



**Chesapeake Bay TMDL Action Plan for the James,
Potomac, Rappahannock, and York River Basins
Amended for Second Permit Cycle**

**Virginia Department of Transportation Municipal Separate
Storm Sewer System (MS4)**

In Compliance with:

Individual VPDES Permit for Discharges of Stormwater from MS4 (VA0092975)
Coverage from July 01, 2017 to June 30, 2022

Prepared By:

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May 31, 2018

CERTIFICATION

"I certify under penalty of law that I have read and understand this document and that this document and all attachments were prepared in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

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Title: Commissioner of Highways

Signature:

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Date:

6/21/2018

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ACRONYMS

BMP	Best Management Practice
CBPO	Chesapeake Bay Program Office
CGP	Construction General Permit
CTB	Commonwealth Transportation Board
CUA	Census Urbanized Area
CWA	Clean Water Act
DCR	Virginia Department of Conservation and Recreation
DEQ	Virginia Department of Environmental Quality
DGIF	Virginia Department of Game and Inland Fisheries
DRPT	Department of Rail and Public Transportation
EOS	Edge-of-Stream
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
GIS	Geographic Information System
GP	General Permit
HUC	Hydrologic Unit Code
IDDE	Illicit Discharge Detection and Elimination
IFB	Invitation for Bid
IIM	Instructional and Informational Memorandum
L2	Level 2
L&D	Location & Design
LAP	Locally Administered Projects
LB(S)	Pound or pounds
LID	Low Impact Development
LDA	Land-Disturbing Activity
LRS	Linear Referencing System
LUP	Land Use Permit
MCM	Minimum Control Measure
MOA	Memorandum of Agreement
MRLC	Multi-Resolution Land Characteristics
MS4	Municipal Separate Storm Sewer System
NLCD	National Land Cover Database
NMP	Nutrient Management Plan
P2	Pollution Prevention
POC	Pollutant of Concern
QA	Quality Assurance
QC	Quality Control
RFP	Request for Proposal
RLDA	Regulated Land-Disturbing Activities
ROW	Right of Way
SSAR	Secondary Street Acceptance Requirements

SWM	Stormwater Management
SWPPP	Stormwater Pollution Prevention Plan
SYIP	Six-Year Improvement Plan
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
VAC	Virginia Administrative Code
VDOT	Virginia Department of Transportation
VGIN	Virginia Geographic Information Network
VSMP	Virginia Stormwater Management Program
VPDES	Virginia Pollutant Discharge Elimination System
WIP	Watershed Implementation Plan
WLA	Wasteload Allocation
WQGIT	Water Quality Goals Implementation Team

DEFINITIONS

The words and terms used in this Plan shall have the meanings defined in the State Water Control Law, the Virginia Stormwater Management Program (VSMP) regulations, and the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4) General Permit, DEQ Guidance Memorandum #15-2005, unless the context clearly indicates otherwise in italics. The following definitions apply to this Plan.

“Best Management Practices” or “BMPs” or “management practices” means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices, including both structural and nonstructural practices, to prevent or reduce the pollution of surface waters and groundwater systems.

“Chesapeake Bay watershed” means all land areas draining to the following Virginia river basins: Potomac River Basin, James River Basin, Rappahannock River Basin, Chesapeake Bay and its small coastal basins, and York River Basin.

“Control measure” means any BMP, stormwater facility, or other method used to minimize the discharge of pollutants to state waters.

“Excluded lands” means any land cover of forest, water or wetland.

“Existing Sources” means for purposes of this Plan, impervious and pervious urban land cover, within the MS4 Service Area as of June 30, 2009.

“Historical BMPs” means, for purposes of this Plan, a stormwater management facility that is creditable under the Chesapeake Bay TMDL provided it was initially installed on or after January 1, 2006 and prior to July 1, 2009, and constructed to address water quality within the permittee’s MS4 Service Area.

“Hydrologic Unit Code” or “HUC” means a watershed unit established in the most recent version of Virginia's 6th Order National Watershed Boundary Dataset unless specifically identified as another order.

“Impervious Cover” means a surface composed of material that significantly impedes or prevents natural infiltration of water into soil, and for purposes of this Plan, is a regulated land cover if within the MS4 Service Area.

“Locality” means a county, city, or town.

“Means and Methods” means, for purposes of this Plan, an array of BMP types and retrofit programs that will be utilized to meet the required 5% reductions of the L2 scoping run.

“MS4 Service Area” or “VDOT MS4 Service Area” means, for purposes of this Plan, the acres of VDOT right-of-way (ROW) and VDOT property located within the 2000 U.S. Census Bureau delineated urbanized areas. VDOT Properties in VDOT’s MS4 service area include district and headquarter offices, supporting storage facilities, and park and ride commuter lots. VDOT MS4 Service Area is synonymous with “VDOT MS4 Permit Area.”

“Municipal Separate Storm Sewer System” or “MS4” means conveyance or system of conveyances otherwise known as a municipal separate storm sewer system, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains:

1. Owned or operated by a federal state, city, town, county, district, association, or other public body, created by or pursuant to state law, having jurisdiction or delegated authority for erosion and sediment control and stormwater management, or a designated and approved management agency under § 208 of the Clean Water Act (CWA) that discharges to surface waters;
2. Designed or used for collecting or conveying stormwater;
3. That is not a combined sewer; and,
4. That is not part of a publicly owned treatment works.

“New Sources” means, for purposes of this Plan impervious and pervious urban land cover within the VDOT MS4 Service Area developed or redeveloped on or after July 1, 2009.

"National Pollutant Discharge Elimination System" or "NPDES" means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing state permits, and imposing and enforcing pretreatment requirements under § 307, 402, 318, and 405 of the CWA. The term includes an approved program.

"Nutrient credit" or "credit" means a nutrient reduction that is certified pursuant to the Chesapeake Bay Watershed Nutrient Credit Exchange Program and is expressed, for the purposes of this Plan, in pounds of phosphorus, nitrogen, and total suspended solids (i) delivered to tidal waters when the credit is generated within the Chesapeake Bay Watershed or (ii) as otherwise specified when generated in the Southern Rivers watersheds.

"Operator" means, for purposes of this Plan, the entity overseeing maintenance of a particular roadway segment and infrastructure within the MS4 Service Area. The term shall apply to VDOT, when VDOT’s sole role is, by agreement, to maintain a roadway owned by another party.

“Pervious Cover” means any surface other than impervious cover or excluded lands that is within VDOT’s MS4 Service Area, and for purposes of this Plan, is regulated land surface. Pervious surfaces might include: shoulders, medians, unimpacted gravel, embankments/side slopes, etc.

“Pollutants of Concern” or **“POC”** means Total nitrogen (“TN”), total phosphorous (“TP”), and total suspended solids (“TSS”).

“Prior Developed Lands” or **“Redevelopment”** means land that has been previously utilized for residential, commercial, industrial, institutional, recreational, transportation, or utility facilities or structures, and that will have the impervious areas associated with those uses altered during a land-disturbing activity.

“Regulated Land” means, for purposes of this Plan, those portions of the VDOT MS4 Service Area which is an urban impervious or pervious land surface.

“Regulated Land-Disturbing Activity” means any new development/redevelopment that disturbs greater than or equal to one acre or any new development/redevelopment disturb greater than or equal to 2,500 square feet in a Chesapeake Bay Preservation Area designated area.

“Residue parcel” or **“residual property”** means, for purposes of this Plan, a parcel or a portion of a parcel that was acquired by VDOT either through agreement or eminent domain, and was not immediately used for highway right-of-way. Residual properties typically result when the remainder of such property or part thereof can no longer be utilized for its original purpose.

“Right of way” or **“ROW”** means that property within the entire area of every way or place of whatever nature within the system of state highways under the ownership, control, or jurisdiction of the board or VDOT that is open or is to be opened within the future for the use of the public for purposes of travel in the Commonwealth. The area set out above includes not only the traveled portion but the entire area within and without the traveled portion, from boundary line to boundary line, and all parking and recreation areas that are under the ownership, control, or jurisdiction of the board or VDOT.

“Transitional Land” or **“Transitional Sources”** means regulated land disturbing activities that are temporary in nature and discharge through the MS4.

“Sediment” means total suspended solids (“TSS”) as in a POC of the Chesapeake Bay TMDL.

“Unregulated Land” means those acres that are not owned or operated by the MS4 permittee.

2013 MS4 GENERAL PERMIT AND 2017 MS4 INDIVIDUAL PERMIT CROSS REFERENCE TABLE

PERMIT REFERENCE	DESCRIPTION OF SPECIAL CONDITION	ACTION PLAN SECTION
2013 General Permit Section I.C.2.a.(1) 2017 Individual Permit Section I.D.3.a.(ii)	Current Program and Existing Legal Authority	Section 1.0
2017 Individual Permit Section I.D.3.a.(i)	New or Modified Legal Authority	Section 2.0
2013 General Permit Section I.C.2.a.(3)	Means and Methods to Address Discharges from New Sources	Section 3.0
2013 General Permit Section I.C.2.a.(4) 2017 Individual Permit Section I.D.1.A & 2.A	Estimated Existing Source Loads	Section 4.0
2013 General Permit Section I.C.2.a.(5) 2017 Individual Permit Section I.D.1.A & 2.A	Calculated Total Pollutant of Concern (POC) Required Reductions	Section 4.0
2013 General Permit Section I.C.2.a.(6) 2017 Individual Permit Section I.D.3.a.(iii) & (iv)	Means and Methods to Meet the Required Reductions and Schedule	Section 5.0
2013 General Permit Section I.C.2.a.(7)	Means and methods to offset increased loads from new sources initiating construction between July 1, 2009 and June 30, 2014	Section 6.0
2013 General Permit Section I.C.2.a.(8)	Means and methods to offset increased loads from grandfathered projects that begin construction after July 1, 2014	Section 7.0
2013 General Permit Section I.C.2.a.(10)	A list of future projects, and associated acreage that qualify as grandfathered	Section 8.0
2013 General Permit Section I.C.2.a.(11)	An estimate of the expected cost to implement the necessary reductions	Section 9.0
2017 Individual Permit Section I.D.3.b.(iii)	Public Comments on Draft Action Plan	Section 10.0

EXECUTIVE SUMMARY

As of July 1, 2017, the Virginia Department of Transportation (VDOT) is now covered under Individual Permit VAR0092975 due to the unique nature and extent of the VDOT MS4 and associated regulated service area. VDOT had previously been covered under the General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4s) (2003 through 2017).

Per the Permit Fact Sheet, permitted MS4s, such as VDOT, are required to reduce the loadings of nutrients and sediment from existing sources (pervious and impervious regulated urban lands developed prior to July 1, 2009) equivalent to Level 2 (L2) scoping run reductions simulated in the Chesapeake Bay Watershed Model. Level 2 implementation equates to an average reduction of 9% of nitrogen loads, 16% of phosphorus loads, and 20% of sediment loads from impervious regulated acres and 6% of nitrogen loads, 7.25% of phosphorus loads and 8.75% sediment loads from pervious regulated acres beyond 2009 progress loads and beyond urban nutrient management reductions for pervious regulated acreage.

In the Phase I and Phase II Chesapeake Bay Total Maximum Daily Load (TMDL) Watershed Implementation Plan (WIP) for the Chesapeake Bay TMDL, the Commonwealth of Virginia (Commonwealth) committed to a phased approach to reducing nutrients and suspended solids discharging from MS4s. This phased approach established the Commonwealth's schedule of reducing pollutant loads over 3 MS4 permit cycles, with

- 5% of the reductions achieved in the first permit cycle,
- an additional 35% in the second permit cycle,
- and the remaining 60% in the third permit cycle.

The 2013 General Permit required the 5% reduction to be completed by June 30, 2018. In order to provide VDOT five years to implement the 5% reduction of L2, this Individual Permit includes a requirement that the 5% reduction be achieved no later than June 30, 2018.

The expiration of this permit on June 30, 2022 would provide VDOT with only nine years to complete both the first and second phase of reductions. Therefore, the cumulative reduction required by the end of this permit term has been pro-rated to 36%.

The previous Special Condition for the Chesapeake Bay TMDL (Special Condition) required a TMDL Action Plan (Action Plan) to describe the means and methods VDOT would use to meet the 5% required reduction. The Special Condition in the Individual Permit requires VDOT to develop an amended Action Plan by July 1, 2018 (12 months after permit coverage) describing the means and methods VDOT will use to meet the 36% required reduction.

Similar to VDOT's first Action Plan, this amended Action Plan provides a review of the current MS4 Program, which demonstrates VDOT's ability to ensure compliance with the Special Condition and includes the means and methods VDOT will use to meet 36% of the L2 scoping run

reduction for existing development during the second permit cycle. VDOT will review and revise this amended Action Plan as necessary during the permit cycle.

The amended Action Plan addresses the four major river basins within the Chesapeake Bay TMDL Watershed for which VDOT has regulated acres within its MS4 Service Area. Using VDOT's updated regulated area based on the 2010 Census Urbanized Area and the tables included in the Individual Permit, the pollutant loads, and 36% reduction requirements were estimated in each river basin. Table ES-1 depicts the estimated load reductions for the pollutants of concern (POCs) for the 36% load reductions (second permit cycle) for each river basin.

Table ES-1. Summary of Required 36% Reductions for VDOT's MS4

POC	River Basin	36% Reduction Required for VDOT's MS4 Permit (lbs/yr)
Nitrogen	James	7,007
	Potomac	18,801
	Rappahannock	905
	York	868
Phosphorus	James	1,948
	Potomac	2,811
	Rappahannock	213
	York	255
Sediment	James	904,473
	Potomac	2,477,611
	Rappahannock	77,268
	York	92,595

In addition to the estimated load reductions, this amended Action Plan includes a review of the current MS4 permit authority and implementation capabilities; existing, new, and modified legal authorities necessary to meet required reductions; best management practices and other strategies to meet the reductions; an implementation schedule; and a public comment process and period.

VDOT's first Action Plan was developed under the general intent of the Guidance Memorandum Number 15-2005, issued May 18, 2015 by the Virginia Department of Environmental Quality (DEQ), which provided background information and procedures to meet the Chesapeake Bay TMDL Special Condition Requirements for the MS4 General Permit. This amended Action Plan was also developed using DEQ's Guidance and meeting the requirements of VDOT's Individual Permit. The amended Action Plan provides DEQ sufficient information to verify that VDOT will be able to meet the requirements for the Special Condition for the Chesapeake Bay by the end of the second permit cycle (June 30, 2022). This Action Plan provides sufficient supporting material to show that VDOT has calculated the full scope of offsets for existing source loads that are required to be made during the second permit cycle and determined the practices that will be used to meet the 36% reductions required by the end of the second permit cycle.

1.0 CURRENT PROGRAM AND EXISTING LEGAL AUTHORITY

(2013 GENERAL PERMIT SECTION I.C.2.A.(1)) – A review of the current MS4 program implemented as a requirement of this state permit including a review of the existing legal authorities and the operator’s ability to ensure compliance with this special condition

(2017 INDIVIDUAL PERMIT SECTION I.D.3.a.(ii)) – The contact person(s) and/or positions or departments responsible for the Action Plan.

The VDOT MS4 Program strives to improve environmental compliance, quality, and stewardship in VDOT’s MS4 Service Area through effective management and implementation of sound technical guidelines, criteria, and practices for stormwater management and erosion and sediment control. VDOT’s collective efforts under the MS4 Program result in significant reduction of all pollutants that may be discharged from its regulated MS4. In addition, VDOT has specifically developed its MS4 Program and other support programs such as local TMDL Action Plans to address specific pollutants, including the pollutants of concern (POCs) of the Chesapeake Bay TMDL (nitrogen, phosphorus, and suspended solids). Pollutant removal from the implementation of best management practices (BMPs) that address the six Minimum Control Measures (MCM) should be accounted for in evaluation of VDOT’s goal for meeting wasteload allocation (WLA) targets, including those reductions required by the Chesapeake Bay TMDL.

1.1 MS4 Program Plan

As specified in the Chesapeake Bay TMDL Special Condition of the 2013 MS4 General Permit (GP Section I.C.3), implementation of the following existing BMPs from VDOT’s MS4 Program Plan represents implementation to the maximum extent practicable and demonstrates adequate progress for this permit cycle and VDOT’s ability to meet the Special Condition of VDOT’s Individual Permit:

- a. Implementation of Nutrient Management Plans (NMP) in accordance with the schedule identified in the minimum control measure in Section II [of the MS4 Permit] related to pollution prevention/good housekeeping for VDOT operations (**addressed in BMP 6(C) of the VDOT MS4 Program Plan**);
- b. Implementation of the minimum control measure in Section II [of the MS4 Permit] related to construction site stormwater runoff control in accordance with [the MS4 Permit] shall address discharges from transitional sources (**addressed in BMPs 4(A) through 4(C) of the VDOT MS4 Program Plan**); and
- c. Implementation of the means and methods to address discharges from new sources in accordance with the minimum control measure in Section II [of the MS4 Permit] related to post-construction stormwater management in new development and development of prior developed lands (**addressed in BMPs 5(A) and 5(B) of the VDOT MS4 Program Plan**).

In addition to these BMPs, VDOT’s robust program has BMPs that address the POCs of the Chesapeake Bay TMDL. The BMPs identified in Table 1 are those in VDOT’s MS4 Program Plan that are particularly effective in reducing sediment and nutrients. Though these MS4 Program

BMPs are effective, VDOT has chosen not to claim credit for Chesapeake Bay TMDL pollutant reductions from the implementation of the MS4 Program Plan.

Table 1. VDOT MS4 Program BMPs

BMP #	BMP Description
1(A)	Maintain and update VDOT Stormwater Webpage to communicate MS4 program elements
2(C)	Continue to participate in the development of local TMDLs in watersheds located within the CUA and in which the VDOT MS4 discharges.
3(A)	Develop and maintain a storm sewer map that supports a successful Illicit Discharge Detection and Elimination (IDDE) Program
3(B)	Prohibit non-stormwater discharges into the storm sewer system
3(C)	Utilize written procedures to detect, identify, and address unauthorized non-stormwater discharges, including illegal dumping, to VDOT's MS4
4(A)	VDOT will utilize its annual Erosion and Sediment Control (ESC) and Stormwater Management (SWM) Standards & Specifications to address discharges entering the MS4 from VDOT land-disturbing activities regulated by the VPDES and Virginia Stormwater Management Program (VSMP)
4(B)	Inspect and enforce compliance with the VPDES Construction General Permit and attending regulations on applicable projects
5(A)	VDOT will utilize its annual ESC and SWM Standards & Specifications to address post-construction stormwater runoff that enters the MS4 from regulated land-disturbing activities
5(B)	Provide adequate long-term operation and maintenance of its SWM facilities in accordance with the VDOT BMP Inspection and Maintenance Manuals
6(A)	Develop and refine, as appropriate, written procedures designed to minimize or prevent pollutant discharge from non-high-priority support facilities, daily operations, equipment maintenance, and the application, storage, transport, and disposal of pesticides, herbicides, and fertilizers
6(B)	Develop and refine turf and landscape nutrient management plans (NMPs) that have been developed by a certified turf and landscape nutrient management planner to minimize or prevent pollutant discharge from turf and landscape management
6(C)	Continue to implement VDOT's efforts to prevent and reduce stormwater pollution from VDOT-related activities
6(D)	Develop and implement applicable TMDL Action Plans for approved TMDLs that have assigned VDOT's MS4 a wasteload allocation
7(A)	Coordinate with other large MS4s regarding physical interconnection of systems
SC1(A)	Develop and implement 2 nd Phase TMDL Action Plan for the Chesapeake Bay Watershed TMDL

1.2 Parties Responsible for Action Plan

The Commissioner of Highways is responsible for compliance with the MS4 Permit, including the Special Condition for Chesapeake Bay TMDL. VDOT's Environmental Division has been tasked with the development of the Chesapeake Bay TMDL Action Plan. Implementation and planning

for individual BMPs within this plan varies and may involve multiple divisions and Districts within the VDOT organizational structure. The Environmental Division will establish the schedule for and report on implementation in coordination with those divisions and Districts.

1.3 Code of Virginia

The MS4 Program Plan is built upon portions of the Code of Virginia that authorizes VDOT to develop and implement policies and procedures to comply with the Individual Permit. The following laws have applicability when satisfying the requirements of the Chesapeake Bay TMDL Special Condition for the Individual Permit:

Title 33.2. Highways and other Surface Transportation Systems

Chapter 2. Transportation Entities

Article 2. Commonwealth Transportation Board; Powers and Duties

Article 3. Commissioner of Highways

Chapter 3. Highway Systems

Article 1. Interstate System

Article 2. Primary State Highway System

Article 3. Secondary State Highway System.

Chapter 7. Local Authority Over Highways

Article 1. General Provisions

Chapter 10. Eminent Domain

Article 1. Eminent Domain and Damages

Below is a summary of citations from the various chapters and articles of the Code of Virginia.

§ 33.2-208. Location of routes.

A. The Board shall have the power and duty to locate and establish the routes to be followed by the highways comprising the systems of state highways between the points designated in the establishment of such systems, except that such routes shall not include highways or streets located within any local system of highways or streets, within the urban highway system, or those local highways in any county that has resumed full responsibility for all of the secondary state highway system within such county's boundaries pursuant to § [33.2-342](#). Such routes to be located and established shall include corridors of statewide significance pursuant to § [33.2-353](#).

§ 33.2-214. Transportation; Six-Year Improvement Program.

A. The Board shall have the power and duty to monitor and, where necessary, approve actions taken by the Department of Rail and Public Transportation pursuant to Article 5 (§ [33.2-281](#) et seq.) in order to ensure the efficient and economical development of public transportation, the enhancement of rail transportation, and the coordination of such rail and public transportation plans with highway programs.

§ 33.2-222. Commissioner of Highways.

The Commissioner of Highways shall be the chief executive officer of the Department of Transportation. The Commissioner of Highways shall be an experienced administrator able to direct and guide the Department in the establishment and achievement of the Department's core mission as provided in subsection B of § [33.2-256](#) and other transportation objectives determined by the Commonwealth Transportation Board.

§ 33.2-300. Power and authority of Commonwealth Transportation Board relating to the Interstate System, generally.

The Board may plan, designate, acquire, open, construct, reconstruct, improve, maintain, discontinue, abandon, and regulate the use of the Interstate System in the same manner in which it is now or may be authorized to plan, designate, acquire, open, construct, reconstruct, improve, maintain, discontinue, abandon, and regulate the use of the primary state highway system. The Board may vacate, close, or change the location of any highway or street in the manner in which it is now authorized by law to vacate, close, or change the location of a highway in the primary state highway system. The Board has any and all other authority and power relative to the Interstate System as is vested in it relative to highways in the primary state highway system, including the right to acquire by purchase, eminent domain, grant, or dedication title to lands or rights-of-way for such interstate highways whether within or without the limits of any city or town, and in addition thereto has such other power, control, and jurisdiction necessary to comply with the provisions of the Federal-Aid Highway Act of 1956 and all acts amendatory or supplementary thereto, all other provisions of law to the contrary notwithstanding.

§ 33.2-310. Primary state highway system.

The primary state highway system shall be constructed and maintained by the Commonwealth under the direction and supervision of the Board and the Commissioner of Highways.

§ 33.2-311. Certain highways in parks included in primary state highway system.

All highways in state parks that provide connections between highways, in either the primary or secondary state highway system, outside such parks and recreation centers within such parks shall continue to be portions of the primary state highway system.

§ 33.2-312. Maintenance of highways, bridges, and toll facilities within state parks.

The Commissioner of Highways may maintain all highways, bridges, and toll facilities within the boundaries of any state park established by and under the control of the Department of Conservation and Recreation. For the purpose of maintaining the highways in any such park, the Commissioner of Highways may expend funds under his control and available for expenditure upon the maintenance of highways in the secondary state highway system in the county or counties in which such state park is located. This section shall not affect the jurisdiction, control,

and right to establish such highways, bridges, and toll facilities that are now vested in the Department of Conservation and Recreation.

All roads, bridges, and toll facilities constructed by way of revenue bonds issued by the Department of Conservation and Recreation shall operate under the terms of their establishment as a park facility, notwithstanding the right of the Commissioner of Highways to use highway funds to maintain them.

§ 33.2-313. Maintenance of highways at state institutions.

The Commissioner of Highways may, when requested by the governing body of a state institution, assume the maintenance of any highway within the grounds of such state institution that has been established and constructed by such institution to standards acceptable to the Commissioner of Highways. Any such highways accepted for maintenance by the Commissioner of Highways under the provisions of this section shall be a part of the primary state highway system, but the state institution shall continue to exercise police power over such highways.

§ 33.2-320. Incorporation into primary state highway system of connecting streets and highways in certain other cities and towns.

The Board may, by and with the consent of the Governor and the governing body of any city or town having a population of 3,500 or less, incorporate in the primary state highway system such streets and highways or portions thereof in such city or town as may in its judgment be best for the handling of traffic through such city or town from or to any highway in the primary state highway system and may eliminate any of such streets or highways or portions thereof from the primary state highway system. Every such action of the Board incorporating any such street or highway or portion thereof in the primary state highway system or eliminating it therefrom shall be recorded in its minutes.

Any such street or highway or portion thereof in any such city or town so incorporated in the primary state highway system shall be subject to the rules, regulations, and control of the state highway authorities as are other highways in the primary state highway system. But such city or town shall be obligated to pay the maintenance, construction, and reconstruction costs of such streets or highways or portions thereof so incorporated in the primary state highway system in excess of the amounts authorized to be spent by the Commissioner of Highways on such streets or highways.

Every provision in the charter of any such city or town insofar as it is in conflict with this section is hereby repealed.

The Commissioner of Highways may permit such city or town to maintain any such street or highway or portion thereof incorporated in the primary state highway system and may reimburse such city or town up to such amount as he is authorized to expend on the maintenance of such street or highway or portion thereof.

§ 33.2-322. Counties may perform certain maintenance.

Any county may enter into an agreement with the Department to permit the county to landscape and maintain any or all medians and other non-traveled portions of primary highways located in the county.

§ 33.2-324. Secondary state highway system; composition.

The secondary state highway system shall consist of all the public highways, causeways, bridges, landings, and wharves in the counties of the Commonwealth not included in the primary state highway system. The secondary state highway system shall include such highways and community roads leading to and from public school buildings, streets, causeways, bridges, landings, and wharves in towns having a population of 3,500 or less according to the United States census of 1920, and in all towns having such a population incorporated since 1920, that constitute connecting links between highways in the secondary state highway system in the counties and between highways in the secondary state highway system and highways in the primary state highway system, not to exceed two miles in any one town. If in any such town that is partly surrounded by water less than two miles of the highways and streets therein constitute parts of the secondary state highway system, the Board shall, upon the adoption of a resolution by the governing body of such town designating for inclusion in the secondary state highway system certain highways and streets in such town not to exceed a distance of two miles, less the length of such highways and streets in such town that constitute parts of the secondary state highway system, accept and place in the secondary state highway system such additional highways and streets.

