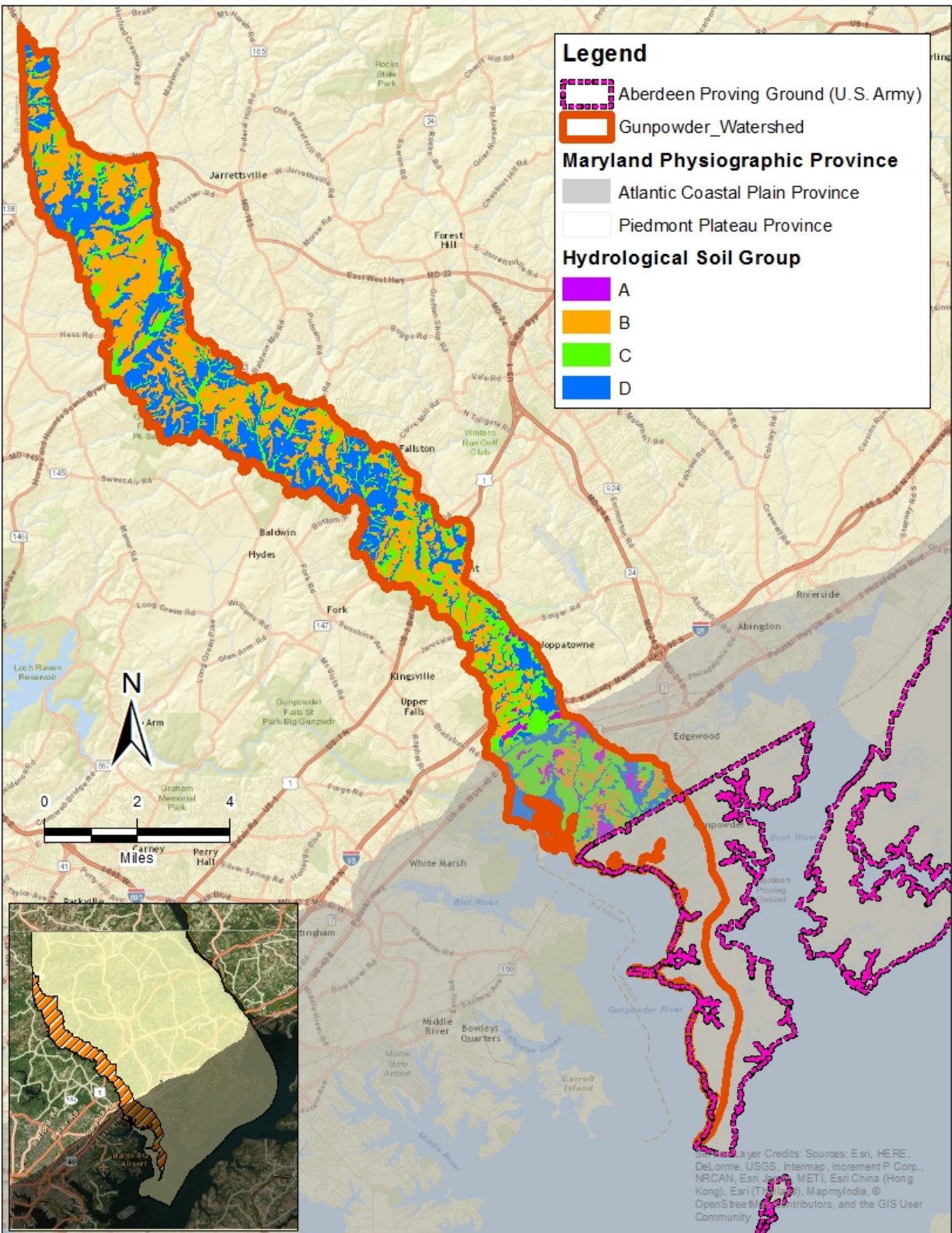


Figure 6-1: Physiographic setting and Hydrologic Soil Group distribution in the Gunpowder River Watershed

6.4.1 Structural Stormwater Controls

The 2015 County GIS data contain 156 existing BMPs in the Gunpowder River Watershed, 95 which meet the 2002 MDE design standards. Figure 2-2 provides the distribution of the BMPs implemented from 2002 to 2015 and Table 6-2 provides a summary of the BMPs implemented by BMP era. Approximately 1,256 acres of the Harford County portion of the Gunpowder River Watershed are managed by BMPs (470 acres are treated by BMPs that meet the 2002 MDE standards). Several BMPs in the County GIS database do not have information on the impervious area treated by them. Also, several BMPs in the watershed are not included in the County GIS database. The County continues to compile and refine historic BMP data that will be incorporated into future plan updates.

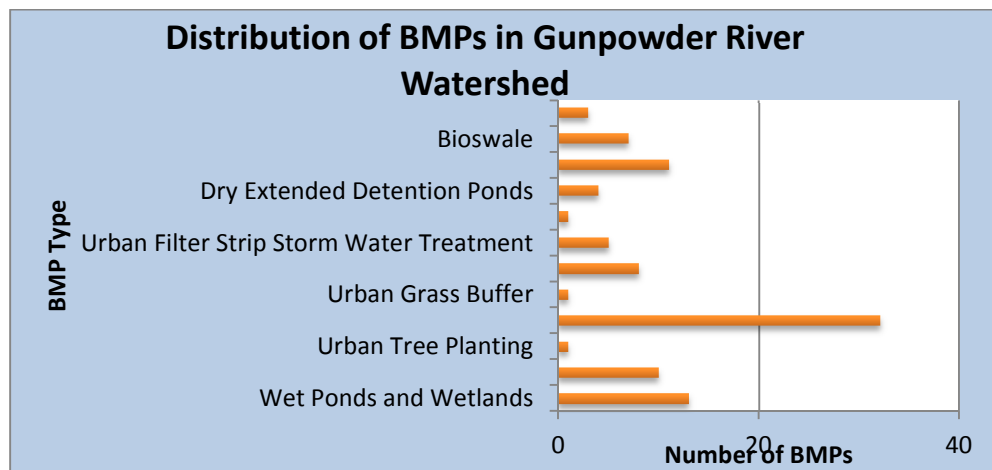


Figure 6-2: Distribution of BMPs in Gunpowder River Watershed from County GIS data that meet 2002 MDE design standards (implemented 2002 to 2015)

Table 6-32: Structural Stormwater Controls in the Gunpowder River Watershed

Stormwater Management Era	Number of BMPs	Area Managed (acres)
1985-2001 ⁽¹⁾	61	781
2002-2009	21	175
2010-2015	74	300
Total	156	1,256

(1) According to MDE guidance, 1985-era BMPs do not provide adequate water quality treatment of runoff (MDE, 2014c).

6.4.2 Non-Structural Stormwater Controls

In 2002 MDE also approved the use of non-structural stormwater controls. These controls include disconnection of rooftop runoff, disconnection of non-roof top runoff, and sheetflow to conservation areas. Harford County has not inventoried non-structural stormwater controls. Therefore, non-structural stormwater controls are not included in the baseline or current conditions scenarios. The inclusion of this information into the plan will provide additional load reductions. The County will compile this historic data and incorporate the data into future updates to this plan.

6.5 ASSESSMENT OF NUTRIENT AND SEDIMENT LOADS

Nitrogen, phosphorus, and sediment loads were updated for the TMDL baseline conditions (2010) and the current conditions (2015) using MAST.

6.5.1 Updated Baseline Conditions (2010) Scenario

Table 6-4 lists the distribution of urban land from MAST for the Gunpowder River Watershed in 2010. The user is unable to make modifications to this data.

Table 6-4: Urban Land in the Updated Baseline Conditions (2010) Scenario

Urban Land	Impervious Area (acres)	Pervious Area (acres)	Total Area (acres)
County Phase I MS4	1,402	5,828	7,230
Federal	236	997	1,233
Regulated Industrial Facility	14	24	38
MDSHA Phase I/II MS4	111	236	347
State Phase II MS4	19	101	120
Nonregulated extractive	–	45	45
Regulated extractive	–	–	135
Total	1,782	7,231	9,148

Source: Urban Land use from the Maryland Assessment Scenario Tool (MAST) using 2015 Land Use Data (CBP, 2015b).

MDSHA = Maryland State Highway Administration

MS4 = Municipal Separate Storm Sewer System

Table 6-5 lists the BMPs included in the updated baseline conditions (2010) scenario, along with the drainage area and impervious area based on as-built plan reviews. This scenario includes BMPs completed between January 1, 2002, and December 31, 2009. BMPs constructed prior to the 2002 MDE stormwater management standards were assumed to provide no control and were not included in this scenario.

Gunpowder River Watershed Characterization

Table 6-5: BMPs in Updated Baseline Conditions (2010) Scenario

BMP Type	Number of BMPs	Drainage Area (acres)	Impervious Area (acres)
Bioretention/Rain Garden C/D Soils, underdrain	2	7.3	3.3
Dry Detention Ponds and Hydrodynamic Structures	5	70.0	111.8
Dry Extended Detention Ponds	4	43.9	0.0
Urban Filtering Practices	4	5.3	69.4
Wet Ponds and Wetlands	6	48.4	362.5
Total	21	175	53

Also included in this scenario is one stream restoration completed before 2009. The results of the updated baseline conditions (2010) scenario are listed in Table 6-6.

Table 6-6: Loads from Updated Baseline Conditions (2010) Scenario

Land Use	Area (acres)	Nitrogen Loads (lbs/year)	Phosphorous Loads (lbs/year)	Sediment Loads (tons/year)
County Phase I MS4 Impervious Area	1,402	20,736	2,211	1,200
County Phase I MS4 Pervious Area	5,828	68,773	1,801	820
Total	7,231	89,509	4,013	2,020

6.5.2 Target Loads

According to MDE's TMDL Data Center, WLA search, Harford County's stormwater WLA for the Chesapeake Bay TMDL for the Gunpowder River Segment are reductions from baseline (2010) for nitrogen (27.1%) and phosphorus (48.1%). Applying these percentages to the update baseline conditions (2010) produces the target loads for the TMDL shown in Table 6-7

Table 6-7: Target Loads from Updated Baseline Conditions (2010) Scenario

Pollutant	Target Reduction ⁽¹⁾	Updated Baseline (2010) Load	Target Load
Nitrogen	27.1%	89,509 lbs/year	65,251 lbs/year
Phosphorous	48.1%	4,013 lbs/year	2,082 lbs/year

⁽¹⁾ Required reductions from Maryland's Phase II WIP (MDE, 2012a)

6.5.3 Updated Current Conditions (2015) Scenario

Table 6-8 lists the distribution of urban land from MAST for the Gunpowder River Watershed in 2015. Between 2010 and 2015, the County Phase 1 MS4 (as delineated by MDE) increased by 262 impervious acres and 192 pervious acres. The user is unable to make modifications to this data.

Table 6-8: Urban Land in Updated Current Conditions (2015) Scenario

Urban Land	Impervious Area (acres)	Pervious Area (acres)	Total Area (acres)
County Phase I MS4	1,140	6,020	7,460
Federal	240	1,000	1,230
Regulated Industrial Facility	10	20	40
MDSHA Phase I/II MS4	110	240	350
State Phase II MS4	20	100	120
Nonregulated extractive	—	80	80
Regulated extractive	—	40	40
Total	1,820	7,500	9,320

Source: Urban Land use from the Maryland Assessment Scenario Tool (MAST) using 2015 Land Use Data (CBP, 2015b).

MDSHA = Maryland State Highway Administration

MS4 = Municipal Separate Storm Sewer System

Similar to the updated baseline conditions (2010) scenario the BMP data in MAST was adjusted based on the as-built reviews. The BMPs include those in the updated baseline (2010) scenario and the additional BMPs constructed between January 2010 and January 2015. BMPs constructed prior to the 2002 MDE stormwater management standards were assumed to provide no control and were not included in this scenario. Table 6-9 lists the BMPs included in the updated current conditions (2015) scenario, along with the drainage area and impervious area.

Table 6-9: BMPs in Updated Current Conditions (2015) Scenario

BMP Type	Number of BMPs	Drainage Area (acres)	Impervious Area (acres)
Bioretention/Rain Garden C/D Soils, underdrain	3	7.6	3.1
Bioswale	7	5.8	2.7
Dry Detention Ponds and Hydrodynamic Structures	11	136.0	24.3
Dry Extended Detention Ponds	4	43.9	16.9
Urban Filter Strip Storm Water Treatment	5	5.6	0.6
Urban Filtering Practices	8	24.4	12.2
Urban Grass Buffer	1	0.6	0.1
Urban Infiltration Practices w/o Sand	32	30.5	6.0
Urban Tree Planting	1	0.6	0.2
Vegetated Open Channels - C/D Soils, no underdrain	10	12.6	5.1
Wet Ponds and Wetlands	13	195.7	135.7
Total	95	463	206

BMP = best management practice

Gunpowder River Watershed Characterization

Also included in this scenario are restoration projects completed between 2010 and 2015 including one stormwater retrofits and one stream restoration.

The results of the updated current conditions (2015) scenario are listed in Table 6-10

Table 6-10: Loads from Updated Current Load Conditions (2015) Scenario

Land Use	Area (acres)	Nitrogen Loads (lbs/year)	Phosphorous Loads (lbs/year)	Sediment Loads (tons/year)
County Phase I MS4 Impervious Area	1,440	20,740	2,080	1,140
County Phase I MS4 Pervious Area	6,020	70,850	1,850	850
Total	7,460	91,590	3,930	1,980

Progress towards addressing the Chesapeake Bay TMDL for Bush River Watershed is listed in Table 6-11. Additional reductions in nitrogen (26,340 lbs/year) and phosphorus (1,850 lbs/year) are necessary to address the Chesapeake Bay TMDL.

Table 6-11: Gunpowder River Watershed Progress (2015)

Pollutant	Update Current Conditions (2015) Load (lbs/year)	Target Load (lbs/year)	Target Reduction (lbs/year)
Nitrogen	91,590 lbs/year	65,250 lbs/year	26,340 lbs/year
Phosphorous	3,930 lbs/year	2,080 lbs/year	1,850 lbs/year

SECTION SEVEN: GUNPOWDER RIVER RESTORATION STRATEGIES

This section describes the proposed restoration strategies to address the Chesapeake Bay TMDL for nitrogen and phosphorous in the Gunpowder River Watershed. Although specific reduction targets are not provided for sediments in Maryland's Phase II WIP (MDE, 2012a) the reductions from proposed restoration practices were included in this plan. The proposed strategies were developed using existing County GIS data, reports such as the *Foster's Branch Watershed Small Watershed Action Plan* (Harford County, 2013), the County's Capital Improvement Program (CIP), the *Accounting Document for Stormwater Wasteload Allocations and Impervious Area Credits* (MDE, 2014b) and other relevant data and resources. This section also includes the planning-level implementation costs for the proposed restoration projects and the potential load reductions that were estimated using MAST. The proposed strategies can be broadly categorized as follows:

The proposed strategies can be broadly categorized into:

- **Structural Stormwater Management Strategies:** This category includes retrofits to existing BMPs or new BMPs that are designed to the current MDE standards to collect and treat stormwater runoff to remove pollutants through processes such as filtration and infiltration. The proposed BMPs include both ESD and traditional structural practices.
- **Alternative Urban Strategies:** Alternative urban strategies generally do not require detailed design like structural BMPs and are aimed at conservation of natural resources through techniques such as tree planting, forest buffers, nutrient management plans, and converting existing impervious areas to pervious areas. These strategies are approved by MDE and provide flexibility for jurisdictions in meeting their NPDES MS4 and TMDL goals.

7.1 STRUCTURAL STORMWATER MANAGEMENT STRATEGIES

Structural strategies were developed using previously identified projects listed within completed small watershed assessment plans, and additional projects identified using the County GIS data including BMP retrofits and new structural BMPs

7.1.1 Previously Identified Projects

Harford County has completed the *Foster Branch Watershed Small Watershed Action Plan* (Harford County, 2012) for the Gunpowder River Watershed that includes concept-level design of proposed BMPs.

7.1.2 Additional Proposed Projects

Structural BMP Retrofits

In addition to the proposed structural BMPs from the existing watershed studies, 37 additional BMPs were identified using County GIS.

New Structural BMPs

Proposed new structural BMPs were identified by analyzing school-owned properties, county-owned properties, county road rights-of-way, and outfalls adjacent to school properties, county-owned properties community-owned properties such as community open space, churches and institutions. The methods used to identify these new BMPs using County-GIS is discussed below.

The proposed new structural BMPs are as follows:

- **School-Owned Properties and County-Owned Properties:** Fifty-three (53) structural BMPs were identified on school-owned property or county-owned property. Proposed practices focus on diverting runoff from impervious surfaces to filtering practices such as tree box filters, rain gardens, micro-bioreentions, bioreentions, and sand filters. There is a combination of 370 acres of school-owned property and county-owned property within the Gunpowder River Watershed.
- **County Rights-of-Way:** County rights-of-way were identified where filters could be implemented to capture and treat stormwater runoff. A combination of bioreentions, micro-bioreentions, and tree box filters could be implemented to treat runoff in the county rights-of-way where sufficient space is available. All of these practices are classified as bioreentions in MAST, so the focus was on county rights-of-way where the predominant soil type was HSG A or B, both of which receive substantially higher reductions than bioreentions with HSG C or D soils. Restoration projects within the county rights-of-way will be considered in combination with future road improvement projects in the watershed.
- **Outfalls on or Adjacent to School-owned, County-owned or Community-owned Properties:** Outfalls were identified as locations where a BMP could be constructed to capture and treat stormwater runoff. Storm drain outfalls that convey flows directly to the streams were evaluated for potential retrofit opportunities. Structural BMPs were proposed at or upstream of the outfalls to intercept runoff prior to entering storm drain inlets at locations with no upstream water quality treatment and with sufficient space. The most common proposed BMPs at existing outfalls were SPSCs. Filters (i.e., bioreentions and sand filters). The most common BMPs proposed upstream of existing

outfalls were a combination of bioretentions, micro-bioretentions, and tree box filters at existing inlets.

Methods used to select new BMPs

A desktop analysis using aerial imagery, and County GIS data for parcels, topography, and existing infrastructure was completed for each existing or proposed new BMP to determine the most appropriate type of structural BMP. The County GIS data was also used to estimate drainage areas and impervious areas. The Chesapeake Bay Program removal efficiencies show that infiltration practices provide the greatest nutrient reductions, followed by bioretentions on A or B soils, filtration practices (e.g., sand filter), bioretentions on C or D soils, and wet pond retrofits. Table 3-1 summarizes the initial protocol for selecting the type of BMP for retrofitting existing practices.

Table 7-1: Protocol for pre-2002 BMP Retrofits

Existing Practice	Drainage Area (acres)	Hydrologic Soil Group	Proposed Practice	Proposed Number
Dry ponds and extended detention dry ponds	Less than 5	A or B	Infiltration Basin or Bioretention	15
Dry ponds and extended detention dry ponds	Less than 5	C or D	Sand Filter	18
Dry ponds and extended detention dry ponds	5 to 10	A or B	Infiltration Basin	8
Dry ponds and extended detention dry ponds	5 to 10	C or D	Sand Filter	36
Any dry or wet pond	Greater than 10	Any	MS4 Permit-Required Stormwater Retrofit	156

MS4 = Municipal Separate Storm Sewer System

7.1.3 New and Retrofit Projects Summary

Figure 7-1 provides the locations of the previously identified BMPs (in-progress structural BMPs), additional BMP retrofits and proposed new BMPs.

Table 7-2 summarizes the proposed new and retrofit structural BMPs including the project type, anticipated drainage area, anticipated impervious area and implementation level costs. Table 7-3 provides a similar summary for the proposed stream restoration projects mostly identified from the watershed assessments. Planning-level cost estimates were based on the *Cost of Stormwater Management Practices in Maryland Counties* (King and Hagan, 2011). A 35 percent contingency was added to account for an increase in construction costs since publication of the document.

Appendix E provides a list of the proposed projects including a unique project ID, project name, project location, proposed project type, planning level area treated, and notes. Because the SPSCs are not included in MAST, they were input as bioretentions per MDE guidance (MDE, 2014c and Anne Arundel County, 2012). Sixty-one (61) proposed new and retrofit BMPs are traditional BMPs or ESD practices, and 19 are proposed stream restoration projects.

Table 7-2: Proposed Structural Restoration Projects in Gunpowder River Watershed

Proposed Structural BMP	Number of BMPs	Drainage Area (acres)	Impervious Area (Acres)	Planning-Level Implementation Cost
Bioretention/Rain Garden A/B Soils, no underdrain	10	16	9	\$2,262,900
Bioretention/Rain Garden C/D Soils, underdrain	22	37	16	\$3,859,500
MS4 Permit-Required Stormwater Retrofit	17	744	149	\$12,906,000
Urban Filtering Practices	4	22	4	\$281,800
Urban Infiltration Practices without Sand	3	14	3	\$228,700
Wet Ponds and Wetlands	5	152	37	\$1,211,200
Total	61	986	218	\$20,750,100

Table 7-3: Proposed Stream Restoration Projects in River Gunpowder Watershed

Number of Projects	Length of Stream Restoration (feet)	Equivalent Impervious Acres	Planning-Level Implementation Cost
19	11,000	110	\$2,483,250.00

7.2 ALTERNATIVE URBAN BMPS

MDE-approved alternative urban BMPs are important tools for the County to achieve nitrogen, phosphorus, and sediment load reductions. The County has already adopted some of these strategies. Expansion or modification of these strategies is proposed to receive credit from MDE as an approved alternative urban BMPs. Appendix B shows the approximate locations of the alternative urban BMPs.

The alternative urban BMPs are as follows:

- **Management Plans for Existing Forest Buffers:** Riparian areas that are at least 35 feet wide on one side of a stream and managed to promote filtering of runoff receive credit from MDE as an alternative urban BMP. Many of the streams in the Gunpowder River Watershed have at least 35 feet of forest buffers and could be eligible for credit by creating management plans and a GIS database of the existing buffers. To receive credits from MDE for tree buffers, a survival rate of at least 100 trees per acre is

Gunpowder River Restoration Strategies

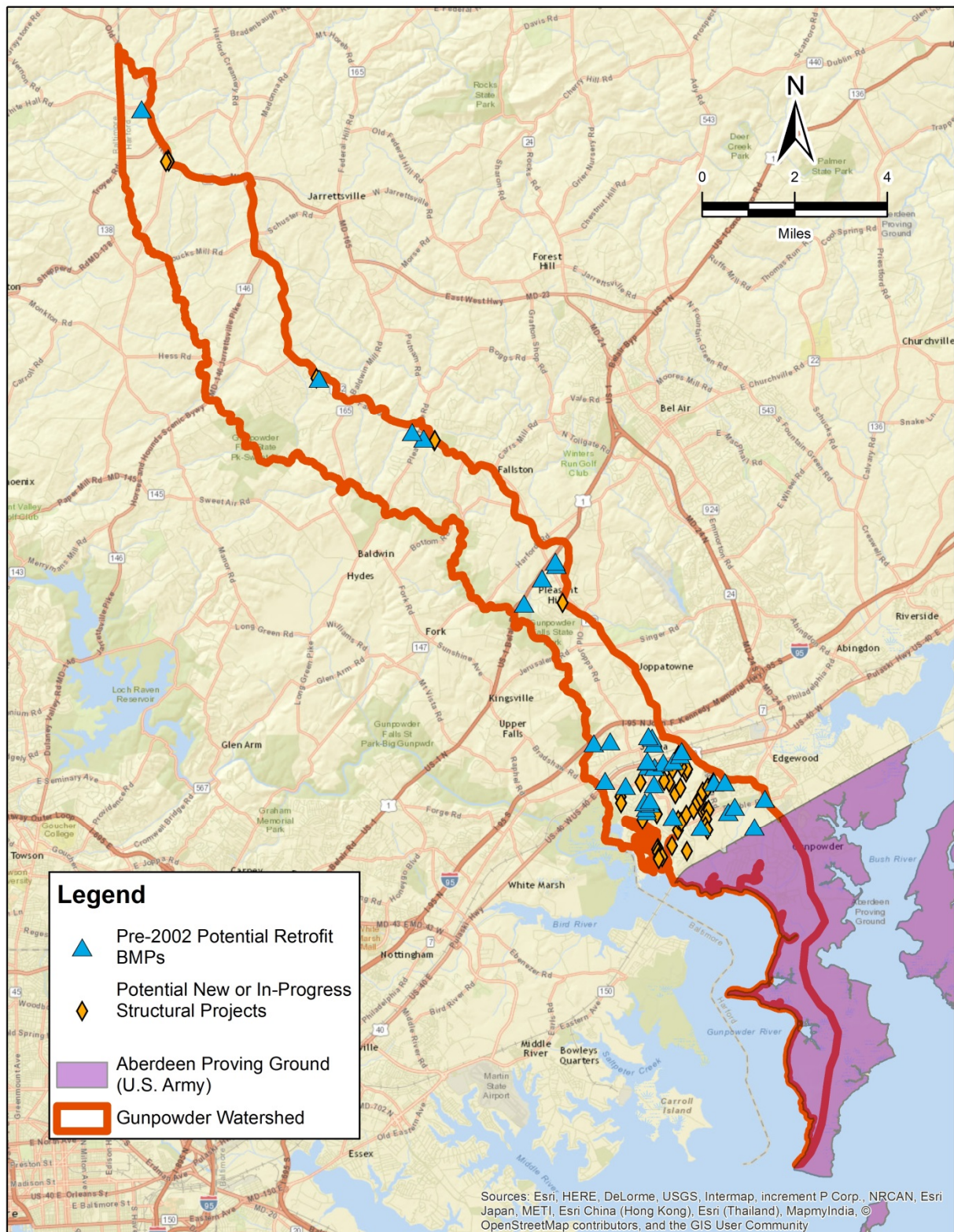


Figure 7-1: Locations of Proposed BMPs in Gunpowder Watershed

necessary, and 50 percent of the trees must be at least 2 inches in diameter and have a 4.5-foot-tall trunk. For this plan, a maximum buffer width of 150 feet was assumed, only areas covered by the existing vegetation GIS layer were considered, and distance was taken from the stream centerline. Approximately 4,000 acres of existing forest buffers were identified.

Planning-level implementation costs of \$207,000 are estimated to create management plans including a GIS dataset of the management areas based on the MAST nutrient management plan capital cost estimates per acre.

- **Urban Tree Planting:** The County is already implementing tree planting as part of its watershed restoration program on schools and county-owned properties . As an expansion to this program, additional properties with available open area for tree planting were identified. Approximately 7 acres of open area are available for tree planting. To receive credits from MDE for tree planting, a survival rate of at least 100 trees per acre is necessary, and 50 percent of the trees must be at least 2 inches in diameter and have a 4.5-foot-tall trunk. It would result in a reduction of nitrogen of 1,300 lbs/year, a reduction of phosphorus of 30 lbs/year, a reduction of sediment of 10 tons/year, and credit from MDE for treating 3 equivalent impervious acres. Planning-level implementation costs of \$100,000 are estimated for this strategy based on recent capital improvement tree planting projects with a contingency of 30 percent.
- **Street Sweeping:** The County currently conducts annual street sweeping on county-owned roads using mechanical sweepers. To receive credits for this practice, the street sweeping program needs to be expanded to twice a month. According to the guidance in *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014c), regenerative vacuum sweepers provide greater nutrient reductions than mechanical sweepers. This alternative urban strategy is not recommended at this time because the County does not currently plan to expand its street sweeping program, but the strategy would be considered as a future restoration option.
- **Catch Basin Cleaning:** There are approximately 1,600 storm drain inlets in the Harford County portion of the Gunpowder River Watershed. The current County program schedules catch basins and storm drain inlets cleaning to remove sediment and debris once every 3 years. If the program is expanded to increase the frequency of the catch basin cleaning so the catch basins and storm drain inlets are routinely maintained, the program could qualify for MDE credit as an alternative urban BMP. According to the guidance in *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014c), credits for catch basin cleaning are based on the weight of material that is collected. A nitrogen reduction of 3.5 pounds, a phosphorus reduction of 1.4 pounds, and a sediment reduction of 420 pounds are credited for every ton of

material collected. This alternative urban strategy is not recommended at this time because the County does not currently plan to expand its catch basin cleaning program, but the strategy could be considered as a future restoration option to be re-evaluated once all the restoration options are exhausted. A planning-level implementation cost of approximately \$14 .00 per catch basin is estimated based on *Stormwater O&M Fact Sheet-Catch Basin Cleaning* (EPA, 1999). A contingency of 35 percent was added to the cost of catch basin cleaning in EPA (1999) to account for the increase in implementation cost since 1999.

7.3 PROJECT PRIORITIZATION

The proposed structural projects were prioritized based primarily on property ownership. The prioritization provides a framework for selecting projects and assists with the selection of a timeline for project implementation. Projects were prioritized as high, medium, or low as follows:

- **High Priority:** All projects on county-owned property are considered a high priority over privately-owned property. Proposed projects from the watershed studies with existing concept-level design are also high priority.
- **Medium Priority:** Projects on community-owned properties (HOAs, churches, or institutions) are considered medium priority projects. The County has established relationships with the various community groups throughout Harford County (particularly HOAs) through implementation of stormwater management projects and public education and outreach. Because it is generally feasible to implement new and retrofit projects on community-owned areas through agreements, the proposed restoration strategies on community-owned properties were given a medium priority.
- **Low Priority:** Projects on privately owned properties (e.g., commercial and industrial areas) were given low priority. It is typically more difficult for the County to implement stormwater management projects on private properties than on county-owned or community-owned properties because of the individual agreements that are required for construction and maintenance. Projects on county-owned rights-of-way are also categorized as low priority.

7.4 NUTRIENT AND SEDIMENT LOAD REDUCTIONS

The proposed structural stormwater BMPs and alternative urban BMPs were added to the Gunpowder Watershed Current Load Conditions (2015) Scenario in MAST to create the proposed conditions scenario. As shown in Table 7-5, the reductions listed in Table 7-4 could be reached using the proposed high priority projects.

Gunpowder River Restoration Strategies

Table 7-4: Effectiveness of All Proposed Projects for Gunpowder Watershed

Pollutant	Target Reduction	Proposed Reduction	Target Load	Proposed Load
Nitrogen	27.1%	65.9%	65,250 lbs/year	30,490 lbs/year
Phosphorous	48.1%	87.6%	2,080 lbs/year	500 lbs/year
Sediment	Not applicable	77.6%	Not applicable	450 tons/year

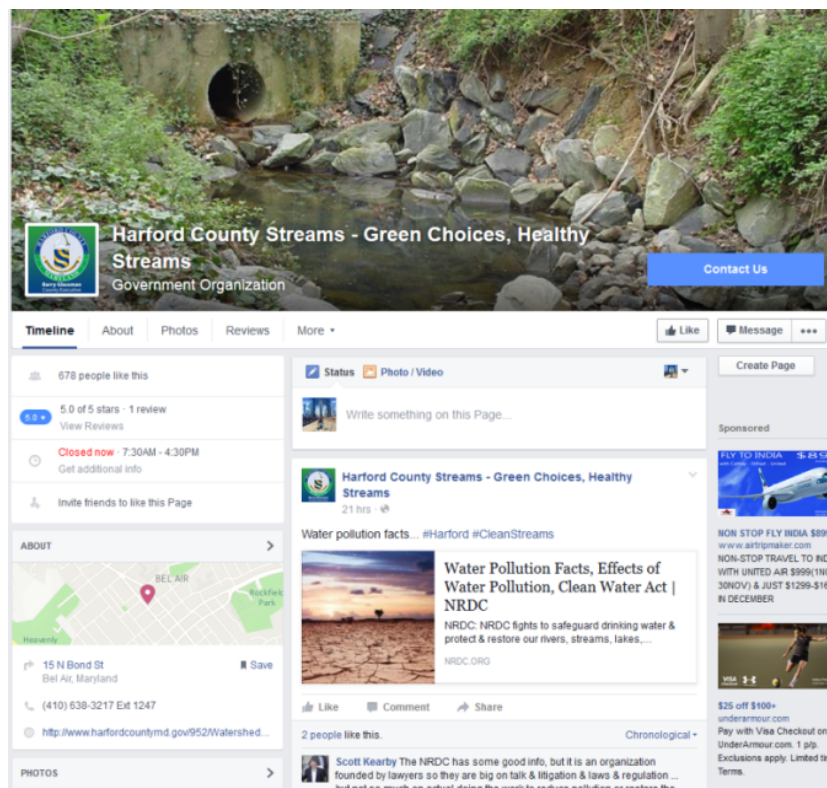
Table 7-5: Effectiveness of High Priority Projects for Gunpowder River Watershed

Pollutant	Target Reduction ⁽¹⁾	High Priority Projects	High, Medium, and Low Priority Projects
Nitrogen	27.1%	64.4%	65.9%
Phosphorous	48.1%	86.0%	87.6%
Sediment	Not applicable	75.1%	77.6%

SECTION EIGHT: PROGRAMMATIC STRATEGIES

Public participation and stakeholder engagement are essential for the successful implementation of a TMDL restoration plan. Part IV.E.3 of the County's NPDES MS4 permit requires the County to engage the public to solicit their input. Most of the land in the Northern Chesapeake Bay Watershed is privately owned; therefore, developing programs to promote education and outreach to private property owners, including homeowners and businesses, in pollution prevention and good housekeeping would encourage their participation as environmental stewards and work towards addressing the TMDL.

