Chesapeake Bay TMDL Action Plan

Virginia Stormwater Management Program (VSMP)

Permit No. VA0088625

July 1, 2016 – June 30, 2021

Chesapeake VIRGINIA

AECOM Imagine it. Delivered.

Certification Statement

9VAC25-870-370. SIGNATORIES TO STATE PERMIT APPLICATIONS AND REPORTS

A. All state permit applications shall be signed as follows:

1. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy-making or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for state permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

2. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

3. For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

B. All reports required by state permits, and other information requested by the board shall be signed by a person described in subsection A of this section, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described in subsection A of this section;

2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. A duly authorized representative may thus be either a named individual or any individual occupying a named position; and

3. The written authorization is submitted to the department.

CERTIFICATION	
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate 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."	
Eric J Martt	July 24, 2018
Responsible Official Signature	**Date**
VA0088625	City of Chesapeake Municipal Separate Storm Sewer System
Permit Number	**Facility Name**

Version History

The City of Chesapeake (the "City" or "Chesapeake") may wish, or be required, to make modifications to this Chesapeake Bay TMDL Action Plan as provided for in MS4 Permit No. VA0088633. Any such modifications will be noted and described below. The most recent date listed below is the "current version" of this Chesapeake Bay TMDL Action Plan.

Date (Version)	Modifications Made
June 30, 2018	Initial version of Chesapeake's Chesapeake Bay TMDL Action Plan, as required by the City's 2016 MS4 Permit (VA0088625) that became effective on July 1, 2016.

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Definitions & Acronyms

The following definitions shall apply to this Chesapeake Bay TMDL Action Plan:

Action Plan – unless specifically stated otherwise, the Chesapeake Bay TMDL Action Plan
Permit – unless specifically stated otherwise, the City's current MS4 permit valid from July 1, 2016 to June 30, 2021

The following acronyms are used in this Chesapeake Bay TMDL Action Plan:

BMP – Best Management Practice
CBPA District – The City's Chesapeake Bay Preservation Area District
CIP – Capital Improvement Project (or 'Projects', typically referring to Chesapeake's CIP budget)
City – unless specifically stated otherwise, the City of Chesapeake
DEQ – Virginia Department of Environmental Quality
EOS – Edge of Stream
EPA – The U.S. Environmental Protection Agency
HRSD – Hampton Roads Sanitation District
IDA – Intensely Developed Area
L2 – Level 2 (scoping run of Chesapeake Bay Watershed Model)
MS4 – Municipal Separate Storm Sewer System
NAVD88 – North American Vertical Datum of 1988
POCs – Pollutants of Concern (Specifically Nitrogen, Phosphorus, and Total Suspended Solids)
RMA – Resource Management Area
RPA – Resource Protection Area
SLAF – Stormwater Local Assistance Fund (administered by DEQ)
SWIFT – Sustainable Water Initiative for Tomorrow (HRSD program)
TMDL – Total Maximum Daily Load
TN – Total Nitrogen
TCC – Tidewater Community College
TP – Total Phosphorous
TSS – Total Suspended Solids
VAMSA – Virginia Municipal Stormwater Association
VDOT – Virginia Department of Transportation
VPDES - Virginia Pollutant Discharge Elimination System
VSMP – Virginia Stormwater Management Program
WIP – Watershed Implementation Plan

1. Executive Summary

1.1 REQUIREMENTS FOR THIS CHESAPEAKE BAY TMDL ACTION PLAN

Stormwater discharges from the City of Chesapeake are regulated by state and federal laws. The City operates a "municipal separate storm sewer system" (MS4), that is regulated by the Commonwealth of Virginia through a Virginia Stormwater Management Program (VSMP) MS4 permit (No. VA0088625). This permit was reissued in 2016 with new terms, conditions, and requirements that became effective on July 1, 2016.

The 2016 MS4 permit stipulates that the City, *"shall develop and submit to [DEQ] for its review and approval a phased **Chesapeake Bay TMDL Action Plan** that includes:*

- *(a) A review of the current MS4 Program Plan including existing legal authorities and the permittee's ability to ensure compliance with this special condition.*
- *(b) Identification of any new or modified legal authorities, such as ordinances, permits, orders, contracts and inter-jurisdictional agreements, implemented or needing to be implemented to meet the requirements of this special condition.*
- *(c) The means and methods utilized to address discharges into the MS4 from new sources.*
- *(d) An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009 based on the 2009 progress run. The permittee shall utilize Table 1 and multiply the total existing acres served by the MS4 on June 30, 2009 and the 2009 Edge of Stream (EOS) Loading Rate.*
- *(e) A determination of the total pollutant load reductions necessary to reduce the annual POC existing loads using Table 2 by multiplying the Total Existing Acres served by MS4 by the First Permit Cycle Required Reduction in Loading Rate.*
- *(f) The means and methods, such as the management practices and retrofit programs that will be utilized to meet the required reductions identified in Part I.D.1.b)(1)(e) and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting the reductions.*
- *(g) The means and methods to reduce 15% of total pollutant load reduction calculated in (e) to offset increased loads from new sources initiating construction between July 1, 2009 and June 30, 2014 and grandfathered projects in accordance with 9 VAC 25-870-48, 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. The permittee shall utilize Table 3 to develop the equivalent pollutant load for nitrogen and total suspended solids.*
- *(h) An estimate of the expected cost to implement the necessary reductions during the permit cycle.*
- *(i) An opportunity for receipt and consideration of public comment on the draft Chesapeake Bay TMDL Action Plan.*
- *(j) A list of all comments received as a result of public comment and any modifications made to the draft Chesapeake Bay TMDL Action Plan as a result of the public comments."*

Tables 1, 2, and 3, mentioned above, may be found in the City's MS4 permit, available online at: http://www.cityofchesapeake.net/Assets/documents/departments/public_works/MS4.pdf

This document contains Chesapeake's responses to items (a) through (j) above, and comprises the City's Chesapeake Bay TMDL Action Plan.

This Action Plan details the City's estimation of its existing source loads of POCs as of June 30, 2009 based on the Chesapeake Bay Program's Phase 5.3.2 watershed model and the required reductions in POCs by the end of the first permit cycle. The means and methods by which the required reductions can be met have also been addressed.

1.2 STEPS UNDERTAKEN TO PREPARE THIS PLAN

The City of Chesapeake considers its water features to be extremely valuable assets to the City and its residents, and has invested considerable financial and human capital to protect these vital resources. In addition to performing routine maintenance of its public waterways and infrastructure and promoting responsible development and land management, the City has enacted ordinances to protect the Chesapeake Bay from further pollution and follows a rigorous program to enforce building regulations and erosion and sediment control practices. The City's Stormwater Management Program has grown and evolved to remain compliant with new environmental laws, and increasing requirements from state and federal regulators.

The City established the Chesapeake Stormwater Committee, made up of 11 City Council appointed representatives, and three Ex-Officio members from the City staff. The duties of the committee include preparing drainage and stormwater utility-related recommendations for the City Manager, reviewing recommendations from Public Works to improve drainage and maintenance operations, and reviewing the status of City-wide drainage projects, study areas, maintenance operations and issues of wetlands permitting.

The City has implemented a stormwater management fee paid by owners of developed property in the city. The fee is paid twice a year, and applies to both residential and non-residential properties. The money collected through the stormwater utility fee is used to fund the City's Stormwater Management Program. Cleaning and maintenance of the City's stormwater pipes, structures, ditches, and BMP facilities are all funded by the stormwater utility fee. The City has also used those funds to perform detailed drainage studies on the City's local watersheds. The City has put considerable effort

into modeling its local watersheds. In 1988 the City completed a Master Drainage Study and Map for the entire City of Chesapeake. Between 2005 and 2014 additional modeling was performed for 14 of the City's 27 local watersheds to update the Master Drainage Study. These watershed studies are an important tool to help the City identify stormwater retrofits to reduce localized flooding in the City. Wherever possible, the City has taken the opportunity to incorporate water quality features in the design of stormwater retrofits meant to improve local flooding. The City posts these studies online at http://www.cityofchesapeake.net/government/City-Departments/Departments/Public-WorksDepartment/newsletters/watershed.htm as they are completed. Chesapeake has also used its watershed studies to take advantage of funding provided through DEQ using Virginia's Stormwater Local Assistance Fund. Some of the stormwater retrofit projects that appear in this Chesapeake Bay TMDL Action Plan were identified by these studies.

The City has also partnered with the Elizabeth River Project; an independent non-profit environmental group that is dedicated to improving water quality in the Elizabeth River to the highest practical level through public education and outreach. The Elizabeth River Project recruits residents into a pledge program to encourage environmental stewardship, and facilitates the implementation of water quality BMPs on individual residential lots. The City's stormwater utility fee helps fund the design and construction of these BMPs, which are included as part of this Chesapeake Bay TMDL Action Plan.

To prepare this Chesapeake Bay TMDL Action Plan, Chesapeake had to determine the POC loads from existing sources. To do so, the City delineated its MS4 boundary using guidance from the Virginia Municipal Stormwater Association and definitions from DEQ. The City's GIS data and aerial imagery from 2009 were used to delineate the MS4 service area. Contour information, storm system pipe and structure data, as well as infrared LiDAR data, were used to determine drainage patterns during the delineation process. The City's MS4 service area is shown in Figure 3.4-3.

Land cover within the MS4 as of June 30, 2009 was also identified using the City's aerial imagery, and GIS data, as depicted in Figures 3.4-4, and 3.4-5. Table 3.4-1 shows the computed annual pollutant loads from the City's MS4 based on the acres of regulated pervious and impervious land, as prescribed in the MS4 permit. The City's annual pollutant reduction requirements are presented in Table 3.5-1.

The City has met the 5.75-percent level of compliance of this first permit cycle, with nutrient reduction credits provided by a combination of existing BMPs installed between January 1, 2006 and July 1, 2009, septic tank disconnects, individual residential BMPs installed and implemented with the help of the Elizabeth River Project, and regional stormwater BMP retrofit projects identified through the City's watershed studies. The means and methods used to comply with the requirements of the first permit cycle are discussed in detail in Section 3.6. Nutrient reduction credits are summarized in Table 3.6-1.

1.3 SUMMARY OF THIS PLAN

As prescribed in the City's MS4 permit, this Chesapeake Bay TMDL Action Plan is phased. The first permit cycle, from July 1, 2016 to June 30, 2021, requires the City to implement means and methods to achieve at least 5.75 percent of its total required reductions under the Chesapeake Bay TMDL. The reductions in discharges of nitrogen, phosphorous, and total suspended solids to the Chesapeake Bay have been achieved through existing BMPs that were not accounted for in the Chesapeake Bay Program's Phase 5.3.2 watershed model, the City's efforts to reduce the number of septic tanks in the City through new sanitary sewer projects, and the implementation of stormwater BMP projects that include BMPs on residential lots installed voluntarily by citizens, as well as the construction of regional stormwater retrofit BMPs identified in the City's watershed studies. This Action Plan identifies the specific BMPs the City intends to utilize to satisfy the first permit cycle requirements.

As summarized in Sections 3.6 through 3.8 of this Action Plan, by the end of the first permit cycle, the City will have connected more than ninety parcels in the Chesapeake Bay Watershed to sanitary sewer, constructed five regional stormwater retrofit BMPs, and paid to implement numerous BMPs on individual residential lots at a total estimated cost of $5.29 million. Many of these projects have already been constructed while some are in various stages of planning and design.

Using computational guidance provided by DEQ, Chesapeake estimates the total annual reductions in its discharges of pollutants to the Chesapeake Bay will be 2,908.45 pounds of Nitrogen, 465.91 pounds of Phosphorus, and 217,253 pounds of Total Suspended Solids by the end of the first permit cycle.

Chesapeake reserves the right to substitute other means and methods for any of these BMPs, in accordance with the MS4 permit, if it becomes advantageous to the City to do so. The City has already met the first permit cycle required reductions through credits from existing BMPs installed between January 1, 2006 and June 30, 2009, completed sanitary sewer connection projects, and completed regional stormwater BMP retrofit projects. Chesapeake intends to make steady progress implementing the remaining sanitary sewer projects, and regional stormwater BMPs using available funding in a fiscally responsible manner. The remaining projects are scheduled for completion well before the end of the first permit cycle, however the City reserves the right to reschedule any of these projects, providing the terms of the MS4 permit are satisfied.

The next permit cycle, from July 1, 2021 to June 30, 2026 will require an additional 35 percent of pollutants to be removed, with the third permit cycle achieving 100 percent of the mandated reductions. This Action Plan does not directly address requirements for the second and third permit cycle phases.

2. Background Information

2.1 MS4 Watersheds

Chesapeake is the second largest City in Virginia in terms of land area, covering 353 square miles in both the Chesapeake Bay and Albemarle Sound watersheds. The City's 2009 MS4 service area spans 48,214 acres in the Chesapeake Bay Watershed and 63,688 acres in the Albemarle Sound Watershed. The City's MS4 is bordered by the City of Suffolk and the Dismal Swamp National Wildlife Refuge on the west, the cities of Norfolk and Portsmouth on the North, the City of Virginia Beach on the east, and the City's Southern Watershed on the south. The Chesapeake Bay MS4 area drains to the Western, Southern, and Eastern branches of the Elizabeth River, all of which are in the James River Basin for the purposes of computing nutrient loading rates and removals for this Chesapeake Bay TMDL Action Plan. Stormwater discharges from the City's Chesapeake Bay MS4 area enter the following sixth (6th) order hydrologic units:

- Southern Branch Elizabeth River-New Mill Creek (JL51),
- Dismal Swamp-Dismal Swamp Canal-Big Entry Ditch (JL52),
- Southern Branch Elizabeth River-Deep Creek (JL53),
- Eastern Branch Elizabeth River (JL54), and
- Western Branch Elizabeth River (JL55).

2.2 Population and Stormwater Infrastructure

According to the April 1, 2010 U.S. Census, the City's population is estimated to be 222,209. The City's GIS data shows over 73,000 residential, commercial, and industrial buildings in the Chesapeake Bay MS4 service area, more than 800 miles of stormwater pipes and ditches and over 24,000 stormwater structures.

2.3 MS4 Permit Coverage

The City first obtained a permit to discharge stormwater from its MS4 in 1996, under Phase I of the National Stormwater Program, administered in Virginia. The permit was re-issued in 2001, expired in 2006, and administratively continued until 2016, when a new Virginia Stormwater Management Program ("VSMP") Permit was reissued (MS4 Permit No. VA0088625). The 2016 permit became effective on July 1, 2016 and incorporates substanial new terms and requirements. This permit may be reviewed online at http://www.cityofchesapeake.net/Assets/documents/departments/public_works/MS4.pdf.

2.4 MS4 Program Plan

Chesapeake submitted an updated MS4 Program Plan to DEQ for approval prior to the end of the FY17 fiscal year. The City made revisions to the plan based on comments by DEQ and has posted the plan on its website. A link to Chesapeake's MS4 Program Plan may be found online at http://www.cityofchesapeake.net/government/City-Departments/Departments/Public-Works-Department/Divisions/stormwatermanagement/stormwatermanagement-pollutioninstormwaterrunoff.htm.

The 2016 MS4 permit requires Chesapeake to review the current MS4 Program Plan annually, in conjunction with the preparation of the annual report.

2.5 MS4 Annual Reports

Chesapeake submits MS4 annual reports in accordance with its permit requirements. Annual reports for the prior year are posted online. A link to the City's annual report can be found on the City's webpage at http://www.cityofchesapeake.net/government/City-Departments/Departments/Public-Works-Department/Divisions/stormwatermanagement/stormwatermanagement-pollutioninstormwaterrunoff.htm.

2.6 Contacts

Barbara Brumbaugh was the project manager for the City of Chesapeake. Sean Bradberry, ENV SP and Seshadri Iyer, Ph.D., PE were the project engineer and project manager, respectively, for AECOM.

3. Required Components of the Chesapeake Bay TMDL Action Plan

The "Permit Requirements" described below are taken verbatim from Section I.D.1.b)1) of the City's MS4 Permit, which states, "*No later than 24-months after the effective date of this state permit, the permittee shall develop and submit to the Department for its review and approval a phased Chesapeake Bay TMDL Action Plan that includes:*

- *A Review of the Current MS4 Program Plan,*
- *New or Modified Legal Authorities,*
- *The Means and Methods to Address Discharges into the MS4 from New Sources,*
- *An Estimate of Annual POC Loads Discharged from Existing Sources as of June 30, 2009,*
- *Determination of Total Pollutant Load Reductions Necessary to Reduce the Annual POC Existing Loads,*
- *The Means and Methods to Meet the Required Reductions,*
- *The Means and Methods to Reduce the First 5% Pollutant Load Reductions by an Additional 15%,*
- *An Estimate of the Expected Cost to Implement the Necessary Reductions During the Permit Cycle,*
- *An Opportunity for Receipt and Consideration of Public Comment on the Draft Chesapeake Bay TMDL Action Plan, and*
- *A List of All Public Comments Received and Modifications Made in Response to Public Comments.*

3.1 REVIEW OF THE CURRENT MS4 PROGRAM PLAN

Permit Requirement: *I.D.1.b)1)(a) A review of the current MS4 Program Plan including existing legal authorities and the permittee's ability to ensure compliance with this special condition.*

The City has obtained coverage under a VSMP MS4 Permit (VA0088625) that authorizes the discharge of stormwater from all existing and new municipal separate stormwater point source discharges to surface waters from the MS4 owned or operated by the City.

The City maintains a MS4 Program Plan, which was extensively updated and submitted to DEQ in 2017, as required in the MS4 permit, along with its Permit Year 1 Annual Report. DEQ requested minor edits be made and the City resubmitted the Program Plan to DEQ on (Date).

In accordance with the permit requirements, Chesapeake has developed and shall submit to DEQ for its review and acceptance, this Chesapeake Bay TMDL Action Plan on or before July 1, 2018. Unless specifically denied in writing by DEQ, this plan becomes effective and enforceable 90 days after the date received by DEQ.

No revisions or modifications to the Program Plan are required to accommodate or facilitate this Chesapeake Bay TMDL Action Plan.

3.2 NEW OR MODIFIED LEGAL AUTHORITIES

Permit Requirement: *I.D.1.b)1)(b) Identifies any new or modified legal authorities, such as ordinances, permits, orders, contracts and inter-jurisdictional agreements, implemented or needing to be implemented to meet the requirements of this special condition.*

The City of Chesapeake has developed its MS4 program in accordance with the State Water Control Law, Virginia Pollutant Discharge Elimination System (VPDES) permitting program, Regulations for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed, Virginia Erosion and Stormwater Management Program (VESMP) Regulations, and past and present MS4 permit requirements. It has incorporated water quality measures into various chapters of the Chesapeake City Code, including:

- Chapter 26, ARTICLE III. - EROSION AND SEDIMENT CONTROL
- Chapter 26, ARTICLE VII. - STORMWATER MANAGEMENT, and
- Chapter 26, ARTICLE IX. - CHESAPEAKE BAY PRESERVATION AREA DISTRICT

No new or modified legal authorities are required to implement this Chesapeake Bay TMDL Action Plan.