§ 33.2-325. Certain school roads in secondary state highway system.

All roads leading from the state highways, either primary or secondary, to public schools in the counties of the Commonwealth to which school buses are operated shall continue to constitute portions of the secondary state highway system insofar as these roads lead to or are on school property and as such shall be improved and maintained.

§ 33.2-326. Control, supervision, and management of secondary state highway system components.

A. The control, supervision, management, and jurisdiction over the secondary state highway system shall be vested in the Department, and the maintenance and improvement, including construction and reconstruction, of such secondary state highway system shall be by the Commonwealth under the supervision of the Commissioner of Highways. The boards of supervisors or other governing bodies of the counties shall have no control, supervision, management, or jurisdiction over such public highways, causeways, bridges, landings, and wharves constituting the secondary state highway system. Except as otherwise provided in this article, the Board shall be vested with the same powers, control, and jurisdiction over the

secondary state highway system in the counties and towns of the Commonwealth, and such additions as may be made, as were vested in the boards of supervisors or other governing bodies of the counties on June 21, 1932, and in addition thereto shall be vested with the same power, authority, and control as to the secondary state highway system as is vested in the Board in connection with the primary state highway system.

B. Nothing in this chapter shall be construed as requiring the Department, when undertaking improvements to any secondary state highway system component or any portion of any such component, to fully reconstruct such component or portion thereof to bring it into compliance with all design and engineering standards that would be applicable to such component or portion thereof if the project involved new construction.

§ 33.2-334. Requirements for taking new streets into secondary state highway system.

A. The governing body of any county that has not withdrawn from the secondary state highway system or any town within which the Department maintains the streets may, by resolution, request the Board to take any new street or highway into the secondary state highway system for maintenance if such street or highway has been developed and constructed in accordance with the Board's secondary street acceptance requirements. The Board shall adopt regulations establishing such secondary street acceptance requirements, which shall include such provisions as the Board deems necessary or appropriate to achieve the safe and efficient operation of the Commonwealth's transportation network.

B. In addition to such other provisions deemed necessary or appropriate by the Board, the regulations shall include (i) requirements to ensure the connectivity of highway and pedestrian networks with the existing and future transportation network, (ii) provisions to minimize stormwater runoff and impervious surface area, and (iii) provisions for performance bonding of new secondary highways and associated cost recovery fees.

§ 33.2-700. Transfer of highways, etc., from secondary state highway system to local authorities.

Whenever any town has a population of more than 3,500 inhabitants, all the streets, highways, causeways, bridges, landings, and wharves in such town that were incorporated within the secondary state highway system shall be eliminated from such system and the control and jurisdiction over them shall be vested in the local authorities. This section shall in no way affect the rights of such towns to receive the benefits provided elsewhere in this title.

§ 33.2-1009. Acquisition of residue parcels declared to be in public interest.

The acquisition of such residue parcels in addition to the lands necessary for the immediate use for highway rights-of-way or purposes incidental to the construction, reconstruction, or

improvement of public highways is hereby declared to be in the public interest and constitutes a public use as the term public uses is used in Article I, Section 11 of the Constitution of Virginia.

§ 33.2-1010. Use and disposition of residue parcels of land.

The Commissioner of Highways may lease, sell, or exchange such residue parcels of land upon such terms and conditions as in the judgment of the Commissioner of Highways may be in the public interest, provided, however, that the Commissioner of Highways shall not use such parcels for any commercial purpose. The Commissioner of Highways may lease, sell, or exchange such residue parcels of land as may have been acquired under the provisions of the Transportation Development and Revenue Bond Act (§ [33.2-1700](#) et seq.), upon such terms and conditions as in the judgment of the Commissioner of Highways may be in the public interest. The Commissioner of Highways may lease such parcels of land as may have been acquired under the provisions of § [33.2-1005](#) in the event the former owner fails to make the request authorized under § [33.2-1005](#) to persons other than the former owner, upon such terms and conditions as in the judgment of the Commissioner of Highways may be in the public interest. The provisions of Articles 1 (§ [33.2-900](#) et seq.) and 2 (§ [33.2-908](#) et seq.) of Chapter 9 shall not be construed to apply to the disposition of land authorized in this section.

1.4 Virginia Administrative Code

The MS4 Program Plan is also built upon portions of the Virginia Administrative Code (VAC) that afford VDOT the ability to develop and implement policies and procedures to comply with the MS4 General Permit. The following regulations have applicability when satisfying the requirements of the Chesapeake Bay TMDL Special Condition for the MS4 General Permit:

24VAC30. Department of Transportation

- 21. *General Rules and Regulations of the Commonwealth Transportation Board*
 - 10. *Definitions*
 - 20. *General Provisions Concerning Permits*
 - 30. *General Provisions Concerning Use of Right of Way*
- 91. *Subdivision Street Requirements*
 - 10. *Definitions*
 - 20. *Applicability, Effective Date, and Transition*
 - 60. *Administrative Procedure*
 - 110. *Design and Agreement Requirements*
 - 150. *Subdivision Street Development, Plan Review, and Acceptance*
- 92. *Secondary Street Acceptance Requirements*
 - 70. *Administrative Procedure*
- 420. *Operation and maintenance of roads in incorporated towns less than 3,500*
- 430. *Maintenance of roads crossing the interstate system*
- 490. *Roads in the grounds of state institutions*
- 500. *Roads in the grounds of state parks*

Below is a summary of the relevant citations from the Virginia Administrative Code.

24VAC30. Department of Transportation – Agency Summary

The Virginia Department of Transportation (VDOT) is charged with implementing and enforcing the policies and regulations of the Commonwealth Transportation Board (board). VDOT operates under the overall supervision of the Secretary of Transportation, who is designated as Chairman of the board. The senior non-legislative citizen member serves as vice-chairman of the board, and presides during the absence of the Chairman. Code of Virginia, Title 33.2, Subtitle I, Chapter 2.

The board is a policy board as defined by the Code of Virginia. Title 2.2, Subtitle I, Part D, Chapter 21. It has general powers and duties, including, but not limited to, the following: to locate and name highways; let contracts for construction, maintenance, and improvement of the systems of state highways; make decisions concerning the financing of transportation projects, including the administration of funds in the Transportation Trust Fund; oversee policy objectives of VDOT and the Department of Rail and Public Transportation (DRPT); comply with federal acts; and enter into contracts with other states. Code of Virginia, 33.2, Subtitle I, Chapter 2.

The commissioner, as chief executive officer of VDOT, is authorized to perform all acts necessary for constructing, improving, and maintaining the roads comprising the state system of highways. The commissioner is also authorized to execute all orders and decisions of the board and may require that all employees and appointees perform their duties as required by statute. Code of Virginia, Title 33.2, Subtitle I, Chapter 2.

The Code of Virginia authorizes the board, VDOT, or the commissioner to promulgate regulations, establish guidelines, administer programs, or take other actions related to transportation. This authority may be granted under general powers, or may be granted in connection with a specific subject. Code of Virginia, Title 33.2, Subtitles I, II, and III, Chapters 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 16, 17, and 18 and Title 46.2, Subtitle III, Chapter 8.

Regulations of the board or VDOT generally deal with the following subjects:

1. Application of civil engineering concepts to the design, planning, and delivery of construction or maintenance projects (e.g., Secondary Street Acceptance Requirements). (Code of Virginia, Title 33.2, Subtitle II and III, Chapters 2 and 3).
2. Use of traffic signs, signals and other devices on highways in the Commonwealth (e.g., Standards for Use of Traffic Control Devices to Classify, Designate, Regulate, and Mark State Highways) (Code of Virginia, Title 33.2, Subtitle I, Chapter 2 and Title 46.2, Subtitle III, Chapter 8);
3. Use of highway right-of-way under the control of the Board (e.g., Land Use Permit Regulations) (Code of Virginia, Title 33.2, Subtitle I, Chapter 2 and Title 46.2, Subtitle III, Chapter 8); and

4. Activities associated with requirements of federal law, or in connection with an agreement with the federal government (e.g. Rules and Regulations Governing Relocation Assistance (Code of Virginia, Title 25.1, Chapter 4 and Title 33.2, Subtitle I, Chapter 2) and Rules and Regulations Governing Outdoor Advertising and Directional and Other Signs and Notices) (Code of Virginia, Title 33.2, Subtitles I and II, Chapters 2 and 12).

Guidance documents of the board or VDOT explain or interpret subjects such as:

1. Business operations of VDOT (e.g., VDOT Budget) (Code of Virginia, Title 33.2, Subtitle I, Chapter 2);
2. Procedures related to administration of special-purpose funds; (e.g., Revenue Sharing Program Guidelines) (Code of Virginia, Title 33.2, Subtitle II, Chapter 3);
3. Procurement of civil engineering contracts (e.g., Design-Build Procurement Manual) (Code of Virginia, Title 33.2, Subtitle I, Chapter 2, Section 33.2-209); and
4. Technical evaluation procedures related to highway studies (e.g., Highway Traffic Noise Impact Analysis Guidance Manual) (Code of Virginia, Title 33.2, Subtitle I, Chapter 2, Section 33.2-215).

24VAC30-21-10. Definitions

The following words and terms when used in this chapter shall have the following meanings unless the context clearly indicates otherwise:

"Board" means the Commonwealth Transportation Board.

"Commissioner" means the Commissioner of Highways, the individual who serves as the chief executive officer of the Virginia Department of Transportation (VDOT) or his designee.

"Commonwealth" means the Commonwealth of Virginia.

"Right of Way" means that property within the entire area of every way or place of whatever nature within the system of state highways under the ownership, control, or jurisdiction of the board or VDOT that is open or is to be opened within the future for the use of the public for purposes of travel in the Commonwealth. The area set out above includes not only the traveled portion but the entire area within and without the traveled portion, from boundary line to boundary line, and all parking and recreation areas that are under the ownership, control, or jurisdiction of the Board or VDOT.

"System of state highways" means all highways and roads under the ownership, control, or jurisdiction of the Board including, but not limited to, the primary, secondary, and interstate systems.

"VDOT" means the Virginia Department of Transportation, the Commissioner of Highways, or a designee.

24VAC30-21-20. General Provisions Concerning Permits

A. No work of any nature shall be performed on any real property under the ownership, control, or jurisdiction of the board or VDOT including, but not limited to, the right of way of any highway in the system of state highways until written permission is first obtained from VDOT. Written permission under this section is granted by way of permit. In addition, the letting of a contract by and between VDOT and any other party grants to that party automatically such permission for the area under contract, unless otherwise stated in the contract. VDOT is authorized to establish specific requirements for such permits including, but not limited to, permit authority, application procedure, and conditions under which a permit may be denied or revoked.

B. No land use permit shall be issued until the applicant has complied with the conditions set forth in and pursuant to applicable VDOT regulations filed as part of the Virginia Administrative Code.

C. Applicants to whom permits are issued shall at all times indemnify and save harmless the board, members of the board, the Commonwealth, and all Commonwealth employees, agents, and officers from responsibility, damage, or liability arising from the exercise of the privileges granted by these permits.

D. Any structure placed upon or within the right of way pursuant to a permit issued by VDOT shall be relocated or removed whenever ordered by VDOT. Such relocation or removal shall be accomplished at no expense to the Commonwealth unless VDOT agrees or has agreed otherwise.

24VAC30-21-30. General Provisions Concerning Use of Right of Way

A. No person, firm, or corporation shall use or occupy the right of way of any highway for any purpose except travel, except as may be authorized by VDOT, either pursuant to regulation or as provided by law.

B. Except as permitted by subdivision 2 of this subsection, the following restrictions apply to activities occurring on bridges forming a part of the system of state highways:

1. No person, firm, or corporation shall stand or park a vehicle of any description on any bridge unless authorized by VDOT.

2. No person shall fish or seine from any bridge except when facilities are provided for such purposes as set out in § [33.2-278](#) of the Code of Virginia.

3. No person, firm, or corporation shall use any bridge as a wharf from which to load or unload any vehicle, as a place of deposit for any property, or for any other purpose except crossing.

4. No master or owner of any vessel shall make it fast to or lay it alongside such bridge.

5. Provisions of this subsection shall not apply to highway maintenance vehicles or vessels.

C. No person, firm, or corporation shall, without the consent of VDOT, remove, injure, destroy, break, deface, or in any way tamper with any property, real or personal, that is growing or has been placed on the right of way of any highway within the system of state highways by or with the consent of VDOT.

D. No person, firm, or corporation may cause water to flow from any source upon the right of way of any highway within the system of state highways, nor shall any person, firm, or corporation cause any increase of the water, at present, lawfully on the right of way of any highway or concentrate the flow of water upon the right of way of any highway in the system of state highways without the written consent of VDOT.

E. No road, railroad, or tracks of any description shall be laid along, upon, or across any portion of a highway in the system of state highways without the written consent of VDOT.

24VAC30-21-40. Board Authority to Regulate Entrances from Adjacent Property to Right of Way of Highways Within the State Highway System.

The board, under § [33.2-210](#) of the Code of Virginia, reserves the power to regulate entrances from adjacent property upon the right of way of any highway within the system of state highways. No entrance of any nature shall be made, built, or constructed upon the right of way of any highway within the system of state highways until the location has been determined in the opinion of the commissioner or designee of VDOT to be acceptable from a public safety standpoint and, further, until approval has been granted by VDOT. The design and construction of such entrances as approved by the commissioner pursuant to §§ [33.2-241](#) and [33.2-245](#) of the Code of Virginia must comply with VDOT's regulations where applicable.

24VAC30-91-10. Definitions

Part I. General Provisions

"Secondary system of state highways" means those public roads, streets, bridges, etc., established by a local governing body pursuant to § [33.2-705](#) of the Code of Virginia and subsequently accepted by the department for supervision and maintenance under the provisions of Article 3 (§ [33.2-324](#) et seq.) of Chapter 3 and Article 2 (§ [33.2-908](#) et seq.) of Chapter 9 of Title 33.2 of the Code of Virginia.

24VAC30-91-20. Applicability, Effective Date, and Transition

A. Applicability. This regulation is intended to govern subdivision street development and the criteria for acceptance of these streets by the department for subsequent maintenance. The

Subdivision Street Design Guide ([24VAC30-91-160](#)) offers guidance on the design and construction features of subdivision street development and sets out design parameters deemed appropriate for most land development scenarios. However, the business of land development is fluid and the department, in consultation with local government officials, is prepared to consider innovative transportation approaches associated with land development proposals that are consistent with the geometric requirements of the Subdivision Street Design Guide ([24VAC30-91-160](#)). However, when not specifically addressed in one of these documents, the relevant requirements of the Road Design Manual ([24VAC30-91-160](#)), standards, specifications, Pavement Design Guide ([24VAC30-91-160](#)) and associated instructions shall govern.

These requirements apply to all subdivision streets designated to be maintained by the department as part of the secondary system of state highways. The department's review and approval shall apply only to streets proposed for addition to the secondary system of state highways maintained by the department. Any plans submitted for review that contain only streets proposed for maintenance by others may be reviewed for general guidance at the discretion of the resident engineer but will not be officially approved. However, any such review shall not represent the department's commitment to accept such streets for maintenance irrespective of the quality of the construction of the street or streets.

If a subdivision plan with streets proposed for VDOT acceptance includes any streets that are not initially intended to be accepted for maintenance by the department as part of the secondary system, the plan must include a notation identifying these streets. In the absence of this notation, the plans will not be approved. It is also recommended that any streets proposed to be privately maintained also have a notation on the plat and impacted deeds that clearly indicate that as a prerequisite for the streets future acceptance, the streets must be improved to the department's prevailing standards for acceptance at no cost to the department.

B. Effective date. All streets proposed for acceptance by the department after January 1, 2005, shall be accepted in accordance with these provisions, except as may be waived by the commissioner or his designee.

C. Transition. Prior to July 1, 2005, the department will allow the design of streets developed in accordance with either the former requirements (1996) or these requirements. Any street design initially submitted to the department for consideration after June 30, 2005, however, shall be in accordance with these requirements.

24VAC30-91-60. Administrative Procedure

E. Street acceptance. Upon the satisfactory completion of construction of the subdivision street, the department will advise the local governing body regarding the street's readiness for acceptance and the governing body, in consultation with the resident engineer, will initiate its

acceptance into the secondary system of state highways maintained by the department provided:

1. The developer dedicates the prescribed right-of-way to public use.
2. The street has been constructed in accordance with the applicable specifications, standards and the plats or plans approved by the department.
3. The street renders a public service as prescribed in [24VAC30-91-50](#) (Service requirements) or as may otherwise be approved under those provisions.
4. The street has been properly maintained since its completion.
5. The developer furnishes the surety and fees in accordance with [24VAC30-91-140](#) (Surety and fees).
6. The governing body has executed all agreements prescribed by these requirements, unless specifically waived on an individual case basis by the appropriate Central Office Division Administrator, or other designee appointed by the commissioner.
7. The governing body, by proper resolution, requests the department to accept the street or streets for maintenance as part of the secondary system of state highways under its jurisdiction. The resolution shall include the governing body's guarantee of an unrestricted and unencumbered right-of-way as dedicated, plus any necessary easements for fills, drainage, or sight distance.

Upon the department's determination that the requested addition is in compliance with the applicable provisions of these requirements, the governing body will be officially advised of the street's acceptance into the secondary system of state highways and the effective date of such action. This notification serves as the resident engineer's authority to begin maintenance thereon.

24VAC30-91-110. Design and Agreement Requirements

Part II. Specific Provisions

L. Roadway drainage.

1. Policy and procedures. All drainage facilities shall be designed in accordance with the department's Drainage Manual ([24VAC30-91-160](#)) and supplemental directives. All drainage computations supporting a proposed drainage design shall be submitted to the department for review as part of the documents necessary for the approval of a construction plan.
2. Stormwater management. Whereas the department considers matters regarding stormwater management associated with the construction of new subdivision streets to be under the

authority of the local governing body, decisions regarding stormwater management in the construction of subdivision streets are deferred to the locality. However, stormwater management, including the construction of detention or retention facilities, or both, is recognized as an available design alternative. Where the developer is required by regulations promulgated by an agency or governmental subdivision other than the department or the developer chooses to use stormwater management facilities in the design of a subdivision, the governing body shall, by formal agreement, and as a prerequisite for the transfer of jurisdiction over the street to the department, acknowledge that the department is not responsible for the operation, maintenance, or liability of the stormwater management facility or facilities associated with the subdivision. However, in the event the governing body has executed a comprehensive, countywide agreement with the department addressing these matters, a specific agreement addressing stormwater management controls in the subdivision will not be required as a condition for street acceptance.

Stormwater management controls for VDOT projects are designed in accordance with the VDOT Erosion and Sediment Control and Stormwater Management Program Specifications Manual ([24VAC30-91-160](#)), the Erosion and Sediment Control Regulations, [9VAC25-840](#), and the Virginia Stormwater Management Program (VSMP) Regulation, [9VAC25-870](#). While these controls may be necessary whenever a street maintained by VDOT is widened or relocated, the department does not require them in the development of new subdivision streets, because such activity is regulated by the local governments. However, developers and counties may find these controls useful in managing land development activity.

Devices and treatments intended to mitigate the impact of stormwater shall be placed off of the right-of-way and shall be designed to prevent the backup of water against the roadbed.

Where development activity results in increased runoff to the extent that adjustment of an outfall facility is required, such adjustment shall be at the developer's expense and be contained within an appropriate easement.

3. Drainage easements.

a. An acceptable easement shall be provided from all drainage outfalls to a natural watercourse, as opposed to a swale. (See [24VAC30-91-10](#) for definitions.)

b. The department normally accepts and maintains only that portion of a drainage system that falls within the limits of the dedicated right-of-way for a street. The department's responsibility to enter drainage easements outside of the dedicated right-of-way shall be limited to undertaking corrective measures to alleviate problems that may adversely affect the safe operation or integrity of the roadway.

c. In the event drainage to a natural watercourse is not accomplished or is interrupted, an acceptable agreement from the governing body may be considered as an alternative to providing an easement to a natural watercourse, provided the agreement acknowledges that the department is neither responsible nor liable for drainage from the roadway.

24VAC30-91-150. Subdivision Street Development, Plan Review, and Acceptance.

Part III. Reference Section

A. The county-state partnership governing VDOT acceptance of new streets for maintenance. Section [33.2-705](#) of the Code of Virginia (a Byrd Act provision) creates the authority under which local governments establish new roads as part of the secondary system of state highways. Sections [15.2-2240](#) and [15.2-2241](#) of the Code of Virginia establish the authority of local subdivision ordinances and the authority of counties to set the standards for new streets within their territories.

VDOT's participation in the development and acceptance of subdivision streets for maintenance is a cooperative commitment of the Commonwealth Transportation Board.

VDOT's concurrence with or approval of a construction plan represents VDOT's commitment to accept the streets shown on the plan when satisfactorily constructed and all other requirements governing the department's acceptance of streets are satisfied, including the governing body's request for the acceptance of or transfer of the maintenance and operational jurisdiction over the street, as outlined in these requirements.

Pursuant to these principles:

1. Local government controls land development activity and establishes new streets, the relocation of existing streets, and the criteria governing the development of such streets.
2. VDOT establishes the minimum standards that must be satisfied for new subdivision streets to be considered for maintenance by the department as part of the secondary system of state highways under its jurisdiction.

Within each locality, VDOT is represented by a resident engineer or comparable designee.

B. Street development and acceptance of maintenance process.

1. Concept and construction plan approval phase. The proposed construction plan shall be considered incomplete in the absence of a preliminary pavement design based on the Pavement Design Guide ([24VAC30-91-160](#)) and the presumed values therein.
2. Construction phase. Upon approval of the construction plan and prior to construction, the resident engineer should advise the developer regarding inspection of the construction phases and the scheduling of those inspections. VDOT approval of each of the following phases of construction is recommended.

a. Installation of any enclosed drainage system before it is covered.

- b. Installation of any enclosed utility placements within the right-of-way before being covered.
 - c. Construction of the cuts and fills, including field density tests, before placement of roadbed base materials.
 - d. A final pavement design, based on actual soil characteristics and certified tests, shall be completed and approved before the pavement structure is placed.
 - e. Placement of base materials, including stone depths, consistent with the approved pavement design, prior to placement of the paving course or courses, followed by field density and moisture tests and the placement of a paving course as soon as possible.
 - f. Construction of pavement, including depth and density, upon completion as part of the final inspection.
3. Street acceptance process. In the absence of any other formal acceptance, the governing body's resolution requesting the department to accept a street for maintenance as part of the secondary system of state highways completes the dedication and is deemed to constitute the governing body's acceptance of the street.

24VAC30-92-70. Administrative Procedure.

Street acceptance. Upon the satisfactory completion of construction of the street or streets in a network addition, the department will advise the local governing body regarding the street or network addition's readiness for acceptance and the local governing body, in consultation with the district administrator's designee, will initiate its acceptance into the secondary system of state highways maintained by the department provided:

1. The developer dedicates the prescribed right-of-way to public use.
2. The street has or streets in the network addition have been constructed in accordance with the applicable specifications, standards and the plats or plans approved by the department.
 - a. Traffic control markings, signs, and devices have been installed in accordance with VDOT standards, specifications, and practices.
 - b. Speed limits have been set in accordance with Article 8 (§ [46.2-870](#) et seq.) of Chapter 8 of Title 46.2 of the Code of Virginia. For any streets with speed limits different from those set out in § [46.2-870](#) or §§ [46.2-873](#) through [46.2-875](#) of the Code of Virginia, traffic engineering investigations supporting such speed limits have been submitted to VDOT.
3. The developer furnishes all required information and data to the district administrator's designee and the local government official pertaining to the development's stormwater

management system that are pertinent to the locality's, department's, or other entity's Municipal Separate Storm Sewer System (MS4) permit, if applicable.

4. The street or streets in a network addition provides sufficient public benefit as prescribed in [24VAC30-92-60](#) and meets the requirements of this chapter.

5. The street or streets in the network addition has been properly maintained since its completion.

6. The developer furnishes the surety and fees in accordance with [24VAC30-92-140](#).

7. The governing body or other responsible parties have executed all agreements prescribed by these requirements, unless specifically waived on an individual case basis by the department employee, or his successor or his designee, responsible for overseeing these requirements and the final acceptance of streets as part of the secondary system of state highways maintained by the department.

8. The governing body, by proper resolution, requests the department to accept the street or streets in the network addition for maintenance as part of the secondary system of state highways under its jurisdiction. The resolution shall include the governing body's guarantee of an unrestricted and unencumbered right-of-way as dedicated, plus any necessary easements for fills, drainage, or sight distance.

Upon the department's determination that the requested street or network addition is in compliance with the applicable provisions of these requirements, the governing body will be officially advised of the street or network addition's acceptance into the secondary system of state highways and the effective date of such action. This notification serves as the district administrator's designee's authority to begin maintenance thereon.

24VAC30-420-10. Operation and maintenance of roads in incorporated towns less than 3,500

The regulations governing operation and maintenance of roads in incorporated towns less than 3,500 cites state law establishing requirements for local governments to request the Commonwealth Transportation Board (CTB) to provide funds for road improvements from secondary funds, as well as CTB funding authority if no request is made.

24VAC30-430-10. Maintenance of roads crossing the interstate system

The regulations governing maintenance of roads crossing the interstate system discusses the responsibilities of municipalities and the Virginia Department of Transportation in maintaining interchanges and underpasses in cities and towns, roads in counties, and roads in Arlington and Henrico counties.

24VAC30-490-10. Roads in the grounds of state institutions

The regulations governing roads in the grounds of state institutions establish the criteria highways must meet to be considered for inclusion into the primary system. The criteria address design issues, such as road widths, drainage facilities, and pavement type. Also included is a table showing information on the source of funding for new road improvements.

24VAC30-500-10. Roads in the grounds of state parks

The regulations governing roads in the grounds of state parks establish the policy that all state secondary roads located completely within state parks, government parks, reservations and recreational areas may be closed or turned over for maintenance and construction to the various authorities in charge of such facilities, if they request. Boards of Supervisors of the county where the road is located must first give their approval before the action can be completed.