The County uses communication tools and social media such as Facebook, Twitter, and other media to promote various education and outreach programs. The County's stream protection and restoration web page has information on various pollution prevention activities. The County has been involved in other outreach events such as Earth Day and the Wade-In by setting up booths at parks and schools. The County also conducts programs at schools annually to educate students on effective stormwater management.



In addition, the County could consider the following potential programmatic strategies to inform residents of the impact of nutrient and sediment pollution.

- **Education and Outreach Program for Erosion and Sediment Control (ESC):** Currently, the County requires implementation of ESC practices for all new development that disturbs more than 5,000 square feet of area using MDE-approved ESC practices. A County inspector inspects all of the sites and requires installation and maintenance of proper ESC practices. The County's ESC web page lists the sediment control practices that can be used. An education and outreach program for builders, contractors, and construction workers could be developed on the web page with instructions on the proper use of sediment control practices to reduce sediment pollution. The EPA poster, at <http://water.epa.gov/polwaste/npdes/stormwater/upload/posterside1.pdf> is one of the readily available outreach materials for the construction industry. In addition, the County could increase awareness of readily available resources such as the County ESC web page.
- **Education and Outreach Program for Homeowners:** The County's Facebook page Harford County Streams – Green Choices, Healthy Streams already posts several related messages on topics such as the importance of tree planting, pollution from stormwater runoff, and ongoing stormwater restoration projects throughout the County to increase awareness. Incentive programs could be developed at the County level to promote installation of rain barrels, rain gardens, and other techniques to capture stormwater in residential areas. The EPA material at http://water.epa.gov/polwaste/npdes/stormwater/upload/solution_to_pollution.pdf could be used as potential outreach material for educating homeowners on pollution prevention. Additional resources are available on the websites of the Maryland's Phase I NPDES MS4 community's (e.g., Montgomery County's RainScapes website at <http://www.montgomerycountymd.gov/DEP/water/rainscapes.html#resources>).
- **Expansion of County's Current Urban Nutrient Management:** The County has adopted a nutrient management program at schools. The program promotes no-mow or low-mow areas throughout the property, a reduction of stormwater runoff through infiltration, and a restriction on the use of any fertilizers. The program could be expanded to County properties so concentrated runoff from impervious areas is captured by filter strips, reducing the nutrient and sediment loads.
- **Expansion of Stormwater Management Facility Maintenance Workshop Program:** County DPW offers an annual workshop for HOAs, businesses, and contractors on maintaining stormwater management facilities. Expanding the program by offering the workshop biannually and increasing the number of participants could increase awareness of the importance of maintaining stormwater management facilities.

SECTION NINE: FUNDING AND TECHNICAL ASSISTANCE

9.1 POTENTIAL FUNDING SOURCES

The proposed restoration projects require funding for their successful implementation and continued maintenance. Funding is needed for project implementation, operational expenditures, administrative costs, and education and outreach program development. The County's CIP projects are funded through sources such as pay-as-you-go funds, bonds, recordation tax, and other State and Federal funds. While these funds may be adequate for the implementation of some of the proposed restoration strategies as part of the CIP projects, additional funds will be needed to implement the restoration strategies and to expand educational and outreach programs. Table 9-1 provides potential State and Federal funding, non-profit grants, and loans that may be appropriate for the proposed restoration strategies.

Table 9-1: Potential Available Funding Sources for the Implementation of Restoration Strategies

Funding Type	Funding Agency	Funding Type	Restoration Measure Type Supported
Federal	NFWF/EPA	Matching Funds/Grants	- Stream restoration - Water quality improvement
Federal	EPA 319 Funds	Matching Funds/Grants	Restore impaired waters by implementing watershed plans
Federal	EPA Urban Waters Small Grants	Matching Funds/Grants	For projects that address urban pollution through outreach
State	Maryland DNR – Chesapeake Bay Implementation Grants	Grants	- Watershed assistance - Natural filters - Innovative technology - Maryland agriculture cost-share
State	Maryland DNR – Natural Filters	Technical Assistance/ Funding	- Forest buffers - Wetlands
State	Stormwater Pollution Prevention Cost-Share Program	Cost-Share	Stormwater management retrofits
State	State Water Quality Revolving Loan Fund	Loans	- Point source pollution prevention - Nonpoint source pollution prevention
Non-Profit	Chesapeake Bay Trust	Grants	- Environmental education - Outreach - Water quality improvement through restoration and retrofits

DNR = Department of Natural Resources

NFWF = National Fish and Wildlife Foundation

9.2 TECHNICAL ASSISTANCE

MDE has been providing guidance to jurisdictions on the development of restoration plans and restoration strategies to address TMDL goals through the publication of various documents such as *Guidance for Developing Stormwater Wasteload Allocation Implementation Plans for Nutrient and Sediment Total Maximum Daily Loads* (MDE, 2014b) and *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014c). MDE has also conducted webinars and workshops to train staff in NPDES MS4 jurisdictions (e.g., County, municipal, state) on MDE-developed tools and technologies. Technical guidance is also available for educators in the Maryland Department of Natural Resources (DNR) Resources for Educators available at <http://dnr2.maryland.gov/Education/pages/educators.aspx>.

SECTION TEN: IMPLEMENTATION SCHEDULE

As discussed in previous sections, strategies were developed for each of the sub-watersheds in the Chesapeake Bay including Bush River, Northern Chesapeake Bay, and Gunpowder River. These strategies combined include nearly 800 structural BMPs. MAST scenarios for each sub-watershed show that implementing all of the proposed strategies (structural BMPs and alternative BMPs) provided an excessive amount of load reduction to address the Chesapeake Bay TMDL.

The TMDL target load reductions for nitrogen and phosphorus can be achieved by implementing all of the proposed strategies for Bush River, 95% of all of the proposed strategies for Northern Chesapeake Bay, and 55% of all the proposed strategies for Gunpowder River. The County has flexibility to select from the various high, medium, and low priorities for structural and alternative urban BMPs. Completion of the strategies listed above to address the TMDL would cost approximately \$360 M (Table 10-1).

On February 17, 2015, the Harford County Council approved Resolution 005-15 which dedicates a portion of the recordation tax toward watershed protection and restoration improvement projects. The projected \$2M per year will be used to pay for debt services for future bonds and / or loans. Harford County's projected annual budget for the implementation of the MS4 permit including capital improvement projects, watershed assessments and plans, water quality monitoring, etc. is \$10 M.

Allocating \$8 M towards watershed restoration per year, it will take an estimated 46 years or until 2062 to address the Chesapeake Bay TMDL.

Over the next two years, Harford County anticipates completing additional small watershed assessments including one for Upper Bynum Run. The small watershed assessments will provide field collected survey data of the stream conditions and identify additional restoration opportunities such as stream restoration that could provide lower costs per load reduction. Harford County will focus restoration within the existing and proposed small watershed assessments over the next four years through the expiration of the County's MS4 permit on December 29, 2019.

Table 10-1: Cost and Benefits of Implementation to Address the Chesapeake Bay TMDL

Sub-watershed	Nitrogen			Phosphorus			Costs (millions)
	Current (lbs/yr)	Proposed (lbs/yr)	Target (lbs/yr)	Current (lbs/yr)	Proposed (lbs / yr)	Target (lbs/yr)	
Bush River	397,090	278,800	286,080	16,410	8,370	8,380	\$270
Northern Chesapeake Bay	308,332	171,985	190,834	9,645	4,551	4,591	\$77
Gunpowder River	91,590	57,930	65,250	3,930	2,044	2,080	\$13
Total	797,012	508,715	542,164	29,985	14,965	15,051	\$360

The following table lists projected expenditures and load reductions through 2019 which accounts for 9% of the load reduction.

Table 10-2: Cost and Benefit of Implementation through 2019

Sub-watershed	Reductions N (lb)	Reductions P (lb)	Cost (millions)
Bush River	10,510	714	\$24
Northern Chesapeake Bay	12,115	453	\$7
Gunpowder River	2,991	168	\$1
Total	25,616 (9%)	1,335 (9%)	\$32

An estimated general implementation schedule is provided in Table 10-3. Documented load reduction efficiencies established by MDE at the time designs are initiated will be locked in unless efficiencies are increased.

The County reserves the right, because the availability of resources is dependent on several factors and because new technologies continuously emerge, to re-evaluate the implementation plan annually and update the plan based upon the feasibility of the proposed BMPs and the implementation schedule. As noted above, compliance with the County's MS4 permit is based upon an MEP level-of-effort as determined by the County.

Table 10-3: Implementation Schedule

Restoration Project	2016	2017	2018	2019
Planning Projects				
Complete additional small watershed assessments	X	X		
Develop and initiate a new monitoring plan; Continue to implement existing monitoring plans	X	X	X	X
Develop and initiate an outreach program	X			
Review and update historical BMP database	X			
Update MAST model		X		X
Coordinate with Harford County Schools to prioritize projects on school property	X		X	
Prioritize projects on county owned property	X		X	
Investigate incentives to encourage property owners to allow the County to complete retrofits on private property	X			
Contact HOAs		X	X	
Contract business owners			X	X
Conduct targeted hotspot investigates	X	X	X	X
Design Projects				
Initiate designs on County owned property in Upper Bynum Run	X	X	X	X
Initiate designs on HOA owned property in Upper Bynum Run		X	X	X
Construction Projects				
Complete construction	X	X	X	X

SECTION ELEVEN: MONITORING AND EVALUATION

11.1 EVALUATING PROGRESS OF PROPOSED RESTORATION STRATEGIES

Documentation regarding the County's progress on restoration is to be submitted in the County's annual reports due on December 30 each year and will include net changes in pollutant load reductions, and costs for completed projects. Pollutant load reductions will be calculated for each individual project constructed. Progress towards addressing the TMDL stormwater WLA will be calculated as a reduction from the current loads as specified in Table 2-10 . Updated MAST modeling is anticipated in 2017 to incorporate a completed historical review of BMPs. This will be an updated current load scenario for 2015. Harford County anticipates updating the planimetric GIS data in 2019. An updated MAST current load scenario will be completed with this data.

11.2 WATER QUALITY MONITORING

One method to determine the effectiveness of restoration strategies is to conduct a combination of physical, chemical, and biological monitoring. Improvements to biological communities are not instantaneous. Reducing nutrient and sediment loads does not guarantee the return of a healthy biological community because it may be impacted by yet determined stressors. In addition, monitoring is costly. This plan, and the underlying County review, focuses on nutrient and sediment load reduction and recognizes the impact flow has on nutrient and sediment loading. The flow itself within the stream can also be a biological stressor. Therefore, load reductions should be credited towards for both TMDLs and impervious area restoration for managing the channel protection volume.

Harford County will continue to focus water quality monitoring within watersheds with complete small watershed assessments. The County has collaborated with U.S. Geological Survey (USGS), Maryland Department of Natural Resources (DNR), and various consultants to develop and implement physical, chemical and biological monitoring plans at a watershed scale in order to demonstrate improvements in stream hydrology, channel conditions, instream habitat and water quality. The County has developed these watershed scale monitoring strategies because conducting site specific monitoring as generally required through wetland permitting by MDE and / or U.S. Army Corp of Engineers is very costly, labor intensive, and does not provide useful data for restoration planning at the local level. Monitoring efforts are currently in progress for the following watersheds.

11.2.1 Bush River Watershed Water Quality Monitoring

Within the Bush River Watershed, small watershed assessments have been complete for Wheel Creek, Plumtree Run, Sam's Branch, Declaration Run, and Sam's Branch.

Wheel Creek Watershed

In 2009, Harford County and MDE selected this watershed to monitor ambient water quality conditions to in order address the County's MS4 permit requirements. The County developed a monitoring plan to demonstrate measureable reductions of sediments and nutrients, improvements in physical stability and instream habitat and improvements in biological communities. The monitoring plan follows a Before-After, Control-Impact (BACI) study design to compare pre-construction baseline conditions to post-construction restoration conditions. In support of this project, the County partnered with the USGS to operate a stream flow gage located on Wheel Creek (USGS 0158175320) near the confluence with Winters Run at Atkisson Reservoir. The County also partnered with MD DNR to conduct biological assessments using state standardized MBSS protocols and to collect continuous flow data at designated headwater stations. Additionally the County has worked with consultants to assess the stream's physical characteristics and to collect and analyze surface water during baseflow and stormflow conditions.

Plumtree Run Watershed

Harford County has developed and implemented a watershed scale monitoring plan for Plumtree Run that follows a Before-After, Control-Impact (BACI) study design to compare pre-construction baseline conditions to post-construction restoration conditions. The monitoring plan was developed to demonstrate measureable reductions of sediments and nutrients and improvements in instream habitat and biological communities. USGS operates a stream flow gage on Plumtree Run (USGS 01581752) at Plumtree Road and conducts water quality monitoring at this same location during baseflow and stormflow conditions. All monitoring protocols are designed to be compatible with the Chesapeake Bay Nontidal Monitoring Network (NTN) to maintain the ability to compare conditions observed at this station to those measured across the region. Continuous water quality monitoring data for water temperature, specific conductance and turbidity are also collected at this site and displayed in near real time on the USGS web page. County consultants conduct fish and macroinvertebrate assessments using state standardized MBSS protocols at designated sites throughout the watershed. Sites were selected that would best characterize the ecological health of the watershed as well as assess the benefits of the planned restoration projects.

Sam's Branch

In 2008, Harford County contracted a plan to develop a baseline stream assessment of the Sam's Branch Watershed. The monitoring efforts included a community awareness survey, an upland assessment, and a physical stream assessment, a survey of the riparian condition, an assessment of the baseline water quantity levels and water quality conditions, and an assessment of biological communities.

Declaration Run

Harford County is developing monitoring plan to address the physical geomorphologic conditions in the watershed. This monitoring program will be designed to assess the geomorphic stability of the stream channels in the Declaration Run watershed as they respond to restoration activities scheduled to be implemented. The geomorphic monitoring will include surveying and analyzing monumented cross-sections and longitudinal profiles at representative reaches, monitoring bank pins and scour chains, mapping substrate facies and evaluating substrate particle size distribution. The methods will evaluate bed and bank stability, channel profile, and bed features.

Table 11-1: USGS Flow Gages in Bush River Watershed

Tributary	USGS Site Number
Bynum Run	01581500
Winters Run	01581700
Plumtree Run	01581752
Atkisson Reservoir	01581753
Wheel Creek	0158175320
James Run	01581649
Otter Point Creek	01581757

11.2.2 Gunpowder River Watershed Water Quality Monitoring

Within the Gunpowder River Watershed, a small Watershed Assessments have been complete for Foster Branch.

Foster Branch Watershed

Harford County has developed and implemented a watershed scale monitoring plan for Foster Branch that follows a Before-After, Control-Impact (BACI) study design to compare pre-construction baseline conditions to post-construction restoration conditions. The monitoring plan was developed to demonstrate measureable reductions of sediments and nutrients and improvements in instream habitat and biological communities. USGS operates a stream flow gage on Foster Branch (USGS 01585075) at Trimble Road and conducts water quality monitoring at this same location during baseflow and stormflow conditions. All monitoring protocols are designed to be compatible with the Chesapeake Bay Nontidal Monitoring Network (NTN) to maintain the ability to compare conditions observed at this station to those measured across the region. Continuous water quality monitoring data for water temperature, specific conductance and turbidity are also collected at this site and displayed in near real time on the USGS web page. County consultants conduct fish and macroinvertebrate assessments using state standardized MBSS protocols at designated sites throughout the watershed. Sites were selected that would best characterize the ecological health of the watershed as well as assess the benefits of the planned restoration projects.

Harford County has partnered with USGS to operate stream flow gages on in the Gunpowder River Watershed. The operation of these gages supports the ongoing efforts with other Maryland counties to create a state-wide stream gaging network.

Table 11-2: USGS Flow Gages in Gunpowder River Watershed

Tributary	USGS Site Number
Foster Branch	01585075
Little Gunpowder River	01584500

11.2.3 Northern Section Chesapeake Bay Water Quality Monitoring

In 2012, the County completed a small watershed action plan for Stout Bottle Branch and Cabbage Run, tributaries of Deer Creek. The plan identified and developed conceptual designs and planning level costs for restoration opportunities that included bank stabilizations, buffer plantings and stormwater management retrofits. The County is in the process of developing a monitoring plan to assess the baseline biological, physical and chemical conditions of the watershed. Monitoring locations will be at representative sites throughout the watershed.

Harford County has partnered with USGS to operate stream flow gages on in the Northern Chesapeake Bay Watershed. The operation of these gages supports the ongoing efforts with other Maryland counties to create a state-wide stream gaging network.

Table 11-3: USGS Flow Gages in Northern Chesapeake Bay Watershed

Tributary	USGS Site Number
Deer Creek – Rocks	01580000
Deer Creek - Darlington	01580520
Swan Creek	01580700

11.3 INSPECTION AND MAINTENANCE

Maintenance is a key component for the success of any proposed or existing BMP to maintain the design level of treatment of runoff. Inspectors are important because they provide guidance for BMP operators to ensure they are following maintenance consistent with BMP design. Chapter 3 and Chapter 5 of the Maryland Stormwater Design Manual (MDE, 2000) describe maintenance requirements for conventional stormwater BMPs and for ESD practices, respectively.

Maintenance can be broken up into three general categories: routine, structural, and emergency. Routine maintenance should be the most frequent and does not require any structural changes to an existing stormwater practice (e.g., mowing, weeding, and removing trash from an existing stormwater practice). Structural maintenance is less frequent and involves replacing or repairing structural features of an existing practice (e.g., replacing broken storm drain pipes, repairing riser structures, replacing filter media). Emergency maintenance is the least common, and is required when an existing structure has failed or is about to fail (e.g., emergency spillway failure, flooding at an existing BMP).

Typical maintenance practices for stormwater BMPs include removal of invasive vegetation, mowing grass, removing sediment from pretreatment forebays, and replacing structural features (e.g., weirs, storm drain pipes, overflow structures). Wetlands require additional maintenance, as wetland plantings may be required if vegetation cover requirements are not met. Infiltration (e.g., infiltration trenches, infiltration basins, dry wells) and filtering practices (sand filters, bioretentions, micro-bioretentions, submerged gravel wetlands, and rain gardens) require additional inspection and maintenance considerations related to the filtering media, which may need to be replaced if clogged with sediments.

Inspectors must understand the unique design considerations and maintenance needs of each type of stormwater BMP. For example, wet swales and bio-swales do not require mowing, a dry swale should have grass heights in the 4- to 6-inch range, and a surface sand filter should have grass heights of less than 12 inches. While these slight differences may seem trivial, incorrect maintenance can substantially reduce pollutant removal effectiveness. Qualified inspectors are therefore an important element in enforcing proper maintenance practices.

MDE's *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (MDE, 2014a) indicates that:

Regular maintenance shall occur for all BMPs once every 3 years and each jurisdiction shall implement appropriate actions and document that any deficiencies are rectified. Otherwise, the credits will be removed until proper performance is verified.

Harford County is responsible for conducting triennial inspections for all stormwater management facilities. Most stormwater management facilities are privately owned, typically by homeowner associations, individual businesses or business parks. These owners are required to provide preventative and long-term maintenance as outlined within a maintenance agreement and / or maintenance schedules included within approved design plans. Ensuring these facilities are functioning properly is important in maintaining load reductions for Bynum Run. Harford County anticipates reviewing the status of all existing stormwater management facilities within the Bynum Run watershed. All maintenance records will be associated with plans review records, and an inspection and outreach program will be developed. Restoration that includes retrofitting existing stormwater management facilities and constructing new stormwater management facilities are included in the inventory for triennial inspections.

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Appendix A
Bush River Watershed List of Restoration Projects

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Appendix A: Bush River Watershed Restoration Strategies

A.1 STRUCTURAL STORMWATER BEST MANAGEMENT PRACTICES (BMPS)

A.1.1 DESIGNED – STRUCTURAL BMPS

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes
Wheel Creek 3	Wheel Creek SWM Pond Retrofit	Gardens of Bel Air along Darby Lane	Wet Pond	58.8	20.7	The drainage area was back calculated from "potential WQv" provided on the County website.

A.1.2 DESIGNED – STREAM RESTORATION PROJECTS

Project ID	Project Name	Location	Length of Restoration (feet)	Notes
Design-Sunnyview	Sunnyview Road Stream Restoration	Unnamed Tributary to Bynum Run behind homes on Sunnyview Road	2100	Stream Restoration under design, length from County website.
MMS	Wheel Creek at Calverts Walk Stream Restoration	Headwater Tributary to Wheel Creek	800	Based on the map in the Wheel Creek Restoration Plan part of the Middle Mainstem overlaps with the Calvert's Walk stream restoration. From Harford County Phase II watershed Implementation Plan 2012-2013 Two-Year Milestones document.
LMS-MMS	Lower Wheel Creek Stream Restoration	Main Channel of Wheel Creek (Lower and Middle)	5740	According to the pre-bid information, the restoration will take place from the Country Walk Subdivision (upstream of Wheel Road) to the Akisson Reservoir. Assume this includes the "Lower Mainstem" described in the report, as well as the areas in the "Middle Mainstem" that are recommended.

Appendix A: Bush River Watershed Restoration Strategies

A.1.3 WATERSHED PLAN – STRUCTURAL BMPS

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes/Data Source	HSG
Wheel Creek 1	Festival at Bel Air SWM Pond	Festival shopping center at Bel Air SWM Pond	Wet Pond (Retrofit)	25.7	22.5	Wheel Creek Restoration Plan. Drainage area back calculated from "potential WQv" , DA, and IA.	B
D-ES-2	Wetland at End of Oreganum Court (Declaration Run Watershed)	End of Oreganum Court	Wetland	11.3	4.9	Declaration Run and Riverside Small Watershed Action Plan	C
D-ES-5	Bioretention at North end of Foxglove Court (Declaration Run Watershed)	North end of Foxglove Court	Bioretention	8.9	2.8	Declaration Run and Riverside Small Watershed Action Plan	B
D-ES-6	Bioretention at Germander Drive (Declaration Run Watershed)	Germander Drive	Bioretention	3.4	1.6	Declaration Run and Riverside Small Watershed Action Plan	C
D-ES-7	Bioretention at Germander Drive and Church Creek Road (Declaration Run Watershed)	Germander Drive and Church Creek Road	Bioretention	2.28	1.3	Declaration Run and Riverside Small Watershed Action Plan	C
D-ES-8A	Wetland at Baneberry Drive (Declaration Run Watershed)	Baneberry Drive	Wetland	1.9	0.83	Declaration Run and Riverside Small Watershed Action Plan	B
D-ES-8B	Step Pool Conveyance System at Baneberry Drive (Declaration Run Watershed)	Baneberry Drive	Step Pool Conveyance System	2	0.83	Declaration Run and Riverside Small Watershed Action Plan	B
D-ES-12	Wetland at End of Marigold Lane (Declaration Run Watershed)	End of Marigold Lane	Wetland	1.8	1	Declaration Run and Riverside Small Watershed Action Plan	C
D-ES-15	Bioretention at Procedure Way (Declaration Run Watershed)	Procedure Way	Bioretention	3	2	Declaration Run and Riverside Small Watershed Action Plan	A
D-NS-3	Green Roofs at Liriope Court (Declaration Run Watershed)	Liriope Court	Green Roofs	0.1	0.1	Declaration Run and Riverside Small Watershed Action Plan	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes/Data Source	HSG
D-NS-4	Green Street Bump Out at Church Creek Road (Declaration Run Watershed)	Church Creek Road	Green Street	2.1	1.6	Declaration Run and Riverside Small Watershed Action Plan	D
D-NS-7	Step Pool Conveyance System at Foxglove Court (Declaration Run Watershed)	Foxglove Court	Step Pool Conveyance System	6	2.1	Declaration Run and Riverside Small Watershed Action Plan	C
D-NS-8	Bioretention at Dalmatian Place (Declaration Run Watershed)	Dalmatian Place	Bioretention	3.7	2	Declaration Run and Riverside Small Watershed Action Plan	D
D-NS-9	Tree Box Filters at Golden Rod Court (Declaration Run Watershed)	Golden Rod Court	Tree Box Filters	6.3	3.6	Declaration Run and Riverside Small Watershed Action Plan	C
D-NS-12	Bioretention at Church Creek Elementary School (Declaration Run Watershed)	Church Creek Elementary School	Bioretention	0.9	0.9	Declaration Run and Riverside Small Watershed Action Plan	C
D-NS-13	Green Street Bump Out at Church Creek Road (Declaration Run Watershed)	Church Creek Road	Green Street	0.9	0.8	Declaration Run and Riverside Small Watershed Action Plan	C
D-SWM0110	Dry Pond Retrofit to Infiltration Basin at Church Creek Elementary School (Declaration Run Watershed)	Church Creek Elementary School	Dry Pond Retrofit to Infiltration Basin	8.2	4.4	Declaration Run and Riverside Small Watershed Action Plan	B
R-ES-1	Dry Pond retrofit to Wet Pond at Halls Chance Road (Riverside Watershed)	Halls Chance Road	Dry Pond retrofit to Wet Pond	130.4	40.3	Declaration Run and Riverside Small Watershed Action Plan	B
R-NS-1	Bioretention at Belcamp Park (Riverside Watershed)	Belcamp Park	Bioretention	5.5	1.7	Declaration Run and Riverside Small Watershed Action Plan	C
R-NS-6	Rain Garden at Winners Circle (Riverside Watershed)	Winners Circle	Rain Garden	1.3	0.2	Declaration Run and Riverside Small Watershed Action Plan	D

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes/Data Source	HSG
R-NS-7	Bioswale at Caldwell Court South (Riverside Watershed)	Caldwell Court South	Bioswale	10.52	3.5	Declaration Run and Riverside Small Watershed Action Plan	C
R-NS-8	Bioswale at Carlyle Garth (Riverside Watershed)	Carlyle Garth	Bioswale	1.8	0.7	Declaration Run and Riverside Small Watershed Action Plan	C
R-SWM0491	Filter Strips at West end of Millennium Drive (Riverside Watershed)	West end of Millennium Drive	Filter Strips	4.9	3.1	Declaration Run and Riverside Small Watershed Action Plan	C
R-SWM0627	Filter Strips at Millennium Drive (Riverside Watershed)	Millennium Drive	Filter Strips	4.6	3.3	Declaration Run and Riverside Small Watershed Action Plan	D
H5	Ring Factory Elementary School	Route 924 Elementary	Shallow Marsh	23	8	Plumtree Run Small Watershed Action Plan. Retrofit of SWM0052.	
H6	Barrington Place Outfalls Facility	Barrington Place	Shallow Marsh	23	8	Plumtree Run Small Watershed Action Plan	
H7	Barrington Village COURT and Rollins Court Outfalls SWM Facility	At Barrington Village Court and Rollins Court	Shallow Marsh	28	13.5	Plumtree Run Small Watershed Action Plan	
SBD-1	Step Pool Conveyance System near the intersection of Edgewood Rad and Willoughby Beach Road	Near the intersection of Edgewood Rad and Willoughby Beach Road	Step Pool Conveyance System	19.42	7.38	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	D
SBD-2	Retrofit of Existing Dry Pond to Wet Pond north of Willoughby Beach Road	West of the intersection of Willoughby Beach Road and Edgewood Road	Wet Pond	12.99	4.94	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	D
SBD-3	Retrofit of Existing Dry Pond to Wet Pond north of Willoughby Beach Road	East of the Intersection of Willoughby Beach Road and Trimble Road	Wet Pond	2.7	1.35	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	B
SBE	Wetland near Harford Commons	Harford Commons near the intersection of Trimble Road and Southridge Drive.	Sand Seepage Wetland	9	3.42	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes/Data Source	HSG
SBA	Hanson Road Bioretention	Hanson Road from Route 24 to Route 755	Bioretention	1.6	0.8	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	D
SBC-1	Edgewood Elementary School Bioretention 1	Parking lot of Edgewood Elementary School along Cedar Drive.	Bioretention	0.36	0.36	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	D
SBC-2	Edgewood Elementary School Bioswale	Lawn area southwest of Edgewood Elementary School	Bioswale	0.33	0	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	C
SBC-3	Edgewood Elementary School Bioretention 2	Parking lot of Edgewood Elementary School along Cedar Drive.	Bioretention	0.18	0.18	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	D
SBN-1	Public Library Bioretention	At the intersection of 755 and Hanson Road	Bioretention	0.07	0.07	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	C
SBL-2	Step Pool Conveyance System near Cedar Drive	West of 755 near Cedar Drive	Step Pool Conveyance System	0.23	0.23	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	D
SBB	Impervious surface removal at Hawthorne Drive	Hawthorne Drive	Impervious cover reduction	0.57	0.57	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	B
SBJ	Bioretention at the intersection of Perry Avenue and Banyan Road	Intersection of Perry Avenue and Banyan Road	Bioretention	1.07	1.07	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	C
SBK	Bioretention near the intersection of Edgewood Road and Rosewood Drive	NE of the intersection of Edgewood Road and Rosewood Drive	Bioretention	0.51	0.51	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	C
SBF	Bioretention at Southridge Drive	At the center of the Southridge Drive circle.	Bioretention	0.42	0.42	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	B
SBO	Bioretention west of Royal Farms	West of the Royal Farms on Edgewood Road	Bioretention	0.16	0.16	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes/Data Source	HSG
SBL-1	Permeable Paving at Baker Circle	Baker Circle	Permeable Paving	0.76	0.76	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	C
SBI	Permeable Paving at Sequoia Drive Cul-de-sac Parking	Sequoia Drive Cul-de-sac Parking	Permeable Paving	0.31	0.31	Sam's Branch Tributary Watershed Assessment and Baseline Stream Monitoring Report	C
HH-1	Dry pond to Shallow Marsh Extended Detention Wetland by Continental Drive.	South of Continental Drive.	Extended Detention Wetland	40	34	Bush River Watershed Management Plan. Retrofit of SWM0278.	C
HH-4	Shallow Marsh Extended Detention Wetland south of Windy Laurel Drive.	South of the intersection of Continental Drive and Copper Ridge Road.	Extended Detention Wetland	27	8.1	Bush River Watershed Management Plan	C
OP-4	Dry pond to Shallow Marsh Extended Detention Wetland at Edgewood Plaza Shopping Center	At the intersection of Hanson Road and Silver Bell Drive.	Extended Detention Wetland	7.5	6.8	Bush River Watershed Management Plan. Retrofit of SWM0314	C
OP-6	Dry pond to Extended Wet Detention Pond at BJ's	Southeast of Constant Friendship Boulevard	Extended Detention Wet Pond	50	35	Bush River Watershed Management Plan. Retrofit of SWM0188.	C
OP-9	Dry pond to Shallow Marsh Wetland north of the intersection of 24 and 924.	North of the intersection of MD-24 and MD-924.	Shallow Marsh	120	36	Bush River Watershed Management Plan. Retrofit of SWM0187.	B
OP-14	Shallow Marsh Wetland near Hanna Road.	Southeast of Hanna Road.	Shallow Marsh	25	6.3	Bush River Watershed Management Plan	C
OP-1	Dry Pond to Extended Detention Wetland near Southridge Drive	Northeast of the intersection of Southridge Drive and Trimble Road.	Extended Detention Wetland	15	4.5	Bush River Watershed Management Plan. Retrofit of SWM0360.	C
OP-7	Dry Pond to Micropool Extended Detention at Walmart	Southwest of the intersection of MD-24 and MD-924, near Walmart.	Micropool Extended Detention Pond	120	60	Bush River Watershed Management Plan	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes/Data Source	HSG
OP-11	Dry Pond to Micropool Extended Detention near Ferring Court	West of Ferring Court.	Micropool Extended Detention Pond	35	14	Bush River Watershed Management Plan. Retrofit of SWM0184.	B
OP-8	Dry pond to extended detention wetland near Nanticoke Court.	Southwest of the intersection of Nanticoke Court and Tollgate Road.	Extended Detention Wetland	17	6.0	Bush River Watershed Management Plan	B
OP-9A	Bioretention at Weiss market parking lot	Southwest of Trellis Lane and Emmorton Road intersection.	Bioretention	3	3	Bush River Watershed Management Plan	C
OP-10	Micropool Extended Detention Pond near Crisfield Drive.	Southeast of the intersection of Crisfield Drive and Hebron Terrace.	Micropool Extended Detention Pond	19	4.8	Bush River Watershed Management Plan	B
OP-12	Dry pond to Shallow Marsh Extended Detention Wetland near Tall Pines Court	East of Tall Pines Court.	Extended Detention Wetland	19	9.5	Bush River Watershed Management Plan	B
OP-13A	Bioretention at Festival at Bel Air shopping center.	Parking lot of Festival Shopping Center.	Bioretention	2	2	Bush River Watershed Management Plan	C