Chesapeake's MS4 Program Plan, available online at http://www.cityofchesapeake.net/government/CityDepartments/Departments/PublicWorksDepartment/Divisions/stormwatermanagement/stormwatermanagement-pollutioninstormwaterrunoff.htm, contains a summary of its existing legal authority, and Appendix D contains the city ordinances related to the City's MS4 Program. Specifically, Chesapeake is regulated under and complies with:

- The Virginia Stormwater Management Act (§§ 62.1-44.15:24, et seq.),
- The State Water Control Law Act (§§ 62.1-44.2, et seq.),
- The Clean Water Act (33 U.S.C. §1251, et seq.),
- The Virginia Erosion and Sediment Control Law (§§ 62.1-44.15:51, et seq.),
- The Chesapeake Bay Preservation Act (§§ 62.1-44.15:67, et seq.),
- The VSMP Permit Regulation (9VAC 25-870, et seq.),
- The EPA NPDES Regulation (40 CFR Part 122),
- The EPA Effluent Guidelines (40 CFR Part 133 or 400-471),
- Water Quality Standards (9VAC 25-260, et. seq.), and
- Wasteload Allocations from a TMDL or River Basin Plan.

The MS4 Program Plan is a consolidation of Chesapeake's relevant ordinances and other regulatory requirements, the description of

programs and procedures (including standard forms to be used for reports and inspections) that will be implemented and enforced to comply with the MS4 permit, and documentation of the selection, design, and installation of stormwater control measures.

The Hampton Roads Sanitation District (HRSD) proposes to add advanced treatment processes to several of its wastewater treatment facilities to produce water that exceeds drinking water standards, and to pump up to 120 million gallons per day of this clean water into the ground. This will ensure a sustainable source of water to meet current and future groundwater needs throughout eastern Virginia while helping local waters and the Chesapeake Bay meet the water quality goals in the Bay TMDL. A pilot project is currently underway at the SWIFT Research Facility in Suffolk, VA. The SWIFT project is an integrated approach to accomplish the following goals:

- Significantly reduce the discharge of nitrogen, phosphorus, and sediment to the Chesapeake Bay by eventually eliminating most discharges of treated wastewater to the James, York, and Elizabeth Rivers
- Restore Virginia's groundwater supplies, ensuring a sustainable source of water for future generations
- Protect Virginia's groundwater resources from salt water intrusion
- Potentially reduce the rate of land subsidence

In 2017 the City of Chesapeake entered into a Water Quality Credit Agreement with HRSD to accept existing surplus nutrient and sediment credits as allowed by state law. This trading agreement will enable Chesapeake to meet its obligations under the Chesapeake Bay TMDL cost effectively, while allowing the City to better utilize existing resources. The credits will be transferred on an annual basis. More information can be found at http://swiftva.com/ . See Appendix D for the City's SWIFT Water Quality Credit Agreement.

The legal authority to use SWIFT credits would be pursuant to Virginia Code § 62.1-44.19:21, which allows the City to acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL.

3.3 MEANS AND METHODS TO ADDRESS DISCHARGES INTO THE MS4 FROM NEW SOURCES

Permit Requirement: *I.D.1.b)1)(c) The means and methods utilized to address discharges into the MS4 from new sources.*

The City of Chesapeake requires that stormwater discharges from any new development adhere to the criteria outlined in the VSMP regulations for both water quality and quantity. Post-development stormwater management facilities and structures must meet the design standards and specifications of the Virginia Stormwater BMP Clearinghouse, and plans for proposed post-development stormwater management facilities must be reviewed and approved by the City. In addition, all construction activities must follow the minimum standards and requirements outlined in Virginia's Erosion and Sediment Control Law as well as the City's Erosion and Sediment Control ordinance, to prevent sediment-laden stormwater from being discharged into or beyond the MS4. Chesapeake generally does not impose more burdensome requirements on its citizens than state and federal law require, however the City did lower the regulatory threshold for land disturbing activities related to single family residential construction, as allowed by state law, from 10,000 to 2,500 square feet in all areas of the city, not just those areas within the City's CBPA District.

The City also regulates all land within its CBPA District according to the Chesapeake Bay Preservation Act and Chapter 26, Article IX of the City's ordinances. The City's CBPA District is made up of RPAs, RMAs, and IDAs. The City's RPAs are comprised of tidal wetlands; tidal shores; non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow with a one-hundred-foot vegetation buffer. Chesapeake designates all lands contiguous to the inland boundary of the RPA that, if improperly disturbed, used or developed, have the potential for causing significant water quality degradation or for diminishing the functional value of the resource protection area as RMAs. These areas include, but are not limited to, the following land categories: floodplains, highly erodible soils, including steep slopes, highly permeable soils; and nontidal wetlands not included in the RPA. The City's IDA is a designated redevelopment area of the city which incorporates portions of the RPA and RMA. The IDA includes areas in which development was concentrated as of January 21, 1992, so that little of the natural environment remains, and where at least one of the following conditions existed as of that date: (1) Development severely altered the natural state of the area such that it has more than 50 percent impervious surface; (2) Public sewer and water systems, or a constructed stormwater drainage system, or both, were constructed and activated to serve the area on or before January 21, 1992; or (3) Housing density was equal to or greater than four dwelling units per acre.

3.4 ESTIMATE OF ANNUAL POC LOADS DISCHARGED FROM EXISTING SOURCES AS OF JUNE 30, 2009

Permit Requirement: *I.D.1.b)1)(d) An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009 based on the 2009 progress run. The permittee shall utilize Table 1 and multiply the total existing acres served by the MS4 on June 30, 2009 and the 2009 Edge of Stream (EOS) Loading Rate.*

To determine the POC loads from existing sources, the City delineated its MS4 service area within the Chesapeake Bay Watershed as of June 30, 2009 using guidance from VAMSA and definitions from DEQ. The City's Chesapeake Bay Watershed, for the purposes of this Chesapeake Bay TMDL Action Plan, is defined by the VAHU6 watersheds or portions of watersheds within the City's boundary that drain to the James River. The VAHU6 watershed boundaries often conflict with known local watershed boundaries, especially where local watershed boundaries have been delineated or refined during detailed watershed studies.

The City of Chesapeake has spent considerable effort and money performing local watershed studies. Through these studies, the City identified approximately 4,100 acres which drain to the Chesapeake Bay, but are included with VAHU6 watersheds that drain to the Albemarle Sound. The City wanted those acres included in the Chesapeake Bay Watershed, even though it increases their MS4 service area. Chesapeake has local TMDLs for bacteria and total phosphorus in its Southern Watershed, so those acres will count towards the bacterial and phosphorus TMDL loads if not included in the Chesapeake Bay Watershed. In a letter to the DEQ dated November 30, 2016, the City requested permission to redraw the Chesapeake Bay Watershed to include the additional 4,100 acres, based on the local watershed studies. The City corrected its Chesapeake Bay Watershed boundary by making edits the JL51 VAHU6 watershed, as well as the three adjacent watersheds; AS07, AS09, and AS12. After the edits, approximately 3,660 acres of the 4,100 were added to the area of the JL51 VAHU6 watershed, while the AS07, AS09, and AS12 watersheds were reduced by 1,466, 1,285, and 909 acres respectively. Jaime Bauer from the DEQ approved the adjusted Chesapeake Bay Boundary which was used to map the City's MS4 service area, and to calculate the City's annual POC loads from existing sources for the James River Basin. The City's letter to the DEQ concerning the VAHU6 adjustments, as well as the response from Jaime Bauer is provided in Appendix A. Figure 3.4-1 shows the City's corrected Chesapeake Bay Watershed boundary and VAHU6 watersheds. Edits made to the VAHU6 watershed boundaries based on the City's watershed studies are presented in Figure 3.4-2.

To delineate its MS4 boundary, the City's GIS data and Virginia Geographic Information Network's (VGIN) orthophotography from 2009 were used. The mapping process began by delineating areas within the City that drain directly to Waters of the United States (WOUS), without passing through the City's stormwater network. Tidal waters and associated wetlands were delineated using Virginia's definition of vegetated tidal wetlands, which applies to land between mean low water and an elevation above mean low water equal to 1.5 times the mean tide range. The City of Chesapeake uses an elevation of 3.0 (NAVD88) to define the limit of tidal wetlands. The City's topographic, and shaded relief data in GIS was then used to delineate land areas within the City that drain directly to WOUS. Land that drains directly to WOUS without passing through the City's MS4 network was subtracted from the City's Chesapeake Bay Watershed.

The City then subtracted land that is not regulated under the City's MS4 permit, or is covered under another MS4 permit. City parcel data was used to identify and remove state and federally owned land, as well as parcels owned by the cities of Norfolk, Portsmouth, and Virginia Beach. Finally VDOT's MS4 area was subtracted from the City's land area. The remaining land within the Chesapeake Bay watershed makes up the City's MS4 Service Area. Figure 3.4-3 shows the City's MS4 service area and the excluded land within the Chesapeake Bay Watershed.

To determine the regulated land within its MS4 Service Area, the City then identified land that is not included with the acres of regulated pervious and impervious land when calculating the City's nutrient reductions required under the Chesapeake Bay TMDL. This includes forested land, agricultural land, wetlands, open water, and land with a facility covered by an individual or general VPDES permit related to industrial stormwater runoff. The City's GIS data, and the 2009 orthophotography was used to delineate forest land cover, agricultural areas and open water in the Chesapeake Bay Watershed as of 2009. Wetland areas were included with the land excluded from the MS4 service area that drained directly to WOUS, or were included with forested or agricultural land. Agricultural land was identified from the City's land use data in GIS, and only those forested areas meeting the minimum size and density requirements according to DEQ and the Chesapeake Bay Program were included with the forest land cover. Figure 3.4-4 shows the forested and agricultural land, open water, and parcels covered by VPDES permits within the Chesapeake Bay Watershed.

The area of regulated pervious and impervious land was found by subtracting the forested and agricultural land, open waters, and the parcel areas covered by a VPDES permit, from the City's MS4 service area. The area remaining was the land regulated under the City's MS4 permit, and included both pervious and impervious land. To determine the acres of regulated impervious land, the City used GIS data for imperviousness of local drainage subbasins created for its Master Drainage Plan studies performed between 2004 and 2012. Percent impervious values assigned to subbasins as part of the drainage studies were updated to reflect land cover conditions as of 2009. Areas outside of the studied subbasins, were subdivided based on land use, and were assigned a value of imperviousness as well. The regulated land was then intersected with the imperviousness layer in GIS. The areas of the resulting polygons were multiplied by the imperviousness to determine the acres of regulated impervious land, with the remaining acres counting as regulated pervious land. Figure 3.4-5 shows the City's regulated land within its MS4 service area, and the imperviousness values assigned to the land.

Within the City's MS4 service area, there are 27,817 acres of regulated land comprised of 16,892 acres of regulated pervious land, and 10,925 acres of regulated impervious land. Using the loading rates prescribed in Table 1 of the MS4 permit, and the acres of regulated pervious and impervious land as of June 30, 2009, Chesapeake's estimated annual POC loads from existing sources are approximately 220,206 pounds of nitrogen, 27,896

pounds of phosphorous, and 9,437,437 pounds of total suspended solids per year. Table 3.4-1 summarizes the estimated annual POC loads from existing sources as of June 30, 2009.

3.5 DETERMINATION OF TOTAL POLLUTANT LOAD REDUCTIONS NECESSARY TO REDUCE THE ANNUAL POC EXISTING LOADS

Permit Requirement: *I.D.1.b)1)(e) A determination of the total pollutant load reductions necessary to reduce the annual POC existing loads using Table 2 by multiplying the Total Existing Acres served by MS4 by the First Permit Cycle Required Reduction in Loading Rate.*

Applying the land cover data summarized in Section 3.4 with the reduction factors prescribed in Table 2 of the City's MS4 Permit, Chesapeake computed the required nutrient reductions to reduce the existing annual pollutant loads by five percent for the first permit cycle in straightforward fashion. Table 3.5-1 lists the total pollutant load reductions necessary to reduce the annual POC existing loads for this permit cycle.

During the first permit cycle, the required annual reductions from Chesapeake's MS4 are 940.15 pounds of nitrogen, 214.46 pounds of phosphorus, and 97,192.08 pounds of total suspended solids. **These values and Table 3.5-1 include the additional 15% reduction described in Section 3.7.**

3.6 MEANS AND METHODS TO MEET THE REQUIRED REDUCTIONS

Permit Requirement: *I.D.1.b)1)(f) The means and methods, such as the management practices and retrofit programs that will be utilized to meet the required reductions identified in Part I.D.1.b)(1)(e) and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting the reductions.*

The City will meet the required nutrient reductions for the first permit cycle through a combination of existing BMPs that went online between January 1, 2006 and June 30, 2009; sanitary sewer connections implemented by the City; five regional stormwater BMPs constructed by the City; and individual residential parcel BMPs implemented through a partnership with the Elizabeth River Project.

There are seventy existing BMPs in the City's MS4 service area that went online between January 1, 2006 and June 30, 2009, and thus are eligible for credit towards the City's required POC reductions during the first permit cycle. Together these BMPs provide nutrient reductions of 477.79 pounds of nitrogen, 153.32 pounds of phosphorus, and 75,605.80 pounds of suspended solids annually. The seventy BMPs were included with the City's 2015 Historical BMP Data Cleanup that was submitted to DEQ. While putting this Chesapeake Bay TMDL Action Plan together, the City rechecked the BMP locations and information and made minor corrections to data for 3 of the BMPs. One BMP practice was changed from a wet (retention) pond to a dry (detention) pond, another was changed from a detention pond to an extended detention pond, and the total service area to one of the wet ponds was reduced from 29 acres to 26.1 acres since the pond was constructed during the first phase of a multi phased project, and the development plans for the final phase changed slightly from the original plans. Two of the corrections; changing the wet pond to a dry pond, and reducing the wet pond service area from 29 acres to 26.1 results in a decrease in nutrient credit for the City. The increase in nutrient credit from changing the detention pond to an extended detention pond is very small, given that the service area is only 3.7 acres, and results in increases of 0.46, 4.73, and 825.24 pounds of total phosphorus, nitrogen, and suspended solids respectively. A summary of the nutrient reductions provided by the seventy existing BMPs brought online between January 1, 2006 and June 30, 2009 is presented in Table 3.6-1. A complete list of the BMPs with addresses, service areas, and latitude and longitude coordinates can be found in Table B-1 in Appendix B. Nutrient reduction calculations for these BMPs are found in Table B-3. The Chesapeake Bay Program's established efficiencies for BMPs were used to calculate nutrient reductions.

In an effort to improve water quality in its waterways, the City has worked to take septic tanks offline by connecting those parcels with septic tanks to the City's sanitary sewer system. In a June 17, 2015 conference call with the Hampton Roads Regional Stormwater Work Group, DEQ decided that localities could take nitrogen reduction credits for sanitary sewer connections equal to 3.6 pounds of TN per person per year. In a June 29, 2015 email to Virginia localities, DEQ stated that when determining the number of individuals in a household for calculating sewer connection credits, the average number of people per household based on the latest Census data for that locality should be used. Population data confirmed by the City's planning department, as well as population data from the U.S. Census Bureau's 2010 census both list the average number of people per household in the City as 2.75. With a nitrogen credit of 3.6 pounds per person, and an average household of 2.75 people, each parcel connected to the City's sanitary sewer system results in a 9.9 pound reduction of nitrogen annually. Since 2006, the City has taken 43 septic tanks in the City's MS4 area offline, and connected those parcels to sanitary sewer. In the first part of 2018, the City began connecting additional parcels in the MS4 area to sanitary sewer and expects to take 51 septic tanks offline, and connect those parcels to sanitary sewer before the end of the first permit cycle. By connecting 94 parcels to the City's sanitary sewer system, the total nitrogen reduction is 930.60 pounds per year. The nitrogen reduction credit for the septic disconnects is included in Table 3.6-1. Table B-2 in Appendix B contains the addresses of the 43 parcels that were connected to the City's sanitary sewer after 2006 and the year they were connected, as well as the addresses of the 51 parcels that will be connected before the end of the first permit cycle.

During its watershed modeling efforts and master drainage plan studies, the City identifies retrofit opportunities to construct new BMPs or enhance existing BMPs to help alleviate local flooding as

well as improve water quality. The City is taking nutrient reduction credit under this action plan for the construction of five retrofit BMPs. The five regional retrofit BMPs include 3 wet ponds, a wet swale, and a dry detention basin. The City submitted applications to the state for SLAF grants to fund the design and construction of the wet ponds and the wet swale, and was awarded grant money for those four BMPs. Construction has been completed on three of the BMPs; the Washington Manor wet pond, the Yadkin Road wet swale, and the Copeland Drive dry detention pond, with construction beginning on the Twenty Second Street wet pond in early 2018. The New Mill Regional BMP is currently under design, and included in the City's FY18 budget. Construction is expected to be complete before the end of the first permit cycle. The locations and service areas of the five BMPs are shown in Figure 3.6-2. Together these BMPs provide annual reductions of 1,483.97, 310.71, and 112,340.71 pounds of nitrogen, phosphorus and suspended solids respectively. Reductions for the BMPs are summarized in Table 3.6-1 and nutrient reduction calculations for the BMPs are included in Table B-3.

The last group of BMPs that provide annual nutrient reductions towards meeting the City's required POC reductions are BMPs that have been implemented on single family residential parcels, through a partnership between the City and The Elizabeth River Project; a non-profit independent organization dedicated to restoring the Elizabeth River. The Elizabeth River Project recruits homeowners to implement BMPs such as raingardens, rain barrels, shoreline buffers, and nutrient management plans on their property. The City helps fund the BMPs on these properties, known as "River Star Homes", and the Elizabeth River project helps with the installation and implementation. Since November of 2015, the Elizabeth River Project has helped install 78 rain barrels on 54 parcels, develop 48 nutrient management plans for residential lawns, create 200 linear feet of living shoreline, convert 0.33 acres of pervious land to forest on 7 individual parcels, and create a shoreline buffer of 5,400 square feet. The total annual reductions provided by these BMPs are 16.09, 1.88, and 29,307.02 pounds of nitrogen, phosphorus and suspended solids respectively. While the nutrient reductions provided by these BMPs are very modest, they represent a very important part of the City's MS4 Program Plan. The work done by the Elizabeth River Program provides public education and outreach to homeowners on topics such as stormwater pollution prevention, and how the City's residents can contribute and improve the City's water quality. More information about the Elizabeth River Project and the River Star Home BMPs can be found at https://elizabethriver.org/.The reductions from these BMPs are summarized in Table 3.6-1 and the nutrient reduction calculations for each BMP type, as well as the addresses where these BMPs have been implemented are found in Tables C-1 through C-6 in Appendix C.

Together, the BMPs described above will provide total annual reductions of 2,908.45 pounds of nitrogen, 465.91 pounds of phosphorus, and 217,253.53 pounds of total suspended solids, and will exceed the City's required first permit cycle reductions by more than 1,900 pounds of nitrogen, 250 pounds of phosphorus, and 120,000 pounds of total suspended solids. The excess nutrient reductions will be carried forward to help the City meet its required 35% POC reductions during the City's second MS4 permit cycle.

3.7 MEANS AND METHODS TO REDUCE THE FIRST 5% POLLUTANT LOAD REDUCTIONS BY AN ADDITIONAL 15%

Permit Requirement: *I.D.1.b)1)(g) The means and methods to reduce 15% of total pollutant load reduction calculated in (e) to offset increased loads from new sources initiating construction between July 1, 2009 and June 30, 2014 and grandfathered projects in accordance with 9 VAC 25-870-48, 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. The permittee shall utilize Table 3 to develop the equivalent pollutant load for nitrogen and total suspended solids.*

Chesapeake's MS4 permit requires reductions of increased loads from new sources as well as projects grandfathered under the VSMP regulation. This requirement recognizes that the Phase 5.3.2 Chesapeake Bay Watershed Model does not account for increased loads after 2009 where the design of post-construction stormwater management facilities utilized an average land cover condition greater than 16%.

