



DUMFRIES, VIRGINIA

Virginia's Oldest Continuously Chartered Town
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September 21, 2016

Bryant Thomas
Water Permits & Planning Manager
Virginia Department of Environmental Quality
Northern Regional Office
13901 Crown Court
Woodbridge, Virginia 22193

**RE: Town of Dumfries, VAR040117
2015-2016 MS4 General Permit Annual Report**

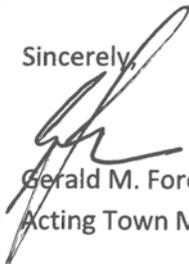
Mr. Thomas,

The Town of Dumfries is pleased to submit our 2015-2016 MS4 Annual Report which details the Town's status of compliance with the MS4 Program requirements as enumerated in the General Permit. The Town has worked diligently over the past year to develop and implement our MS4 Program and we expect progress to continue into the next reporting year.

We appreciate the opportunity to maintain an open dialogue with DEQ as development of our MS4 Program continues. We look forward to further discussing our MS4 Program and welcome any recommendations of ways in which we can make improvements.

Please do not hesitate to contact us if you have any questions regarding this document.

Sincerely,



Gerald M. Foreman
Acting Town Manager

cc: Richard West, Director of Public Works
Shaina Schaffer, MS4 Coordinator

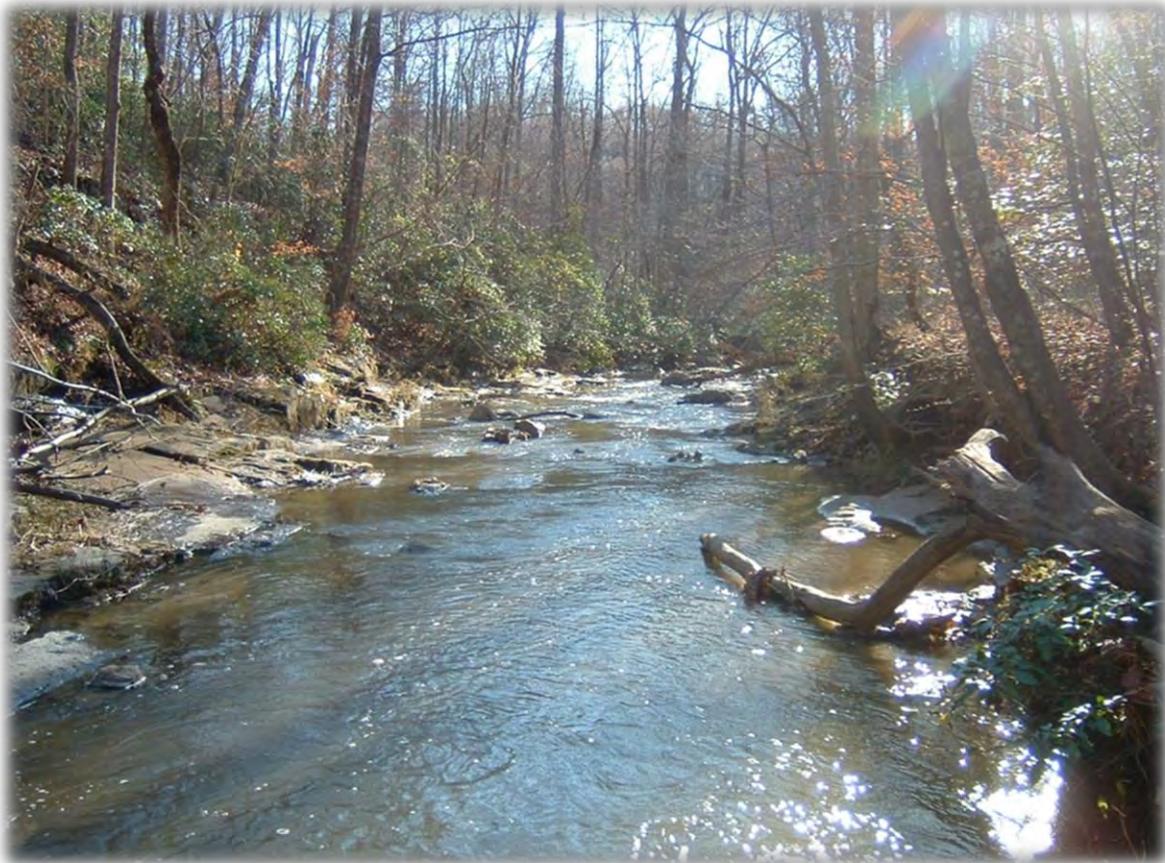


Town of Dumfries, Virginia

MS4 Annual Report

Reporting Period: July 1, 2015 – June 30, 2016

In compliance with the Virginia Stormwater Management Program (VSMP) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4).



Town of Dumfries

MS4 Annual Report

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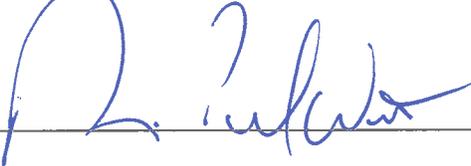
Appendix D: Total Maximum Daily Load (TMDL) Action Plans

Certification Statement

“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.”

Print Name: Richard Paul West

Title: Director of Public Works

Signature: 

Date: 19 Sep 2016

Print Name: Gerald M. Foreman

Title: Acting Town Manager

Signature: 

Date: 19 Sep 2016

Background Information

Name: Town of Dumfries Municipal Separate Storm Sewer System
Permit Number: VAR040117
Reporting Period: July 1, 2015-June 30, 2016
Modifications of Department Roles and Responsibilities: MS4 Coordinator oversees MS4 Program under the guidance of Public Works Director.
New Outfalls and Associated Acreage: There were no new outfalls added to the MS4 system for this reporting year however, a study and delineation of the Town's MS4 service area was performed. The Town will continue to update its MS4 map as new outfalls are added, interconnections are clarified, or other modifications become necessary.

The Town of Dumfries comprises approximately 1.54 square miles of urban mixed use land development located approximately 25 miles south of Washington, D.C. The sole watershed area, Quantico Creek, discharges into the Potomac River. The Town is an operator of a Small Municipal Separate Storm Sewer System (MS4). A *municipal separate storm sewer system* is defined as "a conveyance or system of conveyances otherwise known as municipal separate storm sewer system, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains:

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

The US Census in 2010 determined the Town's population to be 4,961 and that the Town is within an Urbanized Area and thus is subject to the General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges from Small Municipal Storm Sewer Systems (General Permit).

In accordance with the requirements of General Permit (9VAC25-890-40 et seq.), this annual report was prepared by the Town of Dumfries for the reporting period of July 1, 2015- June 30, 2016. The Town's most recent five-year General Permit (VAR040117) became effective on July 1, 2013 and will expire on June 30, 2018.

MS4 permit also requires the Town to develop a Municipal Separate Storm Sewer System (MS4) Program Plan. The Town annually updates the MS4 Program Plan in accordance with Table 1 of the General Permit. The updated MS4 Program Plan will be available on the Town's stormwater webpage within 30 days of

submittal of this report: <http://www.dumfriesva.gov/governmentpublic-works-municipal-separate-storm-sewer-system-ms4/>

Watersheds

The Town of Dumfries is highly urbanized and is encompassed by a sole watershed area, Quantico Creek, which discharges into the Potomac River. Quantico Creek is listed for several impairments as detailed in the table below. If appropriate measures are not taken to protect and prevent further degradation to Quantico Creek, water quality will decline beyond existing conditions.

Subwatershed Name	Hydrologic Unit Code (HUC)	Approximate Length within Town (miles)	Approximate Drainage Area (acres)	Impairments	TMDL WLA?
Quantico Creek	020700110104	1.45	4,877	<ul style="list-style-type: none"> • PCB in fish Tissue • Estuarine Bioassessments • Sediment • Bacteria 	No



The Town of Dumfries also drains into the Chesapeake Bay Watershed. With a watershed encompassing 64,000 square miles, the Chesapeake Bay is North America's largest estuary. Through its tributaries, over 100,000 streams, creeks, and rivers from six states – Virginia, Maryland, Delaware, Pennsylvania, West Virginia, and New York – drain into the Chesapeake Bay. The water quality of the Bay has been significantly degraded by land use activities in the watershed. As part of the efforts to protect and restore the Chesapeake Bay, the MS4 Permit requires the Town of Dumfries to address impairments for phosphorus, nitrogen, and sediment in accordance with the Special Conditions for the Chesapeake Bay TMDL.



Chesapeake Bay Watershed Map

Organizational Structure

The Town of Dumfries Public Works Department coordinates the Town's municipal separate storm sewer system (MS4) program. The Public Works Director is responsible for developing and updating the MS4 Program Plan and submitting Annual Reports. The Town Manager is responsible for providing the appropriate certification for submittals. The Department of Community Development, Police Department, and other relevant town staff are major contributors to the Town's MS4 Program although it is recognized that this is a Town-wide and community-wide program.

Contact Information

Principal Executive Officer
Title: Acting Town Manager Name: Gerald M. Foreman Address: 17755 Main St. Dumfries, VA 22026 Phone: (703)-221-3400 Email: hongforeman@dumfriesva.gov

Duly Authorized Representative
Title: Public Works Director Name: Richard West Address: 17755 Main St. Dumfries, VA 22026 Phone: (703)-221-3400 Email: rwest@dumfriesva.gov
Title: MS4 Program Coordinator Name: Shaina Schaffer Address: 17755 Main St. Dumfries, VA 22026 Phone: 703-221-3400 Email: sschaffer@dumfriesva.gov

MS4 Annual Report 2015-2016

The MS4 Annual Report details the Town of Dumfries' stormwater management program and efforts taken to manage the quality of stormwater discharges from the MS4. The MS4 Annual Report is categorized into the following six minimum control measures (MCMs) and special conditions for TMDLs:

1. Public education and outreach on stormwater impacts
2. Public involvement and participation
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction runoff control for development and redevelopment
6. Good housekeeping and pollution prevention for municipal operations
7. Virginia TMDL Special Conditions
8. Chesapeake Bay TMDL Special Conditions

This MS4 Annual Report provides summaries for each of the established best management practices (BMPs) to address the six MCMs. The Annual report also provides an analysis of the effectiveness and progress towards meeting the identified measurable goals. Evaluation of BMPs during the development of the 2015-2016 MS4 Annual Report will be considered during the annual review of the MS4 Program Plan. The Town will maintain the MS4 Program Plan and Annual Reports from the five year permit cycle on file in the Public Works Department and on the Town's MS4 webpage: <http://www.dumfriesva.gov/governmentpublic-works-municipal-separate-storm-sewer-system-ms4/>.

Status of Compliance

Minimum Control Measure #1: Education & Outreach on Stormwater Impacts

BMP 1.1 Develop and Implement Stormwater Public Education and Outreach Program

1.1.1 Description: The Town shall continue to implement an education and outreach program in accordance with the conditions of this permit.

1.1.2 Summary: The Town developed a comprehensive Public Education and Outreach Program (PEOP) in September 2015 to more effectively target audiences such as children, minorities, and Limited English Proficiency (LEP) individuals and families. With the development of a PEOP for the Town's stormwater program, the Town has been able to rely less upon Clean Water Partners to meet the requirements for MCM 1. The Town's PEOP focuses on the following four high-priority water quality issues: bacteria from pet waste, illicit discharges from automobile shops (wastewater, chemicals, oil/fuel), illicit discharges from car washes (wastewater, solvents, chemicals), and illicit discharges from restaurants (oils, grease, chemicals).

BMP 1.2: List of Education and Outreach Activities Conducted During Reporting Period

1.2.1 Description: The Town shall continue to document the annual activities for the reporting period.

1.2.2 Annual Reporting Requirements: The following education and outreach activities occurred during Year 3:

- Pet Owners: The Town estimates that there are approximately 575 registered dog owners within the MS4 permit area. During this reporting year, the Town utilized the following activities to reach 42% of the target audience:
 - Fall Festival (October 16, 2015) – Public Works Staff had a table at the Fall Festival to distribute tri-fold brochures titled “Pet Waste and Water Quality” detailing the impact of pet waste on water quality and answer any questions citizens may have. At this event, brochures were available in English and Spanish. Forty-eight (48) of the English brochures were distributed.
 - Town Hall Lobby – The “Pet Waste and Water Quality” tri-fold was also available in the lobby of Town Hall in both English and Spanish. Town staff kept track of the number of brochures available to determine how many brochures were distributed. No brochures were taken during the reporting year.
 - Quantico Creek Cleanup (April 16, 2016) – The Town held its annual Quantico Creek Cleanup and Public Works staff were present to distribute educational brochures entitled “Pick up after your pet!” The brochure was available in both English and Spanish. At the event, 2 English copies and 1 Spanish copies were taken.
 - Multicultural Festival (May 14, 2016) – Town staff were present at the Town's Multicultural Festival to distribute the “Pick up after your pet!” brochures and pet waste bags/holders. At the festival, 49 English brochures, 43 Spanish brochures, and 100 pet waste bags/holders.
- Restaurants: The Town estimates that there are 15 restaurants within the MS4 Permit area. During this reporting year, 20% of the target audience was reached. The MS4 Coordinator visited three (3) restaurants regarding the Town's stormwater management program. Visits

were tracked with a signoff sheet and each business received “How does your restaurant impact water quality?” brochures and “You Can Prevent Stormwater Pollution!” posters in both English and Spanish.

- **Automotive Shops:** The Town estimates that there are 24 auto repair shops within the MS4 permit area. During this reporting year, 25% of the target audience was reached. The MS4 Coordinator visited six (6) auto shops regarding the Town’s stormwater management program. Visits were tracked with a signoff sheet and each business received “How does your auto repair shop impact water quality?” brochures and “You Can Prevent Stormwater Pollution!” posters in both English and Spanish.
- **Car Washes:** The Town estimates that there are 2 car washes within the MS4 permit area. During this reporting year, 50% of the target audience was reached. The Assistant Director of Public Works visited one (1) car wash regarding the Town’s stormwater management program. Visits were tracked with a signoff sheet and each business received “How does your car wash impact water quality?” brochures in both English and Spanish.
- **Town Charter Newsletter:** The Town also utilizes the Town Charter Newsletter which is published quarterly as a mechanism for reaching citizens regarding stormwater concerns. In the First Quarter newsletter which came out in January 2016, there was an article entitled “Keep Our Waters Clean This Winter” which detailed recommendations to help reduce stormwater pollution during snow and ice removal. The Second Quarter newsletter came out in April 2016 and had an article entitled “Quantico Creek Cleanup” which encouraged citizens to engage in the Town’s annual cleanup.
- **Facebook Page:** The Town uploaded a short video regarding illicit discharges to the Town’s Facebook page in May 2016. The Town will continue to look for other opportunities to use its Facebook page and website to strengthen public education and outreach initiatives.
- **Clean Water Partner Regional Stormwater Campaign:** The Town is also a member of the Northern Virginia Clean Water Partners which is coordinated through the Northern Virginia Regional Commission. The partnership runs an annual outreach campaign focused upon educating the public and promoting awareness of stormwater pollution. For the 2015-2016 reporting year, the Northern Virginia Clean Water Partners selected the following three high priority water quality issues: 1) bacteria, 2) nutrients, 3) illicit discharges of chemical contaminants. The target audiences identified for these issues was identified as: 1) pet owners, 2) homeowners with a lawn or garden, and 3) home mechanics. During the 2015-2016 reporting year, the campaign utilized the Only Rain Down the Storm Drain website and television, print, and internet advertising to reach the identified target audiences. See Appendix A for the full campaign report.

BMP 1.3: List of Education and Outreach Activities To Be Conducted During Next Reporting Period

1.3.1 Description: The Town will continue to announce and list the education and outreach activities planned for the next reporting period.

1.3.2 Annual Reporting Requirements:

Planned activities for 2016-17 include: educational materials targeting automobile repair shops, commercial automobile washes, restaurants (proper fats, oil, and grease disposal), and pet waste. Town staff and volunteers will continue to distribute educational materials at Town events such as the Fall Festival. The Town intends to also continue to utilize the Town Charter Newsletter and will increase its use of the stormwater webpage and Town Facebook page to reach citizens.

Minimum Control Measure 1 Evaluation
<i>Appropriateness of the identified BMPs</i> The Public Education and Outreach Program (PEOP) comprehensively addresses all of the General Permit requirements and targets four primary areas: automobile repair shops, commercial automobile washes, restaurants, and pet waste.
<i>Effectiveness of BMPs in addressing discharges into impaired waterways</i> The Town’s PEOP program was developed to achieve the best results in a relatively short period of time. The number of facilities targeted are significant, but limited, which enabled contact and activities to be accurately tracked and monitored.
<i>Progress towards achieving the identified measurable goals</i> The development of a Public Education and Outreach Program (PEOP) has greatly enhanced the Town’s public outreach initiatives. The PEOP helps to identify high-priority water quality issues to focus outreach efforts upon, associated targeted audiences, and methods for implementation. Through implementation of the program this reporting year, the Town has been able to reach at least 20% of each target audience in accordance with permit conditions.
<i>Modifications to any operators, departments, roles and responsibilities</i> The Town continues to work with The Berkley Group to evaluate, develop, and implement the Town’s MS4 Program.
<i>Steps to be taken to address deficiencies</i> No deficiencies have been identified at this time.
<i>Plans for the next reporting cycle</i> The public education and outreach activities conducted during the 2016-2017 reporting year will continue at a higher level of intensity as the Town strives to strengthen the effectiveness of its Public Education and Outreach Program.

Minimum Control Measure #2: Public Involvement/Participation

BMP 2.1: Maintaining Updated MS4 Program Plan and Annual Reports
<i>2.1.1 Description:</i> The Town of Dumfries will review and, as needed, will update the MS4 Program Plan in conjunction with the Annual Report at a minimum of once a year. The Town shall post copies of the MS4 Program Plan on its website within 30 days of submittal of the Annual Report. The Town shall solicit public comments of the MS4 Program Plan prior to applying for coverage and address how comments were received on the MS4 Program Plan as part of the reapplication package.
<i>2.1.2 Summary:</i> During the 2015-2016 reporting year, the MS4 Program Plan was updated and posted on the Town’s website at: http://www.dumfriesva.gov/governmentpublic-works-municipal-separate-storm-sewer-system-ms4/ . A 30-day public comment period was held beginning on September 29, 2015. No comments were received. The Town will review the MS4 Program Plan and as needed, modify it and post a revised plan on the Town’s MS4 page.
BMP 2.2: Public Participation Events
<i>2.2.1 Description:</i> The Town of Dumfries will participate in at least four local activities annually. Participation can be through promotion, sponsorship, or other involvement. Information for these activities will be advertised, tracked, and stored in the Town’s archives and online.
<i>2.2.2 Annual Reporting Requirements:</i> The Town of Dumfries participated in four Public Participation events:

- Quantico Creek Cleanup (April 16, 2016) – The cleanup consisted of 28 volunteers and resulted in 31 bags of trash (9 recyclable) and approximately 50 pounds of bulk trash pickup.
- Keep Prince William Beautiful Festival (April 22, 2016) – The Town promoted and participated in the 2016 Keep Prince William Beautiful, sponsored by a local environmental non-profit, Keep Prince William Beautiful. The festival featured educational showcases on recycling, litter awareness, beautification, and water preservation. Town staff had a booth at the event and promoted stormwater pollution awareness and community engagement in water quality initiatives.
- Prince William County’s Compost Awareness Day (April 30, 2016) – The Town promoted Prince William County’s Compost Awareness Day to Town citizens. Information about the event was posted on the Town website, Facebook, and Twitter pages. The event was entitled “Get the Dirt” and highlighted the soil and water connection to compost. The event had several components including compost exhibits, free compost samples, plant sale, compost bin sales, gardener’s workshops and demos from the Virginia Cooperative Extension Master Gardeners.
- Stormwater Presentation at Dumfries Elementary School (May 13, 2016) – In partnership with the Prince William County Public Schools (PWCS), a presentation was given at Dumfries Elementary School. The presentation consisted of a discussion on what stormwater is, connection to the Chesapeake Bay, and impact of water quality on wildlife. The presentation concluded by showing a video entitled “Freddy the Fish Teaches About Stormwater.” Approximately, 252 kindergarten through second grade students and 8 school staff members were in attendance.

Minimum Control Measure 2 Evaluation
<i>Appropriateness of the identified BMPs</i> The identified BMPs for MCM 2 address the public participation requirements of the MS4 permit and are therefore deemed appropriate.
<i>Effectiveness of BMPs in addressing discharges into impaired waterways</i> Each participation event encourages citizen action with pollution prevention and water quality improvement and is therefore effective in addressing discharges into impaired waterways
<i>Progress towards achieving the identified measurable goals</i> The measurable goals set forth in the MS4 permit requirements have been achieved for this minimum control measure.
<i>Modifications to any operators, departments, roles and responsibilities</i> The Berkley Group will continue to work with Town departments and staff in the implementation of the Dumfries MS4 Program.
<i>Steps to be taken to address deficiencies</i> No deficiencies have been identified at this time.
<i>Plans for the next reporting cycle</i> The Town will continue its Quantico Creek Cleanup Day in association with the Alice Ferguson Foundation’s Potomac River Watershed Cleanup Day. The Town will look for opportunities to coordinate events with surrounding MS4s and other opportunities to engage the public in water quality improvement initiatives.

Minimum Control Measure #3: Illicit Discharge Detection & Elimination

BMP 3.1: Storm Drain System, Outfalls, and Information Map

3.1.1 Description: The Town of Dumfries will maintain an updated map of the Town's MS4 system.

3.1.2 Summary: The Town maintains a storm sewer map that identifies MS4 outfalls. All outfalls are uniquely identified on the map in accordance with a study performed by Draper Aden in Fall 2015. The storm sewer map is updated when necessary. Additional data available upon request.

BMP 3.2: Maintenance of BMP Tracking System

3.2.1 Description: The Town of Dumfries will maintain a BMP tracking system.

3.2.2 Summary: The Town continues to maintain its BMP Tracking System in accordance with permit requirements. As new facilities are brought online, they are added into the database. No new facilities were brought online during this reporting year.

BMP 3.3: Bacteria Sampling and Testing

3.3.1 Description: The Town of Dumfries will maintain records of bacteria sampling conducted by Jim White, a citizen volunteer monitor with the Prince William Soil and Water Conservation District.

3.3.2 Summary: Bacteria sampling and testing continued through the reporting year (Appendix B). Data is submitted to DEQ annually and posted on the Department's website.

BMP 3.4: Notification of Regulated Downstream MS4

3.4.1 Description: The Town of Dumfries will notify in writing, any downstream regulated MS4 to which the small regulated MS4 is physically interconnected.

3.4.2 Annual Reporting Requirements: During the 2015-2016 reporting year, the Town issued written notifications of interconnections to the following MS4s:

- Virginia Department of Transportation
- Prince William County Public Schools
- Prince William County

See Appendix B for copies of the notifications sent and received during this reporting year.

BMP 3.5: Illicit Discharges & Connections Ordinance

3.5.1 Description: The Town of Dumfries will effectively prohibit non-stormwater discharges into the storm sewer system by adopting an Illicit Discharges and Connection ordinance.

3.5.2 Annual Reporting Requirements: During the reporting year, the Town developed an illicit discharge and connections ordinance which was adopted by Town Council on February 2, 2016.

BMP 3.6: Written Procedures to Detect & Eliminate Illicit Discharges

3.5.1 Description: The Town of Dumfries shall implement and update written procedures to detect, identify, and address unauthorized non-stormwater discharges to the MS4.

3.5.2 Summary: The Town has revised the written dry weather field screening methodologies and the illicit discharge investigation procedures. These procedures are included in the Town's Standard Operating Procedures Handbook (Appendix B— excerpt from handbook containing the procedures).

3.5.3 Annual Reporting Requirements: During the 2015-2016 reporting year, 50 outfalls were inspected by Town staff in accordance with permit requirements. At outfalls NI, NE, 57, AD, AE1, and 43 staff noted orange/rust colored water near the outfalls. Staff followed up on 5/20/2016 and all of the outfalls still had orange/rust colored water with the exception of outfall 43. During the follow-up inspections, staff tested the iron levels outfalls NI, NE, 57, AD, and AE1. As noted in the table below,

field tests for those outfalls noted high iron levels which explained the unusual color. Staff consulted the criteria for surface water at 9VAC25-260-140 and noted that the only water quality standard (WQS) for iron was associated with public water supplies and there is no standard for iron levels in surface waters. Staff researched this further and noted that high iron levels are generally assumed to be natural occurrences and not indicative of illicit discharges. A pyrite (FeS₂) mine used to be located within Dumfries which staff noted as a possible explanation for higher iron levels throughout the Town.