A.1.4 WATERSHED PLAN – STREAM RESTORATION PROJECTS

Project ID	Project Name	Location	Length of Restoration (feet)	Notes/Source
UMS	Upper Wheel Creek Stream Restoration	Main Channel of Wheel Creek (Upper)	1375	Bush River Watershed Management Plan
MB	Middle Branch of Wheel Creek Watershed Stream Restoration	Middle Branch of the Wheel Creek Watershed	1350	Bush River Watershed Management Plan

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Project ID	Project Name	Location	Length of Restoration (feet)	Notes/Source
SB	South Branch of Wheel Creek Watershed Stream Restoration	South Branch of the Wheel Creek Watershed	440	Bush River Watershed Management Plan
Declaration Run Reach 1	Declaration Run Upstream of Baneberry Drive to MD 7 Stream Restoration	Baneberry Drive to Maryland Route 7	360	Declaration Run and Riverside Small Watershed Action Plan
Tributary DR5	Declaration Run Tributary south of Baneberry Drive Stream Restoration	Ephemeral channel South of Baneberry Drive	120	Declaration Run and Riverside Small Watershed Action Plan
Tributary DR9	Declaration Run Tributary south of Riverside Parkway Stream Restoration	South of Riverside Parkway near the Church Creek Elementary School.	1900	Declaration Run and Riverside Small Watershed Action Plan
StrRest Project 1	Plumtree Run Stream Restoration 1	Plumtree Run SW of the intersection of W Ring Factory Rd and MD24	2750	Plumtree Run Small Watershed Action Plan
StrRest Project 3	Plumtree Run Stream Restoration 3	Plumtree Run and Tributary S of S Tollgate Rd	3650	Plumtree Run Small Watershed Action Plan.
StrRest Project 4	Plumtree Run Stream Restoration 4	Unnamed Tributaries of Plumtree Run N and S of Crystal Ct (NE of MD24)	3125	Plumtree Run Small Watershed Action Plan.
StrRest Project 5	Plumtree Run Stream Restoration 5	N of Oak Valley Drive	1650	Plumtree Run Small Watershed Action Plan.
StrRest Project 6	Plumtree Run Stream Restoration 6	Plumtree Run from W Macphail Rd to MD24	1863	Plumtree Run Small Watershed Action Plan.
StrRest Project 7	Plumtree Run Stream Restoration 7	Unnamed Tributary of Plumtree Run from Lake Drive to Oak Valley Drive	2255	Plumtree Run Small Watershed Action Plan.
StrRest Project 9	Plumtree Run Stream Restoration 9	Unnamed Tributary of Polumtree Run from Oak Valley Drive to MD24	1350	Plumtree Run Small Watershed Action Plan.
StrRest Project 10	Plumtree Run Stream Restoration 10	Plumtree Run from 2000 ft N of Plumtree Rd to 2000 ft S of Plumtree Rd as needed.	1750	Plumtree Run Small Watershed Action Plan.
SS-1	Stream Restoration downstream of Edgewood Food Lion and Post Office	Parallel to Hanson Road.	1200	Bush River Watershed Management Plan

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Project ID	Project Name	Location	Length of Restoration (feet)	Notes/Source
SS-2	Stream Restoration near Edgewood Elementary School.	Parallel to Cedar Drive	1200	Bush River Watershed Management Plan
SS-3	Stream Restoration of Haha Branch downstream of Philadelphia Station	Stream near Abingdon Road.	1000	Bush River Watershed Management Plan
SS-4	Stream Restoration downstream of Windy Laurel Way	At Box Hill South development, downstream of Windy Laurel Way and parallel to Deer Creek Drive.	500	Bush River Watershed Management Plan
SS-5	Stream Restoration at Woodsdale Apartment Community	Near 924.	1600	Bush River Watershed Management Plan

A.1.5 HIGH PRIORITY – STRUCTURAL BMPS (COUNTY OWNED)

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0008	Lake Serene	Brookside Drive	MS4 Permit-Required Stormwater Retrofit	206.2	38.5	Proposed Retrofit of SWM0008	A
SWM0283	St Clair	SW Intersection Singer Road & Route 924	MS4 Permit-Required Stormwater Retrofit	18.1	3.4	Proposed Retrofit of SWM0283	B
SWM0141	Emmorton Elementary	2502 Tollgate Parkway	Infiltration Basin	7.7	1.4	Proposed Retrofit of SWM0141	B
SWM0047	Plumtree Estates	E.S. Royal Fern Ct	MS4 Permit-Required Stormwater Retrofit	13.4	2.5	Proposed Retrofit of SWM0047	B
SWM0454	Fallston Rec Complex	1809 Fallston Rd	MS4 Permit-Required Stormwater Retrofit	12.4	2.3	Proposed Retrofit of SWM0454	B
SWM0443	Trails At Gleneagles	Kilmarnock Trail	Wet Pond or Wetland	39.7	7.4	Proposed Retrofit of SWM0443	D

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0274	Forest Lakes Elementary School	100 Osborne Parkway	MS4 Permit-Required Stormwater Retrofit	27.1	5.1	Proposed Retrofit of SWM0274	B
SWM0302	Reckord Road Park	Intersection Of MD 152 And Reckord Road	MS4 Permit-Required Stormwater Retrofit	8.1	1.5	Proposed Retrofit of SWM0302	C
SWM0153	Fallston Volunteer Fire & Ambulance Co. Inc.	2201 Carrs Mill Rd.	Sand Filter	3.9	0.7	Proposed Retrofit of SWM0153	C
SWM0151	Fallston/Jarrettsville Library	N.S. Md. Rt. 152 W. Of Falls Crest Dr.	MS4 Permit-Required Stormwater Retrofit	12.5	2.3	Proposed Retrofit of SWM0151	C
SWM0003	Jarrettsville Volunteer Fire Co.	3825 Federal Hill Road	Infiltration Basin	4.4	0.8	Proposed Retrofit of SWM0003	B
SWM0001	Joppa Magnolia Volunteer Fire Department	1601 Hanson Road	Sand Filter	2.2	0.4	Proposed Retrofit of SWM0001	C
PROP_01	William Paca/Old Post Road ES	2706 Philadelphia Road	Bioretention	1.8	1.1	5 catch basins drain towards grass area, can install curb-cuts to bioretentions in grass islands (3x).	C
PROP_02	George D. Lisby ES at Hillsdale	810 Edmund Street	Micro-Bioretention	0.6	0.5	A single micro-bioretention north of the building, or several rain gardens could work here.	C
PROP_03	Youth Benefits ES	1901 Fallston Road	Bioretention	0.9	0.7	Bioretention at pipe outfall.	B
PROP_06	Jarrettsville ES/Recreation Complex	3818 Norrisville Road	Bioretention	1.4	1.3	Proposed bioretention in median, as well as micro-bio or tree box filters to treat the northern portion of the parking lot.	B
PROP_08	Aberdeen Fire Department	1437 Perryman Road	Raingarden	0.1	0.1	Rain garden adjacent to roof.	B
PROP_09	Fallston Volunteer Fire and Ambulance Inc.	2201 Carrs Mill Road	Micro-Bioretention	0.5	0.3	Bioretention in NW corner of property.	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
PROP_10	Joppa Magnolia Volunteer Fire Company	1403 Old Mountain Road South	Non-Rooftop Disconnect	0.3	0.3	There appears to be a helicopter landing area so standing water must be avoided. Add filter strips to provide non-rooftop disconnect north of building and for helipad.	C
PROP_11	Abingdon - Long Bar Volunteer Fire Department	3813 Washington Avenue	Disconnect	0.3	0.1	Add splash blocks and flow dissipaters as needed to promote roof and driveway disconnect.	D
PROP_12	Alice & William Longley Park	620 Long Bar Harbor and Longley Roads	Bioswale	0.7	0.3	Convert existing swale south of parking lot to a Bioswale to provide WQ benefits for parking lot and rooftop of 4 upstream houses.	D
PROP_13	Flying Point Park	511 Kennard Avenue	Dry Swale	4.8	1.2	Upgrade existing swale to a dry swale or wet swale (pending water table).	C
PROP_14	Bel Air MS	99 Idlewild Street	Step Pool Conveyance System	19.3	9.2	Step Pool Conveyance System downstream of the existing outfalls. It may be possible to move outfall upstream.	D
PROP_15	Hollywoods Park	Holly Oak Circle	Tree Box Filters	0.4	0.4	Tree Box filter at existing storm drain inlet at the north of the existing parking lot.	C
PROP_16	Lyn Stacie Getz Creative Playground	301 West Ring Factory Road	Micro-Bioretenention	0.2	0.2	Curb cut to micro-bioretenention in existing grass median.	B
PROP_17	Lyn Stacie Getz Creative Playground	301 West Ring Factory Road	Micro-Bioretenention	0.5	0.4	Implement micro-bioretenention at location of existing Riprap transition to grass area.	B
PROP_18	Mountain Road Park	2301 Singer Road	Micro-Bioretenention	0.4	0.2	Runoff from parking lot drains o grass swale to south. Add Micro-bioretenention downstream.	A
PROP_19	Mountain Road Park	2301 Singer Road	Non-Rooftop Disconnect	0.1	0.1	Disconnect basketball court (possibly add filter stip downstream)	A
PROP_20	Plater Street Park	Plater Street	Disconnect	0.1	0.1	Disconnect roof and driveway by implementing filter strips and splash blocks.	D

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
PROP_21	William N. McFaul Activity Center	525 W. MacPhail Road	Micro-Bioretentation	0.6	0.5	Implement Micro-Bioretentation in existing grass area northeast of activity center.	B
PROP_22	William N. McFaul Activity Center	525 W. MacPhail Road	Micro-Bioretentation	0.6	0.3	Implement Micro-Bioretentation in existing grass area northwest of parking area	B
PROP_23	William N. McFaul Activity Center	525 W. MacPhail Road	Micro-Bioretentation	1.3	1.2	Implement multiple Micro-Bioretentations in the southern parking lot in existing grass areas.	B
PROP_24	Abingdon Water Treatment Plant	1538 Perryman Road	Sand Filter	1.6	0.7	Install Sand Filter toward the north of property where runoff drains currently.	D
PROP_25	Forest Hill Recreation Complex	21 Rock Spring Church Road	Step Pool Conveyance System	3.7	2.1	Install Step Pool Conveyance system downstream of 2 outfalls.	B
OUT_01	Arden Dr Step Pool Conveyance System	NW of the intersection of Arden Dr and Oakmont Rd	Step Pool Conveyance System	8.3	2.1	Implement SPCS between outfall and driveway culvert on County Property.	C
OUT_02	Jenny Road Sand Filter	W of the intersection of Jenny Rd & N Tollgate Rd	Sand Filter	2.6	0.5	Implement Sand Filter in open space downstream of outfall.	D
OUT_03	Summershade Ct Step Pool Conveyance System	W of the Summershade Ct cul-de-sac.	Step Pool Conveyance System	10.0	3.0	Implement SPCS W of Summershae Ct., DA is approx. 13.9 AC, but assume credit for only 10 AC.	C
OUT_04	Friendship Park Wet Pond Retrofit	South of Singer Rd in Constant Friendship Park	MS4 Permit-Required Stormwater Retrofit	21.9	2.1	There appears to be an existing wet pond downstream of this outfall that could be retrofit.	C
OUT_05	Church Creek Elementary Step Pool Conveyance System	Church Creek Elementary School S of Riverside Pkwy	Step Pool Conveyance System	10.0	7.2	A SPCS could be implemented downstream of the existing outfall. The DA is approx. 18.7 AC, but assume on 10 AC could be treated.	A
OUT_06	Stockett Square Step Pool Conveyance System	Church Creek Elementary School W of Stockett Square	Step Pool Conveyance System	2.6	1.0	A small SPCS could be implemented downstream of the existing outfall, possibly connecting to the proposed SPSC to the north.	D

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_07	Cristfield Dr Step Pool Conveyance System	W of Crisfield Dr	Step Pool Conveyance System	10.0	3.7	SPCS between outfall and Winters Run. DA is approx. 13.4 AC, but assume only 10 AC is treated.	B
OUT_08	Easview Ter Step Pool Conveyance System	S of Eastview Ter	Step Pool Conveyance System	9.8	5.1	SPCS between outfall and Winters Run.	B
OUT_09	Sand Filter W of Declaration Cir-A Loop	W of Declaration Cir-B Loop	Sand Filter	3.1	1.5	Implement Sand Filter in the mild sloped area downstream of the existing outfall.	C
OUT_10	Old Post Road School Step Pool Conveyance System	2706 Philadelphia Road	Step Pool Conveyance System	5.0	1.6	A SPCS could be implemented downstream of the existing outfall flowing toward Deep Sea Branch.	C
OUT_11	Seagull Dr Step Pool Conveyance System	W of Seagull Dr	Step Pool Conveyance System	5.1	2.1	A SPCS could be implemented	D
OUT_12	Kingston Ct Step Pool Conveyance System	W of Kingston Ct	Step Pool Conveyance System	10.0	5.2	A SPCS could be implemented downstream of the outfall. DA is approx. 17.5 AC, but assume only 10 AC could be treated.	C
OUT_13	Gilway Ct Step Pool Conveyance System	E of Gilway Ct	Step Pool Conveyance System	8.3	4.3	A SPCS could be implemented downstream of the outfall.	C
OUT_14	Edgewood High School Sand Filter	Edgewood High School, north of Railroad	Sand Filter	7.8	2.6	Implement sand filter at existing outfall and/or provide WQv conveyance to sand filter.	D
OUT_15	Edgewood Middle School	Edgewood Middle School, southwest of existing wet pond.	Extended Detention Wetland	39.2	11.6	An extended detention wetland could be implemented in the existing low area upstream of the railroad culvert.	C
OUT_16	Jarrettsville Elementary School Bioretention	Jarrettsville Elementary School /Recreation Complex S of Norrisville Rd	Bioretention	4.7	3.1	There appears to be an existing pond in the area that is not in th BMP database, consider retrofitting to a bioretention.	B
OUT_17	John Archer School Bioretention	100 Thoms Run Rd, John Archer School	Bioretention	4.0	2.3	A bioretention could be implemented at the southeast corner of the property at the existing outfall.	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_18	Fallston High School Step Pool Conveyance System (north)	Fallston High School northeast of the track	Step Pool Conveyance System	10.0	3.8	A SPSC could be implemented downstream of the existing outfall. DA is approx 14.6, but assume only 10 AC can be treated.	D
OUT_19	Fallston High School Step Pool Conveyance System (South)	Fallston High School southwest of the track	Step Pool Conveyance System	4.0	2.2	A SPSC could be implemented downstream of the existing outfall.	B
OUT_20	Homestead/Wakefield Elementary School Bioretention	North of W Macphail Rd, Homestead/Wakefield Elementary School	Bioretention	4.9	2.7	Runoff appears to leave the existing outfall as sheet flow, implement bioretention southwest of the existing tennis courts.	B
OUT_21	Brookside Dr Step Pool Conveyance System	E of the intersection of Crimson Tree Way & Brookside Dr	Step Pool Conveyance System	6.9	3.5	A SPSC could be implemented downstream of the existing outfall east of Brookside Dr.	C
OUT_82	Timberlea Dr Step Pool Conveyance System	N of Timberlea Dr	Step Pool Conveyance System	8.7	1.2	A SPSC could be implemented downstream of the existing outfall. Existing colluvial channel may be on County or Private property.	C
OUT_83	Ring Factory Elementary School Sand Filter	W of Ring Factory Elementary School	Sand Filter	5.3	2.4	Upgrade eastern half of the existing depression (not on BMP inventory) to a sand filter. The western half could remain as a dry pond since it is downstream of a proposed retrofit.	C
OUT_85	Sassafras Ct Step Pool Conveyance System	W of Sassafras Ct	Step Pool Conveyance System	5.4	1.7	Implement SPCS downstream of existing outfall on County Property.	B
OUT_84	Deadora Rd Step Pool Conveyance System	W of intersection of Deadora Rd and Cypress Dr	Step Pool Conveyance System	9.9	3.0	Implement SPCS downstream of existing outfall on County Property.	C
OUT_92	Easton Ct Step Pool Conveyance System	SW of Easton Ct	Step Pool Conveyance System	7.1	2.3	A SPSC could be implemented downstream of the existing outfall.	A

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_94	Armstrong St Step Pool Conveyance System	SW of the intersection of Brown St and Armstrong St	Step Pool Conveyance System	10.0	4.1	A SPSC could be implemented downstream of the existing outfall on County Property. DA is approx 15.2 AC, but assume credit for only 10 AC.	D
Bynum_CP -1	William S. James Elementary School Tree Box Filter	1 Laurentum Parkway	Tree Box Filter	0.8	0.8	Two inlets that can be retrofitted with tree box filters to treat the driveway at the entrance	B
Bynum_CP -3	East OF Forest Hill Annex Bioretention	101 Industry Lane	Bioretention	0.8	0.6	There is open space available at the east end of the parking lot to add a bioretention	B
Bynum_CP -5	C. Milton Wright High School SPSC	1301 N Fountain Green Rd	SPSC	20.3	8.9	Majority of the property drains to the outfall on the southwest corner. A channel runs downstream of the outfall until confluence with the stream. Good place for SPSC at OF001309	B
Bynum_CP -6	Abingdon Fire Company Bioretention	1311 Abingdon Road	Bioretention	1.3	0.8	Bioretention to treat rooftop runoff and parking lot in front of the building. The grass area in front of the building available for implementation.	B
Bynum_CP -6A	Abingdon Fire Company Permeable Pavement	1311 Abingdon Road	Permeable Pavement	0.7	0.6	Parking lot can be converted to permeable pavement.	C
Bynum_CP -7	Southampton Middle School Bioretention	1321 Moores Mill Road	Bioretention	1.1	0.4	Bioretention to treat parking lot runoff, open area available	B
Bynum_CP -7A	Southampton Middle School Bioretention	1321 Moores Mill Road	Bioretention	6.0	4.3	Multiple bio-filtering practices can be implemented in the open area around the building to treat rooftop runoff and parking lot runoff	B
Bynum_CP -9	County Property on 45 E Gordon Street Micro-Bioretention	45 E Gordon Street	Micro-Bioretention	0.3	0.1	Micro-bioretention to treat a portion of the roof	B
Bynum_CP -10	County Property on 503 Bynum Road Bioretention/Sand Filter	503 Bynum Road	Sand Filter	0.1	0.1	A filtration practice can be implemented to treat runoff from the entire building and also a portion of the driveway.	D

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
Bynum_CP -11	Harford County Animal Control Division Bio-Swale	611 Fountain Green Rd	Bio-Swale	3.6	2.0	Half of the property draining to a grass area along the road. Potential for bio-swale.	D
Bynum_CP -12	County Property on 621A Hickory Overlook Drive Bioretention	621A Hickory Overlook Drive	Bioretention	0.3	0.1	Bioretention to treat half of drive way and the buildings. Infiltration not possible as it is C/D soils.	D
Bynum_CP -12A	County Property on 621A Hickory Overlook Drive Permeable Pavement	621A Hickory Overlook Drive	Permeable Pavement	0.2	0.1	The lower portion of the driveway drains to the wooded area on the east. Potential for permeable pavement.	C
Bynum_CP -13	County Property on Wright Street Micro-bioretention	Wright Street	Micro-bioretention	0.2	0.2	County parking lot can be treated by adding a micro bioretention at the east corner next to the entrance.	C
Bynum_CP -14	Bel Air Elementary School Bioretention	30 E Lee Street	Bioretention	3.4	2.1	A flow splitter can be added to the inlet near the median and divert the flow to the open area southeast of the property.	B
Bynum_CP -14A	Bel Air Elementary School Downspout Disconnection and Micro-Bio	30 E Lee Street	Downspout Disconnection and Micro-Bio	0.2	0.1	Downspouts from the rooftop of East portion of the building can be disconnected and a micro-bioretention can be implemented	B
Bynum_CP -15	Wakefield Elementary School Downspout Disconnection & landscape infiltration	900 S Main Street	Downspout Disconnection & landscape infiltration	0.4	0.3	HSG B soils in the area , so potential for downspout disconnection and landscape infiltration	B
Bynum_CP -16	County Property on S Conowingo Road Bio-Swale	S Conowingo Road	Bio-Swale	3.0	2.7	A bioswale can be implemented downstream of the existing outfall. Topo looks suitable for implementation.	C
Bynum_CP -17	County Property on Courtland & Burns Alley Permeable Pavements	Courtland & Burns Alley	Permeable Pavements	0.2	0.2	Permeable pavements possible option as there is not much open area available for other practices	B
Bynum_CP -18	County Property on 11 W Courtland Street Permeable Pavements	11 W Courtland Street	Permeable Pavements	0.1	0.1	Permeable pavements possible option as there is not much open area available for other practices	B
Bynum_CP -19	County Property on 112 S Hickory Avenue Permeable Pavements	112 S Hickory Avenue	Permeable Pavements	0.2	0.2	Permeable pavements possible option as there is not much open area available for other practices	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
Bynum_CP-20	County Property on Wheel & Emmorton Road Bioretention	Wheel & Emmorton Road	Bioretention	0.2	0.2	Bioretention can be implemented to treat portion of Old Emmorton Road which is a County road.	C
Bynum_CP-21	County Property Off Mardic Drive Infiltration Trenches	Off Mardic Drive	Infiltration Trench	0.6	0.2	Possibility to treat the road parcel using infiltration practices as the soils are HSG B in the area.	D
Bynum_CP-22	Fountain Green Elementary School Pond to Filtering Practice	E Fountain Green Road	Pond to Filtering Practice	3.6	1.9	Portion of parking lot drains to this unidentified pond. Potential to retrofit to provide water quality.	C
Bynum_CP-25	County Senior Citizen Center Micro-Bioretentions	145 N Hickory Avenue	Micro-Bioretentions	0.6	0.3	Micro-bioretention can be implemented to treat up to 0.5 acres.	B
Bynum_CP-26	County Public Library-Bel Air Permeable Pavement	100 E Pennsylvania Ave	Permeable Pavement	0.5	0.4	Potential to convert parking lot to permeable pavement to treat portion of rooftop and parking lot runoff as well.	B
Bynum_CP-27	County Property on 611 E Wheel Road Sand Filter	611 E Wheel Road	Sand Filter	0.6	0.4	Potential to treat a portion of runoff from Wheel Road	D
Bynum_CP-28	County Property on 703 Wheel Road Sand Filter	703 Wheel Road	Sand Filter	0.2	0.2	Potential to treat a portion of runoff from Wheel Road	C
Bynum_CP-30	Fountain Green Elementary School Micro-bioretention	517 S Fountain Green Road	Micro-bioretention	0.4	0.4	Micro-bioretention to treat portion of rooftop	C
Bynum_CP-30A	Fountain Green Elementary School Micro-bioretention	517 S Fountain Green Road	Micro-bioretention	0.4	0.4	Micro-bioretention to treat parking lot	C
Bynum_CP-31	County Property on 121 S Main Street Permeable Pavements	121 S Main Street	Permeable Pavements	1.7	1.6	Permeable pavements possible option as there is not much open area available for other practices	B
SWM000164	Fountain Green Elementary School Retrofit	517 S Fountain Green Rd	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
BYNUM_OF-17	C. Milton Wright High School Sand Filter	C. Milton Wright High School, 1301 Fountain Green Road	Sand Filter	1.6	1.0		C
BYNUM_OF-18	Malku's Way SPSC	South of Malku's Way	SPSC	4.7	2.0		B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
BYNUM_OF-19	E. Broadway Sand Filter	North of E. Broadway	Sand Filter	6.6	2.2		C
BYNUM_OF-33	Briarcliff Lane across Rolling Place SPSC	East of Briarcliff Lane across Rolling Place	SPSC	10.0	2.3		B
BYNUM_OF-35	Glenangus Drive Sand Filter	South of Glenangus Drive	Sand Filter	7.8	2.5		C
BYNUM_OF-49	Brewster Drive SPSC	End of Brewster Drive	SPSC	5.3	1.6		B
BYNUM_OF-17	C. Milton Wright High School Sand Filter	C. Milton Wright High School, 1301 Fountain Green Road	Sand Filter	1.6	1.0		C
BYNUM_OF-18	Malku's Way SPSC	South of Malku's Way	SPSC	4.7	2.0		B
BYNUM_OF-19	E. Broadway Sand Filter	North of E. Broadway	Sand Filter	6.6	2.2		C
BYNUM_OF-33	Briarcliff Lane across Rolling Place SPSC	East of Briarcliff Lane across Rolling Place	SPSC	10.0	2.3		B

A.1.6 HIGH PRIORITY – STREAM RESTORATION PROJECTS

Project ID	Project Name	Location	Length of Restoration (feet)	Notes/Source
PROP_27	Approximately 1 Mile of Stream Restoration Within Watershed (optimized to meet Phosphorous requirements).	High risk streams within Harford County	4,576	Streams within the Bush River Watershed.