1.5 VDOT Policies, Guidance, and Instructional and Informational Memoranda

Internally, VDOT regularly updates its practices and programs to reflect changes to regulations and the agency's objectives. This includes VDOT's Instructional and Informational Memoranda (IIMs), Manuals, Standards, and Specifications, etc. Significant internal guiding documents and policies that will be used to address the Chesapeake Bay TMDL may include the following:

- BMP Design Manual (2013)
- Department Policy Memoranda and Department Memoranda Manual (2017) Drainage Manual (2017)
- Location & Design (L&D) Instructional and Informational Memoranda (2015)
 - **IIM-LD-195** Development of Post-Construction Stormwater Management Plans (2018)
 - **IIM-LD-242** General Permit for Discharges of Stormwater from Construction Activities including SWPPP General Insertable Sheets (2018)
 - **IIM-LD-243** Sealing and Signing Responsibilities of the Responsible Persons (2018)
 - **IIM-LD-251** Stormwater Management (Nutrient Credits) (2018)
 - **IIM-LD-256** VDOT Oversight Responsibilities for VDOT projects with coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges of Stormwater Construction Activities (2018)
 - **IIM-LD-257** VDOT's Roles and Responsibilities for Erosion & Sediment Control and Stormwater Management for Non-VDOT Projects (2018)
- Plant Palette for Stormwater BMPs (2015)
- Stormwater BMP Standards & Specifications (2017)
- 2017 Road Design Manual
- 2016 Road and Bridge Standards
- 2016 Road and Bridge Specifications
- 2014 Structure and Bridge Manual with revisions through 2017
- 2011 Secondary Street Acceptance Requirements
- 2009 Subdivision Street Design Guide Appendix B (1)

1.6 VDOT Six-Year Improvement Program

Section 33.2-361 of the Code of Virginia requires that a public hearing be held prior to the allocation of any transportation funds. The Six-Year Improvement Program (SYIP) is a document that outlines planned spending for transportation projects proposed for construction development or study for the next six years.

The SYIP is updated annually and is the means by which the CTB meets its statutory obligation under the Code of Virginia to allocate funds to interstate, primary, secondary and urban highway systems, public transit, ports and airports and other programs for the immediate fiscal year. The SYIP also identifies planned program funding for the succeeding five fiscal years. The CTB allocates funds for the first fiscal year of the SYIP, but the remaining five years are estimates of future allocations. Fiscal years start on July 1 and end on June 30.

The CTB updates the SYIP each year as revenue estimates are updated, priorities are revised, project schedules and costs change, and study results are known. Development of the SYIP begins in the fall and VDOT hosts a series of meetings seeking public comment with various other multi-modal transportation agencies. Each spring, a draft SYIP is presented to the CTB and made available for public comment.

2.0 NEW OR MODIFIED LEGAL AUTHORITIES

(2017 INDIVIDUAL PERMIT SECTION I.D.3.a.(i)) – Any new or modified legal authorities, such as permits, orders, contracts, and interjurisdictional agreements, implemented or needing to be implemented to meet the requirements of Part I.D.2.

As part of its MS4 Program, VDOT uses adaptive management to ensure it minimizes the discharge of pollutants through its MS4 to the maximum extent practicable. This adaptive management program, or iterative process, allows policies, practices, procedures, or other BMPs to be enhanced, revised, or created, as necessary. These enhancements may be made in response to self-identification, changes in regulations, and changes in technology.

As was true for the first TMDL Action Plan, VDOT has a number of policies and procedures to address its MS4 Program, including but not limited to:

- VDOT's ESC and SWM Standards & Specifications;
- The VDOT Drainage Manual;
- The Secondary Street Acceptance Regulations and Guidance Manual;
- The Land Use Permit (LUP) Regulations and Guidance Manual; and
- The Locally Administered Projects (LAP) Manual.

For the purposes of this amended Action Plan, VDOT has not identified the need for new or modified legal authorities to address the requirements of this Special Condition. However, VDOT has added MS4 Program staff to facilitate implementation of the MS4 Program Plan and this amended Chesapeake Bay TMDL Action Plan. VDOT will continue to employ its adaptive management for the MS4 Program, including efforts to address the Chesapeake Bay TMDL. If new or modified authorities are identified and implemented, they will be reported in the MS4 Annual Report.

In order to implement the anticipated water quality improvements addressed later in Section 5.0, agreements or contracts will be necessary, as follows:

- Collaboration agreements with State Agency partners (e.g. Virginia Department of Game and Inland Fisheries (DGIF), Virginia Department Conservation and Recreation (DCR)).
- Various Program and Project Delivery Procurement Methods (Request for Proposals (RFPs), Invitation for Bids (IFBs) or other delivery mechanisms).

3.0 MEANS AND METHODS TO ADDRESS DISCHARGES FROM NEW SOURCES

(2013 GENERAL PERMIT SECTION I.C.2.a.(3)) – The means and methods that will be utilized to address discharges into the MS4 from new sources.

For the 5% implementation milestone VDOT was required to describe the means and methods utilized to address new sources, however this condition is not a requirement of the Chesapeake Bay TMDL Action Plan in the Individual Permit. The language presented in the 5% Action Plan is retained below; however, it is displayed in strike-out as it is not relevant to this amended 36% Action Plan

~~VDOT addresses its new source discharges through implementation of the VDOT ESC and SWM Standards and Specifications that are annually approved by DEQ. VDOT's ESC and SWM Standards and Specifications contain provisions to comply with applicable regulations, including provisions for new sources related to regulated land disturbing activities (RLDA). A RLDA is any new development/redevelopment that disturbs greater than or equal to one acre or any new development/redevelopment that disturbs greater than or equal to 2,500 square feet in a Chesapeake Bay Preservation Area designated area. These Standards and Specifications are consistent with the requirements of the Virginia Stormwater Act, the Virginia Stormwater Management Program (VSMP) Regulations, the General Permit for Discharges of Stormwater from Construction Activities (9VAC25-880), and the Erosion and Sediment Control Law and Regulations. Additionally, the Standards and Specifications are updated to reflect new Stormwater BMPs and encourage the use of Low Impact Development (LID) practices and green technology BMPs in order to reduce the stormwater runoff impacts of development.~~

~~For each RLDA it undertakes, VDOT addresses new source discharges by developing and implementing post construction stormwater management plans that are in accordance with its ESC and SWM Standards and Specifications. The applicable portions of the ESC and SWM Standards and Specifications for new sources include:~~

- ~~1. Provisions for the preparation of stormwater management plans for each construction project, when applicable. Each SWM Plan will adhere to the applicable technical criteria (Part IIB or IIC) to meet the requirements of the Stormwater Management Act and VSMP Regulations (Instances where Part IIC technical criteria may be utilized are discussed in Sections 7.0 and 8.0 of this Action Plan);~~
- ~~2. Provisions for stormwater management program administration, plan design, review, and approval;~~
- ~~3. Provisions for ensuring that responsible personnel and contractors obtain certifications or qualifications for stormwater management comparable to those required for VSMP Authorities;~~

- ~~4. Provisions for the long-term responsibility and maintenance of stormwater management control devices and other techniques specified to manage the quantity and quality of runoff, including an inspection and maintenance schedule;~~
- ~~5. Implementation of a system for project tracking and notification of the DEQ for all land disturbing activities covered under the Stormwater Management Act and VSMP; and~~
- ~~6. Requirements for documenting on-site changes as they occur to ensure compliance with the provisions of the Stormwater Management Act and VSMP.~~

~~There are projects that result in new sources that are undertaken by other parties, but will ultimately be under the maintenance purview of VDOT after construction is complete. VDOT has several programs and regulations in place to address the acceptance of these projects into the roadway system at project completion. Such programs include, but are not limited to, Secondary Street Acceptance Regulations (SSAR), Locally Administered Projects (LAP), and Land Use Permits (LUP). For these projects to be accepted into the state system for maintenance by VDOT, the improvements must meet the applicable standards and requirements of these programs.~~

~~Furthermore, new subdivision streets accepted into the VDOT secondary street system are required by the VSMP Authority (municipality or DEQ) to maintain compliance with stormwater quality (and quantity) requirements. These requirements are locally administered as cited in 24VAC30-91-110, "Whereas the department considers matters regarding stormwater management associated with the construction of new subdivision streets to be under the authority of the local governing body, decisions regarding stormwater management in the construction of subdivision streets are deferred to the locality." Where stormwater management facilities are required by the VSMP Authority or local governing body to provide treatment for the subdivision street, the oversight, design, construction and maintenance of these facilities is governed by agreements between the developer and local governing body. 24VAC30-91-110 states further that, "Where the developer is required by regulations promulgated by an agency or governmental subdivision other than the department or the developer chooses to use stormwater management facilities in the design of a subdivision, the governing body shall, by formal agreement, and as a prerequisite for the transfer of jurisdiction over the street to the department, acknowledge that the department is not responsible for the operation, maintenance, or liability of the stormwater management facility or facilities associated with the subdivision." These stormwater decisions, approvals and facilities serving new subdivision streets are administered through the local governing body and VSMP Authority. These new subdivision streets are considered by VDOT to be VSMP and Virginia Runoff Reduction Methodology (VRRM) compliant and subsequently requiring no additional actions by VDOT for Chesapeake Bay TMDL compliance.~~

4.0 ESTIMATED EXISTING SOURCE LOADS AND POLLUTANT OF CONCERN REQUIRED REDUCTIONS

(2013 GENERAL PERMIT SECTION I.C.2.A.(4) AND (GENERAL PERMIT SECTION I.C.2.A.(5)) – An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009, based on the 2009 progress run. The operator shall utilize the applicable [Table/Tables] in this section based on the river basin to which the MS4 discharges by multiplying the total existing acres served by the MS4 on June 30, 2009, and the 2009 Edge of Stream (EOS) loading rate;

A determination of the total pollutant load reductions necessary to reduce the annual POC loads from existing sources utilizing the applicable [Table/Tables] in this section based on the river basin to which the MS4 discharges. This shall be calculated by multiplying the total existing acres served by the MS4 by the first permit cycle required reduction in loading rate. For the purposes of this determination, the operator shall utilize those existing acres identified by the 2000 U.S. Census Bureau urbanized area and served by the MS4.

(2017 INDIVIDUAL PERMIT SECTION I.D.1.A.) – No later than 12 months after the effective date of this permit, the permittee shall reduce the load of total nitrogen, total phosphorus and total suspended solids from existing developed lands served as of June 30, 2009 by the MS4 based on the 2000 Census Urbanized Area by at least 5% of the Level 2 Scoping Run Reductions.

(2017 INDIVIDUAL PERMIT SECTION I.D.2.A.) – No later than the expiration date of this permit, the permittee shall reduce the load of total nitrogen, total phosphorus and total suspended solids from existing developed lands served as of June 30, 2009 by the MS4 based on the 2010 Census Urbanized Area by at least 36% (cumulative) of the Level 2 Scoping Run Reductions.

VDOT submitted an Action Plan to DEQ to address the 5% of the L2 Scoping Reductions. DEQ approved that Action Plan on June 29, 2016. VDOT has reported progress towards the 5% annually. The 5% reduction permit tables are provided in Appendix A. The Chesapeake Bay TMDL Special Condition in the Individual Permit requires VDOT to reduce the load of total nitrogen, total phosphorus and total suspended solids from existing developed lands served as of June 30, 2009 by the MS4 based on the 2010 Census Urbanized Area by at least 36% (cumulative) of the Level 2 (L2) Scoping Run Reductions by the expiration date of the permit (June 30, 2022).

The Individual Permit requires VDOT to estimate the loadings and the necessary 36% reductions from the L2 Scoping Run POC reductions for existing sources as of June 30, 2009 and provides in tabular format the specific equations per basin. In accordance with the permit, VDOT estimated the size and extent of its regulated MS4 using the 2010 Census Urbanized Area and the total regulated acres of urban pervious and urban impervious surface served by the MS4 as of June 30, 2009. This process is described in the following subsections.

Since VDOT's regulated MS4 system serves all four major river basins of the Chesapeake Bay watershed identified in the Individual Permit, VDOT estimated the existing POC loads and required reductions for each basin. Table 2 identifies the 2010 Census Urbanized Area associated with each basin. Note that some urbanized areas overlap multiple river basins.

Table 2. River Basins and Associated 2010 Census Urbanized Areas

RIVER BASIN	URBANIZED AREAS
James River Basin	Charlottesville
	Lynchburg
	Richmond
	Roanoke
	Virginia Beach
	Williamsburg
Potomac River Basin	Fredericksburg
	Harrisonburg
	Staunton/Waynesboro
	Washington D.C.
	Winchester
Rappahannock River Basin	Fredericksburg
	Washington D.C.
York River Basin	Fredericksburg
	Richmond
	Virginia Beach
	Williamsburg

4.1 Extent of VDOT MS4 Service Area

In order for VDOT to determine the annual POC loads discharged from its MS4 system and the required reductions from the existing sources, the extent of the VDOT MS4 Service Area was estimated. The VDOT MS4 Service Area accounted for in this amended Action Plan includes VDOT right-of-way (ROW) and property that is located within the 2010 Census Urbanized Areas in each of the four major river basins of the Chesapeake Bay watershed.¹

The majority of VDOT’s MS4 area is composed of ROW within urbanized areas that encompass roadways owned or operated (herein referred to as ‘maintained’) by VDOT. Additionally, VDOT operates a number of support facilities that are essential to maintaining the roads or providing transportation services to the public. These facilities include district complexes, residence offices, area headquarters, safety/rest areas, park and ride sites, and permanent storage areas/lots. Only those portions of the system and the VDOT facilities located with the designated urbanized area as defined by the 2010 Bureau of Census (known as the Census Urbanized Area or CUA) is regulated by this permit.

VDOT ROW and associated acreage is constantly in a state of transition due to new roads being built, existing roads being redesigned, and acquisition of lands necessary for highway rights-of-

¹ During the first permit cycle, VDOT was not required to account for the expanded urbanized areas that were identified as a result of the 2010 US Census. VDOT’s first Chesapeake Bay Action Plan addressed the 5% reductions for the 2000 US Census Bureau urbanized areas.

way or purposes incidental to the construction, reconstruction, or improvement of public highways (including residual property). Given the dynamic nature of the VDOT ROW and the fact that detailed ROW and land cover mapping in 2009 does not exist statewide at this time, the spatial information is not readily available for use in a Geographic Information System (GIS) format. Therefore, VDOT developed a methodology using available mapping tools to estimate the extent of the VDOT MS4 Service Area based on best data available and best professional judgment for use in this Action Plan.

The methodology utilized road centerline data as the basis for acreage estimation. This data was obtained from the Virginia Geographic Information Network (VGIN) and VDOT's Linear Referencing System (LRS, Quarterly Release 2009 Q4). Depending on the location, type of roadway, and agreements between VDOT and the locality, a roadway may either be owned by the locality or by VDOT. LRS catalogs road ownership and maintenance and was used in this process to cull out all roads not owned or maintained by VDOT. Once the VDOT roadway centerlines have been screened and processed, the area surrounding the centerlines must be estimated to derive an overall acreage. Figure 1, below, simulates an example area where the roadway centerlines have been analyzed to determine which roads are owned or maintained by VDOT. On the left, a full roadway centerline dataset, including both VDOT and non-VDOT roadways, is shown in red. On the right, only the non-VDOT roadways remain red, with VDOT roadways shown in black. Note: even though the attribute data indicates the roadway is maintained by VDOT, it does not always mean it is owned by VDOT. This nuance can lead to instances where an adjacent MS4 may be claiming ownership and subsequently MS4/Chesapeake Bay TMDL responsibility for the same area. Furthermore, the adjacent MS4 likely oversees the maintenance of a BMP that treats these roadways. The main area where this nuance could occur is secondary streets, specifically roads under the purview of the Secondary Street Acceptance Regulations (SSAR). VDOT has acknowledged this possibility of double counting load contributions from these areas, and is moving forward with this determination as a conservative estimate of the VDOT MS4 Service Area, which is allowable under the DEQ Guidance Memorandum #15-2005, issued May 18, 2015. VDOT will continue its discussion and coordination with adjacent MS4 localities. VDOT will utilize and incorporate new information when appropriate to adjust VDOT's regulated area.

Figure 1. Road centerlines before and after processing



VDOT determined the most accurate and efficient method to estimate the area of ROW surrounding VDOT roads was through utilization of existing parcel datasets from local

jurisdictions. Empty or unowned parcels surrounding VDOT roads were initially assigned to VDOT. VDOT developed a GIS methodology and visual quality assurance/quality control (QA/QC) process to evaluate the empty parcels and assign this void space as VDOT’s ROW where appropriate. In instances of geospatial data conflict, where there was an existing VDOT road and an overlapping parcel, VDOT assumed a uniform ROW width surrounding the VDOT road to maintain a conservative estimate until further refinement. The parcel-driven ROW, combined with any other properties VDOT owns in the Census Urbanized Area, define VDOT’s MS4 Service Area. Maps of the VDOT MS4 Service Area within the Chesapeake Bay watershed are provided in Appendix B.

The method has excluded areas as allowed by DEQ Guidance Memorandum #15-2005 (e.g. forested lands and water) within VDOT’s ROW, for purposes of determining existing loads and required reductions. However, these excluded areas have been summarized in this section to accurately depict VDOT’s total MS4 Service Area (VDOT MS4 Permit Area). Per the Fact Sheet, the method considers any upgradient run-on outside of VDOT’s MS4 Service Area to be unregulated for the purposes of VDOT’s MS4 Program. Table 3 shows the calculated VDOT MS4 Service Area in each Census Urbanized Area compared to the total Census Urbanized Area within the Chesapeake Bay watershed. The name of the Census Urbanized Area, as defined and used by the U.S. Census, is the central core jurisdiction that is presumed to be the driver for the urbanization. For example, the Washington D.C. CUA covers several jurisdictional boundaries in Virginia and Maryland. This point is noteworthy as total CUA acreage is often times larger than the jurisdictional boundary named in the CUA.

Table 3. VDOT MS4 Acreage relative to Census Urbanized Areas (CUA)¹

Urban Area ²	Total CUA Acreage ^{3,5}	VDOT Acreage ^{4,5}	% of CUA ⁵
Charlottesville	22,314	1,117	5.01%
Fredericksburg	50,289	4,214	8.38%
Harrisonburg	20,892	806	3.86%
Lynchburg	45,453	1,361	2.99%
Richmond	314,701	20,018	6.36%
Roanoke	168	16	9.50%
Staunton/Waynesboro	24,513	1,432	5.84%
Virginia Beach	326,236	8,439	2.59%
Washington D.C.	452,254	40,662	8.99%
Williamsburg	36,282	2,468	6.80%
Winchester	23,877	1,969	8.25%

- 1) Based on 2010 CUA
- 2) Refers to surrounding urban area, which may include several localities
- 3) Includes Regulated, Unregulated Lands, and Excluded Lands (such as forest and surface water)
- 4) VDOT’s ROW and properties
- 5) Chesapeake Bay Watershed only

4.2 Land Cover Breakdowns of MS4 Service Area

Following determination of the MS4 Service Area, VDOT characterized the ROW to estimate the acreage of regulated impervious, regulated pervious, and excluded land cover types. VDOT evaluated the potential use of several GIS datasets to accomplish this task. VDOT selected the National Land Cover Database (NLCD) for the first phase Action Plan, because at the time it was the best available data.

The NLCD is a statewide (also national), current, consistent, and public domain dataset that reflects land cover, including areas of development as well as forest, open water, and wetlands. NLCD is the product of the Multi-Resolution Land Characteristics (MRLC) Consortium, which is a group of 13 Federal programs in 10 agencies that partner to create this dataset. Datasets were developed for 1992, 2001, 2006, and 2011. VDOT used the 2011 dataset as the closest representative of the 2009 land cover conditions.

NLCD has a spatial resolution of 30 meters which may be sufficient for certain purposes at a large scale, but becomes more limiting when used at smaller and more refined scales. Roadways can be recognized with this dataset, however road widths and geometry definitions do not maintain consistency as the 30 meter cells are too coarse to accurately represent roadway surfaces (especially narrower roads). Many segments of VDOT ROW with narrow linear features are not reflected in NLCD, causing an under predicted account of impervious cover. Although these datasets are readily used by the Environmental Protection Agency (EPA) and DEQ for modeling purposes, VDOT developed a methodology to increase the accuracy of estimating the imperviousness throughout its ROW as follows.

To adjust for these limitations, VDOT roadway centerlines were used to estimate the impervious area within VDOT ROW attributed to road lanes and compacted shoulders. Each roadway was buffered based on its classification, such as Interstate, Primary, Secondary, etc., as described in further detail in Appendix B. These roadway components were characterized as 100% impervious. The remaining area of VDOT ROW (medians, ditches, curb and gutter, shoulders, embankments, etc.) has varying degrees of impervious, pervious, and forested conditions depending on the surrounding land cover. These areas were characterized by land use category using NLCD to estimate the impervious, pervious, and forested extent. A schematic of VDOT ROW components is shown in Figure 2.

Figure 2. VDOT ROW Schematic

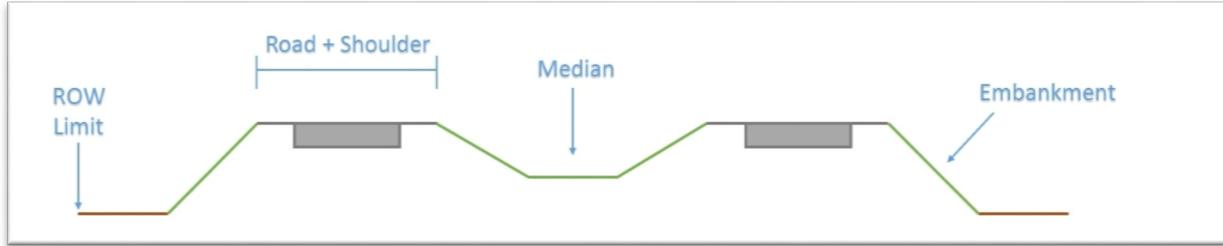


Table 4 through Table 7 identify the impervious, pervious, forested areas and the land cover category used to derive the estimates for each river basin.

VDOT also evaluated the VGIN land cover data, but determined the NLCD GIS data, discussed above, was the best data for the amended TMDL Action Plan. There were several reasons for this conclusion, including:

- VDOT's permit uses Phase 5.3.2 Chesapeake Bay TMDL model, calibrated to 2009 inputs, and requires the MS4 Service Area as of June 30, 2009. NLCD most closely represents land cover conditions for the modeled time period. The VGIN land cover data more closely represents land cover conditions for 2013-2015, which will be more appropriate with the Phase 6.0 Chesapeake Bay TMDL Model rates once this model is updated and released.
- Upon evaluation of the VGIN land cover data, VDOT discovered errors in the incorporation of local impervious datasets (e.g. Fairfax) where land cover is clearly misclassified in VDOT ROW, impacting the pervious and impervious acre estimates, and therefore, the estimated pollutant reduction requirements. Presumably, these errors were not captured during the development of the VGIN dataset because it was not focused at a linear resolution. Using NLCD and adjusting for the roadway system, as described below, will be more accurate because it is specifically developed with the linear system in mind.
- NLCD land cover estimates forest in 30 meter resolution. For that reason, DEQ Guidance (DEQ Guidance Memorandum #15-2005) allows permittees to exclude forested lands from their service area at a minimum of 30 m x 30 m (0.22 ac) contiguous areas. The VGIN land cover excludes anything under 1 acre from the "Forest" category.

4.2.1 James River Basin Land Cover Summary

For the James River Basin, the VDOT MS4 Service Area is comprised of 29,404 acres, which is summarized in Table 4.

Table 4. Land Cover Summary for VDOT MS4 Service Area in James River Basin

Land Use Category	Impervious Acres ¹	Pervious Acres ¹	Excluded Acres
Roadway (derived from methodology)	15,517	0	0
Developed, High Intensity (80% Impervious)	207	52	0
Developed, Low Intensity (50% Impervious)	1,089	1,089	0
Developed, Medium Intensity (20% Impervious)	1,066	4,264	0
Developed, Open Space	0	4,707	0
Planted/Cultivated	0	116	0
Shrubland/Herbaceous/Barren	0	154	0
Forested ²	0	0	906
Water ²	0	0	15
Wetlands ²	0	0	222
Total	17,879	10,382	1,143

Note: 1 – Regulated Area based on the U.S. Census Bureau 2010 urbanized areas
 2 – Area excluded from permit-required loading and reduction estimations

4.2.2 Potomac River Basin Land Cover Summary

For the Potomac River Basin, the VDOT MS4 Service Area is comprised of 44,865 acres, which is summarized in Table 5.

Table 5. Land Cover Summary for VDOT MS4 Service Area in Potomac River Basin

Land Use Category	Impervious Acres ¹	Pervious Acres ¹	Excluded Acres
Roadway (derived from methodology)	23,942	0	0
Developed, High Intensity (80% Impervious)	377	94	0
Developed, Low Intensity (50% Impervious)	2,193	2,193	0
Developed, Medium Intensity (20% Impervious)	1,871	7,483	0
Developed, Open Space	0	5,130	0
Planted/Cultivated	0	193	0
Shrubland/Herbaceous/Barren	0	63	0
Forested ²	0	0	1,222
Water ²	0	0	15
Wetlands ²	0	0	89
Total	28,383	15,156	1,326

Note: 1 – Regulated Area based on the U.S. Census Bureau 2010 urbanized areas
 2 – Area excluded from permit-required loading and reduction estimations

4.2.3 Rappahannock River Basin Land Cover Summary

For the Rappahannock River Basin, the VDOT MS4 Service Area is comprised of 3,914 acres, which is summarized in Table 6.

Table 6. Land Cover Summary for VDOT MS4 Service Area in Rappahannock River Basin

Land Use Category	Impervious Acres ¹	Pervious Acres ¹	Excluded Acres
Roadway (derived from methodology)	2,115	0	0
Developed, High Intensity (80% Impervious)	32	8	0
Developed, Low Intensity (50% Impervious)	118	118	0
Developed, Medium Intensity (20% Impervious)	186	742	0
Developed, Open Space	0	479	0
Planted/Cultivated	0	25	0

Land Use Category	Impervious Acres ¹	Pervious Acres ¹	Excluded Acres
Shrubland/Herbaceous/Barren	0	16	0
Forested ²	0	0	71
Water ²	0	0	0
Wetlands ²	0	0	4
Total	2,451	1,388	75

Note: 1 – Regulated Area based on the U.S. Census Bureau 2010 urbanized areas

2 – Area excluded from permit-required loading and reduction estimations

4.2.4 York River Basin Land Cover Summary

For the York River Basin, the VDOT MS4 Service Area is comprised of 4,274 acres, which is summarized in Table 7.