Outfall Follow-up Inspections		
Date	Outfall ID	Iron Level
5/20/2016	NI	2.5 mg/L
5/20/2016	NE	0.5 ppm
5/20/2016	57	0.7 ppm
5/20/2016	AD	>10 mg/L
5/20/2016	AE1	> 10 mg/L

Illicit Discharge Summary 2015-2016				
Incident Date	Follow-up Date	Date Closed	Incident Narrative	Resolutions/Conclusion
12/30/2015	12/31/2015	2/19/2016	A small, uncovered pot of what appeared to be used motor oil was left outdoors near Quantico Creek. Although it was not leaking at the time, it had the potential to lead to an illicit discharge.	Director of Public Works left phone messages with the property owner detailing need to remove the item. It was observed on 2/19/2016 that the pan of oil had been removed.
4/14/2016	4/15/2016	5/20/2016	Observed that there was an oily discharge coming out of outfall 25.	Followed upstream to outfall 60 and 45, still noted oily discharge. Continued following upstream, around the back of 17495 Jefferson Davis Hwy, staff noted a large tank used by Dumfries Marine Repair to test boat motors. Town issued an IDDE Violation letter on 4/22/2016 which gave the property owner 10 days to remedy the problem. Staff followed met with owner on 5/20/2016 and noted the tank was properly sealed. Owner agreed to keep the tank properly sealed to ensure no fluids would discharge from the tank. He assured staff that the tank would be periodically pumped out and waste properly disposed.

BMP 3.7 Promotion and Facilitation of Public Reporting of Illicit Discharges
3.7.1 Description: The Town of Dumfries shall operate and promote an online pollution reporting form for citizens to report illicit discharges. Citizens may also call the Town of Dumfries for reporting.
3.7.2 Summary: Information regarding how citizens can report pollution can be found on the Town’s MS4 webpage. Additionally, information regarding reporting potential illicit discharges has been incorporated into a brochure produced by the Town entitled, “You can help save the Chesapeake Bay!” That brochure is available at Town Hall, the Community Center, and at Town events.

Minimum Control Measure 3 Evaluation
Appropriateness of the identified BMPs The Town made great strides in the implementation of MCM 3 in the 2015-16 reporting year. Significant progress will continue into the next reporting year.
Effectiveness of BMPs in addressing discharges into impaired waterways An IDDE program was developed and two potential IDDE incidents were reported and resolved.
Progress towards achieving the identified measurable goals The Town continues to implement its Illicit Discharge Detection and Elimination (IDDE) Program. The adoption of the Town’s IDDE ordinance has greatly helped in the enforcement component of the program. The measurable goals set forth in the MS4 permit requirements have been achieved for this minimum control measure.
Modifications to any operators, departments, roles and responsibilities The MS4 Coordinator aids the Public Works Director in overseeing and facilitating follow-up on potential illicit discharges.
Steps to be taken to address deficiencies The Town’s IDDE ordinance has significantly strengthened this component of the MS4 Program. The Town seeks to continue to utilize the IDDE ordinance as a mechanism to enforce the IDDE Program as necessary. The Town will continue to document potential illicit dischargers. The Town will strive to follow-up on reports and after initial inspections in a timely manner.
Plans for the next reporting cycle The Town will continue to promote the IDDE program in the next reporting cycle. The Town intends to continue employee training focused upon identifying and reporting illicit discharges and will look for opportunities to increase awareness and involve the public in this component of the MS4 Program.

Minimum Control Measure #4: Construction Site Stormwater Runoff Control

BMP 4.1: Ordinance and other legal authorities to require Erosion & Sediment Controls
4.1.1 Description: The Town of Dumfries will implement its ordinance and legal authorities to require erosion and sediment controls on construction sites that disturb 10,000 square feet or greater, or land-disturbing activities in jurisdictions in Tidewater Virginia, as defined in §62.1-44.15:68 of the Code of Virginia, that disturb 2,500 square feet or greater and are located in areas designated as Resource Protection Areas (RPA), Resource Management Areas (RMA) or Intensely Developed Areas (IDA), pursuant to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act. Legal authorities include: <ul style="list-style-type: none"> • Chapter 26, Article IV of the Town Code describes the Erosion and Sediment Control Ordinance. • Town’s Subdivision (Chapter 54) and Zoning Ordinances (Chapter 70) • References from above ordinances and documents to the “Virginia Erosion and Sediment Control Regulations” and the Virginia Erosion and Sediment Control Handbook

Additional information about the Town's erosion and sediment control program can be found at: www.dumfriesva.gov (Note: The Town of Dumfries utilizes an agreement in lieu of a plan for the construction of single-family residences as provided in Code of Virginia §62.1-44.15:55.).

4.1.2 Summary: Town staff noted that the Town's Erosion and Sediment Control ordinance was out of date due to modifications at the state level. The Town has amended the ordinance in compliance with Va. Code §62.1-44.15:51 et seq. The Town held a public hearing on the proposed amendments to the E&S ordinance on September 20, 2016. The amended ordinance is on the October 5, 2016 consent agenda for adoption.

BMP 4.2: Inspections and Tracking of Land Disturbance Activities

4.2.1 Description: Town inspectors will inspect land-disturbing activities for compliance with an approved erosion and sediment control plan or agreement in lieu of a plan in accordance with minimum standards. Inspections shall take place (a) upon installation of erosion and sediment controls; (b) at least once during every two-week period; (c) within 48 hours of any runoff producing storm event; and (d) upon completion of the project and prior to the release of any applicable bonds.

The Town shall also:

- Utilize legal authority to require compliance with an approved plan when an inspection finds that the approved plan is not being properly implemented.
- Utilize, as appropriate, legal authority to require changes to an approved plan when an inspection finds that the approved plan is inadequate to effectively control soil erosion, sediment deposition, and runoff to prevent the unreasonable degradation of properties, stream channels, waters, and other natural resources.

The Town shall ensure that inspections are conducted by personnel who hold a certificate of competence in accordance with 9VAC25-850-40.

4.2.2 Annual Reporting Requirements:

- Total number of regulated land-disturbing activities: 3
- Total number of acres disturbed: 2.47
- Total number of inspections conducted: 8
- Summary of enforcement actions taken, including the total number and type of enforcement actions taken during the reporting period:

During the reporting period, alleged violations were noted on inspection files and discussed with the property owner/RLD either on site or via email. All alleged violations noted on inspections files were resolved in a timely manner without the need for further enforcement actions.

- The Cannon Ridge Subdivision Lot 1 & 2 (19588/19589 Duke St.) had several alleged E&S violations which were noted during the 2/22/16 inspection. The site was given a corrective action deadline of 2/27/16 was issued for the silt fence repairs. The site was re-inspected on 2/26/16 which documented installation of new silt fencing and some additional silt fencing to prevent sediment from flowing down the south side of the lawn. During the 2/26/16 inspection, a corrective action deadline of 3/4/16 was issued for the denuded areas in the front and side lawns to be stabilized. A follow-up inspection on 3/4/16 noted that final grading was in process in the front and side lawns which was compliant with the discussion with the RLD to reach final stabilization.

The Town enters Land Disturbing Permits into a Permit Tracker database when permits are issued. In February 2016, the Town entered into a contract with Total Construction Solutions (TCS) and since that time, TSC has been performing inspections of land-disturbing activities in accordance with permit requirements.

Regulated Land-Disturbing Activities

Project Name: Canon Ridge Subdivision Lot 1
Total Acres Disturbed: 0.49 acres

Project Name: Canon Ridge Subdivision Lot 2
Total Acres Disturbed: 0.49 acres

Project Name: Danforth Homes The Point
Total Acres Disturbed: 1.49

BMP 4.3: Require VSMP Permit for Land Disturbing Activities

4.3.1 Description: The Town of Dumfries requires all land disturbing activities encompassing areas over 2,500 square feet to secure a VSMP storm water permit, through the Town’s MS4 Permit Program, for the activity.

4.3.2 Summary: The Town of Dumfries continues to require VSMP permits for land-disturbing activities in accordance with its Stormwater Management Ordinance (Town Code Chapter 26, Article V) and its MS4 Program.

BMP 4.4: Promote to the Public a Mechanism for Receipt of Complaints Regarding Regulated Land Disturbing Activities

4.4.1 Description: The Town of Dumfries promotes reporting of construction site issues through contact with the public at public education and outreach events as described in MCM 1 and 2, and also promotes reporting through its website at <http://www.dumfriesva.gov/governmentpublic-works-municipal-separate-storm-sewer-system-ms4/>. Calls are received by the Department of Public Works and Planning & Zoning.

4.4.2 Summary: During the 2015-2016 reporting year, no calls regarding complaints about land-disturbing activities were received by Town staff.

Minimum Control Measure 4 Evaluation

Appropriateness of the identified BMPs

The identified BMPs are appropriate and effective, but land disturbing activities in the Town were very limited during this reporting period.

Effectiveness of BMPs in addressing discharges into impaired waterways

The Town is working with Total Construction Solutions (TCS) to ensure all inspections of land-disturbing activities are occurring in accordance with permit requirements.

Progress towards achieving the identified measurable goals

The Town will track and document the permits and inspections in its existing system.

Modifications to any operators, departments, roles and responsibilities

The Public Works and Zoning Program Administrator position assists in tracking this information for reporting in each permit cycle. In February 2016, the Town entered into a contract with TCS to ensure all land-disturbing activities are conducted according to permit requirements.

Steps to be taken to address deficiencies

The Town will continue to utilize TCS to ensure inspections at land-disturbing activities occur in accordance with permit requirements.

Plans for the next reporting cycle

The Town will continue to promote the use of its website to receive complaints and encourage phone calls.

Minimum Control Measure #5: Post-Construction Stormwater Management in New Development & Redevelopment

BMP 5.1: Ordinance and other legal authorities to address Post-Construction Runoff

5.1.1 Description: The Town of Dumfries will implement its ordinance to address post-construction runoff from new development and redevelopment projects to ensure compliance with the Virginia Stormwater Management Act and attendant regulations. Legal authorities include:

- Chapter 26, Article V of the Town Code described the Stormwater Management Ordinance

Additional information about the Town's stormwater management program can be found at:

<http://www.dumfriesva.gov/governmentpublic-works-municipal-separate-storm-sewer-system-ms4/>.

5.1.2 Summary:

The Town's Code of Ordinances Environment chapter addresses erosion and sediment control and stormwater runoff. These legal authorities are directly supported by the Code of Virginia. Other local tools also help enforce these regulations in terms of the site plan review process and enforcement of the standards set forth in Prince William County's Design and Construction Standards Manual (DCSM), which has been adopted by the Town.

5.1.3 Annual Reporting Requirements

The Town continues to utilize its Stormwater Management Ordinance and other legal authorities to address Post-Construction Runoff. During the reporting period, zero exceptions were granted by the Town.

BMP 5.2: Require long-term operation and maintenance of stormwater management facilities not owned by the Town

5.2.1 Description: The Town shall require adequate long-term operation and maintenance of stormwater management facilities owned by the owner by requiring the owner to develop a recorded inspection schedule and maintenance agreement.

The Town provides developers with a template maintenance agreement in the Design and Construction Standards Manual (Section 720.15). The maintenance agreement requires that the owner submit to the Town an annual inspection report, along with one certified by a professional engineer every 3 years, to assure safe and proper functioning of the facilities.

If maintenance is neglected by the owner, the maintenance agreement allows the Town, after proper notice is provided, to enter upon the property and take whatever steps necessary to correct deficiencies and charge the costs of such repairs to the owner.

5.2.2 Summary: The Town is working to ensure that all future stormwater management facilities not owned by the Town have recorded maintenance agreements. No enforcement actions were taken during this reporting year.

BMP 5.3: Require long-term operation and maintenance of stormwater management facilities owned by the Town

5.3.1 Description: The Town shall require adequate long-term operation and maintenance of stormwater management facilities owned by the Town. Town inspectors inspect stormwater management facilities annually, generally in the Fall, and inform Town departments responsible for the stormwater management facilities of any deficiencies found.

Town departments are responsible for maintaining stormwater management facilities on properties they manage unless an alternative agreement has been established.

5.3.2 Summary:

During the 2015-2016 reporting year, staff developed a "Stormwater Post-Construction Inspection Manual" which details inspection and maintenance procedures, and includes a table of Town-owned stormwater management facilities, periodic inspection checklists, annual inspection checklists, and an appendix containing the Operations & Maintenance Manuals for relevant proprietary stormwater management facilities.

BMP 5.4: Track Stormwater Management Facilities

5.4.1 Description: The Town shall maintain an updated electronic database of all known operator-owned and privately-owned stormwater management facilities that discharge into the MS4. The database shall include:

- a) The stormwater management facility type;
- b) A general description of the facility's location, including the address or latitude and longitude;
- c) The acres treated by the facility, including total acres, as well as the breakdown of pervious and impervious acres;
- d) The date the facility was brought online (MM/YYYY). If the date is not known, the Town shall use June 30, 2005, as the date brought online for all previously existing stormwater management facilities;
- e) The sixth order hydrologic unit code (HUC) in which the stormwater management facility is located;
- f) The name of any impaired water segments within each HUC listed in the 2010 §305(b)/303(d) Water Quality Assessment Integrated Report to which the stormwater management facility discharges;
- g) Whether the stormwater management facility is operator-owned or privately owned;
- h) Whether a maintenance agreement exists if the stormwater management facility is privately owned;
- i) The date of the operator's most recent inspection of the facility.

5.4.2 Annual Reporting Requirements: All Town-owned facilities were inspected during the 2015-2016 reporting year. In total four facilities were inspected.

Minimum Control Measure 5 Evaluation
<i>Appropriateness of the identified BMPs</i> The identified programmatic BMPs are an effective means of managing post-construction runoff and are therefore deemed appropriate.
<i>Effectiveness of BMPs in addressing discharges into impaired waterways</i> The Town performs routine maintenance and regular inspections of publicly maintained stormwater facilities. These permit-required BMPs are effective in addressing discharges into impaired waterways.
<i>Progress towards achieving the identified measurable goals</i> The Town continues to utilize its BMP database to track stormwater facilities. Where possible, the Town strives to address any data gaps.
<i>Modifications to any operators, departments, roles and responsibilities</i> No modifications have been made to roles and responsibilities.
<i>Steps to be taken to address deficiencies</i> The optional periodic inspection checklist is a tool departments are encouraged to utilize as stormwater management facilities are maintained. If deficiencies are found during routine maintenance, they are reported to the responsible party within the department, and repairs scheduled. This will help to ensure deficiencies are addressed in a timely manner.
<i>Plans for the next reporting cycle</i> The Town of Dumfries continues to implement its post-construction stormwater management facility operations and maintenance (O&M) program.

Minimum Control Measure #6: Pollution Prevention & Good Housekeeping

BMP 6.1: Develop Operational Procedures to Minimize or Prevent Non-stormwater Discharges
<i>6.1.1 Description:</i> The Town of Dumfries shall develop and implement written procedures for daily operations designed to minimize or prevent discharges. Procedures shall be written for: daily street and parking lot maintenance, equipment maintenance, and pesticide, herbicide, and fertilizer application, storage, and transport of materials.
<i>6.1.2 Annual Reporting Requirements:</i> The Town of Dumfries has developed written procedures for daily operations designed to minimize or prevent discharges. Procedures have been developed for: daily street and parking lot maintenance, equipment maintenance, spill response, and pesticide, herbicide, and fertilizer application, storage and transport of materials. These procedures are found in the Town’s Stormwater Management Standard Operating Procedures Handbook which will continue to be updated as modifications become necessary.
<i>Implementation.</i> As part of the required employee training, staff discussed the developed written procedures for daily operations designed to minimize or prevent discharges: <ul style="list-style-type: none"> • Street and parking lot maintenance – Staff ensure litter is picked up throughout the Town. Additionally, staff sweep a minimum of 21.67 lane-miles of street monthly depending on the weather. Staff have also been trained to recognize and report any illicit discharges observed during daily operations. • Equipment maintenance – Maintenance of vehicles is not performed at the Town Shop. The Town staff usually takes the lawnmowers to John Deere to have the oil changed but occasionally Town staff does change the oil at the shop. During employee training events, staff was reminded of pollution prevention measures to take when doing such maintenance to ensure discharges are minimized or prevented.

- Herbicide, pesticide and fertilizer use - The Town has a policy that no pesticides or herbicides are applied by Town employees until employees obtain the appropriate certifications in accordance with the Virginia Pesticide Control Act. This policy was reiterated to staff. Town employees do not apply fertilizers.
- Spill response – Spill kits have been placed in the Public Works Shop along with a designated container for used absorbent. Proposed spill response was discussed with staff during training events.

BMP 6.2: Identify All Municipal High-Priority Facilities and Municipal High-Priority Facilities with a High Potential for Pollutant Discharges

6.2.1 Description: The Town of Dumfries identified all high-priority facilities. The Town shall continue to update this list as new facilities are created or as existing facilities are modified or updated.

6.2.2 Summary: The Town has identified the following municipal high-priority facilities with a high-potential for pollutant discharges:

- Public Works Facility, 3460 Canal Road

BMP 6.3: Develop and Implement Specific Stormwater Pollution Prevention Plans (SWPPPs) for High Priority Facilities with a High Potential for Discharging Pollutants

6.3.1 Description: The Town of Dumfries shall develop and implement site-specific Stormwater Pollution Prevention Plans for identified high priority facilities with a high potential for discharging pollutants. Any facilities covered under a separate VPDES permit shall be excluded from this requirement. Each SWPPP shall be evaluated and updated as necessary to reflect any discharge, release or spill from the facility. A copy of each SWPPP shall be kept and updated and utilized as part of staff training.

6.3.2 Annual Reporting Requirements: The Town evaluated its high priority facilities and determined that the Public Works Shop is the only high priority facility with a high potential for pollutant discharges. The Town is in the process of developing the SWPPP for this facility to be developed and implemented in accordance with permit requirements and the timeline established in Table 1 of the MS4 Permit.

BMP 6.4: Implement Turf and Landscape Nutrient Management Plans

6.4.1 Description: The Town of Dumfries shall implement turf and landscape nutrient management plans developed by a certified nutrient management planner on all lands owned or operated by the Town where nutrients are applied to a contiguous area greater than one acre.

6.4.2 Annual Reporting Requirements:

The Town has three properties that qualified for Nutrient Management Plans: Merchant Park, Garrison Park, and Ginn Memorial Park. The Town has a policy that no nutrients, herbicides or pesticides be administered by Town staff. The Town did not administer nutrients, herbicides, or pesticides to either site during the reporting period. Nutrient Management Plans have been developed for Merchant Park, Garrison Park, and Ginn Memorial Park (Appendix C) should the Town decide to apply nutrients in the future.

BMP 6.5: Implement Employee Training on Written Procedures to Minimize or Prevent Discharges

6.5.1 Description: The Town of Dumfries shall conduct stormwater training for municipal employees. Training shall be designed specifically for different departments/duties and how it relates to stormwater management. The Town shall document training activities, employees in attendance, and other applicable information.

6.5.2 Annual Reporting Requirements: During the 2015-2016 reporting year, the Town implemented its stormwater training program in accordance with the conditions of the MS4 permit.

2015-2016 Stormwater Training Events			
Training Type	Training Date	Number of Employees in Attendance	Training Objective
IDDE	12/22/15	5	Recognizing and reporting potential illicit discharges
IDDE	1/27/16	8	Recognizing and reporting potential illicit discharges
Pollution Prevention/Good Housekeeping	2/19/16	6	Pollution Prevention/Good Housekeeping procedures at municipal facilities including storage and handling of chemicals, equipment maintenance, equipment washing, and spill response.
Pollution Prevention/Good Housekeeping	3/16/16	7	Pollution Prevention/Good Housekeeping practices for road/street maintenance including snow and ice removal, street sweeping, and right-of-way maintenance.
IDDE	4/13/16	6	Recognizing and reporting potential illicit discharges
Pollution Prevention/Good Housekeeping	5/20/16	6	Pollution Prevention/Good Housekeeping procedures at municipal facilities and during road/street maintenance including storage and handling of chemicals, equipment maintenance, equipment washing, spill response, street sweeping, snow and ice removal, and right-of-way maintenance.

BMP 6.6: Require Municipal Contractors Use Appropriate Control Measures and Procedures for Stormwater Discharges to the MS4 System

6.6.1 Description: The Town of Dumfries shall require that municipal contractors use appropriate control measures and procedures for stormwater discharges to the MS4 system.

6.6.2 Annual Reporting Requirements: The Town is working to assess its General Terms and Conditions to determine if modifications are necessary to prevent stormwater discharges to the MS4 system.

BMP 6.7: Street Sweeping

6.7.1 Description: The Town of Dumfries maintains a schedule to sweep every street monthly. Approximately half the streets are swept more than once per month.

6.7.2 Annual Reporting Requirements: Town staff sweeps on average a minimum of 21.67 lane-miles of street monthly.

BMP 6.8: Litter Pickup

6.8.1 Description: The Town of Dumfries has a dedicated part-time position for litter pickup. The position is able to remove litter from the public rights-of-way and other public properties at least three days per week.

6.8.2 Annual Reporting Requirements: The maintenance crew provides litter pickup throughout the Town on a weekly basis, weather permitting. A part-time position was added in the 2014-2015 to have someone pick up litter several days each week. The Town has received numerous positive comments about the employee's effectiveness from citizens, elected officials, and other staff members.

BMP 6.9: Snow and Ice Removal

6.9.1 Description: The Town of Dumfries shall require that any staff or contractors use appropriate control measures and procedures for stormwater discharges to the MS4 system.

6.9.2 Annual Reporting Requirements: As part of the required stormwater training for municipal employees, the maintenance crews are instructed in proper snow removal and ice control application to provide environmentally conscientious winter road maintenance.

Minimum Control Measure 6 Evaluation

Appropriateness of the identified BMPs

Six new programmatic BMPs have been added to this MCM for subsequent permit years. These 9 measures will greatly enhance the Town's good housekeeping efforts.

Effectiveness of BMPs in addressing discharges into impaired waterways

The Town's street sweeping efforts alone should make a significant impact toward the Town's 5 percent reduction goal in this permit cycle. The TMDL Action Plan which is underway will quantify that program's effectiveness.

Progress towards achieving the identified measurable goals

The additional litter pick-up position has significantly increased this MCM's visibility and program effectiveness.

Modifications to any operators, departments, roles and responsibilities

No modifications occurred during this reporting year.

Steps to be taken to address deficiencies

As part of the SWPPP development and implementation, the Town anticipates further evaluation of activities at the Public Works Facility to ensure pollution prevention practices are effective.

Plans for the next reporting cycle

The next reporting cycle will reflect the implementation of the 6 new measures. This will more comprehensively address the intent of the Pollution Prevention MCM.

Virginia Total Maximum Daily Load (TMDL) Special Conditions

Local TMDL Special Conditions

Description: The Town will work on developing the TMDL Action Plan to address pollutants which the Town's MS4 has been assigned a waste load allocation.

Summary: The Town has developed an Action Plan for the Quantico Creek Bacteria TMDL which was submitted to DEQ in April 2016. The Action Plan sets forth best management practices and interim milestone activities to be implemented over the permit cycle.

Chesapeake Bay Total Maximum Daily Load (TMDL) Special Conditions

Chesapeake Bay Total Maximum Daily Load (TMDL) Special Conditions

Description: The Town will work on developing the Chesapeake Bay Action Plan during the first three years of this permit cycle in accordance with the permit requirements.

Summary: The Town has developed an Action Plan for this permit cycle and the next permit cycle to address the pollutants of concern identified in the Chesapeake Bay TMDL. The Action Plans were approved by DEQ in June 2016. Throughout the next reporting year, the Town will continue street sweeping activities as outlined within the Action Plan to ensure the pollutant reductions for this permit cycle are met.

Evaluation & Assessment:

Information Collected and Analyzed

Bacteria sampling was performed. (Appendix B)

BMP Modifications

No modifications to the identified BMPs were made during this reporting year. Any future modifications to BMPs will be made in accordance with the procedures outlined within the MS4 permit.

Notice of External Assistance

The Town is a member of the Northern Virginia Clean Water Partners Regional Stormwater Education Campaign which enhances the Town's public education and outreach efforts through the use of television, print, and internet ads focused on stormwater management.