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A.1.7 MEDIUM PRIORITY – STRUCTURAL BMPS (COMMUNITY OWNED)

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0549	Lord Willoughbys Rest Pond 2	Bagnell Court	MS4 Permit-Required Stormwater Retrofit	10.9	2.0	Proposed Retrofit of SWM0549	D
SWM0548	Lord Willoughbys Rest Pond 1	Broadneck Crossing Road	MS4 Permit-Required Stormwater Retrofit	25.4	4.7	Proposed Retrofit of SWM0548	D
SWM0586	Forest Oaks Ph 1	Siwanoy Drive	MS4 Permit-Required Stormwater Retrofit	13.2	2.5	Proposed Retrofit of SWM0586	D
SWM0550	Lord Willoughbys Rest Pond 3	Profit Path	MS4 Permit-Required Stormwater Retrofit	17.4	3.2	Proposed Retrofit of SWM0550	D
SWM0607	Park Farm Beach Sec 2	Oakdale Ave	Sand Filter	7.7	1.4	Proposed Retrofit of SWM0607	D
SWM0397	Park Farm Beach Sec 1 Pond 1	Poplar Grove Avenue	MS4 Permit-Required Stormwater Retrofit	12.0	2.2	Proposed Retrofit of SWM0397	C
SWM0554	Smiths Landing	Smiths Landing Court	MS4 Permit-Required Stormwater Retrofit	10.1	1.9	Proposed Retrofit of SWM0554	C
SWM0291	Bata Business Center-Lot 2	East Side Of Bata Boulevard	"MS4 Permit-Required Stormwater Retrofit	19.2	3.6	Proposed Retrofit of SWM0291	B
SWM0445	Vanguard Prop Pond 1	Between Emmorton Rd And Woodspring Dr	Sand Filter	5.3	1.0	Proposed Retrofit of SWM0445	C
SWM0341	Constant Friendship Ii	Dunnigan Drive	MS4 Permit-Required Stormwater Retrofit	25.0	4.7	Proposed Retrofit of SWM0341. Based on available space assume only 25 Acre could be treated, although 50 is currently being treated.	B
SWM0391	Monmouth Meadows Ph 1 Pond 1	End Of Isle Drive	MS4 Permit-Required Stormwater Retrofit	11.3	2.1	Proposed Retrofit of SWM0391	B
SWM0432	Monmouth Meadows Ph 1 Pond 4	Northside Montrose Way And Scottish Isle Drive	MS4 Permit-Required Stormwater Retrofit	11.6	2.2	Proposed Retrofit of SWM0432	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0392	Monmouth Meadows Ph 1 Pond 2	Behind Townhouses Glenroths Drive	Infiltration Basin	9.8	1.8	Proposed Retrofit of SWM0392	B
SWM0873	Monmouth Meadows Ph 1 Pond 3	Kirkaldy Way	Infiltration Basin	7.0	3.7	Proposed Retrofit of SWM0873. From DA estimated Polygon: DA = 7 AC, IA = 3.7	B
SWM0602	Monmouth Meadows Ph 1 Pond 5	Montrose Way	MS4 Permit-Required Stormwater Retrofit	18.6	3.5	Proposed Retrofit of SWM0602	B
SWM0494	Seven Trails	Seven Trails Circle	MS4 Permit-Required Stormwater Retrofit	19.3	3.6	Proposed Retrofit of SWM0494	D
SWM0466	Hollywoods Ph1 Pond 1	Bristle Cone Circle	MS4 Permit-Required Stormwater Retrofit	6.4	1.2	Proposed Retrofit of SWM0466	C
SWM0468	Hollywoods Ph1 Pond 3	Holly Oak Circle Across From Bristle Cone Circle	Sand Filter	3.7	0.7	Proposed Retrofit of SWM0468	C
SWM0467	Hollywoods Ph1 Pond 2	Holly Oak Circle	MS4 Permit-Required Stormwater Retrofit	9.4	1.8	Proposed Retrofit of SWM0467	C
SWM0003 12	Bright Oaks Apartments Section 2	Next To 210 Royal Oak Dr	MS4 Permit-Required Stormwater Retrofit	10.0	1.9	Proposed Retrofit of SWM000312	D
SWM0470	West Valley Oaks	End Of South Dahlia Court	MS4 Permit-Required Stormwater Retrofit	48.1	9.0	Proposed Retrofit of SWM0470. The Pond is approx. 12 feet deep with SA of over 18,000 SF and appears to be large enough to treat the 48 acres	B
SWM0581	East Valley Oaks	Oak Valley Drive	MS4 Permit-Required Stormwater Retrofit	13.2	2.5	Proposed Retrofit of SWM0581	B
SWM0890	Fairwind Farms Section 5 & 6	Rosefield Court	MS4 Permit-Required Stormwater Retrofit	14.4	5.8	Proposed Retrofit of SWM0890. Constructed prior to 2002, repaired in 2013. From DA estimated Polygon: DA = 14.4 AC, IA=5.8	B
SWM0509	Fallston Valley Farms Pond 1	Ryan Road	MS4 Permit-Required Stormwater Retrofit	20.0	3.7	Proposed Retrofit of SWM0509	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0517	Fallston Valley Farms Pond 3	Hidden Valley Court	MS4 Permit-Required Stormwater Retrofit	25.0	4.7	Proposed Retrofit of SWM0517. Based on available space assume only 25 acres could be treated.	B
SWM0510	Fallston Valley Farms Pond 2	Coachman Court	MS4 Permit-Required Stormwater Retrofit	50.0	9.3	Proposed Retrofit of SWM0510. The pond is approx. 12 feet deep with SA over 30,000 SF, assume can treat 56 AC DA	B
SWM0514	Saddle View Pond 1	Saddle View Way	MS4 Permit-Required Stormwater Retrofit	10.7	2.0	Proposed Retrofit of SWM0514	C
SWM0161	Forest Lakes Section 6	S.W. Corner Bear Creek & Bear Cabin	Wet Pond or Wetland	50.0	9.3	Proposed Retrofit of SWM0161. The pond is approx. 10 ft deep with SA over 25,000, assume can treat 50 Max	C
SWM0380	Forest Lakes Section 10 +	Garden Drive	MS4 Permit-Required Stormwater Retrofit	52.0	9.7	Proposed Retrofit of SWM0380. The pond is approx. 14 feet deep with SA over 30,000, assume can treat entire DA	C
SWM0675	Ridgefield Farms Main Pond	Twin Lakes Drive	Sand Filter	7.3	1.4	Proposed Retrofit of SWM0675	C
SWM0657	Ridgefield Farms Minor Pond	Twin Lakes Drive	Infiltration Basin	6.3	1.2	Proposed Retrofit of SWM0657	B
SWM0658	Centennial Oaks Pond 2	South Laura Court	MS4 Permit-Required Stormwater Retrofit	21.3	4.0	Proposed Retrofit of SWM0658	B
SWM0481	Centennial Oaks Pond 1	Wiley Oak Drive	MS4 Permit-Required Stormwater Retrofit	30.9	5.8	Proposed Retrofit of SWM0481. Large pond, with potential room to expand	B
SWM0139	Emmorton Baptist Church	106 A Plumtree Rd.	Sand Filter	7.1	1.3	Proposed Retrofit of SWM0139	C
SWM0228	Holy Communion Lutheran Church	621 Old Fallston Rd.	Sand Filter	1.9	0.4	Proposed Retrofit of SWM0228	C
SWM0325	Northern Chesapeake Unitarian Universalist Society	Edsd	Sand Filter	2.3	0.4	Proposed Retrofit of SWM0325	C
SWM0507	Saddle View Way	Saddle View Pond 2	MS4 Permit-Required Stormwater Retrofit	28.2	5.3	Proposed Retrofit of SWM0507	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0131	Durham Manor Section 1	S. Of Dellcrest W. Of Ross Rd.	Infiltration Basin	7.9	1.5	Proposed Retrofit of SWM0131	B
SWM0162	Forest Lakes Section 7 Phase 1 & 2	Osborne Parkway 300 Ft W. Of Md. Rt. 24	MS4 Permit-Required Stormwater Retrofit	100.0	18.7	Proposed Retrofit of SWM0162. Pond is approx. 14-16 feet deep, with approx. top SA over 4 AC. Assume can treat ~100 acres.	C
SWM0120	Brentwood Park Dr.	N.S. Brentwood Park Dr. Opposite Barrymore	MS4 Permit-Required Stormwater Retrofit	125.0	23.3	Proposed Retrofit of SWM0120. Pond is approx. 15-20 feet deep, SA 7-10 acres, assume can treat 125 acres.	B
SWM0072	Victorious Faith Fellowship Church	106 Rock Spring Church Rd.	Infiltration Basin	6.2	1.2	Proposed Retrofit of SWM0072	B
SWM0446	Victorious Faith Fellowship	106 Rock Spring Church Rd	Infiltration Basin	2.5	0.5	Proposed Retrofit of SWM0446	B
SWM0154	Fellowship Chapel	3821 Federal Hill Rd.	Infiltration Basin	2.2	0.4	Proposed Retrofit of SWM0154	B
SWM0132	Durham Manor Section 2	S.S. Dellcrest W. Of Annatanna	MS4 Permit-Required Stormwater Retrofit	75.0	14.0	Proposed Retrofit of SWM0132. Pond is approx. 8 feet deep, with SA approaching 10 AC. Assume it could treat 75 AC.	C
SWM0133	Edgewood Assembly Of God	803 Edgewood Rd	Infiltration Basin	8.1	1.5	Proposed Retrofit of SWM0133	B
SWM000048	PONDEROSA ESTATES	N. OF W. MACPHAIL RD. & MACPHAIL CT. N.	MS4 Permit-Required Stormwater Retrofit	26.1	4.9	Proposed Retrofit of SWM000048	D
OUT_22	Cedar Dr Step Pool Conveyance System	N of the intersection of Cedarwood Dr and Pearwood Dr	Step Pool Conveyance System	9.9	3.7	A SPSC could be implemented starting from the County property through the HOA property.	C
OUT_23	Poplarwood Ct Cedar Dr Step Pool Conveyance System	W of Polarwood Ct	Step Pool Conveyance System	2.4	0.8	A SPSC could be implemented downstream of the existing outfall, and may intersect the proposed Cedar Dr SPCS	B
OUT_24	Yvette Dr Step Pool Conveyance System	NW of the intersection of Yvette Dr and Yvette Ct	Step Pool Conveyance System	5.9	1.9	A SPSC could be implemented downstream of the existing outfall toward Bear Cabin Branch.	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_25	Delray Dr Dual Sand Filters	NW of Delray Dr	Sand Filter	14.7	5.8	Dual sand filters with a shared sediment basin could be implemented at the outfall upstream of Bear Cabin Branch.	C
OUT_26	Delrary Dr Step Pool Conveyance System 1	NW of the intersection of Delray Dr & Osborne Pkw	Step Pool Conveyance System	9.3	4.4	A SPCS could be implemented downstream of the existing outfall toward Bear Cabin Branch.	B
OUT_27	Delrary Dr Step Pool Conveyance System 2	At the intersection of Delray Dr & Osborne Pkwy	Step Pool Conveyance System	2.2	1.2	A SPCS could be implemented downstream of the existing outfall toward Bear Cabin Branch, it may overlap with another proposed SPCS.	B
OUT_28	Brandy Dr Step Pool Conveyance System 1	W of intersection of Brandy Dr & Tiffany Ter	Step Pool Conveyance System	5.0	2.7	A SPSC could be implemented downstream of the existing outfall toward Bear Cabin Branch.	B
OUT_29	Brandy Dr Step Pool Conveyance System 2	N of Brandy Dr	Step Pool Conveyance System	10.0	4.9	A SPSC could be implemented downstream of the existing outfall, DA=12.8, assume 10 AC treated. It may join a channel downstream of a nearby SWM facility on County owned property.	C
OUT_30	Bear Creek Dr Step Pool Conveyance System	E of the intersection of Bear Creek Dr & Yvette Dr	Step Pool Conveyance System	7.9	2.5	A SPSC could be implemented downstream of the existing outfall toward Bear Cabin Branch.	B
OUT_31	Beth Bridge Circle Step Pool Conveyance System	NW of Beth Bridge Cir	Step Pool Conveyance System	4.3	2.1	A SPSC could be implemented downstream of the existing outfall toward an unnamed tributary to Bear Cabin Branch. The slopes near the outfall are too steep to implement a BMP in the open space.	B
OUT_32	Beth Bridge Cir Bioretention	N of parking lot N of the intersection of Dellcrest Dr and Beth Bridge Cir	Bioretention	1.0	0.4	A bioretention could be implemented by implementing a curb cut an the existing catch basin inlet, or by implementing a bioretention at the outfall.	B
OUT_33	Singer Woods Dr Wet Pond Retrofit	W of Singer Woods Dr	MS4 Permit-Required Stormwater Retrofit	15.2	3.9	There is what appears to be an existing wet pond on HOA property that could be retrofit to provide WQ benefits (S of playground).	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_34	Laurel Woods Dry Swale	NW of the intersection of Laurel Woods Dr and Singer Woods Dr	Grass Swale	3.1	0.8	The outfall drains to an existing channel on HOA property that could be upgraded to a Dry Swale to provide WQ benefits.	B
OUT_35	Greenwich Ct Step Pool Conveyance System	S of Greenwich Ct	Step Pool Conveyance System	7.3	2.2	A SPSC could be implemented downstream of the existing outfall toward Unnamed Tributary to Bush River.	B
OUT_36	Danbury Square Bioretention	SE of Danbury Square	Bioretention	2.1	1.4	A bioretention could be implemented either at the existing outfalls, or curb cuts could be implemented at the existing catch basins to multiple bioretention facilities.	A
OUT_37	Tolchester Ct Sand Filter	S of Tolchester Ct	Sand Filter	2.3	1.4	Bioretentions and Tree Box filters could be implemented adjacent to existing catch basins or a flow splitter could be provided to a Sand Filter at the northern of the two connected outfalls.	C
OUT_38	Crisfield Ct Step Pool Conveyance System	NE of Crisfield Ct	Step Pool Conveyance System	3.5	1.0	A SPSC could be implemented downstream of the existing outfall toward Unnamed Tributary to Winters Run.	D
OUT_39	Hampton Hall Ct Bioretention	S of Hampton Hall Ct	Bioretention	3.0	1.2	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream of outfall (in open space/at existing catch basins)	D
OUT_40	Talbott Square Step Pool Conveyance System	S of Talbott Square	Step Pool Conveyance System	4.9	1.8	A SPSC could be implemented downstream of the existing outfall toward Bush Creek.	C
OUT_41	Greys Run Cir Step Pool Conveyance System	S of the intersection of Greys Run Cir and Horner Ln	Step Pool Conveyance System	9.7	3.9	A SPSC could be implemented downstream of the existing outfall toward Bush Creek.	C
OUT_42	Ashmead Square Bioretention	Within, and S of Ashmead Square	Bioretention	2.4	1.1	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream of outfall (in open space/at existing catch basins)	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_43	Angel Valley Ct N SPCS	NW of the intersection of Clover Valley Way & Angel Valley Ct N	Step Pool Conveyance System	10.0	4.6	A SPSC could be implemented downstream of the existing outfall, primarily on County Owned property. DA is approx. 17.6 AC, but assume only 10 AC could be treated.	D
OUT_44	Waltman Rd Step Pool Conveyance System	E of the intersection of Ashby Square Dr & Walman Rd	Step Pool Conveyance System	6.5	3.4	A SPSC could be implemented downstream of the existing outfall.	D
OUT_45	Berg Way Sand Filter	E of Berg Way	Sand Filter	2.6	1.2	There appears to be an existing dry pond (not in any BMP inventory) that could be retrofit to a Sand Filter.	C
OUT_46	Ebbtide Dr Pond Retrofit	Area enclosed by Ebbtide Dr, Harbour Oak Dr, and Sounding Dr	MS4 Permit-Required Stormwater Retrofit	28.7	11.2	Retrofit existing pond (no BMP data available) to provide WQ benefit.	D
OUT_47	Harford Town Dr Sand Filter	SW of intersection of Harford Town Dr & Bush Rd	Sand Filter	1.8	0.7	The existing 2 catch basins drain to depression that could be converted to a Sand Filter.	C
OUT_48	Medallion Ct Step Pool Conveyance System	E of Medallion Ct cul-de-sac	Step Pool Conveyance System	10.0	0.9	A SPSC could be implemented downstream of the existing outfall toward Bear Cabin Branch.	B
OUT_49	Willow Bend Dr Bioretention	Lake Front Dr and Willow Bend Dr	Bioretention	4.6	2.6	Combination of Bioretentions, micro-bioretentions, and tree box filters in the Willow Bend Dr/Lake front Drive (in open space and at existing catch basins)	D
OUT_50	Medallion Ct Step Pool Conveyance System 2	NE of the intersection of Medallion Ct and Charisma Ct	Step Pool Conveyance System	15.2	1.3	A SPSC could be implemented downstream of the existing outfall toward Bear Cabin Branch.	C
OUT_51	N Branch Ct Bioretention	N Branch Ct	Bioretention	4.9	2.4	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream of outfall (in open space/at existing catch basins)	B
OUT_52	Stone Mill Ct Bioretention	Stone Mill Ct	Bioretention	2.2	1.4	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream of outfall (in open space/at existing catch basins)	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_53	Eastview Terrace Bioretention	W of Eastview Terrace	Bioretention	2.7	1.3	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream of outfall (in open space/at existing catch basins).	B
OUT_54	Wakefield Dr Wet Pond	W of the intersection of Wakefield Dr and E Belerest Rd	Wet Pond	26.6	6.8	The existing depression NE of the W Heather Rd Culvert could be retrofit into a wet pond. Implementation should not require substantial changes to existing infrastructure.	C
OUT_55	Autumn Harvest Ct Bioretentions	Autumn Harvest Ct and Deerhill Cir	Bioretention	3.5	2.3	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream of outfall (in open space/at existing catch basins)	B
OUT_56	Stratford Rd Sand Filter	E of the intersection of Copeland Rd and Stratford Rd	Sand Filter	10.6	3.3	A sand filter could be implemented at the existing depression (possibly a pond not listed in the BMP databased) downstream of the existing outfall.	D
OUT_57	Agate Dr Bioretention	Agate Dr	Bioretention	2.0	1.4	Combination of Bioretentions, micro-bioretentions, and tree box filters in the Agate Dr area (in open space and at existing catch basins)	B
OUT_58	Viking Ct Step Pool Conveyance System	SW of Viking Ct	Step Pool Conveyance System	10.0	4.4	A SPSC could be implemented downstream of the existing outfall toward an unnamed tributary to Otter Point Creek. The DA is 20.3 AC, but assume only 10 AC can be treated.	C
OUT_59	Mayapple Ct Bioretentions	Mayapple Ct	Bioretention	3.7	2.0	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream of outfall (in open space/at existing catch basins)	B
OUT_60	Dunnigan Dr Step Pool Conveyance System	SE of the intersection of Dunnigan Dr and Beaver Dam Rd	Step Pool Conveyance System	7.6	3.2	A SPSC could be implemented downstream of the existing outfall toward an unnamed tributary to Winters Run.	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_61	Waltman Rd Bioretentions	Waltman Rd about 1/2 way between Ashby Dr and Cardiff Cir	Bioretention	2.6	1.2	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream of outfall (in open space/at existing catch basins).	B
OUT_62	Pumkin Patch Ct Bioretention	SE of Pumkin Patch Ct	Bioretention	1.8	0.4	It may be possible to retrofit existing pond to Bioretention (pond not in BMP databases).	C
OUT_63	Raking Leaf Dr Sand Filter	SW of Raking Leaf Dr	Sand Filter	10.0	3.3	It may be possible to retrofit existing pond to sand filter (pond not in BMP databases).	B
OUT_64	Bernadette Dr Pond Retrofit	NE of the intersection of Osborne Pkwy and Bernadette Dr	MS4 Permit-Required Stormwater Retrofit	36.7	5.0	It may be possible to retrofit the existing pond to provide WQ benefits (pond not in BMP databases).	C
OUT_65	Fairwind Dr Pond Retrofit	NW of the intersection of Fairwind Dr and Foot Hill Rd	MS4 Permit-Required Stormwater Retrofit	30.0	10.7	It may be possible to retrofit the existing pond to provide WQ benefits (pond not in BMP databases). Assume only 30 AC could be treated in available area.	C
OUT_66	Deep Ridge Rd Step Pool Conveyance System	SW of the intersection of Deep Ridge Rd and Fairwind Dr	Step Pool Conveyance System	5.1	1.8	A SPSC could be implemented downstream of the existing outfall.	B
OUT_67	Woodspring Dr Bioretentions (east)	SW of Woodspring Dr Cul-de-sac	Bioretention	5.1	2.8	Provide WQv to a bioretention in the open space adjacent to the northern of the two connected outfalls.	A
OUT_68	Woodspring Dr Bioretentions (west)	S of Woodspring Dr by the NW bend.	Bioretention	0.6	0.5	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream or at the existing outfalls (in open space/at existing catch basins).	C
OUT_69	White Oak Drive Step Pool Conveyance System	SW of White Oak Dr	Step Pool Conveyance System	3.6	1.5	A SPSC could be implemented downstream of the existing outfall.	D
OUT_70	Torey Lane Bioretentions	Along Torey lane S of Marpat Dr	Bioretention	1.9	1.3	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream of outfall (in open space/at existing catch basins)	C
OUT_71	Queensbury Dr Pond Retrofit	NE of the intersection of Queensbury Dr and Stratford Rd	MS4 Permit-Required Stormwater Retrofit	18.1	4.2	It may be possible to retrofit the existing pond to provide WQ benefits (pond not in BMP databases).	D

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_72	Laura Ct Step Pool Conveyance System	S of Laura Ct	Step Pool Conveyance System	3.4	1.1	A SPSC could be implemented downstream of the existing outfall.	B
OUT_73	King James Circle Grass Swale	NW of King James Circle	Grass Swale	4.7	1.7	Upgrade the existing swale downstream of the outfall to a grass swale that meets MDE requirements for water quality credit.	D
OUT_74	King James Circle Bioretentions	Within and West of King James Circle	Bioretention	1.1	0.6	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream or at the existing outfalls (in open space/at existing catch basins).	D
OUT_75	Broadneck Crossing Rd Bioretentions	Adjacent to Broadneck Rossing Rd, and within Crown Cir	Bioretention	5.7	3.0	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream or at the existing outfalls (in open space/at existing catch basins).	D
OUT_76	Lord Willoughby Way Sand Filter	S of the Lord Willoughby Way Cul-de-sac	Sand Filter	2.9	1.3	A sand filter cell could be installed downstream of the existing outfall.	D
OUT_77	Forest View Ct Bioretention	W of Forest View Ct (south of the southernmost house)	Bioretention	1.9	0.9	A bioretention cell could be installed downstream of the existing outfall.	B
OUT_83	Holy Communion Luthern Church Step Pool Conveyance System	N of intersection of Plainfield Dr and Old Fallston Rd	Step Pool Conveyance System	9.9	2.4	A SPSC could be implemented downstream of the existing outfall.	B
OUT_78	Collette Ct Step Pool Conveyance System	NW of the intersection of Yvette Dr and Collette Ct	Step Pool Conveyance System	6.9	2.3	A SPSC could be implemented downstream of the existing outfall toward Bear Cabin Branch.	B
OUT_79	Honeysuckle Dr Step Pool Conveyance System	N of Honeysuckle Dr	Step Pool Conveyance System	8.3	2.9	A SPSC could be implemented downstream of the existing outfall.	A
OUT_80	Dellcrest Dr Step Pool Conveyance System 1	SW of Dellcrest Dr Cul-de-sac	Step Pool Conveyance System	2.7	1.5	A SPSC could be implemented downstream of the existing outfall.	B
OUT_81	Dellcrest Dr Step Pool Conveyance System 2	N of Dellcrest Dr	Step Pool Conveyance System	2.1	1.2	A SPSC could be implemented downstream of the existing outfall.	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
OUT_88	Chapelgate Pl Bioretentions	W portion of Chapelgate Pl	Bioretention	1.4	0.9	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream or at the existing outfalls (in open space/at existing catch basins).	D
OUT_86	Goodson Ct Bioretentions	Goodson Ct	Bioretention	2.5	1.6	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream or at the existing outfalls (in open space/at existing catch basins).	C
OUT_87	Gilmer Ct Bioretentions	Gilmer Ct	Bioretention	4.6	2.0	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream or at the existing outfalls (in open space/at existing catch basins).	B
OUT_89	Perkins Place Bioretentions	NW of intersection of Gilmer Way and Perkins Pl	Bioretention	8.0	3.5	Combination of Bioretentions, micro-bioretentions, and tree box filters upstream or at the existing outfalls (in open space/at existing catch basins).	B
OUT_90	Fairhaven Terrace Bioretention	Fairhaven Terrace Cul-de-sac	Bioretention	2.7	1.4	The single inlet could be partially blocked and a bioretention could be implemented in the HOA owned center of the Fairhaven Terrace cul-de-sac.	B
OUT_91	Herbron Terrace Bioretention	Herbron Terrace Cul-de-sac	Bioretention	2.3	1.1	The single inlet could be partially blocked and a bioretention could be implemented in the HOA owned center of the Herbron Terrace cul-de-sac.	B
OUT_93	Woodsdale Rd Sand Filter	SW of the intersection of Woodsdale Rd and Waldon Rd	Sand Filter	5.8	2.2	A sand filter could be implemented on HOA property downstream of the existing outfall.	D
OUT_95	Caspian Ct Wet Pond	NW of the intersection of Caspian Ct and Otter Creek Rd	Wet Pond	21.4	8.4	Upgrade existing dry pond (not in BMP inventory) to a wet pond to receive WQ credit.	C
SWM0002 23	Hidden Stream Facility 1 Retrofit	Next To 1318 Hidden Stream Dr	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0000 89	Abingdon Reserve Pond 1 Retrofit	Between 3723 & 3715 Federal Ln	MS4 Permit Required Stormwater Retrofit	12.8	2.9	Proposed retrofit within Bynum Run.	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0002 87	Village Of Bynum Run Section 1 Pond 2 Retrofit	End Of Gittings Ct	Sand Filter	7.6	1.7	Proposed retrofit within Bynum Run.	C
SWM0000 85	Woodland Run Pond 2 Retrofit	Next To 3120 Birchbrook La	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0000 84	Woodland Run Pond 1 Retrofit	Next To 321 Eastbend Ct	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0003 59	Woodland Run Pond # 1 Retrofit	Eastbend Ct	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0004 15	Village Of Bynum Run Estates Section 1 Pond 1 Retrofit	Next To 805 Tiffany Ter	MS4 Permit Required Stormwater Retrofit	19.7	4.4	Proposed retrofit within Bynum Run.	D
SWM0002 86	Village Of Bynum Run Section 1 Pond 1 Retrofit	End Of Towson Dr	MS4 Permit Required Stormwater Retrofit	20.3	4.6	Proposed retrofit within Bynum Run.	B
SWM0001 26	Bynum Overlook Pond 1 Retrofit	Next To 911 Deer Ct	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0001 18	Box Hill North Section 7 Retrofit	Behind 34 Mitchell Dr	Sand Filter	7.4	1.7	Proposed retrofit within Bynum Run.	C
SWM0000 40	Overview Manor Pond 2 Retrofit	Behind 305 Lindsay Ct	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0000 39	Overview Manor Pond 1 Retrofit	Behind 2603 Smallwood Ct	Sand Filter	6.3	1.4	Proposed retrofit within Bynum Run.	B
SWM0002 29	Hunters Run Drive Retrofit	Next To 368 Hunters Run Dr	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0003 63	Kings Charter Section 1 Retrofit	Next To 540 David Dr	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0000 06	Kings Charter Retrofit	N.S. David Dr. E. Of Rambler Rd	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0002 59	Glenangus Section 11 12A 12B Retrofit	Behind 1504 Parkland Dr	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0002 95	Glenagnus Section 12B 12C 13 14 Retrofit	Across From 1500 Dunkeld Way	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0001 98	Glen Angus Section 8 & 9 Retrofit	Behind 1402 Royal Troon Ct	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0006 85	Stone Ridge Pond 1 Retrofit	Next To 1307 Forest Oak Ct	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0001 66	Foxborough Farms Section 3 Phase 2 Retrofit	N.S. Foxborough D. W. Of Bennett Pl	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	A
SWM0001 99	Glenwood Garth Retrofit	S.S. Macphail Rd At Ring Factory	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0001 63	Fountain Glen Section 2 Retrofit	Fountain Glen Dr	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0002 03(1)	Greenbrier Hills Section 5 Retrofit	W. Of Vanguard S. Of Royston Pl	MS4 Permit Required Stormwater Retrofit	16.2	3.6	Proposed retrofit within Bynum Run.	D
SWM0003 38	Greenbrier Hills Section 6 Retrofit	Todd Rd And Treadmore Rd	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0000 96	Amyclae Estates Section 1 Pond 1 Retrofit	Across From 1302 Beckett Ct	MS4 Permit Required Stormwater Retrofit	10.4	2.3	Proposed retrofit within Bynum Run.	C
SWM0000 97(1)	Amyclae Estates Section 1 Pond 2 Retrofit	Behind 1204 Bancroft Ct	Sand Filter	7.0	1.6	Proposed retrofit within Bynum Run.	D
SWM0001 16	Birchwood Manor Retrofit	Behind 1357 Crofton Dr	MS4 Permit Required Stormwater Retrofit	18.9	4.3	Proposed retrofit within Bynum Run.	C
SWM0000 37(2)	Old Fields Retrofit	Across From 438 Ellis Ln	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0000 99	Amyclae Estates Section 3 & 4 Retrofit	Behind 1200 Gyros Ct	MS4 Permit Required Stormwater Retrofit	16.4	3.7	Proposed retrofit within Bynum Run.	D
SWM0002 60	Hampton Ridge Pond 3 Retrofit	Behind 1100 Runnymede La	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0002 10	Hampton Ridge Section 3B Pond 4 Retrofit	Behind 1203 Hampton Ridge Ln	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0000 70	Tudor Manor Retrofit	Intersection Rt 543 & Thomas Run Rd	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0000 14	Longmeadow 2 Retrofit	Behind 1013 Shaffner Dr	Sand Filter	5.3	1.2	Proposed retrofit within Bynum Run.	D
SWM0002 09	Hampton Ridge Section 2 Facility #1 Retrofit	N.S. Henderson Rd W. Of Md. Rt. 543	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0000 11	Leeswood Garth Retrofit	Behind 1315 Cheshire Ln	MS4 Permit Required Stormwater Retrofit	11.9	2.7	Proposed retrofit within Bynum Run.	C
SWM0000 12	Leeswood Garth Pond 2 Retrofit	Behind 1339 Cheshire Ln	Sand Filter	5.1	1.1	Proposed retrofit within Bynum Run.	D
SWM0000 73	Village Of Thomas Run Retrofit	Behind 1800 Queen Anne Sq	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0003 82	Hickory Overlook Phase 1 Retrofit	Behind 721 Hickory Limb Cir	MS4 Permit Required Stormwater Retrofit	24.8	5.6	Proposed retrofit within Bynum Run.	C
SWM0004 28	Woodland Run Annex Retrofit	East Side Of Birch Brook Ln	Sand Filter	5.8	1.3	Proposed retrofit within Bynum Run.	C
SWM0004 16	Village Of Bynum Run Estates Section 3 Retrofit	Behind 4001 Off Andrew Ct	MS4 Permit Required Stormwater Retrofit	10.9	2.5	Proposed retrofit within Bynum Run.	C
SWM0001 25	Bynum Overlook Pond 2 Retrofit	Across From Bynum Overlook Dr On Hookers Mill Rd	MS4 Permit Required Stormwater Retrofit	13.8	3.1	Proposed retrofit within Bynum Run.	C
SWM0003 32	Village Of Bynum Run Section 2 Pond 1 Retrofit	Off Hookers Mill Rd	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0003 47	Village Of Bynum Run Estates Section 2 Retrofit	Clarkson Dr	MS4 Permit Required Stormwater Retrofit	11.0	2.5	Proposed retrofit within Bynum Run.	B
SWM0003 33	Village Of Bynum Run Section 2 Pond 2 Retrofit	Off Oak Mill Ct	Sand Filter	6.8	1.5	Proposed retrofit within Bynum Run.	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0000 41	Overview Manor 2 Retrofit	Behind 2608 Rhododendron Dr	MS4 Permit Required Stormwater Retrofit	24.1	5.4	Proposed retrofit within Bynum Run.	B
SWM0004 53	Cedarday Section 2 Phase 1 Retrofit	Behind 925 Sidehill Dr	MS4 Permit Required Stormwater Retrofit	16.2	3.7	Proposed retrofit within Bynum Run.	B
SWM0002 57	Cedarday Section 1 Phase 2 Retrofit	Behind 803 Deep Wood Ct	MS4 Permit Required Stormwater Retrofit	22.2	5.0	Proposed retrofit within Bynum Run.	B
SWM0003 42	Cedar Hill Retrofit	Behind 511 Cedar Hill Ct	MS4 Permit Required Stormwater Retrofit	12.7	2.9	Proposed retrofit within Bynum Run.	B
SWM0000 58	Sable Woods / Southgate / Parsons Ridge Retrofit	Behind 1704 Sable Ct	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0006 21	Stone Ridge Pond 3 Retrofit	Behind 1200 Sparrow Mill Wy	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0004 55	Greenbrier Hills Section 9 Retrofit	Behind 1302 Streamview Ct	MS4 Permit Required Stormwater Retrofit	12.6	2.8	Proposed retrofit within Bynum Run.	B
SWM0004 69	Greenbrier Hills Section 8 Pond 3 Retrofit	Behind 1301 Harling Ct	MS4 Permit Required Stormwater Retrofit	17.7	4.0	Proposed retrofit within Bynum Run.	B
SWM0002 81	Amyclae Estates Section 5 Retrofit	Next To 1344 Agora Pl	MS4 Permit Required Stormwater Retrofit	11.5	2.6	Proposed retrofit within Bynum Run.	C
SWM0002 90(1)	Amyclae East Phases 1-3 Retrofit	NE Corner Of Amyclae Dr & Md 543	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0000 64	Southampton Retrofit	Next To 1411 Banstead Ct	MS4 Permit Required Stormwater Retrofit	24.0	5.4	Proposed retrofit within Bynum Run.	C
SWM0003 22	Irwins Choice Section 1 Pond 3 Retrofit	Behind 904 Felicia Ct	Sand Filter	6.3	1.4	Proposed retrofit within Bynum Run.	D
SWM0001 00	Amyclae Estates Section 6 Pond 5 Retrofit	Behind 318 Sparta Ct	Sand Filter	5.3	1.2	Proposed retrofit within Bynum Run.	D
SWM0003 21	Irwins Choice Section 1 Pond 2 Retrofit	Behind 589 Henderson Rd	MS4 Permit Required Stormwater Retrofit	10.3	2.3	Proposed retrofit within Bynum Run.	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0003 37	Amyclae East Phase 4 Retrofit	Next To 1712 Amyclae Dr	Sand Filter	8.0	1.8	Proposed retrofit within Bynum Run.	B
SWM0004 58	Irwins Choice Section 1 Pond 1 Retrofit	Next To 569 Henderson Rd	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0004 47	Wagners Farm Phase 1 Pond 1 Retrofit	Across From 303 Wagner Rd	MS4 Permit Required Stormwater Retrofit	14.7	3.3	Proposed retrofit within Bynum Run.	B
SWM0004 49	Amyclae East Phase 5 Retrofit	Next To 1806 Amyclae Dr	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0005 43	Henderson Manor Retrofit	Next To 1015 Henderson Manor Ct	MS4 Permit Required Stormwater Retrofit	12.1	2.7	Proposed retrofit within Bynum Run.	B
SWM0002 08(1)	Hampton Ridge Section 2 Pond 2 Retrofit	Behind 1219 Cheshire Ln	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0004 01	Pelhamwood Water Quality Retrofit	Next To 616 Loring Ave	Sand Filter	5.5	1.2	Proposed retrofit within Bynum Run.	B
SWM0003 20	Hickory Overlook Phase 2 Retrofit	Behind 733 Hickory Limb Cir	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0003 29	Spenceola Farms Phase 1 Pond 1 Retrofit	Across From 1733 Chrisara Ct On Spenceola Pkwy	MS4 Permit Required Stormwater Retrofit	20.4	4.6	Proposed retrofit within Bynum Run.	C
SWM0004 08	Spenceola Farms Phase 2 Pond 1 Retrofit	Behind 327 Donald Cir	MS4 Permit Required Stormwater Retrofit	14.2	3.2	Proposed retrofit within Bynum Run.	C
SWM0004 76	Forest Glen Pond 2 Retrofit	Next To 101 Wagner Wy	Sand Filter	7.5	1.7	Proposed retrofit within Bynum Run.	D
SWM0004 75	Forest Glen Pond 1 Retrofit	Next To 16 Wagner Wy	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0000 25	Melrose La. Apts Retrofit	Md. Rt. 23 And Aster La W. Of Melrose La	Bioretention	1.2	0.3	Proposed retrofit within Bynum Run.	B
SWM0003 35	Vineyard Oak North Pond 3 Retrofit	Behind 1011 Saddleback Wy	Sand Filter	9.5	2.1	Proposed retrofit within Bynum Run.	D