Table 7. Land Cover Summary for VDOT MS4 Service Area in York River Basin

Land Use Category	Impervious Acres ¹	Pervious Acres ¹	Excluded Acres
Roadway (derived from methodology)	2,463	0	0
Developed, High Intensity (80% Impervious)	25	6	0
Developed, Low Intensity (50% Impervious)	107	107	0
Developed, Medium Intensity (20% Impervious)	127	508	0
Developed, Open Space	0	679	0
Planted/Cultivated	0	22	0
Shrubland/Herbaceous/Barren	0	27	0
Forested ²	0	0	151
Water ²	0	0	4
Wetlands ²	0	0	48
Total	2,722	1,349	203

Note: 1 – Regulated Area based on the U.S. Census Bureau 2010 urbanized areas

2 – Area excluded from permit-required loading and reduction estimations

4.3 Existing Source Load Estimates and Required Reduction Estimates for River Basins

VDOT inserted the estimated regulated urban pervious acres and regulated urban impervious acres for each basin into Tables 2a through 2d from the Individual Permit to estimate the existing source loads for the POCs based on the Edge of Stream (EOS) loading rate from the June 30, 2009 Progress Run. Tables 8 through Table 11 show the estimated loads for the VDOT Regulated Area for each of the river basins as well as the required reductions. VDOT must meet the 36% reductions for existing development within the second permit cycle.

Forested lands have been included as footnotes in the loading estimate tables in the event VDOT identifies opportunities to implement BMPs in these areas. Note: Inclusion of forested lands does not obligate VDOT to achieve a pollutant reduction in these areas per DEQ Guidance Memorandum #15-2005.

4.3.1 James River Basin Existing Source Loads and 36% Required Reductions

Table 8. Existing Source Loads and Required Reductions for VDOT Regulated Area in the James River Basin based on the 2010 CUA

Pollutant	Subsource	2009 EOS Loading Rate (lbs/ac/yr)	Total Existing Acres Served by MS4 as of 6/30/2009	Loading (lbs/ac/yr)	MS4 Required Chesapeake Bay Total Loading Rate Reduction	36% of L2 Required Reduction by 6/30/2022 (lb/ac/yr)	Cumulative Reduction Required by 6/30/2022 (lbs/yr)
Nitrogen	Regulated Urban Impervious	9.39	17,879	167,884	9%	0.304236	7,007
	Regulated Urban Pervious	6.99	10,382	72,570	6%	0.150984	
Phosphorus	Regulated Urban Impervious	1.76	17,879	31,467	16%	0.101376	1,948
	Regulated Urban Pervious	0.50	10,382	5,191	7.25%	0.01305	
Total Suspended Solids	Regulated Urban Impervious	676.94	17,879	12,103,010	20%	48.73968	904,473
	Regulated Urban Pervious	101.08	10,382	1,049,413	8.75%	3.18402	

1 – Loads from forested lands in James River Basin are estimated to be 2,137, 118, and 70,083 lbs/yr for TN, TP, and TSS, respectively.

4.3.2 Potomac River Basin Existing Source Loads and 36% Required Reductions

Table 9. Existing Source Loads for VDOT Regulated Area in the Potomac River Basin based on the 2010 CUA

Pollutant	Subsource	2009 EOS Loading Rate (lbs/ac/yr)	Total Existing Acres Served by MS4 as of 6/30/2009	Loading (lbs/ac/yr)	MS4 Required Chesapeake Bay Total Loading Rate Reduction	36% of L2 Required Reduction by 6/30/2022 (lb/ac/yr)	Cumulative Reduction Required by 6/30/2022 (lbs/yr)
Nitrogen	Regulated Urban Impervious	16.86	28,383	478,537	9%	0.546264	18,801
	Regulated Urban Pervious	10.07	15,156	152,621	6%	0.217512	
Phosphorus	Regulated Urban Impervious	1.62	28,383	45,980	16%	0.093312	2,811
	Regulated Urban Pervious	0.41	15,156	6,214	7.25%	0.010701	
Total Suspended Solids	Regulated Urban Impervious	1,171.32	28,383	33,245,576	20%	84.33504	2,477,611
	Regulated Urban Pervious	175.8	15,156	2,664,425	8.75%	5.5377	

1 – Loads from forested lands in Potomac River Basin are estimated to be 6,464, 159, and 97,650 lbs/yr for TN, TP, and TSS, respectively.

4.3.3 Rappahannock River Basin Existing Source Loads and 36% Required Reductions

Table 10. Existing Source Loads for VDOT Regulated Area in the Rappahannock River Basin based on the 2010 CUA

Pollutant	Subsource	2009 EOS Loading Rate (lbs/ac/yr)	Total Existing Acres Served by MS4 as of 6/30/2009	Loading (lbs/ac/yr)	MS4 Required Chesapeake Bay Total Loading Rate Reduction	36% of L2 Required Reduction by 6/30/2022 (lb/ac/yr)	Cumulative Reduction Required by 6/30/2022 (lbs/yr)
Nitrogen	Regulated Urban Impervious	9.38	2,451	22,990	9%	0.303912	905
	Regulated Urban Pervious	5.34	1,388	7,412	6%	0.115344	
Phosphorus	Regulated Urban Impervious	1.41	2,451	3,456	16%	0.081216	213
	Regulated Urban Pervious	0.38	1,388	527	7.25%	0.009918	
Total Suspended Solids	Regulated Urban Impervious	423.97	2,451	1,039,150	20%	30.52584	77,268
	Regulated Urban Pervious	56.01	1,388	77,742	8.75%	1.764315	

1 – Loads from forested lands in York River Basin are estimated to be 322, 11, and 4,169 lbs/yr for TN, TP, and TSS, respectively.

4.3.4 York River Basin Existing Source Loads and 36% Required Reductions

Table 11. Existing Source Loads for VDOT Regulated Area in the York River Basin based on the 2010 CUA

Pollutant	Subsource	2009 EOS Loading Rate (lbs/ac/yr)	Total Existing Acres Served by MS4 as of 6/30/2009	Loading (lbs/ac/yr)	MS4 Required Chesapeake Bay Total Loading Rate Reduction	36% of L2 Required Reduction by 6/30/2022 (lb/ac/yr)	Cumulative Reduction Required by 6/30/2022 (lbs/yr)
Nitrogen	Regulated Urban Impervious	7.31	2,722	19,898	9%	0.236844	868
	Regulated Urban Pervious	7.65	1,349	10,320	6%	0.16524	
Phosphorus	Regulated Urban Impervious	1.51	2,722	4,110	16%	0.086976	255
	Regulated Urban Pervious	0.51	1,349	688	7.25%	0.013311	
Total Suspended Solids	Regulated Urban Impervious	456.68	2,722	1,243,083	20%	32.88096	92,595
	Regulated Urban Pervious	72.78	1,349	98,180	8.75%	2.29257	

1 – Loads from forested lands in York River Basin are estimated to be 322, 11, and 4,169 lbs/yr for TN, TP, and TSS, respectively.

4.4 Overall 36% Required Reduction Estimates for VDOT’s MS4 Area

Table 12. 36% Required Reductions for VDOT’s Statewide Regulated Area based on the 2010 CUA

POC	River Basin	Total Reduction Required by 6/30/2022 (lbs/yr)	Total Reduction Required by 6/30/2022 (lbs/yr)
Nitrogen	James	7,007	27,581
	Potomac	18,801	
	Rappahannock	905	
	York	868	
Phosphorus	James	1,948	5,227
	Potomac	2,811	
	Rappahannock	213	
	York	255	
Sediment	James	904,473	3,551,947
	Potomac	2,477,611	
	Rappahannock	77,268	
	York	92,595	

5.0 BMPS AND OTHER STRATEGIES TO MEET THE REQUIRED REDUCTIONS AND SCHEDULE

(2013 GENERAL PERMIT SECTION I.C.2.A.(6)) – The means and methods, such as management practices and retrofit programs that will be utilized to meet the required reductions included in subdivision 2 a (5) of this subsection, and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting those reductions;

(2017 INDIVIDUAL PERMIT SECTION I.D.3.a.(iii)) – The BMPs and/or other strategies to be implemented by the permittee prior to the expiration of this permit to meet the reductions calculated in Part I.D.2.a through d above and not previously submitted in the original action plan, including as applicable:

- 1) Project name;*
- 2) Location;*
- 3) Percent Removal Efficiency, as applicable; and*
- 4) Demonstration (calculated in accordance with Part I.D.1.f) of the reduction in load provided by the BMP.*

(2017 INDIVIDUAL PERMIT SECTION I.D.3. a.(iv)) – Anticipated schedule of implementation of BMPs and/or strategies identified as required by Part I.D.3.a.ii above.

VDOT has identified several BMPs and other strategies, such as an array of BMP types and retrofit programs, which may be utilized to meet the required reductions identified in Section 4.0. All management practices and programs that are identified in this Section are based on information that, at the time of Action Plan development, will meet the reductions required for this permit cycle. VDOT expects to implement a combination of BMPs and other strategies to achieve the required reductions for this permit cycle, which may include, but is not limited to:

- Historical BMPs
- Redevelopment
- Stream Restoration and Stabilization
- Outfall and Dry Channel Stabilization
- Shoreline Erosion Control
- Land Cover Conversion
- Forest Buffers
- Street Sweeping and Other Annual Pollutant Removal Efforts
- Purchase of Nutrient Credits
- Structural BMP Enhancements and Retrofits

VDOT has developed a dynamic Action Plan that will allow adaptation to changing project and fiscal outlooks, as well as adoption of emerging technologies. While this Action Plan does not identify the exact number and combination of individual BMPs that will be implemented to meet the required 36% reduction, VDOT has taken great care to estimate the likely BMPs that will be implemented and the associated pollution reductions. VDOT has built flexibility into the amended Action Plan to allow for adjustments to the BMPs actually implemented in the event that new data or opportunities arise that result in pollutant reductions that have not been forecasted, or in the event that VDOT cannot implement a planned BMP within this permit cycle. Where possible, this Action Plan has identified potential projects for planning purposes. VDOT has developed a summary report on each project that will assist with screening and planning

purposes. VDOT will annually report BMP information in accordance with Section I.D.3.5 of the Individual Permit to demonstrate annual progress is being made.

Implementation of the BMPs described below demonstrates compliance with the reduction requirements for this permit cycle with the understanding that any changes in established efficiencies will not be retroactively applied to projects approved to meet reductions for this permit cycle. Likewise, where the BMPs included in this amended Action Plan result in reductions beyond the required 36%, VDOT will apply those additional reductions at the established efficiencies to meet further reduction requirements necessary in the subsequent permit cycles. VDOT may implement additional projects beyond those identified in this Action Plan to meet anticipated permit requirements beyond the required 36% reduction.

5.1 BMP Types

The following subsections discuss the various BMPs that VDOT may utilize to meet the required reductions of the Chesapeake Bay TMDL. The discussion includes BMP appropriateness, scale of implementation, and crediting (if different from DEQ Guidance Memorandum #15-2005).

5.1.1 Historical BMPs

VDOT has taken great strides to organize and manage its stormwater management inventory and associated data. VDOT's L&D Division maintains a database of permanent post-construction stormwater BMPs installed over the years. VDOT uses this database to track BMPs that are currently operating and being maintained by VDOT. The database includes fields for BMP type, unique ID, 6th order Hydrologic Unit Code (HUC), location, treated impervious acres, total drainage area, date of installation, etc.

In accordance with DEQ Guidance Memorandum #15-2005, VDOT reviewed the BMPs that were installed on or after January 1, 2006 and before July 1, 2009, and determined which BMPs were treating regulated area in the Chesapeake Bay River Basins. Load reductions for each of the "historical BMPs" were determined using the impervious area treated (as determined by the VSMP requirements) and assuming the percent impervious to determine the pervious treatment based on the analysis of VDOT ROW using a methodology similar to that presented in Section 4.2. Note: VDOT did not treat for pervious acreage for purposes of VSMP compliance; however, the Chesapeake Bay Program assigns credit for such treatment. A majority of the BMPs identified in the historical dataset were dry extended detention basins. Other BMPs evaluated include retention ponds, bioretention, and Manufactured Treatment Devices. To compute reductions for total nitrogen (TN), total phosphorus (TP), and total suspended sediments (TSS), BMP removal efficiencies were assigned using efficiencies established by the Bay Program and outlined in *Appendix V.C – Structural BMPs, Methodology III* of DEQ Guidance Memorandum #15-2005. For dry extended detention basins, these efficiencies are 20%, 20%, and 60%, respectively; and for wet ponds, these efficiencies are 20%, 45% and 60%, respectively.

For each of the historical BMPs identified, the contributing load was first computed based on the land cover composition of the BMP drainage area and relevant unit loading rates. Impervious

area and percent impervious area, which are data field entries within the VDOT BMP database, were utilized when available to compute total area and pervious area. If no percent impervious area was specified for a particular BMP database entry, then 62% imperviousness was assumed. This estimate is based on the previous geospatial computations completed to estimate loads for this Action Plan and is the average land cover percent imperviousness within VDOT ROW. If no impervious area or percent impervious area information was available for a BMP entry, then impervious and pervious areas were set to zero, thereby excluding the BMP from consideration for credits as an historical bmp. Pollutant load contributions were computed using the following equations:

$$L_{TN} = (A_{IMP} \times UL_{IMP,TN,B}) + (A_{PER} \times UL_{PER,TN,B})$$

$$L_{TP} = (A_{IMP} \times UL_{IMP,TP,B}) + (A_{PER} \times UL_{PER,TP,B})$$

$$L_{TSS} = (A_{IMP} \times UL_{IMP,TSS,B}) + (A_{PER} \times UL_{PER,TSS,B})$$

Where:

L_{TN} , L_{TP} , and L_{TSS} = Annual untreated load contributions from individual BMP drainage areas for Nitrogen, Phosphorus, and Sediment, respectively (lbs/year)

A_{IMP} = Impervious area draining to the BMP (acres)

A_{PER} = Pervious area draining to the BMP (acres)

$UL_{IMP,TN,B}$; $UL_{IMP,TP,B}$; AND $UL_{IMP,TSS,B}$ = Impervious unit loading rates for Nitrogen, Phosphorus, Sediment, respectively within River Basin 'B' (lbs/acre/year)

$UL_{PER,TN,B}$; $UL_{PER,TP,B}$; AND $UL_{PER,TSS,B}$ = Pervious unit loading rates for Nitrogen, Phosphorus, Sediment, respectively within River Basin 'B' (lbs/acre/year)

B = River Basin (e.g. James, Potomac, Rappahannock, York)

The impervious and pervious loading rates for each of the pollutants are derived from the Corrected Loading Rates by River Basin in the DEQ Guidance Memo #15-2005. Once annual load contributions to each individual structural BMP were estimated, removal efficiencies were applied to each structure, depending on the BMP type. The equations below were used to compute POC reductions.

$$L_{TN,Reduction} = EFF_{BMP,TN} \times L_{TN}$$

$$L_{TP,Reduction} = EFF_{BMP,TP} \times L_{TP}$$

$$L_{TSS,Reduction} = EFF_{BMP,TSS} \times L_{TSS}$$

Where:

$L_{TN,Reduction}$ = Annual Total Nitrogen Load removed by BMP (lbs/year)

$L_{TP,Reduction}$ = Annual Total Phosphorus Load removed by BMP (lbs/year)

$L_{TSS,Reduction}$ = Annual Total Sediment Load removed by BMP (lbs/year)

$EFF_{BMP, TN}$, $EFF_{BMP, TP}$, and $EFF_{BMP, TSS}$ = Chesapeake Bay Program Established Removal Efficiencies for Nitrogen, Phosphorus, and Sediment, respectively by BMP Type (%)

These equations were used to compute POC load reductions for all of the individual historical BMPs, which are reported in Appendix C. These load reductions were then summed by POC for each major river basin and are reported below in Table 13.

Table 13. Reductions Achieved by Historical BMPs in VDOT’s MS4 Service Area

Basin	Total BMPs	Acres Treated (Impervious/Pervious)	TN Reductions (lbs/yr)	TP Reductions (lbs/yr)	TSS Reductions (lbs/yr)
James	3	(8/4.9)	22	3	3,538
Potomac	23	(127.7/78.3)	569	45	90,783
Rappahannock	0	(0/0)	0	0	0
York	3	(22.6/13.9)	55	9	2,631
Total	29	(158/97)	646	57	96,952

Note: Reductions are estimated using the applicable loading table of 2a – 2d, and then applying the removal efficiencies from the Chesapeake Bay Program.

Reductions for historical BMPs in relation to the required pollutant reductions have been summarized by basin in Table 27 through Table 30 of Section 5.2.

On August 28, 2015, VDOT submitted historical data to DEQ for BMPs installed statewide prior to June 30, 2013. DEQ acknowledged receipt on the same day. This historical information included BMPs implemented throughout VDOT’s jurisdiction, not only those BMPs implemented in VDOT’s regulated MS4 area. A list of BMPs that VDOT applied towards credit (i.e. within the MS4 regulated areas of the Chesapeake Bay TMDL watershed) is provided in Appendix C and was reported in the 2016 MS4 Annual Report.

5.1.2 Redevelopment

VDOT undertakes many projects that qualify as “prior developed land (redevelopment).” Prior developed land is defined in the VSMP regulations as land that has been previously utilized for residential, commercial, industrial, institutional, recreational, transportation, or utility facilities or structures, and that will have the impervious areas associated with those uses altered during a land-disturbing activity. Whether a project is considered new development or redevelopment is determined during the project planning phase.

VDOT has reported redevelopment credit towards the 5% POC reductions in the James, Potomac, and York River basins. The amount of credit for redevelopment projects is shown in Table 14.

Table 14. Reported Reductions from Redevelopment in Each Basin (2016 - 2017)

Basin	TN Removed due to Redevelopment (lbs/yr)	TP Removed due to Redevelopment (lbs/yr)	TSS Removed due to Redevelopment (lbs/yr)
James	60	8.2	4,360
Potomac	4.5	1.4	618
Rappahannock	0	0	0
York	62	20	8,823
Total	126.5	29.6	13,801

The nutrient and sediment loads removed by redevelopment are expected to increase as VDOT enhances documentation efforts within its program. The projected reductions from redevelopment projects to be achieved in the upcoming years are shown in Table 15 below.

Table 15. Projected Reductions from Redevelopment in Each Basin (2017 - 2022)

Basin	TN Removed due to Redevelopment (lbs/yr)	TP Removed due to Redevelopment (lbs/yr)	TSS Removed due to Redevelopment (lbs/yr)
James	25	3	3,288
Potomac	1,970	167	347,856
Rappahannock	10	1	747
York	69	10	7,950
Total	2,074	181	359,841

Reductions for redevelopment in relation to the required 36% reduction have been summarized by basin in Table 27 through Table 30 of Section 5.2.

5.1.3 Stream Restoration and Stabilization

Stream restoration projects have historically been used by multiple divisions at VDOT for various purposes. VDOT's Environmental Division occasionally restores degraded streams in order to provide compensatory mitigation for other project-related impacts requiring Clean Water Act (CWA) Section 404 permits or Virginia Water Protection Permits. VDOT's L&D Division encounters degraded receiving streams located downstream from proposed project outfalls that are inadequate for current or future conditions. In these instances, the designers must provide for restoration or stabilization of the downstream receiving tributaries to create an adequate channel for discharges. VDOT's Maintenance Division occasionally encounters degraded urban streams below existing stormwater outfalls which are experiencing significant erosion and head-cutting. These areas are often stabilized or restored through a variety of means including natural stream channel design. VDOT is undertaking several stream restoration projects to meet the pollutant reduction requirements for the TMDL Action Plan. VDOT has completed projects in the Potomac and Rappahannock River Basins with the reductions shown in Table 16.

Table 16. Reported Reductions from Stream Restoration and Stabilization in Each Basin (2016 - 2017)

Basin	TN Removed due to Stream Restoration and Stabilization (lbs/yr)	TP Removed due to Stream Restoration and Stabilization (lbs/yr)	TSS Removed due to Stream Restoration and Stabilization (lbs/yr)
James	0	0	0
Potomac	104	97	36,680
Rappahannock	475	110	176,378
York	0	0	0
Total	579	207	213,058

VDOT follows the four protocols discussed in the EPA Chesapeake Bay Program Office (CBPO) “Expert Panel” guidance entitled, “Final Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects” to calculate credits.

There are several stream stabilization projects underway, planned or anticipated that satisfy the Chesapeake Bay TMDL requirements and others for which VDOT may seek credit. These projects include four stream restoration projects in the James River Basin (Timsbury Creek, Skiffes Creek, Slatersville Area Headquarters, and Lithia Road), three in the Potomac River (Pike Branch, Lake Ridge Area Headquarters and Wancopin Creek), as well as one in the York River Basin (I-64 Colonial Parkway). Additional details for each project are provided in Appendix D. The anticipated reductions from the identified projects are shown below in Table 17. In addition to these projects, multiple opportunities have been identified on VDOT’s properties that are undergoing additional review as possible stream restoration projects.

Table 17. Projected Reductions from Stream Restoration and Stabilization in Each Basin

Basin	TN Removed due to Stream Restoration and Stabilization (lbs/yr)	TP Removed due to Stream Restoration and Stabilization (lbs/yr)	TSS Removed due to Stream Restoration and Stabilization (lbs/yr)
James	1,434	699	121,589
Potomac	11,211	5,211	1,730,893
Rappahannock	0	0	0
York	127	58	10,044
Total	12,772	5,968	1,862,526

Reductions for stream restoration in relation to the required 36% reduction have been summarized by basin in Table 27 through Table 30 of Section 5.2

5.1.4 Outfall and Dry Channel Stabilization

VDOT maintains stormwater and culvert outfalls throughout the state, some of which are experiencing erosion due to contributing factors such as increased imperviousness in upstream catchment areas. These outfalls and eroding channels present an opportunity to reduce nutrients and sediments contributing to downstream waters through a directed maintenance program that will prioritize project locations to focus efforts where maximum nutrient and sediment reductions would be achieved. In the absence of written Expert Panel guidance to credit outfall stabilization efforts, stream restoration methodologies are used to credit the nutrients and sediment transport reduced by stabilizing the outfalls for TMDL Action Plan purposes per the verbal recommendation from the Expert Panel (Urban Stormwater Workgroup Meeting, May 19, 2015). Outfall stabilization is similar in concept to Protocol 1 for stream restoration (prevented sediment) from the EPA CBPO's "Final Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects." This guidance was used to assess the nutrient and sediment reductions associated with stabilizing outfalls. VDOT reported the reduction of nutrients and sediment as the result of stabilizing several outfalls. The credits are summarized in Table 18.

Table 18. Reported Reductions from Outfall and Dry Channel Stabilization in Each Basin (2016 - 2017)

Basin	TN Removed due to Outfall and Dry Channel Stabilization (lbs/yr)	TP Removed due to Outfall and Dry Channel Stabilization (lbs/yr)	TSS Removed due to Outfall and Dry Channel Stabilization (lbs/yr)
James	11	10	2,267
Potomac	0	0	0
Rappahannock	0	0	0
York	8.7	7.9	1,748
Total	19.7	17.9	4,015

VDOT has two outfall stabilization projects planned in the James River Basin and will continue capturing additional outfall stabilization projects as they occur in all basins. The amount of credit reported from outfall stabilization projects is expected to increase as VDOT continues to document these projects for TMDL purposes. The projected reductions from the known outfall projects to be achieved in the upcoming years are shown in Table 19.

Table 19. Projected Reductions from Outfall Stabilization Projects in Each Basin

Basin	TN Removed due to Outfall and Dry Channel Stabilization (lbs/yr)	TP Removed due to Outfall and Dry Channel Stabilization (lbs/yr)	TSS Removed due to Outfall and Dry Channel Stabilization (lbs/yr)
James	179	82	313,520
Potomac	0	0	0
Rappahannock	0	0	0
York	0	0	0
Total	179	82	313,520

Newly identified projects may replace or supplement a portion of the projects identified here, potentially exceeding target reductions outlined in Table 19. To assist in identifying degraded outfalls, VDOT conducted a visual review of field inventory photographs to identify candidates for stabilization. The results of the screening are listed in Appendix G. To enable a simplified estimate, the overall stabilization length was roughly estimated using the length of a typical VDOT outlet stabilization apron based on the culvert diameter. This methodology is conservative, as it is likely that some outfalls will require more substantial stabilization approaches. Actual outfalls with eroding channels that are stabilized, and associated credits, will be reported in the appropriate MS4 Annual Report.

Reductions for outfall stabilization in relation to the required 36% reduction have been summarized by basin in Table 27 through Table 30 of Section 5.2.

5.1.5 Shoreline Erosion Control

Guidance from EPA’s Chesapeake Bay Program identifies shoreline erosion as one of the greatest sources of sediment and turbidity in the Bay and its tributaries. The published guidance prepared by the CBPO Water Quality Goals Implementation Team (WQGIT), *Recommendation of the Expert Panel to Define Removal Rates for Shoreline Management Projects* (July 31, 2015), provides four protocols for evaluating shoreline erosion control activities regarding their function and design for TMDL crediting.

These protocols are additive, and all or none of them may apply to a given shoreline erosion control project. The protocols are summarized as follows:

- *Protocol 1: Prevented Sediment* – This protocol provides credit for the shoreline management project preventing sediment from entering downstream waters. This credit is reduced for sand content of the sediment and for bank instability (if applicable).
- *Protocol 2: Denitrification* – This protocol provides credit for nitrogen removal from microbial action in tidal marsh plantings.

- *Protocol 3: Sedimentation* – This protocol provides a sediment and phosphorus reduction credit for sediment captured in tidal marsh plantings.
- *Protocol 4: Marsh Redfield Ratio* – This protocol provides nitrogen and phosphorus removal credit for annual plant uptake of these nutrients in tidal marsh plantings.

VDOT has identified multiple potential project locations where shoreline erosion control is proposed for nutrient and sediment reductions. In addition to some locations along VDOT right-of-way, these identified projects include shoreline segments along waterways managed and/or owned by the DCR and the DGIF. These potential projects include three projects in the James River Basin (Chippokes Plantation State Park, Goose Island and Ragged Island), one project in the Potomac River (Westmoreland State Park), one project in the Rappahannock (Belle Isle State Park), and one project in the York River Basin (York River State Park). VDOT is in the process of negotiating a Memorandum of Agreement (MOA) with each agency to allow for implementation of these or other projects.

Project summary sheets for each project above are provided in Appendix E. Table 20 provides a summary of the anticipated TSS, TP, and TN removal in each Basin from the above-referenced projects.