Proposed Programs

The Town has no proposed programs which would require approval status pursuant to Section II C of the General Permit.

Section I B 9 Requirements

The Town of Dumfries must comply with the WLA's assigned by the Chesapeake Bay TMDL as well as the Potomac River Bacteria TMDL. No TMDL has been assigned to Quantico Creek.

Agreements

During the 2015-2016 reporting year, the Town entered into a contract with Total Construction Solutions (TCS) to ensure inspections of land-disturbing activities were being conducted in accordance with the timeline established within the MS4 permit.

Written Comments

There were no public comments regarding either the MS4 Program Plan or any modifications during the reporting period.

APPENDICES

Appendix A – Public Education & Outreach (MCM #1)



Northern Virginia Clean Water Partners

2016 Summary

WORKING TOGETHER FOR HEALTHY STREAMS AND RIVERS

Polluted stormwater runoff is the number one cause of poor water quality in streams and rivers in Northern Virginia. When it rains and water runs off city streets, suburban yards and parking lots, it picks up pesticides, grass clippings, fertilizer from lawns, bacteria from pet waste, as well as petroleum and oil from driveways and parking lots. Don't forget about the sediment from construction sites or the litter and cigarette butts from the sidewalk. All of this pollution enters the storm drains on the street and is discharged directly to a stream. It is not filtered or sent to a sanitary sewage facility.

To reduce the impacts of stormwater pollution, the Northern Virginia Clean Water Partners aims to change human behaviors in our cities and neighborhoods through a public awareness and education campaign.

The Northern Virginia Clean Water Partners is comprised of a multi-disciplined group of local governments, drinking water and sanitation authorities, and individual businesses working together to inform individuals and households about the pollution potential of common activities, such as washing cars, applying lawn chemicals, changing motor oil, and disposing of leftover paint and household chemicals so

that individuals can take direct action to reduce pollution.

“Only Rain Down the Storm Drain” is the motto of the partnership.

The primary goal of the partnership is to reduce stormwater-related pollution from entering local waterways.

To meet this goal, the Partners work together to:

-  Identify high priority water quality issues for the region;
-  Identify the target audience(s) for outreach;
-  Educate the region's residents on simple ways to reduce pollution around their homes;
-  Monitor changes in behavior through surveys and other data collection techniques; and
-  Pilot new cost-effective opportunities for public outreach and education.

Members include stormwater program managers, Municipal Separate Storm Sewer System (MS4) Permit managers, communication directors, public information officers, water quality compliance specialists, and environmental planners.

Membership is voluntary and each member pays annual dues to fund the program. The partnership provides a cost-effective means to meet mandatory state and federal stormwater requirements. By working together the partners are able to leverage their available funds to develop and place bilingual educational products with common messages and themes, thereby extending their individual reach.

Regional Stormwater Education Campaign

The Annual Regional Stormwater Education Campaign was initiated in 2003 to assist localities in leveraging funds to achieve common goals regarding stormwater education and outreach and promote consistent messages for high priority water quality issues.

The 2016 campaign satisfied MS4 (Municipal Separate Storm Sewer System) Phase I and Phase II permit requirements for stormwater education and documenting changes in behavior.

For more information visit www.onlyrain.org



About the Partnership

The Northern Virginia Clean Water Partners is open to any water and sewer district, government agency, or school system in and around Northern Virginia.



2016 Northern Virginia Clean Water Partners

Fairfax County | Arlington County | Loudoun County | Stafford County | Fairfax Water | City of Alexandria | Loudoun Water | City of Fairfax | Town of Herndon | City of Falls Church | Town of Leesburg | Town of Vienna | Town of Dumfries | Doody Calls | Northern Virginia Regional Commission | Virginia Coastal Zone Management Program | George Mason University | Fairfax County Public Schools | Northern Virginia Community College | Prince William County Public Schools | Northern Virginia Soil and Water Conservation District



2016 Campaign Overview

In 2016, the Northern Virginia Clean Water Partners selected the following three high priority water quality issues; 1) bacteria, 2) nutrients, and 3) illicit discharge of chemical contaminants to focus on for the Campaign. The Partners identified the target audiences for these issues as 1) pet owners, 2) homeowners with a lawn or garden, and 3) home mechanics.

The Campaign used television, print, internet advertising and the Only Rain Down the Storm Drain website to distribute messages linked to specific stormwater problems, such as proper pet waste disposal, over fertilization of lawns and gardens and proper disposal of motor oil. In addition to the multi-channel media campaign, educational events hosted throughout the Northern Virginia region also raised awareness and encouraged positive behavior change in residents. The television and internet ads featured the well known national symbol of non-point source pollution; the rubber ducky.



Throughout the campaign year, the Partners made the following efforts to educate the public and promote awareness of stormwater pollution:

 From July 2015 through June 2016, four Public Service Announcements featuring messages on the importance of picking up pet waste and general household stormwater pollution reduction measures aired on 32 English language cable TV channels, and four Spanish speaking channels a total of 41,434 times.





- 

The campaign also featured banner ads on Xfinity.com and Cox.com websites that promote the same messages as the cable TV ads.
- 

Featured two full day, full page ads on the sign-in pages for Xfinity.com
- 

Conducted an online survey of 500 Northern Virginia residents to determine the effectiveness of the ads, aid in directing the future efforts of the campaign, and to reveal any changes in behavior.



- 

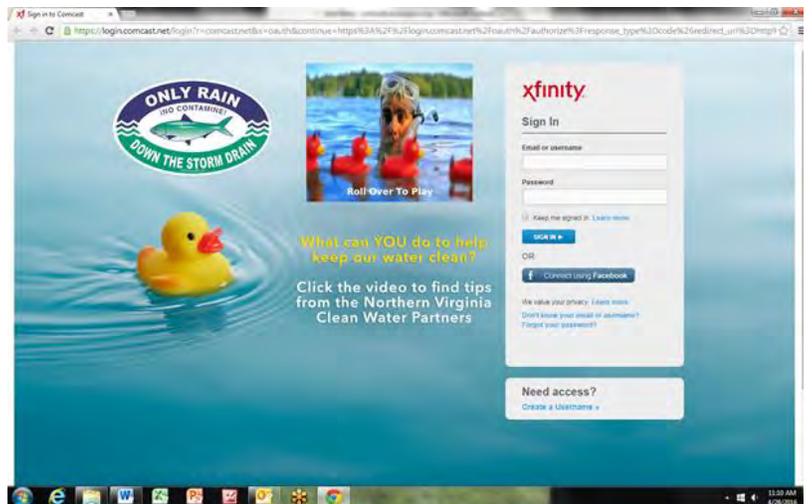
Attended various community events to promote awareness of proper disposal of pet waste and clean water lawn care tips.
- 

Continued to update and maintain the Northern Virginia Clean Water Partners website. ➤

2016 Accomplishments

16,750,236	Total household television impressions*
1,381,317	Total digital impressions including internet banner ads and in-stream video ads
41,434	Number of times the ads aired on television from July 2015 – June 2016
37,489	Visits to the www.onlyrain.org website
500	Online Annual Survey Responses
75%	Percent of target audience reached

**Impressions are the number of times an ad appeared on a single television or computer screen.*





Main cause of water pollution...

The believed #1 cause of local water pollution was fertilizers and pesticides.



Where stormwater goes...

79 percent of Northern Virginia residents surveyed stated that stormwater goes to the Potomac River, the Chesapeake Bay, or to local streams and rivers.



90%

Stated the actions of individuals are important in protecting water quality in local streams, the Potomac River, and the Chesapeake Bay is important.



70%

Would be more likely to take actions to reduce the amounts of pollutants they personally put into storm drains, after learning that polluted water runoff is the number one cause of local water pollution.



95%

Believe it is important for local governments to spend more money on protecting water quality.

Annual Survey Highlights

Findings in the 2016 survey include:

- 🦆 A video clip of one of the Clean Water Partners ads was presented in the survey and 16% of respondents recalled seeing the ad after watching the video.
- 🦆 The two channels that were most strongly associated with recall of the ad were Cartoon Network and Animal Planet. In fact, the highest numbers of impressions (2.8 million) were delivered on Cartoon Network.
- 🦆 Of those who recalled the ads, 18 percent state they now pick up their pet waste more often, eight percent state that they now properly dispose of motor oil, and 14 percent state they plan to fertilize fewer times per year.
- 🦆 13 percent of respondents believe that stormwater runoff goes to a wastewater treatment facility which indicates the importance of storm drain marking to promote awareness.
- 🦆 In a new question for 2016 to understand the barriers to taking action, 40 percent of the respondents felt they were most prevented from taking action to protect clean water because they didn't know what to do.
- 🦆 In another new question added in 2016, approximately one-third (34%) indicated that email newsletters with reminders and quick tips and/or online resources would help them take action to protect clean water.
- 🦆 When shown the Only Rain Down the Storm Drain logo, 61 percent of the respondents recognized it compared to 54 percent in 2013. This increase is statistically significant and indicates that awareness of the logo has increased over time.
- 🦆 Interestingly, the number of respondents who prefer to receive information from online sources has decreased from a high of 57 percent in 2012 to 40 percent in 2016. Television (19%), newspaper and community newsletters were equally preferred information sources. This suggests that a future outreach effort might include reaching homeowners through their Community Associations.

Understanding Behaviors

In addition to capturing responses to questions regarding the effectiveness of the campaign, this year's survey honed in on the current behaviors and attitudes of Northern Virginia residents as they relate to pet waste management, lawn care, and motor oil disposal. Responses to these questions support the development of future messages and targeted promotion.

The most important reason dog owners are motivated to pick up their pet's waste is because "It's what good neighbors do". The number of respondents choosing "It causes water pollution" as the most important reason to pick it up has fluctuated but remains the third most common reason.

Consistent with the past five years, almost a third of lawn and garden owners fertilize their lawns two or more times per year; an equal number never fertilize their lawns. Among those who fertilize once a year, 18 percent fertilize in the spring and only seven percent fertilize in the fall. This suggests that there is room to educate more residents of Northern Virginia that fertilizing in the fall is better for local waterways than fertilizing in the spring.

About half of the respondents reported using an herbicide to treat weeds in their lawn or garden.

Among those who fertilize their lawn, 70 percent have never had or were not sure if their soil had been tested for fertility or pH and fifty nine percent reported using a slow release fertilizer.

Consistent with the past five years, the majority of respondents take their vehicle to a service station for oil changes (79%) or take used oil to a gas station or hazmat facility for recycling (13%). Three percent of Northern Virginians reported storing used motor oil in their garage, placing it in the trash or dumping it down the storm drain.

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Drain
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2016 Northern Virginia Clean Water Partners

Fairfax County | Arlington County | Loudoun County | Stafford County | Fairfax Water |
City of Alexandria | Loudoun Water | City of Fairfax |
Town of Herndon | City of Falls Church | Town of Leesburg | Town of Vienna |
Town of Dumfries | Doody Calls | Northern Virginia Regional Commission | George Mason
University | Virginia Coastal Zone Management Program | Northern Virginia Community College |
Fairfax County Public Schools | Prince William County Public Schools | Northern Virginia Soil and
Water Conservation District



Summary prepared by NVRC on behalf of the Partners

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Public Education Outreach Program

A component of the

Virginia Municipal

Separate Storm Sewer System Management Program

Town of Dumfries, Virginia

Public Works Department

17755 Main Street

Dumfries, VA 22026

Adopted 12-1-15

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1.0 Introduction

The purpose of the Public Education Outreach Program (PEOP) is to identify the community involvement approach the Town of Dumfries will use to promote methods to reduce the discharge of pollutants in stormwater runoff. The Town of Dumfries' Public Works Department is responsible for coordinating the PEOP for the town's municipal storm sewer system (MS4) management program.

1.1 Goals

The Virginia General Permit for Discharges of Stormwater from Small MS4s (General Permit), published at 9 VAC-25-890-40 et al, has specific requirements for public education and outreach efforts. The Town of Dumfries obtained coverage under the 2013 General Permit as General Permit Number VAR040117.

As required in Section II, Part B. 1.b of the General Permit, this plan was designed with the consideration of the following goals:

- Increasing target audience knowledge about the steps that can be taken to reduce stormwater pollution, placing priority on reducing impacts to impaired waters and other local water pollution concerns
- Increasing target audience knowledge of hazards associated with illegal discharges and improper disposal of waste, including pertinent legal implications; and
- Implementing a diverse program with strategies that are targeted toward audiences most likely to have significant stormwater impacts

1.2 Objectives

The PEOP outlines a plan for communicating with the people living and working within the Town of Dumfries that will support the Town's objective of achieving improved water quality through reduced pollutant loads entering water bodies through the Town's small MS4. Implementation of the actions described under this program will help the Town achieve the objective of improving water quality in the Town of Dumfries.

The PEOP complies with the General Permit requirements to:

- Identify, at a minimum, three high-priority water quality issues, that contribute to the discharge of stormwater and provide a rationale for the selection of these issues;
- Identify and estimate the population size of the target audience(s) associated with each high-priority water quality issue;
- Develop relevant message(s) and associated educational materials for message distribution to target audiences while considering minorities, disadvantaged audiences, and minors;
- Provide for public participation during PEOP development
- Annually conduct outreach activities designed to reach 20% of the target audience for each high-priority water quality issue. Failing to reach that goal is not considered a compliance issue unless "insufficient effort" is made to reach that goal; and
- Provide for the adjustment of target audiences and messages, including educational materials and delivery mechanisms to reach target audiences, in order to address any observed weaknesses or shortcomings.

2.0 Municipal Separate Storm Sewer System Stormwater Management Program

The Town of Dumfries is an operator of a Small Municipal Separate Storm Sewer System (MS4). A municipal separate storm sewer is defined as “a conveyance or system of conveyances otherwise known as a municipal separate storm sewer system, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains

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

The US Census in 2010 determined the Town’s population to be 4,961, that the Town is within an Urbanized Area, and thus subject to the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems which became effective July 1, 2013 and will expire on June 30, 2018 when a new permit cycle is expected to become effective. Among the requirements of the permit, the Town of Dumfries must develop and implement a PEOP as one measure to prevent harmful pollutants from entering the Town’s MS4. This document fulfills the requirement to develop a PEOP.

2.1 Background

Common stormwater pollutants that may be found in the Town of Dumfries MS4 area include bacteria from pet waste; chemicals contained in materials used on green spaces such as fertilizers; and chemicals contained in leaked, spilled or dumped materials such as oils, cleaners, paints, and pesticides.

2.2 Applicable Regulations

As a small MS4 operator, the Town of Dumfries is obligated to comply with the requirements set forth in the “General Permit for Discharges of Stormwater from Small Municipal Storm Sewer Systems”, General Permit No. VAR040117, dated July 1, 2013. The permit establishes six “minimum control measures” (MCMs) to prevent stormwater pollution in the MS4:

1. Public education and outreach on stormwater impacts
2. Public involvement and participation
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction runoff control for development and redevelopment
6. Good housekeeping and pollution prevention for municipal operations

The Town’s MS4 Program Plan (which is updated annually) outlines specific actions, known as best management practices (BMPs), that the Town will use to address the six MCMs. The General Permit issued on July 1, 2013, mandate the preparation of a plan which addresses public education and outreach. Under this plan, there are opportunities for communicating with the people living and working in the Town of Dumfries that will support the broad goals of improved water quality through reduced pollutant loads entering water bodies through the Town’s MS4.

3.0 Community Conditions

The Town of Dumfries is an incorporated town located in Northern Virginia and is surrounded by Prince William County. The Town comprises approximately 1.6 square miles of urban mixed land use development located approximately 25 miles south of Washington, D.C.

3.1 High Priority Water Quality Issues

The Town of Dumfries must identify at least three high-priority water quality issues, and provide rationale for their selection in accordance with the General Permit. The Town has identified four high-priority issues for this permit cycle.

3.1.1 Bacteria Impacts to Water Quality from Pet Waste

The EPA recommends *E. coli* as the best indicator of health risk from water contact in recreational waters. In urban areas, such as the Town of Dumfries, sources of *E. coli* include human fecal matter (in the case of poorly functioning wastewater treatment plants or septic systems) or animal fecal matter (both domesticated animals and wildlife). The Town of Dumfries has selected bacteria from pet waste as one of its four high-priority water quality issues on which public education and outreach efforts will focus. Section 5.1 of this document will provide the rationale for this selection.

3.1.2 Illicit Discharges from Commercial Automobile Washes

According to the Virginia Stormwater Management Program (VSMP) Regulations (9VAC25-870-10), illicit discharge is defined as “any discharge to municipal separate storm sewer that is not composed entirely of stormwater, except discharges pursuant to a separate Virginia Pollutant Discharge Elimination System (VPDES) or state permit (other than the state permit for discharges from the municipal separate storm sewer), discharges resulting from firefighting activities, and discharges identified by and in compliance with 9VAC25-870-400.” Illicit discharge detection and elimination (IDDE) is important because stormwater runoff from the Town of Dumfries’ MS4 flows into streams and rivers without additional treatment. The Town of Dumfries has selected illicit discharges related to commercial automobile shops as the second high-priority water quality issue on which public education and outreach efforts will focus. Section 5.1 of this document will provide the rationale for this selection.

3.1.3 Illicit Discharges from Automobile Repair Shops

The Town of Dumfries has selected illicit discharges related to automobile repair shops as the third high-priority water quality issue on which public education and outreach efforts will focus. Section 5.1 of this document will provide the rationale for this selection.

3.1.4 Illicit Discharges from Restaurants

The Town of Dumfries has selected illicit discharges related to restaurants as the fourth high-priority water quality issue on which public education and outreach efforts will focus. Section 5.1 of this document will provide the rationale for this selection.

4.0 Current and Past Community Outreach Efforts

As noted in Section 2.2 of this document, the Town of Dumfries must meet the requirements in the Virginia General Permit for Discharges of Stormwater from Small MS4s. The Town has identified numerous BMPs to comply with the permit’s MCMs to prevent stormwater pollution within the MS4. These actions are reviewed below.

4.1 Existing Program

The Town of Dumfries added a stormwater page to their website located at <http://www.dumfriesva.gov/governmentpublic-works/municipal-separate-storm-sewer-system-ms4>. The page is used to provide citizens with information about the stormwater program. Available on the page are annual progress reports, pollution reporting form, and other educational and environmental information. The Town is also a member of the Northern Virginia Clean Water Partners.

4.2 Existing Resources

The Town has conducted several community outreach activities in the past and has a variety of existing resources at their disposal including:

- Promotional material prepared by the Northern Virginia Clean Water Partners
- Outreach Handouts (About 100 of the following were distributed at the September 13, 2014 Fall Festival):
 - “Taking Care of Stormwater”
 - “Town of Dumfries, Virginia- How to Dispose of Leaves the Bay-friendly Way”

5.0 Public Education and Outreach Planning

Stormwater runoff is generated from various pervious and impervious surfaces such as roads, sidewalks, lawns, managed green spaces, driveways and roofs. Efforts to control stormwater pollution must take into account individual, household, business, and public behaviors and activities that can generate pollution coming from these surfaces. The purpose of outreach is to educate the public about the impact their actions can have on stormwater pollution, and to encourage changes in behavior to reduce future stormwater pollution. The goals of the PEO program are to educate the public by:

- Increasing target audience knowledge about the steps that can be taken to reduce stormwater pollution, placing priority on reducing impacts to impaired waters and other local water pollution concerns;
- Increasing target audience knowledge of hazards associated with illegal discharges and improper disposal of waste, including pertinent legal implications; and
- Implementing a diverse program with strategies that are targeted toward audiences most likely to have significant stormwater impacts.

The following sections present the rationale used to develop the PEO program and the process to be followed to implement the plan.

5.1 High-Priority Water Quality Issues

The Town of Dumfries will focus on the four high-priority water quality issues identified in Section 3.2. The high-priority water quality issues, along with the rationale as to why they were selected, are presented in **Table 1** below.

Table 1. High-Priority Water Quality Issues

High-Priority Water Quality Issue	Rationale
Bacteria-Pet Waste	Bacteria from pet waste (such as E. Coli), has been identified as a significant concern that is contributing to impairments in waters in Virginia and the Town of Dumfries. There is a significant target population with whom to work within the Town.
Illicit Discharges- Commercial Automobile Washes	Improper discharges from car washes can result in the release of oil and grease, detergents, phosphates, debris and other hazardous chemicals to waters of Virginia and the Town of Dumfries.
Illicit Discharges- Automobile Repair Shops	Wastewater at auto repair shops is often generated by rinsing of parts and washing engines or dirty tools. Improper discharges from auto repair shops can result in the release of oil and grease, antifreeze, paints, and other hazardous solvents to waters of Virginia and the Town of Dumfries.
Illicit Discharges- Restaurants	Restaurants can be a significant source of illicit discharges into stormwater systems. Improper discharges from restaurants can result in the release of fats, oils, grease, debris, and hazardous chemicals to waters of Virginia and the Town of Dumfries.

5.2 Target Audiences

Population characteristics of the Town of Dumfries MS4 were evaluated to identify the Town populations to be reached by the education and outreach effort. Target audiences were selected through an assessment of the Town’s community profile. The target audiences for stormwater outreach are shown in **Table 2** below.

High-Priority Water Quality Issue	Topic of Concern	Target Audience	Size
Bacteria- Pet waste	Pet waste	Homeowners and residents with pets	575 dogs (36.5% of US households x 1573 households)
Illicit Discharges- Commercial Auto Washes	Proper disposal of wastewater and debris	Commercial auto washes within the Town of Dumfries MS4	2
Illicit Discharges- Auto Repair Shops	Proper disposal of wastewater and hazardous chemicals	Auto repair shops within the Town of Dumfries MS4	24

Illicit Discharges- Restaurants	Proper disposal of fats, oils, grease, and other hazardous chemicals	Restaurants within the Town of Dumfries MS4	15
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Pet Waste- To reduce levels of bacteria, the focus will be on pet waste from dogs. The Town has approximately 575 registered dog owners in the MS4 permit area.

Commercial Auto Washes- Proper disposal of wastewater and chemicals from commercial auto washes will be the focus of illicit discharge control. There are approximately 2 auto wash companies in the MS4 permit area.

Auto Repair Shops- Proper disposal of wastewater and chemicals from auto repair shops will be another focus of illicit discharge control. There are approximately 24 auto repair shops within the MS4 permit area.

Restaurants- Proper disposal of fats, oils, grease, and wastewater from restaurants will also be a focus of illicit discharge control. There are approximately 15 restaurants located within the MS4 permit area.

5.3 Plan Implementation

A variety of actions will be conducted to educate the public in attempts to change behavior within the Town’s permitted MS4 area. Actions will be focused on targeted audiences and high-priority water quality issues identified in this implementation plan. The framework for action was introduced in **Table 2**, details for implementation are provided below.

5.3.1 Actions and Messages

The messages developed for public education and outreach will be provided in both English and Spanish language versions. Attention will be given to developing informative, easily-understood materials.

Pet Waste

Written Materials- A trifold brochure that presents the impact animal waste can have on water quality will be developed.

Active Engagement- In-person presentations for selected targeted audiences will be provided.

The brochure will address pet waste as a major source of the bacteria found in waters within the Town that needs to be reduced. Topics that will be addressed: Why pet waste is a concern; how it can impact local water by affecting bacteria levels; and simple ways to keep pet waste out of water. Local contact information and sources for additional information will be included.

Commercial Automobile Washes

Written Materials- A set of take-home training handouts for recipients of the training.

Active Engagement- In-person training for auto wash companies within the Town of Dumfries.

The training information will address the basics of stormwater runoff and how improper water discharges to the storm sewers contribute to the degradation of water quality in nearby waters. Training materials will include: why car washes are a concern and how they can impact local water; how to

manage and discharge wastewater; and ways to make car washes more environmentally friendly. Local contact information and other sources for additional information will be provided. **Automobile Repair Shops**

Written Materials- A set of take-home training handouts for recipients of the training.

Active Engagement- In-person training for auto repair shops that operate within the Town of Dumfries.

The training for auto repair shops will address the basics of stormwater runoff and how improper control of chemicals and discharge of wastewater can contribute to the degradation of water quality in nearby waters. The training materials will include the do's and don'ts for disposing of hazardous waste, discharging wastewater, and managing spills.

Restaurants

Written Materials- A set of take-home training handouts for recipients of the training.

Active Engagement- In-person training for restaurants that operate within the Town of Dumfries.