After weighing considerable input from permittees, stakeholders, and concerned citizens during the permit drafting process, DEQ determined that requiring Hampton Roads MS4 permittees to meet an additional 15% pollutant load reduction during the first permit cycle would adequately compensate for this shortcoming in the Phase 5.3.2 model. Because the first permit cycle requires 5% compliance with the Chesapeake Bay TMDL, the 15% addition comprises a total increase of 0.75% in the TMDL requirements.

Chesapeake's MS4 Permit Fact Sheet, prepared by DEQ describes, in detail, how the 15% increase was determined and how it is to be applied.

This Chesapeake Bay TMDL Action Plan complies with the 15% requirement. **Table 3.5-1 includes the 15% addition in computing the total pollutant reduction requirements, which are used to determine permit compliance in Table 3.6-1.**

For the first permit cycle, the required 15% additional annual reductions from Chesapeake's MS4 are 122.62 pounds of Nitrogen, 27.97 pounds of Phosphorus, and 12,677.23 pounds of Total Suspended Solids. **These additional reductions are included with the required first permit cycle nutrient reductions listed in Table 3.6-1.**

3.8 ESTIMATE OF THE EXPECTED COST TO IMPLEMENT THE NECESSARY REDUCTIONS DURING THE PERMIT CYCLE

Permit Requirement: *I.D.1.b)1)(h) An estimate of the expected cost to implement the necessary reductions during the permit cycle.*

With the exception of the existing BMPs installed between January 1, 2006 and June 30, 2009, Chesapeake has estimated the design, construction and implementation costs to the City for the 94 sanitary sewer connections, 5 regional BMPs, and funding for the residential BMP program managed by the Elizabeth River Project. The estimated cost to the City to implement those BMPs is approximately:

- **$2,241,653** for sanitary sewer connections,
- **$154,492** for River Star Homes BMPs, and
- **$2,894,400** for the design and construction of regional stormwater retrofit BMPs.

These budget items produce a total cost to the City during the first permit cycle of $5,290,545 dollars.

Table 3.8-1 has a breakdown of costs to the City to implement the BMPs described in this Action Plan. As stated previously, the City has completed 43 of 94 sanitary sewer connections and finished construction on 3 of 5 regional retrofit BMPs. Also, the City's partnership with the Elizabeth River Project will continue through September of 2019. The City is committed to the remaining 51 sanitary sewer connections and the construction of the 22nd Street and New Mill wet ponds. Construction on the 22nd Street pond and the new sanitary sewer connections is expected to begin by the time the City submits this Chesapeake Bay TMDL Action Plan to DEQ, and both projects together with the New Mill Regional BMP will be completed before the end of the first permit cycle.

Chesapeake reserves the right to substitute other means and methods for any of these BMPs, in accordance with the MS4 permit, if it becomes advantageous to the City to do so.

3.9 OPPORTUNITY FOR RECEIPT AND CONSIDERATION OF PUBLIC COMMENT ON THE DRAFT CHESAPEAKE BAY TMDL ACTION PLAN

Permit Requirement: *I.D.1.b)1)(i) An opportunity for receipt and consideration of public comment on the draft Chesapeake Bay TMDL Action Plan.*

The City held discussions with DEQ during the permit negotiation process and informed DEQ that there would not be a formal public notice, as it is not required. The City collected public input on the draft Chesapeake Bay TMDL Action Plan by:

- Providing a copy and presenting the plan to our Citizen Stormwater Committee. The Committee is appointed by the Mayor and City Council and more information can be found here: http://www.cityofchesapeake.net/government/Boards-Commissions/full-listing/Chesapeake-Stormwater-Committee.htm
- The draft plan was circulated directly to interested organizations and citizens including the Elizabeth River Project, the Chesapeake Bay Foundation, and Friends of Indian River.
- The draft report was also published on the City's web page.
- In all cases the City provided a 14 day period to collect comments.

3.10 LIST OF ALL PUBLIC COMMENTS RECEIVED AND MODIFICATIONS MADE IN RESPONSE TO PUBLIC COMMENTS

Permit Requirement: *I.D.1.b)1)(j) A list of all comments received as a result of public comment and any modifications made to the draft Chesapeake Bay TMDL Action Plan as a result of the public comments.*

A list of all public comments received can be found in Appendix E, as well as a list of any modifications made to Chesapeake's draft Chesapeake Bay TMDL Action Plan based on those comments.

Table 3.4-1. Estimate of Annual POC Loads Discharged from Existing Sources as of June 30, 2009

Land Cover	Pollutant	Acres Served as of 6/30/2009	2009 EOS Loading Rate* (lbs/ac/yr)	Estimated POC Load - 2009 Progress Run (lbs/yr)	Total POC Load (lbs/yr)
Regulated Urban Impervious	Nitrogen	10,924.61	9.574666034	104,599.49	220,206.20
Regulated Urban Pervious		16,892.27	6.843763814	115,606.71	
Regulated Urban Impervious	Phosphorus	10,924.61	1.786015931	19,511.53	27,895.68
Regulated Urban Pervious		16,892.27	0.496330705	8,384.15	
Regulated Urban Impervious	Total Suspended Solids	10,924.61	703.4240675	7,684,633.60	9,437,436.96
Regulated Urban Pervious		16,892.27	103.763636	1,752,803.36	

*Loading rates for the James River Basin taken from Table 1 of the City's MS4 Permit.

Table 3.5-1. Total Pollutant Load Reductions Necessary to Reduce the Annual the Annual POC Existing Loads

Land Cover	Pollutant	Acres Served as of 6/30/2009	First Permit Cycle Reduction* (lbs/ac/yr)	Reduction Required (5%) (lbs/yr)	Additional Reduction (Additional 15%) (lbs/ac/yr)	Additional 15% Reduction (lbs/yr)	Total Reduction (5% + additional 15%) (lbs/yr)	Total Pollutant Reduction (lbs/yr)
Regulated Urban Impervious	Nitrogen	10,924.61	0.043085997	470.70	0.006462900	70.60	541.30	940.15
Regulated Urban Pervious		16,892.27	0.020531291	346.82	0.003079694	52.02	398.84	
Regulated Urban Impervious	Phosphorus	10,924.61	0.014288127	156.09	0.002143219	23.41	179.51	214.46
Regulated Urban Pervious		16,892.27	0.001799199	30.39	0.000269880	4.56	34.95	
Regulated Urban Impervious	Total Suspended Solids	10,924.61	7.034240675	76,846.34	1.055136101	11,526.95	88,373.29	97,192.08
Regulated Urban Pervious		16,892.27	0.453965907	7,668.51	0.068094886	1,150.28	8,818.79	

*Reductions in loading rates for the James River Basin taken from Table 2 of the City's MS4 Permit.

Table 3.6-1. Summary of the Means and Methods to Meet the Required Reductions

Existing BMPs Online Between January 1, 2006 and June 30, 2009.	Nutrient Reductions (lbs/yr)		
	TN	TP	TSS
Wet Ponds	395.86	138.36	68,304.47
Bioretention Basins	3.64	0.77	305.75
Dry Detention Ponds	19.53	4.51	1,450.14
Dry Extended Detention Ponds	15.99	2.14	2,237.79
Filterra Units	9.01	1.80	1,076.70
Dry Swales	16.09	1.92	646.74
Infiltration Basins	9.05	1.38	551.07
Hydrodynamic Structures	5.05	1.57	582.08
Surface Sand Filter	3.02	0.79	408.68
Vegetated Filter Strip	0.55	0.08	42.38
Total Reductions	**477.79**	**153.32**	**75,605.80**

Septic Tank Disconnects and Connections to Sanitary Sewer	Nutrient Reductions (lbs/yr)		
	TN	TP	TSS
Total Reductions	**930.60**	**0.00**	**0.00**

City of Chesapeake Regional Stormwater Retrofit BMPs.	Nutrient Reductions (lbs/yr)		
	TN	TP	TSS
Washington Manor Wet Pond (Level 2 Design)	452.22	139.84	46,368.33
22nd St. Wet Pond (Level 1 Design)	28.26	10.41	5,237.99
Yadkin Rd. Wet Swale (Level 1 Design)	287.23	34.65	32,496.96
Copeland Dr. Dry Detention Pond	24.71	6.08	2,042.05
New Mill Wet Pond (Level 2 Design)	691.55	119.73	26,195.38
Total Reductions	**1,483.97**	**310.71**	**112,340.71**

River Star Homes Residential BMPs.	Nutrient Reductions (lbs/yr)		
	TN	TP	TSS
Rain Barrels	2.60	0.57	238.89
Rain Gardens	3.94	0.65	268.16
Shoreline Buffers	0.49	0.12	40.40
Living Shoreline	4.29	0.27	28,740.34
Land Use Conversion	1.67	0.16	19.23
Residential Nutrient Management	3.10	0.11	0.00
Total Reductions	**16.09**	**1.88**	**29,307.02**

TOTAL REDUCTIONS ACHIEVED (lbs/yr)	TN	TP	TSS
	2,908.45	465.91	217,253.53

First Permit Cycle	Pollutant		
	TN	TP	TSS
*Required Reductions (lbs/yr)	940.15	214.46	97,192.08
Reductions Achieved (lbs/yr)	2,908.45	465.91	217,253.53
Remaining Reductions (lbs/yr)	-1,968.30	-251.45	-120,061.45

*Includes the Additional 15% Required Reductions.

Table 3.8-1. BMP Implementation Costs for the First Permit Cycle

City of Chesapeake Regional Retrofit BMPs			
BMP	Implementation Cost[1]	State Funding[2]	Total Cost To City
Washington Manor Wet Pond (Level 2 Design)	$2,305,814	$1,055,814	$1,250,000
22nd St. Wet Pond (Level 1 Design)	$675,000	$337,500	$337,500
Yadkin Rd. Wet Swale (Level 1 Design)	$115,090	$57,545	$57,545
Copeland Drive Dry Detention Pond	$226,380	$0	$226,380
New Mill Creek Wet Pond (Level 1 Design)	$2,045,950	$1,022,975	$1,022,975
		Total Cost	$2,894,400

Elizabeth River Project and River Star Home BMPs			
	Year 1 (2015-2016)	Year 2 (2016-2017)	Total Cost To City
Total Program Cost[3]	$63,822	$90,670	$154,492

Sanitary Sewer Connections for Parcels with Septic Tanks			
Project	Jolliff Rd./Moore Cir. /Jaye Cir.	Jolliff Rd./Manning Ct./ Wampler Pl./Vico Dr.	Total Cost To City
Total Cost[4]	$659,798	$1,581,855	$2,241,653

Total Cost for BMPs Implemented to Meet the City's Chesapeake Bay TMDL Requirements:	$5,290,545

Notes:

1. Implementation costs for the City's regional retrofit BMPs include design and permitting fees, and construction costs. Property acquisition fees are not included in the implementation costs.
2. State funding was provided through matching grants from the Virginia Stormwater Local Assistance Fund (SLAF) program.
3. Total program costs for River Star Home BMPs include funds for BMP construction and/or implementation, as well as program oversight by the Elizabeth River Project.
4. Total costs include design fees and construction costs. The projects listed were part of two infrastructure upgrade projects that included water and sewer line improvements and sanitary sewer connections to residential parcels with septic tanks. The total costs reflect construction costs for the sanitary sewer improvements only, and do not include the construction costs for other utilities. Design fees for the entire project are included with the total costs, and were not broken out specifically for the sanitary sewer improvements. The total costs include design fees of $152,793 for the Jolliff Rd./Moore Cir./Jaye Cir. Project, and $351,883 for the Jolliff Rd./Manning Ct./Wampler Pl./Vico Dr. project.