Table 20. Projected Reductions from Shoreline Erosion Control Projects in Each Basin

Basin	TN Removed due to Shoreline Stabilization (lbs/yr)	TP Removed due to Shoreline Stabilization (lbs/yr)	TSS Removed due to Shoreline Stabilization (lbs/yr)
James	3,635	2,408	3,113,184
Potomac	1,328	903	3,074,626
Rappahannock	250	153	252,722
York	464	319	148,349
Total	5,677	3,783	6,588,881

Reductions for shoreline erosion control in relation to the required 36% reduction have been summarized by basin in Table 27 through Table 30 of Section 5.2.

5.1.6 Land Cover Conversion

A portion of VDOT’s right-of-way (shoulders, medians, and side slopes) is comprised of maintained vegetated areas that are classified as regulated pervious cover by the Chesapeake Bay model. Several of these areas may offer an opportunity for conversion to forested lands or unmanaged meadow, provided that operational and safety features, such as clear zones and line of sight are maintained. VDOT has reviewed right-of-way in its MS4 Service Area for potential areas of land cover conversion. These locations feature large contiguous areas and optimal widths, as well as suitable clear zones and line of sight for VDOT safety features. Each land conversion opportunity will require internal coordination and review by the District Maintenance section. A small subset of these areas is anticipated to be converted during the 36% Action Plan

implementation timeframe. VDOT maintains a much larger list of potential land cover conversion areas for substitution in the event that one or more of the currently selected sites is not feasible. Table 21 below shows the resulting credits VDOT anticipates achieving through land cover conversion in the right-of-way to meet the 36% requirement in each basin. The land cover conversion anticipated in the table is from turf to forest cover, but alternate land conversion opportunities (e.g. turf to unmanaged pervious) may also be implemented during the permit cycle and reported accordingly.

There are also several areas where VDOT right-of-way was a regulated pervious cover in 2009, but have naturally returned to a forested state at the time of this Action Plan. VDOT has identified these areas and will protect selected areas as BMPs designated to remain as forested area.

There may also be opportunities for land cover conversion credit when VDOT removes pavement for greenspace or safety purposes during the redesign of a developed area, such as an intersection or the discontinuance of a road. VDOT will report the impervious to pervious land use conversions for credit that is not claimed for other purposes, such as Virginia Stormwater Management Program (VSMP) compliance. Land cover conversion that occurs near streams may serve as a riparian buffer. Where such co-benefit exists, VDOT will also determine the pollutant reduction creditable through a forest buffer BMP.

In addition to VDOT’s right-of-way area, a small portion of VDOT’s MS4 Service Area is comprised of residual properties and facilities that also contain managed pervious cover. VDOT is considering land cover conversion on residual properties and facilities where it is appropriate. VDOT has one land cover conversion project planned at its Richmond District Complex in the James River Basin and is currently reviewing opportunities at 35 other facilities. VDOT recently completed a land cover conversion project at the Harrisonburg Residency in the Potomac River Basin, where roughly 22 acres of pervious cover were converted to forested land. The resulting pollutant loads reduced by the land cover conversion are shown in Table 21.

Table 21. Achieved Reductions from Land Cover Conversion in Each Basin

Basin	TN Removed due to Land Cover Conversion (lbs/yr)	TP Removed due to Land Cover Conversion (lbs/yr)	TSS Removed due to Land Cover Conversion (lbs/yr)
James	0	0	0
Potomac	158	8.4	2,942
Rappahannock	0	0	0
York	0	0	0
Total	158	8.4	2,942

Table 22 shows the credit VDOT anticipates achieving in each basin through reforestation and continued protection of these forested areas.

Table 22. Projected Reductions from Land Cover Conversion in Each Basin

Basin	TN Removed due to Land Cover Conversion (lbs/yr)	TP Removed due to Land Cover Conversion (lbs/yr)	TSS Removed due to Land Cover Conversion (lbs/yr)
James	864	83	9,930
Potomac	616	32	11,421
Rappahannock	167	12	1,670
York	17	1.6	253
Total	1,664	129	23,274

Reductions for land cover conversion in relation to the required 36% have been summarized by basin in Table 27 through Table 30 of Section 5.2

5.1.7 Forest Buffers

Forest Buffers can be credited as both a land cover conversion and an efficiency BMP. Much like land cover conversion, VDOT will credit these opportunities where appropriate for use in VDOT right-of-way or at residual properties and facilities, and other private or public properties. VDOT will continue to explore forest buffer opportunities when exploring possible stream stabilization and land cover conversion efforts throughout the VDOT MS4 regulated area. VDOT recently reported forest buffer credit with a land cover conversion project at the Harrisonburg Residency in the Potomac River Basin, where roughly 2 acres of pervious cover were converted to forested land buffering a stream. The resulting pollutant loads reduced by the forest buffer are shown in Table 23.

Table 23. Achieved Reductions from Forest Buffers in Each Basin

Basin	TN Removed due to Forest Buffers (lbs/yr)	TP Removed due to Forest Buffers (lbs/yr)	TSS Removed due to Forest Buffers (lbs/yr)
James	0	0	0
Potomac	13	0.10	436
Rappahannock	0	0	0
York	0	0	0
Total	13	0.10	436

Reductions for forest buffers in relation to the required 36% are captured with associated land cover and stream restoration projects and have been summarized by Basin in Table 27 through Table 30 of Section 5.2. The credit achieved from these practices will be reported with the related project.

5.1.8 Street Sweeping and Other Annual Pollutant Removal Efforts

VDOT practices street sweeping at varying degrees of frequency and location depending on the needs and abilities at the local level. The frequency of sweeping is based on safety, local agreements, and availability of equipment and personnel. Depending on the VDOT Residency or District, VDOT roads are swept by VDOT forces or by a contractor. VDOT also partners with local jurisdictions by sharing resources. These resources may be equipment, labor, VDOT roads, or funding.

In addition to tracking street sweeping efforts, VDOT is exploring a mechanism to document efforts related to other activities, such as catch basin clean-out and ditch pulling, associated with the gross removal of POCs. These efforts are like street sweeping in that POCs are removed on an annual basis and can be tracked by a unit measure (e.g. number of miles) or by tonnage. Currently, there are two local TMDLs in the Chesapeake Bay watershed in which VDOT utilizes street sweeping to achieve local sediment waste load allocations. In the Rivanna River watershed (located in the James River Basin) and the Bull Run watershed (located in the Potomac River Basin), VDOT's street sweeping efforts are tracked and reported for Bay and local TMDL credits. There are additional areas where VDOT's street sweeping efforts are tracked and reported solely for Bay credit. The reductions that VDOT achieved from street sweeping, as reported in the 2017 MS4 Annual Report, are shown in Table 24.

Table 24. Reported Reductions from Street Sweeping in Each Basin (2017)

Basin	TN Removed due to Street Sweeping (lbs/yr)	TP Removed due to Street Sweeping (lbs/yr)	TSS Removed due to Street Sweeping (lbs/yr)
James	262	41	111,364
Potomac	2,031	554	115,201
Rappahannock	0	0	0
York	67	10	28,382
Total	2,360	605	254,947

The method VDOT uses to calculate the credit reductions for the street sweeping follows DEQ's Guidance Memorandum (Mass Loading Approach or Qualifying Street Lanes Method) with supplemental information provided by Tom Schueler. DEQ's Guidance Memorandum did not address the sediment loading rate from impervious cover, therefore the loading rate (0.65 tons/ac/year) provided by Tom Schueler to Jaime Bauer in an email dated December 18, 2015 is used for this calculation. A copy of this email is provided in Appendix F. Example calculations are shown in Appendix H. Depending on the VDOT Residency or District, street sweeping practices may be tracked differently; therefore, the calculation VDOT uses for each Residency or District may vary depending on the type of data reported.

VDOT is also evaluating the potential reduction of nitrogen, phosphorus, and sediment associated with Roadside Ditch Management. Roadside ditches are primarily designed in transportation projects to convey runoff away from roadway surfaces. These ditches also provide

the ancillary benefit of reducing sediment loads and increasing water quality, by infiltration and filtration processes. However, because roadside ditches are not designed with their primary purpose being pollutant removal, their full attenuation capacity is not always realized. VDOT is reviewing roadside ditch characteristics and maintenance activities that could be adopted as best management practices to achieve reduction of nitrogen, phosphorus, and sediment. This review includes a full literature search in addition to the research report released by the Chesapeake Bay Program’s Scientific and Technical Advisory Committee. VDOT will report any creditable practices achieved from Roadside Ditch Management in the appropriate MS4 Annual Report.

5.1.9 Purchasing of Nutrient Credits

Internal research conducted by VDOT indicated the use of nutrient credits by the Department can be very cost effective compared to many structural BMP practices on a dollar per pound basis, with an average cost savings of 51%. For Chesapeake Bay TMDL purposes, VDOT has purchased credits in the Potomac and James River basins, as shown in Table 25. VDOT will consider purchasing additional credits, as needed, to meet reductions, including achieving the 36% reduction in this permit cycle and for additional permit cycles. VDOT reports nutrient credit purchases in the MS4 Annual Report for the permit year the purchase is made.

Table 25. Reductions Achieved from Nutrient Credit Purchases in Each Basin

Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James	452	140	TBD
Potomac	832	112	TBD
Rappahannock	0	0	0
York	0	0	0
Total	1,284	252	TBD

In terms of stormwater sources, the “currency” that is typically traded is normalized to Total Phosphorus, which is a keystone pollutant representative of an array of urban stormwater pollutants. The DEQ elects to utilize TP for stormwater new development and redevelopment criteria as a convenient single medium of exchange, rather than calculating required reductions and executing trades separately for TN, TP and TSS. However, the Chesapeake Bay TMDL requires reductions to be quantified for each these pollutants. DEQ is in the process of developing guidance for TSS reduction assignments. VDOT will make use of Nutrient Credits to satisfy TP, TN and TSS reductions requirements where necessary. Reductions for nutrient credits in relation to the required 36% reduction have been summarized by basin in Table 27 through Table 30 of Section 5.2.

5.1.10 Structural Enhancements, Retrofits, and New BMPs

VDOT has a significant asset base of existing structural BMPs, mainly detention and extended detention facilities, commonly referred to in VDOT as “dry ponds.” There are opportunities at many of these dry ponds for functional enhancements or retrofits for which VDOT could increase the amount of nutrient and sediment removal achieved by the BMP. Examples which VDOT may

consider include, but are not limited to: BMP conversions such as a dry basin to an extended basin or constructed wetlands; BMP enhancements to improve design elements, such as storage volume, residence time, or circuit pathway and thus increase pollutant removal; and BMP rehabilitations, such as sediment cleanouts exceeding 10% of the storage volume; major vegetative harvesting; and filter media replacement.

VDOT reviewed the existing structural BMP inventory to identify potential BMP enhancement or retrofit opportunities. The retrofit opportunities were prioritized for greatest credit reduction and cost effectiveness. Several BMPs in the James and Potomac River Basins have been identified for retrofit potential and are being pursued for TMDL credit. VDOT will report any resulting credits from the BMP retrofits in the appropriate MS4 Annual Report.

VDOT will also install new BMPs as needed to meet the requirements of the Chesapeake Bay TMDL. VDOT has already implemented several new BMPs. The credit achieved from these BMPs is shown below in Table 26.

VDOT is currently assessing its ROW for opportunities to install grass swales or filter strips. Multiple areas of ROW were identified by screening the ROW characteristics using GIS tools. Characteristics, such as land cover, width, slope and length, were reviewed to highlight potential areas. VDOT will continue to review these areas and may identify BMP locations in the future as part of this effort.

Table 26. Achieved Reductions from Enhancements, Retrofits, and New BMPs in Each Basin

Basin	TN Removed due to BMPs (lbs/yr)	TP Removed due to BMPs (lbs/yr)	TSS Removed due to BMPs (lbs/yr)
James	63	17	7,874
Potomac	0	0	0
Rappahannock	2.9	1.1	280
York	4.5	1.4	559
Total	70	20	8,713

5.2 Summary of Proposed BMPs per River Basin

Utilizing all the information collected and reviewed in Section 5.1, VDOT projected the implementation of each BMP type in the four River Basins, as shown in Table 27 through Table 30. When implementation of the BMPs results in reductions beyond the required 36%, VDOT intends to apply the additional reductions in the subsequent permit cycles.

5.2.1 James River Basin BMP Projections

For the James River Basin, the BMPs in Table 27 are anticipated to meet the requirements of the 2017 MS4 Individual Permit Chesapeake Bay TMDL Special Condition.

Table 27. Proposed BMPs to Achieve Required Reductions in the James River Basin

BMP Type	Potential Nitrogen Removal (lbs/yr)	Potential Phosphorus Removal (lbs/yr)	Potential TSS Removal (lbs/yr)
<i>Reductions have been achieved at the time the Action Plan was developed. Credits were reported to DEQ in annual reports.</i>			
Historical BMPs	22	3	3,538
Redevelopment	60	8.2	4,360
Outfall and Channel Stabilization	11	10	2,267
Nutrient Credits	452	140	TBD*
Street Sweeping and Catch Basin Clean-Out	262	41	111,364
New BMPs	63	17	7,874
<i>Future reductions are anticipated in subsequent years of this permit cycle</i>			
Stream Restoration and Stabilization	1,434	699	121,589
Redevelopment	25	3	3,288
Outfall and Channel Stabilization	179	82	313,520
Land Cover Conversion	864	83	9,930
Shoreline Erosion Control	3,635	2,408	3,113,184
<i>BMPs that may be implemented in subsequent years, but not currently projected to assist with required reductions.</i>			
Nutrient Credits	0	0	0
New BMPs	0	0	0
Structural Enhancements and Retrofits	0	0	0
Forest Buffers	0	0	0
Total	7,007 (100 %)	3,494 (179 %)	3,690,914 (408 %)*

*Sediment value of nutrient credit has not been provided by DEQ at this time. Sediment credits, when available, will be reported with appropriate MS4 Annual Report.

5.2.2 Potomac River Basin BMP Projections

For the Potomac River Basin, the BMPs in Table 28 are anticipated to meet the requirements of the 2017 MS4 Individual Permit Chesapeake Bay TMDL Special Condition.

Table 28. Proposed BMPs to Achieve Required Reductions in the Potomac River Basin

BMP Type	Potential Nitrogen Removal (lbs/yr)	Potential Phosphorus Removal (lbs/yr)	Potential TSS Removal (lbs/yr)
<i>Reductions have been achieved at the time the Action Plan was developed. Credits were reported to DEQ in annual reports.</i>			
Historical BMPs	569	45	90,783
Redevelopment	4.5	1.4	618
Stream Restoration and Stabilization	104	97	36,680
Land Cover Conversion	158	8.4	2,942
Forest Buffer	13	0.10	436
Street Sweeping and Catch Basin Clean-Out	2,031	554	115,201
Nutrient Credits	832	112	TBD*
<i>Future reductions are anticipated in subsequent years of this permit cycle</i>			
Redevelopment	1,970	167	347,856
Stream Restoration and Stabilization	11,211	5,211	1,730,893
Shoreline Erosion Control	1,328	903	3,074,626
Land Cover Conversion	616	32	11,421
<i>BMPs that may be implemented in subsequent years, but not currently projected to assist with required reductions.</i>			
Outfall and Channel Stabilization	0	0	0
Structural Enhancements and Retrofits	0	0	0
New Structural BMPs	0	0	0
Total	18,837 (100 %)	7,131 (254 %)	5,411,456 (218%)*

*Sediment value of nutrient credit has not been provided by DEQ at this time. Sediment credits, when available, will be reported with appropriate MS4 Annual Report.

5.2.3 Rappahannock River Basin BMP Projections

For the Rappahannock River Basin, the BMPs in Table 29 are anticipated to meet the requirements of the 2017 MS4 Individual Permit Chesapeake Bay TMDL Special Condition.

Table 29. Proposed BMPs to Achieve Required Reductions in the Rappahannock River Basin

BMP Type	Potential Nitrogen Removal (lbs/yr)	Potential Phosphorus Removal (lbs/yr)	Potential TSS Removal (lbs/yr)
<i>Reductions have been achieved at the time the Action Plan was developed. Credits were reported to DEQ in annual reports.</i>			
Stream Restoration and Stabilization	475	110	176,378
New Structural BMPs	2.9	1.1	280
<i>Future reductions are anticipated in subsequent years of this permit cycle</i>			
Redevelopment	10	1	747
Land Cover Conversion	167	12	1,670
Shoreline Erosion Control	250	153	252,722
<i>BMPs that may be implemented in subsequent years, but not currently projected to assist with required reductions.</i>			
Forest Buffers	0	0	0
Stream Restoration and Stabilization	0	0	0
New Structural BMPs	0	0	0
Nutrient Credits	0	0	0
Structural Enhancements and Retrofits	0	0	0
Total	905 (100 %)	277 (130%)	431,797 (559%)

5.2.4 York River Basin BMP Projections

For the York River Basin, the BMPs in Table 30 are anticipated to meet the requirements of the 2017 MS4 Individual Permit Chesapeake Bay TMDL Special Condition.

Table 30. Proposed BMPs to Achieve Required Reductions in the York River Basin

BMP Type	Potential Nitrogen Removal (lbs/yr)	Potential Phosphorus Removal (lbs/yr)	Potential TSS Removal (lbs/yr)
<i>Reductions have been achieved at the time the Action Plan was developed. Credits will be reported to DEQ in the annual report.</i>			
Historical BMPs	55	9	2,631
Outfall and Channel Stabilization	8.7	7.9	1,748
Street Sweeping and Catch Basin Clean-Out	67	10	28,382
Redevelopment	62	20	8,823
<i>Future reductions are anticipated in subsequent years of this permit cycle</i>			
Land Cover Conversion	17	1.6	253
Redevelopment	69	10	7,950
Shoreline Erosion Control	464	319	148,359
Stream Restoration and Stabilization	127	58	10,044
<i>BMPs that may be implemented in subsequent years, but not currently projected to assist with required reductions.</i>			
Forest Buffers	0	0	0
Structural Enhancements and Retrofits	0	0	0
New Structural BMPs	0	0	0
Nutrient Credits	0	0	0
Total	870 (100%)	436 (171%)	208,190 (225%)

5.3 Schedule and Annual Reporting

VDOT has already reported reductions towards the required 36% reductions to date, shown in Table 31. VDOT will continue to implement all BMPs necessary to achieve the remainder of the required reductions by June 30, 2022.

Table 31. Percent Achieved Reductions in Each Basin

Basin	Reported TN Removed to Date	Reported TP Removed to Date	Reported TSS Removed to Date
James	4.5%	4.1%	5.2%
Potomac	7.1%	10.5%	3.6%
Rappahannock	19.0%	18.8%	82.3%
York	8.0%	6.6%	16.2%
Overall	6.9%	8.2%	6.0%

VDOT is working to secure funding to implement additional projects through our BMP toolbox. Until funding has been secured, a schedule of implementation for specific projects cannot be provided. Therefore, we are providing a benchmark schedule in Table 32. for planning purposes only, as it is the best available information at this time, and is not intended for funding, design, or construction purposes:

For all BMPs that are implemented to meet the Special Condition, VDOT will annually report the BMP information in accordance with Section I.D.5 of the MS4 Individual Permit to demonstrate adequate progress is being made. VDOT will identify which BMPs were implemented to meet the Special Condition to distinguish from those BMPs that were installed to satisfy the technical criteria of the VSMP regulations. VDOT will also provide a revised schedule, as appropriate, in the annual report. VDOT has established a standing quarterly meeting with DEQ personnel to discuss BMPs that have been recently implemented and/or are targeted for implementation during the applicable quarter.

VDOT will estimate the TMDL credit using the information presented in this Action Plan and within the intent of DEQ Guidance Memorandum #15-2005. VDOT will maintain the applicable calculations for the BMPs that are implemented and reported to DEQ.

Table 32. Estimated Number of Projects or Activities Completed and Submitted for Credits with Annual Report ¹

BMP	Basin	Permit Year 2018	Permit Year 2019	Permit Year 2020	Permit Year 2021	Permit Year 2022
Stream Restoration	James	3	1			
	Potomac		1	1	1	1
	Rappahannock					
	York			1		
Outfall Stabilization	James			2		
	Potomac					
	Rappahannock					
	York					
Redevelopment	James	5	5	5	5	5
	Potomac	5	5	5	5	5
	Rappahannock	5	5	5	5	5
	York	5	5	5	5	5
Shoreline Stabilization	James			1		2
	Potomac				1	
	Rappahannock			1		
	York				1	
Land Cover Conversion	James			19	20	20
	Potomac			15	15	15
	Rappahannock			6	6	
	York			8	8	8

¹ Estimates provided for planning purposes only. Actual number of projects or activities reported could be higher or lower than these projections.

6.0 MEANS AND METHODS TO OFFSET INCREASED LOADS FROM NEW SOURCES INITIATING CONSTRUCTION BETWEEN JULY 1, 2009 AND JUNE 30, 2014

(2013 General Permit Section I.C.2.a.(7)) – The means and methods to offset the increased loads from new sources initiating construction between July 1, 2009, and June 30, 2014, that disturb one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities.

For the 5% implementation milestone VDOT was required to describe the means and methods to offset increased loads from new sources initiating construction between July 1, 2009 and June 30, 2014, however this condition is not a requirement of the Chesapeake Bay TMDL Action Plan in the Individual Permit. The language presented in the 5% Action Plan is retained below; however, it is displayed in strike-out as it is not relevant to this amended 36% Action Plan.

~~In accordance with VDOT's ESC and SWM Standards and Specifications, construction projects that were initiated between July 1, 2009 and June 30, 2014, were required to utilize an average impervious land cover condition of 16% for the design of post construction stormwater management plan.~~

~~As such, there are no new sources that would require load reductions according to this Special Condition requirement of the MS4 General Permit.~~

7.0 MEANS AND METHODS TO OFFSET INCREASED LOADS FROM GRANDFATHERED PROJECTS

(2013 General Permit Section I.C.2.a.(8)) – The means and methods to offset the increased loads from projects as grandfathered in accordance with 9VAC25-870-48, that disturb one acre or greater that begin construction after July 1, 2014, where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities. The operator shall utilize Table 4 in this section to develop the equivalent pollutant load for nitrogen and total suspended solids.

For the 5% implementation milestone VDOT was required to describe the means and methods to offset increased loads from grandfathered projects, however this condition is not a requirement of the Chesapeake Bay TMDL Action Plan in the Individual Permit. The language presented in the 5% Action Plan is retained below; however, it is displayed in strike-out as it is not relevant to this amended 36% Action Plan.

~~In accordance with VDOT's ESC and SWM Standards and Specifications, construction projects that are grandfathered are required to utilize an average impervious land cover condition of 16% for the design of post-construction stormwater management plan.~~

~~As such, there are no new sources that would require load reductions according to this Special Condition requirement of the MS4 General Permit.~~

8.0 A LIST OF FUTURE PROJECTS THAT QUALIFY AS GRANDFATHERED

(2013 General Permit Section I.C.2.a.(10)) – A list of future projects and associated acreage that qualify as grandfathered in accordance with 9VAC25-870-48

For the 5% implementation milestone VDOT was required to describe projects that qualify as grandfathered projects, however this condition is not a requirement of the Chesapeake Bay TMDL Action Plan in the Individual Permit. The language presented in the 5% Action Plan is retained below; however, it is displayed in strike-out as it is not relevant to this amended 36% Action Plan.

~~VDOT established criteria to identify if a VDOT project would be considered grandfathered thus allowing the utilization of Part IIC technical criteria of the VSMP regulations. For a VDOT project or activity to be grandfathered it must fall into one of the following two categories:~~

- ~~1. Project specific bonds must have been issued prior to July 1, 2012.
 - ~~Projects or activities meeting this requirement may be grandfathered indefinitely.~~~~
- ~~2. Funding (PE, RW or Construction) must have been allocated to the project or activity prior to July 1, 2012 (e.g., allocation in SYIP in FY13 or prior) and construction activity on the project must physically begin prior to July 1, 2019.~~

~~While the SYIP for FY13 is reviewable on VDOT's website, it is difficult to establish a list of projects that may qualify for grandfathering. There are several cases, where projects might meet one of the two criteria, but VDOT will opt to utilize the Part IIB technical criteria of the VSMP regulations. A few examples are presented below:~~

- ~~• For Design/Bid/Build (D/B/B) projects, the beginning of construction activity (as defined herein) typically occurs within five to six months after advertisement. Therefore, those projects with an advertisement date of January 1, 2019 or after should not be considered a candidate for grandfathering.~~
- ~~• Likewise, for Design/Build (D/B) projects, beginning of construction activity (as defined herein) typically occurs within 18 months following issuance of a Request for Proposal (RFP). Therefore, those projects with an RFP issuance date of January 1, 2018 or after should not be considered a candidate for grandfathering.~~

9.0 ESTIMATE OF THE EXPECTED COST TO IMPLEMENT THE ACTION PLAN

(General Permit Section I.C.2.a.(11)) – An estimate of the expected costs to implement the requirements of this special condition during the state permit cycle;

For the 5% implementation milestone VDOT was required to describe the expected cost to implement the Action Plan, however this condition is not a requirement of the Chesapeake Bay TMDL Action Plan in the Individual Permit. The language presented in the 5% Action Plan is retained below; however, it is displayed in strike-out as it is not relevant to this amended 36% Action Plan.

~~The purpose of this section is to provide an estimate of the expected costs to implement the requirements of this Special Condition during the current MS4 General Permit cycle. Cost estimates, derived herein, are based on published sources or VDOT's experience implementing similar practices. These costs are a starting point for VDOT, but will be refined based on actual cost data derived from implemented projects. Note: the refined costs will be what VDOT uses to develop budgetary needs, and it may not necessarily match what is identified in this section. Costs for this permit cycle include costs already incurred by VDOT, costs associated with BMP construction, and costs associated with long term life cycles of the BMPs.~~

~~As discussed in previous sections of this Plan, VDOT has already achieved portions of the 5% reduction requirements. Many of the costs already incurred by VDOT were associated with project implementation, tracking, and maintenance operations (e.g. accounting for existing BMPs, reductions associated with Construction General Permit (CGP) compliance for redevelopment, and other such projects). While it is difficult to quantify all of these efforts, the majority of the total costs incurred to date is associated with implementation of historical BMPs, reductions due to redevelopment, and purchase of nutrient credits. Using a \$15,000 average cost per pound for phosphorus, VDOT estimated the cost for the credits associated with historical BMPs (57 lbs of P), previous redevelopment (40 lbs of P), and nutrient credits (15 lbs of P) to be approximately \$1,680,000.~~

~~The remaining costs to implement the proposed BMPs were estimated using expected construction costs and typical unit costs of phosphorus for the various BMPs types. The future cost to construct or implement the proposed BMPs is estimated to be \$3,150,000 to \$5,250,000 by adjusting the total cost estimate in Table 27 by $\pm 25\%$.~~

Table 27. Estimated Statewide Cost to Implement Proposed BMPs for TMDL Compliance

BMP Category	Unit Cost	Number of Units	Projected Implementation Cost for 5% Reductions
Stream Restoration and Stabilization	\$700/LF	2,850	\$1,995,000
Land Cover Conversion	\$15,000/acre	10	\$150,000
Forest Buffers	\$15,000/acre	1	\$15,000
Nutrient Credit Purchase	\$15,000/lb of TP	24	\$360,000
Outfall Stabilization	\$20,000/each	58	\$1,160,000
Street Sweeping and Catch Basin Cleanout	\$1,200/acre/yr	172	\$412,800 ¹
Data Management	\$100,000/each	1	\$100,000
TOTAL			\$4,192,800

¹Assume cost to implement street sweeping is two years of implementation through June 30, 2018.