The training information for restaurants will address the basics of stormwater runoff and how improper disposal of waste from food preparation can contribute to the degradation of water quality in nearby waters. Training materials will include: how restaurants can be a source for illicit discharge, how to dispose of waste properly; and how to prevent accidental contamination. Local contact information and other sources for additional information will be provided.

5.3.2 Format and Distribution

Brochures will include visually appealing graphics and will provide information in easily understood terms. Use of existing themes developed under previous Town outreach efforts will be continued and where appropriate supplemented with new or additional color schemes, graphics, and slogans. These features will be used throughout the Town's stormwater education and outreach efforts. Repeating themes enhances the familiarity of the community with messages related to stormwater management and thus the same themes will be used to develop training materials for commercial automobile washes, automobile repair shops, and restaurants.

Brochures will be distributed to HOAs within the MS4 permit area along with a cover letter explaining the importance of the brochure and its intended use. Follow-up with communication with HOA points of contact will be critical to ensuring effectiveness.

5.4 Public Participation

The Town's MS4 permit also requires that the public be given the opportunity to participate in the development of the PEOP. Expanded education and outreach requirements must be implemented for the remaining years of the permit. Each year, there must be an evaluation of the strengths and weaknesses of the education and outreach effort improvements, if any, that will be implemented in the next permit year.

5.4.1 Involvement of the Community in Program Development

As noted in Section 1.2 of this plan, there are a number of required actions specified in the permit related to the public education and outreach. This plan provides for these actions as stated in the previous sections. Input from the community can help to increase the success of education efforts.

Citizens are invited to give input on ideas about how the Town can inform the public of best management practices related to stormwater. Opportunities for public input are advertised to improve citizen awareness.

5.5 Evaluation

The methodology for evaluating the effectiveness of the education and outreach program is provided in this section. Despite best efforts, there is usually room for improvement once the program has been implemented. Program success requires continued evaluation and modification where necessary.

A planned evaluation process is necessary to record strengths and weaknesses encountered during program implementation. Observations and evaluations will be made and feedback will be sought and documented at the following key points in the process:

1. Planning and Development- time during which activities and educational tools are identified, developed, and scheduled;
2. Execution of Actions- time during which planned activities and educational tools are conducted and introduced to community;
3. Target Audience Feedback- time during which members of the targeted audience provide feedback regarding their understanding of the need to change behavior;
4. Behavior Change and Evaluation Period- time during which the Town observes improved conditions within a targeted audience related to stormwater pollution.

Feedback during the planning and development period may indicate the need to add additional audiences or alter the way educational material is presented. Activities may need to be changed to better address the needs of the Town or of the targeted audience.

During the execution of actions stage, feedback regarding general difficulties encountered and responsiveness from targeted audiences will be recorded.

After the first year of conducting education and outreach activities on stormwater pollution reduction, feedback from targeted audiences will be formally sought. Short surveys seeking input should be developed and distributed. For the auto washes, auto repair shops, and restaurants, surveys can be distributed to the points of contact established for each business.

There will be an organized formal effort to determine the percentage of the target audience reached in any given year, along with how effective that communication was in changing behavior. Observed changes will be recorded and reported. The evaluation process will identify strengths and weaknesses associated with the POE program. Significant changes identified during this process will be made as soon as possible or at the end of each annual review cycle. Minor issues will be considered and addressed immediately when appropriate.

5.6 Additional Opportunities for Education and Outreach

The Town of Dumfries' Public Works Department is fully committed to maintaining compliance with its MS4 Permit requirements. The PEOP is designed to guide the Town through the required steps to increase target audience knowledge about stormwater pollution reduction. The PEOP was developed to address the MS4 Permit requirements for MCM 1, as noted in Section 2.2. Other education and outreach steps may be taken to supplement other aspects of permit compliance and to improve water

quality in the Town. The Town will revise and adapt the PEOP throughout the permit term in order to address noted weaknesses or shortcomings.

Appendix B – Illicit Discharge Detection & Elimination (MCM #3)



Prince William County
PUBLIC SCHOOLS
Providing A World-Class Education

April 12, 2016

Town of Dumfries
17755 Main Street
Dumfries, VA 22026

Subject: Municipal Separate Storm Sewer System (MS4) Permit; Notice of Potential Interconnected Stormwater Systems

Attention: MS4 Permit Manager

The Prince William County Public Schools (PWCS) is a Phase II Small MS4 and is covered under the Virginia Stormwater Management Program (VSMP) General Permit for Discharges of Stormwater from Small MS4s. (Registration Number VAR040100)

The purpose of this letter is to notify you of the potential for interconnections between the stormwater systems operated by PWCS and the stormwater systems that you operate. The MS4 permit requires that PWCS notify in writing, any downstream regulated MS4 to which PWCS is physically interconnected. At this time, we are in the process of identifying our storm sewer systems which may or may not discharge water into your regulated MS4 system. There is no action required on your part at this time, as this letter is for notification purposes only. PWCS is greatly appreciative of the work that has already been accomplished from this past year and looks forward to working closely with the Town of Dumfries for years to come.

If you have any questions or need additional information, please contact me or:

Andrew F. Uglow
Office of Facilities Services
Environmental Project Manager
Telephone – 703-906-7212
E-mail – uglowaf@pwcs.edu

Sincerely,

Ray Edelstein
Office of Facilities Services
Environmental Coordinator
Telephone -703-791-8801
Email – edelstrl@pwcs.edu

Ray Edelstein
Environmental Coordinator



DUMFRIES, VIRGINIA

Virginia's Oldest Continuously Chartered Town
CHARTERED 1749 INCORPORATED 1961

John Wilmer Porter Building
17755 Main Street
Dumfries, Virginia 22026-2386
Tel: 703-221-3400 / Fax: 703-221-3544
www.dumfriesva.gov

June 23, 2016

Prince William County
c/o Marc Aveni
Environmental Services Division Chief
5 County Complex Ct.
Prince William, VA 22192

Subject: MS4 Permit; Notice of Interconnected Stormwater Systems

Mr. Aveni,

The Town of Dumfries is a Phase II small MS4 and is covered by the Virginia Stormwater Management Program (VSMP) General Permit for Discharge of Stormwater from Small Municipal Separate Storm Sewer System (Registration Number VAR040117).

The purpose of this letter is to notify you of the interconnection between the stormwater systems operated by the Town of Dumfries and the stormwater systems operated by Prince William County. Section II.B.3(4) of the General Permit requires the Town to notify in writing, any downstream regulated MS4 that may be interconnected with the Town's MS4. This letter is for notification purposes only and there is no action required on your part at this time.

If you have any questions or concerns related to this subject, please contact me at rwest@dumfriesva.gov or 703-221-3400.

Respectfully,

Richard Paul West
Director of Public Works

cc: Daniel Taber, Town Manager
Shaina Schaffer, MS4 Coordinator



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John Wilmer Porter Building
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www.dumfriesva.gov

October 15, 2015

Prince William County Schools
C/o Ray Edelstein, Environmental Coordinator
14715 Bristow Rd.
Manassas, VA 20112

Subject: MS4 Permit; Notice of Interconnected Stormwater Systems

Mr. Edelstein,

The Town of Dumfries is a Phase II small MS4 and is covered by the Virginia Stormwater Management Program (VSMP) General Permit for Discharge of Stormwater from Small Municipal Separate Storm Sewer System (Registration Number VAR040117)

The purpose of this letter is to notify you of the interconnection between the stormwater systems operated by the Town of Dumfries and the stormwater systems operated by PWCS. Section II.B.3(4) of the General Permit requires the Town to notify in writing, any downstream regulated MS4 that may be interconnected with the Town's MS4. This letter is for notification purposes only and there is not action required on your part at this time.

If you have any questions or concerns related to this subject, please contact me at rwest@dumfriesva.gov or 703-221-3400 ext. 119.

Respectfully,

Richard Paul West
Public Works Director

C: Mr. Daniel E. Taber, Town Manager
Mr. Olaun Simmons, Town Attorney
Ms. Shaina Schaffer, Stormwater Management Specialist



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Dumfries, Virginia 22026-2386
Tel: 703-221-3400 / Fax: 703-221-3544
www.dumfriesva.gov

October 15, 2015

Virginia Department of Transportation
C/o Roy T. Mills, State Stormwater Program Administrator
1401 E. Broad Street
Richmond, VA 23219

Subject: MS4 Permit; Notice of Interconnected Stormwater Systems

Mr. Mills,

The Town of Dumfries is a Phase II small MS4 and is covered by the Virginia Stormwater Management Program (VSMP) General Permit for Discharge of Stormwater from Small Municipal Separate Storm Sewer System (Registration Number VAR040117)

The purpose of this letter is to notify you of the interconnection between the stormwater systems operated by the Town of Dumfries and the stormwater systems operated by VDOT. Section II.B.3(4) of the General Permit requires the Town to notify in writing, any downstream regulated MS4 that may be interconnected with the Town's MS4. This letter is for notification purposes only and there is not action required on your part at this time.

If you have any questions or concerns related to this subject, please contact me at rwest@dumfriesva.gov or 703-221-3400 ext. 119.

Respectfully,

Richard Paul West
Public Works Director

C: Mr. Daniel E. Taber, Town Manager
Mr. Olaun Simmons, Town Attorney
Ms. Shaina Schaffer, Stormwater Management Specialist

2.4 Standard Operating Procedures for Snow and Ice Removal

The following SOP shall be followed for snow and ice removal during inclement weather. The Town of Dumfries requires any staff or contractors to use appropriate control measures during snow and ice removal to minimize discharges to the MS4 system.

Responsible Parties: Department of Public Works

Practices and Procedures:

- Before leaving the Public Works' Shop, check all vehicles to be used for leaks. Be sure to follow the equipment maintenance and washing procedures outlined in Section 2.1 of this handbook.
- The Town will use the lowest application rate of salt and sand to effectively treat surfaces to meet safety needs while minimizing negative impacts on water quality.
- Roads will be continuously plowed and sanded during a snow event to keep roads safe for motorists.
- After a snow event, crews will inspect roadways to determine necessary maintenance actions.
- Snow should not be piled on or near storm drains.
- Loading areas shall be swept frequently to prevent build-up of sediment
- When applying salt/sand, operator should take notice of proximity to surface waters to prevent materials from entering waterways during application.
- Storage of deicing materials:
 - Salt, sand, and other deicer materials must be stored away from storm drain inlets and other conveyance structures.
 - Salt and other chemical deicers will be stored in a covered structure or container at all times. Temporary stock piles must be covered with a tarp and secured at all times when not being used.
 - Salt and other chemical deicers will only be stored on an impervious surface such as a concrete slab.

Employee Training:

Employee training must include: preventative maintenance and good housekeeping practices, proper fueling procedures; material handling including spill prevention and response. The General Permit requires biennial training for all good housekeeping practices.

3.0 Standard Operating Procedures for Illicit Discharge Detection and Elimination (IDDE)

The General Permit requires the Town of Dumfries to develop and implement written procedures to detect, identify, and address unauthorized nonstormwater discharges, including illegal dumping to the MS4. The procedures outlined in the following subsections fulfill these requirements.

3.1 Written Dry Field Screening Methodologies:

The MS4 permit requires annual dry screening of outfalls from Dumfries' MS4. The Town has more than 50 known outfalls and thus is required to inspect a minimum of 50 outfalls each year. Dry screening inspections will be defined as inspections performed when precipitation is less than 0.5 inches within a 48-hour period. Inspections of outfalls are to be performed by trained Town staff. Annual reporting requirements and procedures for inspections are detailed below:

Annually report to DEQ:

- Number of outfalls inspected
- Screening results
- Detail of any follow-up actions necessitated by screening results

Pre-Inspection Instructions

It is important to conduct outfall screening inspections during dry weather. Dry weather screening is preferable because presence of dry weather flow may suggest that there is an illicit discharge or connection and further investigation will need to be conducted. Dry weather flow may not indicate a problem if it is originating from an allowable or conditionally allowed nonstormwater discharge (Town Code Sec. 26-185(b)). Prior to performing inspections, check to see if the area is experiencing dry weather conditions:

1. Go to <http://weather.gov>.
2. In the search box on the left hand side of the page, type in Dumfries, VA.
3. On the right hand side of the page, under More Information, click “3 Day History.”
4. Note whether any precipitation was recorded for the past three days.
5. Note the time and quantity of last rain on the outfall inspection form.

Inspection Instructions:

1. Walking from downstream to upstream (in the stream so as not to disturb water or sediments which could alter assumptions of an outfall) inspect outfalls one at a time.
2. On the outfall inspection report form, note:
 - a. Date and time of inspection
 - b. Outfall number
 - c. Name of staff performing inspection
 - d. Site descriptions, see regulations
 - e. Estimated discharge
 - f. Visual observations: odor, color, clarity, floatables, deposits or stains, vegetation condition, structural condition, biology- good/bad designations for each
3. If the outfall has dry weather flow, take photos and collect a water sample.
4. Label each sample bottle with the appropriate outfall ID, data and time of collection, and sample collector initials.
5. Follow Table 1 for general information regarding sample holding times and methods.
6. An illicit discharge investigation will be conducted if any of the following apply:
 - a. The overall outfall characterization is determined to be “suspect” or “obvious.”
 - b. On-site or lab water testing results in values exceeding the thresholds indicated in Table 2.

Table 1. Holding Times for Water Samples

Parameter	Holding Time	Holding Methods
Bacteria	6 hours	Cool, 4 °C
Ammonia	Process immediately	Can preserve with sulfuric acid & hold for 28 days
Fluoride	28 days (HDPE plastic container only)	Cool, 4°C
Anionic Surfactants	2 days	Cool, 4°

Potassium	6 months	Frozen
Total nitrogen/Total phosphorus	24 hours 30 days	Cool, 4°C Frozen below -20°C
pH	Process immediately	
Temperature	Process immediately	

Table 2. Dry weather outfall screening water quality indicators.

Screening Parameter	Potential Source	Threshold
Ammonia	Wastewater or Industrial	>0.2 mg/l
Fluoride	Tap Water	>0.25 mg/l
Detergents	Wastewater, Washwater, or Industrial	>0.25 mg/l
Potassium	Wastewater or Industrial	>5-6 ppm

7. If an outfall is suspected to have an illicit discharge, document the outfall/illicit discharge and fill out the illicit discharge reporting form. Any suspected discharge shall be addressed according to the illicit discharge procedures. Additionally, the following procedures apply to suspected discharges at an outfall:
 - a. The investigation should commence within 15 days of the initial identification of any observed continuous or intermittent potential illicit discharges.
 - b. Potential illicit discharges from sewage or that are “significantly contaminated” shall be prioritized.
 - c. The outfall should be visited three additional times during the permit cycle to determine if an intermittent discharge is present.
8. Outfall inspection data will be documented by the MS4 Coordinator and saved on the Public Works Drive (Public Works>Stormwater>MS4 Program> Illicit Discharge Detection and Elimination> Outfall Inspections).

3.2 **Prioritization Schedule:**

The Town estimates that the MS4 contains approximately 63 outfalls that discharge to Quantico Creek. Detailed mapping of the Town’s MS4 showing locations of outfalls and interconnections with VDOT and Prince William County School’s MS4s has been developed (Appendix C). Section II.B.3.c (1) (a) of the General Permit requires the Town to develop a prioritized field screening schedule of areas most likely to contain illicit discharges. Outfalls located along Canal Road will be prioritized because that is an industrialized area of the Town and is more likely to have illicit discharges. Those outfalls will be screened annually and include outfall AA, AB, 54, 44, AC, and 15. The Town’s Outfall prioritization schedule will be modified as land use within the Town changes or as incidents occur that will require an area to be prioritized.

3.3 **IDDE Investigation Procedures:**

The Town of Dumfries has designated an Illicit Discharge Detection Inspection Team as a component of the IDDE Investigation Process. The Illicit Discharge Detection Inspection Team is composed of the MS4 Program Coordinator, Public Works Director, Public Works Assistant Director, and Field Support Team. For each investigation, a Lead Investigator will be appointed. The Lead Investigator may be any member of the inspection team, other town staff, or other agency such as the Virginia Department of

Environmental Quality (DEQ). The appropriate process for IDDE investigation and documentation is outlined below:

Investigation and Documentation Process:

- 1) Report of IDDE event received by town staff (report may have been received by phone, in person, email, etc.)
- 2) Staff forwards information to illicit discharge inspection team who will fill out illicit discharge reporting form (Appendix B). A lead investigator will be assigned.
 - a) Rainfall data may be taken from online source.
 - b) For form:
 - i) Names: Name to match town staff email addresses.
 - ii) Incident location.
- 3) During investigation, the illicit discharge team will update the Investigations folder (Public Works> Stormwater> MS4 Program > Illicit Discharge Detection and Elimination> Investigations) on the Town's Public Works drive with documentation, photos, letters, emails, etc. associated with the IDDE event.
 - a) Within the Investigations folder, a new folder will be created for each investigation of an IDDE event.
 - b) Files saved in the folder will be saved by [date investigation initiated year – month -day] [other additional title]. Examples:
 - i) 2014-02-06 IDDE Report Form.pdf
 - ii) 2014-02-06 Investigation Notes.docx
 - c) A time frame upon which to conduct an investigation or investigations to identify and locate the source of any observed continuous or intermittent non-stormwater discharge to be prioritized as follows per MS4 permit: (i) illicit discharges suspected of being sanitary sewage or significantly contaminated must be discharged first, (ii) investigations of illicit discharges suspected of being less hazardous to human health and safety such as noncontact cooling water or wash water may be delayed until after all suspected sanitary or significantly contaminated discharges have been investigated, eliminated, or identified. Discharges authorized under a separate VPDES or state permit require no further action under this permit.
 - d) If an illicit discharge is found, but within six months of the beginning of the investigation neither the source nor the same non-stormwater discharge has been identified, then this shall be documented.
 - e) If the observed discharge is intermittent, then Lead Investigator must document that a minimum of three separate investigations were made in attempt to observe the discharge when it was flowing. If these attempts are unsuccessful, the operator must document.

- f) The investigator will conduct on-site or lab water testing as necessary to determine the source of the illicit discharge (see section 3.4).

Table 1. Water Quality Indicators

Screening Parameter	Potential Source	Threshold
Ammonia	Wastewater or Industrial	>0.2 mg/l
Fluoride	Tap Water	>0.25 mg/l
Detergents	Wastewater, Washwater or Industrial	>0.25 mg/l
Potassium	Wastewater or Industrial	>5-6 ppm

- g) The MS4 Coordinator will track suspected illicit discharges in a spreadsheet (Table 2) to ensure the appropriate follow-up steps are taken.
- h) Follow the procedures outlined in Section 3.4 to determine the source of the illicit discharge.
- i) Upon determination of the source, the Town will notify the apparent responsible party that a violation of the illicit discharge detection and elimination ordinance exists. If voluntary compliance cannot be achieved within an established timeframe, the program administrator may initiate formal enforcement action as specified in the IDDE ordinance.
- j) After the illicit discharge has been removed from the subdrainage areas, that area must be re-inspected to verify all necessary corrections have been made.
- i) Dependent upon the extent of corrections, verification monitoring may be done at the initial junction manhole or closest downstream manhole.
- ii) Verification is accomplished using the same visual inspection procedures utilized during outfall inspections.
- k) Investigators may use the Center for Watershed Protection’s publication as guides, http://www.cwp.org/online-watershed-library/cat_view/64-manuals-and-plans/79-illicit-discharge-detection-and-elimination:
- i) *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*
- ii) *Illicit Discharge Detection and Elimination: Technical Appendices*
- iii) *Illicit Discharge Detection and Tracking Guide*

- 4) When IDDE event is “closed”, the Lead Investigator will complete the illicit discharge inspector form.
- 5) IDDE Form will be forwarded to the MS4 Coordinator.
- 6) The illicit discharge inspection form will be included with the MS4 Annual Reports, as it will include required information: (i) date that suspected discharge was observed, reported, or both; (ii) how the investigation was resolved, including any follow-up, and (iii) resolution of the investigation and the date the investigation was closed.

3.4 Methodologies to Determine the Source of the Illicit Discharge

Source tracing begins when a suspected illicit discharge is identified through field assessments/testing or complaint call. When the source of the non-stormwater discharge is unknown, the following investigation techniques can be used to locate the source of an illicit discharge:

Storm Drain Network Investigations- systematic testing and inspection of junction manholes in continuous upstream or downstream manner. This investigation method will include the following steps:

1. Consult the drainage system map and identify major branches.
2. Starting from the outfall, observe and take probe readings at the next upstream manhole or junction to determine if there is any evidence of polluted discharge. Field crews should be looking for presence of flow during dry weather conditions, foul odors, colors or stained deposits, oily sheen, floatable materials, and/or unusual probe readings.
3. Repeat observations at each upstream manhole/junction until a junction is found without evidence of polluted discharge. The discharge source will likely be located between the junction without evidence of polluted discharge and the next downstream junction.
4. Work downstream from the “clean” manhole/junction to isolate the source of the polluted discharge entering the storm drain system.
5. If discharge is evident from a private property, follow the inspection procedures outlined in Section 26-186 of the IDDE Ordinance.
6. Document all findings and file according to the Investigation and Documentation Process outlined in section 3.2.

Drainage Area Investigations- An initial analysis is performed to determine potential generating sites by reviewing land uses followed by inspections or testing in areas where the illicit discharge appears to be specific to a certain type of land use or generating site.

1. Staff should make a list of likely discharge sources and consult drainage system maps to identify points of entry for pollutants.
2. Field crews should then conduct a survey of the drainage area to identify and confirm potential sources of the illicit discharge.
3. Town staff should conduct individual site inspections to locate the specific source of the discharge once potential discharge sites are identified.
4. Dye testing may be necessary to confirm a suspected activity is actually draining into the storm drain network. The use of dye tracers must be approved by the Department of Public Works in accordance with DEQ standards and regulations.

The method used will depend upon the type of information collected or reported, the drainage network, and any knowledge of operations/activities on the surrounding properties. The Illicit Discharge Report Form (Appendix B) will be used to document all source tracing investigations.

Water Quality Testing. All identified dry-weather discharges will be tested using commercially available water quality test meters or analyzed according to EPA-approved laboratory analysis methods. In addition to information required by for the IDDE form, all inspections shall be documented with photographs. If a flow is present, grab samples shall be taken and tested either in field or lab for the following indicator parameters:

- pH
- Conductivity
- Fluoride
- Surfactants

Field inspectors will be trained to conduct water quality sampling. Field instruments will be calibrated prior to use. All equipment shall be cleaned and serviced at the end of field investigations and according to manufacturer’s standards.

Table 1 describes indicator parameter levels which may indicate the presence of an illicit discharge. Further lab testing for additional parameters, such as fecal coliform, may be required to confirm a suspected source. References such as the Center for Watershed Protection’s Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments shall also be consulted to identify potential sources based upon field observations and initial results.

Table 3. Water Quality Parameter Thresholds

Screening Parameter	Potential Source	Threshold
Ammonia	Wastewater or Industrial	>0.2 mg/l
Fluoride	Tap Water	>0.25 mg/l
Detergents	Wastewater, Washwater or Industrial	>0.25 mg/l
Potassium	Wastewater or Industrial	>5-6 ppm

3.5 Follow-up Investigations

Once the source of an illicit discharge has been identified, the Town will notify the property owner or operator in writing about the problem. The written notification will include a deadline to correct the illicit discharge along with any of the requirements outlined in Section 26-190 of the IDDE Ordinance. A follow-up investigation will be conducted after the deadline set forth in the property owner’s notification to verify compliance to correct the identified illicit discharge. As outlined in Section 26-190 of the IDDE Ordinance, if the operator fails to comply within the allotted time period, the Town Manager will designate a governmental agency or contractor to fix the problem at the violator’s expense.

3.6 Continued Identification of Other Points of Discharge

To date, the Town has identified downstream interconnections with Prince William County and the Virginia Department of Transportation's MS4s. The Town will continue to identify other points of discharge if interconnections are clarified or the Town becomes aware of new interconnections in the future. If the Town becomes aware of an interconnection with a downstream MS4 that the Town had not previously notified regarding the interconnected systems, the Town will send a notice in writing to that MS4. The Town will continue to update its outfall map as unmapped outfalls are identified or other changes occur.