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0004 09	Spenceola Farms Phase 2 Pond 2 Retrofit	Next To 2046 Mardic Dr	MS4 Permit Required Stormwater Retrofit	21.3	4.8	Proposed retrofit within Bynum Run.	C
SWM0002 40	Belle Manor Retrofit	Behind 2195 Sewanee Dr	MS4 Permit Required Stormwater Retrofit	16.6	3.7	Proposed retrofit within Bynum Run.	B
SWM0003 48	Tuchahoe Farms Retrofit	Behind 2290 Howland Dr	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0002 56(1)	Cedarday Section 1 Phase 1 Retrofit	Behind 812 Bynum Run Ct	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0004 19	Willow Chase Pond 1 Retrofit	Northwest Corner Wheel Rd And Willow Chase Dr	MS4 Permit Required Stormwater Retrofit	1.4	0.3	Proposed retrofit within Bynum Run.	C
SWM0004 21	Willow Chase Pond 3 Retrofit	West Side Of Willow Chase Dr Adjacent To Lot 45	MS4 Permit Required Stormwater Retrofit	5.5	1.2	Proposed retrofit within Bynum Run.	C
SWM0004 20	Willow Chase Pond 2 Retrofit	North East Corner Of Wheel Rd And Willow Chase Dr	MS4 Permit Required Stormwater Retrofit	2.0	0.4	Proposed retrofit within Bynum Run.	C
SWM0004 22	Willow Chase Pond 4 Retrofit	East Side Of Willow Chase Dr Behind Lot 5	MS4 Permit Required Stormwater Retrofit	8.3	1.9	Proposed retrofit within Bynum Run.	B
SWM0004 23	Willow Chase Pond 5 Retrofit	East Side Of Willow Chase Dr Behind Lot 8	MS4 Permit Required Stormwater Retrofit	7.1	1.6	Proposed retrofit within Bynum Run.	C
SWM0004 30	Willow Chase Pond 11 Retrofit	East Side Of Springvale Ct Behind Lots 13 And 14	MS4 Permit Required Stormwater Retrofit	4.0	0.9	Proposed retrofit within Bynum Run.	B
SWM0004 29	Willow Chase Pond 10 Retrofit	East Side Of Springvale Ct Behind Lot 20 And 21	MS4 Permit Required Stormwater Retrofit	4.0	0.9	Proposed retrofit within Bynum Run.	B
SWM0004 25	Willow Chase Pond 7 Retrofit	South Side Of Springvale Ct Adjacent To Lot 17	MS4 Permit Required Stormwater Retrofit	1.1	0.2	Proposed retrofit within Bynum Run.	C

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0004 27	Willow Chase Pond 9 Retrofit	South Side Of Springvale Ct Adjacent To Lot 18	MS4 Permit Required Stormwater Retrofit	1.6	0.4	Proposed retrofit within Bynum Run.	C
SWM0004 24	Willow Chase Pond 6 Retrofit	North Side Of Springvale Ct Adjacent To Lot 28	MS4 Permit Required Stormwater Retrofit	1.9	0.4	Proposed retrofit within Bynum Run.	B
SWM0004 26	Willow Chase Pond 8 Retrofit	North Side Of Springvale Ct Adjacent To Lot 27	MS4 Permit Required Stormwater Retrofit	4.4	1.0	Proposed retrofit within Bynum Run.	B
SWM0002 54	Vineyard Oak Pond 1 Retrofit	Across From 1320 Valley Oak Way	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0000 45	Philadelphia Station Retrofit	Behind 1400 Federal Garth	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0001 17	Box Hill North Retrofit	Across From 52 Laurentum Pkwy	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0000 09	Laurel Valley Section 2 Phase 1 Retrofit	Merrick Way Cul-De-Sac	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0002 30	Hunters Run Phase 5 Section 1 Pond #2 Retrofit	N.E. Corner Laurel Bush Rd And Point To Point	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0000 69	Todd Lakes Section 1 & 2 Retrofit	S.S. Wheel Rd W. Of Md. Rt. 543	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0006 20	Stone Ridge Pond 2 Retrofit	Behind 1502 Stone Post Ct	MS4 Permit Required Stormwater Retrofit	17.7	4.0	Proposed retrofit within Bynum Run.	C
SWM0004 02	Pelhamwood Retrofit	Behind 616 Loring Ave	MS4 Permit Required Stormwater Retrofit	18.2	4.1	Proposed retrofit within Bynum Run.	D
SWM0002 07	Hampton Ridge Section 1B Pond 1 Retrofit	Next To 905 Henderson Rd	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
BYNUM_ OF-10	Bramble Court Bioretention	West of Bramble Court	Bioretention	1.0	0.5		B

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
BYNUM_OF-11	Othello Court Bioretention	West of Othello Court	Bioretention	3.2	1.5		B
BYNUM_OF-12	Fallstaff Road Sand Filter	East of Fallstaff Road	Sand Filter	1.0	0.4		C
BYNUM_OF-13	Shakespeare Drive Sand Filter	North of Shakespeare Drive	Sand Filter	5.4	2.3		C
BYNUM_OF-14	Fall Staff Court SPSC	End of Fall Staff Court	SPSC	5.0	1.9		C
BYNUM_OF-15	Greenwood Drive SPSC	South of Greenwood Drive	SPSC	10.0	2.3		D
BYNUM_OF-16	Thomas Run Road SPSC	West of Thomas Run Road	SPSC	10.0	2.3		B
BYNUM_OF-2	South of Saddleback Way SPSC	South of Saddleback Way	SPSC	2.6	1.5		D
BYNUM_OF-20	Beckett Court Sand Filter	End of Beckett Court	Sand Filter	1.6	0.8		C
BYNUM_OF-23	Clifton Terrace SPSC	End of Clifton Terrace	SPSC	9.0	3.5		B
BYNUM_OF-24	North Ellicott Drive SPSC	North end of Ellicott Drive	SPSC	2.3	1.1		A
BYNUM_OF-25	Ellicott Drive SPSC	East of Ellicott Drive	SPSC	2.9	0.9		A
BYNUM_OF-26	East Mcphail Road, across Ellicott Drive SPSC	North of East Mcphail Road, across Ellicott Drive	SPSC	10.0	2.3		B
BYNUM_OF-27	Fountain Glen Drive across Sandy Ray Terrace SPSC	Fountain Glen Drive across Sandy Ray Terrace	SPSC	3.6	1.9		D

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
BYNUM_OF-28	West Lochern Terrace Sand Filter	West end of Lochern Terrace	Sand Filter	4.6	2.2		D
BYNUM_OF-29	Fountain Glen Drive next to Loch Carron Way SPSC	Fountain Glen Drive next to Loch Carron Way	SPSC	2.4	1.3		A
BYNUM_OF-3	Oakville Court SPSC	End of Oakville Court	SPSC	1.1	0.5		D
BYNUM_OF-30	Loch Carron Way SPSC	End of Loch Carron Way	SPSC	2.0	1.1		B
BYNUM_OF-31	West Brierhill Estates SPSC	West end of Brierhill Estates	SPSC	3.0	1.6		A
BYNUM_OF-32	West Stone Ridge Way Bioretention	West end of Stone Ridge Way	Bioretention	2.4	1.2		B
BYNUM_OF-34	Ring Factory Road Sand Filter	West of Ring Factory Road across Colony Place	Sand Filter	10.0	2.3		C
BYNUM_OF-36	Glenangus Drive SPSC	East of Glenangus Drive next to Lytham Court	SPSC	5.5	2.0		B
BYNUM_OF-38	Patterson Mill Road SPSC	Patterson Mill Road across Patterson Mill Middle School	SPSC	3.9	2.1		C
BYNUM_OF-4	Montgomery Drive SPSC	South of Montgomery Drive	SPSC	10.0	2.3		C
BYNUM_OF-40	Sand Park Court Sand Filter	North of Sand Park Court	Sand Filter	10.0	2.3		D
BYNUM_OF-41	Fox Hunt Court SPSC	End of Fox Hunt Court	SPSC	1.1	0.5		B
BYNUM_OF-42	Kempton Park Circle SPSC	End of Kempton Park Circle	SPSC	10.0	2.3		B

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
BYNUM_ OF-43	Sedgefield Court Sand Filter	End of Sedgefield Court	Sand Filter	10.0	2.3		B
BYNUM_ OF-44	Chantaway Court SPSC	East of Chantaway Court	SPSC	4.2	1.9		B
BYNUM_ OF-45	Abbey Circle SPSC	End of Abbey Circle	SPSC	1.7	0.9		B
BYNUM_ OF-46	Sutton Place SPSC	End of Sutton Place	SPSC	4.4	1.4		B
BYNUM_ OF-47	Abbey Circle SPSC	East of Abbey Circle across Parliament Drive	SPSC	4.7	1.9		B
BYNUM_ OF-48	Butterfield Drive SPSC	End of Butterfield Drive	SPSC	1.4	0.7		B
BYNUM_ OF-5	Brighton Court Sand Filter	End of Brighton Court	Sand Filter	4.5	1.4		D
BYNUM_ OF-50	Millwright Circle Bioretention	End of Millwright Circle	Bioretention	3.9	2.3		C
BYNUM_ OF-51	Parallel Path SPSC	East of Parallel Path	SPSC	10.0	2.3		C
BYNUM_ OF-52	NorthBurgh-Westra Way SPSC	Northeast of Burgh-Westra Way	SPSC	2.3	1.1		B
BYNUM_ OF-53	Toddsbury Court Bioretention	End of Toddsbury Court	Bioretention	1.6	0.9		B
BYNUM_ OF-54	Burgh-Westra Court and Laurel Bush Road SPSC	At the intersection of Burgh-Westra Court and Laurel Bush Road	SPSC	3.4	1.0		B
BYNUM_ OF-55	Clarkson Drive Sand Filter	End of Clarkson Drive	Sand Filter	2.1	1.0		C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
BYNUM_OF-56	Long Meadow Drive and Parallel Path SPSC	South of Laurel Valley Court between Long Meadow Drive and Parallel Path	SPSC	10.0	2.3		C
BYNUM_OF-57	Lynndale Court and Waterbury Court Sand Filter	End of Lynndale Court and Waterbury Court	Sand Filter	10.0	2.3		B
BYNUM_OF-59	Brierhill Estates Drive Bioretention	East of Brierhill Estates Drive next to Briergreen Court	Bioretention	3.9	2.0		B
BYNUM_OF-6	Manchester Court Sand Filter	End of Manchester Court	Sand Filter	2.1	0.9		C
BYNUM_OF-7	Midwood Court SPSC	End of Midwood Court	SPSC	1.7	0.7		B
BYNUM_OF-8	Crescent Knoll Drive Sand Filter	West of Crescent Knoll Drive	Sand Filter	10.0	2.3		D
BYNUM_OF-9	Dulwich Lane Bioretention	End of Dulwich Lane	Bioretention	1.3	0.7		B

A.1.8 LOW PRIORITY – STRUCTURAL BMPS (PRIVATELY OWNED)

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0305	Perryman Bypass	Perryman Road Between Spesutia Road And Michaelsville Road	Infiltration Basin	17.5	3.3	Retrofit existing infiltration Basin. Assume total DA = SWM DA at this site. Proposed Retrofit of SWM0305	B
SWM0197	Crown Service Center	1902 Emmorton Rd.	Sand Filter	0.7	0.1	Proposed Retrofit of SWM0197	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0050	Refuge Temple Church Of God In Christ	116 Spesutia Road	Sand Filter	0.9	0.2	Proposed Retrofit of SWM0050	C
SWM0364	Cranberry Woods	1401-1409 Cranberry Road	Sand Filter	1.3	0.2	Proposed Retrofit of SWM0364	C
SWM000448	Abingdon Box Hill Family Dentistry	2222 Old Emmorton Rd	Infiltration Basin	1.3	0.2	Proposed Retrofit of SWM000448	B
SWM0269	Bohemian American Federal Savings And Loan	501 Stepney Road	Sand Filter	1.3	0.2	Proposed Retrofit of SWM0269	C
SWM0242	Bottcher America	4600 Mercedes Drive	Sand Filter	1.4	0.3	Proposed Retrofit of SWM0242	C
SWM0247	Royal Farm Store Franklinville	2620 Mountain Rd.	Bioretention	1.7	0.3	Proposed Retrofit of SWM0247	D
SWM0020	Kenilworth Property	1415 Mountain Rd	Infiltration Basin	1.9	0.3	Proposed Retrofit of SWM0020	A
SWM0248	Sleep Inn	1807 Edgewood Rd.	Sand Filter	2.3	0.4	Proposed Retrofit of SWM0248	C
SWM000134	Exxon	1804 Emmorton Rd.	Sand Filter	2.3	0.4	Proposed Retrofit of SWM000134	C
SWM000369	Lands Of Raymond Seward	1814 Walton Road	Bioretention	2.3	0.4	Proposed Retrofit of SWM000369	B
SWM000365	Butz Property	807 Bel Air Rd	Infiltration Basin	2.3	0.4	Proposed Retrofit of SWM000365	B
SWM0111	Bel Forest Nursing & Rehabilitation Center	109 Forest Valley Dr.	Bioretention	2.4	0.5	Proposed Retrofit of SWM0111	B
SWM0273	Hardy Mini Storage	Route 40 N Mitchell Lane	Bioretention	2.7	0.5	Proposed Retrofit of SWM0273	D
SWM0112	Berg Dr. Joel	2018 Rock Spring Rd.	Sand Filter	2.7	0.5	Proposed Retrofit of SWM0112	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0404	Ross Machine Comp Riverside Business Park Lot 42	4605 Compass Point Road	Sand Filter	2.9	0.5	Proposed Retrofit of SWM0404	C
SWM0279	84 Lumber	1704 Harford Road	Sand Filter	3.5	0.6	Proposed Retrofit of SWM0279	C
SWM0001 24	Bright Oaks Courtyard	2021 2023 Emmorton Rd	Sand Filter	3.8	0.7	Proposed Retrofit of SWM000124	C
SWM0244	Lauras Landing	E.S. Berg Way	MS4 Permit-Required Stormwater Retrofit	3.9	0.7	Proposed Retrofit of SWM0244	C
SWM0381	Forest View	Forest View Drive	Infiltration Basin	3.9	0.7	Proposed Retrofit of SWM0381	B
SWM0057	Rutledge Compressor Station	2220 Rutledge Rd.	Infiltration Basin	4.8	0.9	Proposed Retrofit of SWM0057	B
SWM0001 82	Van Bibber Motel Facility 1	1700 Van Bibber Rd	Sand Filter	5.2	1.0	Proposed Retrofit of SWM000182	C
SWM0005 97	Lorien - Harford	1909 Emmorton Rd	Infiltration Basin	6.2	1.2	Proposed Retrofit of SWM000597	B
SWM0272	Grace Assembly Of God	2303 Churchville Road	Sand Filter	6.6	1.2	Proposed Retrofit of SWM0272	C
SWM0038	Bge Otter Point Substation	3009 Philadelphia Rd	Sand Filter	6.7	1.3	Proposed Retrofit of SWM0038	C
SWM0358	Mark/Trece Inc.	112 Connolly Road	Sand Filter	7.4	1.4	Proposed Retrofit of SWM0358	C
SWM0436	Riverside Bus Park Ph3 Lots 1&2	1369 Brass Mill Rd	Sand Filter	8.2	1.5	Proposed Retrofit of SWM0436	D
SWM0015	Mci Telecommunications	2606 Carsins Run Road	Sand Filter	9.3	1.7	Proposed Retrofit of SWM0015	C
SWM0000 90	Abingdon Reserve Pond 2	Abingdon Rd Behind 1400 Emily Ct	MS4 Permit-Required Stormwater Retrofit	9.7	1.8	Proposed Retrofit of SWM000090	C

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0138	84 Lumber	1704 Harford Rd.	MS4 Permit-Required Stormwater Retrofit	10.7	2.0	Proposed Retrofit of SWM0138	C
SWM0285	Summervale	Crofton Drive & Vale Road	MS4 Permit-Required Stormwater Retrofit	11.5	2.1	Proposed Retrofit of SWM0285	B
SWM0062	Siena/Route 24	1900 Emmorton Rd	MS4 Permit-Required Stormwater Retrofit	11.6	2.2	Proposed Retrofit of SWM0062	B
SWM0505	Home Depot Edgewood Pond 1	2703 Pulaski Highway	MS4 Permit-Required Stormwater Retrofit	12.0	2.2	Proposed Retrofit of SWM0505	B
SWM0109	Bel Air Auto Auction	777 Belair Rd.	MS4 Permit-Required Stormwater Retrofit	12.3	2.3	Proposed Retrofit of SWM0109	B
SWM0277	Otter Creek Landing Section Ii Phase I	Ne Intersection Willoughby Beach Road & Sweet Bay Drive	MS4 Permit-Required Stormwater Retrofit	15.5	2.9	Proposed Retrofit of SWM0277	C
SWM0604	Monmouth Meadows Ph 3 Pond 2	Airdrie Avenue	MS4 Permit-Required Stormwater Retrofit	16.7	3.1	Proposed Retrofit of SWM0604	B
SWM0500	Home Depot Edgewood Pond 2	2703 Pulaski Highway	MS4 Permit-Required Stormwater Retrofit	17.6	3.3	Proposed Retrofit of SWM0500	B
SWM0243	Brighton Square	N.S. Vale Rd. W. Of Red Pump Rd.	MS4 Permit-Required Stormwater Retrofit	18.5	3.5	Proposed Retrofit of SWM0243	C
SWM0288	West Property	4200 Block Philadelphia Road	MS4 Permit-Required Stormwater Retrofit	19.4	3.6	Proposed Retrofit of SWM0288	C
SWM0077	West Shore Town Houses Section 4 & 5	S.S. Pirates Ct.	MS4 Permit-Required Stormwater Retrofit	10.4	9.6	From DA estimated POLYGON: DA = 10.4 AC, IA = 9.6 Proposed Retrofit of SWM0077	D
SWM0294	Forest Lakes Sec 9	Bear Creek Drive Just North Of Del Ray Drive	MS4 Permit-Required Stormwater Retrofit	23.0	4.3	Proposed Retrofit of SWM0294	B
SWM0603	Monmouth Meadows Ph 3 Pond 1	Clydebank Drive	MS4 Permit-Required Stormwater Retrofit	24.8	4.6	Proposed Retrofit of SWM0603	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0434	Otter Creek Landing Sec 2 Phase 2	Sugarberry Ct	MS4 Permit-Required Stormwater Retrofit	27.9	5.2	Proposed Retrofit of SWM0434	D
SWM0253	Clayton Station	Business Center Way	MS4 Permit-Required Stormwater Retrofit	38.0	7.1	Pond is approx. 12 feet deep, with approx. top SA over 20,000; assume can treat 38 acres. Proposed Retrofit of SWM0253	C
SWM000140	Emmorton Business Park Section 2	Emmorton Park Rd.	MS4 Permit-Required Stormwater Retrofit	25.0	4.7	Pond is at least 8 feet deep with approx. top SA over 1 acre. Assume can only treat ~25. Proposed Retrofit of SWM000140	C
SWM0178	Clorox Co. The	E.S. Md. Rt. 159 S. Of Md. Rt. 7	MS4 Permit-Required Stormwater Retrofit	50.0	9.3	Pond is approx. 12 feet deep, with approx. top SA over 8-10 AC; assume can treat 50 acres. Proposed Retrofit of SWM0178	C
SWM0170	B. Green & Co. Inc.	Perryman Rd. & Advantage Ave.	MS4 Permit-Required Stormwater Retrofit	50.0	9.3	The Pond is approx. 8 feet deep with SA of 3-4 Acres and appears to be large enough to treat 50 Acres. Proposed Retrofit of SWM0170	D
SWM0258	Seward Property Pond 1	Philadelphia Road	MS4 Permit-Required Stormwater Retrofit	25.0	4.7	Pond is approx. 12 feet deep, with approx. top SA over 0.5 acres; assume can treat ~25 acres. Proposed Retrofit of SWM0258	D
SWM0078	William Paca Industrial Park	S.W. Of Governor Ct. Cul-De-Sac	MS4 Permit-Required Stormwater Retrofit	97.9	18.3	Pond is approx. 10-12 feet deep, SA of ~70,000. Assume full 100 Acres could be treated, possibly by utilizing open space NE of pond for pre-treatment. Proposed Retrofit of SWM0078	C
SWM0128	Gardens Of Bel Air South	S.S. Darby B/T Tollgate And Deadora	MS4 Permit-Required Stormwater Retrofit	100.0	18.7	Pond is approx. 16+ feet deep, with approx. top SA over 2 acres; assume can treat ~100 acres. Proposed Retrofit of SWM0128	D
SWM000299	Lakeside	Northeast Side Of Lakeside Blvd.	MS4 Permit-Required Stormwater Retrofit	125.0	23.3	Pond is at least approx. 8 feet deep (from water line) with approx. top SA over 8 acres. Assume can treat ~125. Proposed Retrofit of SWM000299	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0612	Riverside Industrial Park SWM Retrofit	Balman Drive	MS4 Permit-Required Stormwater Retrofit	100.0	18.7	Pond is approx. 10-16 feet deep, with approx. top SA over 3 acre; assume can treat 100 acres. Proposed Retrofit of SWM0612	C
SWM0113	Bge Perryman	Chelsea Rd. B/T Boyer And Bush River Rd.	MS4 Permit-Required Stormwater Retrofit	150.0	28.0	Pond is approx. 15 feet deep, with approx. top SA over 4 acres; assume can treat ~150 acres. Proposed Retrofit of SWM0113	C
SWM0121	Brentwood Park	E. Of Red Pump. & S.S. Barrymore	MS4 Permit-Required Stormwater Retrofit	125.0	23.3	Pond is approx. 14 feet deep, SA 3-4 acres. Assume can treat 125 acres. Proposed Retrofit of SWM0121	C
SWM0205	Grimmels Pond (Rehab.)	W.S. Md. Rt. 165 N. Of Md. Rt. 23	MS4 Permit-Required Stormwater Retrofit	10.0	1.9	Small pond, assume drainage area of 10 (minimum for micropool wet pond) Proposed Retrofit of SWM0205	D
SWM0000 29	New Covenant Presbyterian Church Retrofit	128 St Marys Church Rd	Bioretention	4.3	1.0	Proposed retrofit within Bynum Run.	B
SWM0003 93	Old Emmorton Commons Retrofit	2225 & 2227 Old Emmorton Rd	Bioretention	4.6	1.0	Proposed retrofit within Bynum Run.	B
SWM0001 23(1)	Bright Oaks Commercial Retrofit	Next To 2100 Laurel Bush Rd	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	C
SWM0001 22	Brierhill Texaco Retrofit	S.E. Corner Md Rt. 22 And Brierhill Dr	Bioretention	0.9	0.2	Proposed retrofit within Bynum Run.	B
SWM0000 23	Mc Donalds @ Red Pump Rd. Retrofit	1 Red Pump Rd	Bioretention	0.3	0.1	Proposed retrofit within Bynum Run.	C
SWM0001 68	Cmart Retrofit	Behind 1503 Rock Spring Rd	Bioretention	2.1	0.5	Proposed retrofit within Bynum Run.	B
SWM0000 07(1)	Klein Business Community Retrofit	5 Maurice Dr	MS4 Permit Required Stormwater Retrofit	17.7	4.0	Proposed retrofit within Bynum Run.	B
SWM0002 22(1)	Hickory Kennel Retrofit	534 E Jarrettsville Rd	Bioretention	3.2	0.7	Proposed retrofit within Bynum Run.	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
SWM0002 31	Lutheran Church Of The Good Shepherd Retrofit	1515 Emmorton Rd	Bioretention	2.5	0.6	Proposed retrofit within Bynum Run.	B
SWM0002 45	Mt. Zion Methodist Church Retrofit	1645 E. Churchville Rd	Sand Filter	5.2	1.2	Proposed retrofit within Bynum Run.	B
SWM0002 80	Amyclae Business Center Lot 6 Retrofit	1203 Agora Dr	Bioretention	1.2	0.3	Proposed retrofit within Bynum Run.	B
SWM0002 32	Mothers Choice Retrofit	804 Moores Mill Rd.	Bioretention	2.0	0.5	Proposed retrofit within Bynum Run.	B
SWM0000 33	North Park Centre Retrofit	NE Corner Of MD Rt 924 And North Ave	Sand Filter	9.2	2.1	Proposed retrofit within Bynum Run.	C
SWM0004 61	Learning Garden Child Care Center Retrofit	207 Bynum Rd	Bioretention	1.1	0.3	Proposed retrofit within Bynum Run.	D
SWM0002 02(1)	Greater Harford Industrial Center Retrofit	Next To 1631 Robin Hill Cir	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0000 53	Rock Spring Village Retrofit	1 Colgate Dr	Sand Filter	6.0	1.4	Proposed retrofit within Bynum Run.	B
SWM0003 53	Wyndemede Corporate Center Retrofit	Behind 1303 Enterprise Ct	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	D
SWM0003 79	Forest Hill Industrial Airpark Regional Facility Retrofit	Behind 2209 Commerce Rd	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0001 57	Forest Hill Business Center Section 2 Retrofit	Next To 23 Newport Dr	MS4 Permit Required Stormwater Retrofit	25.0	5.6	Proposed retrofit within Bynum Run.	B
SWM0001 56	Forest Hill Business Center Retrofit	5 Newport Dr	Bioretention	1.3	0.3	Proposed retrofit within Bynum Run.	B
SWM0002 27	Hladky Property Retrofit	209 E Jarrettsville Rd	Bioretention	1.3	0.3	Proposed retrofit within Bynum Run.	B
SWM0005 88	Francis Court Retrofit	St Francis Road	MS4 Permit Required Stormwater Retrofit	3.2	0.7	Proposed retrofit within Bynum Run.	C

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
BYNUM_OF-1	Duffy Court Bioretention	End of Duffy Court	Bioretention	1.6	0.9		D
BYNUM_OF-21	Brierhill Drive and Todd Road SPSC	Intersection of Brierhill Drive and Todd Road	SPSC	1.5	1.1		D
BYNUM_OF-22	Redfield Road Sand Filter	South of Redfield Road	Sand Filter	10.0	2.3		D
BYNUM_OF-37	S Fountain Green Rd SPSC	West of S Fountain Green Road, across Lakeside Drive	SPSC	10.0	2.3		D
BYNUM_OF-39	Fox Catcher Rd SPSC	North of Fox Catcher Road	SPSC	2.3	1.2		B
BYNUM_OF-58	Umbarger Drive Bioretention	End of Umbarger Drive	Bioretention	1.5	0.6		B

A.1.9 LOW PRIORITY – STRUCTURAL BMPS (COUNTY RIGHT-OF-WAY)