In addition to the cost to construct or implement the BMPs described in this Action Plan, which were derived using typical unit costs for construction, there will be additional direct and indirect costs to VDOT for operation, maintenance, design, permitting, inspection, validation, tracking, etc. Total life cycle costs can be estimated by adjusting the unit construction or implementation costs for structural BMP practices (stream restoration, outfall stabilization, etc.) to account for other project related costs as appropriate. These other costs may include plantings, mobilization, erosion and sediment control, and other ancillary project elements.

The life cycle costs for the proposed BMPs are estimated to be \$7,950,000 to \$13,250,000 by adjusting the total cost estimate in Table 28 by ±25%.

Table 28. Total Life Cycle Costs for BMPs Implemented Watershed Wide for TMDL Compliance

BMP Category	Unit Cost	Number of Units	Projected Life Cycle Cost for 5% Reductions
Stream Restoration and Stabilization	\$1,600/LF	2,850	\$4,560,000
Land Cover Conversion	\$17,250/acre	10	\$172,500
Forest Buffers	\$17,250/acre	1	\$172,500
Nutrient Credit Purchase	\$15,000/lb of TP	24	\$360,000
Outfall Stabilization	\$32,000/each	58	\$1,856,000
Street Sweeping and Catch Basin Cleanout	\$1,200/acre/yr	172	\$2,476,000 ¹
Data Management	\$1,000,000/each	1	\$1,000,000
TOTAL			\$10,597,000

¹Assume cost to implement street sweeping is twelve years of implementation through June 30, 2028.

~~The estimates shown above represent the costs for implementing BMPs to meet the pollutant reductions required by July 1, 2018 and projected resources for the long-term impact of meeting the 5% pollutant reductions. The estimates do not capture the cost to implement the numerous other components of VDOT's MS4 Program, nor do the estimates capture the cost for planning, implementing, or maintaining the BMPs to meet 35% and 60% pollutant reductions that will be required for the future Chesapeake Bay TMDL requirements. The cost for these elements will be significant; however, providing an estimate of the future permit cycle costs is not required as a part of this TMDL Action Plan.~~

~~There are already some immediate efforts VDOT is undertaking or envisions taking to approach the future Chesapeake Bay TMDL requirements. For example, as discussed in Section 4.2, the available GIS data to determine land cover characteristics of the VDOT MS4 Service Area was not ideal, but it was necessary to move forward with the data that was readily available. VDOT anticipates revisiting the land cover and pollutant estimates at the time of reapplication for the next permit cycle if improved data or methodologies are presented. The resources necessary to conduct this revision and developing the Implementation Plan for future permit cycles are not captured in the cost estimates above, but it is noteworthy for future planning purposes as the funding required to implement in future permit cycles will likely be significant.~~

10.0 PUBLIC COMMENTS ON DRAFT ACTION PLAN

(2017 Individual Permit Section I.D.3.b.(iii)) – The permittee shall provide an opportunity for public comment on the additional BMPs and/or strategies proposed to meet the reductions not previously approved by the DEQ in the first phase Chesapeake Bay TMDL (5% reduction) action plan for no less than 15 days. The public comment period may occur concurrently with DEQ’s review of the Chesapeake Bay TMDL Action Plan. Upon the end of the public comment period, the permittee shall submit the following to DEQ;

- i. A summary of all comments received as a result of the public comment period;*
 - ii. The permittee’s response to the public comments;*
 - iii. Identification of any public meetings to address comments; and*
 - iv. Any revisions made to the amended Chesapeake Bay TMDL Action Plan as a result of the public comments.*
-

VDOT posted a copy of the draft Action Plan on its stormwater webpage (http://www.virginiadot.org/programs/stormwater_management.asp) from May 10, 2018 through May 25, 2018. VDOT received a single comment. VDOT’s response to the comment is as follows:

Comment: *It appears that the Appendices which were included in the approved 5% CB Action Plan relating to eroded outfalls and Street Sweeping Quantities and Computations (Original Appendices E and F) were inadvertently omitted from the 36% action plan. I think these documents should be retained.*

Response: The referenced Appendices (E&F) from the original Action Plan have been reinserted into the document and are now referenced as Appendices E and H, respectively.

APPENDIX A
VDOT TMDL ACTION PLAN 5% REQUIREMENT

James River Basin Existing Source Loads and 5% Reduction Requirements

Table A1. Existing Source Loads and 5% Reduction Requirements based on the 2000 Census Urbanized Area for the James River, Lynnhaven, Little Creek, and Poquoson Coastal Basins by 6/30/2018

Pollutant	Subsource	2009 EOS Loading Rate (lbs/ac/yr)	Total Existing Acres Served by MS4 as of 6/30/2009	Loading (lbs/ac/yr)	MS4 Required Chesapeake Bay Total Loading Rate Reduction	5% of L2 Required Reduction by 6/30/2018 (lb/ac/yr)	Cumulative Reduction Required by 6/30/2018 (lbs/yr)
Nitrogen	Regulated Urban Impervious	9.39	16,379	153,799	9%	0.042255	896
	Regulated Urban Pervious	6.99	9,745	68,118	6%	0.02097	
Phosphorus	Regulated Urban Impervious	1.76	16,379	28,827	16%	0.01408	249
	Regulated Urban Pervious	0.5	9,745	4,873	7.25%	0.0018125	
Total Suspended Solids	Regulated Urban Impervious	676.94	16,379	11,087,600	20%	6.7694	115,185
	Regulated Urban Pervious	101.08	9,745	985,025	8.75%	0.442225	

Potomac River Basin Existing Source Loads and 5% Reduction Requirements

Table A2. Existing Source Loads and 5% Reduction Requirements based on the 2000 Census Urbanized Area for the Potomac River Basin by 6/30/2018

Pollutant	Subsource	2009 EOS Loading Rate (lbs/ac/yr)	Total Existing Acres Served by MS4 as of 6/30/2009	Loading (lbs/ac/yr)	MS4 Required Chesapeake Bay Total Loading Rate Reduction	36% of L2 Required Reduction by 6/30/2022 (lb/ac/yr)	Cumulative Reduction Required by 6/30/2022 (lbs/yr)
Nitrogen	Regulated Urban Impervious	16.86	26,054	439,270	9%	0.07587	2,395
	Regulated Urban Pervious	10.07	13,828	139,248	6%	0.03021	
Phosphorus	Regulated Urban Impervious	1.62	26,054	42,207	16%	0.01296	359
	Regulated Urban Pervious	0.41	13,828	5,669	7.25%	0.00148625	
Total Suspended Solids	Regulated Urban Impervious	1,171.32	26,054	30,517,571	20%	11.7132	315,811
	Regulated Urban Pervious	175.80	13,828	2,430,962	8.75%	0.769125	

Rappahannock River Basin Existing Source Loads and 5% Reduction Requirements

Table A3. Existing Source Loads and 5% Reduction Requirements based on the 2000 Census Urbanized Area for the Rappahannock River Basin by 6/30/2018

Pollutant	Subsource	2009 EOS Loading Rate (lbs/ac/yr)	Total Existing Acres Served by MS4 as of 6/30/2009	Loading (lbs/ac/yr)	MS4 Required Chesapeake Bay Total Loading Rate Reduction	36% of L2 Required Reduction by 6/30/2022 (lb/ac/yr)	Cumulative Reduction Required by 6/30/2022 (lbs/yr)
Nitrogen	Regulated Urban Impervious	9.38	2,252	21,124	9%	0.04221	116
	Regulated Urban Pervious	5.34	1,314	7,017	6%	0.01602	
Phosphorus	Regulated Urban Impervious	1.41	2,252	3,175	16%	0.01128	27
	Regulated Urban Pervious	0.38	1,314	499	7.25%	0.0013775	
Total Suspended Solids	Regulated Urban Impervious	423.97	2,252	954,780	20%	4.2397	9,870
	Regulated Urban Pervious	56.01	1,314	73,597	8.75%	0.24504375	

York River Basin Existing Source Loads and 5% Reduction Requirements

Table A4. Existing Source Loads and 5% Reduction Requirements based on the 2000 Census Urbanized Area for the York River Basin by 6/30/2018

Pollutant	Subsource	2009 EOS Loading Rate (lbs/ac/yr)	Total Existing Acres Served by MS4 as of 6/30/2009	Loading (lbs/ac/yr)	MS4 Required Chesapeake Bay Total Loading Rate Reduction	36% of L2 Required Reduction by 6/30/2022 (lb/ac/yr)	Cumulative Reduction Required by 6/30/2022 (lbs/yr)
Nitrogen	Regulated Urban Impervious	7.31	2,720	19,883	9%	0.032895	120
	Regulated Urban Pervious	7.65	1,340	10,251	6%	0.02295	
Phosphorus	Regulated Urban Impervious	1.51	2,720	4,107	16%	0.01208	35
	Regulated Urban Pervious	0.51	1,340	683	7.25%	0.00184875	
Total Suspended Solids	Regulated Urban Impervious	456.68	2,720	1,242,170	20%	4.5668	12,849
	Regulated Urban Pervious	72.78	1,340	97,525	8.75%	0.3184125	

Overall 5% Required Reduction Estimates for VDOT's MS4 Area

Table A5. 5% Required Reductions for VDOT's Statewide Regulated Area based on the 2000 Census Urbanized Area

POC	River Basin	Total Reduction Required by June 30, 2018 (lbs/yr)	Total Reduction Required by June 30, 2018 (lbs/yr)
Nitrogen	James	896	3,527
	Potomac	2,395	
	Rappahannock	116	
	York	120	
Phosphorus	James	249	670
	Potomac	359	
	Rappahannock	27	
	York	35	
Sediment	James	115,185	453,715
	Potomac	315,811	
	Rappahannock	9,870	
	York	12,849	

APPENDIX B
METHOD FOR DETERMINING VDOT'S SERVICE AREA
&
MAPS OF VDOT'S MS4 REGULATED AREA

METHOD FOR DETERMINING VDOT'S MS4 SERVICE AREA

The VDOT MS4 Service Area includes VDOT right-of-way (ROW) and property that is located within 2010 US Census Bureau urbanized areas in each of the four major river basins of the Chesapeake Bay watershed. The majority of VDOT's MS4 area is composed of ROW within urbanized areas that encompass roadways owned or maintained by VDOT.

The methodology utilized road centerline data as the basis for acreage estimation. This data was obtained from the Virginia Geographic Information Network (VGIN) and VDOT's Linear Referencing System (LRS, Quarterly Release 2009 Q4). VDOT's Linear Referencing System (LRS) catalogs road ownership and maintenance and was used in this process to cull out all roads not owned or maintained by VDOT. Once the VDOT roadway centerlines have been screened and processed, the area surrounding the centerlines must be estimated to derive an overall acreage.

VDOT utilized existing parcel datasets from local jurisdiction and developed a GIS tool and visual QA/QC process to evaluate the empty parcels surrounding VDOT roads and assign this void space as VDOT's ROW where appropriate. In instances of geospatial data conflict, where there was an existing VDOT road and an overlapping parcel, VDOT assumed a uniform ROW width surrounding the VDOT road, based on the roadway classification, to maintain a conservative estimate until further refinement. The ROW buffer widths were averages based on multiple samples measured by aerial imagery for each roadway classification. These buffer widths are shown in Table B.1 below. The parcel-driven ROW, combined with any other properties VDOT owns in the urbanized areas, define VDOT's MS4 Service Area.

Table B.1- Average Right-of-Way Buffer Widths by Road Classification

Roadway Classification	Right of Way Buffer Width (Feet)
Interstate	130
Interstate Ramp	20
Non-Interstate Frontage Ramp	15
Secondary	25
State Highway Primary	70
Urban	15
US Highway Primary	120

Following determination of the MS4 Service Area, the ROW was characterized to estimate the acreage of regulated impervious, regulated pervious and excluded land cover types. VDOT utilized the 2011 National Land Cover Database (NLCD) dataset in combination with VDOT roadway centerlines to estimate the impervious area within VDOT ROW attributed to road lanes and compacted shoulders.

To adjust for the limited spatial resolution of NLCD, each VDOT roadway was buffered based on its classification, such as Interstate, Primary, Secondary, etc. Roadway components, such as the pavement, paved shoulders, curb and gutter, and sidewalks were characterized as 100% impervious. The buffer widths used to define the 100% impervious components for each road classification are depicted in Table B.2 below.

Table B.2 – Average Buffer Width of the 100% Impervious Component by Road Classification

Roadway Classification	100% Impervious Component Buffer Width (Feet)
Interstate	44
Interstate Ramp	15.5
Non-Interstate Frontage Ramp	11.5
Secondary	16.5
State Highway Primary	24
Urban	14.5
US Highway Primary	37.5

The remaining area of VDOT ROW (medians, ditches, curb and gutter, shoulders, embankments, etc.) has varying degrees of impervious, pervious, and forested conditions depending on the surrounding land cover. These areas were characterized by land use category using NLCD to estimate the impervious, pervious, and forested extent. VDOT excluded areas as allowed by DEQ Guidance Memorandum #15-2005 (e.g. forested lands and water) within VDOT’s ROW, for purposes of determining existing loads and required reductions. These classifications include

- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Woody Wetlands
- Emergent Herbaceous Wetlands
- Open Water

The impervious, pervious, and forested areas and the land cover category that was used to derive the estimates for each river basin are provided in the TMDL Action Plan.

Maps of VDOT's MS4 Regulated Area

APPENDIX C
LIST OF HISTORICAL BMPs

Table C.1 Historical BMPs in Regulated Area

L&D ID	Maintenance ID	BMP Type ¹	Installation Date	River Basin	Drainage Area (Acres)	Impervious Area (Acres)	Pervious Area (Acres)
55366	99021	EDB	22-May-09	James	6.66	4.13	2.53
55363	42006	EDB	22-Feb-08	James	2.63	1.63	1.00
55463	C12106	EDB	9-Aug-07	James	3.58	2.22	1.36
54060	29151	EDB	1-Jan-08	Potomac	2.06	1.28	0.78
54059	29150	EDB	1-Jan-08	Potomac	1.15	0.71	0.44
54061	29152	EDB	1-Jan-08	Potomac	5.18	3.21	1.97
54062	29153	EDB	1-Jan-08	Potomac	6.74	4.18	2.56
55375	53035	EDB	21-Jan-09	Potomac	2.86	1.78	1.08
54573	29149	O	9-Aug-07	Potomac	5.60	3.47	2.13
54903	291077	O	15-Jul-08	Potomac	27.03	16.76	10.27
54927	291107	EDB	23-Jul-07	Potomac	10.11	6.33	3.78
54929	291109	EDB	23-Jul-07	Potomac	5.08	3.43	1.65
54925	29166	EDB	23-Jul-07	Potomac	29.68	9.7	19.98
54926	291106	EDB	23-Jul-07	Potomac	5.53	2.67	2.86
54928	291108	EDB	23-Jul-07	Potomac	6.38	4.65	1.73
54924	29165	EDB	23-Jul-07	Potomac	4.18	3.51	0.67
54956	29117	EDB	2-Feb-13	Potomac	3	1.5	1.5
54070	76123	EnEDB	1-Jan-08	Potomac	6.77	3.65	3.12
54069	76122	EDB	1-Jan-08	Potomac	10.98	1.62	9.36
54999	76081	EnEDB	20-Mar-06	Potomac	4.14	3.06	1.08
54057	29146	EDB	1-Jan-08	Potomac	11.13	6.9	4.23
54058	29147	EDB	1-Jan-08	Potomac	7.34	4.55	2.79
53489	29124	EDB	1-Jan-06	Potomac	6.50	4.03	2.47
54583	29148	EnEDB	20-Aug-08	Potomac	14.24	8.83	5.41
54071	76131	EDB	1-Jan-09	Potomac	12.28	9.08	3.20
55022	34035	EDB	1-Feb-06	Potomac	17.77	11.02	6.75
53900	88024	EDB	1-Jan-06	York	3.16	1.96	1.20
53899	88023	EDB	1-Jan-06	York	1.31	0.81	0.50
54642	36009	RB1	29-May-08	York	32.00	1.78	30.22

1 EDB = Extended Detention Basin; EnEDB = Enhanced Extended Detention Basin; O = Other/Unknown; RB1 = Retention Basin Type 1; EDB, EnEDB and O classified as “Dry Extended Detention Ponds”, RB1 classified as “Wet Pond” for purposes of CBP Established Efficiency assignments

APPENDIX D
PROJECT SUMMARIES FOR STREAM RESTORATION PROJECTS

Identified Stream Restoration Projects

Table D.1. Results Identified Stream Restoration Projects

River Basin	Project Name	TN Reductions (lbs/yr)	TP Reductions (lbs/yr)	TSS Reductions (tons/yr)
James	Lithia Road	86	78	51,343
	Skiffes Creek	254	117	13,566
	Slatersville Area Headquarters	257	118	40,764
	Timsbury Creek	837	386	15,916
Potomac	Lake Ridge Area Headquarters	29	13	4,600
	Pike Branch	1,949	898	104,293
	Wancopin Creek	9,233	4,300	1,622,000
York	I-64 Colonial Parkway	127	58	10,044
Total		12,772	5,968	1,862,526

Project Summaries

Project Name: Lithia Road											
Location	UPC Code or BMP ID: 0										
Geographic (County/City): Botetourt	District: Salem Residency: Salem River Basin: James										
Inside Year 2000 Urbanized Area? (Y/N) No	Latitude: 37.487 Longitude: -79.74 Coastal/ Non-Coastal: Non-Coastal										
BMP Type: Stream Restoration											
Project Description: <i>Stream design to alleviate road flooding.</i>	Photos, Plans and/or Project graphics 										
Project Drainage Area: Inside CUA Impervious Area (ac.) 0.00 Pervious Area (ac.) 0.00 Outside CUA Impervious Area (ac.) 83.51 Pervious Area (ac.) 14828.49 Forested Area (ac.) 11,695.00											
Existing Conditions Proposed Improvements: Compensatory? (Y/N) N Onsite stream relocation? (Y/N) N Condition of Existing Stream eroding banks Proposed Stream Designed using Natural Channel principles? (Y/N) Y Linear Feet Restored (centerline) 1,436.00 Existing Avg Bank Height Restored (ft) 3.00 Method of Stabilization: Protocol 1 Existing Avg Channel Top Width (ft) 30.00											
Qualifying Conditions: Project primarily designed to protect public infrastructure by bank armoring or rip rap? (Y/N) N Stream Reach > 100 L.F.? (Y/N) Y Existing stream still actively enlarging or degrading? (Y/N) Y Project utilizing comprehensive approach to SR addressing long term stability of channels, banks, and floodplain? (Y/N) Y Will project comply with all state and federal permitting requirements, including 404 and 401 permits? Y Project proposed for sole purpose of receiving nutrient or sediment reduction? N Will project have a designated authority responsible for routine maintenance and long term repairs? Y											
Method of Estimating Bank Erosion 1.) Measured in-field pre-restoration N 2.) BANCs Method N 3.) Interim Rate Y Protocols applied: Protocol 1											
Estimated Credit <table border="1"> <thead> <tr> <th></th> <th>TN</th> <th>TP</th> <th>TSS</th> <th>*SDR applied? (Y/N)</th> </tr> </thead> <tbody> <tr> <td>lbs/yr</td> <td>85.80</td> <td>77.79</td> <td>51,342.72</td> <td>Y</td> </tr> </tbody> </table>			TN	TP	TSS	*SDR applied? (Y/N)	lbs/yr	85.80	77.79	51,342.72	Y
	TN	TP	TSS	*SDR applied? (Y/N)							
lbs/yr	85.80	77.79	51,342.72	Y							
Discussion <i>Project is located outside the CUA, however forested drainage area. Therefore, pro-rating has minimal to no effect on crediting. Project drainage area estimated using USGS Stream Stats.</i>											
Est. Implementation Date: 1/31/2018 Project Contact Name: Chris Swanson Project Completed: No Contact Information (email/phone): (804) 786-6839											
Photos, Plans and/or Project graphics Plans, Profile sheets available? (Y/N) Y Please include as attachments											

Project Name: **Skiffes Creek**

Location		UPC Code or BMP ID:	0		
Geographic (County/City):	James City	District:	Hampton Roads		
Residency:	Williamsburg	River Basin:	James		
Inside Year 2000 Urbanized Area? (Y/N)	Yes	Latitude:	37.215		
		Longitude:	-76.599		
		Coastal/ Non-Coastal:	Coastal		
BMP Type: Stream Restoration					
Project Description:		Photos, Plans and/or Project graphics			
Constructed under VDOT's TMDL implementation contract. Will be reported in VDOT's 2018 MS4 Annual Report.					
Project Drainage Area:					
Inside CUA Impervious Area (ac.)	0.00	Pervious Area (ac.)	0.00		
Outside CUA Impervious Area (ac.)	8.663	Pervious Area (ac.)	14.838		
		Forested Area (ac.)	0.00		
Existing Conditions Proposed Improvements:					
Compensatory? (Y/N)	N	Onsite stream relocation? (Y/N)	N		
Condition of Existing Stream Undergoing vertical and horizontal instability as a result of the excess shear stress and velocities.					
Proposed Stream Designed using Natural Channel principles? (Y/N) Y					
Linear Feet Restored (centerline)	801.00	Existing Avg Bank Height Restored (ft)	8.00		
Method of Stabilization:	Protocol 1	Existing Avg Channel Top Width (ft)	25.00		
Qualifying Conditions:					
Project primarily designed to protect public infrastructure by bank armoring or rip rap? (Y/N)				N	
Stream Reach > 100 L.F.? (Y/N) Y				Existing stream still actively enlarging or degrading? (Y/N)	Y
Project utilizing comprehensive approach to SR addressing long term stability of channels, banks, and floodplain? (Y/N)				Y	
Will project comply with all state and federal permitting requirements, including 404 and 401 permits?				Y	
Project proposed for sole purpose of receiving nutrient or sediment reduction?				N	
Will project have a designated authority responsible for routine maintenance and long term repairs?		Y			
Method of Estimating Bank Erosion					
1.) Measured in-field pre-restoration N 2.) BANCs Method Y 3.) Interim Rate N					
Protocols applied: Protocol 1					
Estimated Credit	TN	TP	TSS		
lbs/yr	254.00	117.00	13,566.00		
			*SDR applied? (Y/N) Y		
Discussion					
Final numbers to be based on as-built. Will be reported in 2018 MS4 Annual Report. Drainage Area calculations determined from Pond Pack Model.					
Est. Implementation Date: 12/15/2017		Project Contact Name: Tracey Harmon			
Project Completed: Yes		Contact Information (email/phone): 804-371-6834			
		Plans, Profile sheets available? (Y/N) Y			
		Please include as attachments			

Project Name: **Slatersville**

Location		UPC Code or BMP ID: 0	
Geographic (County/City):	New Kent	District: Richmond	Residency: Ashland
Inside Year 2000 Urbanized Area? (Y/N)	No	Latitude: 37.48697	Longitude: -76.909487
		Coastal/ Non-Coastal: Coastal	
BMP Type: Stream Restoration			
Project Description: <i>These headquarters include a hard-packed gravel lot, main building, and several outbuildings located on-site. The site drains to a channel that is experiencing severe erosion. The conveyance channel parallels Route 33 for about 150 linear feet before sharply turning west downgradient of an advancing headcut. The surrounding watershed consists of mostly forested area.</i>		Photos, Plans and/or Project graphics 	
Project Drainage Area: Inside CUA Impervious Area (ac.) 1.62 Pervious Area (ac.) 1.59 Outside CUA Impervious Area (ac.) 0 Pervious Area (ac.) 0 Forested Area (ac.) 0.25			
Existing Conditions Proposed Improvements:			
Compensatory? (Y/N)	N	Onsite stream relocation? (Y/N)	N
Condition of Existing Stream <i>The conveyance has incised, vertical banks that range in height from 4 to 14 feet.</i>			
Proposed Stream Designed using Natural Channel principles? (Y/N) Y			
Linear Feet Restored (centerline)	185.00	Existing Avg Bank Height Restored (ft)	15.00
Method of Stabilization:	Protocol 1	Existing Avg Channel Top Width (ft)	45.00
Qualifying Conditions:			
Project primarily designed to protect public infrastructure by bank armoring or rip rap? (Y/N)		N	
Stream Reach > 100 L.F.? (Y/N)		Y	
Existing stream still actively enlarging or degrading? (Y/N)		Y	
Project utilizing comprehensive approach to SR addressing long term stability of channels, banks, and floodplain? (Y/N)		Y	
Will project comply with all state and federal permitting requirements, including 404 and 401 permits?		Y	
Project proposed for sole purpose of receiving nutrient or sediment reduction?		N	
Will project have a designated authority responsible for routine maintenance and long term repairs?		Y	
Method of Estimating Bank Erosion			
1.) Measured in-field pre-restoration Y		2.) BANCS Method N	
		3.) Interim Rate N	
Protocols applied: Protocol 1			
Estimated Credit		TSS	
lbs/yr	TN 257.00	TP 118.00	40,764.00 *SDR applied? (Y/N) Y
Discussion <i>System is not located in CUA. Crediting shown here is pro-rated to account for baseline. The lower of the two estimates for nutrient reduction is reported herein. See original memo for range provided.</i>			
Est. Implementation Date: 6/30/2019		Project Contact Name: Tracey Harmon	
Project Completed: No		Contact Information (email/phone): (804) 371-6834	
		Photos, Plans and/or Project graphics Plans, Profile sheets available? (Y/N) Y Please include as attachments	