4.0 Inspection and Maintenance Procedures for Stormwater Facilities

4.1 Inspection Procedures

The quality of stormwater entering local, state, and federal waters depends on appropriate operation and maintenance of best management practices (BMPs). Stormwater management facilities must be regularly inspected to ensure that BMPs are functioning properly. It is important to inspect BMPs post-construction to ensure that they have been installed properly. The following procedures should be adhered to when performing post-construction inspections for BMPs:

1. Inspections will be performed by the Town's Public Works Department at the time of construction completion.
2. Using the approved plans, walk the site to determine if BMPs are installed properly.
3. Fill out the Stormwater Facility Inspection Form (Appendix D) and record any observed violations.
4. Discuss any observed violations that require corrective actions with the Director of Public Works.
5. Corrective measures will be completed within a reasonable timeframe as determined by the Director of Public Works. A written notice of violations with a deadline to comply will be sent to the project operator.
6. If compliance is not met within the designated timeframe, the enforcement procedures outlined in Section 26-165.13 of the Town Code.

Routine inspections also help to determine appropriate maintenance required for the facility. The procedures outlined below should be followed when inspecting stormwater facilities:

1. All stormwater facilities owned by the Town will be inspected on an annual basis to ensure they are operating properly and to determine any maintenance needs.
2. The Town will implement a schedule for inspecting all privately owned BMPs that discharge to the MS4 at least once every five years.
3. The Stormwater Facility Inspection Form (Appendix D), will be utilized during the inspection.
4. Review any on-site records such as site plans, stormwater management plans, spill prevention and response plans, etc.
5. Complete thorough walkthrough of the property. Inspector should look for:
 - a. On-site BMPs
 - b. Indicators or presence of illicit connections or discharges
 - c. Evidence of past spills
 - d. Material handling and storage areas (including loading and unloading areas)
 - e. Equipment fueling and maintenance areas
 - f. Storm drain structures and receiving streams

Coliscan Sampling Results

Site	D1	D2	D3	D4	Rainfall Past 24 Hours (inches)
Latitude	38.56863	38.56764	38.56585	38.56602	
Longitude	-77.3359	-77.3346	-77.329	-77.3244	
Date	E. coli forming units per 100 mL				
7/12/2015	75	225	125	25	1.46
8/15/2015		50			none
8/16/2015	25		50	25	none
8/25/2015		75	75	100	none
9/20/2015	25	50	100	100	none
9/27/2015	175	75	100	600	0.12
10/2/2015	875	850	1400		1.43
10/3/2015				900	none
10/29/2015	125	475	300	600	none
11/10/2015	500	300	500	375	0.53
12/26/2015	25	50		50	0.09
12/27/2015			25		0.03
2/18/2016	25	25	25	25	none
2/25/2016	25	25	50	25	1.05
3/24/2016	50	25	75	50	none
4/7/2016	225	400	250	400	0.48
4/8/2016	150	25	25	75	0.48
4/20/2016				25	none
5/19/2016	25	25	25		0.62
6/5/2016	0	50	75	25	0.2
6/23/2016	425	425	375	800	0.55
6/26/2016	50	1	2350	950	none
6/28/2016	50	100	525	250	none

Appendix C – Pollution Prevention/Good Housekeeping (MCM #6)

Town of Dumfries Stormwater Training Program

Under the MS4 permit, the Town of Dumfries is required to develop and implement a training program for applicable field personnel that addresses the following:

- Recognition and reporting of illicit discharges;
- Good housekeeping and pollution prevention employed during road, street, and parking lot maintenance; and
- Good housekeeping and pollution prevention practices that are to be employed in and around maintenance and public work facilities.

These training requirements are applicable to staff from the Public Works Department. Training events for each of the three topics listed above will occur at a least biennially each year. In addition to information related to the specific training topic, each training event will include an overview of the Town's stormwater management program, requirements, and local waterway impairments.

A standard operating procedures (SOP) handbook has been developed. This handbook is a compilation of procedures related to illicit discharge detection and elimination and good housekeeping/pollution prevention practices. The information presented in the handbook will be incorporated into the training program and will be distributed to all relevant staff. The handbook will continue to be updated as circumstances may change. The training coordinator will provide for an open discussion during the training events to address any questions or concerns and to allow for input in regards to good housekeeping/pollution prevention practices.

Additionally, the Town must ensure that the appropriate emergency response employees receive training in spill response. The Town will coordinate with the Police Department to ensure that those employees have received training in spill response.

The MS4 permit requires the Town to ensure that employees, and require that contractors, who apply pesticides and herbicides are properly trained or certified in accordance with the Virginia Pesticide Control Act (§3.2-3900 et seq. of the Code of Virginia). Town employees do not apply pesticides or herbicides and the Town ensures all contractors provide documentation of their certification.

The Town ensures that employees and contractors serving as plan reviewers, inspectors, program administrators, and construction site operators obtain the appropriate certifications as required under the Virginia Erosion and Sediment Control Law and its attendant regulations. The Town will maintain copies of certifications from relevant staff and contractors. Although it is the employee's responsibility to maintain their certifications, the Town will track certification expiration dates and issue reminders regarding recertification.

Training Schedule and Tracking:

Sign-in sheets will be used to track attendance at each training. Each annual report will include a list of training events, the training date, the number of employees attending the training, and the training objective. The training coordinator will develop the training calendar for the reporting period no later than September 1st each year. The training coordinator will issue reminders to ensure all relevant staff attend the training. As needed, one makeup training event may be scheduled.

Department	Training Topic		
	Illicit Discharge Detection & Elimination	Pollution Prevention & Good Housekeeping ¹	Emergency Spill Response
Public Works Department	Biennial	Biennial	N/A
Police Department	N/A	N/A	On-going ²

1. Pollution Prevention & Good Housekeeping training will be provided to the listed municipal departments. The training will include good housekeeping and pollution practices employed during road, street, and parking lot maintenance, in and around public works facilities, and in and around recreational facilities.
2. Emergency response employees with Hazmat certification will be responsible for ensuring their certifications are maintained.

The Reilly Group

Nutrient Management Plan

Prepared for

Town of Dumfries

17755 Main Street, Dumfries VA 22026

Prepared by

Francis J. Reilly, Jr. Certification #834 and

Patricia M. Reilly Certification #835

The Reilly Group

12364 Meyer Lane, Stafford VA 22556

540-455-2146

April 30, 2016

Total Acreage: 5.41 acres

Nutrient Management Plan for the Town of Dumfries - Information

Landowner Information

The Town of Dumfries
Richard West, Director of Public Works
17755 Main Street, Dumfries VA 22026
Phone: 703-221-3400, ext. 119
Email: rwest@dumfriesva.gov

Planners Information

Francis J. Reilly, Certification #834 and Patricia M. Reilly, Certification #835
12364 Meyer Lane, Stafford VA 22556
Phone: 540-455-2146
Email: pat@thereillygroup.net

Location Information

Cecil W. Garrison Park

17755 Main Street, Dumfries VA 22026
Latitude: 38° 33' 59.1438 Longitude: -77° 19' 33.2256
VAHU6 Watershed Code PL52, Quantico Creek
Prince William County
Square footage total 84,009 sq. ft.

Ginn Memorial Park

3876 Graham Park Road, Dumfries VA 22026
Latitude: 38° 33' 33.8358 Longitude: -77° 19' 35.079
VAHU6 Watershed Code PL52, Quantico Creek
Prince William County
Square footage total – 75,176 sq. ft.
Area 1 Athletic field – 18,461 sq. ft.
Area 2 Turf area – 54,691 sq. ft.
Area 3 Landscaped memorial garden – 936 sq. ft.
Area 4 Community garden – 1,088 sq. ft.

Merchant Park

3944 Cameron Street, Dumfries VA 22556
Latitude: 38° 34' 6.5706
Longitude: -77° 9' 47.6724
VAHU6 Watershed Code PL52, Quantico Creek
Prince William County
Square footage total 76,362 sq. ft.

Plan Start Date – May 1, 2016

Plan End Date – April 30, 2019

Signatures of Planners


Francis J. Reilly, Jr


Patricia M. Reilly

Executive Summary

The Reilly Group was contracted by the Town of Dumfries to prepare Nutrient Management Plans for three parks. The sites were visited. Measurements of management areas within the parks were obtained and areas excluded from nutrient applications were subtracted from the nutrient management areas. Soil samples were obtained and submitted to the Virginia Tech Soil Laboratories (Lab ID: 16-27416) for testing. Nutrient management plans were prepared for each of the parks' management areas.

Cecil W. Garrison Park is an 84,009 square feet (sq. ft.) parcel of mainly cool-season turf grass. The buffer pH of the soil was found to be 6.33 and liming is not recommended. Phosphorus levels were deemed Medium (M) and potassium levels were deemed to be less than high (-H). This area is an environmentally sensitive site due to the soils present and the proximity to Quantico Creek. If fertilization is to be performed at this site, fertilizers that contain phosphorus or potassium should be avoided. Nitrogen could be applied in September, October and November at a rate not to exceed 1.5 pounds of Nitrogen per 1000 sq. ft. in a 12-month period. Special care should be taken to observe the suggested application dates and rates on the Nutrient Application Worksheet and to avoid any fertilization when precipitation is expected. In addition, it seems likely that a portion of this parcel located behind the adjacent building is being managed differently than the section directly behind the town office buildings.

Ginn Memorial Park has a total of 75,176 sq. ft. with four separate management areas including:

Area 1 Athletic field is 18,461 sq. ft. of mainly cool-season turf grass. The buffer pH of the soil was found to be 6.33 and liming is not recommended. Phosphorus levels were deemed very high (VH) and potassium levels are -H. Fertilization would improve the playing surface. A fertilizer without phosphorus and with low potassium is recommended. Nitrogen totaling approximately 1.5 pounds of nitrogen per 1000 sq. ft. could be applied in September, October and November.

Area 2 Turf area is a 54,691 sq. ft. of mainly cool-season grass turf growing throughout the park. The buffer pH of the soil was found to be 5.5 and 160 pounds (lbs.) of lime should be applied per 1000 sq. ft. Phosphorus levels were H+ and potassium levels -H. Fertilization would improve the turf's appearance. A fertilizer without phosphorus and with low potassium is recommended. Nitrogen totaling approximately 1.5 pounds of nitrogen per 1000 sq. ft. could be applied in September, October and November.

Area 3 Landscaped memorial garden is a 936 sq. ft. area of bedded trees, shrubs and herbaceous plants. The buffer pH of the soil was found to be 6.7 and no liming is necessary. Phosphorus levels are H+ and potassium levels VH. Fertilization of healthy trees and shrubs is not generally needed and is not recommended.

Area 4 Community garden is a 1,088 sq. ft. area of gardening plots available for rental. The buffer pH was found to be 5.9 for a recommendation of 16 lbs. of lime per 100 sq. ft. Phosphorus levels and potassium levels were deemed to be very high. Fertilization of this area should be with a fertilizer that is nitrogen only. Phosphorus and potassium are present in the soil and should be avoided. Given that this is an organic garden area, typical turf-type fertilizers should not be used. An application of 1-2 cups of blood meal per 100 sq. ft. is recommended, or incorporation of compost into the soil.

Merchant Park is a 76,362 sq. ft. parcel of mainly cool-season turfgrass. The buffer pH of the soil was found to be 6.2 and no liming is required. Phosphorus levels are H+ and potassium levels –H, requiring no application. If fertilization is desired, a fertilizer without phosphorus and with low potassium is recommended. Nitrogen totaling approximately 1.5 pounds of nitrogen per 1000 sq. ft. could be applied in September, October and November.

This Nutrient Management Plan should be re-examined and the soils re-tested within 3 years. The Plan will expire on April 30, 2019. A new Nutrient Management Plan will be required at the end of this three-year period or at any time when a significant change in the nutrient management of these areas occurs.

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Introduction

The Reilly Group was contracted to provide the Town of Dumfries with three nutrient management plans for the properties known as Garrison Park, Ginn Memorial Park and Merchant Park. The purpose of this nutrient management plan is to ensure minimum movement of nitrogen and phosphorus from the specified areas of application to surface and ground waters where they can potentially have a detrimental effect on water quality. They also serve to ensure that plants have optimum soil nutrient availability for good productivity and quality. By following these soil test-based plans, the Town of Dumfries is helping to protect local waters and the Chesapeake Bay.

If you have questions, please contact plan writer Pat Reilly at pat@thereillygroup.net or 540-455-2146. Further information may be obtained from the Virginia Department of Conservation and Recreation, Nutrient Management Program through their website at <http://www.dcr.virginia.gov/soil-and-water/nutmgt>.

How to use this report

This report has several sections. Some of the information contained is required by the standards and criteria governing nutrient management plans. Other information is provided to help the Town of Dumfries manage these properties in an economical way that achieves the land use goals of the different management areas.

The first section of this report describes the three parks and the management areas found within the parks. Vegetation, field observations, and soil types are discussed.

The next section provides maps of the areas. Each of the parks is shown. The portion of the Cecil W. Garrison Park that lies within the Resource Protection Area designation is shown. The four different land use areas within Ginn Memorial Park are identified.

The soil test results are given in the next section and followed by a summary of the soil test results. The individual Nutrient Application Worksheets contain the specific fertilization and nutrient management recommendations for Garrison Park, Merchant Park and the four different management areas within Ginn Memorial Park.

We have included two sections of the Standards and Criteria from the Virginia Nutrient Management Standards and Criteria Revised 2014. The sections pertain to turf management and to environmentally sensitive sites that are pertinent to the Town of Dumfries.

In the Resources section, we have included publications from Virginia Cooperative Extension providing specific information to help in proper fertilization. Two publications pertain to lawn care. A third describes spreader calibration, a Best Management Practice.

Lastly we have included several copies of blank record-keeping sheets. Use of these sheets is not required, but are provided as a suggested template. Recording actual nutrient management applications will record the Town's efforts towards adhering to the nutrient management plan. The records will be useful when a new nutrient management plan is required after three years or when there is a significant change in management of any of the areas.

Site Descriptions

General

Three parks were assessed for nutrient management plans. This report will examine each park separately, with custom plans for different parks and land uses within those parks. Public Works Director Richard West shared that no liming, fertilization or pest/disease treatments have been applied at any of the locations. The Town of Dumfries is waiting until nutrient management plans are created and a certified applicator identified to make nutrient applications on the Town's land.

This section will describe the parks. Land uses and activities held at the park are important to the level of nutrients applied as vegetation must meet expectations. The type of vegetation at the parks is noted as it is an important factor in the nutrients needed for plant health. United States Department of Agriculture (USDA), National Resources Conservation Service Soil Survey Maps were consulted for the presence of "environmentally sensitive" sites. Specific soil properties or steep slopes create conditions for potential negative impact on water quality, and plans include further restrictions. Other observations relevant to the application of nutrients are also included.

Cecil W. Garrison Park

Cecil W. Garrison Park lies adjacent to the offices of the Town of Dumfries just off US Route 1. It is owned and maintained by the Town of Dumfries for occasional use for festivals, farmers markets and by employees lunching outside. The triangle-shaped parcel gently slopes down to Quantico Creek on the south side, with a parking area bordering most of the land to the northwest and a wooded area lying to the northeast.

Expectations are low for the quality of the turf.

It was observed during measuring and soil sampling activities that the northeast corner of the parcel is being maintained at a higher level. This area is behind the structure to the east of the Town office building, and is outlined in orange on Map 1. There were fewer weeds and the turf was greener than that to the southeast of the Town office. While this could be the result of different soil conditions, it suggests that the turf has received different treatment, possibly of mowing height, fertilizer and/or herbicide applications. It is suggested that the Town confirm with the neighboring property that the Town is responsible for the maintenance of the turf area so that the Town can assure that the nutrient management plan is being followed.

The Chesapeake Bay Preservation Act established 100-foot buffer areas on perennial streams such as Quantico Creek. Much of Garrison Park is a Resource Protection Area (RPA) as shown on the Prince William County Mapper image, Map 2. Actual measurements by the planners from the edge of the stream closely follow the Mapper delineation of the RPA. There was no flow in the intermittent stream on the east side of the park barring any measurements of a buffer area.

The soil of this park is described in the USDA Soil Survey as Hatboro-Codorus complex. It has slopes of 0 to 2 percent, and all of the site is within this soil complex. The Soil Survey notes that this site is prone to frequent flooding, a criterion of an environmentally sensitive site. The concerns of nutrient management applications on environmentally sensitive sites are addressed by the practices of rate,

timing and placement as reflected in the Nutrient Application Worksheet. The times of year when nutrient losses are most likely to occur are late fall, winter and early spring. It should be noted superior turfgrass results can be obtained through the implementation of two practices – proper mowing and overseeding. Proper mowing includes keeping the turf at a height of 3 to 4 inches, not removing more than one-third of the blade at any time, returning clippings to the soil and maintaining sharp mower blades. Overseeding is best done in fall; consult the *Maintenance Calendar for Cool Season Grasses* in the Resources section. Rates would be 2 to 4 pounds of seed per 1,000 square feet.

As seen on Map 1, the lighter color of vegetation to the southeast is where vegetation was allowed to grow tall. It is encouraging that this vegetation is not mowed from this line to Quantico Creek; the recommendation is that the practice is continued. Water quality purposes may be better served, however, by allowing taller vegetation in the areas equating to the RPA shown on Map 2. The installation of small trees and shrubs, particularly native species, along the creek would enhance the area through additional filtration, the reduction of erosion, and beautification. Recommendations for appropriate plants can be obtained from the Native Plant Society or Virginia Cooperative Extension.

The park land drains an area of impervious surface so vegetation is important in filtering potential pollutants before surface water enters Quantico Creek. The Nutrient Application Worksheet has been prepared so that turf is sustained at a low quality level requiring fewer inputs.

Ginn Memorial Park

Ginn Park is a rectangular parcel located in the residential neighborhood of Williamstown and is owned and maintained by the Town. The park has multiple uses requiring nutrient management: a landscaped memorial garden, rental plots for community gardeners, a multi-purpose athletic field and turf areas. Non-turf and impervious surfaces include a hard surface basketball court, a playground area covered with wood chips, vehicle parking and park trails of gravel and grit, horseshoe pits, sanitation facilities and bleachers for athletic field spectators. Trees and shrubs line two sides of the park, providing a visual screen from the neighborhood and providing some shade.

USDA Soil Survey Maps describe the soils as the Urban land – Udorthents complex with slopes of 0 to 7 percent. This soil series covers 100% of the park, and does not meet criteria for an environmentally sensitive site. The athletic field is crowned, but the site overall has a flat slope to the road on the southwest side of the park. The southeast side of the park drops to a vegetated drainage ditch which runs toward the road. A cobble-filled drainage ditch directs water from the center of the park around the community garden plots to the ditch along the southeast side. A corrugated drainage pipe exits below the retaining walls around the garden plots. Map 3 in the next section shows the park.

Landscaped Memorial Garden

The Yohey Memorial Garden at the park is landscaped with low evergreen shrubs, grasses and groundcovers. Plants were installed in beds built up with compost and mulched. Supplemental watering will help establish the plants and mulching to a depth no greater than 3 inches will allow precipitation to reach the root zone while retaining moisture. Once established, the woody plant material will require about one inch of water a week to be healthy and not need insect or disease treatment, or costly replacement. It is not recommended that annuals be planted unless they can be regularly watered and fertilized. Should additional plants be incorporated into the

garden, native plants are recommended. Native plants provide aesthetic value while being well-adapted and often requiring less fertilization or watering than non-native species. The Virginia Native Plant Society and Virginia Cooperative Extension are resources for plant recommendations.

Community Garden Plots

The rental plots for community vegetable gardeners are located above a retaining wall next to the basketball court. Organic matter is one of the sources of nitrogen for the garden plots, however, while sampling the soil in the individual plots, it was observed that there is not a consistent horizon of organic matter. Plants in plots devoid of organic matter may not grow as well, will require more water and may fall prey to insects and diseases as a result of stress.

The observation of varying amounts of organic matter in the plots could indicate that individual renters have added other amendments. Of concern is the amount of lime in individual plots. Soil sampling was done by pooling samples taken from individual plots. The homogenized, pooled sample is representative for the garden as a whole and results do not reflect the pH of individual plots. Renters may wish to look for signs of chlorosis and add lime when it appears that nutrients are not absorbed from the soil as needed.

The agreement between the renter and the Town calls for the gardens to be organic, and asks the renter to attend classes on soil amending and insect and disease control. This practice will ensure that water leaving the site will have minimal potential pollutants. This also limits the nitrogen source available to the renters to materials such as compost and blood meal.

Athletic Field

The multi-purpose athletic field is vegetated with tall fescue. There is a considerable amount of weeds but rather than herbicides, it may be more cost effective to focus on fall and/or spring overseeding and proper mowing practices as described in the Garrison Park narrative. A more consistent turf will enhance the playing surface. As noted, the athletic field is crowned. Photographs from park development, the surrounding topography and the composition of the soil cores confirm that the field was graded for the good drainage necessary for sustainable turf.

Turf Areas

Other than the uses mentioned and the non-turf or impervious surfaces, Ginn Park is vegetated with established trees and a turf-type tall fescue. The age of the trees, the soil cores and the soil test results indicate that this is native soil. Lime will need to be added to bring the soil pH into a range where turfgrass is adapted for nutrient uptake. While the need for overseeding is not as great as for the multi-purpose athletic field, it should be noted that turfgrass is a short-lived plant. Turf areas could benefit from a fall overseeding annually and following proper mowing practices.

Merchant Park

Merchant Park is owned and maintained by the Town of Dumfries and operated by Historic Dumfries. The park is flat with the exception of a slope from the roadside parking at the northeast side of the park. USDA Soil Survey Maps describe the soils as Urban land – Udorthents complex with slopes of 0 to 7 percent. This soils complex covers 100% of the park and does not meet any criteria for an environmentally sensitive site. A map of the park is found in the next section; see Map 4.

The park is vegetated with trees and turf-type tall fescue, with shrubs and herbaceous plants as foundation plantings around some of the structures and a garden at the Weems-Botts Museum. Landscape shrubs and herbaceous plants are well established and healthy and do not require any nutrient input. The museum occupies the southeast corner of the park and the annex the southwest corner. Other impervious, non-turf surfaces include the Grayson Bandstand Memorial gazebo with adjoining concrete pad, historic well house, a covered picnic pavilion, sanitation facilities, utility buildings, a driveway at the annex and walkways.

The site hosts occasional events, including site rental for weddings and other events. The expectation of turf quality may be higher than the turf in other parks, thus a higher level of management may be needed. Following recommended practices for mowing and overseeding will maintain the turf in good condition. The application of recommended rates and timing of nitrogen will also help sustain the turf.

Maps

Cecil W. Garrison Park



Map 1. Cecil W. Garrison Park

The nutrient management plan area is shown highlighted in yellow. The lighter color is taller vegetation. The orange box denotes an area where it appears that different maintenance practices have been employed.