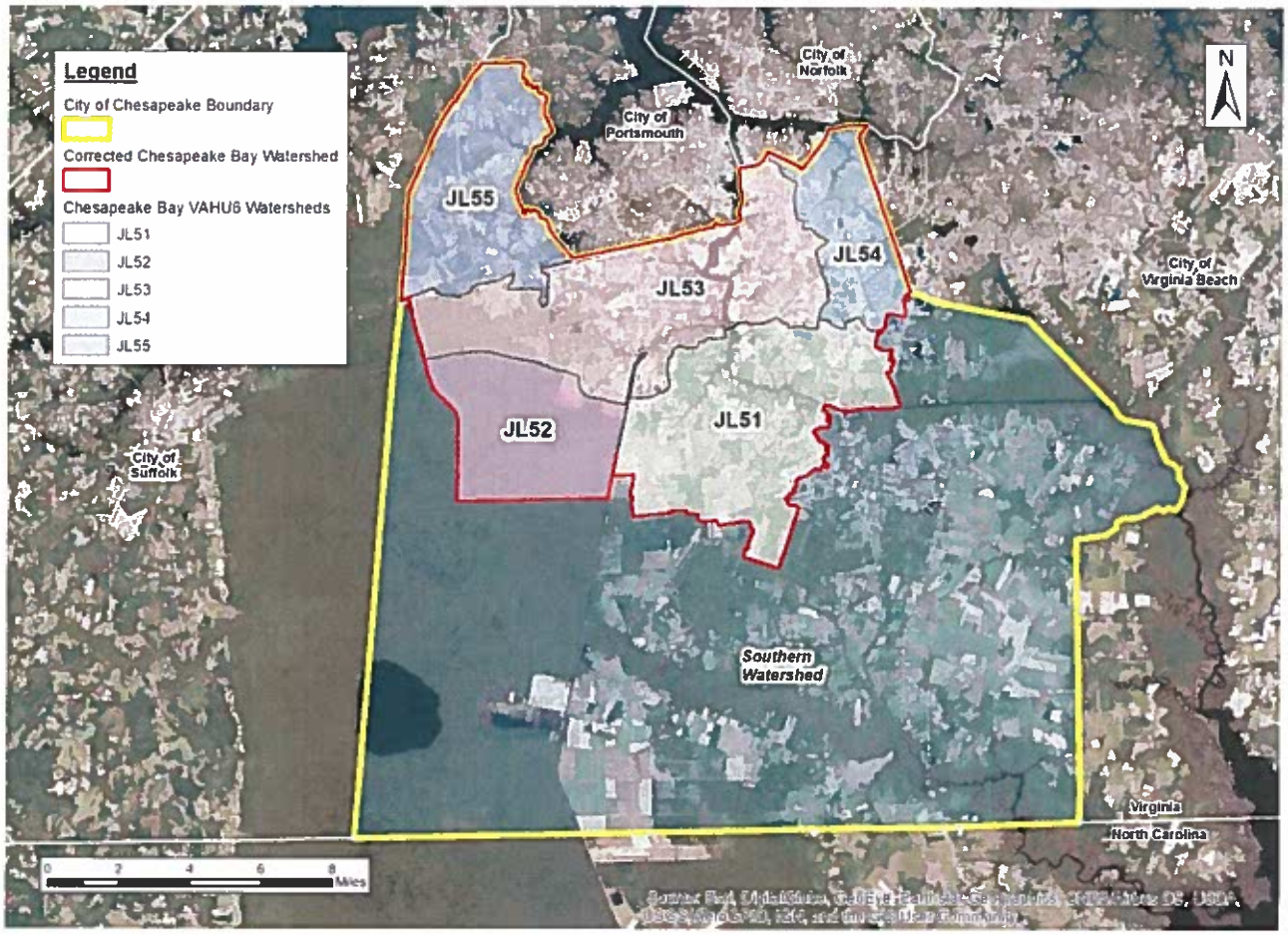


Figure 3.4-1. Corrected Chesapeake Bay Watershed Boundary and VAHU6 Watersheds

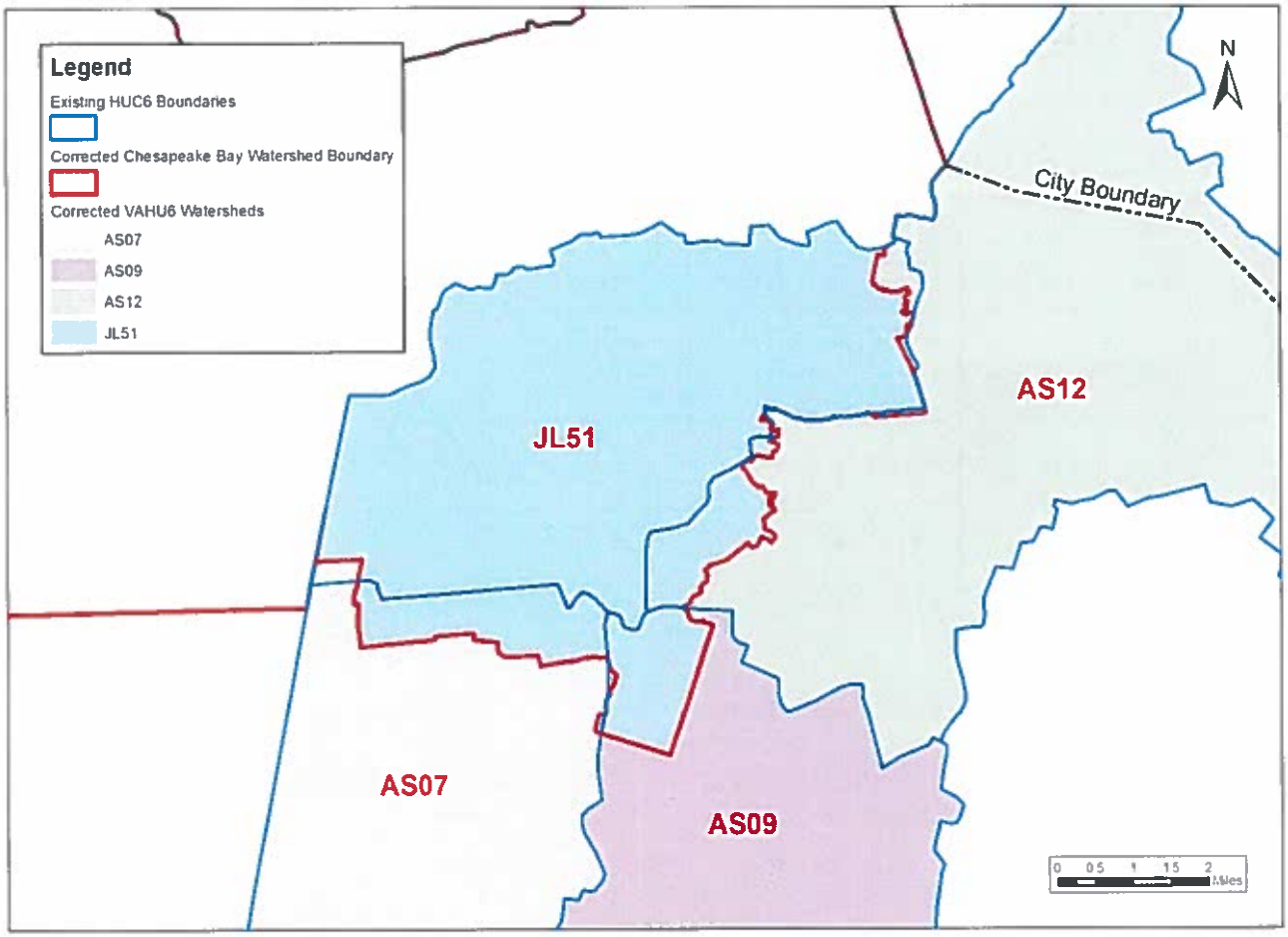


Figure 3.4-2. Existing and Corrected VAHU6 Boundaries

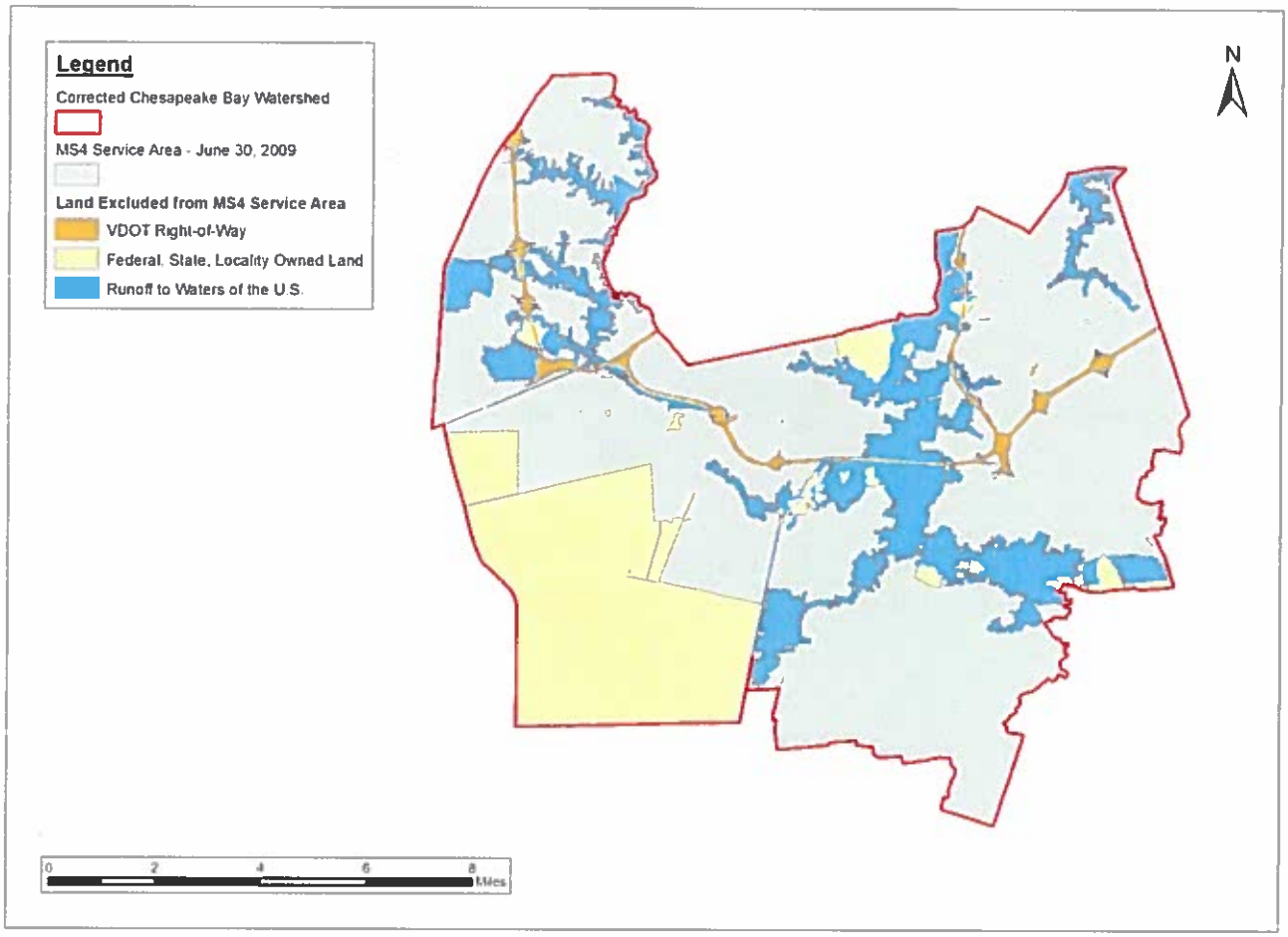


Figure 3.4-3. Chesapeake Bay MS4 Service Area as of June 30, 2009

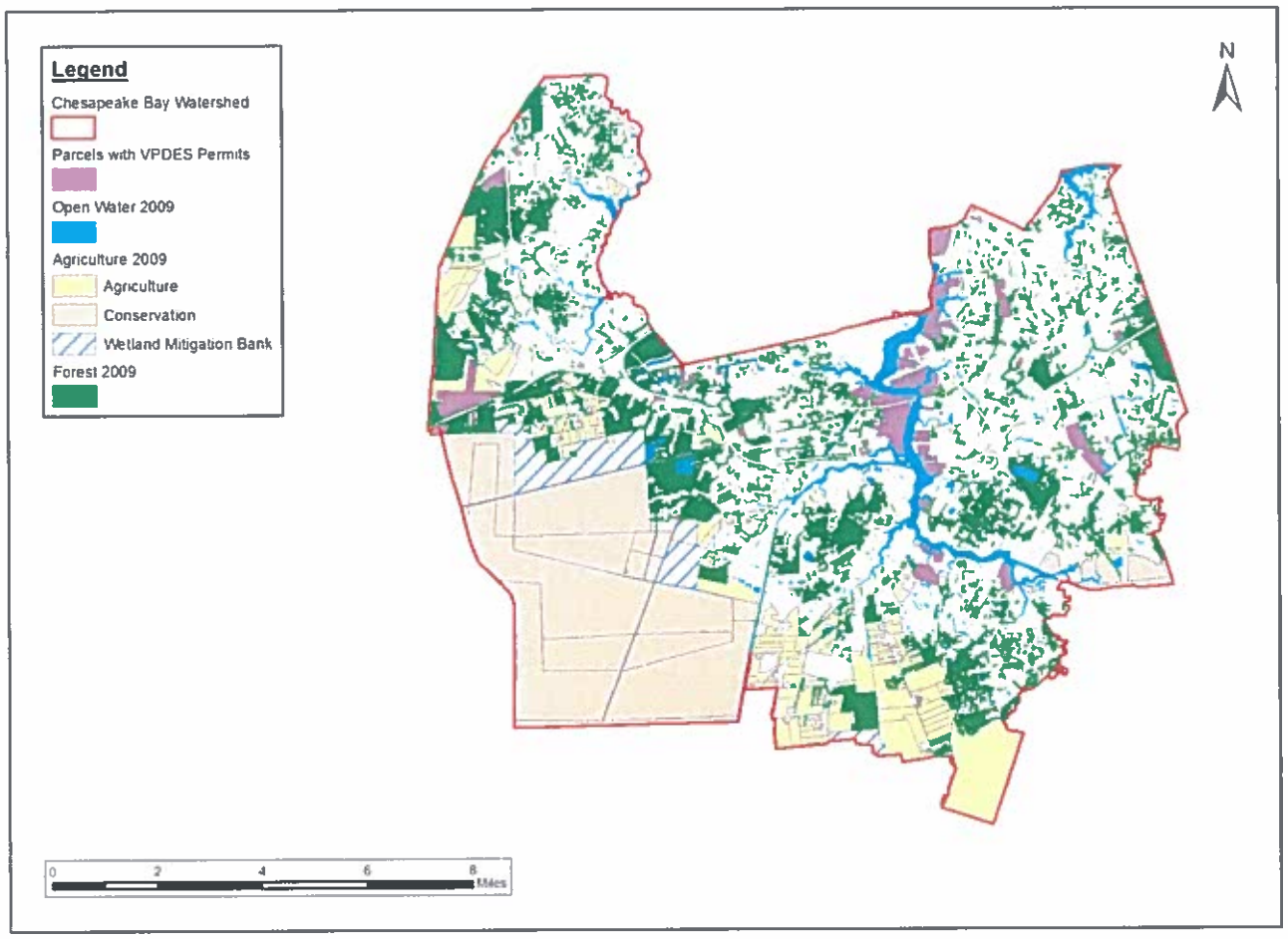


Figure 3.4-4. Excluded Land Cover and Parcels with VPDES Permits

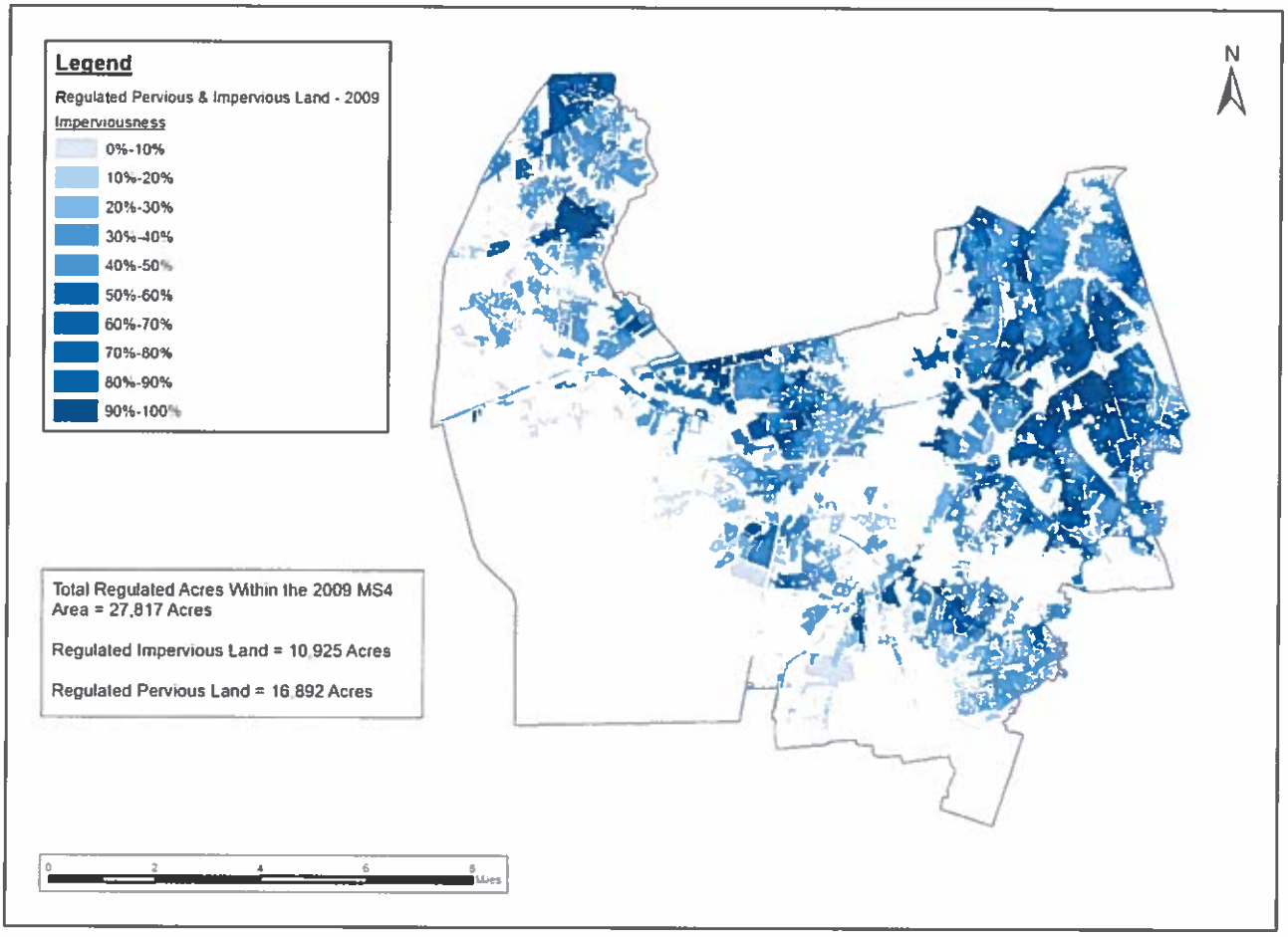


Figure 3.4-5. Regulated Pervious and Impervious Land within the MS4 Service Area

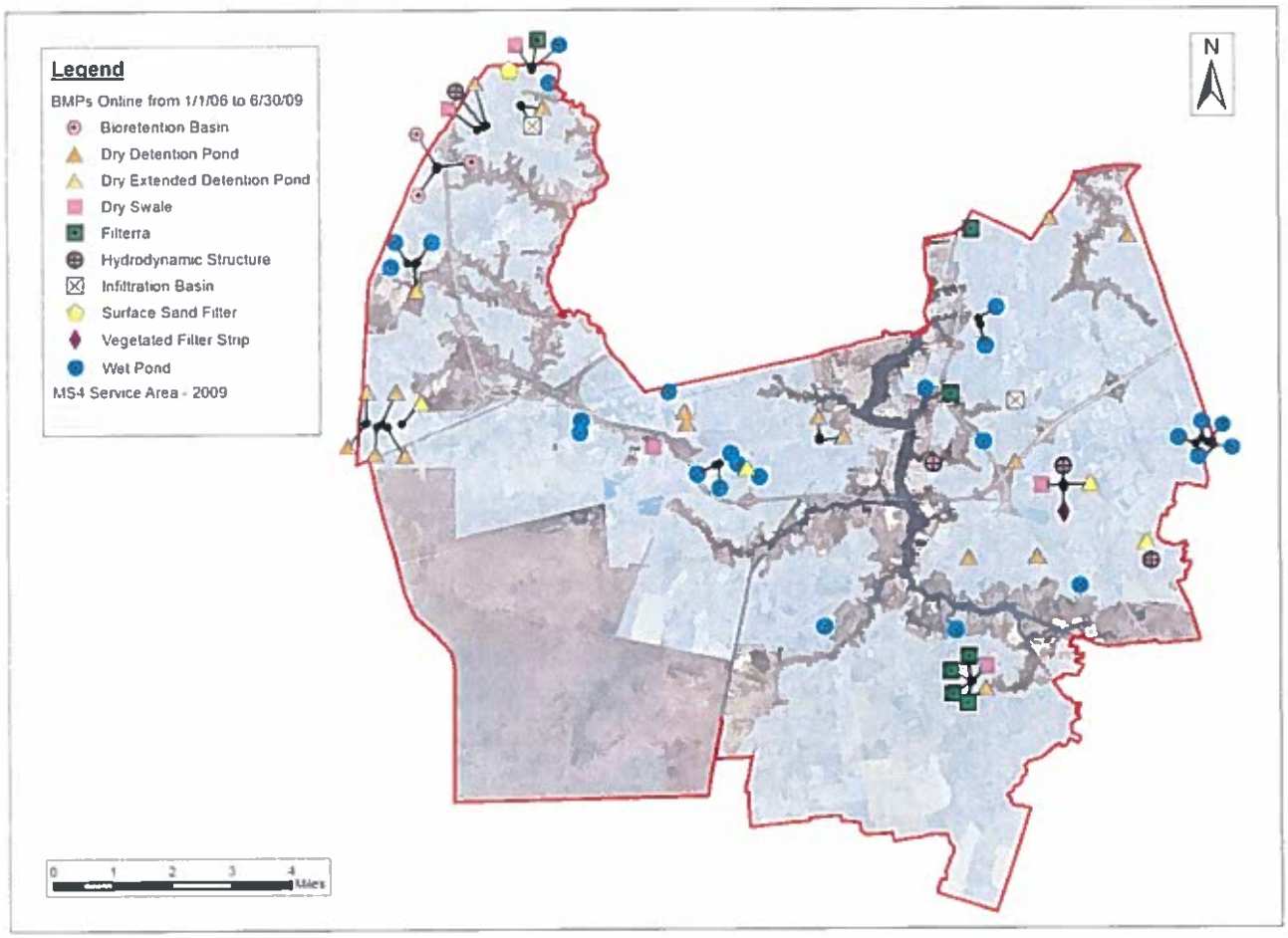


Figure 3.6-1. Existing BMPs Online Between January 1, 2006 and June 30, 2009

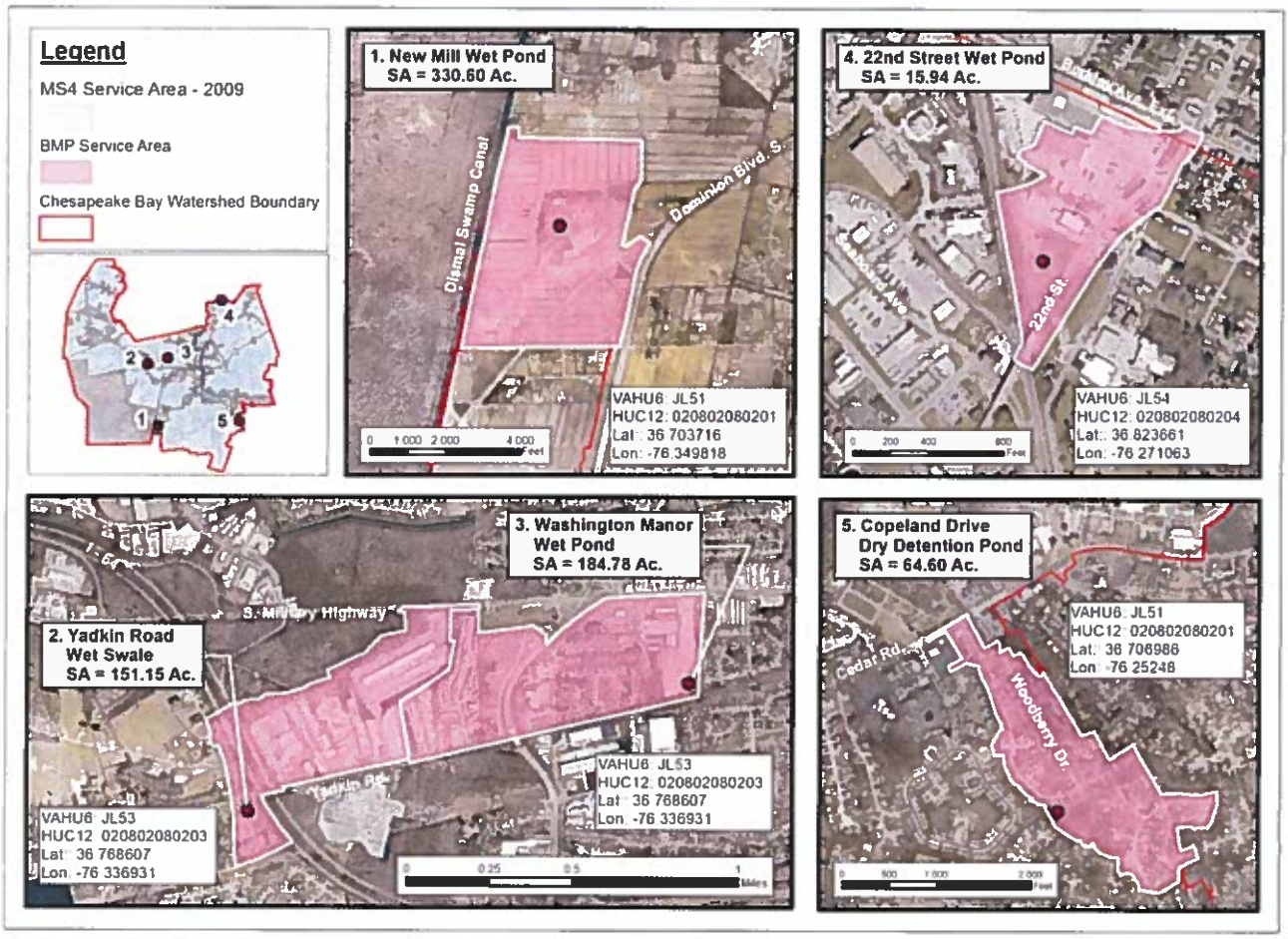


Figure 3.6-2. Regional Stormwater Retrofit BMPs

Appendix A.
DEQ Approval for Adjustments to Chesapeake's VAHU6 Watershed Boundaries

Chesapeake VIRGINIA

AECOM

Chesapeake VIRGINIA

City of Chesapeake

Department of Public Works
Post Office Box 15225
306 Cedar Road
Chesapeake, Virginia 23328
(757) 382-6101

November 30, 2016

Ms. Jaime Bauer
Environmental Specialist II
DEQ Central Office
629 East Main Street
Richmond, Virginia 23218

Dear Ms. Bauer:

The City of Chesapeake is nearing completion of its MS4 service area mapping, and will begin work on the City's Chesapeake Bay TMDL Action Plan soon. Before beginning to compute pollutant loads, and required nutrient and sediment reductions, the City wishes to resolve TMDL planning issues concerning discrepancies between the 6th order hydrologic unit (HUC 6) boundaries, and the local watershed boundaries delineated by the City.