Project Name: **Timsbury-RDC**

Location		UPC Code or BMP ID: 0											
Geographic (County/City):	Chesterfield	District: Richmond	Residency: Chesterfield										
Inside Year 2000 Urbanized Area? (Y/N)	Yes	Latitude: 37.291	Longitude: -77.401										
		Coastal/ Non-Coastal:	Non-Coastal										
BMP Type: Stream Restoration													
Project Description: <i>Timsbury Creek is located near the Richmond District office complex grounds. It is a perennial stream with approximately 6,425 L.F. within the project area on VDOT property. The tributary to Timsbury Creek is an intermittent stream comprising approximately 999 L.F. within the VDOT property. Both are highly degraded channels and are good candidates for stream restoration.</i>		Photos, Plans and/or Project graphics 											
Project Drainage Area: Inside CUA Impervious Area (ac.) 509.00 Pervious Area (ac.) 4,249.00 Outside CUA Impervious Area (ac.) 0 Pervious Area (ac.) 0 Forested Area (ac.) 0.00													
Existing Conditions Proposed Improvements: Compensatory? (Y/N) N Onsite stream relocation? (Y/N) N Condition of Existing Stream Valley wall conflicts with the stream pattern, vertical walls exceeding 15 feet high in places. Proposed Stream Designed using Natural Channel principles? (Y/N) Y Linear Feet Restored (centerline) 3,914.00 Existing Avg Bank Height Restored (ft) 5.00 Method of Stabilization: Protocol 1 Existing Avg Channel Top Width (ft) 20.00													
Qualifying Conditions: Project primarily designed to protect public infrastructure by bank armoring or rip rap? (Y/N) N Stream Reach > 100 L.F.? (Y/N) Y Existing stream still actively enlarging or degrading? (Y/N) Y Project utilizing comprehensive approach to SR addressing long term stability of channels, banks, and floodplain? (Y/N) Y Will project comply with all state and federal permitting requirements, including 404 and 401 permits? Y Project proposed for sole purpose of receiving nutrient or sediment reduction? N Will project have a designated authority responsible for routine maintenance and long term repairs? Y													
Method of Estimating Bank Erosion 1.) Measured in-field pre-restoration Y 2.) BANCS Method N 3.) Interim Rate N Protocols applied: Protocol 1													
Estimated Credit <table border="1"> <thead> <tr> <th></th> <th>TN</th> <th>TP</th> <th>TSS</th> <th></th> </tr> </thead> <tbody> <tr> <td>lbs/yr</td> <td>837.00</td> <td>386.00</td> <td>15,916.00</td> <td>*SDR applied? (Y/N) Y</td> </tr> </tbody> </table>			TN	TP	TSS		lbs/yr	837.00	386.00	15,916.00	*SDR applied? (Y/N) Y		
	TN	TP	TSS										
lbs/yr	837.00	386.00	15,916.00	*SDR applied? (Y/N) Y									
Discussion <i>Preliminary estimates based on select reaches. Final credit will be calculated after construction.</i>		Photos, Plans and/or Project graphics Plans, Profile sheets available? (Y/N) Y Please include as attachments											
Est. Implementation Date: 4/1/2018 Project Contact Name: Tracey Harmon Project Completed: No Contact Information (email/phone): 804-371-6834													

Project Name: **Lake Ridge Area Headquarters**

Location		UPC Code or BMP ID:	0	
Geographic (County/City):	Prince William	District:	Northern Virginia	
		Residency:	Manassas	
		River Basin:	Potomac	
Inside Year 2000 Urbanized Area? (Y/N)	Yes	Latitude:	38.671472	
		Longitude:	-77.330825	
		Coastal/ Non-Coastal:	Non-Coastal	
BMP Type: Stream Restoration				
Project Description:		Photos, Plans and/or Project graphics		
A small channel traverses the VDOT property for approximately 900 linear feet. The channel exits the property and flows through an adjacent county park. The site is part of medium-density urban watershed that drains to a small channel that is currently experiencing moderately severe erosion.				
Project Drainage Area:				
Inside CUA	Impervious Area (ac.) 0.00			Pervious Area (ac.) 0.00
Outside CUA	Impervious Area (ac.) 19			Pervious Area (ac.) 19
	Forested Area (ac.) 0.00			
Existing Conditions Proposed Improvements:				
Compensatory? (Y/N)	N	Onsite stream relocation? (Y/N)	N	
Condition of Existing Stream	Unstable vertically and laterally. Height from 1.5 to 3 feet.			
Proposed Stream Designed using Natural Channel principles? (Y/N)	Y			
Linear Feet Restored (centerline)	300.00	Existing Avg. Bank Height Restored (ft)	2.00	
Method of Stabilization:	Protocol 1	Existing Avg. Channel Top Width (ft)	10.00	
Qualifying Conditions:				
Project primarily designed to protect public infrastructure by bank armoring or rip rap? (Y/N)			N	
Stream Reach > 100 L.F.? (Y/N)	Y	Existing stream still actively enlarging or degrading? (Y/N)	Y	
Project utilizing comprehensive approach to SR addressing long term stability of channels, banks, and floodplain? (Y/N)			Y	
Will project comply with all state and federal permitting requirements, including 404 and 401 permits?			Y	
Project proposed for sole purpose of receiving nutrient or sediment reduction?			N	
Will project have a designated authority responsible for routine maintenance and long term repairs?			Y	
Method of Estimating Bank Erosion				
1.) Measured in-field pre-restoration	N	2.) BANCS Method	Y	
		3.) Interim Rate	N	
Protocols applied: Protocol 1				
Estimated Credit		TN	TP	
lbs/yr	29.10	13.40	4,600.00	
			*SDR applied? (Y/N) Y	
Discussion				
Preliminary estimates based on site visit and conceptual design. SDR and 50% efficiency applied.				
Est. Implementation Date:		Project Contact Name:		
6/1/2019		Tracey Harmon		
Project Completed:		Contact Information (email/phone):		
No		(804) 371-6834		
		Plans, Profile sheets available? (Y/N) Y		
		Please include as attachments		

Project Name: **Pike Branch**

Location		UPC Code or BMP ID: 0	
Geographic (County/City):	Fairfax	District: Northern Virginia	Residency: Fairfax
Inside Year 2000 Urbanized Area? (Y/N)	Yes	Latitude: 38.785	Longitude: -77.098
		Coastal/ Non-Coastal:	Coastal
BMP Type: Stream Restoration			
Project Description:		Photos, Plans and/or Project graphics	
Pike Branch is within a 22-acre VDOT owned parcel between Telegraph Road and Old Telegraph Road. Three perennial tributaries are also located within the project area. There have been historical efforts to stabilize the stream to protect infrastructure.			
Project Drainage Area:			
Inside CUA Impervious Area (ac.)	338.79	Pervious Area (ac.)	757.24
Outside CUA Impervious Area (ac.)	0	Pervious Area (ac.)	0
		Forested Area (ac.)	0.00
Existing Conditions Proposed Improvements:			
Compensatory? (Y/N)	N	Onsite stream relocation? (Y/N)	N
Condition of Existing Stream	Incised with extensively destabilized banks that are actively eroding.		
Proposed Stream Designed using Natural Channel principles? (Y/N)	Y		
Linear Feet Restored (centerline)	3,981.00	Existing Avg Bank Height Restored (ft)	15.00
Method of Stabilization:	Protocol 1	Existing Avg Channel Top Width (ft)	70.00
Qualifying Conditions:			
Project primarily designed to protect public infrastructure by bank armoring or rip rap? (Y/N)	N		
Stream Reach > 100 L.F.? (Y/N)	Y		
Existing stream still actively enlarging or degrading? (Y/N)	Y		
Project utilizing comprehensive approach to SR addressing long term stability of channels, banks, and floodplain? (Y/N)	Y		
Will project comply with all state and federal permitting requirements, including 404 and 401 permits?	Y		
Project proposed for sole purpose of receiving nutrient or sediment reduction?	N		
Will project have a designated authority responsible for routine maintenance and long term repairs?	Y		
Method of Estimating Bank Erosion			
1.) Measured in-field pre-restoration	Y	2.) BANCs Method	N
		3.) Interim Rate	N
Protocols applied: Protocol 1			
Estimated Credit		TSS	
	TN	TP	
lbs/yr	1,949.07	897.60	104,292.60
			*SDR applied? (Y/N) Y
Discussion			
See original memo. Conservative reductions reported here using NC BER. However, using different methods, the upper estimate range is 1,805.72 and 3,920.97 lbs TP and TN, respectively.			
Est. Implementation Date:	6/1/2019	Project Contact Name:	Tracey Harmon
Project Completed:	No	Contact Information (email/phone):	804-371-6834
		Plans, Profile sheets available? (Y/N) Y	
		Please include as attachments	

Project Name: **Wancopin Stream Restoration**

Location		UPC Code or BMP ID:	0
Geographic (County/City):	Loudoun	District:	Northern Virginia
		Residency:	Leesburg
Inside Year 2000 Urbanized Area? (Y/N)	No	Latitude:	39.00576
		Longitude:	-77.693425
		Coastal/ Non-Coastal:	Non-Coastal
BMP Type: Stream Restoration			
Project Description: Turnkey Stream Restoration project.		Photos, Plans and/or Project graphics	
Project Drainage Area: Inside CUA Impervious Area (ac.) 1.50 Pervious Area (ac.) 1.50 Outside CUA Impervious Area (ac.) 429 Pervious Area (ac.) 429 Forested Area (ac.) 215.00			
Existing Conditions Proposed Improvements:			
Compensatory? (Y/N)	N	Onsite stream relocation? (Y/N)	N
Condition of Existing Stream			
Proposed Stream Designed using Natural Channel principles? (Y/N)	Y		
Linear Feet Restored (centerline)	17,000.00	Existing Avg Bank Height Restored (ft)	
Method of Stabilization:	Protocol 1	Existing Avg Channel Top Width (ft)	
Qualifying Conditions:			
Project primarily designed to protect public infrastructure by bank armoring or rip rap? (Y/N)			N
Stream Reach > 100 L.F.? (Y/N)	Y	Existing stream still actively enlarging or degrading? (Y/N)	Y
Project utilizing comprehensive approach to SR addressing long term stability of channels, banks, and floodplain? (Y/N)			Y
Will project comply with all state and federal permitting requirements, including 404 and 401 permits?			Y
Project proposed for sole purpose of receiving nutrient or sediment reduction?			N
Will project have a designated authority responsible for routine maintenance and long term repairs?			Y
Method of Estimating Bank Erosion			
1.) Measured in-field pre-restoration	N	2.) BANCS Method	N
		3.) Interim Rate	N
Protocols applied: Protocol 1			
Estimated Credit		TN	TP
lbs/yr	9,233.00	4,300.00	162,200.00
			*SDR applied? (Y/N) Y
Discussion Turnkey stream restoration - Project drainage area estimated using USGS Stream Stats and assuing watershed is partially in CUA (50%). All numbers are estimates and will be finalized upon completion of the project.			
Est. Implementation Date: 11/1/2020		Project Contact Name: Tracey Harmon	
Project Completed: No		Contact Information (email/phone): (804) 371-6834	
		Photos, Plans and/or Project graphics	
		Plans, Profile sheets available? (Y/N) N	
		Please include as attachments	

Project Name: **I-64 Colonial Parkway**

Location		UPC Code or BMP ID: 0	
Geographic (County/City):	York	District:	Hampton Roads
Residency:	Williamsburg	River Basin:	York
Inside Year 2000 Urbanized Area? (Y/N)	No	Latitude:	37.277945
		Longitude:	-76.66295
		Coastal/ Non-Coastal:	Coastal
BMP Type: Stream Restoration			
Project Description:		Photos, Plans and/or Project graphics	
The reach begins south of Colonial National Historic Parkway and extends northwest towards Lakeshead Drive and is culverted underneath both roadways. The channel provides moderate structural instream habitat, with areas of significant erosion, typically occurring where headcuts are actively advancing upstream, with large vertical walls.			
Project Drainage Area:			
Inside CUA Impervious Area (ac.)	3.81		
Outside CUA Impervious Area (ac.)	0	Pervious Area (ac.)	0
		Forested Area (ac.)	0.00
Existing Conditions Proposed Improvements:			
Compensatory? (Y/N)	N	Onsite stream relocation? (Y/N)	N
Condition of Existing Stream	Areas of significant erosion, headcuts, and large vertical walls.		
Proposed Stream Designed using Natural Channel principles? (Y/N)	Y		
Linear Feet Restored (centerline)	431.00	Existing Avg Bank Height Restored (ft)	8.00
Method of Stabilization:	Protocol 1	Existing Avg Channel Top Width (ft)	30.00
Qualifying Conditions:			
Project primarily designed to protect public infrastructure by bank armoring or rip rap? (Y/N)	N		
Stream Reach > 100 L.F.? (Y/N)	Y		
Existing stream still actively enlarging or degrading? (Y/N)	Y		
Project utilizing comprehensive approach to SR addressing long term stability of channels, banks, and floodplain? (Y/N)	Y		
Will project comply with all state and federal permitting requirements, including 404 and 401 permits?	Y		
Project proposed for sole purpose of receiving nutrient or sediment reduction?	N		
Will project have a designated authority responsible for routine maintenance and long term repairs?	Y		
Method of Estimating Bank Erosion			
1.) Measured in-field pre-restoration	N	2.) BANCs Method	Y
		3.) Interim Rate	N
Protocols applied:	Protocol 1		
Estimated Credit	TN	TP	TSS
lbs/yr	126.90	58.30	10,044.14
			*SDR applied? (Y/N) y
Discussion			
Need to verify CUA and pro-rating. Estimate based on site visit. Final credit will be verified after construction. Project to be pro-rated based on regulated area.			
Est. Implementation Date:	6/1/2022	Project Contact Name:	Tracey Harmon
Project Completed:	No	Contact Information (email/phone):	(804) 371-6834
		Plans, Profile sheets available? (Y/N) Y	
		Please include as attachments	

APPENDIX E
SCREENING RESULTS OF SEVERELY ERODED OUTFALLS

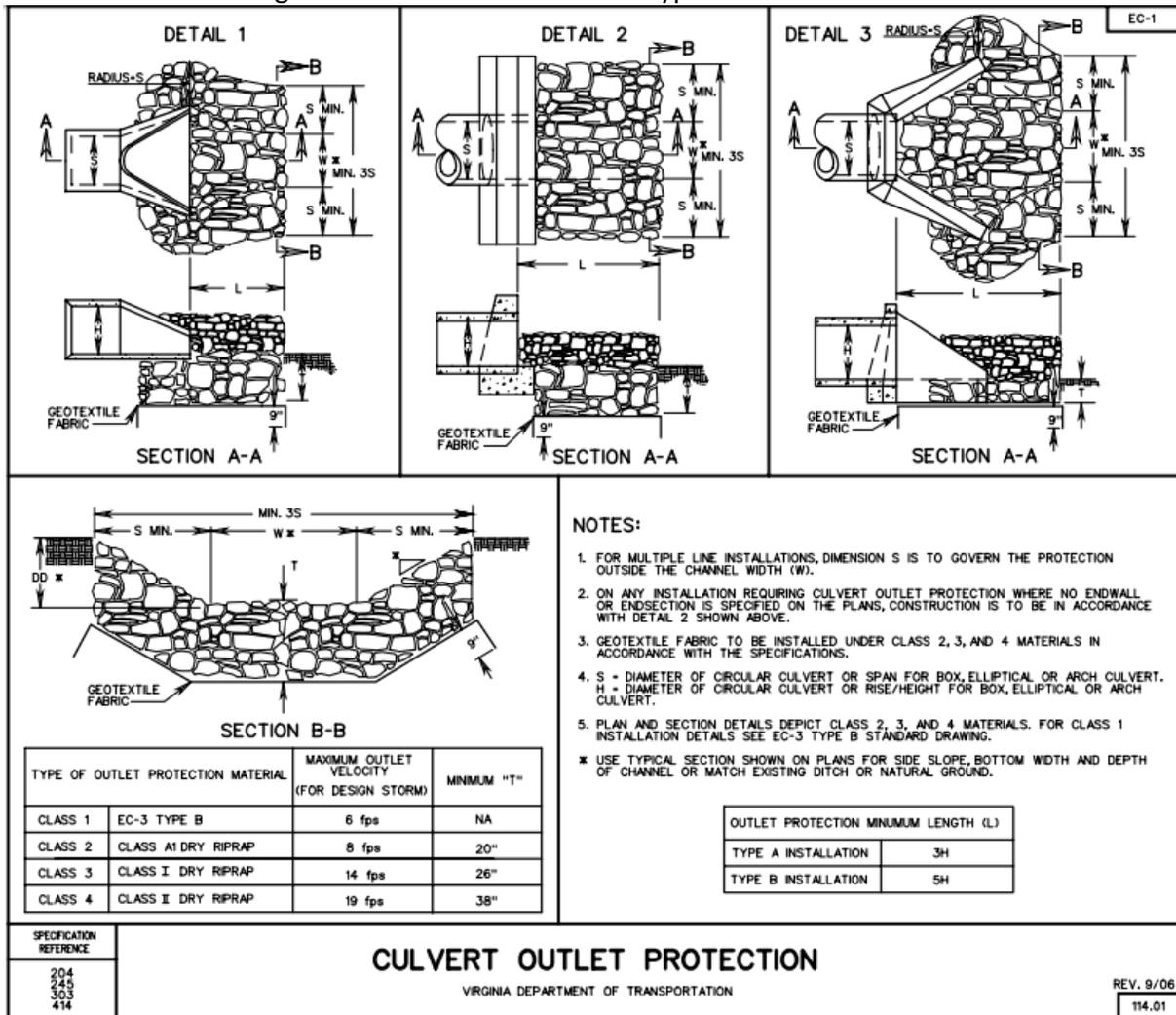
Table E.1 – Screening Results of Severely Eroded Outfalls

Outfall ID	River Basin	Culvert Diameter (inches)	Number of Linear Feet	TN Reductions (lbs/yr)	TP Reductions (lbs/yr)	TSS Reductions (lbs/yr)
CH-L3-06	James	36	15	1.125	1.02	673.2
DC-AD5-009	Potomac	36	15	1.125	1.02	673.2
DC-M15-G08	Potomac	18	8	0.5625	0.51	336.6
DC-O16-G01	Potomac	24	10	0.75	0.68	448.8
FR-C5-02	Rappahannock	30	13	0.9375	0.85	561
FR-E6-005	Rappahannock	18	8	0.5625	0.51	336.6
FR-G4-POD-06	Rappahannock	24	10	0.75	0.68	448.8
FR-I3-01	Rappahannock	36	15	1.125	1.02	673.2
FR-K2-01	York	32	13	1	0.906667	598.4
FR-K2-05	York	32	13	1	0.906667	598.4
FR-K5-09	Rappahannock	42	18	1.3125	1.19	785.4
LY-H8-EEE-02	James	24	10	0.75	0.68	448.8
LY-I8-EEE-01	James	24	10	0.75	0.68	448.8
LY-O3-EEE-01	James	20	8	0.625	0.566667	374
LY-P6-03	James	18	8	0.5625	0.51	336.6
RC-AB-5-008	James	24	10	0.75	0.68	448.8
RC-AC12-19	James	15	6	0.46875	0.425	280.5
RC-AC-68	James	18	8	0.5625	0.51	336.6
RC-AD7-12	James	24	10	0.75	0.68	448.8
RC-AG12-23	James	24	10	0.75	0.68	448.8
RC-AM18-01	James	36	15	1.125	1.02	673.2
RC-AM18-07	James	36	15	1.125	1.02	673.2
RC-J12-I95-87	James	12	5	0.375	0.34	224.4
RC-J12-I95-94	James	16	7	0.5	0.453333	299.2
RC-K12-I295-07	James	36	15	1.125	1.02	673.2
RC-K12-I295-10	James	26	11	0.8125	0.736667	486.2
RC-K12-I295-13	James	24	10	0.75	0.68	448.8
RC-K14-05	York	24	10	0.75	0.68	448.8
RC-K14-06	York	18	8	0.5625	0.51	336.6
RC-L12-I295-10	James	30	13	0.9375	0.85	561
RC-L15-05	York	18	8	0.5625	0.51	336.6
RC-O12-I95-17	James	18	8	0.5625	0.51	336.6
RC-O15-06	James	36	15	1.125	1.02	673.2
RC-O15-07	James	18	8	0.5625	0.51	336.6
RC-O15-09	James	18	8	0.5625	0.51	336.6
RC-P16-I295-13	James	36	15	1.125	1.02	673.2
RC-V10-10	James	18	8	0.5625	0.51	336.6

Chesapeake Bay TMDL Action Plan
VDOT MS4 VPDES #: VAR0092975

Outfall ID	River Basin	Culvert Diameter (inches)	Number of Linear Feet	TN Reductions (lbs/yr)	TP Reductions (lbs/yr)	TSS Reductions (lbs/yr)
RC-Y11-18	James	16	7	0.5	0.453333	299.2
RC-Y9-06	James	15	6	0.46875	0.425	280.5
RC-Y9-34	James	18	8	0.5625	0.51	336.6
RC-Z7-17	James	24	10	0.75	0.68	448.8
Rich-ah18-001	James	18	8	0.5625	0.51	336.6
VB-AA14-10	York	16	7	0.5	0.453333	100.8667
VB-AA16-01	James	18	8	0.5625	0.51	113.475
VB-AA16-03	James	15	6	0.46875	0.425	94.5625
VB-AE13-19	James	16	7	0.5	0.453333	100.8667
VB-AK9-03	James	36	15	1.125	1.02	226.95
VB-AQ13-02	James	18	8	0.5625	0.51	113.475
VB-AT23-08	James	24	10	0.75	0.68	151.3
VB-F9-01	York	24	10	0.75	0.68	151.3
VB-N11-03	York	18	8	0.5625	0.51	113.475
VB-O11-07	York	16	7	0.5	0.453333	100.8667
VB-O12-38	York	19	8	0.59375	0.538333	119.7792
VB-R12-54	York	18	8	0.5625	0.51	113.475
WM-C4-02	James	24	10	0.75	0.68	151.3
WM-K5-005	James	24	10	0.75	0.68	151.3
WM-K9-002	York	24	10	0.75	0.68	151.3
WM-L8-EEE-02	James	24	10	0.75	0.68	151.3

Figure E.1 –VDOT Standard for Typical Outfall Stabilization

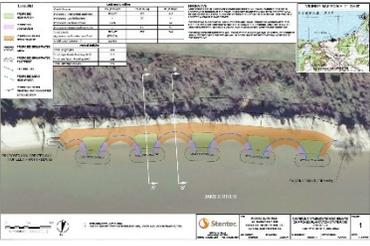


APPENDIX F
PROJECT SUMMARIES FOR SHORELINE MANAGEMENT PROJECTS

River Basin	Project Name	TN Reductions (lbs/yr)	TP Reductions (lbs/yr)	TSS Reductions (tons/yr)
James	Chippokes Plantation State Park	359	244	298,677
	Goose Island	840	589	233,092
	Ragged Island	2,436	1,575	2,581,415
Potomac	Westmoreland State Park	1,328	903	3,074,626
Rappahannock	Belle Isle State Park	250	153	252,722
York	York River State Park	464	319	148,359
Total		5,677	3,783	6,588,891

James River Basin Shoreline Projects

Project Name: **Chippokes Plantation 1-4 (DCR)**

Location		UPC Code or BMP ID:		0	
Geographic (County/City): Surry		District: Hampton Roads	Residency: Williamsburg	River Basin: James	
		Latitude: 37.145356	Longitude: -76.729088	12 digit HUC: 020802060704	
BMP Type: Shoreline Stabilization					
Project Description: <i>The Chippokes Plantation site is highly eroded with bank heights of approximately 30 feet. The proposed improvements include grading the existing banks back, adding breakwaters, marsh plantings, and beach nourishment. The proposed breakwaters will stabilize the shoreline, help reduce sediment/nutrient loads, and enhance the recreational aspects of the shoreline.</i>			Photos, Plans and/or Project graphics		
Existing Conditions Proposed Improvements: Average Bank Height (FT): 26.43 Area of Existing Marsh (SF): 0 Method of Stabilization: Protocol 1, Protocol 2, Protocol 3, Protocol 4 Linear Feet Stabilization: 626.00 Area of Proposed Marsh (SF): 10454.4			 		
Qualifying Conditions: Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation? N Will project comply with all state and federal permitting requirements, including 404 and 401 permits? N Practice-specific Qualifying Conditions (1, 2, and 3, below) The site is currently experiencing shoreline erosion (Y/N)? (All practices) Y 1. If living shoreline- Y -A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N). Y 2. If Revetment AND/OR Breakwater system without a living shoreline- N -A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)? N -When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)? N 3. If Bulkhead/Seawalls- N -The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)? N					
Method of Estimating Bank Erosion Erosion Rate (FT/YR): -0.68 Source of Erosion Rate: VIMS Data (Y/N)? Y Manually calculated with aerials (Y/N) and years? N Protocols applied: P1-Prevented Sediment x P2-Denitrification x P3-Sedimentation x P4-Marsh Redfield Ratio x ("x" applicable)					
Estimated Credit: lbs/yr TN 359.00 TP 244.00 TSS 298,677.00 Field-collected data and elevations (Y/N)? Y Default rates applied (Y/N)? N					
Discussion Credit numbers are for All Protocols Estimated Cost is for Construction Cost only (does not include any associated permitting costs, etc.)					
Est. Implementation Date: 6/30/2022		Project Contact Name: Tracey Harmon		Plans, Profile sheets available? (Y/N) 	
Project Completed: No		Contact Information (email/phone): (804) 371-6834		Please include as attachments 	