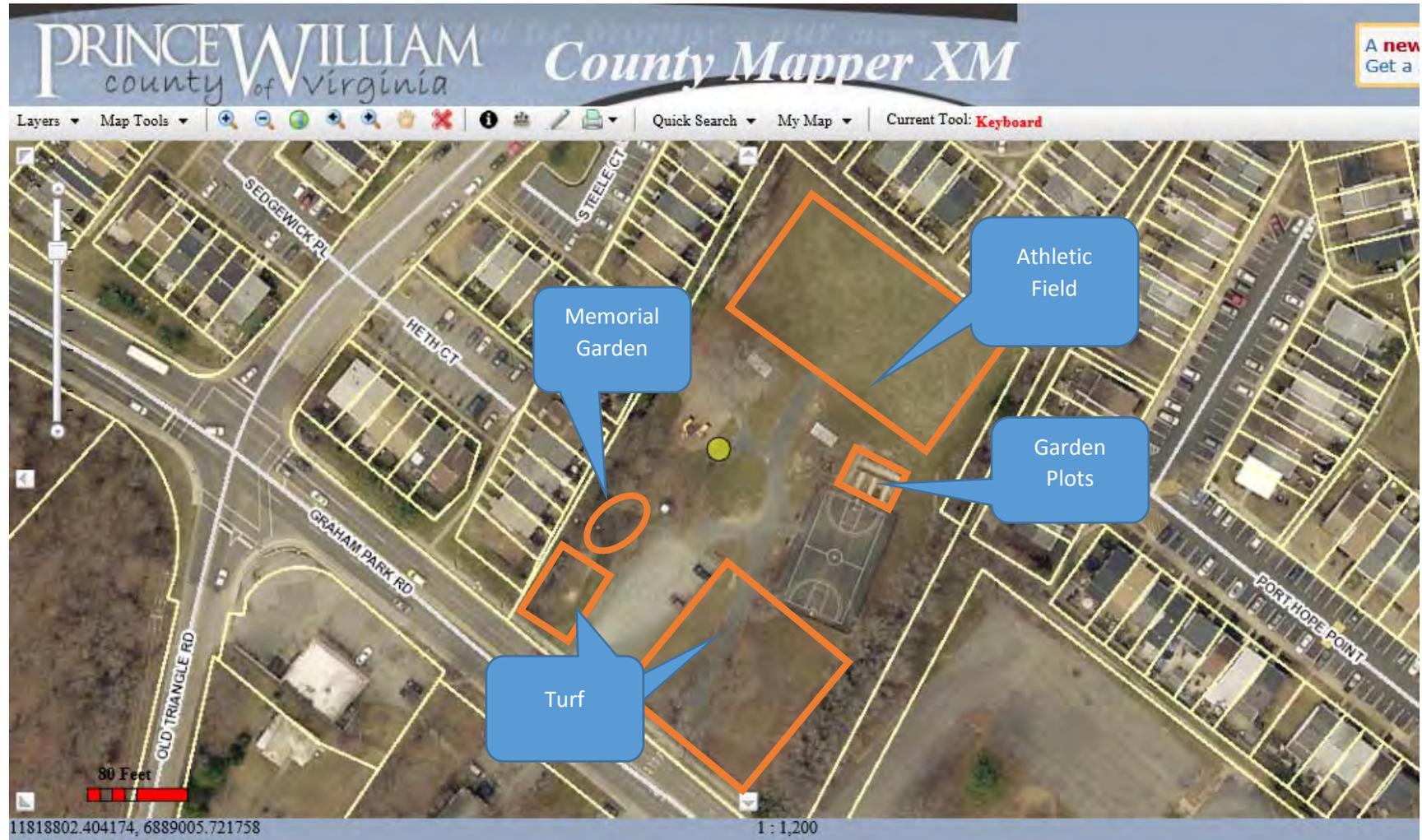
Cecil W. Garrison Park - RPA



Map 2. Cecil W. Garrison Park – RPA

The 100-foot RPA buffer is indicated by blue.

Ginn Memorial Park



Map 3. Ginn Memorial Park

Merchants Park



Map 4. Merchants Park

Soil Test Results

General

Soil samples were submitted for Garrison and Merchants Parks and for the four management areas of Ginn Memorial Park. A soil corer was used to pull a minimum of 10 sub-samples from a depth of 5 inches, or until refusal. The sub-samples were taken randomly to minimize variability and obtain the most representative results. Sub-samples had to be dried, clumps broken and rocks, roots and non-decomposed plant material removed before samples were packed and sent for analysis.

Samples were sent to the Virginia Tech Soil Testing Lab. Standard analysis was requested to provide results for pH, nutrients and cation exchange capacity. Nutrient analysis includes the plant requirements of phosphorus, potassium, calcium, magnesium, zinc, manganese, copper, iron and boron. Nitrogen is not included as it is too mobile in the soil; testing lab knowledge of the nitrogen requirements of plants to be grown are the basis for recommendations of this nutrient.

Results of levels of nutrients are provided in terms of low (L), medium (M), high (H) and very high (VH), with plus and minus signs indicating levels somewhat less or greater, e.g. -H or less than high. Applications are not needed unless the level is medium or low.

Soil sampling should be repeated after three years. If a turf area is to be renovated, soil sampling in advance of work should be done and amendments incorporated into the soil. Incorporation is more effective than surface application.

This section presents a discussion of the soil test analysis. The Soil Test Reports from the Virginia Tech Soil Testing Lab are found in the Resources section. Specific nutrient application rates and timing are found in the Nutrient Application Worksheets.

Garrison Park

Garrison Park was treated as one management area. The soil pH is 6.4 with a buffer index of 6.33 indicating that no lime is needed for turfgrass. Applications of phosphorus are not recommended as the amount in the soil is sufficient. This nutrient has been limited unless phosphorus is low according to the soil test results, and the analysis of this soil shows that phosphorus is very high (VH). Fertilizers available commercially generally omit phosphorus. Potassium is in the high range in the soil. Other nutrients are in sufficient amounts for turfgrass growth. The fertilizer recommended, then, is one high in nitrogen, without phosphorus and containing a small amount of potassium. Examples of this recommended fertilizer would be analysis of 30-0-10, 28-0-3 or 32-0-4. As discussed later, this site meet criteria as environmentally sensitive due to the soil characteristics and its proximity to Quantico Creek. Fertilization should be carefully considered and, if fertilization will occur, it should be scheduled as directed in the Nutrient Application Worksheet (September, October or November) when rain or flooding is not anticipated.

Ginn Memorial Park

Landscaped Memorial Garden

The soil of the landscaped memorial garden has a pH of 6.7, appropriate for the landscape plants that are grown there. Phosphorus is at a high level, and all other nutrients of very high levels or in sufficient

quantity. Fertilizers are not recommended for healthy trees and shrubs that have good color and normal leaf size. Unnecessary fertilization may cause excessive growth which can be detrimental to the plant. The plants in the memorial garden are mulched with organic material. The mulch provides nutrients as it decomposes which is why fertilizer applications are unnecessary and not recommended for healthy plants. Soil Test Note #20, *Home Shrubs and Trees*, is attached for more information.

Community Garden Plots

Annual plants such as vegetables, herbs and annual flowers are those likely to be grown on the community garden plots. The soil test results call for the addition of lime and fertilizer for good plant growth. See the attached Soil Test Note 19, *Vegetable and Flower Gardens*, for details.

Lime. The soil pH is 5.9 and 14 pounds of lime per 100 square feet is needed. There are two ways for this to be added to the soil. 1) Before planting, 7 pounds is spaded to the depth of 5 inches into the soil and 7 pounds worked into the top 2 inches of the soil. 2) If lime is to be applied after plants have been established, apply the 14 pounds in 5 pound applications at intervals of 1 to 6 months until the total amount is applied. The lime is to be spread evenly around the plants. If possible to do so without disturbing plant roots, rake into the top inch of soil. Any lime that comes in contact with foliage should be washed off. Lime can be applied at any time of the year that the soil is not frozen.

Fertilizer. The Town has an agreement with the garden plot renters to maintain the garden as organic. The soil test results reveal that none of the measured nutrients needed by plants require applications. Nitrogen is not measured because it is mobile in the soil, but is required for plant growth at rates known from experience by the Soil Testing Lab. Nitrogen is applied in one of two ways before planting. 1) A 1- to 2-inch layer of compost or green manure can be incorporated into the soil to a depth of 6 to 8 inches a few weeks before planting. 2) Incorporate other organic material at the following rates per 100 square feet: compost or blood meal – 5 pounds. Other traditional organic soil amendments such as fish meal, soybean-seed meal, and particularly poultry manure should be avoided due to their phosphorus content.

Athletic Field

Recommendations for the multi-purpose athletic field include no lime and turf-type fertilizer.

Lime. The soil supporting the turf of the athletic field has a pH of 6.6 and a buffer index of 6.33. No lime is recommended.

Fertilizer. Phosphorus is at a very high level, potassium high and calcium and magnesium both very high, requiring no additional input of those nutrients. The fertilizer recommended is a turf-type fertilizer high in nitrogen, without phosphorus and containing a small amount of potassium. Examples of this recommended fertilizer would be analysis of 30-0-10, 28-0-3 or 32-0-4.

Turf

The soil test results of the turf area of Ginn Memorial Park recommend both lime and fertilizer applications.

Lime. The soil of the turf area has a pH of 5.5 and a buffer index of 5.91. A total of 160 pounds of lime is recommended per 1,000 square feet. This is to be applied as ground, pulverized or pelletized agricultural limestone. Because the soil can only absorb 50 pounds per 1,000 square feet every 30 days, lime must be applied in four separate applications over a period of 4 – 10 months. Lime can be applied any month of the year that the ground is not frozen.

Fertilizer. Applications of phosphorus are not recommended as the amount in the soil is adequate for turfgrass growth. The use of this nutrient has been limited by state regulation unless phosphorus is low according to the soil test results, and the analysis of this soil shows that phosphorus is high. Potassium is in the high range in the soil requiring the minimal input of one-half to one pound of potassium per 1,000 square feet according to the *Standards and Criteria*. Other nutrients are at levels requiring no additional input. The fertilizer recommended is a turf-type fertilizer high in nitrogen, without phosphorus and containing a small amount of potassium. Examples of this recommended fertilizer would be analysis of 30-0-10, 28-0-3 or 32-0-4.

Merchant Park

Merchant Park was treated as one management area. The soil pH is 6.4 with a buffer index of 6.19 indicating that no lime is needed for turfgrass growth. Applications of phosphorus are not recommended as the amount in the soil is sufficient. The use of this nutrient has been limited by state regulation unless phosphorus is low according to the soil test results, and the analysis of this soil shows that phosphorus is high+. Potassium is high in the soil. Calcium and magnesium are very high and other nutrients are in sufficient quantities. The fertilizer recommended is a turf-type fertilizer, one high in nitrogen, without phosphorus and containing a small amount of potassium. Examples of this recommended fertilizer would be analysis of 30-0-10, 28-0-3 or 32-0-4.

Standards and Criteria

The following pages were excerpted from *Virginia Nutrient Management Standards and Criteria*, published by the Department of Conservation and Recreation, Division of Soil and Water Conservation, July 2014.

Section VI. Turfgrass Nutrient Recommendations for Home Lawns, Office Parks, Public Lands and Other Similar Residential/Commercial Grounds

Definitions

For the purposes of this section, the following definitions, as presented by the Association of American Plant Food Control Officials (AAPFCO), apply:

“Enhanced efficiency fertilizer” describes fertilizer products with characteristics that allow increased plant nutrient availability and reduce the potential of nutrient losses to the environment when compared to an appropriate reference product.

“Slow or controlled release fertilizer” means a fertilizer containing a plant nutrient in a form which delays its availability for plant uptake and use after application, or which extends its availability to the plant significantly longer than a reference “rapidly available nutrient fertilizer” such as ammonium nitrate, urea, ammonium phosphate or potassium chloride. A slow or controlled release fertilizer must contain a minimum of 15 percent slowly available forms of nitrogen.

“Water soluble nitrogen”, “WSN”, or “readily available nitrogen” means: Water soluble nitrogen in either ammonical, urea, or nitrate form that does not have a controlled release, or slow response.

Recommended Season of Application For Nitrogen Fertilizers - Applies to all Turf

A nitrogen fertilization schedule weighted toward fall application is recommended and preferred for agronomic quality and persistence of cool season turfgrass; however, the acceptable window of applications is much wider than this for nutrient management. The nutrient management recommended application season for nitrogen fertilizers to cool season turfgrasses begins six weeks prior to the last spring average killing frost date and ends six weeks past the first fall average killing frost date (see Figures 6-1 & 6-2). Applications of nitrogen during the intervening late fall and winter period should be avoided due to higher potential leaching or runoff risk, but where necessary, apply no more than 0.5 pounds per 1,000 ft² of water soluble nitrogen within a 30-day period. Higher application rates may be used during this late fall and winter period by using materials containing slowly available sources of nitrogen, if the water soluble nitrogen contained in the fertilizer does not exceed the recommended maximum of 0.5 pounds per 1,000 ft² rate. Do not apply nitrogen or phosphorus fertilizers when the ground is frozen.

The acceptable nitrogen fertilizer application season for non-overseeded warm season turfgrass begins no earlier than the last spring average killing frost date and ends no later than one month prior to the first fall average killing frost date (see Figures 6-1 & 6-2).

Figure 6-1

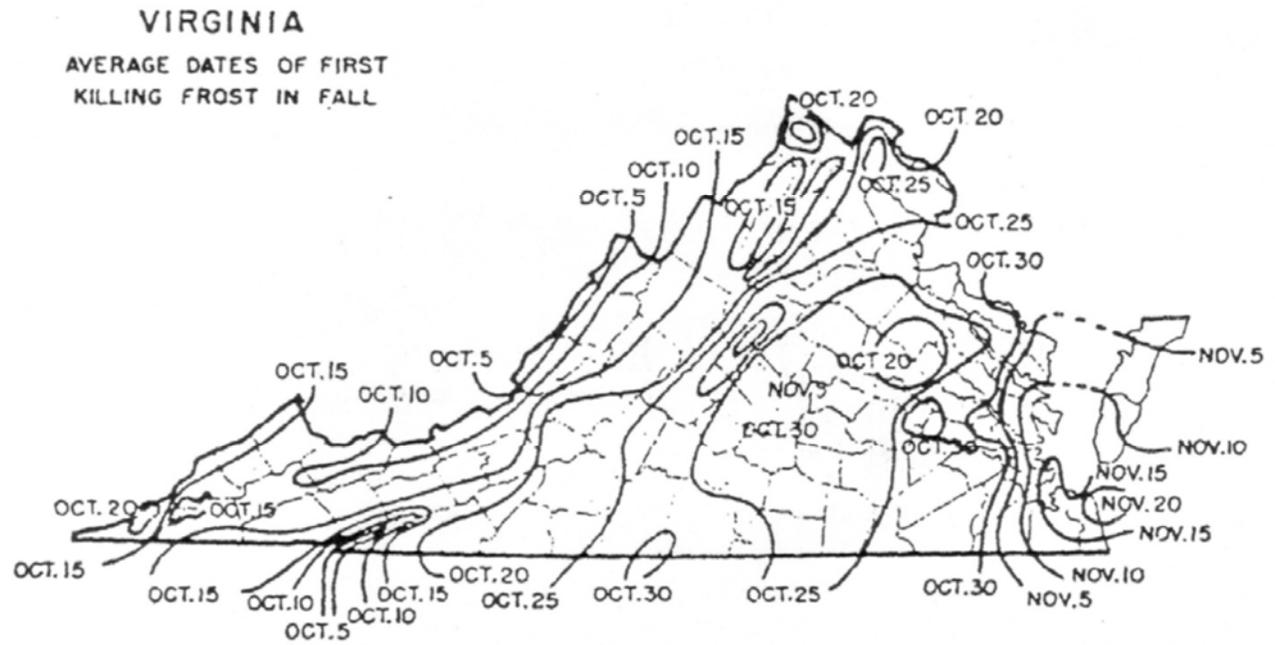
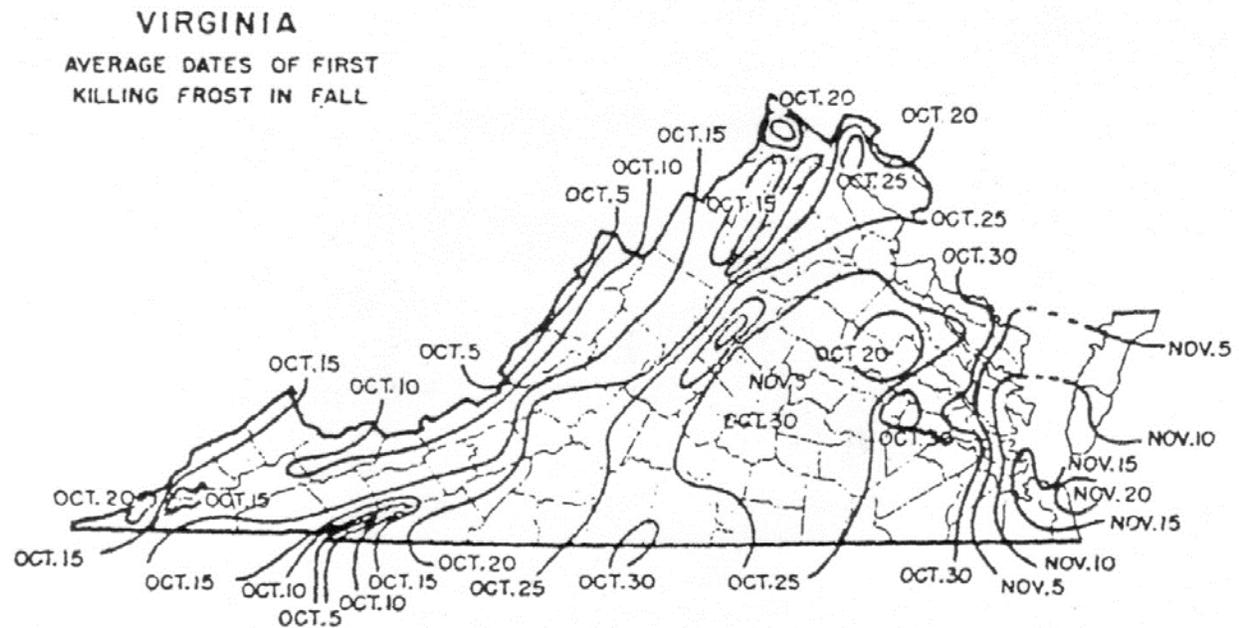


Figure 6-2



Per Application Rates

Do not apply more than 0.7 pounds of water soluble nitrogen per 1,000 ft² within a 30-day period. For cool season grasses, do not apply more than 0.9 pounds of total nitrogen per 1,000 ft² within a 30-day period. For warm season grasses, do not apply more than 1.0 pounds of total nitrogen per 1,000 ft² within a 30-day period. Lower per application rates of water soluble nitrogen sources or use of slowly available nitrogen sources should be utilized on very permeable sandy soils, shallow soils over fractured bedrock, or areas near water wells.

Annual Application Rates for Home Lawns and Commercial Turf

Up to 3.5 pounds per 1,000 ft² of nitrogen may be applied annually to cool season grass species or up to 4 pounds per 1,000 ft² may be applied annually to warm season grass species using 100 percent water soluble nitrogen sources. Lower rates of nitrogen application may be desirable on those mature stands of grasses that require less nitrogen for long-term quality. As a result, lower application rates will probably be more suited to the fine leaf fescues (hard fescue, chewings fescue, creeping red fescue, and sheep fescue) and non-overseeded zoysiagrass. Lower rates should also be used on less intensively managed areas.

Use of Slowly Available Forms of Nitrogen

For slow or controlled release fertilizer sources, or enhanced efficiency fertilizer sources, no more than 0.9 pounds of nitrogen per 1,000 ft² may; be applied to cool season grasses within a 30-day period and no more than 1.0 pounds of nitrogen per 1,000 sq.ft. may be applied to warm season grasses within a 30-day period.

Provided the fertilizer label guarantees that the product can be used in such a way that it will not release more than 0.7 pounds of nitrogen per 1,000 ft² in a 30-day period, no more than 2.5 pounds of nitrogen per 1,000 ft² may be applied in a single application. Additionally, total annual applications shall not exceed 80 percent of the annual nitrogen rates for cool or warm season grasses.

Phosphorus and Potassium Nutrient Needs (Established Turf)

Apply phosphorus (P₂O₅) and potassium (K₂O) fertilizers as indicated necessary by a soil test using the following guidelines:

<u>Soil Test Level</u>	<u>Nutrient Needs (pounds per 1,000 ft²)*</u>	
	<u>P₂O₅</u>	<u>K₂O</u>
L	2-3	2-3
M	1-2	1-2
H	0.5-1	0.5-1
VH	0	0

- * For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range. (For example the recommendation for a P₂O₅ soil test level of L- would be 3 pounds per 1,000 ft².)

Do not use high phosphorus ratio fertilizers such as 10-10-10 or 5-10-10, unless soil tests indicate phosphorus availability below the M+ level.

Recommendations for Establishment of Turf

These recommendations are for timely planted turfgrass, that is, the seed or vegetative material (sod, plugs, and /or sprigs), are planted at a time of the year when temperatures and moisture are adequate to maximize turfgrass establishment. These recommended establishment periods would be late summer to early fall for cool-season turfgrasses and late spring through mid-summer for warm-season turfgrasses.

Nitrogen Applications

At the time of establishment, apply no more than 0.9 pounds per 1,000 ft² of total nitrogen for cool season grasses or 1.0 pounds per 1,000 ft² of total nitrogen for warm season grasses, using a material containing slowly available forms of nitrogen, followed by one or two applications beginning 30 days after planting, not to exceed a total of 1.8 pounds per 1,000 ft² total for cool season grasses and 2.0 pounds per 1,000 ft² for warm season grasses for the establishment period. Applications of WSN cannot exceed more than 0.7 pounds per 1,000 ft² within a 30-day period.

Phosphorus and Potassium Recommendations for Establishment

<u>Soil Test Level</u>	<u>Nutrient Needs (pounds per 1,000ft²) *</u>	
	<u>P₂O₅</u>	<u>K₂O</u>
L	3-4	2-3
M	2-3	1-2
H	2-1	0.5-1
VH	0	0

* For the lower soil test level within a rating, use the higher side of the range and for higher soil test level within a rating use the lower side of the recommendation range.

Commonwealth of Virginia. July 2014. *Virginia Nutrient Management Standards and Criteria*, pages 96-99.

Section I.A Explanation of Environmentally Sensitive Sites

The regulations define "environmentally sensitive site" to mean any field which is particularly susceptible to nutrient loss to groundwater or surface water since it contains or drains to areas which contain sinkholes; or where at least 33% of the area in a specific field contains one or any combination of the following features:

1. Soils with high potential for leaching based on soil texture or excessive drainage;
2. Shallow soils less than 41 inches deep likely to be located over fractured or limestone bedrock;
3. Subsurface tile drains;
4. Soils with high potential for subsurface lateral flow based on soil texture and poor drainage;
5. Floodplains as identified by soils prone to frequent flooding in county soil surveys; or
6. Lands with slopes greater than 15%.

Commonwealth of Virginia. July 2014. *Virginia Nutrient Management Standards and Criteria*, page 27.

Resources – Soil Test Results and Publications

Soil Test Reports and Soil Test Notes

Publications

Lawn Fertilization in Virginia

Maintenance Calendar for Cool Season Grasses

Calibrating Your Lawn Spreader

Virginia Cooperative Extension

Soil Test Report

Questions? Contact:
Stafford County Office
1739 Jefferson Davis Highway
P.O. Box 339
Stafford, VA 22555-0339
540-658-8000

Virginia Tech Soil Testing Laboratory
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www.soiltest.vt.edu

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SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
GARPK				---	None applied.					

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	26	183	2469	247	33.3	21.8	16.2	54.4	0.3	
Rating	M	H-	VH	VH	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.4	6.33	7.8	5.3	94.7	78.7	13.0	3.0	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: LAWN MAINTENANCE - BLUEGRASS, FESCUE (202)

619. Lime recommendations: NONE NEEDED.

990. We are trying to improve our service. PLEASE take a moment to complete our brief, anonymous customer survey at tinyurl.com/soiltestsurvey.

991. "Explanation of Soil Tests, Note 1" and other referenced notes are viewable at www.soiltest.vt.edu under Report Notes.

208. FERTILIZER RECOMMENDATIONS: Use any complete "turf-type" fertilizer according to the instructions in the note on lawn fertilization. (A "turf-type" fertilizer is typically high in nitrogen, and has little or no phosphorus and potassium, e.g., 25-0-7.)

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SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
GNMEM				---	None applied.					

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	99	459	3886	590	14.7	18.5	1.5	15.4	0.9	
Rating	H+	VH	VH	VH	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.7	6.26	13.5	6.1	93.9	71.6	17.9	4.3	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: SHRUBS, NON ACID-LOVING (245)

619. Lime recommendations: NONE NEEDED.

261. FERTILIZER RECOMMENDATIONS: See Note 20.

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SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
GNGDN										

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	21.4	587	4042	715	14.9	19.2	0.6	21.3	1.0	
Rating	VH	VH	VH	VH	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	5.9	5.98	16.3	15.3	84.7	62.0	18.1	4.6	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: VEGETABLE GARDEN (210)

610. LIME RECOMMENDATIONS: Apply 14 pounds of agricultural limestone (ground or pulverized) per 100 square feet. If lime is not going to be mixed into the soil, make several small applications of up to 5 lbs each, at intervals of 1 to 6 months, until the full amount is applied.

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991. "Explanation of Soil Tests, Note 1" and other referenced notes are viewable at www.soiltest.vt.edu under Report Notes.

225. FERTILIZER RECOMMENDATIONS: Apply a nitrogen-only fertilizer, such as one of the following amounts per 100 sq. ft. --- 1.25 lbs (2 cups) of nitrate of soda (16-0-0) or 1.33 lbs (2 2/3 cups) of calcium nitrate (15-0-0) or 1.0 lb (2 1/2 cups) of ammonium sulfate (21-0-0) or 0.4 lbs (1 cup) of urea (46-0-0). Do not over fertilize! These products will burn plants at high rates! If you are unable to find one of these fertilizers, apply a turf-type (lawn maintenance) fertilizer that is high in nitrogen with little or no phosphorus and potassium at a rate close to 0.2 lb of nitrogen per 100 sq. ft., such as applying two-thirds of a pound of either 26-0-2 or 32-0-4. For additional information on fertilization, see Note 19.