Over the last ten years, the City has spent considerable time and effort conducting local watershed studies. These watershed studies involved detailed delineations of watershed boundaries based on topography as well as the hydraulic connectivity of the City's stormwater system. As you are likely aware, there are often major differences between the HUC 6 boundaries and watershed boundaries based on detailed delineations made during local watershed studies. The attached PDF shows the HUC 6 watersheds (in red), and some of the local watershed sub basins delineated during master drainage studies. There are approximately 4,100 acres draining to the Chesapeake Bay that are not included in the Bay's HUC 6 watersheds. While including these areas in the Chesapeake Bay watershed, for purposes of our TMDL Action plan, may increase our pollutant load slightly, there may be opportunities for BMP construction or retrofitting in these areas as well. In addition, there are local TMDLs for bacteria and total phosphorus in the City's southern watersheds. If these areas are not included with the Bay watershed, they add to southern watershed areas with bacterial or phosphorus waste load allocations, as well as present inaccuracies in the southern watershed land cover data.

Unless directed otherwise by the Department, the City intends to include the acreage in discrepancy within our Chesapeake Bay TMDL Action Plan since this area actually drains to the Elizabeth River and Chesapeake Bay. Likewise, the City will not include those acres in the southern watershed TMDL Action Plans. The City is requesting direction from the Department regarding what additional actions, including reporting methodologies (i.e. HUC 6 acres vs. local watershed acres) if any, the City needs to take in order to resolve these differences between the HUC 6 boundaries and the actual watershed boundaries.

In short, the City has accurate local watershed and drainage data that does not match the HUC 6 boundaries. TMDL compliance efforts need to be based on the best available data. Please feel free to contact me if you have questions or would like to discuss this further.

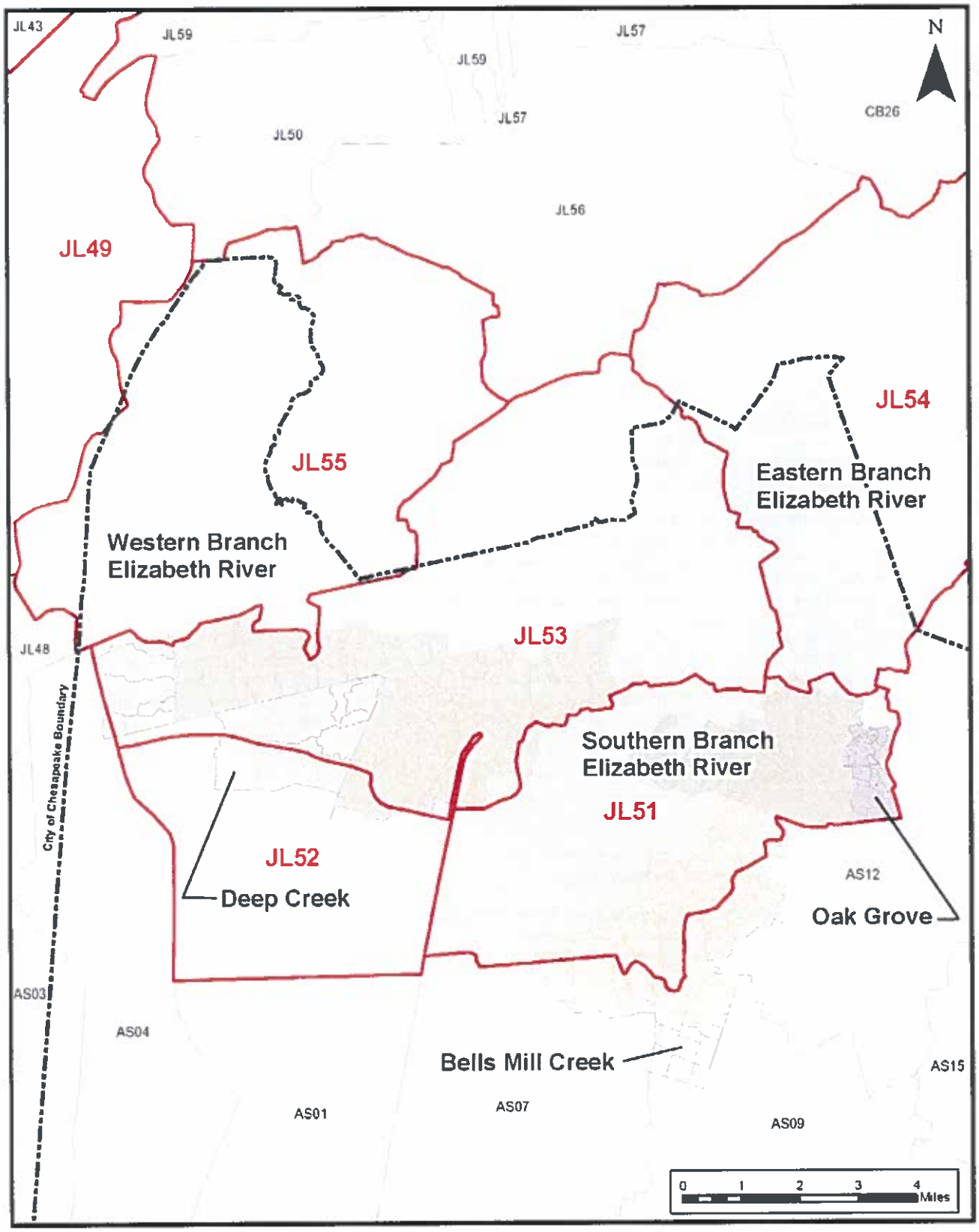
Sincerely,

Barbara S. Brumbaugh

Barbara S. Brumbaugh
Environmental Quality Coordinator

CC: Mr. James Davis-Martin, DEQ

"The City of Chesapeake adheres to the principles of equal employment opportunity. This policy extends to all programs and services supported by the City."



City of Chesapeake - 6th Order Hydrologic Units

From: Bauer, Jaime (DEQ) [mailto:Jaime.Bauer@deq.virginia.gov]
Sent: Tuesday, December 13, 2016 3:05 PM
To: Barbara Brumbaugh
Cc: Davis-Martin, James (DEQ)
Subject: RE: Chesapeake Bay HUC 6 Boundaries

Hi, Barbara,

As discussed this afternoon, DEQ is fine with the City using the real HUC boundaries that were verified for the Bay and Local TMDL action plans. When you prepare and submit your Bay Action Plan, and any local TMDL action plan that is also impacted, please include a copy of your letter and the map as well as this acknowledgement.

Additionally, as you mentioned you are trying to pull together the information requested by James regarding GIS shape files. As you are aware time adjustments to the Bay modeling inputs is running out, so the sooner you can provide that information, the better.

If you have any further questions, please let me know.

Jaime

Jaime L. Bauer | Environmental Specialist II | DEQ | 804-698-4416| jaime.bauer@deq.virginia.gov

From: Davis-Martin, James (DEQ)
Sent: Thursday, December 08, 2016 9:21 AM
To: Bauer, Jaime (DEQ); Barbara Brumbaugh
Subject: RE: Chesapeake Bay HUC 6 Boundaries

Barbara:
In order to have any chance of advancing this at the Bay Program, we will need the GIS shape Files for the Bay boundary. Can you provide that shape file ASAP?

From: Bauer, Jaime (DEQ)
Sent: Thursday, December 08, 2016 7:41 AM
To: Barbara Brumbaugh
Cc: Davis-Martin, James (DEQ)
Subject: RE: Chesapeake Bay HUC 6 Boundaries

Good morning, Barbara,

I apologize for the delayed response, but I am still catching up from a hectic week last week. From a permitting and TMDL compliance standpoint, the proposal to use the actual, confirmed, and delineated watersheds makes sense but also want to understand the full implications of this approach. I am checking with our regional TMDL staff to get an idea of the impact this may have on any local TMDLs. Additionally, DEQ staff is also checking with the Chesapeake Bay Program staff to see if it is possible to get the watershed boundaries corrected in Phase 6 of the model.

I'll be in touch soon.

Jaime

Jaime L. Bauer | Environmental Specialist II | DEQ | 804-698-4416| jaime.bauer@deq.virginia.gov

From: Barbara Brumbaugh [mailto:Bbrumba@cityofchesapeake.net]
Sent: Thursday, December 01, 2016 5:20 PM
To: Bauer, Jaime (DEQ); Davis-Martin, James (DEQ)
Subject: Chesapeake Bay HUC 6 Boundaries
Importance: High

Jaime and James, please see attached letter and exhibit regarding how the City of Chesapeake intends to account for discrepancies between HUC 6 watershed boundaries and local watershed boundaries.

Please feel free to contact me if you have questions or would like to discuss this further.

Thank you,
Barbara

Barbara Brumbaugh
Environmental Quality Coordinator
City of Chesapeake Public Works Dept
Environmental Quality Division
(757) 382-6919
bbrumba@cityofchesapeake.net

Appendix B.
Nutrient Reduction Calculations for Existing BMPs, Sanitary Sewer Connections, and Regional Stormwater BMPs

Chesapeake VIRGINIA

AECOM

Table B-1. Existing BMPs Brought Online Between January 1, 2006 and June 29, 2009

BMP	Date Online	Address	Total Acres Served	Impervious Acres Served	Pervious Acres Served	VAHU6	HUC12	Latitude	Longitude	Comment
Bioretention Basin	11/2/2006	3032 GUM CT	0.630	0.200	0.430	JL55	020802080205	36.841908	-76.436153	Three Basins confirmed by City.
Bioretention Basin	11/2/2006	3032 GUM CT	0.630	0.200	0.430	JL55	020802080205	36.842071	-76.436462	Three Basins confirmed by City.
Bioretention Basin	11/2/2006	3032 GUM CT	0.630	0.200	0.430	JL55	020802080205	36.841475	-76.436515	Three Basins confirmed by City.
		Total	1.890	0.600	1.290					
Dry Detention Pond	6/12/2009	5164 W MILITARY HWY	9.020	0.819	8.201	JL55	020802080205	36.779042	-76.453514	
Dry Detention Pond	1/4/2006	2601 INDIAN RIVER RD	8.210	5.250	2.960	JL54	020802080204	36.825799	-76.251887	
Dry Detention Pond	6/12/2009	5164 W MILITARY HWY	6.720	0.610	6.110	JL55	020802080205	36.779214	-76.456647	
Dry Detention Pond	4/4/2006	821 FERNBRIDGE PL	4.880	1.035	3.845	JL51	020802080201	36.743808	-76.279066	
Dry Detention Pond	6/12/2009	5038 W MILITARY HWY	4.620	0.419	4.201	JL55	020802080205	36.779936	-76.460295	
Dry Detention Pond	7/20/2006	2122 JOLLIFF RD	4.042	1.455	2.587	JL55	020802080205	36.818484	-76.443928	
Dry Detention Pond	7/18/2008	521 MCCOSH DR	2.940	0.970	1.970	JL53	020802080203	36.766766	-76.264222	
Dry Detention Pond	7/26/2006	940 CEDAR RD	2.315	0.644	1.671	JL51	020802080201	36.711954	-76.275037	
Dry Detention Pond	6/12/2009	5164 W MILITARY HWY	1.320	0.120	1.200	JL55	020802080205	36.780280	-76.459694	
Dry Detention Pond	5/6/2008	3500 CLOVER RD	1.300	1.274	0.026	JL55	020802080205	36.851707	-76.421124	
Dry Detention Pond	12/21/2007	3617 KOPPENS WAY	1.272	0.092	1.180	JL53	020802080203	36.781086	-76.363518	
Dry Detention Pond	5/2/2007	201 RIVER WALK PKY	1.200	0.866	0.334	JL51	020802080201	36.743604	-76.258357	
Dry Detention Pond	12/31/2008	1101 CAVALIER BLVD	1.100	1.100	0.000	JL53	020802080203	36.778123	-76.362989	Corrected- Wet pond to dry pond
Dry Detention Pond	6/12/2009	5164 W MILITARY HWY	1.010	0.092	0.918	JL55	020802080205	36.779799	-76.455338	
Dry Detention Pond	1/5/2009	4201 INDIAN RIVER RD	0.341	0.220	0.121	JL54	020802080204	36.821266	-76.228450	
Dry Detention Pond	7/5/2006	2973 S MILITARY HWY	0.230	0.167	0.063	JL53	020802080203	36.773643	-76.322935	
Dry Detention Pond	7/5/2006	2973 S MILITARY HWY	0.216	0.157	0.059	JL53	020802080203	36.773112	-76.322951	
Dry Detention Pond	1/22/2008	4261 TAYLOR RD	0.211	0.078	0.133	JL55	020802080205	36.856215	-76.410367	
		Total	50.947	15.367	35.580					
Dry Extended Detention Pond	4/25/2006	ASTOR WAY	3.770	2.100	1.670	JL53	020802080203	36.766988	-76.345144	Corrected -Detention to Extended Detention
Dry Extended Detention Pond	6/12/2009	5164 W MILITARY HWY	2.700	0.245	2.455	JL55	020802080205	36.779799	-76.449223	
Dry Extended Detention Pond	5/9/2007	500 JUDAH WAY	2.480	1.700	0.780	JL51	020802080201	36.746519	-76.225355	
Dry Extended Detention Pond	11/9/2007	1133 BATTLEFIELD BLVD N	0.930	0.465	0.465	JL54	020802080204	36.760680	-76.249618	
		Total	9.880	4.510	5.370					
Dry Swale	1/25/2008	4626 TAYLOR RD	1.500	0.300	1.200	JL55	020802080205	36.850745	-76.423987	
Dry Swale	2/23/2007	1004 ENTERPRISE COURT	1.006	0.197	0.809	JL53	020802080203	36.772566	-76.373246	
Dry Swale	3/28/2007	3207 CHURCHLAND BLVD	0.281	0.182	0.099	JL55	020802080205	36.865538	-76.406947	
Dry Swale	11/9/2007	1133 BATTLEFIELD BLVD N	0.150	0.075	0.075	JL54	020802080204	36.760659	-76.250029	
Dry Swale	6/10/2009	1100 CEDAR RD	0.092	0.071	0.021	JL51	020802080201	36.713696	-76.278871	
		Total	3.029	0.824	2.205					

BMP	Date Online	Address	Total Acres Served	Impervious Acres Served	Pervious Acres Served	VAHU6	HUC12	Latitude	Longitude	Comment
Filterra	6/6/2006	300 LIBERTY ST	0.630	0.250	0.380	JL53	020802080203	36.823400	-76.275627	
Filterra	6/8/2007	4202 BAINBRIDGE BLVD	0.619	0.590	0.029	JL53	020802080203	36.783470	-76.283102	
Filterra	3/28/2007	3207 CHURCHLAND BLVD	0.499	0.323	0.176	JL55	020802080205	36.864944	-76.407023	
Filterra	6/10/2009	1108 CEDAR RD	0.206	0.159	0.047	JL51	020802080201	36.713671	-76.279449	
Filterra	6/10/2009	1100 CEDAR RD	0.206	0.159	0.047	JL51	020802080201	36.713485	-76.279192	
Filterra	6/10/2009	1100 CEDAR RD	0.206	0.159	0.047	JL51	020802080201	36.713568	-76.279085	
Filterra	6/10/2009	1100 CEDAR RD	0.206	0.159	0.047	JL51	020802080201	36.713560	-76.279074	
		Total	2.574	1.799	0.775					
Hydrodynamic Structure	5/11/2009	HARVEST GREEN LANE	8.750	6.040	2.710	JL51	020802080201	36.741899	-76.224080	
Hydrodynamic Structure	1/25/2008	4626 TAYLOR RD	1.500	0.300	1.200	JL55	020802080205	36.851403	-76.421936	
Hydrodynamic Structure	5/6/2008	1636 GREAT BRIDGE BLVD	1.300	1.274	0.026	JL53	020802080203	36.766709	-76.288794	
Hydrodynamic Structure	11/9/2007	1129 BATTLEFIELD BLVD N	0.140	0.070	0.070	JL54	020802080204	36.760554	-76.249587	
		Total	11.690	7.684	4.006					
Infiltration Basin	9/12/2006	2121 S MILITARY HWY	1.160	0.580	0.580	JL53	020802080203	36.781611	-76.283486	
Infiltration Basin	1/22/2008	4261 TAYLOR RD	0.200	0.152	0.048	JL55	020802080205	36.856349	-76.410557	
		Total	1.360	0.732	0.628					
Surface Sand Filter	6/27/2006	3333 WESTERN BRANCH BLVD	0.820	0.710	0.110	JL55	020802080205	36.665281	-76.413806	
Vegetated Filter Strip	11/9/2007	1125 BATTLEFIELD BLVD N	0.150	0.075	0.075	JL54	020802080204	36.760023	-76.249737	
Wet Pond	11/7/2008	CORNER LOT COR	30.160	24.730	5.430	JL55	020802080205	36.818750	-76.446036	
Wet Pond	11/7/2008	SADLER ST	26.100	20.880	5.220	JL55	020802080205	36.817874	-76.451347	Changed total SA to 26.1 Ac
Wet Pond	1/22/2007	3516 S MILITARY HWY	15.343	12.945	2.398	JL53	020802080203	36.767852	-76.354491	
Wet Pond	1/22/2007	3516 S MILITARY HWY	12.585	10.618	1.967	JL53	020802080203	36.768091	-76.353332	
Wet Pond	5/2/2007	1400 CAVALIER BLVD	12.234	8.833	3.401	JL53	020802080203	36.785882	-76.368284	
Wet Pond	4/7/2009	CARROLLTON WAY	11.878	5.325	6.554	JL54	020802080204	36.769847	-76.209712	
Wet Pond	12/31/2006	2500 RODGERS ST	11.030	5.070	5.960	JL53	020802080203	36.801734	-76.273988	
Wet Pond	7/15/2008	255 GREAT BRIDGE BLVD	11.000	9.900	1.100	JL51	020802080201	36.736195	-76.245725	
Wet Pond	5/22/2006	FALLS CREEK DRIVE	10.708	0.921	9.788	JL51	020802080201	36.726012	-76.283419	
Wet Pond	11/7/2008	CORNER LOT COR	10.250	7.180	3.070	JL55	020802080205	36.818870	-76.443279	
Wet Pond	8/31/2007	1401 KELLAND DR	10.213	7.374	2.839	JL53	020802080203	36.771781	-76.273581	
Wet Pond	6/19/2008	500 FREEMAN AVE	10.100	2.800	7.300	JL53	020802080203	36.784979	-76.290644	
Wet Pond	4/16/2007	713 FENWAY AVE.	10.100	8.200	1.900	JL53	020802080203	36.764604	-76.341462	
Wet Pond	5/1/2006	CARROLLTON WAY	8.056	3.097	4.959	JL54	020802080204	36.770088	-76.205994	