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
ROW_01	Sand Pebble Drive Bioretention	Sand Pebble Dr	Bioretention	0.8	0.5	Tree box filters or bioretentions could be implemented at both of the inlets located on Sand Pebble Dr	D
ROW_02	Engle Rd Bioretentions	Along the ROW of Engle Rd and Pritchett Ln	Bioretention	31.1	6.3	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_03	Parlor Ct Bioretentions	Along the ROW of Parlor Ct	Bioretention	9.2	1.8	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
ROW_04	Rutledge Rd Bioretentions	Along the ROW of Rutledge Rd	Bioretention	10.5	2.2	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_05	Aquillas Delight Bioretentions	Along the ROW of Aquillas Delight, Quiet Inheritance, and Widows Care.	Bioretention	26.9	6.7	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_06	Furnace Rd Bioretentions	Along the ROW of Furnace Rd (S of the intersection of N Furnace Rd)	Bioretention	12.7	2.8	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_07	Northcliff Dr Bioretentions	Along the ROW of Northcliff Dr and Shepherd Ct	Bioretention	19.5	5.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_08	Wood Holme Dr Bioretentions	Along the ROW of Wood Holme Dr and Northcliff Dr	Bioretention	20.2	4.6	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_09	Cool Woods Ct Bioretentions	Along the ROW of the northernmost section of Cool Woods Ct	Bioretention	6.7	1.7	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_10	Hunt Crest Rd and Colwyn Dr Bioretentions	Along the ROW of Hunt Crest Rd and Colwyn Dr	Bioretention	17.6	4.6	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_11	Breidenbaugh Ct Bioretentions	Along the ROW of Breidenbaugh Ct	Bioretention	4.0	0.7	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_12	Belmont Dr Bioretentions	Along the ROW of Belmont Dr and Challendon Rd	Bioretention	20.5	4.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_13	Grimm Rd Bioretentions	Along the ROW of Grimm Rd	Bioretention	10.6	2.7	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_14	North Bend Rd Bioretentions	Along the ROW of North Bend Rd S of Old Federal Hill Rd	Bioretention	6.5	2.0	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
ROW_15	Jarrettsville Rd Bioretentions	Along the ROW of Jarrettsville Rd between Federal Hill Rd and Anderson Ln	Bioretention	17.0	5.5	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_16	Dulaney Dr Bioretentions	Along the ROW of Dulaney Dr	Bioretention	17.3	4.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_17	Advocate Hill Dr and Side Streets Bioretentions	Along the ROW of Advocate Hill Dr and its side streets	Bioretention	57.7	13.7	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_18	Kreitler Rd and Side Streets Bioretentions	Along the ROW of Kreiler Rd and its side streets	Bioretention	55.8	13.0	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_19	Hillcroft Dr and Highfield Ct Bioretentions	Along the ROW of Hillcroft Dr and Highfield Ct	Bioretention	8.7	2.7	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_20	Andover Rd Bioretentions	Along the ROW of Andover Rd	Bioretention	19.0	4.0	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_21	Parkwood Dr, Tree Line Dr, and Stillwater Ct Bioretentions	Along the ROW of Parkwood Dr, Tree Line Dr, and Stillwater Ct	Bioretention	18.3	4.8	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_22	N Furnace Rd Bioretentions	Along the ROW of N Furnace Rd from 2000 ft N of Furnace Rd to 2000 ft S of Georgeanna Ct	Bioretention	14.4	2.1	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_23	Morse Rd Bioretentions	Along the ROW of Morse Rd from Ivy Stone Way to Baldwin Mill Rd.	Bioretention	16.1	3.3	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_24	Trout Farm Rd Bioretentions	Along the ROW of Trout Farm Rd from Baldwin Mill Rd to drainage divide to existing BMP	Bioretention	25.5	7.2	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
ROW_25	Lady Anne Ct and Side Streets Bioretentions	Along the ROW of Trout Farm Rd from Baldwin Mill Rd to drainage divide to existing BMP	Bioretention	19.6	6.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_26	Hunt Field Way Bioretentions	Along the ROW of Hunt Field Way N of Balddwin Mill Rd	Bioretention	21.4	3.6	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_27	Morning Brook Dr Bioretentions	Along th ROW of Morning Brook Dr north of the circle	Bioretention	9.3	2.0	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_28	Sparks Dr Bioretentions	Along the ROW of Sparks Dr	Bioretention	26.6	4.3	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_29	Cannongate Rd Bioretentions	Along the ROW of Cannongate Rd	Bioretention	8.2	2.1	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_30	Boggs Rd Bioretentions	Along the ROW of Boggs Rd W of High Point Rd	Bioretention	29.7	7.6	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_31	Pleasantville Rd Bioretentions	Along the ROW of Pleasantville Rd between High Point Rd and Montford Dr	Bioretention	24.5	5.1	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_32	Creston Dr Bioretentions	Along the ROW of Creston Dr	Bioretention	22.7	6.2	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_33	Campbell Rd Bioretentions	Along the ROW of Campbell Rd S of Pleasantville Rd	Bioretention	19.1	6.2	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_34	Henry Way Bioretentions	Along the ROW of Henry Way	Bioretention	17.1	2.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_35	Alpine Dr Bioretentions	Along the ROW of Alpine Dr	Bioretention	3.1	1.1	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
ROW_36	Belvue Dr Bioretentions	Along the ROW of Belvue Dr	Bioretention	34.7	8.7	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_37	Turnbridge Rd Bioretentions	Along the ROW of Turnbridge Rd	Bioretention	6.2	2.1	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_38	Beaumont Ct Bioretentions	Along the ROW of Beaumont Ct	Bioretention	3.2	1.2	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_39	Ridgecroft Dr Bioretentions	Along the ROW of Ridgecroft Dr	Bioretention	5.3	1.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_40	Lasalle Rd Bioretentions	Along the ROW of Lasalle Rd	Bioretention	3.4	1.0	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_41	Bear Hollow Ct Bioretentions	Along the ROW of Bear Hollow Ct, S of Kiersten Ct	Bioretention	15.1	3.6	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_42	Kiersten Ct Bioretentions	Along the ROW of Kiersten CT S of BMP drainage divide	Bioretention	10.4	0.0	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_43	Grist Ct Bioretentions	Along the ROW of Grist Ct	Bioretention	2.1	0.7	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_44	Mill Creek Rd Bioretention	Along the ROW of Mill Creek Rd	Bioretention	8.7	3.0	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	A
ROW_45	Hillsboro Ct Bioretention	Along the ROW of Hillsboro Ct	Bioretention	3.7	1.2	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_46	Wild Orchid Dr Bioretention	Along the ROW of Wild Orchid Dr	Bioretention	4.2	1.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_47	Wildwood Dr Bioretention	Along the ROW of Wildwood Dr	Bioretention	4.3	1.1	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
ROW_48	Wildwood Dr Bioretention	Along the ROW of Wildwood Dr	Bioretention	2.0	1.1	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	A
ROW_49	Carlo Ct Bioretention	Along the ROW of Carlo Ct	Bioretention	3.9	1.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_50	Hyden Ct Bioretention	Along the ROW of Hyden Ct	Bioretention	4.8	1.5	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_51	Lamar Ct Bioretention	Along the ROW of Lamar Ct	Bioretention	2.9	1.0	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_52	Grandview Ct Bioretention	Along the ROW of Grandview Ct	Bioretention	7.7	2.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_53	Fallgrove Way Bioretention	Along the ROW of Fallgrove Way	Bioretention	28.8	7.7	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_54	Larchmont Dr Bioretention	Along the Row of Larchmont Dr	Bioretention	9.3	2.6	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_55	Cloverdale Rd Bioretention	Along the Row of Cloverdale Rd	Bioretention	5.6	1.6	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_56	Crest Way Ct Bioretention	Along the Row of Crest Way Ct	Bioretention	14.5	3.2	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_57	Falls Crest Dr Bioretention	Along the Row of Falls Crest Dr	Bioretention	12.6	3.8	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_58	Murgatroyd Rd Bioretention	Along the Row of Murgatroyd Rd	Bioretention	7.5	2.4	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
ROW_59	Dellwood Dr	Along the ROW of Dellwood Dr	Bioretention	8.9	3.0	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
ROW_60	Lake Vista Dr	Along the ROW of Lake Vista Dr	Bioretention	11.2	3.5	A combination of bioretentions, micro-bioretentions, and tree box filters could be implemented in the County ROW	B
Bynum_R OW-1	Agora Drive Tree Box Filters	Agora Drive	Tree Box Filters	0.5	0.4	On Agora Drive along the commercial area. No sewer and water impacts	B
Bynum_R OW-2	Alconbury Court, Brighwater Lane, Ruskin Court, Salford Drive and Meredith Court Bioretention	Alconbury Court, Brighwater Lane, Ruskin Court, Salford Drive and Meredith Court	Bioretention	29.8	11.0	Bioretention on the right side towards the inlet on Alconbury Road. No water or sewer impacts.	B
Bynum_R OW-3	Harrogate Way, Dumbarton Drive, Colchester Court, Hastings Court, Taunton Court, and Greenock Court Bioretention	Harrogate Way, Dumbarton Drive, Colchester Court, Hastings Court, Taunton Court, and Greenock Court	Bioretention	21.8	8.3	Bioretentions on either side of Dumarton Drive	C
Bynum_R OW-4	Academy Garth and Federal Lane Bioretention	Academy Garth and Federal Lane	Bioretention	10.6	4.8	Bioretention at left inlet on Academy Garth towards Federal Lane	D
Bynum_R OW-5	Andreas Drive, Andreas Court and Parthenon Court Tree Box Filter	Andreas Drive, Andreas Court and Parthenon Court	Tree Box Filters	6.9	3.8	Tree box filter to treat Andreas Drive.	B
Bynum_R OW-6	Frogleay Way Bioretention	Frogleay Way	Bioretention	0.7	0.0	Bioretention in the median of Frogleap Way	D
Bynum_R OW-7	North Forest Drive, Tory Way and Issacs Way, Tree Box Filters	North Forest Drive, Tory Way and Issacs Way,	Tree Box Filters	17.3	7.9	Tree box filters to treat the neighborhood	B
Bynum_R OW-9	Hidden Stream Court and Swift Run Court Tree Box Filter	Hidden Stream Court and Swift Run Court	Tree Box Filters	6.4	3.0	Tree box filters to treat along Swift Run Court and Hidden Stream Court	B
Bynum_R OW-10	My Lady's Drive Tree Box Filter	My Lady's Drive	Tree Box Filters	4.0	1.8	Tree box filters to treat neighborhood along Myladys Drive	C
Bynum_R OW-11	Pouska Road Tree Box Filter	Pouska Road	Tree Box Filters	5.6	2.6	Tree box filters to treat neighborhood along Puska Road	A

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
Bynum_R OW-12	Jourdan Court Tree Box Filter	Jourdan Court	Tree Box Filters	1.6	0.9	Tree box filters to treat neighborhood along Jourdan Road	A
Bynum_R OW-13	Parallel Path Tree Box Filter	Parallel Path	Tree Box Filters	8.9	3.0	Tree box filters to treat neighborhood along Parallel Path	B
Bynum_R OW-14	Kensington Parkway, Strathaven Lane, Craigston Lane, Sunderland Court and Maidstone Lane Tree Box Filter	Kensington Parkway, Strathaven Lane, Craigston Lane, Sunderland Court and Maidstone Lane	Tree Box Filters	34.7	13.4	Tree box filters to treat neighborhood along Craigston Lane and Strathaven Lane	C
Bynum_R OW-15	Lynnbrook Place, Fairmont Drive, and Sherwood Place Tree Box Filter	Lynnbrook Place, Fairmont Drive, and Sherwood Place	Tree Box Filters	27.6	8.9	Tree box filters to treat neighborhood along Lynbrook Lane and Fairmont Drive	B
Bynum_R OW-16	Boxthorn Road, Bluebell Court, White Rose Court and Red Rose Court Tree Box Filter	Boxthorn Road, Bluebell Court, White Rose Court and Red Rose Court	Tree Box Filters	6.2	2.9	Tree box filters to treat neighborhood along Boxthorn Road	B
Bynum_R OW-17	Longstream Court, Henderson Road, and Autumn View Court Bioretention	Longstream Court, Henderson Road, and Autumn View Court	Bioretention	10.5	4.8	Bioretentions to treat runoff from Long Stream Court. Can be implemented at the in the area between side walks	B
Bynum_R OW-18	Bynum Ridge Road, Montgomery Court, Carrolton Court Bioretention	Bynum Ridge Road, Montgomery Court, Carrolton Court	Bioretention	20.0	4.9	Bioretentions to treat runoff from Bynum Ridge Road and can be implemented in the area between sidewalk and the road	B
Bynum_R OW-19	Marston Court Bioretention	Marston Court	Bioretention	1.4	0.7	Bioretention to treat runoff from Marson Court	B
Bynum_R OW-20	Long Meadow Drive, Edith Stone Drive, Cinnamon Tree Drive, and Whisper Wood Court Bioretention/Tree Box Filters	Long Meadow Drive, Edith Stone Drive, Cinnamon Tree Drive, and Whisper Wood Court	Bioretention	16.1	6.8	Bioretention or tree box filters to treat the neighborhood.	B

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Bynum_R OW-21	Fordham Court, Princeton Lane, Saint Francis Road and Marywood Drive Bioretention/Tree Box Filters	Fordham Court, Princeton Lane, Saint Francis Road and Marywood Drive	Bioretention	34.3	12.1	Bioretention or tree box filter to treat Princeton Lane neighborhood	D

A.2 ALTERNATIVE URBAN BMPS

A.2.1 HIGH PRIORITY – ALTERNATIVE URBAN BMPS (COUNTY OWNED)

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Notes
PropTree_01	Fallston Volunteer Fire and Ambulance Inc.	3108 Hunt Road	Tree Planting	1.6	Potential tree planting in the open grass area toward the south of the property.
PropTree_02	Lyn Stacie Getz Creative Playground	301 West Ring Factory Road	Tree Planting	1.1	Potential tree planting east of the playground, and south of the parking lot.
PropTree_03	Edgewood ES	2100 Cedar Drive	Tree Planting	4.7	Potential tree planting in the open grass areas toward the north and south of the property.
PropTree_04	Deerfield ES, Edgewood MS, Edgewood HS	2307,2311,2415 Willoughby Beach Road	Tree Planting	1.0	Potential tree planting east of the tennis courts.
PropTree_05	William Paca/Old Post Road ES	2706 Philadelphia Road	Tree Planting	1.8	Potential tree planting at the northeast corner of the property, and east of the baseball field.
PropTree_06	George D. Lisby ES at Hillsdale	810 Edmund Street	Tree Planting	2.2	Potential tree planting in the open space east of the property.
PropTree_07	Fallston MS, Fallston HS	2303 Carrs Mill Road	Tree Planting	3.7	Potential tree planting in the open space toward the west of the property (near the parking lot).

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Notes
PropTree_08	Fallston Recreation Complex	1809 Fallston Road	Tree Planting	4.1	Potential tree planting north of the existing stormwater management pond.
PropTree_09	Forest Lakes ES	100 Osborne Parkway	Tree Planting	2.0	Potential tree planting at the southeast corner of the property.
PropTree_10	Jarrettsville ES/Recreation Complex	3818 Norrisville Road	Tree Planting	0.7	Potential tree planting at the southeast corner of the property.
PropTree_11	Abingdon Library	2510 Tollgate Drive	Tree Planting	2.4	Potential tree planting in open grass areas north of the library.
PropTree_12	Fallston Library	1461 Fallston Road	Tree Planting	0.9	Potential tree planting at the northeast corner of property.
PropTree_13	Fallston Volunteer Fire and Ambulance Inc.	2201 Carrs Mill Road	Tree Planting	0.4	Potential tree planting south of the existing pond.
PropTree_14	Jarrettsville Volunteer Fire Company	3825 Federal Hill Road	Tree Planting	0.8	Potential tree planting in open space east of the facility.
PropTree_15	Joppa Magnolia Volunteer Fire Company	1403 Old Mountain Road South	Tree Planting	2.0	Potential tree planting in the open space southeast and north of the parking lots.
PropTree_16	Abingdon Fire Company Inc.	3301 Willoughby Beach Road	Tree Planting	0.5	Potential tree planting in open space to the north and west of the building.
PropTree_17	Abingdon - Long Bar Volunteer Fire Department	3813 Washington Avenue	Tree Planting	0.3	Potential tree planting in open space toward the east of the property.
PropTree_18	Alice & William Longley Park	620 Long Bar Harbor and Longley Roads	Tree Planting	0.5	Potential tree planting in the open space toward the south of the property.
PropTree_19	Belcamp Park	1119 Bel Camp Garth	Tree Planting	0.5	Potential tree planting toward the southwest of the property.
PropTree_20	Dr. James B. Rutledge Memorial Park	3969 Norrisville Road	Tree Planting	5.6	Potential tree planting adjacent to the stream.

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Notes
PropTree_21	Edgeley Grove Farm	864 Smith Lane	Tree Planting	15.3	Potential tree planting along stream and the open space to the west of the stream surrounded by trees.
PropTree_22	Edgewater Village Park	Edgewater Village	Tree Planting	1.3	Potential tree planting to the north and south of Watergate Court.
PropTree_23	Flying Point Park	511 Kennard Avenue	Tree Planting	5.5	Potential tree planting in the open space adjacent to the bay and toward the east of the property.
PropTree_24	Howard Park	Thomas Street	Tree Planting	0.3	Potential tree planting adjacent to stream.
PropTree_25	Jarrettsville Fox Meadow	3653 Fallston Road	Tree Planting	3.0	Potential tree planting adjacent the western boundary of the property.
PropTree_26	Perryman Park	Ford's Lane	Tree Planting	10.2	Potential tree planting adjacent to the existing walking path.
PropTree_27	Schucks Road Regional Sports Complex	301 Shucks Road	Tree Planting	6.8	Potential tree planting in the undeveloped area north of the sports complex.
PropTree_28	Abingdon Water Treatment Plant	1538 Perryman Road	Tree Planting	1.2	Potential tree planting of the grass areas northeast of the existing facility.
PropTree_29	Library Administration Office	1221 Brass Mill Road	Tree Planting	0.3	Potential tree planting in the grass island north of the parking lot.
PropTree_30	Harford County Abingdon Facility	3111 Philadelphia Road	Tree Planting	3.2	Potential tree planting in open grass areas toward the outside of the property.
Prop_Forest_Buffer_01	Bear Cabin Branch New Forest Buffer 1 (County Owned)	N of the intersection of Timberlea Dr and Grafton Shop Rd	Management Plan for Proposed Riparian Buffer	18.8	
Prop_Forest_Buffer_02	Bear Cabin Branch New Forest Buffer 2 (County Owned)	N of Osborne Pkwy	Management Plan for Proposed Riparian Buffer	0.3	

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Notes
Prop_Forest_Buffer_03	Broad Run New Forest Buffer (County Owned)	N of Schucks Rd (West of Schucks Rd Regional Sports Complex)	Management Plan for Proposed Riparian Buffer	14.7	
Prop_Forest_Buffer_04	Bynum Run New Forest Buffer 1 (County Owned)	N and S of Hookers Mill Rd	Management Plan for Proposed Riparian Buffer	11.3	
Prop_Forest_Buffer_05	Bynum Run New Forest Buffer 2 (County Owned)	At the intersection of E Wheel Rd and Patterson Mill Rd	Management Plan for Proposed Riparian Buffer	3.8	
Prop_Forest_Buffer_06	Bynum Run New Forest Buffer 3 (County Owned)	W of E MacPhail Rd	Management Plan for Proposed Riparian Buffer	5.2	
Prop_Forest_Buffer_07	Bynum Run New Forest Buffer 4 (County Owned)	N of Conowingo Rd	Management Plan for Proposed Riparian Buffer	0.2	
Prop_Forest_Buffer_08	Bynum Run New Forest Buffer 5 (County Owned)	S of Old Southampton Rd	Management Plan for Proposed Riparian Buffer	0.3	
Prop_Forest_Buffer_09	Bynum Run New Forest Buffer 6 (County Owned)	E of Mardic Dr	Management Plan for Proposed Riparian Buffer	14.5	
Prop_Forest_Buffer_10	Bynum Run New Forest Buffer 7 (County Owned)	NE of the intersection of Sutton Pl and Abbey Cir	Management Plan for Proposed Riparian Buffer	1.3	
Prop_Forest_Buffer_11	Bynum Run New Forest Buffer 8 (County Owned)	S of Bel Air Bypass	Management Plan for Proposed Riparian Buffer	0.4	
Prop_Forest_Buffer_12	Bynum Run New Forest Buffer 9 (County Owned)	W of Piper Cove Way	Management Plan for Proposed Riparian Buffer	0.3	
Prop_Forest_Buffer_13	Deep Spring Branch New Forest Buffer (County Owned)	Upstream of the confluence with the Bush River	Management Plan for Proposed Riparian Buffer	9.8	

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Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Notes
Prop_Forest_Buffer_14	East Branch Winters Run New Forest Buffer 1 (County Owned)	S of Salem Church Rd	Management Plan for Proposed Riparian Buffer	5.5	
Prop_Forest_Buffer_15	East Branch Winters Run New Forest Buffer 2 (County Owned)	East of Rutlege Park, Norrisville rd near Madonna Rd	Management Plan for Proposed Riparian Buffer	3.6	
Prop_Forest_Buffer_16	Grays Run New Forest Buffer (County Owned)	NW of Montreal Dr	Management Plan for Proposed Riparian Buffer	0.5	
Prop_Forest_Buffer_17	Heavenly Waters New Forest Buffer 1 (County Owned)	Between N Tollgate Rd and Hillendal Rd	Management Plan for Proposed Riparian Buffer	3.0	
Prop_Forest_Buffer_18	Heavenly Waters New Forest Buffer 2 (County Owned)	W of Loch Doon Trl	Management Plan for Proposed Riparian Buffer	0.4	
Prop_Forest_Buffer_19	High Bridge Branch (County Owned)	E of Dellwood Dr	Management Plan for Proposed Riparian Buffer	6.6	
Prop_Forest_Buffer_20	Lauderick Creek New Forest Buffer (County Owned)	N of Fairview Point Rd	Management Plan for Proposed Riparian Buffer	0.3	
Prop_Forest_Buffer_21	Otter Point Creek New Forest Buffer (County Owned)	E of Perry Ave	Management Plan for Proposed Riparian Buffer	4.4	
Prop_Forest_Buffer_22	Plumtree Run New Forest Buffer 1 (County Owned)	Upstream of Atkisson Reservoir)	Management Plan for Proposed Riparian Buffer	5.2	
Prop_Forest_Buffer_23	Plumtree Run New Forest Buffer 2 (County Owned)	S of S Tollgate Rd	Management Plan for Proposed Riparian Buffer	1.1	
Prop_Forest_Buffer_24	Sod Run New Forest Buffer (County Owned)	NW of Chelsea Rd	Management Plan for Proposed Riparian Buffer	5.8	

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Notes
Prop_Forest_Buffer_25	Unknown Stream New Forest Buffer (County Owned)	NE of the intersection of Top View Dr and Edgewater Dr	Management Plan for Proposed Riparian Buffer	4.4	
Prop_Forest_Buffer_26	Unnamed Tributary to Bynum Run New Forest Buffer 1 (County Owned)	NE of intersection of E Broadway and Jackson Blvd	Management Plan for Proposed Riparian Buffer	3.4	
Prop_Forest_Buffer_27	Unnamed Tributary to Bush River (County Owned)	N of Fords Ln	Management Plan for Proposed Riparian Buffer	5.7	
Prop_Forest_Buffer_28	Unnamed Tributary to Bynum Run New Forest Buffer 1 (County Owned)	Between Birch Brook Ln and Pouska Rd	Management Plan for Proposed Riparian Buffer	2.1	
Prop_Forest_Buffer_29	Unnamed Tributary to Declaration Run (County Owned)	W of Declaration Cir	Management Plan for Proposed Riparian Buffer	0.9	
Prop_Forest_Buffer_30	Unnamed Tributary to Otter Point Creek New Forest Buffer 1 (County Owned)	SW of Edgewood Road	Management Plan for Proposed Riparian Buffer	1.3	
Prop_Forest_Buffer_31	Unnamed Tributary to Otter Point Creek New Forest Buffer 2 (County Owned)	W of the intersection of Emmorton Rd and Edgewood Rd	Management Plan for Proposed Riparian Buffer	1.0	
Prop_Forest_Buffer_32	Unnamed Tributary to Otter Point Creek New Forest Buffer 3 (County Owned)	S of Pulaski Hwy	Management Plan for Proposed Riparian Buffer	1.1	
Prop_Forest_Buffer_33	Unnamed Tributary to Winters Run New Forest Buffer 1 (County Owned)	NW of the intersection of S Tollgate Rd and Ashton Way	Management Plan for Proposed Riparian Buffer	0.6	
Prop_Forest_Buffer_34	Unnamed Tributary to Winters Run New Forest Buffer 2 (County Owned)	S of N Tollgate Rd	Management Plan for Proposed Riparian Buffer	1.4	

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Notes
Prop_Forest_Buffer_35	West Branch Winters Run New Forest Buffer (County Owned)	N of Glenoak Dr	Management Plan for Proposed Riparian Buffer	0.2	
Prop_Forest_Buffer_36	Winters Run New Forest Buffer 1 (County Owned)	Between Philadelphia Rd and I-95	Management Plan for Proposed Riparian Buffer	19.7	
Prop_Forest_Buffer_37	Winters Run New Forest Buffer 2 (County Owned)	Between Singer Rd and I-95 S	Management Plan for Proposed Riparian Buffer	22.8	
Prop_Forest_Buffer_38	Winters Run New Forest Buffer 2 (County Owned)	Between Confluence with Heavenly Waters and Bel Air Rd	Management Plan for Proposed Riparian Buffer	13.7	
ALT_01	Lawns at County Parks (high use)	County Parks in Bush River Watershed	Urban Nutrient Management Plan High Risk Lawn	1236	Assume pervious areas in parks are "high use", and therefore would quality as "high risk" lawns.
ALT_02	Lawns at County Schools (high use)	County Schools in Bush River Watershed	Urban Nutrient Management Plan High Risk Lawn	623	Assume pervious areas in schools are "high use", and therefore would quality as "high risk" lawns.
ALT_03	Lawns on County Property of unknown risk (excluding parks and school)	Lawns on County Property (excluding Parks and Schools)	Urban Nutrient Management Plan Unknown Risk	400	Assume all county pervious areas that are not on parks, or schools are of "unknown" risk.
ALT_04	Existing Stream Buffer	Riparian Buffers Throughout the Bush Watershed	Management Plan for Existing Riparian Buffer	4200	Assume only a management plan is required to receive credit for forest buffer.
Bynum_CP-2	William S. James Elementary School Tree Planting	1 Laurentum Parkway	Tree Planting	1.7	Open area next to parking lot good spot for tree planting
Bynum_CP-4	County Property on 1200 Macphail Road Tree Planting	1200 Macphail Road	Tree Planting	1.4	Bynum Run Restoration at St .Andrews is planned in the same area. As a part of the project this open area can be converted to a tree planting area.
Bynum_CP-8	County Property on 2213 Old Emmorton Road Tree Planting	2213 Old Emmorton Road	Tree Planting	0.2	The entire property drains to a large pond behind the property. Potential for tree planting in the open space.

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Notes
Bynum_CP-23	County Property on E Route 1 Tree Planting	E Route 1	Tree Planting	0.3	Stream buffer area. Tree planting recommended.
Bynum_CP-24	County Property Off Bynum Road Tree Planting	Off Bynum Road	Tree Planting	9.3	Tree Planting along with outfall retrofit.
Bynum_CP-29	County Property on 702 Wheel Road Tree Planting	702 Wheel Road	Tree Planting	1.2	Tree planting

A.2.2 MEDIUM PRIORITY – ALTERNATIVE URBAN BMPS (COMMUNITY OWNED)

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)
Prop_Forest_Buffer_39	Unnamed Tributary to Bush Creek New Forest Buffer	SW of Foxglove Ct	Management Plan for Proposed Riparian Buffer	8.7
Prop_Forest_Buffer_40	Bush Creek New Forest Buffer	N of Pulaski Hwy	Management Plan for Proposed Riparian Buffer	16.7
Prop_Forest_Buffer_41	Unnamed Tributary to Bynum Run New Forest Buffer 7	NW of the intersection of Bynum Run with E Churchville Rd	Management Plan for Proposed Riparian Buffer	5.3
Prop_Forest_Buffer_42	Bynum Run New Forst Buffer 5	S of Greencedar Dr	Management Plan for Proposed Riparian Buffer	3.0
Prop_Forest_Buffer_43	Unnamed Tributary to Winters Run 5	NE of the intersection of Pulaski Hwy and Woodbridge Center Way	Management Plan for Proposed Riparian Buffer	1.4
Prop_Forest_Buffer_44	Unnamed Tributary to Otter Point Creek New Forest Buffer	SW of Pirates Ct	Management Plan for Proposed Riparian Buffer	1.9

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)
Prop_Forest_Buffer_45	Bynum Run New Forest Buffer 4	W of Parliament Dr	Management Plan for Proposed Riparian Buffer	8.1
Prop_Forest_Buffer_46	Unnamed Tributary to Bynum Run New Forest Buffer 6	Upstream and Downstream of the intersection of E Wheel Rd and Waterford Dr	Management Plan for Proposed Riparian Buffer	7.0
Prop_Forest_Buffer_47	Bynum Run New Forest Buffer 4	Between Wagner Way and East West Hwy	Management Plan for Proposed Riparian Buffer	6.9
Prop_Forest_Buffer_48	Unnamed Tributary to Bear Cabin Branch	Between Bear Cabin Branch and Dellcrest Dr	Management Plan for Proposed Riparian Buffer	6.1
Prop_Forest_Buffer_49	Bynum Run New Forest Buffer 2	Between Moores Mill Rd and E Churchville Rd	Management Plan for Proposed Riparian Buffer	7.2
Prop_Forest_Buffer_50	Wheel Creek New Forest Buffer	N of W Wheel Rd	Management Plan for Proposed Riparian Buffer	7.9
Prop_Forest_Buffer_51	Unnamed Tributary to Bynum Run New Forest Buffer 10	Bounded by Fountain Glen Dr	Management Plan for Proposed Riparian Buffer	3.4
Prop_Forest_Buffer_52	Heavenly Waters New Forest Buffer	SW of Edinshall Trl	Management Plan for Proposed Riparian Buffer	1.1
Prop_Forest_Buffer_53	Unnamed Tributary to Bynum Run New Forest Buffer 3	SW of Eastbourne Ct	Management Plan for Proposed Riparian Buffer	5.1
Prop_Forest_Buffer_54	Bynum Run New Forest Buffer 1	W of Conowingo Rd	Management Plan for Proposed Riparian Buffer	10.0
Prop_Forest_Buffer_55	Bynum Run New Forest Buffer 3	Upstream and downstream of Bynum Rd	Management Plan for Proposed Riparian Buffer	8.0
Prop_Forest_Buffer_56	Unnamed Tributary to Bynum Run New Forest Buffer 9	Between the confluence with Bynum Run and Pouska Rd	Management Plan for Proposed Riparian Buffer	5.6

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)
Prop_Forest_Buffer_57	Unnamed Stream New Forest Buffer	SW of Cardiff Cir	Management Plan for Proposed Riparian Buffer	2.7
Prop_Forest_Buffer_58	Bear Cabin Branch New Forest Buffer	Between Osborne Pkwy and Bear Creek Dr	Management Plan for Proposed Riparian Buffer	15.1
Prop_Forest_Buffer_59	Bear Cabin Branch New Forest Buffer	N of Osborne Pkwy	Management Plan for Proposed Riparian Buffer	10.8
Prop_Forest_Buffer_60	Unnamed Tributary to Bynum Run New Forest Buffer 4	S and N of Henderson Rd	Management Plan for Proposed Riparian Buffer	9.7
Prop_Forest_Buffer_61	Unnamed Tributary to Winters Run 2	Between the confluence with Winters Run and S Tollgate Rd	Management Plan for Proposed Riparian Buffer	10.2
Prop_Forest_Buffer_62	Unnamed Tributary to Bynum Run New Forest Buffer 11	Between Cambry Dr and Foxborough Dr	Management Plan for Proposed Riparian Buffer	4.1
Prop_Forest_Buffer_63	Unnamed Tributary to Winters Run 6	NW of the intersection of N Tollgate Rd and Sunset Dr	Management Plan for Proposed Riparian Buffer	1.5
Prop_Forest_Buffer_64	Unnamed Tributary to Winters Run 3	N of Brentwood Park Dr	Management Plan for Proposed Riparian Buffer	2.5
Prop_Forest_Buffer_65	West Branch of Winters Run New Buffer	NW of Charles St	Management Plan for Proposed Riparian Buffer	5.3
Prop_Forest_Buffer_66	Winters Run New Forest Buffer	SW of Foreland Garth	Management Plan for Proposed Riparian Buffer	2.6
Prop_Forest_Buffer_67	Unnamed Tributary to Bynum Run New Forest Buffer 5	W of the intersection of Kidwell Ln and Thomas Run Rd	Management Plan for Proposed Riparian Buffer	6.9
Prop_Forest_Buffer_68	Unnamed Tributary to Bynum Run New Forest Buffer 8	NW of Centreville Way	Management Plan for Proposed Riparian Buffer	3.5

Appendix A: Bush River Watershed Restoration Strategies

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)
Prop_Forest_Buffer_69	Unnamed Tributary to James Run New Forest Buffer	Between Calvary Rd and 12 Stones Rd	Management Plan for Proposed Riparian Buffer	3.0
Prop_Forest_Buffer_70	Unnamed Tributary to Winters Run New Forest Buffer 1	Between Singer Rd and Winters Run Rd	Management Plan for Proposed Riparian Buffer	6.5
Prop_Forest_Buffer_71	Unnamed Tributary to Bush River New Forest Buffer	S of Pulaski HWY	Management Plan for Proposed Riparian Buffer	6.4
Prop_Forest_Buffer_72	Unnamed Tributary to Grays Run New Forest Buffer	NE of the intersection of Old Philadelphia Rd and Holly Oak Cir	Management Plan for Proposed Riparian Buffer	3.0
ALT_06	Lawns on HOA/Church/Institute Property of Unknown Risk	Lawns on HOA, Church, or Institute Properties	Urban Nutrient Management Plan Unknown Risk	1739

A.2.3 LOW PRIORITY – ALTERNATIVE URBAN BMPS (COUNTY RIGHT-OF-WAY)

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)
ALT_07	Lawns on County ROWs	Lawns on County ROW property.	Urban Nutrient Management Plan Unknown Risk	1,746

A.2.4 NOT RECOMMENDED – ALTERNATIVE URBAN BMPS (COUNTY OWNED)

Project ID	Project Name	Location	Proposed Project Type	Drainage Area (Acres)
ALT_08	Street Sweeping	County Roads.	Urban Nutrient Management Plan Unknown Risk	1,905

Appendix B

Location of Proposed Alternative Urban Best Management Practices for the Bush Watershed