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SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
GNATH				---	None applied.					

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	1.28	229	2824	335	21.7	11.5	3.9	20.8	0.5	
Rating	VH	H	VH	VH	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.6	6.33	9.1	4.6	95.5	77.1	15.1	3.2	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: LAWN MAINTENANCE - BLUEGRASS, FESCUE (202)

619. Lime recommendations: NONE NEEDED.

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991. "Explanation of Soil Tests, Note 1" and other referenced notes are viewable at www.soiltest.vt.edu under Report Notes.

208. FERTILIZER RECOMMENDATIONS: Use any complete "turf-type" fertilizer according to the instructions in the note on lawn fertilization. (A "turf-type" fertilizer is typically high in nitrogen, and has little or no phosphorus and potassium, e.g., 25-0-7.)

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Y**FRANK REILLY****STAFFORD, VA 22556****SAMPLE HISTORY**

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
GNTRF				---	None applied.					

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	72	214	1717	333	8.0	13.4	1.5	25.8	0.2	
Rating	H	H	H	VH	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	5.5	5.91	8.8	32.9	67.1	48.5	15.5	3.1	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: LAWN MAINTENANCE - BLUEGRASS, FESCUE (202)

612. LIME RECOMMENDATIONS: Apply 160 pounds of agricultural limestone (ground, pulverized or pelletized) per 1000 square feet in several small applications of up to 50 lbs each, at intervals of 1 to 6 months, until the full amount is applied.

990. We are trying to improve our service. PLEASE take a moment to complete our brief, anonymous customer survey at tinyurl.com/soiltestsurvey.

991. "Explanation of Soil Tests, Note 1" and other referenced notes are viewable at www.soiltest.vt.edu under Report Notes.

208. FERTILIZER RECOMMENDATIONS: Use any complete "turf-type" fertilizer according to the instructions in the note on lawn fertilization. (A "turf-type" fertilizer is typically high in nitrogen, and has little or no phosphorus and potassium, e.g., 25-0-7.)

Virginia Cooperative Extension

Soil Test Report

Questions? Contact:
Stafford County Office
1739 Jefferson Davis Highway
P.O. Box 339
Stafford, VA 22555-0339
540-658-8000

Virginia Tech Soil Testing Laboratory
145 Smyth Hall (0465)
185 Ag Quad Ln
Blacksburg, VA 24061
www.soiltest.vt.edu

SEE NOTES:
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 at www.soiltest.vt.edu under Report Notes

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STAFFORD, VA 22556

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FRANK REILLY

SAMPLE HISTORY

Sample ID	Field ID	LAST CROP		LAST LIME APPLICATION		SOIL INFORMATION				
		Name	Yield	Months Prev.	Tons/Acre	SMU-1 %	SMU-2 %	SMU-3 %	Yield Estimate	Productivity Group
MERCH				---	None applied.					

LAB TEST RESULTS (see Note 1)

Analysis	P (lb/A)	K (lb/A)	Ca (lb/A)	Mg (lb/A)	Zn (ppm)	Mn (ppm)	Cu (ppm)	Fe (ppm)	B (ppm)	S.Salts (ppm)
Result	106	250	2897	289	13.3	14.0	1.0	10.2	1.0	
Rating	H+	H	VH	VH	SUFF	SUFF	SUFF	SUFF	SUFF	

Analysis	Soil pH	Buffer Index	Est.-CEC (meq/100g)	Acidity (%)	Base Sat. (%)	Ca Sat. (%)	Mg Sat. (%)	K Sat. (%)	Organic Matter (%)
Result	6.4	6.19	10.0	12.5	87.5	72.4	11.9	3.2	

FERTILIZER AND LIMESTONE RECOMMENDATIONS

Crop: LAWN MAINTENANCE - BLUEGRASS, FESCUE (202)

619. Lime recommendations: NONE NEEDED.

990. We are trying to improve our service. PLEASE take a moment to complete our brief, anonymous customer survey at tinyurl.com/soiltestsurvey.

991. "Explanation of Soil Tests, Note 1" and other referenced notes are viewable at www.soiltest.vt.edu under Report Notes.

208. FERTILIZER RECOMMENDATIONS: Use any complete "turf-type" fertilizer according to the instructions in the note on lawn fertilization. (A "turf-type" fertilizer is typically high in nitrogen, and has little or no phosphorus and potassium, e.g., 25-0-7.)

Explanation of Soil Tests

Rory Maguire, Extension Nutrient Management Specialist, Virginia Tech
Steve Heckendorn, Soil Test Laboratory Manager, Virginia Tech

The accompanying Soil Test Report (and supplemental Soil Test Notes, when provided) will help you assess your plant's need for fertilizer and lime.

The "History of Sampled Area" section restates the information you filled in on the Soil Sample Information Sheet you submitted with the soil sample.

The "Lab Test Results" section shows the relative availability of nutrients numerically and if appropriate, as a rating. The rating may be interpreted as follows: L=Low, M=Medium, H=High, VH=Very High, EH=Excessively High (soluble salt test only), DEF=Deficient, or SUFF=Sufficient, and sometimes a "+" or "-" When soils test Low, plants almost always respond to fertilizer. When soils test Medium, plants sometimes respond to fertilizer and a moderate amount of fertilizer is typically recommended to maintain fertility. When soils test High to Very High, plants usually do not respond to fertilizer. If there is no rating for a nutrient, the adequacy of that nutrient in the soil for the plant you specified has not been determined.

The following is an explanation of the symbols and abbreviation used in the report:

Report Symbols and Abbreviations

P = phosphorus	K = potassium
Ca = calcium	Mg = magnesium
Zn = zinc	Mn = manganese
Cu = copper	Fe = iron
B = boron	SS = soluble salts
lb/A = pounds per acre	ppm = parts per million
meq = milliequivalent	g = gram
pH = acidity	Sat. = saturation
N = nitrogen	P ₂ O ₅ = phosphate
K ₂ O = potash	% = percent
Est-CEC = estimated cation exchange capacity	
AG = agricultural limestone (dolomitic or calcitic)	

Fertilizer Recommendation

The fertilizer recommendations may be used for the same crop for two to three years. After this time, it is advisable to retest the soil to determine if significant changes have occurred in nutrient levels. When the soil tests Very High for phosphorus or potassium and no fertilizer for these nutrients is recommended, you should retest the following year to determine if fertilizer will be needed. Due to the variability associated with sampling, fertilizer application rates may be varied by a plus or minus 10 percent.

No soil test is performed for **nitrogen** because this element is too mobile in the soil for laboratory results to be useful. Nitrogen fertilizer recommendations are based on the crop/plant to be grown, the previous crop, and when applicable, the soil's yield potential. Comments on the report and other enclosed Notes, if any, will have further information regarding nitrogen.

Lime Recommendation

If needed, a lime recommendation is given to neutralize soil acidity and should last two to three years. After that time, you should have the soil retested. The measured soil test levels of calcium and magnesium are used to determine the appropriate type of limestone to apply. If neither dolomitic nor calcitic lime is mentioned, or "Ag" type or "agricultural" limestone is stated on the report, then it does not matter which type is used. When no information on the Soil Sample Information Sheet was provided regarding the last lime application, the lab assumed you have not applied lime in the past 18 months. If this is not correct, contact your Extension agent for advice on adjusting the lime recommendation to take into consideration recent lime applications. Do not over lime! Too much lime can be as harmful as too little. For best results, apply lime, when possible, several months ahead of the crop/plant to be planted to allow time for more complete soil reaction.

Methods and Meanings

For more detail on the lab procedures used, visit www.soiltest.vt.edu and click on “Laboratory Procedures.”

Soil pH (or soil reaction) measures the “active” acidity in the soil’s water (or hydrogen ion activity in the soil solution), which affects the availability of nutrients to plants. It is determined on a mixed suspension of 1:1, volume to volume ratio of soil material to distilled water.

Virginia soils naturally become acidic, and limestone periodically needs to be applied to neutralize some of this acidity. A slightly acid soil is where the majority of nutrients become the most available to plants, and where soil organisms that decompose organic matter and contribute to the “overall health” of soils are the most active. When a soil is strongly acidic (< 5.0-5.5), many herbicides lose effectiveness and plant growth is limited by aluminum toxicity. When soils are over-limed and become alkaline (> 7.0), micronutrients, such as manganese and zinc, become less available to plants.

For most agronomic crops and landscaping plants, lime recommendations are provided to raise the soil pH to a slightly acid level of between 5.8 and 6.8. Blueberries and acid-loving ornamentals generally prefer a 4.5 to 5.5 pH, and an application of liming material is suggested when the soil pH drops below 5.0. For the majority of other plants, lime may be suggested before the pH gets below 6.0. This is to keep the soil pH from dropping below the ideal range, since lime is slow to react and affects only a fraction of an inch of soil per year when the lime is not incorporated into the soil. If the soil pH is above the plant’s target pH, then no lime is recommended. If the pH is well above the ideal range, then sometimes an application of sulfur is recommended to help lower the pH faster; however, most of the time, one can just let the soil pH drop on its own.

A Mehlich buffer solution is used to determine the **Buffer Index** to provide an indication of the soil’s total (active + reserve) acidity and ability to resist a change in pH. This buffer measurement is the major factor in determining the amount of lime to apply. The Buffer Index starts at 6.60 and goes lower as the soil’s total acidity increases and more lime is needed to raise the soil pH. A sandy soil and a clayey soil can have the same soil pH; however, the clayey soil will have greater reserve acidity (and a lower Buffer Index) as compared to the sandy soil, and the clayey soil will require a greater quantity of lime to be applied in order to raise the soil pH the same amount as the sandy soil. A reported

Buffer Index of “N/A” means that it was not measured since the soil (water) pH was either neutral or alkaline and not acidic (soil pH \geq 7.0) and therefore requires no lime.

Nutrients that are available for plant uptake are extracted from the soil with a Mehlich 1 solution using a 1:5 vol:vol soil to extractant ratio, and are then analyzed on an ICP-AES instrument. An extractable Mehlich 1 level of phosphorus from 12 to 35 pounds per acre (lb/A) is rated as medium or optimum. A medium level of potassium is from 76 to 175 lb/A. Medium levels of calcium and magnesium are 721 to 1440 and 73 to 144 lb/A, respectively. Calcium and magnesium are normally added to the soil through the application of limestone. It is rare for very high fertility levels of P, K, Ca and Mg to cause a reduction in crop yield or plant growth. Levels of micronutrients (Zn, Mn, Cu, Fe and B) are typically present in the soil at adequate levels for plants if the soil pH is in its proper range. See Soil Test Note 4, at www.soiltest.vt.edu/stnotes, for documented micronutrient deficiencies in Virginia.

Soluble Salts (S.Salts) or fertilizer salts are estimated by measuring the electrical conductivity of a 1:2, vol:vol ratio of soil material to distilled water. Injury to plants may start at a soluble salts level above 844 ppm when grown in natural soil, especially under dry conditions and to germinating seeds and seedlings. Established plants will begin to look wilted and show signs related to drought. This test is used primarily for greenhouse, nursery and home garden soils where very high application rates of fertilizer may have led to an excessive buildup of soluble salts.

Soil Organic Matter (SOM) is the percentage by weight of the soil that consist of decomposed plant and animal residues, and is estimated by using either the weight Loss-On-Ignition (LOI method) from 150° to 360°C, or a modified Walkley-Black method. Generally, the greater the organic matter level, the better the overall soil tilth or soil quality, as nutrient and water holding capacities are greater, and improved aeration and soil structure enhance root growth. The percent of organic matter in a soil can affect the application rate of some herbicides. Soil organic matter levels from 0.5% to 2.5% are ordinary for natural, well-drained Virginia soils. A soil organic matter greater than 3% would be considered very high for a cultivated field on a farm, but can be beneficial. Due to relatively large amounts of organic materials being commonly added to gardens, the soil organic matter in garden soils can be raised into the range of 5% to 10%.

The remaining values that are reported under the “Lab Test Results” section are calculated from the previous measured values and are of little use to most growers.

Estimated Cation Exchange Capacity (**Est-CEC**) gives an indication of a soil’s ability to hold some nutrients against leaching. Natural soils in Virginia usually range in CEC from 1 to 12 meq/100g. A very sandy soil will normally have a CEC of 1 to 3 meq/100g. The CEC value will increase as the amount of clay and organic matter in the soil increases. This reported CEC is an estimation because it is calculated by summing the Mehlich 1 extractable cations (Ca + Mg + K), and the acidity estimated from the Buffer Index and converting to units commonly used for CEC. This is also an Effective CEC since it is the CEC at the current soil pH. This value can be erroneously high when the soil pH or soluble salts level is high.

The percent **Acidity** is a ratio of the amount of acid-generating cations (as measured by the Buffer Index) that occupy soil cation exchange sites to the total CEC sites. The higher this percentage, the higher the amount

of reserve acidity in the soil, and the higher the amount of acidity there will be in the soil solution and the lower the soil pH will be. A reported Acidity% of “N/A” means that a buffer index was not determined, and the acidity is probably less than 1 meq/100g and/or 5%, and the soil pH is alkaline (greater than 7.0).

The percent **Base Saturation** is the ratio of the quantity of non-acid generating cations (i.e., the exchangeable bases, Ca, Mg, and K) that occupy the cation exchange (CEC) sites.

The percent **Ca, Mg, or K Saturation** refers to the relative number of CEC sites that are occupied by that particular nutrient and is a way of evaluating for any gross nutrient imbalance.

Additional Information

For questions and more information, contact your local Virginia Cooperative Extension (VCE) office or go to www.ext.vt.edu. Contact information for your local Extension office appears on the upper left of your soil test report.

Conversion Factors

(Some Values are Approximate)

1 acre = 43,560 square feet

1 pound of 5-10-5, 5-10-10 or 10-10-10 fertilizer = 2 cups

1 pound of ground limestone or ground dolomitic limestone = 1.5 cups

1 pound of aluminum sulfate or magnesium sulfate = 2.5 cups

1 pound of sulfur = 3.3 cups

1 quart = 2 pints = 4 cups

1 pint = 2 cups = 32 tablespoons

1 tablespoon = 3 teaspoons

1 bushel = 35.24 liters = 1.25 cubic feet

Pounds per 100 square feet x 0.54 = lbs per cubic yard

100 square feet = 5 feet x 20 feet, 10 feet x 10 feet, or 2 feet x 50 feet

1,000 square feet = 50 feet x 20 feet, 10 feet x 100 feet, or 25 feet x 40 feet

Pounds per 100 square feet x 436 = pounds per acre

Pounds per 1,000 square feet x 43.6 = pounds per acre

Pounds per acre x 0.0023 = pounds per 100 square feet

Pounds per acre x 0.023 = pounds per 1,000 square feet

Soil Test Note 17: Lawn Fertilization for Cool Season Grasses

(Supplement to Soil Test Report)

M. Goatley, Extension Specialist, Turf

E.H. Ervin, Associate Professor, Turf

S.E. Heckendorn, Laboratory Manager, Soil Testing Laboratory

Applying Lime to Established Lawns

If less than 50 pounds of lime per 1,000 square feet is recommended, apply the full amount in one application. If more than 50 pounds of lime per 1,000 square feet is recommended, apply the lime in several applications of up to 50 pounds each at intervals of 1 to 6 months until the full amount is applied. Applying more than 50 pounds per 1,000 square feet at any one time may result in an undesirable residue on the turf.

Repair Bare Spots with Shallow Fertilizer Incorporation

Prepare bare spots for seeding, sodding, plugging or sprigging by raking the soil so that approximately 1 inch of loose soil is on the surface. Mixing topsoil and/or organic matter into these spots will help prepare these areas for seeding or vegetative establishment.

Apply the same amount of lime but only two-thirds of the fertilizer recommended for maintaining your lawn (too much fertilizer will burn your grass seedlings). Rake the fertilizer and lime into the upper inch of loose soil.

After seeding, apply mulch (1 bale of clean straw per 1,000 square feet) to conserve moisture. Seeded, sodded, plugged, or sprigged areas should be watered immediately after planting. Watering should continue as long as necessary to obtain satisfactory germination and establishment.

General Fertilizer Information

Fertilizer Analysis

Fertilizers are often described by three numbers, such as 12-4-8 or 46-0-0. These three numbers indicate, respectively, the percent by weight of nitrogen (N), phosphate (P_2O_5), and potash (K_2O) in the fertilizer and are required on every fertilizer bag or container. For example, a 12-4-8 fertilizer would contain 12 percent nitrogen, 4 percent phosphate, and 8 percent potash on a weight basis. Fertilizers containing all three nutrients (nitrogen, phosphorus, and potassium) are referred to as "complete" fertilizers.

Fertilizer Ratio

If the fertilizer analysis is 16-4-8, the fertilizer ratio is 4-1-2; similarly, a 14-7-14 analysis would have a 2-1-2 ratio. Mature lawns generally require more nitrogen than phosphorus and potassium; therefore, ratios of 4-1-2 or 4-1-3 are commonly recommended. Turf maintenance fertilizers vary in nitrogen content and may contain a portion of the nitrogen as water-insoluble or slowly available nitrogen.

Nitrogen Availability

The source of nitrogen in fertilizers influences nitrogen availability and turf response. There are two categories of nitrogen sources: quickly available and slowly available. Quickly available materials are water-soluble, can be readily utilized by the plant, are susceptible to leaching and have a relatively short period of response. Quickly available sources include ammonium nitrate, urea, ammonium sulfate, and calcium nitrate. Slowly

www.ext.vt.edu

available nitrogen sources release their nitrogen over extended periods of time and are applied less frequently and at somewhat higher rates than the quickly available nitrogen sources. Slowly available sources are less susceptible to leaching and are preferred on sandy soil types, which tend to leach. Slowly available sources include urea formaldehyde (UF), UF based products (methylene ureas), sulfur coated urea (SCU), isobutyli-dene diurea (IBDU), natural organics (bone meal, fish meal, dried blood, and animal manures), and activated sewage sludge.

If a fertilizer contains a slow-release nitrogen source, it will be listed on the label. For UF based fertilizers the portion of the nitrogen that is slowly available is listed on the fertilizer bag as Water Insoluble Nitrogen (WIN). For instance, a 20-10-10 fertilizer with 5 percent WIN has 5/20 or 1/4 of the nitrogen in the slowly available form. If you choose a fertilizer that provides nitrogen in a slowly available form, you should understand how to calculate WIN in order to determine which fertilizer program (see Table 1) best fits your lawn. For example, assume that a fertilizer label provides the following information:

Guaranteed Analysis

Total Nitrogen 16%
 5.6% Water Insoluble Nitrogen (WIN)
 Available Phosphoric Acid (P₂O₅)4%
 Soluble Potash (K₂O).....8%

To find the % nitrogen that is WIN, use the following calculation:

$$\frac{\% \text{ WIN}}{\% \text{ Total Nitrogen}} \times 100 = \% \text{ of total nitrogen that is WIN or slowly available}$$

Therefore:

$$\frac{5.6}{16} \times 100 = 35\% \text{ of the total nitrogen is WIN or slowly available and this fertilizer is most suitable for use in Program 1}$$

If WIN is not listed on the fertilizer label, one should assume it is all water-soluble or quickly available nitrogen, unless the fertilizer label indicates it contains sulfur-coated urea. Sulfur-coated urea fertilizers do provide slowly available nitrogen, but the fertilizer label does not list it as WIN. If the fertilizer contains sulfur-coated urea, include that portion as water-insoluble nitrogen when determining the amount of nitrogen that is slowly available.

Table 1. Fertilization Program for cool-season grasses:

Program 1 - Nitrogen application by month using predominantly quickly available nitrogen fertilizers (less than 50 percent slowly available nitrogen or WIN)

Quality Desired	Sept.	o ct.	nov.	May 15 - June 15
	----- lbs. n/1,000 sq. ft. -----			
Low	0	1	0	0 -1/2
Medium	1	1	0	0 -1/2
High	1	1	1	0 -1/2

Program 2 - Nitrogen application by month using predominantly slowly available nitrogen fertilizers (50 percent or more slowly available nitrogen or WIN)

Quality Desired	a ug. 15 - Sept. 15	o ct. 1 - nov. 1	May 15 - June 15
	----- lbs. n/1,000 sq. ft. -----		
Low	1.5	0	0
Medium	1.5	0	0 - 1.0
High	1.5	1.5	0 - 1.0

Important Comments about Programs 1 and 2:

1. Fine fescues perform best at 1to 2 pounds of nitrogen per 1,000 square feet per year.
2. Applications in successive months should be approximately 4 weeks apart.
3. Up to 1/2 pound of nitrogen in Program 1 and up to 1.0 pound of nitrogen in Program 2 may be applied per 1,000 square feet in the May 15 to June 15 period if nitrogen was not applied the previous fall or to help a new lawn get better established.

Fertilizer Programs

When to fertilize depends on the type of grass. This Note is for cool-season grasses, such as Kentucky Bluegrass, Tall Fescue, Creeping Red Fescue and Perennial Ryegrass. (Use Note 18 for warm-season grasses such as bermudagrass or zoysiagrass.)

Lawn Establishment

Go directly to Table 2 and select an appropriate fertilizer from the recommendation on the Soil Test Report. Use the rate under the 1.0 pound of nitrogen column and

incorporate the fertilizer into the soil (along with lime, if needed) to a depth of 4 to 6 inches. After the turf has been established (6 to 8 weeks), follow one of the maintenance fertilization programs described below.

Lawn Maintenance

If lawn soil tests are low or medium for phosphorus or potassium, a complete fertilizer will be recommended to correct a potential deficiency of either of these plant nutrients. The complete fertilizer should be used for 3 to 4 years and then another soil sample should be taken to determine if a different fertilizer should be used. If the lawn soil test indicates high or very high levels of phosphorus and potassium availability, then fertilizers supplying mainly or only nitrogen need be applied.

The programs listed in Table 1 give flexibility in deciding the types of fertilizer to best meet your needs. Program 1 utilizes fertilizers that contain predominately

readily available nitrogen (i.e., less than 50 percent of the nitrogen is slowly available – listed as WIN on the fertilizer bag). Program 2 utilizes fertilizers that contain predominately slowly available nitrogen (i.e., more than 50 percent of the nitrogen is slowly available or WIN).

If used properly, either program will result in quality turf. Choose the program best suited to your needs and the available fertilizer supply in your area.

Table 2 contains information on the amounts of various types of fertilizers to apply for certain rates of nitrogen per 1,000 square feet. After you decide what kind of fertilizer you want to use, determine the amount at which it should be applied using Table 2. Fertilizers are best applied when the grass is dry, followed by watering the lawn after fertilization to wash particles off the blades.

TABLE 2. The amounts of various types of fertilizers to apply certain rates of nitrogen (N) per 1,000 square feet

Fertilizer analysis	a pproximate Ratio	lbs. of n desired/1,000 sq. ft.		
		0.5	1.0	1.5
		lbs. fertilizer per 1,000 sq. ft.		
5-10-5	1-2-1	10.0	20.0	NA†
5-10-10	1-2-2	10.0	20.0	NA
6-2-0‡	3-1-0	8.3	16.6	24.9
10-10-10	1-1-1	5.0	10.0	NA
12-4-8	3-1-2	4.2	8.3	NA
16-8-8	2-1-1	3.1	6.2	NA
16-4-8	4-1-2	3.1	6.2	NA
20-0-16	4-0-3	2.5	5.0	NA
23-3-7	8-1-2	2.2	4.3	NA
28-0-12	7-0-3	1.8	3.6	NA
31-0-0‡	1-0-0	1.6	3.2	4.8
33.5-0-0	1-0-0	1.5	3.0	NA
38-0-0‡	1-0-0	1.3	2.6	3.9
46-0-0	1-0-0	1.1	2.2	NA

†NA = not applicable. Nitrogen levels from predominantly water-soluble sources should never exceed 1 pound N/1,000 square feet in a single application.

‡Sources containing 50 percent or greater water insoluble N (WIN) can be applied up to 1.5 pounds N/1,000 square feet in a single application.