BMP	Date Online	Address	Total Acres Served	Impervious Acres Served	Pervious Acres Served	VAHU6	HUC12	Latitude	Longitude	Comment
Wet Pond	5/1/2006	CARROLTON WAY	7.414	2.850	4.564	JL54	020802080204	36.770964	-76.207858	
Wet Pond	4/27/2007	1477 KEMPSVILLE RD	6.960	5.250	1.710	JL54	020802080204	36.769376	-76.204445	
Wet Pond	9/6/2007	4156 S MILITARY HWY	4.704	1.079	3.624	JL55	020802080205	36.779352	-76.394985	
Wet Pond	1/22/2007	3516 S MILITARY HWY	4.424	3.733	0.692	JL53	020802080203	36.770514	-76.349899	
Wet Pond	12/31/2006	2500 RODGERS ST	3.880	3.880	0.000	JL53	020802080203	36.800286	-76.273452	
Wet Pond	12/31/2007	LECKFORD DR	3.790	2.010	1.780	JL54	020802080204	36.766690	-76.209092	
Wet Pond	2/28/2008	200 POPLAR HILL RD	2.900	1.653	1.247	JL55	020802080205	36.861601	-76.401930	
Wet Pond	9/6/2007	4144 S MILITARY HWY	2.323	0.533	1.790	JL55	020802080205	36.776448	-76.395425	
Wet Pond	11/24/2008	2100 BRENNHAVEN TRL	1.230	0.261	0.969	JL51	020802080201	36.727814	-76.322992	
Wet Pond	11/22/2006	2824 YADKIN RD	1.077	0.507	0.570	JL53	020802080203	36.767846	-76.347907	
Wet Pond	3/28/2007	3207 CHURCHLAND BLVD	0.832	0.538	0.294	JL55	020802080205	36.865414	-76.406898	
		Total	229.292	150.166	79.126					

Table B-2. Parcels With Septic Tanks Taken Offline and Connected to Sanitary Sewer

No.	Parcel Address	Sanitary Sewer Connection Year	No.	Parcel Address	Sanitary Sewer Connection Year
1	4621 JAYE CIR	2012	48	1721 JOLLIFF RD	Before June 30, 2021.
2	4604 JAYE CIR	2011	49	1724 JOLLIFF RD	Before June 30, 2021.
3	4612 OLD WOODLAND DR	2011	50	1728 JOLLIFF RD	Before June 30, 2021.
4	1801 ARLEAN DR	2010	51	1729 JOLLIFF RD	Before June 30, 2021.
5	4208 JENNELL CT	2010	52	1736 JOLLIFF RD	Before June 30, 2021.
6	1805 ARLEAN DR	2007	53	1737 JOLLIFF RD	Before June 30, 2021.
7	1821 ARLEAN DR	2007	54	1800 JOLLIFF RD	Before June 30, 2021.
8	4613 JAYE CIR	2007	55	1801 JOLLIFF RD	Before June 30, 2021.
9	4620 JAYE CIR	2007	56	1802 JOLLIFF RD	Before June 30, 2021.
10	4625 JAYE CIR	2007	57	1808 JOLLIFF RD	Before June 30, 2021.
11	4200 JENNELL CT	2007	58	1809 JOLLIFF RD	Before June 30, 2021.
12	4205 JENNELL CT	2007	59	1817 JOLLIFF RD	Before June 30, 2021.
13	4209 JENNELL CT	2007	60	1820 JOLLIFF RD	Before June 30, 2021.
14	4213 JENNELL CT	2007	61	1822 JOLLIFF RD	Before June 30, 2021.
15	1833 JOLLIFF RD	2007	62	4904 MANNING CT	Before June 30, 2021.
16	1909 JOLLIFF RD	2007	63	4905 MANNING CT	Before June 30, 2021.
17	4601 MOORE CIR	2007	64	4908 MANNING CT	Before June 30, 2021.
18	4601 OLD WOODLAND DR	2007	65	4909 MANNING CT	Before June 30, 2021.
19	1720 ARLEAN DR	2006	66	4912 MANNING CT	Before June 30, 2021.
20	1800 ARLEAN DR	2006	67	4913 MANNING CT	Before June 30, 2021.
21	1804 ARLEAN DR	2006	68	4916 MANNING CT	Before June 30, 2021.
22	1808 ARLEAN DR	2006	69	4917 MANNING CT	Before June 30, 2021.
23	1809 ARLEAN DR	2006	70	4920 MANNING CT	Before June 30, 2021.
24	1813 ARLEAN DR	2006	71	4924 MANNING CT	Before June 30, 2021.
25	1817 ARLEAN DR	2006	72	4925 MANNING CT	Before June 30, 2021.
26	4600 JAYE CIR	2006	73	4928 MANNING CT	Before June 30, 2021.
27	4608 JAYE CIR	2006	74	4929 MANNING CT	Before June 30, 2021.
28	4609 JAYE CIR	2006	75	4900 VICO DR	Before June 30, 2021.
29	4612 JAYE CIR	2006	76	4901 VICO DR	Before June 30, 2021.
30	4617 JAYE CIR	2006	77	4904 VICO DR	Before June 30, 2021.
31	1832 JOLLIFF RD	2006	78	4905 VICO DR	Before June 30, 2021.
32	1900 JOLLIFF RD	2006	79	4908 VICO DR	Before June 30, 2021.
33	1901 JOLLIFF RD	2006	80	4909 VICO DR	Before June 30, 2021.
34	4600 MOORE CIR	2006	81	4912 VICO DR	Before June 30, 2021.
35	4604 MOORE CIR	2006	82	4913 VICO DR	Before June 30, 2021.
36	4605 MOORE CIR	2006	83	4916 VICO DR	Before June 30, 2021.
37	4608 MOORE CIR	2006	84	4917 VICO DR	Before June 30, 2021.
38	4609 MOORE CIR	2006	85	4920 VICO DR	Before June 30, 2021.
39	1937 OLD JOLLIFF RD	2006	86	4921 VICO DR	Before June 30, 2021.
40	1951 OLD JOLLIFF RD	2006	87	4924 VICO DR	Before June 30, 2021.
41	1955 OLD JOLLIFF RD	2006	88	4925 VICO DR	Before June 30, 2021.
42	4600 OLD WOODLAND DR	2006	89	4928 VICO DR	Before June 30, 2021.
43	4616 OLD WOODLAND DR	2006	90	1703 WAMPLER PL	Before June 30, 2021.
44	1644 JOLLIFF RD	Before June 30, 2021.	91	1704 WAMPLER PL	Before June 30, 2021.
45	1708 JOLLIFF RD	Before June 30, 2021.	92	1705 WAMPLER PL	Before June 30, 2021.
46	1708 JOLLIFF RD	Before June 30, 2021.	93	1708 WAMPLER PL	Before June 30, 2021.
47	1720 JOLLIFF RD	Before June 30, 2021.	94	1709 WAMPLER PL	Before June 30, 2021.

Table B-3. Nutrient Reductions Calculations

Existing BMPs Brought Online Between Jan. 1, 2006 and June 30, 2009

Existing Wet Ponds Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	79.13	6.84	0.50	103.76	541.52	39.27	8210.40
Reg. Impervious	150.17	9.57	1.79	703.42	1437.79	268.20	105630.38
Total	229.29			Total (lbs/yr)	1979.31	307.47	113840.78
				Removal Efficiency*	20%	45%	60%
				Annual Reduction (lbs/yr)	395.86	138.36	68304.47

*Chesapeake Bay Program established efficiencies for wet ponds.

Existing Bioretention Basins Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	1.29	6.84	0.50	103.76	8.83	0.64	133.86
Reg. Impervious	0.60	9.57	1.79	703.42	5.74	1.07	422.05
Total	1.89			Total (lbs/yr)	14.57	1.71	555.91
				Removal Efficiency*	25%	45%	55%
				Annual Reduction (lbs/yr)	3.64	0.77	305.75

*Chesapeake Bay Program established efficiencies for bioretention C/D soils with underdrain.

Existing Dry Detention Ponds Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	35.58	6.84	0.50	103.76	243.50	17.66	3691.91
Reg. Impervious	15.37	9.57	1.79	703.42	147.13	27.45	10809.52
Total	50.95			Total (lbs/yr)	390.64	45.11	14501.43
				Removal Efficiency*	5%	10%	10%
				Annual Reduction (lbs/yr)	19.53	4.51	1450.14

*Chesapeake Bay Program established efficiencies for dry ponds.

Existing Dry Extended Detention Ponds Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	5.37	6.84	0.50	103.76	36.75	2.67	557.21
Reg. Impervious	4.51	9.57	1.79	703.42	43.18	8.05	3172.44
Total	9.88			Total (lbs/yr)	79.93	10.72	3729.65
				Removal Efficiency*	20%	20%	60%
				Annual Reduction (lbs/yr)	15.99	2.14	2237.79

*Chesapeake Bay Program established efficiencies for dry extended detention ponds.

Existing Filterra Units Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	0.78	6.84	0.50	103.76	5.30	0.38	80.42
Reg. Impervious	1.80	9.57	1.79	703.42	17.22	3.21	1265.46
Total	2.57			Total (lbs/yr)	22.53	3.60	1345.88
				Removal Efficiency*	40%	50%	80%
				Annual Reduction (lbs/yr)	9.01	1.80	1076.70

*Efficiencies for TP based on DEQ's published efficiency for filterra units. TN and TSS efficiencies were taken from the Chesapeake Bay Program's established efficiencies for filtering practices based on the scenario building BMP definitions and the associated CBPO release BMPs found in DEQ's Historic BMP submittal spreadsheet.

Existing Dry Swales Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	2.21	6.84	0.50	103.76	15.09	1.09	228.80
Reg. Impervious	0.82	9.57	1.79	703.42	7.89	1.47	579.62
Total	3.03			Total (lbs/yr)	22.98	2.57	808.42
				Removal Efficiency*	70%	75%	80%
				Annual Reduction (lbs/yr)	16.09	1.92	646.74

*Chesapeake Bay Program established efficiencies for bioswales. The Chesapeake Bay Watershed Model includes dry swales under the scenario builder definition of bioswales in DEQ's Historic BMP Data Submittal spreadsheet.

Existing Infiltration Basins Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	0.63	6.84	0.50	103.76	4.30	0.31	65.16
Reg. Impervious	0.73	9.57	1.79	703.42	7.01	1.31	514.91
Total	1.36			Total (lbs/yr)	11.31	1.62	580.07
				Removal Efficiency*	80%	85%	95%
				Annual Reduction (lbs/yr)	9.05	1.38	551.07

*Chesapeake Bay Program established efficiencies for infiltration practices w/o sand, vegetation.

Existing Hydrodynamic Structures Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	4.01	6.84	0.50	103.76	27.42	1.99	415.68
Reg. Impervious	7.68	9.57	1.79	703.42	73.57	13.72	5405.11
Total	11.69			Total (lbs/yr)	100.99	15.71	5820.79
				Removal Efficiency*	5%	10%	10%
				Annual Reduction (lbs/yr)	5.05	1.57	582.08

*Chesapeake Bay Program established efficiencies for dry detention ponds and hydrodynamic structures.

Existing Surface Sand Filter Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	0.11	6.84	0.50	103.76	0.75	0.05	11.41
Reg. Impervious	0.71	9.57	1.79	703.42	6.80	1.27	499.43
Total	0.82			Total (lbs/yr)	7.55	1.32	510.85
				Removal Efficiency*	40%	60%	80%
				Annual Reduction (lbs/yr)	3.02	0.79	408.68

*Chesapeake Bay Program's established efficiencies for filtering practices based on the scenario building BMP definitions and the associated CBPO release BMPs found in DEQ's Historic BMP submittal spreadsheet.

Existing Vegetated Filter Strip Brought Online Between Jan. 1, 2006 and June 30, 2009							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	0.08	6.84	0.50	103.76	0.51	0.04	7.78
Reg. Impervious	0.08	9.57	1.79	703.42	0.72	0.13	52.76
Total	0.15			Total (lbs/yr)	1.23	0.17	60.54
				Removal Efficiency*	45%	45%	70%
				Annual Reduction (lbs/yr)	0.55	0.08	42.38

*Chesapeake Bay Program's established efficiencies for vegetated open channels A/B soils no underdrain, based on the scenario building BMP definitions and the associated CBPO release BMPs found in DEQ's Historic BMP submittal spreadsheet.

Total Reductions for Existing BMPs Brought Online Between Jan. 1, 2006 and June 30, 2009	TN	TP	TSS
	477.79	153.32	75,605.80

City of Chesapeake Septic BMP Credits

Chesapeake Bay Watershed Parcels - Septic Tank Disconnects/Connections to Sanitary Sewer							
Conversion	Number of Households Connected to Sewer[1]	Load Reductions (lbs/household/yr)[2]			Total Reductions (lbs/yr)		
		TN	TP	TSS	TN	TP	TSS
Septic to Sanitary Sewer	94	9.90	0	0	930.60	0	0
				Total Reduction for Land Conversion (lbs/yr)	930.60	0	0

1. Prior disconnects by year: 2006 (25), 2007 (13), 2010 (2), 2011 (2), 2012 (1). (Total = 43).
Future disconnects to be implemented by the City before the end of the first permit cycle = 51.
Total number of disconnects for nitrogen reduction credit = 94.
2. Per email from DEQ to City on June 29, 2015 based on a stream loading value of 3.6 lb TN/year/person and an average number of people per household in Chesapeake of 2.75 based on Census data (Confirmed by City Planning Dept.)

City of Chesapeake Regional Stormwater Retrofit BMPs

Washington Manor Wet Pond (Level 2 Design)							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	5.00	2.36	0.13	77.38	11.80	0.65	386.90
Reg. Pervious	82.66	6.84	0.50	103.76	565.71	41.03	8,577.10
Reg. Impervious	97.12	9.57	1.79	703.42	929.89	173.46	68,316.55
Total	184.78			Total (lbs/yr)	1,507.40	215.13	77,280.55
				Removal Efficiency*	30%	65%	60%
				Annual Reduction (lbs/yr)	452.22	139.84	46,368.33

*Virginia Stormwater BMP Clearinghouse established efficiencies for TN and TP removal for a level 2 design wet pond. TSS removal efficiencies taken from the Chesapeake Bay Program established efficiencies for wet ponds.

22nd Street Wet Pond (Level 1 Design)							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	4.14	6.84	0.50	103.76	28.33	2.05	429.58
Reg. Impervious	11.80	9.57	1.79	703.42	112.98	21.07	8,300.40
Total	15.94			Total (lbs/yr)	141.31	23.13	8,729.99
				Removal Efficiency	20%	45%	60%
				Annual Reduction (lbs/yr)	28.26	10.41	5,237.99

*Virginia Stormwater BMP Clearinghouse established efficiencies for TN and TP removal for a level 1 design wet pond. TSS removal efficiencies taken from the Chesapeake Bay Program established efficiencies for wet ponds.

Yadkin Road Wet Swale (Level 1 Design)							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	25.23	2.36	0.13	77.38	59.54	3.28	1,952.30
Reg. Pervious	42.58	6.84	0.50	103.76	291.41	21.13	4,418.26
Reg. Impervious	83.34	9.57	1.79	703.42	797.95	148.85	58,623.36
Total	151.15			Total (lbs/yr)	1,148.90	173.26	64,993.91
				Removal Efficiency	25%	20%	50%
				Annual Reduction (lbs/yr)	287.23	34.65	32,496.96

*Virginia Stormwater BMP Clearinghouse established efficiencies for TN and TP removal for a level 1 design wet swale. TSS removal efficiencies taken from the Chesapeake Bay Program established efficiencies for vegetated open channels with C/D soils and no underdrain.

Copeland Drive Dry Detention Pond							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	2.38	2.36	0.13	77.38	5.62	0.31	184.16
Reg. Pervious	39.24	6.84	0.50	103.76	268.55	19.48	4,071.69
Reg. Impervious	22.98	9.57	1.79	703.42	220.03	41.04	16,164.69
Total	64.60			Total (lbs/yr)	494.19	60.83	20,420.53
				Removal Efficiency	5%	10%	10%
				Annual Reduction (lbs/yr)	24.71	6.08	2,042.05

*Chesapeake Bay Program established efficiencies for dry ponds.

New Mill Wet Pond (Level 2 Design)							
		Loading Rates (lbs/ac/yr)			Pollutant Loads (lbs/yr)		
Land Use	Acres	TN	TP	TSS	TN	TP	TSS
Forest	0.00	2.36	0.13	77.38	0.00	0.00	0.00
Reg. Pervious	315.00	6.84	0.50	103.76	2,155.79	156.34	32,685.55
Reg. Impervious	15.60	9.57	1.79	703.42	149.36	27.86	10,973.42
Total	330.60			Total (lbs/yr)	2,305.15	184.21	43,658.96
				Removal Efficiency	30%	65%	60%
				Annual Reduction (lbs/yr)	691.55	119.73	26,195.38

*Virginia Stormwater BMP Clearinghouse established efficiencies for TN and TP removal for a level 1 design wet pond. TSS removal efficiencies taken from the Chesapeake Bay Program established efficiencies for wet ponds.

	TN	TP	TSS
Total Reductions for Regional Stormwater Retrofit BMPs	1,483.97	310.71	112,340.71