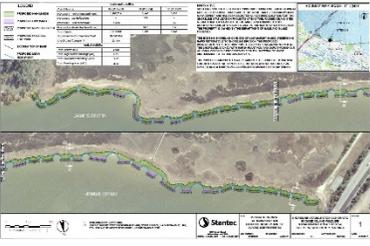
Project Name: **Goose Island-1 (DGIF)**

Location		UPC Code or BMP ID:		0
Geographic (County/City):	Newport News	District: Hampton Roads	Residency: Williamsburg	River Basin: James
	Latitude: 37.162487	Longitude: -76.612371	12 digit HUC: 020802060802	
BMP Type: Shoreline Stabilization				
Project Description: Goose Island, is adjacent to Fort Eustis Army Base at the outfall of Skiffes Creek and the James River. The existing shoreline is highly eroded with bank heights of approximately 3-6ft with some lower heights along Skiffes Creek. The proposed improvements include filling the existing bank with a 2:1 slope, adding breakwaters and marsh plantings, and beach nourishment.			Photos, Plans and/or Project graphics	
Existing Conditions Proposed Improvements: Average Bank Height (FT): 2.82 Area of Existing Marsh (SF): 0 Method of Stabilization: Protocol 1, Protocol 2, Protocol 3, Protocol 4 Linear Feet Stabilization: 1,083.00 Area of Proposed Marsh (SF): 33,541.20				
Qualifying Conditions: Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation? Y Will project comply with all state and federal permitting requirements, including 404 and 401 permits? Y Practice-specific Qualifying Conditions (1, 2, and 3, below) The site is currently experiencing shoreline erosion (Y/N)? (All practices) Y 1. If living shoreline- Y -A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N). Y 2. If Revetment AND/OR Breakwater system without a living shoreline- N -A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)? N -When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)? N 3. If Bulkhead/Seawalls- N -The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)? N				
Method of Estimating Bank Erosion Erosion Rate (FT/YR): -7.11 Source of Erosion Rate: VIMS Data (Y/N)? N Manually calculated with aerials (Y/N) and years? Y Protocols applied: P1-Prevented Sediment x P2-Denitrification x P3-Sedimentation x P4-Marsh Redfield Ratio x ("x" applicable)				
Estimated Credit: lbs/yr TN TP TSS Field-collected data and elevations (Y/N)? Y Default rates applied (Y/N)? Y 1,140.00 773.00 3,058,929.00				
Discussion Credit numbers are for All Protocols Estimated Cost is for Construction Cost only (does not include any associated permitting costs, etc.)				
Est. Implementation Date: 6/30/2022 Project Contact Name: Tracey Harmon Project Completed: No Contact Information (email/phone): (804) 371-6834			Photos, Plans and/or Project graphics Plans, Profile sheets available? (Y/N) Y Please include as attachments	

Project Name: **Ragged Island 3 (DGIF)**

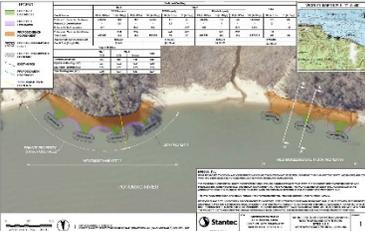
Location		UPC Code or BMP ID: 0	
Geographic (County/City):	Isle of Wight	District: Hampton Roads	Residency: Franklin
	Latitude: 36.96407	Longitude: -76.496827	River Basin: James
			12 digit HUC 020802060906
BMP Type: Shoreline Stabilization			
Project Description:		Photos, Plans and/or Project graphics	
Proposed improvements include a series of low marsh sills near the shoreline backed with marsh plantings and gaps (to allow for habitat access from the marsh to the waterline) throughout. Bank grading will be done with fill material to avoid disturbing existing marsh area. The proposed marsh sills will stabilize the shoreline to prevent further loss and help reduce sediment and nutrient loads.			
Existing Conditions Proposed Improvements:			
Average Bank Height (FT):	3.25		
Method of Stabilization:	Protocol 1, Protocol 2, Protocol 3, Protocol 4		
Linear Feet Stabilization:	2,032.00	Area of Proposed Marsh (SF):	36,590.40
Qualifying Conditions:			
Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation?		N	
Will project comply with all state and federal permitting requirements, including 404 and 401 permits?		N	
Practice-specific Qualifying Conditions (1, 2, and 3, below)			
The site is currently experiencing shoreline erosion (Y/N)?		(All practices) Y	
1. If living shoreline-			
-A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N).		Y	
2. If Revetment AND/OR Breakwater system without a living shoreline-			
-A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)?		N	
-When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)?		N	
3. If Bulkhead/Seawalls-			
-The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)?		N	
Method of Estimating Bank Erosion			
Erosion Rate (FT/YR):	-3.25		
Source of Erosion Rate: VIMS Data (Y/N)?	Y	Manually calculated with aerials (Y/N) and years?	N
Protocols applied:	P1-Prevented Sediment	P2-Denitrification	P3-Sedimentation
("x" applicable)	x	x	x
Estimated Credit:	TN	TP	TSS
lbs/yr	803.00	527.00	864,037.00
			Field-collected data and elevations (Y/N)? Y
			Default rates applied (Y/N)? N
Discussion			
Credit numbers are for All Protocols			
Estimated Cost is for Construction Cost only (does not include any associated permitting costs, etc.)			
Est. Implementation Date:	6/30/2022	Project Contact Name:	Tracey Harmon
Project Completed:	No	Contact Information (email/phone):	(804) 371-6834
		Photos, Plans and/or Project graphics	
		Plans, Profile sheets available? (Y/N)	
		Please include as attachments	

Project Name: **Ragged Island 5-9 (DGIF)**

Location		UPC Code or BMP ID: 0	
Geographic (County/City):	Isle of Wight	District: Hampton Roads	Residency: Franklin
	Latitude: 36.96407	Longitude: -76.496827	River Basin: James
			12 digit HUC 020802060906
BMP Type: Shoreline Stabilization			
Project Description:		Photos, Plans and/or Project graphics	
Proposed improvements include constructing a series of low marsh sills near the shoreline, backed with marsh plantings and regular gaps (for habitat access from the marsh to the waterline). All bank grading is proposed to be fill material to avoid disturbance to existing marsh area. The proposed marsh sills will stabilize the shoreline to prevent further loss of shoreline area.			
Existing Conditions Proposed Improvements: Average Bank Height (FT): 2.81 Area of Existing Marsh (SF): Method of Stabilization: Protocol 1, Protocol 2, Protocol 3, Protocol 4 Linear Feet Stabilization: 4,269.00 Area of Proposed Marsh (SF): 91,476.00			
Qualifying Conditions:			
Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation? N Will project comply with all state and federal permitting requirements, including 404 and 401 permits? N Practice-specific Qualifying Conditions (1, 2, and 3, below) The site is currently experiencing shoreline erosion (Y/N)? (All practices) Y 1. If living shoreline- -A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N). N 2. If Revetment AND/OR Breakwater system without a living shoreline- -A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)? N -When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)? N 3. If Bulkhead/Seawalls- -The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)? N			
Method of Estimating Bank Erosion			
Erosion Rate (FT/YR): -4.02			
Source of Erosion Rate: VIMS Data (Y/N)? Y Manually calculated with aerials (Y/N) and years? N			
Protocols applied: P1-Prevented Sediment P2-Denitrification P3-Sedimentation P4-Marsh Redfield Ratio ("x" applicable)		X X X X	
Estimated Credit:		Field-collected data and elevations (Y/N)? Y	
lbs/yr	TN 1,633.00 TP 1,048.00 TSS 1,717,378.00	Default rates applied (Y/N)? N	
Discussion			
Credit numbers are for All Protocols			
Estimated Cost is for Construction Cost only (does not include any associated permitting costs, etc.)			
Est. Implementation Date:	6/30/2022	Project Contact Name:	Tracey Harmon
Project Completed:	No	Contact Information (email/phone):	(804) 371-6834
		Photos, Plans and/or Project graphics	
		Plans, Profile sheets available? (Y/N)	
		Please include as attachments	

Potomac River Basin Shoreline Projects

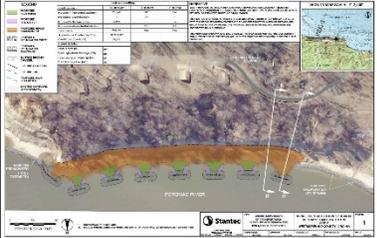
Project Name: **Westmoreland State Park 1 & 2**

Location		UPC Code or BMP ID: 0	
Geographic (County/City): Westmoreland		District: Fredericksburg	Residency: Northern Neck
Latitude: 38.1669		Longitude: -76.8535	River Basin: Potomac
12 digit HUC: 020700110604			
BMP Type: Shoreline Stabilization			
Project Description: Proposed improvements include adding breakwaters, marsh plantings, and beach nourishment to the shoreline. The proposed beach width will accommodate the anticipated bank sloughing to reach equilibrium on its own. The proposed breakwaters will stabilize the shoreline and help reduce sediment and nutrient loads. Some project area is located on private property (Stratford Hall).		Photos, Plans and/or Project graphics	
Existing Conditions Proposed Improvements: Average Bank Height (FT): 40 Area of Existing Marsh (SF): 0 Method of Stabilization: Protocol 1, Protocol 2, Protocol 3, Protocol 4 Linear Feet Stabilization: 707.00 Area of Proposed Marsh (SF): 11,761.20			
Qualifying Conditions: Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation? N Will project comply with all state and federal permitting requirements, including 404 and 401 permits? N Practice-specific Qualifying Conditions (1, 2, and 3, below) The site is currently experiencing shoreline erosion (Y/N)? (All practices) Y 1. If living shoreline- Y -A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N). Y 2. If Revetment AND/OR Breakwater system without a living shoreline- N -A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)? N -When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)? N 3. If Bulkhead/Seawalls- N -The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)? N			
Method of Estimating Bank Erosion Erosion Rate (FT/YR): -2 Source of Erosion Rate: VIMS Data (Y/N)? Y Manually calculated with aerials (Y/N) and years? N Protocols applied: P1-Prevented Sediment x P2-Denitrification x P3-Sedimentation x P4-Marsh Redfield Ratio ("x" applicable) x			
Estimated Credit: lbs/yr TN: 502.00 TP: 345.00 TSS: 1,175,310.00 Field-collected data and elevations (Y/N)? Y Default rates applied (Y/N)? N			
Discussion Credit numbers are for All Protocols Estimated Cost is for Construction Cost only (does not include any associated permitting costs, etc.)		Photos, Plans and/or Project graphics Plans, Profile sheets available? (Y/N) Y Please include as attachments	
Est. Implementation Date: 6/30/2022		Project Contact Name: Tracey Harmon	
Project Completed: No		Contact information (email/phone): (804) 371-6834	

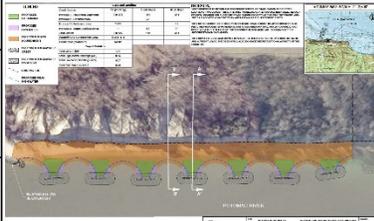
Project Name: **Westmoreland State Park 3**

Location		UPC Code or BMP ID: 0	
Geographic (County/City): Westmoreland		District: Fredericksburg	Residency: Northern Neck
		River Basin: Potomac	
Latitude: 38.1682		Longitude: -76.8561	12 digit HUC: 020700110604
BMP Type: <i>Shoreline Stabilization</i>			
Project Description: <i>Proposed improvements include adding breakwaters, marsh plantings, and beach area; more beach area will accommodate anticipated bank sloughing. The improvements will help stabilize the shoreline and help reduce sediment and nutrient loads and enhance the recreational aspects of the shoreline.</i>		Photos, Plans and/or Project graphics	
Existing Conditions Proposed Improvements: Average Bank Height (FT): 27.67 Area of Existing Marsh (SF): 0 Method of Stabilization: Protocol 1, Protocol 2, Protocol 3, Protocol 4 Linear Feet Stabilization: 584.00 Area of Proposed Marsh (SF): 11,325.60			
Qualifying Conditions: Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation? N Will project comply with all state and federal permitting requirements, including 404 and 401 permits? N Practice-specific Qualifying Conditions (1, 2, and 3, below) The site is currently experiencing shoreline erosion (Y/N)? (All practices) Y 1. If living shoreline- -A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N). Y 2. If Revetment AND/OR Breakwater system without a living shoreline- -A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)? N -When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)? N 3. If Bulkhead/Seawalls- -The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)? N			
Method of Estimating Bank Erosion Erosion Rate (FT/YR): -1.5 Source of Erosion Rate: VIMS Data (Y/N)? Y Manually calculated with aerials (Y/N) and years? N Protocols applied: P1-Prevented Sediment x P2-Denitrification x P3-Sedimentation x P4-Marsh Redfield Ratio ("x" applicable) x			
Estimated Credit: lbs/yr: TN 413.00 TP 282.00 TSS 960,747.00 Field-collected data and elevations (Y/N)? Y Default rates applied (Y/N)? N			
Discussion <i>Credit numbers are for All Protocols</i> <i>Estimated Cost is for Construction Cost only (does not include any associated permitting costs, etc.)</i>		Photos, Plans and/or Project graphics	
Est. Implementation Date: 6/30/2022 Project Contact Name: Tracey Harmon Project Completed: No Contact Information (email/phone): (804) 371-6834		Plans, Profile sheets available? (Y/N) Y Please include as attachments	

Project Name: **Westmoreland State Park 5**

Location		UPC Code or BMP ID: 0	
Geographic (County/City): Westmoreland		District: Fredericksburg	Residency: Northern Neck
		River Basin: Potomac	
Latitude: 38.170883		Longitude: -76.860713	12 digit HUC: 020700110604
BMP Type: <i>Shoreline Stabilization</i>			
Project Description: <i>Proposed improvements include adding breakwaters, marsh plantings, and beach area to the shoreline. The proposed beach width would accommodate the anticipated bank sloughing. The proposed breakwaters will stabilize the shoreline and help reduce sediment and nutrient loads, while enhancing the recreational value and serving to protect the area above where several structures are located.</i>		Photos, Plans and/or Project graphics	
Existing Conditions Proposed Improvements: Average Bank Height (FT): 63 Area of Existing Marsh (SF): 0 Method of Stabilization: <i>Protocol 1, Protocol 2, Protocol 3, Protocol 4</i> Linear Feet Stabilization: 867.00 Area of Proposed Marsh (SF): 12,632.40			
Qualifying Conditions: Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation? N Will project comply with all state and federal permitting requirements, including 404 and 401 permits? N Practice-specific Qualifying Conditions (1, 2, and 3, below) The site is currently experiencing shoreline erosion (Y/N)? (All practices) N 1. If living shoreline- -A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N). Y 2. If Revetment AND/OR Breakwater system without a living shoreline- -A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)? N -When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)? N 3. If Bulkhead/Seawalls- -The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)? Y			
Method of Estimating Bank Erosion Erosion Rate (FT/YR): -0.44 Source of Erosion Rate: VIMS Data (Y/N)? Y Manually calculated with aeriels (Y/N) and years? N Protocols applied: P1-Prevented Sediment x P2-Denitrification x P3-Sedimentation x P4-Marsh Redfield Ratio ("x" applicable) x			
Estimated Credit: lbs/yr TN: 324.00 TP: 216.00 TSS: 733,623.00 Field-collected data and elevations (Y/N)? Y Default rates applied (Y/N)? N			
Discussion			
Est. Implementation Date: 6/30/2022 Project Contact Name: Tracey Harmon Project Completed: No Contact Information (email/phone): (804) 371-6834		Photos, Plans and/or Project graphics Plans, Profile sheets available? (Y/N) Y Please include as attachments	

Project Name: **Westmoreland State Park 6**

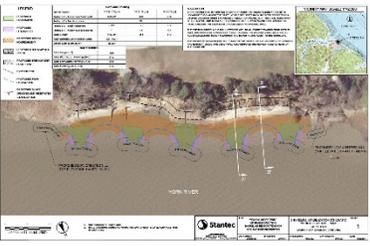
Location		UPC Code or BMP ID: 0	
Geographic (County/City):	Westmoreland	District: Fredericksburg	Residency: Northern Neck
		River Basin: Potomac	
	Latitude: 38.171016	Longitude: -76.865545	12 digit HUC: 020700110604
BMP Type: Shoreline Stabilization			
Project Description: Westmoreland State Park is along the Potomac River in Westmoreland County, with this specific site at an area known as the Horsehead Cliffs. The existing shoreline is highly eroded with bank heights approximately 35-70 feet. The proposed improvements include adding breakwaters, marsh plantings, and beach area to the shoreline.		Photos, Plans and/or Project graphics	
Existing Conditions Proposed Improvements: Average Bank Height (FT): 47.75 Area of Existing Marsh (SF): 0 Method of Stabilization: Protocol 1, Protocol 2, Protocol 3, Protocol 4 Linear Feet Stabilization: 876.00 Area of Proposed Marsh (SF): 12,632.40			
Qualifying Conditions: Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation? N Will project comply with all state and federal permitting requirements, including 404 and 401 permits? N Practice-specific Qualifying Conditions (1, 2, and 3, below) The site is currently experiencing shoreline erosion (Y/N)? (All practices) Y 1. If living shoreline- -A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N). Y 2. If Revetment AND/OR Breakwater system without a living shoreline- -A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)? N -When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)? N 3. If Bulkhead/Seawalls- -The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)? N			
Method of Estimating Bank Erosion Erosion Rate (FT/YR): -0.79 Source of Erosion Rate: VIMS Data (Y/N)? Y Manually calculated with aerials (Y/N) and years? N Protocols applied: P1-Prevented Sediment P2-Denitrification P3-Sedimentation P4-Marsh Redfield Ratio ("x" applicable) x x x x			
Estimated Credit: lbs/yr TN 410.00 TP 276.00 TSS 938,600.00 Field-collected data and elevations (Y/N)? Y Default rates applied (Y/N)? N			
Discussion Credit numbers are for All Protocols Estimated Cost is for Construction Cost only (does not include any associated permitting costs, etc.)		Photos, Plans and/or Project graphics	
Est. Implementation Date: 6/30/2022 Project Contact Name: Tracey Harmon Project Completed: No Contact Information (email/phone): (804) 371-6834		Plans, Profile sheets available? (Y/N) Please include as attachments	

Rappahannock River Basin Shoreline Projects

Project Name: **Belle Isle State Park 2**

Location		UPC Code or BMP ID: 0	
Geographic (County/City):	Lancaster	District: Fredericksburg	Residency: Northern Neck
		River Basin: Rappahannock	
	Latitude: 37.775724	Longitude: -76.605109	12 digit HUC: 020801040602
BMP Type: Shoreline Stabilization			
Project Description: Proposed improvements include grading existing banks, adding breakwaters, marsh plantings, and beach nourishment. Proposed breakwaters will stabilize the shoreline, reduce sediment/nutrient loads, and enhance the recreational aspects of the shoreline.		Photos, Plans and/or Project graphics	
Existing Conditions Proposed Improvements:			
Average Bank Height (FT): 4.8 Area of Existing Marsh (SF): 0 Method of Stabilization: Protocol 1, Protocol 2, Protocol 3, Protocol 4 Linear Feet Stabilization: 752.00 Area of Proposed Marsh (SF): 19,166.40			
Qualifying Conditions:			
Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation? N Will project comply with all state and federal permitting requirements, including 404 and 401 permits? N Practice-specific Qualifying Conditions (1, 2, and 3, below) The site is currently experiencing shoreline erosion (Y/N)? (All practices) Y 1. If living shoreline- -A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N). Y 2. If Revetment AND/OR Breakwater system without a living shoreline- -A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)? N -When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)? N 3. If Bulkhead/Seawalls- -The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)? N			
Method of Estimating Bank Erosion			
Erosion Rate (FT/YR): -1.92			
Source of Erosion Rate: VIMS Data (Y/N)? Y Manually calculated with aerials (Y/N) and years? N			
Protocols applied: P1-Prevented Sediment P2-Denitrification P3-Sedimentation P4-Marsh Redfield Ratio ("x" applicable)			
x x x x			
Estimated Credit: TN TP TSS Field-collected data and elevations (Y/N)? Y			
lbs/yr 250.00 153.00 252,722.00 Default rates applied (Y/N)? N			
Discussion Credit numbers are for All Protocols Estimated Cost is for Construction Cost only (does not include any associated permitting costs, etc.)		Photos, Plans and/or Project graphics	
Est. Implementation Date: 6/30/2022 Project Contact Name: Tracey Harmon		Plans, Profile sheets available? (Y/N)	
Project Completed: No Contact Information (email/phone): (804) 371-6834		Please include as attachments	

York River Basin Shoreline Projects

Project Name: York River 3 & 4												
Location UPC Code or BMP ID: 0												
Geographic (County/City): James City	District: Hampton Roads Residency: Williamsburg River Basin: York											
	Latitude: 37.409812 Longitude: -76.706326 12 digit HUC: 020801070104											
BMP Type: Shoreline Stabilization												
Project Description: <i>This site is accessed by an existing trail. The existing shoreline is highly eroded with bank heights from 15-25 feet. Proposed improvements include grading existing banks back and adding breakwaters, marsh plantings, and beach nourishment. The proposed features will stabilize the shoreline and help reduce sediment and nutrient loads</i>	Photos, Plans and/or Project graphics 											
Existing Conditions Proposed Improvements: Average Bank Height (FT): 18.46 Area of Existing Marsh (SF): 0 Method of Stabilization: Protocol 1, Protocol 2, Protocol 3, Protocol 4 Linear Feet Stabilization: 528.00 Area of Proposed Marsh (SF): 10,454.40												
Qualifying Conditions: Does the project impact the Chesapeake Bay Preservation Act protected vegetation (SAV) without appropriate mitigation? N Will project comply with all state and federal permitting requirements, including 404 and 401 permits? N Practice-specific Qualifying Conditions (1, 2, and 3, below) The site is currently experiencing shoreline erosion (Y/N)? (All practices) Y 1. If living shoreline- -A marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained (Y/N). Y 2. If Revetment AND/OR Breakwater system without a living shoreline- -A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints (Y/N)? N -When the breakwater footprint would not cover SAV, shellfish beds, and/or wetlands (Y/N)? N 3. If Bulkhead/Seawalls- -The site consists of port facilities, marine industrial facilities, etc. and depths deeper than 10 ft 35 feet from shore (Y/N)? N												
Method of Estimating Bank Erosion Erosion Rate (FT/YR): -1.55 Source of Erosion Rate: VIMS Data (Y/N)? Y Manually calculated with aerials (Y/N) and years? N Protocols applied: P1-Prevented Sediment x P2-Denitrification x P3-Sedimentation x P4-Marsh Redfield Ratio ("x" applicable) x												
Estimated Credit: <table border="1"> <tr> <td></td> <td>TN</td> <td>TP</td> <td>TSS</td> <td>Field-collected data and elevations (Y/N)?</td> <td>Y</td> </tr> <tr> <td>lbs/yr</td> <td>464.00</td> <td>319.00</td> <td>148,359.00</td> <td>Default rates applied (Y/N)?</td> <td>N</td> </tr> </table>			TN	TP	TSS	Field-collected data and elevations (Y/N)?	Y	lbs/yr	464.00	319.00	148,359.00	Default rates applied (Y/N)?
	TN	TP	TSS	Field-collected data and elevations (Y/N)?	Y							
lbs/yr	464.00	319.00	148,359.00	Default rates applied (Y/N)?	N							
Discussion <i>Credit numbers are for All Protocols</i> <i>Estimated Cost is for Construction Cost only (does not include any associated permitting costs, etc.)</i>	Photos, Plans and/or Project graphics Plans, Profile sheets available? (Y/N) Please include as attachments											
Est. Implementation Date: 6/30/2022 Project Contact Name: Tracey Harmon Project Completed: No Contact Information (email/phone): (804) 371-6834												

APPENDIX G
STREET SWEEPING SEDIMENT LOADING RATE

From: [Chris Schriener](#)
To: ["TRACEY.HARMON@VDOT.VIRGINIA.GOV"](mailto:TRACEY.HARMON@VDOT.VIRGINIA.GOV); [Sligh, May Louise \(VDOT\)](#); [Beisch, Doug](#); [Foraste, Alex](#); [Hall, Ashley](#)
Subject: FW: Qualifying Street Lanes Approach to Street Sweeping Method Question
Date: Thursday, March 30, 2017 1:33:43 PM

This message has been archived.

From: Tom Schueler [mailto:watershedguy@hotmail.com]
Sent: Friday, December 18, 2015 11:05 AM
To: Bauer, Jaime (DEQ)
Subject: RE: Qualifying Street Lanes Approach to Street Sweeping Method Question

Hi Jamie:
Hope you are doing well and have a great holiday season.
the acceptable sediment load would be 0.65 tons/ac/year for the Phase 5.3.2 model....The correct loading rates for impervious cover are provided in Table 4 on the current street cleaning expert panel report (which I believe you have a copy)

We hope to bring the street cleaning panel report back to the USWG at the January meeting, after we hopefully resolve some objections by MDE and PADEP

Cheers, Tom

From: Jaime.Bauer@deq.virginia.gov <mailto:Jaime.Bauer@deq.virginia.gov >
To: watershedguy@hotmail.com <mailto:watershedguy@hotmail.com >
Subject: Qualifying Street Lanes Approach to Street Sweeping Method Question
Date: Thu, 17 Dec 2015 20:27:04 +0000
Hi, Tom,

I have a questi

Attachments:

[image002.jpg](#)

(78 KB)

APPENDIX H
EXAMPLE STREET SWEEPING QUANTITIES AND COMPUTATIONS

H. Street Sweeping Quantities and Computations

VDOT practices street sweeping at varying degrees of frequency and location depending on the needs and abilities at the local level. VDOT will remove approximately 50 tons of street solids in the James River Basin and 150 tons in the Potomac River Basin using the Mass Loading Approach, or sweep approximately 100 miles and 3000 miles of street lanes in the James River Basin and Potomac River Basin, respectively. Each calculation step as described in the DEQ Guidance Memo is provided in the Tables H.1 and H.2 below.

Table H.1 – Reductions from Street Sweeping- Calculated Using the Mass Loading Approach

Calculation Step per DEQ Guidance Appendix V.G	James River Basin	Potomac River Basin
1. Street Solids Collected (tons/year)	50	150
Street Solids Collected (lbs/year)	100,000	300,000
2. Dry Weight of Street Solids (lbs/year)	70,000	210,000
3. Resulting Nutrient & Sediment Removal:		
Total Nitrogen-0.0025 factor	175 (lbs/yr)	525 (lbs/yr)
Total Phosphorus-0.001 factor	70 (lbs/yr)	210 (lbs/yr)
TSS- 0.3 factor	21,000 (lbs/yr)	63,000 (lbs/yr)

Table H.2 – Reductions from Street Sweeping- Calculated Using the Qualifying Street Lanes Method

Calculation Step per DEQ Guidance Appendix V.G	James River Basin	Potomac River Basin
1. Qualifying Lane Miles Swept	100	3,000
2. Impervious Area Swept (Acres)	121	3,636
3. Pre-Sweeping Nutrient Load		
Total Nitrogen- (15.4 lbs/ac/yr)	1867 (lbs/yr)	56,000 (lbs/yr)
Total Phosphorus- (2.0 lbs/ac/yr)	242 (lbs/yr)	7,273 (lbs/yr)
Total Suspended Sediment- (0.65 lbs/ac/yr) ²	79 (lbs/yr)	2,364 (lbs/yr)
4. Resulting Nutrient & Sediment Removal:		
Total Nitrogen- 0.05 pick up factor ¹	93 (lbs/yr)	2,800 (lbs/yr)
Total Phosphorus- 0.06 pick up factor ¹	15 (lbs/yr)	436 (lbs/yr)
TSS- 0.25 pick up factor ¹	20 (lbs/yr)	591 (lbs/yr)

¹Using regenerative or vacuum assisted sweepers.

²Using Loading Rate provided by Tom Schueler, see Appendix G.