Appendix B: Location of Proposed Alternative Urban BMPs

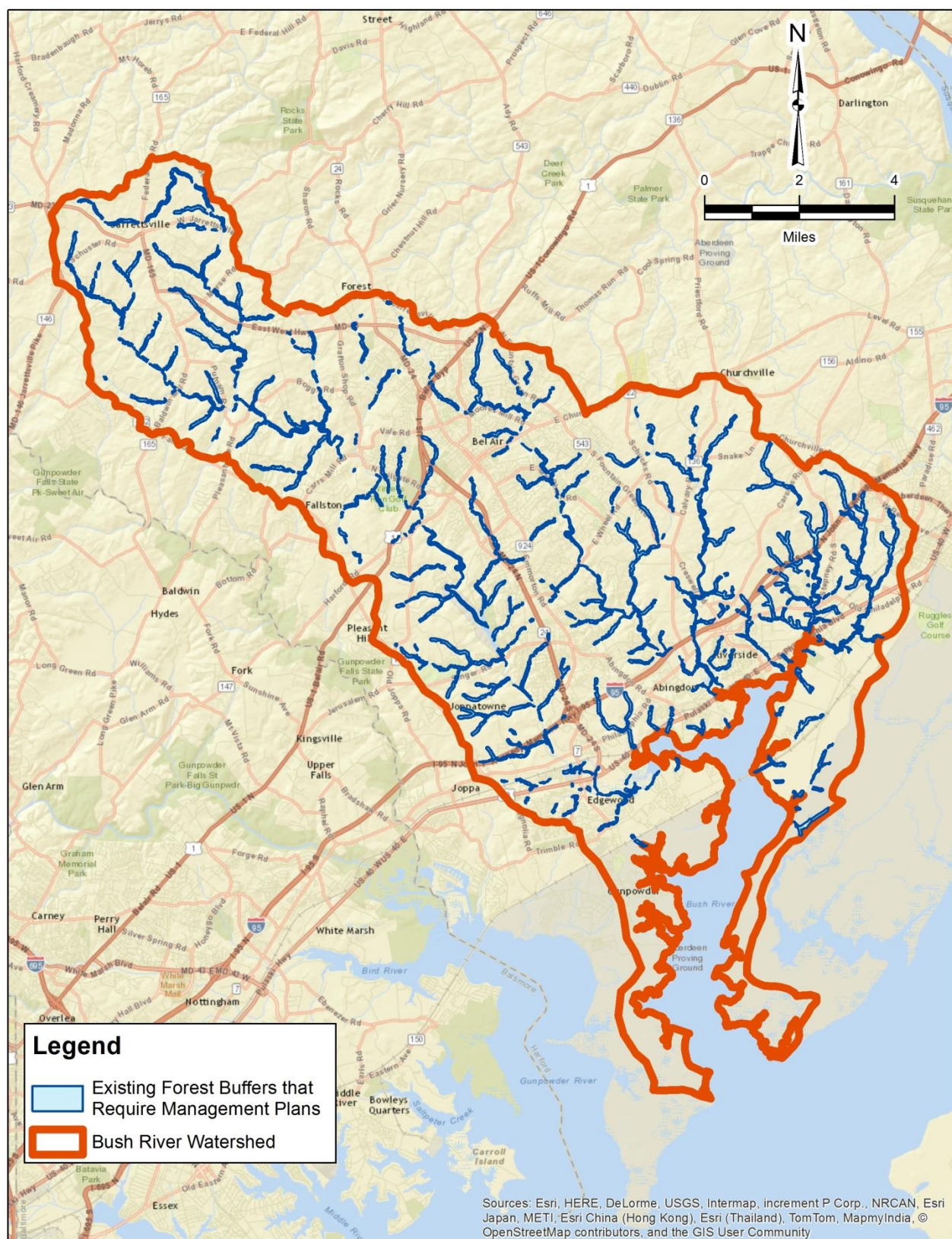


Figure B-1: Location of Existing Forest Buffers that Require Management Plans to Receive Water Quality Credit

Appendix B: Location of Proposed Alternative Urban BMPs

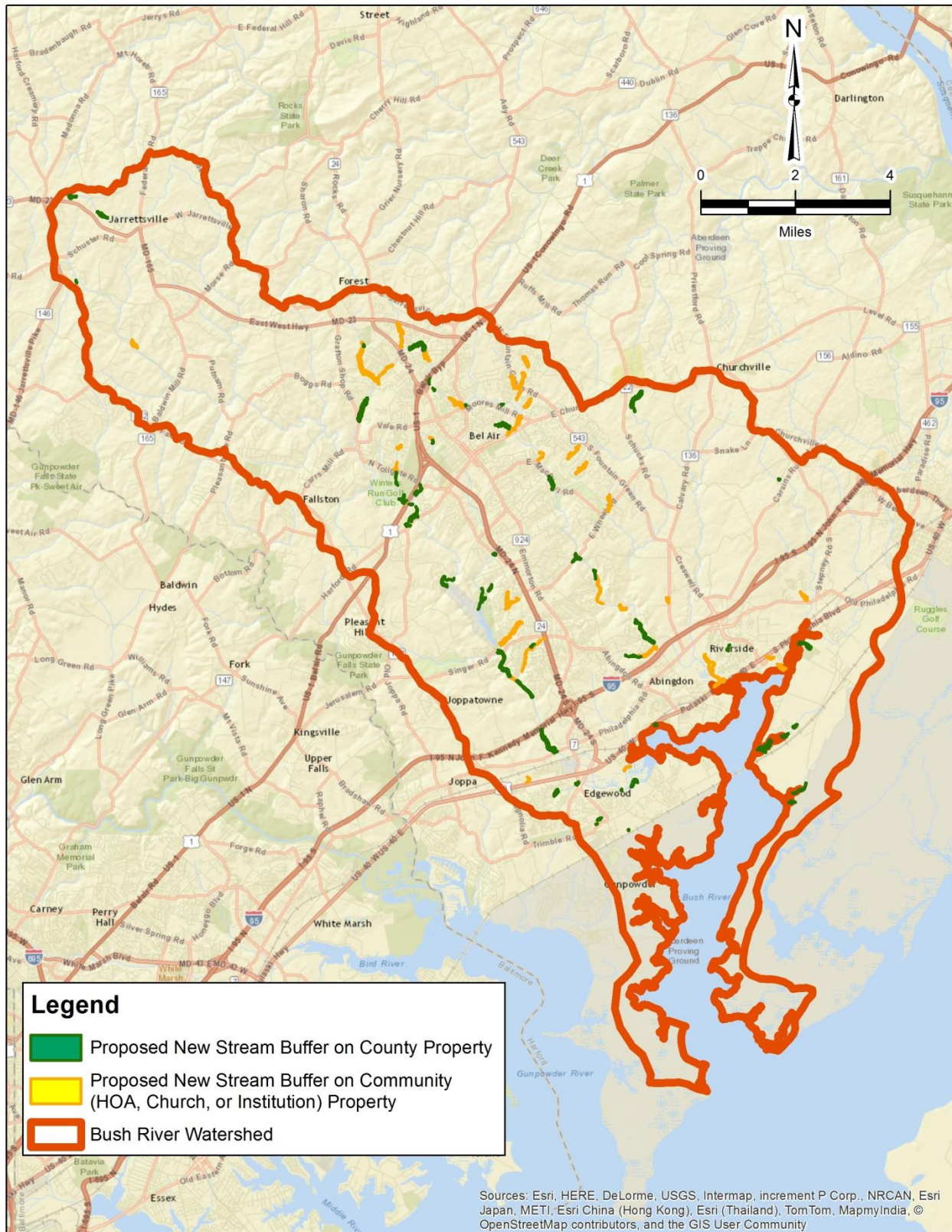


Figure B-2: Location of Proposed Forest Buffers on County and Community (HOA, Church, and Institution) Property

Appendix B: Location of Proposed Alternative Urban BMPs

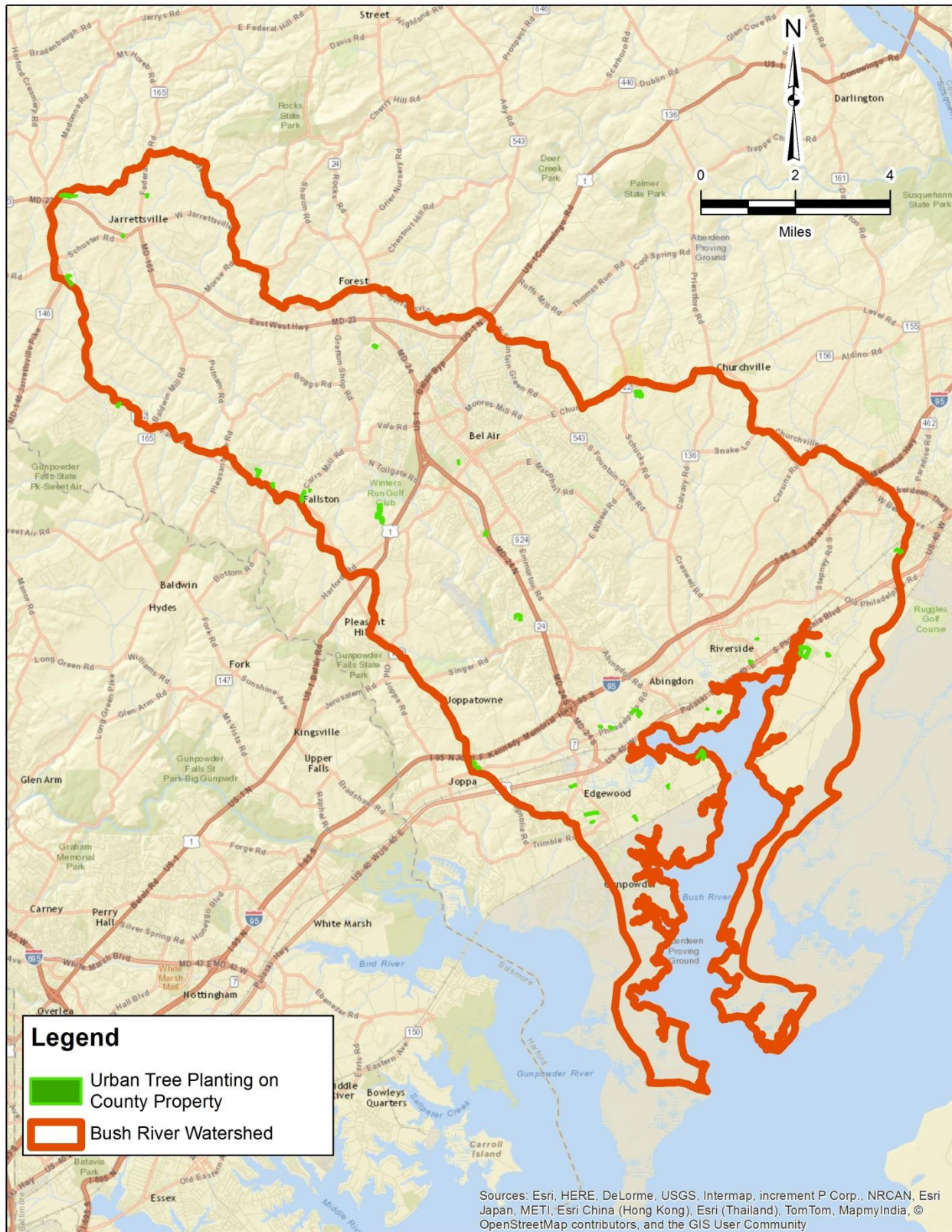


Figure B-3: Location of Proposed Urban Tree Planting on County Property (excluding proposed Forest Buffers)

Appendix B: Location of Proposed Alternative Urban BMPs

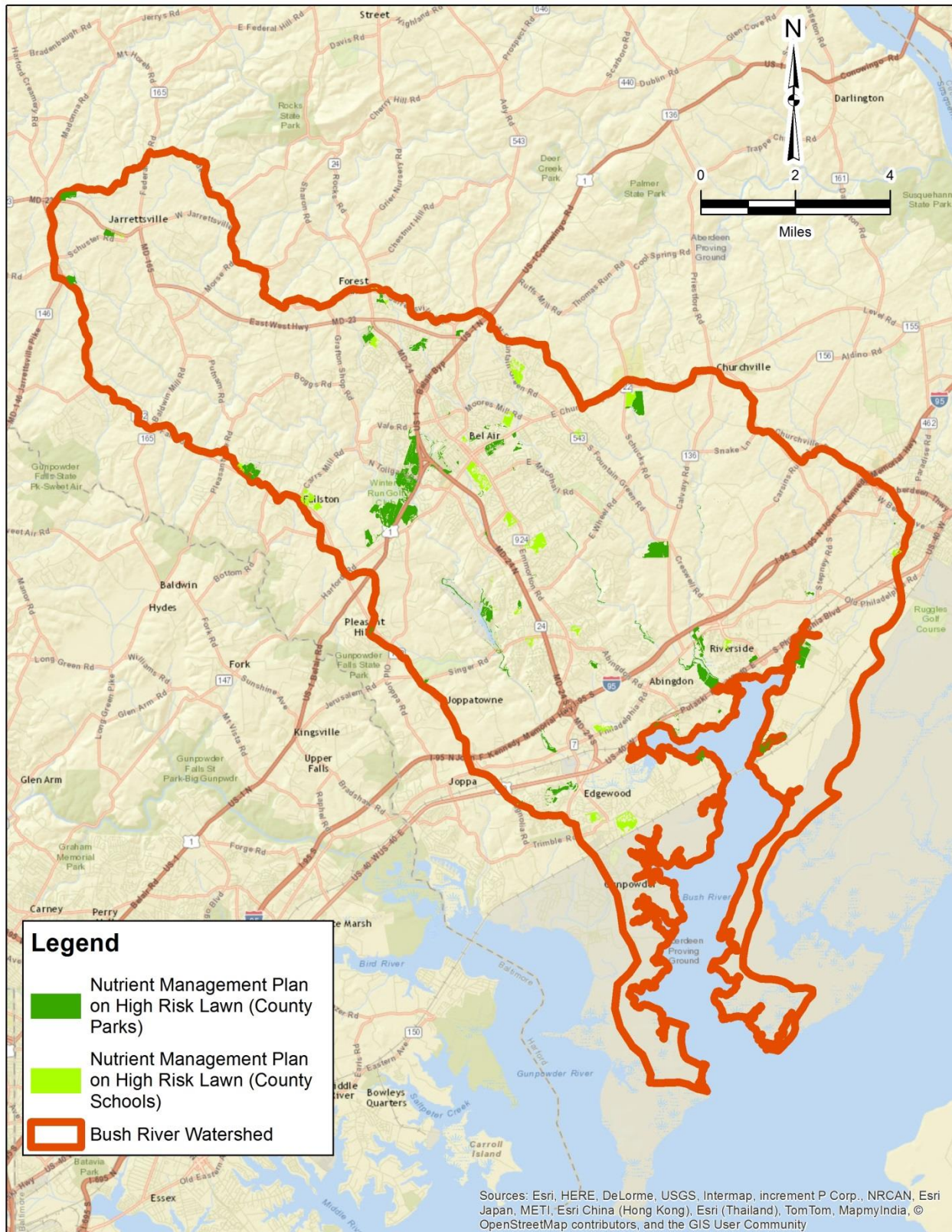


Figure B-4: Location of Proposed Nutrient Management Plans on High Risk Lawns

Appendix B: Location of Proposed Alternative Urban BMPs

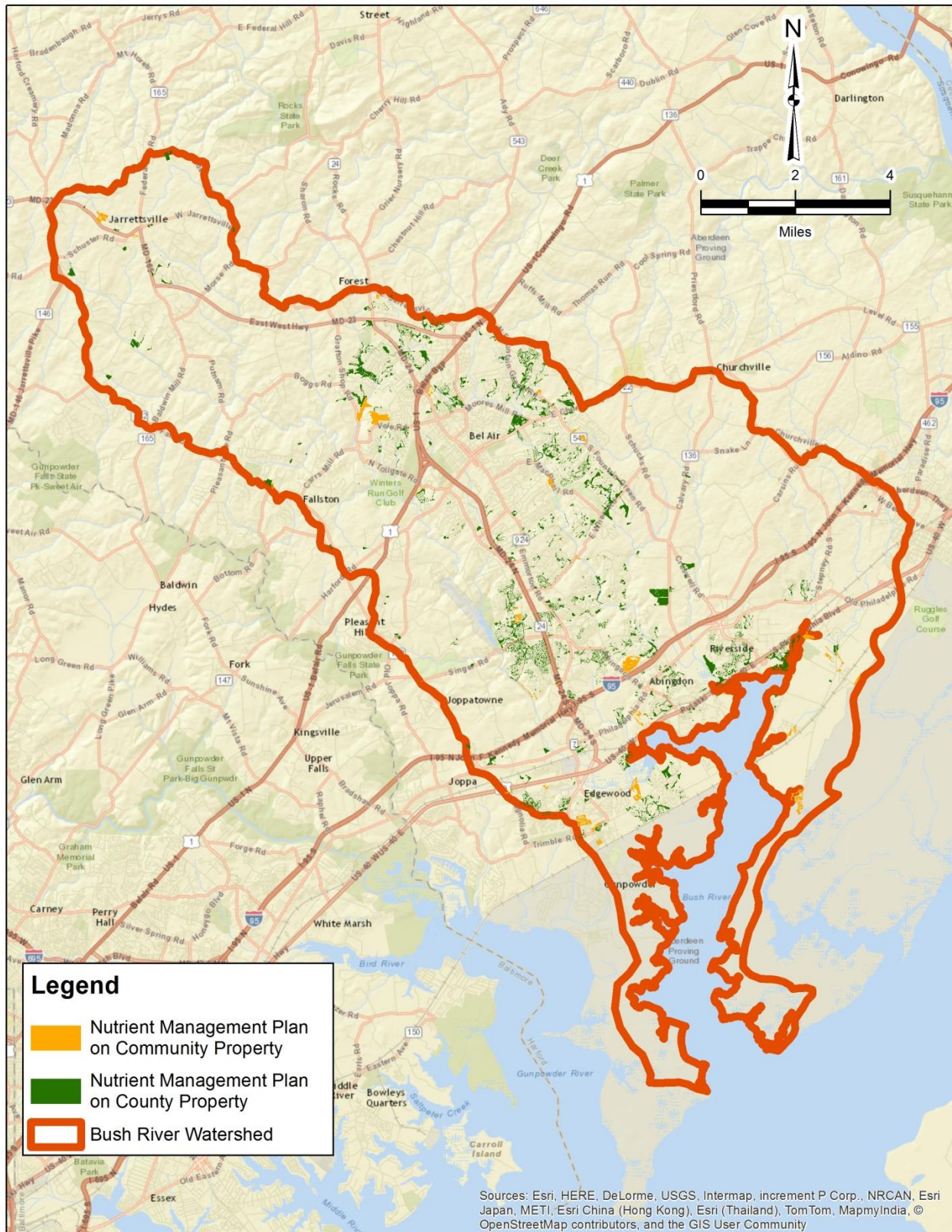


Figure B-5: Location of Proposed Nutrient Management Plans on Unknown Risk Lawns

Appendix B: Location of Proposed Alternative Urban BMPs

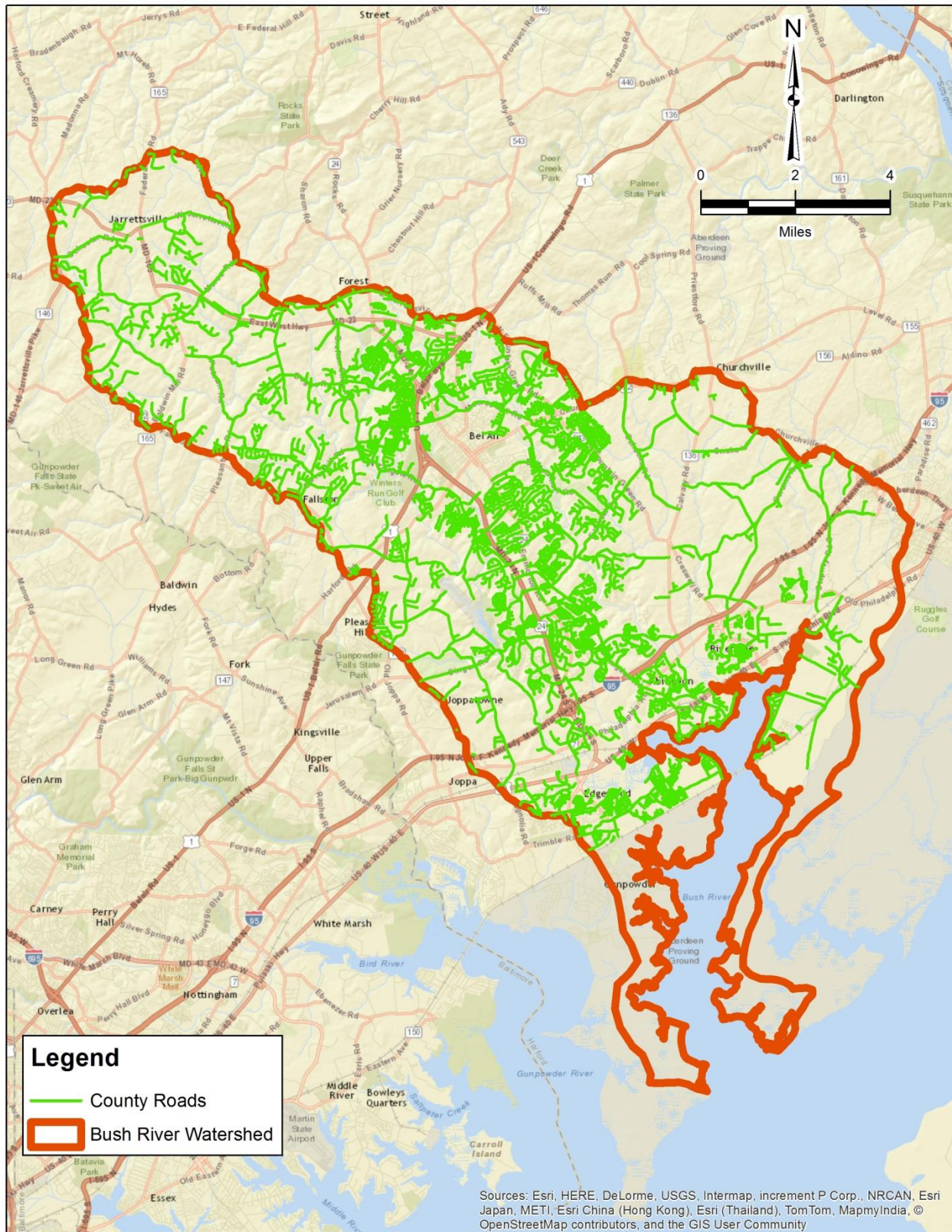


Figure B-6: Location of County Roads

Appendix C
Restoration Strategies Proposed for the Northern Chesapeake Bay
Watershed

Appendix C: Northern Chesapeake Bay Restoration Strategies

C.1 STRUCTURAL STORMWATER BEST MANAGEMENT PRACTICES (BMPS)

C.1.1 HIGH PRIORITY – STRUCTURAL BMPS

Project Name	Owner	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes:
NCB – 001	County	Harford Center	Bioretention	7.76	1.32	Bioretention practice can be implemented in the parking area of the Harford Center.
NCB – 002	County	5310 Norrisville Road	Bioretention	0.54	0.54	Parking lot bioretention/rain garden
NCB – 003	County	Aberdeen Festival Park	Bioretention	0.35	0.35	Bioretention area can be implemented adjacent to the building to capture and treat rooftop runoff.
NCB – 004	County	Aberdeen Fire Department	Bioretention	0.26	0.26	A small bioretention practice can be implemented in the front of the building to capture runoff from the parking area
NCB – 005	County	Aberdeen Fire Department (offsite)	Bioretention	0.04	0.04	A small bioretention can be implemented at the Aberdeen Fire Department storage lot to treat runoff.
NCB – 006	County	Aberdeen Library	Bioretention	0.33	0.33	A small bioretention can be implemented at the Aberdeen library in the front of the building. Roof drains can be disconnected and directed towards the practice.
NCB – 007	County	Aberdeen Middle School	Bioretention	1.36	1.36	Bioretention practice can be implemented in the parking area of Aberdeen Middle School
NCB – 008	County	Alfred B. Hilton Park	Urban Filtering Practices	11.81	2.00	Drainage from the sports fields is directed to a filtering practice before discharging the property.
NCB – 008	County	Churchville Elementary School	Urban Infiltration Practices	0.53	0.53	Implementation of an infiltration basin in the parking lot.
NCB – 009R	County	Churchville Recreation Center	Urban Infiltration Practices	2.00	1.61	Retrofit of an existing underground sand filter to an infiltration basin.
NCB – 010R	County	Harford County Community College	MS4 Permit-Required Stormwater Retrofit	31.87	5.41	Retrofit of an existing stormwater detention basin to 2002 MDE Standards.

Appendix C: Northern Chesapeake Bay Restoration Strategies

Project Name	Owner	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes:
NCB – 011R	County	Harford County Community College	Bioretention	0.76	0.13	Retrofit of an existing small pond to 2002 MDE Standards
NCB – 012R	County	Harford County Community College	Urban Infiltration Practices	1.77	0.30	Retrofit of an existing infiltration trench that was constructed in 1999.
NCB – 013R	County	Harford County Community College	MS4 Permit-Required Stormwater Retrofit	34.23	5.82	Retrofit of an existing wet pond that was constructed in 2001.
NCB – 014	County	Harford County Bus Depot	Urban Filtering Practices	2.60	2.60	A filtration practice can be implemented in the corner of the “Bus Storage Lot” to collect and treat runoff.
NCB – 015	County	Darlington Elementary School	Permeable Pavement	0.66	0.66	Pavement can be replaced with permeable pavement in the parking area of the park area north of Darlington Elementary School.
NCB – 016	County	Darlington Elementary School	Urban Filtering Practices	1.27	1.27	The parking areas of Darlington Elementary can be treated by the implementation of a filtration practice. Space exists around the parking lot area for implementation.
NCB – 017	County	Darlington Library	Bioretention	0.09	0.09	Parking lot runoff can be directed to a small bioretention adjacent to the parking lot areas.
NCB – 018R	County	Darlington Volunteer Fire Department	Urban Filtering Practices	5.31	0.9	Retrofit of a detention pond constructed in 1999 is recommended to be retrofitted to a filtration practices.
NCB – 019R	County	Delta Cardiff Volunteer Fire Department	Bioretention	1.78	0.30	Retrofit of an existing extended detention facility onsite.
NCB – 020R	County	Harford County Landfill	MS4 Permit-Required Stormwater Retrofit	100	16.99	A dry pond that was implemented in 1987 on the landfill property is recommended for retrofit into a pond designed with current design standards.
NCB – 021R	County	Harford County Landfill	MS4 Permit-Required Stormwater Retrofit	20.3	3.45	A dry pond that was implemented in 2000 on the landfill property is recommended for retrofit into a pond designed with current design standards.

Appendix C: Northern Chesapeake Bay Restoration Strategies

Project Name	Owner	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes:
NCB – 022R	County	Harford County Technical High School	Urban Filtering Practices	5.75	0.98	Dry pond from 2000 located at Harford Technical High School is suggested to retrofit into a filtering practice.
NCB – 023	County	Dublin Elementary School	Bioretention	0.70	0.70	A bioretention practice is suggested for implementation in the parking area of Dublin Elementary.
NCB – 024	County	Dublin Elementary School	Bioretention	0.59	0.59	Downspout disconnection is recommended to direct rooftop runoff to a small bioretention area.
NCB – 025	County	Forest Hill Elementary School	Bioretention	1.20	1.20	Bioretention is suggested for implementation in the parking area of Forest Hill Elementary.
NCB – 026R	County	Forest Hill Elementary School	Urban Filtering Practices	6.70	5.60	Existing pond at Forest Hill Elementary is recommended to be retrofitted to a filtering practice.
NCB – 027	County	Harford County Community College	Bioretention	4.12	3.20	A step pool conveyance system is recommended at the outfall of the Harford County Community College
NCB – 028	County	Harford County Highway Shop	Bioretention	0.09	0.09	Directing rooftop runoff from downspouts of the Shop to a small bioretention area in front of the building.
NCB – 029	County	Whiteford Maintenance Shop	Urban Infiltration Practices	5.30	3.43	An infiltration practice is recommended in the open area between the shop area and the salt dome. Aerial imagery shows an existing drainage path to this area.
NCB – 030	County	Harford Technical High School	Bioretention	1.77	0.30	Implement new bioretention in the parking area of the school.
NCB – 031R	County	Harford Technical High School	Urban Filtering Practices	5.75	2.60	Pond retrofit on the school property.
NCB – 032	County	Harford Technical High School	Urban Filtering Practices	1.77	1.77	Implementation of a sand filter on the school property
NCB – 033	County	Havre de Grace Activity Center	Urban Filter Strip Storm Water Treatment	0.57	0.57	Downspout disconnection from the rooftop is suggested to be redirected to an urban filter strip adjacent the building.
NCB – 034	County	Havre de Grace City Dock	Bioretention	0.15	0.15	Small bioretention suggested capturing and treating runoff from parking area.

Appendix C: Northern Chesapeake Bay Restoration Strategies

Project Name	Owner	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes:
NCB – 035	County	Havre de Grace City Dock	Bioretention	0.33	0.33	Small bioretention suggested capturing and treating runoff from parking area.
NCB – 036	County	Havre de Grace High School	Bioretention	0.41	0.41	Small bioretention suggested capturing runoff from parking lot on the eastern property limits.
NCB – 037	County	Havre de Grace High School	Bioretention	0.80	0.80	Downspouts redirected to open area for a small bioretention to be installed.
NCB – 038	County	Havre de Grace High School	Urban Filter Strip Storm Water Treatment	0.20	0.20	Downspouts redirected to open area for implementation of a filter strip.
NCB - 039	County	Havre de Grace Library	Bioretention	0.11	0.11	A small bioretention can be implemented in the open area in front of the building to treat impervious runoff.
NCB – 040	County	Havre de Grace Middle School	Bioretention	10.62	10.11	Step pool conveyance system to be implemented at the outlet of Havre de Grace Middle School.
NCB – 041	County	Hickory Elementary School	Bioretention	1.60	1.60	Bioretention in the parking areas to the west and south of the building.
NCB – 042	County	Hickory Elementary School	Bioswale	11.1	1.60	
NCB – 043R	County	Hickory Elementary School	Wet Ponds and Wetlands	10.7	3.90	Pond retrofit to bring up to current design standards.
NCB – 044R	County	Hickory II Fountain Green	MS4 Permit-Required Stormwater Retrofit	23.05	17.29	Pond retrofit to bring up to current design standards.
NCB – 045	County	Hickory Park	Bioretention	1.05	1.05	Bioretention in the parking area.
NCB – 046	County	Highland Park and Recreational Area	Bioretention	0.18	0.18	Implementation of a small bioretention adjacent to the parking area.