Appendix C.
Nutrient Reduction Calculations for River Star Homes BMPs

Chesapeake VIRGINIA

AECOM

Table C-1. River Star Homes BMP Calculations - Rain Barrels

					Calculations			Percent Reductions (%)			Starting Loads (lbs/yr)			Reductions (lbs/yr)		
Address	Sq. Ft. Captured	# of RB	Install Date	Capacity (gal)	TS	RS	RD	TN	TP	TSS	TN	TP	TSS	TN	TP	TSS
2724 Meadow Dr W	220	1	22-Sep-17	125	18.3333	16.7101	0.9115	0.5816	0.6802	0.7297	0.0484	0.0090	3.5526	0.0281	0.0061	2.5924
2609 River Oaks Dr	300	1	11-Sep-17	125	25.0000	16.7101	0.6684	0.5182	0.6051	0.6488	0.0659	0.0123	4.8445	0.0342	0.0074	3.1431
1605 Tapgallant Quay	281	1	07-Sep-17	125	23.4167	16.7101	0.7136	0.5328	0.6224	0.6674	0.0618	0.0115	4.5377	0.0329	0.0072	3.0282
3109 Joseph Ave	265	1	05-Sep-17	125	22.0833	16.7101	0.7567	0.5453	0.6373	0.6834	0.0582	0.0109	4.2793	0.0318	0.0069	2.9243
3118 Woodcroft lane	300	1	30-Aug-17	125	25.0000	16.7101	0.6684	0.5182	0.6051	0.6488	0.0659	0.0123	4.8445	0.0342	0.0074	3.1431
3921 Cannon Point Dr	330	1	30-Aug-17	125	27.5000	16.7101	0.6076	0.4960	0.5789	0.6207	0.0725	0.0135	5.3290	0.0360	0.0078	3.3075
4220 Duke Of Gloucester Dr	150	1	24-Aug-17	125	12.5000	16.7101	1.3368	0.6380	0.7461	0.8015	0.0330	0.0062	2.4223	0.0210	0.0046	1.9414
4927 Oriole Dr	300	1	15-Aug-17	125	25.0000	16.7101	0.6684	0.5182	0.6051	0.6488	0.0659	0.0123	4.8445	0.0342	0.0074	3.1431
925 Stewart St	100	1	08-Aug-17	125	8.3333	16.7101	2.0052	0.6687	0.7818	0.8431	0.0220	0.0041	1.6148	0.0147	0.0032	1.3615
4121 Woodcroft Ln	550	2	01-Aug-17	250	45.8333	33.4203	0.7292	0.5375	0.6279	0.6733	0.1209	0.0226	8.8816	0.0650	0.0142	5.9801
4744 Condor Dr	340	1	28-Jul-17	125	28.3333	16.7101	0.5898	0.4889	0.5705	0.6116	0.0747	0.0139	5.4905	0.0365	0.0080	3.3580
908 Landing Creek Dr	400	1	14-Jul-17	125	33.3333	16.7101	0.5013	0.4489	0.5234	0.5611	0.0879	0.0164	6.4594	0.0395	0.0086	3.6241
437 Cobblewood Bnd	470	1	23-Jun-17	125	39.1667	16.7101	0.4266	0.4082	0.4757	0.5098	0.1033	0.0193	7.5897	0.0422	0.0092	3.8694
832 Creekside Crescent	430	1	03-Jun-17	125	35.8333	16.7101	0.4663	0.4307	0.5021	0.5381	0.0945	0.0176	6.9438	0.0407	0.0089	3.7366
3309 Georgie Ct	170	1	25-May-17	125	14.1667	16.7101	1.1795	0.6222	0.7279	0.7815	0.0374	0.0070	2.7452	0.0232	0.0051	2.1453
1453 Boxwood Dr	192	1	25-May-17	125	16.0000	16.7101	1.0444	0.6044	0.7072	0.7588	0.0422	0.0079	3.1005	0.0255	0.0056	2.3528
4224 Hawksley Dr	730	2	15-May-17	250	60.8333	33.4203	0.5494	0.4717	0.5502	0.5898	0.1605	0.0299	11.7883	0.0757	0.0165	6.9525
4140 Duke Of Gloucester Dr	180	1	02-May-17	125	15.0000	16.7101	1.1140	0.6142	0.7185	0.7712	0.0396	0.0074	2.9067	0.0243	0.0053	2.2417
1129 Lilac Ave	938	2	24-Apr-17	250	78.1667	33.4203	0.4276	0.4087	0.4763	0.5105	0.2062	0.0385	15.1472	0.0843	0.0183	7.7326
2600 N Elizabeth Harbor Dr	650	2	24-Apr-17	250	54.1667	33.4203	0.6170	0.4997	0.5832	0.6252	0.1429	0.0267	10.4965	0.0714	0.0155	6.5628
2068 River Pearl Way	350	1	13-Apr-17	125	29.1667	16.7101	0.5729	0.4819	0.5623	0.6027	0.0769	0.0144	5.6519	0.0371	0.0081	3.4067
4500 Greendell Rd	200	1	11-Apr-17	125	16.6667	16.7101	1.0026	0.5979	0.6995	0.7505	0.0440	0.0082	3.2297	0.0263	0.0057	2.4240
3528 Annandale Dr	300	1	10-Apr-17	125	25.0000	16.7101	0.6684	0.5182	0.6051	0.6488	0.0659	0.0123	4.8445	0.0342	0.0074	3.1431
3704 Forsythe Ct	185	1	07-Apr-17	125	15.4167	16.7101	1.0839	0.6101	0.7138	0.7661	0.0407	0.0076	2.9875	0.0248	0.0054	2.2886
126 Esplanade Place	217	1	07-Apr-17	125	18.0833	16.7101	0.9241	0.5841	0.6831	0.7328	0.0477	0.0089	3.5042	0.0279	0.0061	2.5680
2336 Bugle Dr E	270	1	06-Apr-17	125	22.5000	16.7101	0.7427	0.5414	0.6326	0.6783	0.0593	0.0111	4.3601	0.0321	0.0070	2.9575
4021 Scotfield Dr	525	1	04-Apr-17	125	43.7500	16.7101	0.3819	0.3802	0.4431	0.4748	0.1154	0.0215	8.4779	0.0439	0.0095	4.0254
4656 Leeward Dr	633	2	23-Mar-17	250	52.7500	33.4203	0.6336	0.5059	0.5906	0.6331	0.1391	0.0260	10.2219	0.0704	0.0153	6.4719
1021 Mains Creek Rd	500	1	17-Mar-17	125	41.6667	16.7101	0.4010	0.3925	0.4574	0.4902	0.1099	0.0205	8.0742	0.0431	0.0094	3.9579
1337 Walnut Ave	500	2	03-Feb-17	250	41.6667	33.4203	0.8021	0.5573	0.6514	0.6986	0.1099	0.0205	8.0742	0.0612	0.0134	5.6409
3087 Stratford Court	500	1	01-Feb-17	125	41.6667	16.7101	0.4010	0.3925	0.4574	0.4902	0.1099	0.0205	8.0742	0.0431	0.0094	3.9579
800 Hidden Harbor Ct.	700	2	25-Jan-17	250	58.3333	33.4203	0.5729	0.4819	0.5623	0.6027	0.1539	0.0287	11.3039	0.0741	0.0161	6.8134
1511 Philmont Ave	325	1	19-Jan-17	125	27.0833	16.7101	0.6170	0.4997	0.5832	0.6252	0.0714	0.0133	5.2482	0.0357	0.0078	3.2814
1000 Sullivan Lane	340	1	06-Jan-17	125	28.3333	16.7101	0.5898	0.4889	0.5705	0.6116	0.0747	0.0139	5.4905	0.0365	0.0080	3.3580
2953 Tyre Neck Road	1000	2	09-Dec-16	250	83.3333	33.4203	0.4010	0.3925	0.4574	0.4902	0.2198	0.0410	16.1484	0.0863	0.0188	7.9159
2927 Crossings Dr	1000	3	08-Apr-16	375	83.3333	50.1304	0.6016	0.4936	0.5761	0.6176	0.2198	0.0410	16.1484	0.1085	0.0236	9.9736
413 Harper Ct	230	1	20-Apr-16	125	19.1667	16.7101	0.8718	0.5735	0.6706	0.7193	0.0506	0.0094	3.7141	0.0290	0.0063	2.6716
924 Chesterfield Terrace	200	1	03-Feb-16	125	16.6667	16.7101	1.0026	0.5979	0.6995	0.7505	0.0440	0.0082	3.2297	0.0263	0.0057	2.4240
104 Sparrow Rd	900	2	09-Feb-16	250	75.0000	33.4203	0.4456	0.4192	0.4886	0.5237	0.1978	0.0369	14.5336	0.0829	0.0180	7.6105

1517 Philmont Avenue	325	1	29-Mar-16	125	27.0833	16.7101	0.6170	0.4997	0.5832	0.6252	0.0714	0.0133	5.2482	0.0357	0.0078	3.2814
429 Broadbend Circle	130	1	14-Apr-16	125	10.8333	16.7101	1.5425	0.6528	0.7632	0.8206	0.0286	0.0053	2.0993	0.0187	0.0041	1.7226
107 Trilby Ct	225	3	12-Feb-16	375	18.7500	50.1304	2.6736	0.6916	0.7987	0.8683	0.0495	0.0092	3.6334	0.0342	0.0074	3.1547
1018 Mains Creek Road	466	1	24-Mar-16	125	38.8333	16.7101	0.4303	0.4103	0.4782	0.5125	0.1024	0.0191	7.5252	0.0420	0.0091	3.8569
3936 Oak Drive East	2000	4	08-Mar-16	500	166.6667	66.8405	0.4010	0.3925	0.4574	0.4902	0.4396	0.0820	32.2968	0.1726	0.0375	15.8318
517 Las Gaviotas Blvd	230	1	27-Jun-16	125	19.1667	16.7101	0.8718	0.5735	0.6706	0.7193	0.0506	0.0094	3.7141	0.0290	0.0063	2.6716
2953 Tyre Neck Road	290	1	28-Apr-16	125	24.1667	16.7101	0.6915	0.5258	0.6141	0.6585	0.0637	0.0119	4.6830	0.0335	0.0073	3.0838
469 San Roman Dr.	190	1	09-Jun-16	125	15.8333	16.7101	1.0554	0.6061	0.7091	0.7609	0.0418	0.0078	3.0682	0.0253	0.0055	2.3347
2527 Drum Creek Rd.	480	2	14-Jun-16	250	40.0000	33.4203	0.8355	0.5654	0.6610	0.7089	0.1055	0.0197	7.7512	0.0596	0.0130	5.4951
1805 Rollis Rd	400	1	03-May-16	125	33.3333	16.7101	0.5013	0.4489	0.5234	0.5611	0.0879	0.0164	6.4594	0.0395	0.0086	3.6241
501 Leary Court	600	2	15-Jun-16	250	50.0000	33.4203	0.6684	0.5182	0.6051	0.6488	0.1319	0.0246	9.6890	0.0683	0.0149	6.2862
929 Stewart Street	160	1	11-Jul-16	125	13.3333	16.7101	1.2533	0.6301	0.7371	0.7915	0.0352	0.0066	2.5837	0.0222	0.0048	2.0452
4220 Duke of Gloucester Dr	740	2	01-Apr-16	250	61.6667	33.4203	0.5420	0.4683	0.5462	0.5855	0.1627	0.0303	11.9498	0.0762	0.0166	6.9971
640 Luther Street	630	3	09-May-16	375	52.5000	50.1304	0.9549	0.5898	0.6899	0.7401	0.1385	0.0258	10.1735	0.0817	0.0178	7.5297
2308 Bugle Dr N	375	1	02-May-16	125	31.2500	16.7101	0.5347	0.4650	0.5423	0.5814	0.0824	0.0154	6.0556	0.0383	0.0083	3.5205
1233 Davis Ave	280	1	24-May-16	125	23.3333	16.7101	0.7161	0.5335	0.6233	0.6683	0.0615	0.0115	4.5216	0.0328	0.0072	3.0219
808 Heritage Pt.	620	2	26-Apr-16	250	51.6667	33.4203	0.6468	0.5107	0.5962	0.6393	0.1363	0.0254	10.0120	0.0696	0.0152	6.4002
	Total	78		9750												
														TN	TP	TSS
													Total Reductions	2.60	0.57	238.89

Calculated reductions for rain barrels based on Chesapeake Stormwater Network's *Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects*, 2015.

Table C-2. River Star Homes BMP Calculations - Shoreline Buffers

Address	Trees	Linear Feet	Average Width	Drainage Area (Sq. Ft)	Pervious	Impervious	BMP Area	Impervious Drainage Area for Calculations	Pervious Drainage Area for Calculations	Percent Reductions* (%)			Starting Loads (lbs/yr)			Reductions (lbs/yr)		
										TN	TP	TSS	TN	TP	TSS	TN	TP	TSS
515 Oaklette Drive*	150	200	32	42000	38000	4000	5400	4000	6800	0.25	0.5	0.5	1.9476	0.2415	80.7918	0.4869	0.1207	40.3959

* Install Date= 24-Apr-17

Summary: Number of Buffers =1, Stems=150, Area Treated=0.124 Ac.

	TN	TP	TSS
Total Reductions	0.49	0.12	40.40

*Percent reductions for forest buffers taken from DEQ's TMDL Guidance Document dated May 18, 2015

Table C-3. River Star Homes BMP Calculations - Land Use Conversion

				Edge of Stream Reductions* - Pervious to Forest (Lbs/Ac/Yr)			Annual Reductions (Lbs)		
Address	Install Date	Area (Sq. Ft.)	Area (Acres)	TN	TP	TSS	TN	TP	TSS
715 Wood Duck Lane	20-Sep-17	910	0.0209	5.03	0.48	57.82	0.1051	0.0100	1.2079
515 Oaklette Drive	24-Apr-17	5400	0.1240	5.03	0.48	57.82	0.6236	0.0595	7.1678
107 Trilby Ct	09-May-16	4093	0.0940	5.03	0.48	57.82	0.4726	0.0451	5.4329
3004 Golden Hind Rd.	23-Aug-16	1293	0.0297	5.03	0.48	57.82	0.1493	0.0142	1.7163
4102 Little Beaver Road	27-Jun-16	1493	0.0343	5.03	0.48	57.82	0.1724	0.0165	1.9818
104 Sparrow Rd	22-Jun-16	930	0.0213	5.03	0.48	57.82	0.1074	0.0102	1.2344
2636 Janson Drive	03-Aug-16	370	0.0085	5.03	0.48	57.82	0.0427	0.0041	0.4911

	TN	TP	TSS
Total Reductions	1.67	0.16	19.23

* Reduction rates taken from DEQ's Chesapeake Bay TMDL Guidance Document dated May 18, 2015

Table C-4. River Star Homes BMP Calculations - Living Shorelines

					Protocol 1: Erosion	Protocol 2: Denitrification	Protocol 3: Sedimentation		Protocol 4: Marsh Redfield*	
Address	DATE INSTALLED	Linear Feet	Erosion Rate (ft/yr)	Area (Sq Ft)	TS	TN	TSS	TP	TN	TP
515 Oaklette Drive	24-Apr-17	200	1.5	2200	28388.8800	4.2929	351.4646	0.2671	0.3449	0.0152

	TN	TP	TSS
Annual Reductions	4.29	0.27	28740.34

*Marsh Redfield Reductions are a one time reduction and are not credited annually

Calculated reductions for protocols 1-4 based on methods from Chesapeake Stormwater Network's *Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects, 2014.*

Table C-5. River Star Homes BMP Calculations - Rain Gardens

							Calculations			Percent Reductions (%)			Starting Loads (lbs/yr)			Reductions (lbs/yr)		
Address	Date Installed	BMP Area (Sq Ft)	Depth (in)	Drainage Area (Sq Ft)	Impervious (Sq Ft)	Pervious (Sq Ft)	TS	RS	RD	TN	TP	TSS	TN	TP	TSS	TN	TP	TSS
2953 Tyre Neck Rd	8/15/2016	100	40	4500	250	4250	375.00	333.33	0.89	0.577	0.675	0.724	0.723	0.059	14.161	0.417	0.040	10.251
2600 N. Elizabeth Harbor Dr.	8/29/2016	70	34	1050	20	1030	87.50	198.33	2.27	0.671	0.784	0.848	0.166	0.013	2.777	0.112	0.010	2.354
2600 N. Elizabeth Harbor Dr.	8/29/2016	72	34	1500	500	1000	125.00	204.00	1.63	0.658	0.769	0.827	0.267	0.032	10.456	0.176	0.025	8.646
1511 Philmont Ave	4/14/2017	200	24	1500	1500	0	125.00	400.00	3.20	0.900	0.970	1.062	0.330	0.062	24.223	0.297	0.060	25.717
1118 Shoal Creek Trl	8/31/2017	70	36	520	520	0	43.33	210.00	4.85	10.648	9.791	10.601	0.114	0.021	8.397	1.217	0.209	89.015
514 Oaklette Drive	9/20/2017	100	36	2200	2200	0	183.33	300.00	1.64	0.658	0.769	0.827	0.484	0.090	35.526	0.318	0.069	29.387
4301 Towanda Rd	9/28/2017	50	48	480	480	0	40.00	200.00	5.00	13.330	12.259	13.261	0.106	0.020	7.751	1.406	0.241	102.791

	TN	TP	TSS
Total Reductions	3.94	0.65	268.16

Calculated reductions for rain gardens based on Chesapeake Stormwater Network's *Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects*, 2015.

Table C-6. River Star Homes BMP Calculations - Residential Nutrient Management

					Starting Loads (lbs/yr)			Pledge reductions		
Address	City	Zip	Letter Date	LAWN AREA (Sq Ft)	TN	TP	TSS	TN	TP	TSS
1708 Swan Lake Cres	Chesapeake	23321-1367	28-Sep-17	3240	0.5090	0.0369	7.7180	0.0305	0.0011	0.0000
515 Oaklette Dr	Chesapeake	23325-2817	08-Sep-17	3160	0.4965	0.0360	7.5274	0.0298	0.0011	0.0000
4400 Anchor Bend Ct	Chesapeake	23321-1977	25-Jul-17	22400	3.5193	0.2552	53.3587	0.2112	0.0077	0.0000
4013 Birchwood Ave	Chesapeake	23321-5301	13-Jul-17	7500	1.1783	0.0855	17.8656	0.0707	0.0026	0.0000
3332 Lynnhurst Blvd	Chesapeake	23321-4451	11-Jul-17	7500	1.1783	0.0855	17.8656	0.0707	0.0026	0.0000
1900 Twilight Arch	Chesapeake	23323-5512	23-Jun-17	6600	1.0369	0.0752	15.7218	0.0622	0.0023	0.0000
4500 Greendell Rd	Chesapeake	23321-5216	15-May-17	10000	1.5711	0.1139	23.8209	0.0943	0.0034	0.0000
1868 Sunsprite Loop	Chesapeake	23323-5515	05-May-17	7500	1.1783	0.0855	17.8656	0.0707	0.0026	0.0000
4140 Duke Of Gloucester Dr	Chesapeake	23321-4564	26-Apr-17	6000	0.9427	0.0684	14.2925	0.0566	0.0021	0.0000
4701 White Owl Cres	Chesapeake	23321-1250	26-Apr-17	10290	1.6167	0.1172	24.5117	0.0970	0.0035	0.0000
4744 Condor Dr	Chesapeake	23321-1325	26-Apr-17	1700	0.2671	0.0194	4.0495	0.0160	0.0006	0.0000
1511 Philmont Ave	Chesapeake	23325-3719	30-Mar-17	2970	0.4666	0.0338	7.0748	0.0280	0.0010	0.0000
715 Wood Duck Lane	Chesapeake	23323	24-Mar-17	11230	1.7644	0.1280	26.7508	0.1059	0.0038	0.0000
2012 Woodgate Arch	Chesapeake	23320-7808	24-Mar-17	200	0.0314	0.0023	0.4764	0.0019	0.0001	0.0000
4218 Woodland Drive	Chesapeake	23321	10-Mar-17	2948	0.4632	0.0336	7.0224	0.0278	0.0010	0.0000
2804 E Point Dr	Chesapeake	23321-4102	03-Mar-17	4142	0.6508	0.0472	9.8666	0.0390	0.0014	0.0000
3002 Miars Grn	Chesapeake	23321-4282	28-Feb-17	11475	1.8029	0.1307	27.3344	0.1082	0.0039	0.0000
2609 River Oaks Dr	Chesapeake	23321-2429	23-Feb-17	6825	1.0723	0.0778	16.2577	0.0643	0.0023	0.0000
1872 Sunsprite Loop	Chesapeake	23323-5515	23-Feb-17	3905	0.6135	0.0445	9.3020	0.0368	0.0013	0.0000
707 Wood Duck Lane	Chesapeake	23323-4011	23-Feb-17	8750	1.3747	0.0997	20.8432	0.0825	0.0030	0.0000
1000 Sullivan Lane	Chesapeake	23322	23-Feb-17	3158	0.4962	0.0360	7.5226	0.0298	0.0011	0.0000
517 Las Gaviotas Blvd	Chesapeake	23322-8044	27-Sep-16	4385	0.6889	0.0500	10.4454	0.0413	0.0015	0.0000
816 Orville Ave	Chesapeake	23324-2123	06-Sep-16	2190	0.3441	0.0250	5.2168	0.0206	0.0007	0.0000
516 Breeze Hill Cres	Chesapeake	23322	19-Apr-16	4928	0.7742	0.0562	11.7389	0.0465	0.0017	0.0000
321 Cedar Rd	Chesapeake	23322-5513	18-Apr-16	11629	1.8270	0.1325	27.7013	0.1096	0.0040	0.0000
3936 Oak Drive East	Chesapeake	23321	17-Apr-16	5300	0.8327	0.0604	12.6251	0.0500	0.0018	0.0000
717 Elderberry Ct	Chesapeake	23320	8-Mar-16	1618	0.2542	0.0184	3.8542	0.0153	0.0006	0.0000
1330 Hull St	Chesapeake	23324	3-Feb-16	2700	0.4242	0.0308	6.4316	0.0255	0.0009	0.0000
706 Watch Island Reach	Chesapeake	23320	30-Nov-15	4364	0.6856	0.0497	10.3954	0.0411	0.0015	0.0000
2251 Averill Drive	Chesapeake	23323	19-Nov-15	5025	0.7895	0.0573	11.9700	0.0474	0.0017	0.0000
500 Bartell Drive	Chesapeake	23322	19-Nov-15	6700	1.0526	0.0763	15.9600	0.0632	0.0023	0.0000
929 Stewart St	Chesapeake	23324-2566	4-Nov-15	2688	0.4223	0.0306	6.4030	0.0253	0.0009	0.0000
310 Kemp Lane	Chesapeake	23325-2302	29-Sep-15	22110	3.4737	0.2519	52.6679	0.2084	0.0076	0.0000
1202 Becca Anne Ct	Chesapeake	23322-4707	11-Aug-16	8400	1.3197	0.0957	20.0095	0.0792	0.0029	0.0000
449 River Walk Parkway	Chesapeake	23320	4-Nov-15	2460	0.3865	0.0280	5.8599	0.0232	0.0008	0.0000
1300 Chesapeake Ave	Chesapeake	23324	16-Jun-16	3,910	0.6143	0.0446	9.3140	0.0369	0.0013	0.0000
429 Broad Bend Circle	Chesapeake	23320	13-Jun-16	5,720	0.8987	0.0652	13.6255	0.0539	0.0020	0.0000
1310 Hull Street	Chesapeake	23324-2244	13-Jun-16	576	0.0905	0.0066	1.3721	0.0054	0.0002	0.0000
1046 Ontario Ave	Chesapeake	23325-2314	13-Jun-16	1,956	0.3073	0.0223	4.6594	0.0184	0.0007	0.0000

405 Brisa Dr	Chesapeake	23322-7136	13-Jun-16	835	0.1312	0.0095	1.9890	0.0079	0.0003	0.0000
32 Redbrick Dr	Chesapeake	23325	13-Jun-16	7,900	1.2412	0.0900	18.8185	0.0745	0.0027	0.0000
2101 Stalham Rd	Chesapeake	23324	13-Jun-16	3,715	0.5837	0.0423	8.8494	0.0350	0.0013	0.0000
2505 Featherbed Ct	Chesapeake	23325	13-Jun-16	4,300	0.6756	0.0490	10.2430	0.0405	0.0015	0.0000
2040 Shillelagh Rd	Chesapeake	23323	11-Aug-16	44,391	6.9743	0.5058	105.7431	0.4185	0.0152	0.0000
401 Penhook Ct	Chesapeake	23322	11-Aug-16	6,115	0.9607	0.0697	14.5665	0.0576	0.0021	0.0000
2600 N Elizabeth Harbor dr	Chesapeake	23321	11-Aug-16	5,965	0.9372	0.0680	14.2091	0.0562	0.0020	0.0000
305 Driftwood Dr	Chesapeake	23320	9-Aug-16	6,900	1.0841	0.0786	16.4364	0.0650	0.0024	0.0000
1021 Mains Creek Rd	Chesapeake	23320-6537	9-Aug-16	10,630	1.6701	0.1211	25.3216	0.1002	0.0036	0.0000
								TN	TP	TSS
							Total Reductions	3.10	0.11	0.00

Calculated reductions for rain barrels based on Chesapeake Stormwater Network's *Recommendations of the Expert Panel to Define Removal Rates for Urban Nutrient Management*, 2013.

Appendix D.
Final Signed SWIFT Agreement Between HRSD and the City of Chesapeake

Chesapeake VIRGINIA

AECOM

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION

THIS HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION (this "Agreement") is made this 10th day of August, 2017, by and between the Hampton Roads Sanitation District ("HRSD") and the City of Chesapeake (the "City") (each a "Party" and jointly, the "Parties).

BACKGROUND

A. The HRSD Plants. HRSD owns and operates various wastewater treatment plants that are authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment as total suspended solids ("TSS") to the Chesapeake Bay watershed (the "HRSD Plants"). The HRSD Plants have TN, TP and TSS waste load allocations assigned by the State Water Control Board and the Virginia Department of Environmental Quality (jointly, "DEQ") pursuant to the Water Quality Management Planning Regulation, 9 VAC 25-720, and by the U.S. Environmental Protection Agency ("EPA") pursuant to the Chesapeake Bay Total Maximum Daily Load ("TMDL") and related Virginia Watershed Implementation Plan ("WIP"). The HRSD Plants are subject to the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, the HRSD Plants currently discharge less TN, TP and TSS than they are authorized to discharge under the Watershed General Permit while protecting Chesapeake Bay water quality and, therefore, HRSD has the ability to provide TN, TP and TSS credits on at least a temporary basis.

B. The Locality MS4. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge TN, TP and TSS to the Chesapeake Bay watershed. Like the HRSD Plants, the MS4 is subject to the Chesapeake Bay TMDL as derived from the Virginia WIP and to a VPDES Permit issued to the City by DEQ. Pursuant to the TMDL, WIP and VPDES Permit for the MS4, it is anticipated that the City will reduce MS4-related TN, TP and TSS discharges pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2017, the City is in its First Bay TMDL Permit Cycle.

C. The SWIFT Project. HRSD's Sustainable Water Initiative For Tomorrow ("SWIFT") Project was conceived with multiple benefits in mind for the Hampton Roads region. Aside from TMDL benefits, this innovative water purification project is designed to enhance the sustainability of the long-term groundwater supply and help address other environmental pressures such as sea level rise and saltwater intrusion. The SWIFT Project is intended to achieve these benefits by taking already-treated wastewater that would otherwise be discharged into the Chesapeake Bay watershed, purifying it through additional rounds of advanced water treatment to meet drinking water standards, and injecting the resulting drinking quality water into the Potomac aquifer deep underground. With respect to TMDL benefits, SWIFT will result in a

significant reduction in the total volume of HRSD discharge to the Chesapeake Bay watershed, to achieve greater environmental benefits with corresponding significant reductions of TN, TP and TSS discharges to the Chesapeake Bay watershed.

D. Legal Authority. Pursuant to Virginia Code § 62.1-44.19:21, the City may acquire and use TN and TP credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TN or TP than permitted under the Watershed General Permit. Pursuant to Virginia Code § 62.1-44.19:21.1, the City may also acquire and use TSS credits for purposes of compliance with the Chesapeake Bay TMDL loading reductions of its MS4 VPDES Permit, including credits generated by the HRSD Plants by discharging less TSS than allocated under the Chesapeake Bay TMDL. With respect to all three parameters, it is recognized that this authority does not limit or otherwise affect the authority of DEQ to establish and enforce more stringent water quality-based effluent limitations in permits where such limitations are necessary to protect local water quality and, further, that the use of water quality credits does not relieve an MS4 permit holder of any requirement to comply with applicable local water quality-based limitations.

E. Redevelopment-Based MS4 TMDL Action Plan. The City expects to achieve its Chesapeake Bay TMDL reduction goals more cost-effectively by utilizing HRSD-generated TN, TP and TSS credits before and during operation of the SWIFT Project in lieu of stormwater retrofit projects on a condensed 10-year schedule (*i.e.*, Second and Third Bay TMDL Permit Cycles) coupled with ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state and local resources for other important water quality projects.

F. Credit Trading Premise of SWIFT. For all of the above reasons and others, the ability to generate TN, TP, and TSS credits through the SWIFT Project and apply those credits as progress under the Hampton Roads localities' MS4 Permits and associated TMDL Action Plans is a fundamental premise for the SWIFT Project. HRSD is proceeding with the SWIFT Project, and the City is supporting it, in large part in reliance on these critical water quality trading-based benefits.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises (hereby incorporated as if fully set forth herein), the mutual covenants and conditions herein, and other good and valuable consideration, the receipt and sufficiency of which HRSD and the City acknowledge, the Parties hereby agree as follows.

1. Annual Credit Transfers Prior to SWIFT Feasibility Determination. Prior to HRSD's determination of SWIFT Project feasibility as provided below, HRSD shall annually generate and transfer to the City the quantity of water quality credits needed to meet the City's

compliance requirements under its DEQ-Approved Chesapeake Bay TMDL Action Plan for its MS4, as provided below. This annual transfer shall be made by HRSD's execution and delivery to the City of the Annual Water Quality Credit Transfer Form (Attachment B hereto) on or before May 20 immediately following each calendar year of HRSD's credit generation.

a. Determination of Total Reductions Needed. The City shall determine the total TN, TP and TSS reductions required for its full MS4 implementation of the Chesapeake Bay TMDL and WIP as issued in December 2010, in accordance with the procedures established in its VPDES Permit and DEQ Guidance Memorandum 15-2005, Chesapeake Bay TMDL Special Condition Guidance (May 18, 2015).

b. Credit Demand Minimization Elements. The City shall minimize its calculated reductions by (i) accurately mapping and delineating its existing MS4 service area, (ii) taking full credit for reductions achieved by stormwater projects and regulated redevelopment projects occurring prior to the effective date of the City's VPDES Permit in effect as of the effective date of this Agreement, and (iii) other procedures or accounting measures reasonably available to the City.

c. Credit Transfer Ceilings. HRSD's annual credit transfer obligations to the City shall not exceed the lesser of (i) the City's initial estimate of credit needs, or (ii) 95 percent of the City's total calculated reductions determined in accordance with Subparagraphs 1.a. and 1.b. and set forth in a DEQ-approved Chesapeake Bay TMDL Action Plan, or (iii) the quantity of credits actually needed to meet such total calculated reductions. The City's initial estimate of credit needs as of the effective date of this Agreement is set forth in Section 1 of Attachment A hereto. Following DEQ's approval of the City's Chesapeake Bay TMDL Action Plan and subsequent acceptance of the credit needs by HRSD as consistent with the requirements of this Subparagraph 1.c., HRSD shall issue an update to Attachment A setting forth in Section 2 thereof HRSD's actual annual credit transfer obligation determined in accordance with this Subparagraph 1.c.

d. Term & Termination of Initial Credit Transfers. HRSD's annual credit transfer obligations to the City under this Paragraph 1 shall expire upon (i) conversion to a permanent transfer of wasteload allocations as provided in Paragraph 2, (ii) termination as specifically authorized by any other provision of this Agreement, or (iii) December 31, 2036, whichever occurs first.

2. Permanent Transfer After SWIFT Feasibility Determination. Upon HRSD's determination that full-scale implementation of the SWIFT Project is feasible, HRSD shall permanently transfer to the City the quantity of TN, TP and TSS waste load allocations set forth for its MS4 on Attachment A hereto, as updated and issued by HRSD in accordance with Paragraph 1 c.

a. Factors for Feasibility Determination. Feasibility shall be determined in HRSD's sole discretion taking into account (i) whether all required permits and approvals have been acquired in final, non-appealable form acceptable to HRSD including the federal Safe Drinking Water Act Underground Injection Control Permit, (ii) whether the first full-scale

HRSD plant upgrade is online and performing as desired, (iii) whether full-scale implementation of the SWIFT Project is technically and financially feasible, and (iv) other material factors.

b. Timing for Feasibility Determination. Without limiting HRSD's discretion to determine whether full-scale SWIFT Project implementation is feasible or when to make such determination, it is the mutual goal of the Parties for HRSD to make such determination as soon as reasonably possible and not later than December 31, 2025, so as to preserve the maximum amount of time prior to the termination date for the City to implement stormwater retrofit projects or other permit compliance measures that might be necessary should it be determined that the SWIFT Project is not feasible.

3. Regulatory Plans & Approvals. In furtherance of the annual credit transfer and, when applicable, the permanent transfer contemplated by this Agreement, the Parties shall collaborate on appropriate submittals to and requests of DEQ, as follows; however, HRSD shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

a. City's TMDL Action Plan. For purposes of annual and, when applicable, permanent transfers, the City shall each include in its Chesapeake Bay TMDL Action Plan a provision for the receipt and use of TN, TP and TSS credits from the HRSD Plants in the form set forth in Attachment C hereto (or such other form as may be mutually agreeable to the City and HRSD).

b. HRSD Watershed General Permit Registration. For purposes of permanent wasteload allocation transfers, when applicable, HRSD shall modify its Watershed General Permit Registration and, if necessary, individual VPDES permits to reflect such transfers.

c. Virginia Chesapeake Bay TMDL Phase III WIP. HRSD and the City shall collaborate to seek inclusion in the Phase III WIP of recognition of the SWIFT Project and the annual and, when applicable, permanent transfers contemplated by this Agreement.

4. Authorized Use of Credits. The City agrees that its sole and limited use of the TN, TP, and TSS credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation and that it shall not transfer any portion of HRSD-generated credits (or waste load allocations, if applicable) to any other person or entity. In the event that the City no longer requires some or all of the credits (or waste load allocations) for such use, they shall revert to HRSD and HRSD shall update and reissue Attachment A accordingly.

5. Mutual Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement.

6. Permits & Approvals. If for any reason any federal, state, regional or local government or agency fails to issue any necessary permit, approval or other authorization for the SWIFT Project or the transfers contemplated by this Agreement, HRSD shall be excused from its performance hereunder.

7. Force Majeure. The obligations of HRSD, including its annual or permanent transfer obligations, shall be suspended while and as long as performance is prevented or impeded by strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, government action (other than by HRSD), major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of HRSD.

8. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practical the provisions and intent of this Agreement. If in any such event HRSD is unable to perform its transfer obligations as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

9. Significant Financial & Budgetary Constraints. Notwithstanding any other provision of this Agreement or any prior determination of feasibility of the SWIFT Project, HRSD reserves the right to terminate or renegotiate this Agreement in the event HRSD experiences significant financial or budgetary challenges which, in HRSD's opinion, would significantly impair its ability to perform its obligations hereunder. In such event, the Parties shall work together to attempt to amend this Agreement to accommodate such challenges, with the goal of providing annual credits to the City (and to other Hampton Roads localities with similar water quality credit agreements) as practical.

10. Credit Supply Constraints. Notwithstanding any other provision of this Agreement, to the extent that HRSD determines in its sole discretion that its available quantity of water quality credits (or allocations) is insufficient to meet the total MS4 Chesapeake Bay TMDL Action Plan compliance requirements of the City and of all other Hampton Roads localities that are party or become party to a similar water quality credit agreement, HRSD's obligations hereunder shall be limited to transferring to the City its pro rata share of HRSD's available credits based on pollutant-specific total credit needs of all Hampton Roads localities. HRSD agrees to provide the City with notice of its ability only to transfer a pro rata share of HRSD's available credits as promptly as possible but no later than 90 days after becoming aware of the event limiting HRSD's ability to meet the total credit needs of all Hampton Roads Localities. For clarity, HRSD shall assume no obligation under this Agreement to install, upgrade, improve, or significantly alter the operation of any portion of its sewerage system or treatment works for purposes of providing water quality credits (or allocations).

11. No Third-Party Beneficiaries. This Agreement is solely for the benefit of the Parties hereto and their permitted successors and assigns and shall not confer any rights or benefits on any other person or entity.

12. No Assignment. This Agreement, and the rights and obligations established hereunder, shall be binding upon and inure to the benefit of any successors of the Parties. However, no Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

13. Expenses; Commissions. Except as provided herein, each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated hereby. The Parties represent and warrant to each other that they have not dealt with any business broker or agent who would be entitled to a brokerage commission or finders fee as a result of this Agreement or any related transactions.

14. Governing Law; Venue; Severability. This Agreement shall be construed in accordance with and governed for all purposes by the laws of the Commonwealth of Virginia. This Agreement is a Virginia contract deemed executed and accepted in the City of Virginia Beach; and all questions with respect to any of its provisions shall be instituted, maintained, and contested in a court of competent jurisdiction in the City of Virginia Beach, Virginia or the U.S. District Court for the Eastern District of Virginia. If any word or provision of this Agreement as applied to any Party or to any circumstance is adjudged by a court to be invalid or unenforceable, the same shall in no way affect any other circumstance or the validity or enforceability of any other word or provision.

15. No Waiver. Neither any failure to exercise or any delay in exercising any right, power or privilege under this Agreement by either Party shall operate as a waiver, nor shall any single or partial exercise of any right, power or privilege hereunder preclude the exercise of any other right, power or privilege. No waiver of any breach of any provision shall be deemed to be a waiver of any preceding or succeeding breach of the same or any other provision, nor shall any waiver be implied from any course of dealing.

16. Entire Agreement; Amendments. This Agreement contains the entire agreement between the Parties as to the subject matter hereof and supersedes all previous written and oral negotiations, commitments, proposals and writings. No amendments may be made to this Agreement except by a writing signed by both Parties.

17. Counterparts; Signatures; Copies. This Agreement may be executed in counterparts, both of which shall be deemed an original, but all of which together shall constitute one and the same instrument. A facsimile or scanned signature may substitute for and have the same legal effect as an original signature. Any copy of this executed Agreement made by photocopy, facsimile or scanner shall be considered the original for all purposes.

18. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its charter or enabling legislation or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected.

IN WITNESS WHEREOF, the Parties hereto have caused the execution of this Agreement as of the date first written above.

[SIGNATURES BEGIN ON NEXT PAGE]

SIGNATURE PAGE OF HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION BY AND BETWEEN HRSD AND CITY OF CHESAPEAKE

HAMPTON ROADS SANITATION DISTRICT

By: _____
Edward G. Henifin
General Manager

CITY OF CHESAPEAKE

By: _____
James E. Baker
City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT A

Water Quality Credit Needs for Second & Third Bay TMDL Permit Cycles

Section 1: Initial Estimate of Credit Needs (lbs/yr)
[As Estimated by City as of Effective Date of this Agreement]

	James River Basin					
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles			
TN	2915	10,628	13,543			
TP	1082	2424	3506			
TSS	473,926	1,098,693	1,572,619			

Section 2: City-Calculated and HRSD-Accepted Credit Needs (lbs/yr)
Under DEQ-Approved TMDL Action Plan and Subparagraph 1.c. of this Agreement
[As Accepted by HRSD After DEQ Approval of City's TMDL Action Plan]

	James River Basin					
Parameter	2nd Permit Cycle	3rd Permit Cycle	Total Both Cycles			
TN	TBD	TBD	TBD			
TP	TBD	TBD	TBD			
TSS	TBD	TBD	TBD			

For any credit need noted as "To Be Determined" or "TBD," please refer to Paragraph 1.c. for process for updating and reissuing this Attachment A.

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT
FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT B

Annual Water Quality Credit Transfer Form

Instructions: To be completed and executed by HRSD and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by HRSD.

By execution and delivery of this Annual Credit Transfer Form, HRSD transfers the following water quality credits in the amounts specified to the City in accordance with, and for the specific and limited purposes of, the Hampton Roads Water Quality Credit Agreement for Chesapeake Bay Restoration.

Transferor: Hampton Roads Sanitation District

Transferee (MS4): City of Chesapeake, Virginia

Year Credits Generated: _____

Date Credits Transfer: _____

River Basin	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
James			
York			

Signed (for HRSD): _____

Name (Print): _____

Title: _____

HAMPTON ROADS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY RESTORATION
ATTACHMENT C

MS4 TMDL Action Plan Provision for Use of HRSD-Generated Water Quality Credits

The intent of this plan is the generation and use of TN, TP and TSS credits before and during operation of the SWIFT Project in collaboration with HRSD pursuant to the Hampton Roads Water Quality Credit Agreement ("agreement") for Chesapeake Bay Restoration to which the City and HRSD are signatories. This compliance method is in lieu of more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This agreement in no way limits the City's ability or option to fund or pursue funding for water quality or flood control projects currently or in the future. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS). The quantity of reduction credits from the SWIFT Project that are allocated to this TMDL Action Plan for the James River Basin are: 13,543 lbs/yr TN, 3506 lbs/yr TP, and 1,572,619 lbs/yr TSS.

Appendix E.
Public Comments on Action Plan and Modifications Made

Chesapeake VIRGINIA

AECOM

Chesapeake VIRGINIA

AECOM