Appendix C: Northern Chesapeake Bay Restoration Strategies

Project Name	Owner	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes:
NCB – 047R	County	Level Fire Pond	MS4 Permit-Required Stormwater Retrofit	40.5	6.88	Retrofit of the existing wet pond on MD 135 off of Glenville Road.
NCB – 048	County	Level Volunteer Fire Department	Urban Filtering Practices	4.38	0.74	New bioretention recommended in the southeastern corner of the property that was constructed in 1997
NCB – 049	County	Meadowale Elementary School	Bioretention	1.07	1.07	Small bioretention practice in the parking area.
NCB – 050	County	Norrisville Elementary School	Bioretention	0.78	0.78	Bioretention in the parking areas
NCB – 051	County	Norrisville Elementary School	Bioretention	0.72	0.72	Downspouts redirected to small bioretentions adjacent to building.
NCB – 052	County	Norrisville Fire Department	Bioretention	0.55	0.55	Implement bioretention in the parking areas
NCB – 053	County	North Bend Elementary School	Urban Filtering Practices	1.3	1.3	Implement bioretention in the parking areas
NCB – 054B	County	North Bend Elementary School	Urban Infiltration Practices	8.4	1.74	Retrofit of an existing pond constructed in 1950 is recommended to bring the design up to current standards
NCB – 055	County	North Deen Park	Bioretention	0.45	0.45	Bioretention is recommended in the park.
NCB – 056R	County	North Harford Elementary	MS4 Permit-Required Stormwater Retrofit	10.86	1.85	Retrofit of an existing pond constructed in 1950 is recommended to bring the design up to current standards.
NCB – 057	County	North Harford High School	Bioretention	2.23	2.23	New bioretention is recommended to treat the parking areas of the school.
NCB – 058R	County	North Harford High School	MS4 Permit-Required Stormwater	67.0	11.38	There are existing ponds at the school are recommended to be upgraded or surveyed to gain credit. These ponds were not a part of the County GIS database

Appendix C: Northern Chesapeake Bay Restoration Strategies

Project Name	Owner	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes:
			Retrofit			
NCB – 059	County	North Harford Middle School	Bioretention	1.53	1.53	New bioretention is recommended to treat the parking areas of the school.
NCB – 060R	County	North Harford School	MS4 Permit-Required Stormwater Retrofit	10.64	1.81	Existing extended detention basin completed in 1997 is recommended to be retrofitted.
NCB – 061R	County	Prospect Mill Elementary School	Wet Ponds and Wetlands	14.7	3.5	Upgrade of the wet pond to current wet pond standards.
NCB – 062R	County	Prospect Mill Park	Bioretention	5.0	0.85	Upgrade of existing BMP to incorporate bioretention.
NCB – 063	County	Susquehanna Hose Company	Bioretention	0.14	0.14	Downspouts redirected to a bioretention area adjacent to the building.
NCB – 064	County	Tydings Park	Bioretention	2.37	2.37	Bioretention implemented in the park area.
NCB – 065	County	Voting Machine Building	Bioretention	0.17	0.17	New bioretention implemented in the front of the building.
NCB – 066R	County	Harford County Landfill	Urban Filtering Practices	9.7	1.65	Pond constructed in 1994 is recommended for retrofit.
NCB – 067R	County	Whiteford Library	MS4 Permit-Required Stormwater Retrofit	1.0	0.17	Infiltration trench constructed in 1950 is recommended for retrofit.

Appendix C: Northern Chesapeake Bay Restoration Strategies

C.1.2 MEDIUM PRIORITY – STRUCTURAL BMPS

Project Name	Owner	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes:
NCB – 068R	Church	Bethel Apostolic Church	MS4 Permit-Required Stormwater Retrofit	10.1	1.72	Pond Retrofit of an existing detention basin to 2002 MDE Standards
NCB – 069	HOA	Boxwood Road off of New Bend Road	Bioretention	31.28	6.22	Inlet Treatment throughout the private community
NCB – 070	HOA	Bramblewood Community	Bioretention	67.9	13.1	Inlet Treatment throughout the private community
NCB – 071R	HOA	Burk's Purchase	Bioretention	3.7	0.64	Pond retrofit to bioretention
NCB – 072	HOA	Campus Lakes Community	Bioretention	234.0	35.37	Implement tree box filters throughout the community
NCB – 073R	HOA	Castle Blaney Phase II	MS4 Permit-Required Stormwater Retrofit	15.7	2.67	Pond retrofit to 2002 MDE Standards
NCB – 074R	HOA	Castle Blaney Phase I	MS4 Permit-Required Stormwater Retrofit	11.95	2.030305	Pond retrofit to 2002 MDE Standards
NCB – 075R	HOA	Cherry Hill Estates	MS4 Permit-Required Stormwater Retrofit	30.33	5.153067	Pond retrofit to 2002 MDE Standards
NCB – 076R	Church	Church of Christ	Bioretention	1.2	0.20388	Pond retrofit to 2002 MDE Standards
NCB – 077R	Church	Church of Jesus Christ of Latter Day Saints	Bioretention	3.00	0.5097	Pond retrofit to 2002 MDE Standards

Appendix C: Northern Chesapeake Bay Restoration Strategies

NCB – 078R	Church	Churchville Presbyterian Church	Urban Filtering Practices	6.57	1.116243	Pond retrofit to 2002 MDE Standards
NCB – 079	HOA	Cool Spring Community	Bioretention	10.02	1.8036	New bioretention implemented throughout the community.
NCB - 080	HOA	Cool Spring Community	Wet Ponds and Wetlands	33.5	1.90	New pond
NCB – 081	HOA	Cool Spring Community	Wet Ponds and Wetlands	134.9	18.2	New pond
NCB – 082	HOA	Eastern watershed community	Bioretention	115.0	22.40	Inlet treatment throughout the community
NCB – 083	Church	Evangelical Methodist Church	Bioretention		5.58	New bioretention practices in the sports field area.
NCB – 084R	Church	Fairview AME Church	Bioretention	1.10	0.19	Pond retrofit to 2002 MDE Standards
NCB – 085R	HOA	Fielders Farms	MS4 Permit-Required Stormwater Retrofit	14.52	2.47	Pond retrofit to 2002 MDE Standards
NCB – 086	HOA	Gilbert Road community	Bioretention	97.70	21.30	Inlet treatment/bioretention throughout the community.
NCB – 087	HOA	Harford Heritage Community - inlet treatment	Bioretention	39.30	5.50	Inlet treatment throughout the community.
NCB – 088R	Church	Helping Hands Ministries	Urban Filtering Practices	5.10	0.86	Pond retrofit to 2002 MDE Standards.
NCB – 089R	Home Owners Association	Howard Chance	MS4 Permit-Required Stormwater Retrofit	21.44	3.64	Pond retrofit to 2002 MDE Standards.

Appendix C: Northern Chesapeake Bay Restoration Strategies

NCB – 090R	Home Owners Association	Howard Chance	MS4 Permit-Required Stormwater Retrofit	22.86	3.88	Pond retrofit to 2002 MDE Standards.
NCB – 091	Home Owners Association	Level Road and Lepidum Road Community	Bioretention	61.9	14.97	Inlet treatment/bioretention throughout the community.
NCB – 092	Home Owners Association	Lynn Lee Drive Community	Bioretention	20.8	12.05	Bioretention throughout the community.
NCB – 093	Home Owners Association	Madonna Manor Community	Bioretention	53.0	7.1	Inlet treatment/bioretention throughout the community.
NCB – 094	Home Owners Association	Meadow Stream Community	Bioretention	80.1	10.0	Bioretention throughout the community.
NCB – 095	Church	Methodist Episcopal Church	Bioretention	0.23	0.23	Bioretention on the church property.
NCB – 096R	Home Owners Association	Michaels Mill Dam	Wet Ponds and Wetlands	254.5	18.80	Wet pond implemented in the community. Redesign of existing pond
NCB – 097	Home Owners Association	Pinehurst Avenue Community	Wet Ponds and Wetlands	25.3	4.50	New pond implemented in the community.
NCB – 098	Home Owners Association	Rolling Green Community	Bioretention	43.8	6.10	Inlet treatment/bioretention throughout the community.
NCB – 099R	Home Owners Association	Rolling Green Community	Wet Ponds and Wetlands	152.9	18.3	Pond retrofit to 2002 MDE Standards.
NCB – 100R	Church	Saint Margaret's Mission	Bioretention	3.60	2.10	Pond retrofit to 2002 MDE Standards.
NCB – 101R	Church	Unitarian Universalist Fellowship	Bioretention	3.34	0.57	Pond retrofit to 2002 MDE Standards.
NCB – 102R	Home Owners Association	Vineyard Oak North	Urban Filtering Practices	7.90	1.34	Pond retrofit to 2002 MDE Standards.
NCB – 103R	Home Owners Association	Wagner Farms Community	MS4 Permit-Required Stormwater Retrofit	35.60	6.05	Pond retrofit to 2002 MDE Standards.

Appendix C: Northern Chesapeake Bay Restoration Strategies

NCB – 104R	Home Owners Association	Wester Village	MS4 Permit-Required Stormwater Retrofit	116.05	19.72	Pond retrofit to 2002 MDE Standards.
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C.1.3 LOW PRIORITY – STRUCTURAL BMPS

Project Name	Owner	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes:
NCB – 105R	Private	Arundel Sand and Gravel	Urban Infiltration Practices	3.0	0.51	Retrofit of the the infiltration trench located on the Arundel Sand and Gravel property constructed in 1992
NCB – 106	Private	Baltimore Gas and Electric	Wet Ponds and Wetlands	45.0	45.0	Baltimore gas and electric area with a pond on the downstream of the large concrete pad.
NCB – 107R	Private	Black horse Golf	MS4 Permit-Required Stormwater Retrofit	20.54	3.49	Retrofit of dry pond from 1998
NCB – 108	Private	Campus Hill Commercial	Bioretention	10.10	10.10	Bioretention facilities installed throughout the parking area of the Campus Hill Commercial Shopping Center
NCB – 109R	Private	Campus Hill Commercial	Wet Ponds and Wetlands	20.29	3.45	Wet pond retrofit
NCB – 110R	Private	Chapel Road	Wet Ponds and Wetlands	27.30	4.64	Two ponds located off Chapel Road.
NCB – 111R	Private	Coalle Property	Urban Infiltration Practices	0.70	0.12	Retrofit of the existing infiltration basin installed 1993
NCB – 112R	Private	Dixie Construction	Urban Filtering Practices	3.03	0.51	Conversion to urban filtering practice on C/D soils at Dixie Construction

Appendix C: Northern Chesapeake Bay Restoration Strategies

NCB – 113R	Private	Douglas B. Clark	Bioretention	1.4	0.24	Retrofit of dry pond built in 1987
NCB – 114	Private	Harford Christian School	Bioretention	1.80	1.80	Harford Christian School - bioretention in the parking areas.
NCB – 115R	Private	Harley Davidson	MS4 Permit-Required Stormwater Retrofit	16.36	2.67	Lands of Richard Crouse - wet pond retrofit near the Harley Davidson shop.
NCB – 116	Private	Havre de Grace Ambulance	Urban Filtering Practices	1.17	0.20	Recommended in old Harford study
NCB – 117R	Private	Havre de Grace Stack and Store	MS4 Permit-Required Stormwater Retrofit	3.20	0.54	Retrofit of ED built in 1997
NCB – 118R	Private	Hickory Emergency Operation Center	MS4 Permit-Required Stormwater Retrofit	15.3	2.60	Retrofit of wet pond built in 1998
NCB – 119R	Private	Highs Bushs Corner	Urban Infiltration Practice	3.39	0.58	Retrofit of infiltration trench from 1998
NCB – 120R	Private	Highs Dairy Store	Urban Infiltration Practice	2.11	0.36	Retrofit of IT from 1994
NCB – 121R	Private	Integrated Community Shopping Center	Urban Infiltration Practice	7.25	1.23	Integrated Community Shopping Center extended detention facility retrofit to incorporate infiltration
NCB – 122R	Private	Jacobs Well LLC	Urban Filtering Practice	8.30	1.41	Wet pond retrofit at Jacobs Wells LLC
NCB – 123R	Private	Land of St. Clair	Urban Infiltration Practice	1.14	0.19	Retrofit of UGS built in 2001
NCB – 124R	Private	Michaels Distribution Warehouse	Bioretention	35.45	6.02	Retrofit of ED built in 2001
NCB – 125R	Private	Midsummer Hill II – Western Auto	Bioretention	0.74	0.74	Retrofit of Infiltration trench from 1992

Appendix C: Northern Chesapeake Bay Restoration Strategies

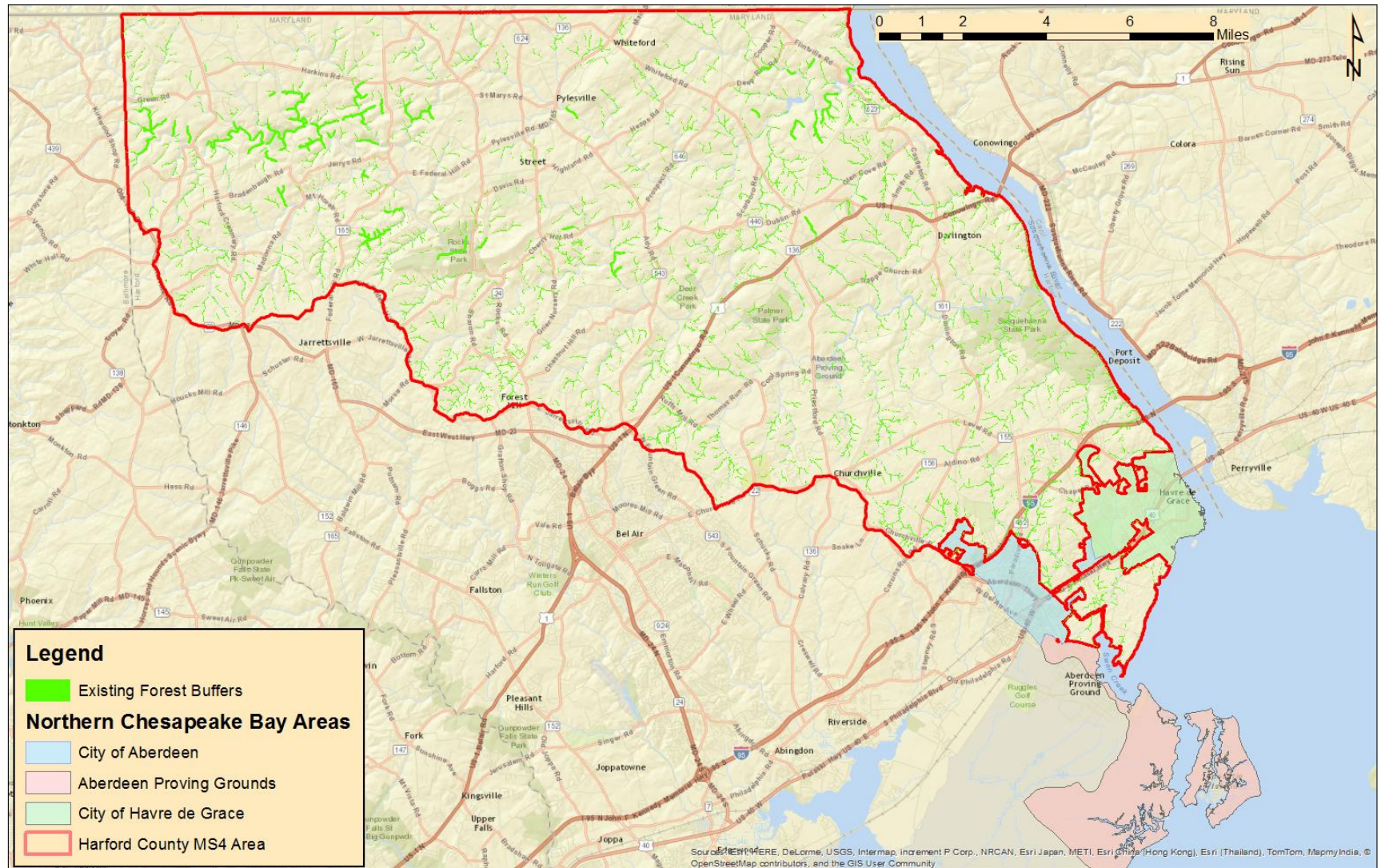
NCB – 126	Private	Conowingo Private Property	Wet Ponds and Wetlands	2.35	2.35	Private property near the Conowingo Dam. Bioretention throughout the parking area.
NCB – 127R	Private	Thompson Village Plaza	Urban Filtering Practices	2.9	0.49	Retrofit of dry pond built in 1993
NCB – 128	Private	Tobacco Run Drive	Urban Infiltration Practice	22.2	3.0	New wet pond at the end of Tobacco Run Drive Drainage area is 22.2 acres with 3 acres impervious and 19.2 acres pervious
NCB – 129	Private	Wawa	Urban Filtering Practice	2.1	1.5	
NCB – 130R	Private	Wawa in Hickory	Urban Infiltration Practice	0.38	0.38	Retrofit of Infiltration trench from 1950

Appendix D

Location of Proposed Alternative Best Management Practices for the Northern Chesapeake Bay Watershed

Appendix D: Northern Chesapeake Bay Location Maps

B.1 FOREST BUFFERS



Appendix E
Restoration Strategies Proposed for the Gunpowder Watershed

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Appendix E: Gunpowder River Restoration Strategies

Appendix E

E.1 STRUCTURAL STORMWATER BEST MANAGEMENT PRACTICES (BMPS)

E.1.1 WATERSHED PLAN – STRUCTURAL BMPS

Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes/Data Source	HSG
FB-SB1_60	See Plan.	Dry Pond Retrofit to Sediment Basin	4.79	1.71	Foster Branch Watershed Small Watershed Action Plan	D
FB-SB2_61	See Plan.	Dry Pond Retrofit to Sediment Basin	9.54	2.60	Foster Branch Watershed Small Watershed Action Plan	D
FB-SWM1_79	See Plan.	Wet Pond Retrofit to Sediment Basin	40.70	1.79	Foster Branch Watershed Small Watershed Action Plan	B
FB-SWM2_80	See Plan.	Wet Pond Retrofit to Pond with Permanent Pool	185.50	45.82	Foster Branch Watershed Small Watershed Action Plan	D
FB-SWM3_81	See Plan.	Wet Pond	26.40	11.54	Foster Branch Watershed Small Watershed Action Plan	D
FB-SWM4_82	See Plan.	Wet Pond Retrofit to Dry Detention	33.00	6.60	Foster Branch Watershed Small Watershed Action Plan	C
FB-SWM5_83	See Plan.	Wet Pond	9.20	3.22	Foster Branch Watershed Small Watershed Action Plan	C

Appendix E: Gunpowder River Restoration Strategies

E.1.2 WATERSHED PLAN – STREAM RESTORATION PROJECTS

Project Name	Location	Length of Restoration (feet)	Notes/Source
FB-SR10-1_62	See Plan.	985.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR1-2_63	See Plan.	110.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR1-3_64	See Plan.	80.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR1-4_65	See Plan.	600.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR1-5_66	See Plan.	1315.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR1-6_67	See Plan.	660.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR2-1_68	See Plan.	600.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR2-2_69	See Plan.	50.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR2-3_70	See Plan.	330.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR3-1_71	See Plan.	100.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR3-2_72	See Plan.	235.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR4-1_73	See Plan.	700.00	Foster Branch Watershed Small Watershed Action Plan
FB-SR4-2_74	See Plan.	1125.00	Foster Branch Watershed Small Watershed Action Plan

Appendix E: Gunpowder River Restoration Strategies

Project Name	Location	Length of Restoration (feet)	Notes/Source
FB-SR6-1_75	See Plan.	750.00	Foster Branch WS Sm WS Action Plan
FB-SR7-1_76	See Plan.	1275.00	Foster Branch WS Sm WS Action Plan
FB-SR8-1_77	See Plan.	635.00	Foster Branch WS Sm WS Action Plan
FB-SR9-1_78	See Plan.	650.00	Foster Branch WS Sm WS Action Plan
FR-SR1-1_84	See Plan.	800.00	Foster Branch WS Sm WS Action Plan

Appendix E: Gunpowder River Restoration Strategies

E.1.3 HIGH PRIORITY – STRUCTURAL BMPs (COUNTY OWNED)

Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
RETRO_27	Falconer Road	Bioretention Retrofit to ED Dry Pond	1.09	0.21	1985 Era BMP Database Proposed Retrofit	D
RETRO_29	Trimble Rd. W. Of Md. Rt. 24	MS4 Retrofit to Dry Pond	107.60	20.77	1985 Era BMP Database Proposed Retrofit	D
RETRO_58	3108 Hunt Rd.	Infiltration Basin	2.97	0.57	1985 Era BMP Database Proposed Retrofit	B
NEW_01		Bioretention	1.21	0.90	County Property Assessment	B
NEW_02		Tree Box Filters	0.60	0.60	County Property Assessment	B
NEW_04	Magnolia Middle School	Bioretention	5.75	5.75	County Property Assessment	B
NEW_05	Joppatowne High School	Bioretention	1.54	1.54	County Property Assessment	C
NEW_06	Riverside Elementary School	Bioretention	5.02	5.02	County Property Assessment	D
NEW_07	Joppa Library	Bioretention	0.84	0.84	County Property Assessment	D
NEW_10	Jarrettsville Volunteer Fire Company	Bioretention	0.46	0.25	County Property Assessment	B
NEW_11	Jarrettsville Volunteer Fire Company	Bioretention	0.73	0.21	County Property Assessment	B
NEW_12	Joppa Magnolia Volunteer Fire Company	Bioretention	0.47	0.47	County Property Assessment	C

Appendix E: Gunpowder River Restoration Strategies

Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
NEW_14	Barksdale Park	Rain Garden	0.05	0.05	County Property Assessment	C
NEW_15	Chell Road Tot Lot	Rain Garden	0.09	0.09	County Property Assessment	C
NEW_16	Mariner Point Park	Rain Garden	0.06	0.06	County Property Assessment	C
NEW_17	Mariner Point Park	Bioretention	1.00	1.00	County Property Assessment	D
NEW_18	Mariner Point Park	Bioretention	0.70	0.70	County Property Assessment	C
NEW_19	Mariner Point Park	Bioretention	0.48	0.48	County Property Assessment	D
NEW_20	Mariner Point Park	Rain Garden	0.04	0.04	County Property Assessment	D
NEW_21	Mariner Point Park	Rain Garden	0.04	0.04	County Property Assessment	D

E.1.4 MEDIUM PRIORITY – STRUCTURAL BMPS (COMMUNITY OWNED)

Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
RETRO_28	Falconer Road	MS4 Retrofit to ED Dry Pond	18.08	3.49	1985 Era BMP Database Proposed Retrofit	C
RETRO_30	Cider Press Loop	Bioretention Retrofit to ED Dry Pond	4.50	0.87	1985 Era BMP Database Proposed Retrofit	C

Appendix E: Gunpowder River Restoration Strategies

Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
RETRO_31	Falconer Road	MS4 Retrofit to Wet Pond	21.33	4.12	1985 Era BMP Database Proposed Retrofit	C
RETRO_32	Sourghum Court	Bioretention Retrofit to ED Dry Pond	4.82	0.93	1985 Era BMP Database Proposed Retrofit	C
RETRO_33	Md. Rt. 24 & Trimble Rd.	Infiltration Basin	5.40	1.04	1985 Era BMP Database Proposed Retrofit	A
RETRO_34	Trimble Road & Erwin Drive	MS4 Retrofit to Dry Pond	36.85	7.11	1985 Era BMP Database Proposed Retrofit	D
RETRO_36	N.E. Corner Hanson Rd. & Rt. 152	MS4 Retrofit to Dry Pond	27.50	5.31	1985 Era BMP Database Proposed Retrofit	C
RETRO_37	B/T Woodbridge Center Way & Pinefield	MS4 Retrofit to Dry Pond	33.02	6.37	1985 Era BMP Database Proposed Retrofit	C
RETRO_48	Spry Island Road	MS4 Retrofit to ED Dry Pond	61.20	11.81	1985 Era BMP Database Proposed Retrofit	B
RETRO_49	Gunpowder Ridge Road	MS4 Retrofit to ED Dry Pond	114.36	22.07	1985 Era BMP Database Proposed Retrofit	B

E.1.5 LOW PRIORITY – STRUCTURAL BMPS (PRIVATELY OWNED)

Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
RETRO_23	Off Magnolia Ridge Drive	MS4 Retrofit to Dry Pond	18.36	3.54	1985 Era BMP Database Proposed Retrofit	A
RETRO_24	The Gap Drive	MS4 Retrofit to Wet Pond	99.30	19.17	1985 Era BMP Database Proposed Retrofit	D

Appendix E: Gunpowder River Restoration Strategies

Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
RETRO_25	Trimble Road	Shallow Wetland	15.60	3.01	1985 Era BMP Database Proposed Retrofit	B
RETRO_26	1301 Trimble Road	Sand Filter Retrofit to ED Dry Pond	5.20	1.00	1985 Era BMP Database Proposed Retrofit	D
RETRO_35	1020 Oak Avenue	MS4 Retrofit to ED Dry Pond	15.30	2.95	1985 Era BMP Database Proposed Retrofit	C
RETRO_38	Us Route 40 & Joppa Farm Road	Bioretention Retrofit to ED Dry Pond	1.93	0.37	1985 Era BMP Database Proposed Retrofit	C
RETRO_39	601 Pulaski Hwy	Bioretention Retrofit to Dry Pond	4.24	0.82	1985 Era BMP Database Proposed Retrofit	C
RETRO_40	1118 Oak Ave.	Bioretention Retrofit to ED Dry Pond	1.42	0.27	1985 Era BMP Database Proposed Retrofit	D
RETRO_41	725 Pulaski Highway	Pocket Wetland	1.38	0.27	1985 Era BMP Database Proposed Retrofit	C
RETRO_42	1002 Pulaski Highway	Bioretention Retrofit to Dry Pond	1.74	0.34	1985 Era BMP Database Proposed Retrofit	A
RETRO_43	911 Route 40	Bioretention Retrofit to ED Dry Pond	2.07	0.40	1985 Era BMP Database Proposed Retrofit	B
RETRO_44	604 Pulaski Hwy	Infiltration Basin	5.95	1.15	1985 Era BMP Database Proposed Retrofit	D
RETRO_45	1002 Pulaski Highway	Bioretention Retrofit to ED Dry Pond	3.08	0.59	1985 Era BMP Database Proposed Retrofit	D
RETRO_46	Route 40 & Joppa Rd.	Sand Filter Retrofit to ED Dry Pond	5.79	1.12	1985 Era BMP Database Proposed Retrofit	D
RETRO_47	709 Philadelphia Road	Bioretention Retrofit to Dry Pond	2.35	0.45	1985 Era BMP Database Proposed Retrofit	C
RETRO_50	712 Philadelphia Rd.	Bioretention Retrofit to Dry Pond	1.95	0.38	1985 Era BMP Database Proposed Retrofit	A

Appendix E: Gunpowder River Restoration Strategies

Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Impervious Area (Acres)	Notes	HSG
RETRO_51	706 Philadelphia Rd.	Sand Filter Retrofit to Dry Pond	5.35	1.03	1985 Era BMP Database Proposed Retrofit	C
RETRO_52	3095 Belair Rd.	Bioretention Retrofit to ED Dry Pond	1.00	0.19	1985 Era BMP Database Proposed Retrofit	B
RETRO_53	2615 Bel Air Road	MS4 Retrofit to Wet Pond	0.95	0.18	1985 Era BMP Database Proposed Retrofit	D
RETRO_54	E. Intersection U.S. Rt. 1 And Md. Rt. 152	MS4 Retrofit to Dry Pond	16.20	3.13	1985 Era BMP Database Proposed Retrofit	D
RETRO_55	2309 Bel Air Road	Bioretention Retrofit to Dry Pond	0.64	0.12	1985 Era BMP Database Proposed Retrofit	D
RETRO_56	2101 Fallston Rd.	Sand Filter Retrofit to ED Dry Pond	5.73	1.11	1985 Era BMP Database Proposed Retrofit	B
RETRO_57	2128 Fallston Road	Bioretention Retrofit to Dry Pond	3.00	0.58	1985 Era BMP Database Proposed Retrofit	D
RETRO_59	3111 White Hall Rd.	Bioretention Retrofit to Dry Pond	0.56	0.11	1985 Era BMP Database Proposed Retrofit	B

Appendix E: Gunpowder River Restoration Strategies

E.2 ALTERNATIVE URBAN BMPS

E.2.1 HIGH PRIORITY – ALTERNATIVE URBAN BMPS (COUNTY OWNED)

Project Name	Location	Proposed Project Type	Drainage Area (Acres)	Notes
NEW_03	Magnolia Middle School	Tree Planting	1.97	County Property Assessment
NEW_08	Fallston Volunteer Fire and Ambulance Inc	Tree Planting	1.50	County Property Assessment
NEW_09	Jarrettsville Volunteer Fire Company	Tree Planting	0.93	County Property Assessment
NEW_13	Barksdale Park	Tree Planting	0.07	County Property Assessment
NEW_22	Reckord Road Park	Tree Planting	3.00	County Property Assessment
Forest_Buffer_85	Throughout the watershed.	Forest Buffer	3949.35	Based on County Vegetation Layers

Appendix F
Location of Proposed Alternative Urban Best Management Practices
for the Gunpowder Watershed

Appendix F: Location of Proposed Alternative Urban BMPs for Gunpowder River

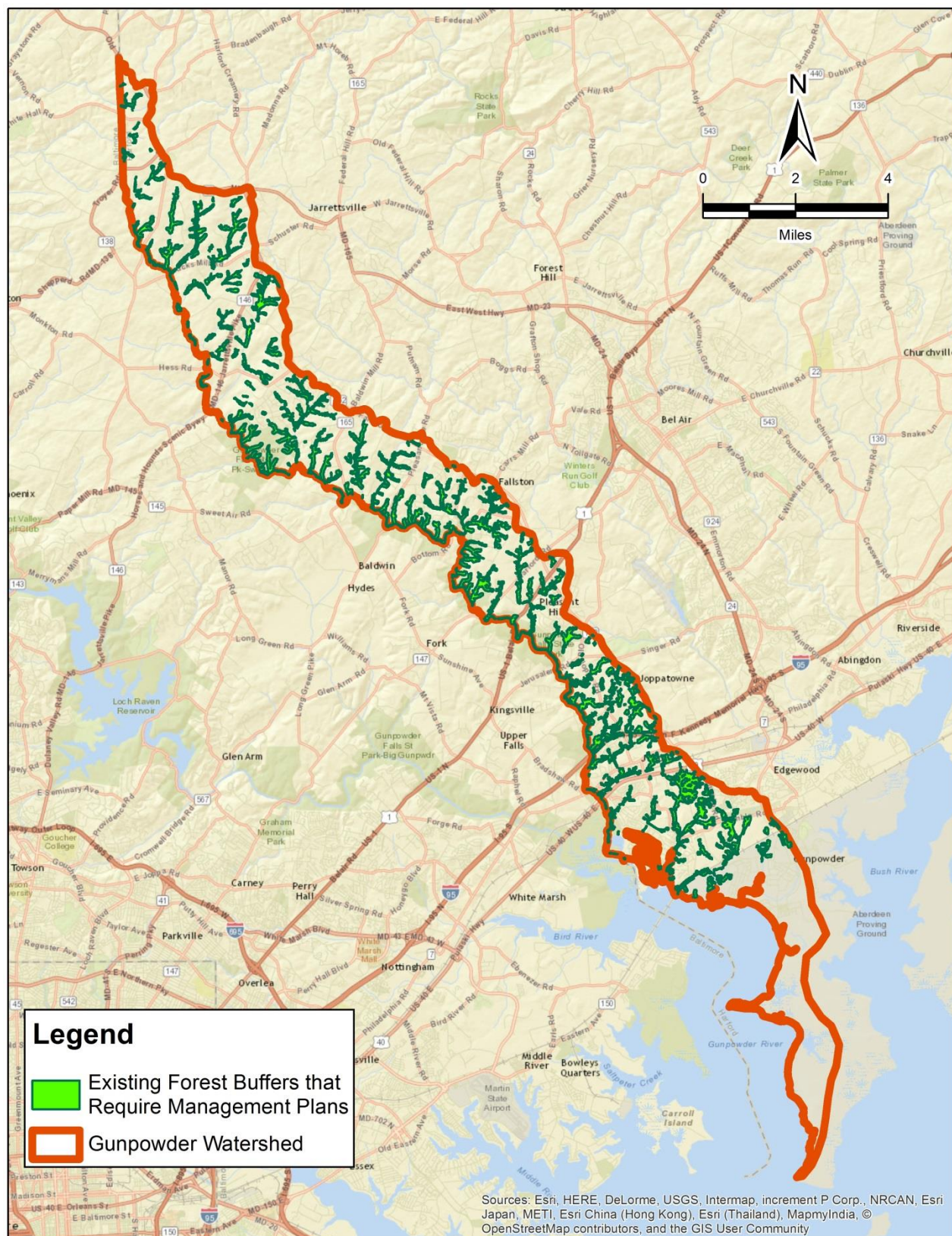


Figure F-1: Location of Existing Forest Buffers that Require Management Plans to Receive Water Quality Credit