If the particular fertilizer you are using is not listed in Table 2, use the following calculation to determine the exact amount of fertilizer to apply per 1,000 square feet of lawn area.

$$\frac{\text{Desired lbs of nitrogen per 1000 sq. ft.}}{\% \text{ Nitrogen in fertilizer}} \times 100 = \text{lbs. of fertilizer needed per 1,000 sq. ft.}$$

For example, if one wants to apply 1.0 pound of nitrogen per 1,000 square feet using a 23-3-7 fertilizer:

$$\frac{1.0}{23} \times 100 = 4.34 \text{ lb. of 23-3-7 is required per 1,000 sq. ft.}$$

Important Application Practices to Protect Water Resources

- **Never exceed 1 lb of water-soluble nitrogen in any single application.**
- **Apply phosphorus only when a soil test determines that it is needed.**
- **Do not apply fertilizers to hard or paved surfaces (driveways, sidewalks, etc.)**

Additional Information

For more information, contact your local Virginia Cooperative Extension office or go to www.ext.vt.edu

Soil test note 19:

Vegetable and Flower Gardens

(Supplement to Soil Test Report)

*J.G. Latimer, Extension Specialist, Horticulture
S.E. Heckendorn, Laboratory Manager, Soil Testing Laboratory*

Liming

For Established Plants – When less than 5 pounds per 100 square feet is recommended, spread lime evenly around plants and, if possible, rake into the top inch of soil without disturbing the root system. Wash off any lime that comes in contact with foliage.

Where more than 5 pounds per 100 square feet is recommended, apply the lime in several applications of 5 pounds each at intervals of approximately 1 to 6 months until the full amount is applied. Spread evenly around plants and, if possible, rake into the top inch of soil without disturbing the root system. Wash off any lime that comes in contact with foliage.

Preplant – When less than 10 pounds per 100 square feet is recommended, broadcast the recommended amount before planting and disk, rototill, or spade 5 inches deep into the soil.

When more than 10 pounds per 100 square feet is recommended, disk, rototill, or spade one-half of lime 5 inches deep into the soil and work the remainder into the top 2 inches of soil to ensure good germination and seedling growth.

Fertilizing Gardens

Vegetables

How to Apply - Broadcast the recommended amount of fertilizer before planting and disk, rototill, or spade 5 inches deep into soil.

Tomatoes, Green Peppers, Lima Beans – If the garden area has been liberally fertilized in the past and the soil tests high or very high for phosphorus (P) and potassium (K), for best results apply one-half the recommended amount of fertilizer before planting and the remaining half after fruit set. Too much fertilizer applied early in the spring for these vegetables will encourage vegetative growth and reduce fruit set.

Sidedressing – Corn and leafy vegetables such as broccoli, cabbage, celery, kale, lettuce, and spinach will respond to a sidedress application of fertilizer applied between the rows about one month after planting. To sidedress, apply one pound of 10-10-10 or two pounds of 5-10-5 (or 5-10-10) per 100 feet of row and scratch into the top inch of soil with a rake.

Organic Matter

Organic matter loosens and improves the structure of heavy clay soils. In medium and light sandy soils, organic matter helps to hold moisture and nutrients. Some sources of organic matter are peat moss, compost, plant residues, leaf mold, manure, and sawdust.

Flowers

Preplant – Broadcast the recommended amount of fertilizer before planting and disk, rototill, or spade 5 inches deep into soil. Avoid excessive fertilizer application because this may cause succulent vegetative growth and few flowers.

For Established Plants – Spread fertilizer evenly around plants and, if possible, rake into the top inch of soil without disturbing the root system. Immediately wash off any fertilizer that comes into contact with foliage.

Additional Rose Fertilization – Roses require periodic fertilization throughout the growing season to promote new flower development. Repeat the basic fertilizer application each month from March through August.

Organic Fertilizers

(Use in place of Fertilizer Recommendations on Soil Test Report.)

For optimum growth of garden plants, maintaining a high level of all the plant nutrients in the soil is desirable. This can be accomplished by adding materials such as compost, manures, and lawn clippings throughout the year.

Nitrogen: A nitrogen source should be applied each year for a successful garden. If a nitrogen-rich material such as compost or green manure (especially from legumes) has been incorporated in the garden soil (1- to 2-inch layer worked into a 6- to 8-inch depth of soil) within a few weeks before planting, then little or no further nitrogen will be required. Otherwise, incorporate any one of the following materials per 100 square feet before planting: 5 pounds of blood meal; 5 pounds of fish meal; 10 pounds of soybean-seed meal; 10 pounds of cotton-seed meal; or 15 to 25 pounds of poultry manure.

If the plant nutrients phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg) indicated on the soil test report fall into the medium (M) or low (L) category, then the following materials may be added per 100 square feet to bring the nutrients back up to a high level:

Phosphorus: 10 pounds of bone meal or rock phosphate.

Potassium: 10 pounds of granite dust or green sand. Wood ash is high in potassium but should be used sparingly only on acid soils (pH less than 6.0) due to its potential to make the soil too alkaline. (General rule of thumb: If applying 10 pounds of wood ash, reduce the lime applied by 5 pounds per 100 square feet.)

Calcium: If limestone is added as recommended due to low pH, this will correct low calcium levels. If limestone is not recommended, add 10 pounds of gypsum.

Magnesium: If dolomitic limestone is recommended due to low pH, this will correct low magnesium levels. If limestone is not recommended, add 10 pounds of Epsom salts.

potted House plants

Potted house plants normally grow well with minimal care other than periodic watering and fertilization, provided they have adequate light for normal growth. Common problems in growth of houseplants are over fertilizing (causing excessive fertilizer salts to accumulate in the soil to toxic levels), over-watering, too little light, and heavy, compacted soil which results in poor drainage and root growth.

Books explaining the fertilization, water, and light requirements of various potted houseplants are commercially available from retail stores or may be found in your local library. The following are instructions for preparing soil mixes, and for fertilizing and liming potted houseplants.

preparing Soil Mixes

A successful potting mixture should have the right texture – one that will hold moisture without becoming waterlogged, and will allow free drainage. It should be free from soil pests, weed seeds, and plant diseases. To have these conditions, a commercially prepared soil mixture may be best. If not available, equal parts of a good garden soil and peat moss make an excellent soil mixture for potted house plants. Add to the mix limestone at 1 tablespoon per 6-inch pot, and a 5-10-5 fertilizer at 1 teaspoon per 6-inch pot or a 10-10-10 fertilizer at 1/2 teaspoon per 6-inch pot. Mix thoroughly into the soil-peat moss mix.

Fertilizing

Important: Make sure soil is moist before fertilizing! Do not fertilize when the soil is dry as this will result in root burn. Apply 1 teaspoon of 5-10-5 fertilizer (or 1/2 teaspoon of 10-10-10 fertilizer) per 6-inch pot and water thoroughly into soil. Do not allow fertilizer to come into direct contact with foliage. Repeat application every 2 months when plants are actively growing, normally during the period from March to November. If other commercial houseplant fertilizers are to be used, follow directions on label. Do not over fertilize, because this may damage plants.

Liming

Most potted houseplants grow well at a pH of 6.0 to 6.5. Apply the recommended amount of lime around the base of the plant and scratch it into the upper 1/4 to 1/2 inch of soil if possible without disturbing the root system.

Additional information

Fertilizer Substitution table

For each 10 lbs. of this grade	You may Substitute			
		lbs.	of	analysis
5-10-5	=	6.3	of	8-16-8
	or	4.2	of	12-24-12
5-10-10	=	8.3	of	6-12-12
	or	5.0	of	10-20-20
10-10-10	=	8.3	of	12-12-12
	or	6.7	of	15-15-15
10-5-5	=	8.3	of	12-6-6
	or	6.3	of	16-8-8

For more information, contact your local Virginia Cooperative Extension office or go to www.ext.vt.edu.

Soil test note 20: Home Shrubs and trees (Supplement to Soil Test Report)

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Fertilization is not recommended for healthy shrubs and trees with good, generally green color (some cultivars normally have red, purple, or yellow colored leaves). The roots of shrubs and trees normally extend one to three times beyond the drip line or crown of the plant. (This is the shaded area directly under a plant at high noon.) If the plants are in or adjacent to a fertilized lawn, the shrubs and trees will absorb some of the lawn fertilizer and generally will need no other supplement. If the plants are mulched with an organic material, they may need no supplements because they can absorb nutrients from the decomposing mulch. Applying unneeded fertilizer wastes money, can lead to water pollution, and can cause excessive growth that can be detrimental to the plants.

If the leaves become paler and smaller than normal, if twigs are thinner and shorter, or if the bud set seems reduced, fertilization may be beneficial. A slow release fertilizer (one containing at least 50% WIN – water insoluble nitrogen) such as 18-6-12 or 17-7-11 can be surface broadcast over double the drip line or crown area of the plant. For example, if the crown of a tree covers 50 square feet, fertilize a 100-square-foot area under and around the tree. Do not place fertilizer in direct contact with tree or shrub stems.

Follow the recommended rate to use printed on the fertilizer bag. To avoid damage to the turf, never apply more than 1.5 pounds of actual nitrogen per 1,000 square feet at any one time (for 18-6-12 that would be 8.3 pounds of fertilizer per 1,000 square feet). Not as

ideal, but if using a fast release fertilizer (less than 50% WIN), such as 10-10-10, then never apply more than 1.0 pound of nitrogen per 1,000 square feet at any one time (for 10-10-10 that would be 10 pounds of fertilizer per 1,000 square feet). If more fertilizer is needed, make split applications one month apart.

The greatest uptake of fertilizer will be between bud break in the spring and leaf coloration in the fall. Apply the fertilizer at that time only if there is moisture available in the soil to dissolve the fertilizer. If it doesn't rain, water the fertilizer in, but avoid fertilizing during a drought. Also be careful not to apply too much fertilizer late in the summer since tender, late-season growth may be damaged during the winter. To protect water resources, do not allow fertilizer to fall on driveways, sidewalks, or other hard surfaces.

additional information

For more information, consult *Fertilizing Landscape Trees and Shrubs*, Virginia Cooperative Extension publication 430-018, at www.pubs.ext.vt.edu/430-018/430-018.html

Other Extension publications are available at www.ext.vt.edu or from your local Virginia Cooperative Extension office.



Lawn Fertilization in Virginia

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Fertilization of lawns is essential for the production of quality turf in Virginia. However, exceeding recommended fertilizer application rates or improper application timing can negatively impact surface water and groundwater quality. A well-planned and environmentally sound turfgrass fertilization program will take the following factors into account

- Soil type.
- Inherent soil fertility.
- Nutrient source characteristics.
- Desired turfgrass quality or performance.
- Nutrient application rate.
- Application frequency.
- Season of application.
- Application method.

The objective of this publication is to help Virginians effectively fertilize lawn turf in an environmentally sound manner.

Selecting a Fertilizer

Fertilizers are used to improve or maintain turfgrass quality. The value of a fertilizer depends on the total amount of nutrients and the source of nitrogen in the fertilizer. Terms to be familiar with before selecting a fertilizer are “soil testing,” “fertilizer analysis,” “fertilizer ratio,” and “nitrogen availability.”

The Soil Test

Soil tests taken every three or four years provide important information about the fertility of your lawn soil. The results will indicate the amounts of phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg) your soil can provide to the turfgrass. It will also indicate the acidity (pH) of your soil and whether lime is needed. Virginia Cooperative Extension publication 430-540, “Soil Testing for the Lawn and Landscape” (<http://pubs.ext.vt.edu/430/430-540/430-540.html>), provides detailed instructions on how to take a soil test and interpret the results. A soil test report will indicate the specific amounts of lime, phosphorus, and potassium your soil needs to provide adequate nutrition for the turfgrass, and it may indicate that you do not need to apply some nutrients.

Generally, a soil test level of at least “medium” for phosphorus and potassium is desirable for existing turf. The nitrogen (N) requirements of turfgrass cannot be reliably evaluated by a soil test. Therefore, the soil test report will not contain a nitrogen test level but will contain a nitrogen recommendation for the kind of grass being grown. Nitrogen applications on lawns in Virginia are best made following the programs in this publication (Programs 1 [table 2] and 2 [table 3]) that were developed on the basis of the grass, its optimal growing period (warm season or cool season), the anticipated nitrogen fertility needs of that grass in a standard home lawn setting, and the nitrogen water solubility (quickly or slowly available to the plant) of the fertilizer.

Your local Virginia Cooperative Extension office can assist with the supplies and data forms needed to submit a sample to the Virginia Tech Soil Testing Lab for analysis. Most VCE offices even have soil probes on loan to take a more representative soil sample. Information about your soil type is also available in most counties. A list of VCE offices and their contact information is available at arewww.ext.vt.edu/offices/index.html.

Fertilizer Analysis

Fertilizers are most often described using three numbers, such as 12-4-8 or 46-0-0. These three numbers indicate, respectively, the percent by weight of nitrogen, phosphate (P_2O_5), and potash (K_2O) in the fertilizer and are required to be on every fertilizer bag or container. For example, a 12-4-8 fertilizer would contain 12% nitrogen, 4% phosphate, and 8% potash on a weight basis. These fertilizers have traditionally been called “complete fertilizers” because they contain nitrogen, phosphorus, and potassium, but they are now often called “starter fertilizers” because it is common for complete fertilizers to be used when establishing turfgrasses. If soil tests indicate high levels of P and K availability, then fertilizers supplying only nitrogen (referred to as “lawn maintenance fertilizers”) need to be applied. High-analysis fertilizers are more concentrated and therefore require less total fertilizer per application (see table 1).

If a soil test indicates additional phosphorus or potassium is needed, it may be applied with a complete fertilizer or in separate applications of phosphate- or potassium-specific fertilizers. Fertilizers normally used to correct severe phosphorus and/or potassium deficiencies are 0-20-20, 0-28-0, 0-0-50, or 0-0-60. Never apply more than 3 pounds of 0-0-50 or 0-0-60 per 1,000 square feet to an established turf in hot weather without watering-in the material to prevent foliar burn.

Fertilizer Ratio

If phosphorus and/or potassium are needed, it is likely that the soil test results will recommend a fertilizer with a certain ratio of nitrogen:phosphate:potash (N: P_2O_5 : K_2O) to meet the turfgrass’s specific nutrient needs. It is not always possible to find the exact fertilizer ratio suggested by the soil test, but strive to find something as close as possible to the ratio given in the soil test analysis

If the fertilizer analysis is 16-4-8, the fertilizer ratio is 4-1-2; similarly, a 14-7-14 analysis would have a 2-1-2 ratio. Mature lawns generally require much more nitrogen than phosphorus and potassium, and it is common that N-only sources are used for maintenance fertilization. Turf maintenance fertilizers vary in nitrogen content and may contain a portion of the nitrogen as water-insoluble or slowly available nitrogen.

Nitrogen Availability

The source of nitrogen in fertilizers influences nitrogen availability and turf response. There are two categories of nitrogen sources: quickly available and slowly available. Quickly available materials are water-soluble, can be readily utilized by the plant, are susceptible to leaching, and have a relatively short period of response. Quickly available sources include urea, ammonium sulfate, and calcium nitrate. The Virginia Department of Conservation and Recreation’s Nutrient Management Standards and Criteria (revised 2014) allows for no more than 0.7 pound of available nitrogen per active growing month for cool-season turfgrasses, and seasonal nitrogen totals up to 3.5 pounds nitrogen per 1,000 square feet for cool-season lawns and 4 pounds nitrogen for certain warm-season lawns. (Note that not all grasses or all situations require this annual level of nitrogen). Slowly available nitrogen sources release their nitrogen over extended periods of time and are applied less frequently and at somewhat higher rates than the quickly available nitrogen sources. Nutrient Management Standards and Criteria defines a slowly available nitrogen source as one that contains $\geq 15\%$ slow-release nitrogen and allows for no more than 0.9 pound nitrogen per 1,000 square feet per growing month for cool-season turfgrasses or 1.0 pound nitrogen per 1,000 square feet per growing month for warm-season turfgrasses.

Slowly available sources are less-susceptible to leaching and are preferred on sandy soil types that tend to leach. Slowly available sources include urea formaldehyde, urea-formaldehyde-based products (methylene ureas), sulfur-coated urea, polymer-coated urea, isobutyraldehyde diurea, natural organics (bone meal, fish meal, dried blood, and animal manures), and Class A biosolids.

If a fertilizer contains a slow-release nitrogen source, it will be listed on the label. For urea-formaldehyde-

or methylene-urea-based fertilizers, the portion of the nitrogen that is slowly available is listed on the fertilizer bag as water-insoluble nitrogen (WIN).

For instance, a 20-10-10 fertilizer with 5% WIN has five-twentieth or one-fourth (25%) of the nitrogen in the slowly available form. If you chose a fertilizer that provides nitrogen in a slowly available form, you should understand how to calculate WIN in order to determine which fertilizer program best fits your lawn (see Programs 2 [table 3] and 3 [table 4]). For example, assume that a fertilizer label provides the following information:

Guaranteed Analysis

Total Nitrogen	16%
5.6% Water Insoluble Nitrogen	
Available Phosphoric Acid (P ₂ O ₅).....	4%
Soluble Potash (K ₂ O).....	8%

To find the percentage of nitrogen that is water-insoluble, use the following calculation:

$$\% \text{ WIN} / \% \text{ total N} \times 100 = \% \text{ slowly available N.}$$
$$(5.6/16) \times 100 = 35\%,$$

so 35% of the total nitrogen is slowly available, and this fertilizer meets the criteria to use in Program 2 (table 3).

If water-insoluble nitrogen is not listed on the fertilizer label, you can assume it is all water-soluble or quickly available nitrogen unless the fertilizer label indicates that it contains sulfur-coated urea. Sulfur-coated and polymer-coated urea fertilizers do provide slowly available nitrogen, but the fertilizer label does not list it as water-insoluble nitrogen. If the fertilizer contains sulfur-coated urea, include that portion as water-insoluble nitrogen when determining the amount of nitrogen that is slowly available.

Statements on a fertilizer bag such as “contains 50% organic fertilizer” do not mean the fertilizer is 50% slowly available. An actual calculation of water-insoluble nitrogen using the information in the Guaranteed Analysis is the only reliable method of determining the portion of the fertilizer that is slowly available.

Seasons of Application – When to Apply

Proper timing of nitrogen applications is different for warm-season and cool-season turfgrasses because of their different growth cycles. The optimal time (in terms of both desirable plant response and environmental protection) to fertilize cool-season grasses in Virginia is from mid-August through early November, keeping in mind that the timing will vary somewhat depending on where you are located in the state. Warm-season grasses perform best when fertilized between April 1 and August 15 in Virginia, again with the understanding that the grasses might be at very different stages of growth on the front and back ends of this date range, depending on where you are located. As indicated in the fertilization programs that follow, adding small amounts of nitrogen to cool-season grasses can be beneficial for spring root growth, but very aggressive spring nitrogen programs are counterproductive and increase the injury potential to lawns from summer disease and drought. Similarly, aggressive late summer and early fall applications of nitrogen to bermudagrass can make the turf more succulent and increase its susceptibility to winter injury. Every third year or so for most native soils (heavy-textured clays and silt soils), be sure to conduct soil tests so you know whether or not additional phosphorus, potassium, or lime is needed. Having sufficient quantities of these nutrients available to the turfgrass is particularly important for summer survival of cool-season grasses and winter survival of warm-season grasses.

Nitrogen Fertilizer Programs

Programs 1-3 (tables 2-4) provide information on when to apply nitrogen and the recommended rates over a 30-day growing period:

- Program 1 (table 2) details nitrogen fertility strategies that use quickly available nitrogen.
- Program 2 (table 3) details the use of slowly available nitrogen sources.
- Program 3 (table 4) details nitrogen fertility strategies that use fertilizer products with the majority (>50%) of nitrogen being from slowly available nitrogen sources.

The programs differentiate between the anticipated nitrogen needs of the grasses (for example, fine fescue and zoysiagrass require significantly less nitrogen than either Kentucky bluegrass or bermudagrass on an annual basis). The units used are pounds of actual nitrogen per 1,000 square feet of lawn area. Refer to table 1 to determine the quantity needed of various fertilizers to apply the recommended nitrogen rate per 1,000 square feet.

Factors Affecting Nutrient Management

After using your water-insoluble nitrogen calculations to choose the appropriate program of fertilization for your lawn, you should then determine the amount and frequency of fertilization that is proper for your situation. This will be influenced by the source of nitrogen, soil type, type and age of turfgrass, length of growing season, traffic, shade, quality desired, whether clippings are recycled, and micronutrients.

There are site and application factors that should be considered with all fertilizer applications too. For instance, how close is your nearest water source? Are you prepared to blow or sweep any fertilizer that ends up on your street, driveway, or sidewalk back onto the lawn? Always keep the environment in mind when it comes to fertilizer applications, particularly any that contain nitrogen and/or phosphorus. Before making a treatment, evaluate your lawn situation based on the following factors and how each affects the amount and frequency of nitrogen application. Then choose the amount and frequency of application that best suits your situation.

Source of Nitrogen

The primary advantage of slowly available nitrogen sources is that they can be applied at higher rates, which reduces the total number of times the fertilizer must be applied. When properly applied, they also reduce the chance of nitrogen loss into the environment by minimizing the leaching potential. In general, lower application rates and higher application frequency allow turfgrass to better use applied nitrogen, but depending on the quality desired, higher application rates one or two times a year can also be effective at maintaining quality turfgrass in mature lawn settings.

Fertilizer “Burn”

When properly applied, slowly available nitrogen sources reduce the chances of foliar burning that sometimes occur with soluble sources such as urea. Foliar burning is the brownish discoloration that occurs on grass blades as a result of contact with soluble fertilizer. Watering the lawn immediately after fertilizing can minimize burn.

Soil Type

Sandy soils will generally leach more nitrogen than heavier-textured clayey or silty soils. Therefore, more frequent nitrogen applications are often required in sandy soils when quickly available sources of nitrogen are used. Leaching can be minimized by using slowly available nitrogen sources.

Type and Age of Turfgrass

Newly established lawns or lawns lacking satisfactory density or groundcover will benefit from properly timed applications of nitrogen until groundcover and density have reached a desirable level. Mature zoysiagrass, centipedegrass, and fine fescue lawns require lower levels of nitrogen than Kentucky bluegrass, tall fescue, perennial ryegrass, or bermudagrass. As your lawn matures, it is very likely that you can use the lower levels of nitrogen applications and still maintain desirable color and quality, especially if you return the clippings from mowing. Think of turfgrass clippings as a form of slow-release fertilizer.

Length of the Growing Season

Areas at higher elevations in western Virginia may have a growing season that is three months shorter than areas in southeastern Virginia. Similar turfgrasses growing in an area with a longer growing season will likely require more nitrogen.

Traffic

Where heavy traffic or use is anticipated, higher rates of properly timed nitrogen can be beneficial in generating recuperative potential.

Shade

Grasses growing in heavily shaded areas require only one-half to two-thirds as much nitrogen as grasses growing in full sun. Shade also affects the timing of nitrogen applications. Since grass plants in shade can best use nitrogen when sunlight can reach the grass leaves, fertilizer applications should be timed after the majority of leaves have fallen from the trees in the fall. Applications made in October and November are generally most effective. In heavily shaded areas with fine fescue turf, it may be beneficial to reduce fertilization rates even further or omit applications until leaf collection is finished in the fall.

Quality Desired

Turfgrass quality is a measure of density, color, uniformity (free of weeds and off-type grasses), smoothness, growth habit, and texture. If high levels of turfgrass quality are desired, a commitment must be made to proper turfgrass species and variety selection, frequent mowing, and slightly higher rates of nitrogen and increased application frequency. Additionally, irrigation, aeration, and pesticide application may at times enhance quality. One of the simplest means of improving overall turfgrass quality, especially for cool-season lawns, is to raise the cutting height before summer stress arrives. Leaving the grass tall shades weeds; cools soil temperatures, which causes less soil moisture evaporation; and promotes a deeper, more-extensive root system.

Clipping Recycling

As previously mentioned, significant amounts of nutrients are returned to a lawn when clippings are returned. Research has indicated that up to one-third of the seasonal nitrogen requirement can be met by returning clippings; this is an important reason why seasonal totals for nitrogen fertilization programs can be reduced for mature lawns. Recycling turfgrass clippings contributes very little to thatch (a layer primarily composed of undecomposed stems between the soil and the turfgrass surface), provides nutrients and organic matter, and is an environmentally friendly method of clipping disposal. The organic matter from clippings improves the soil structure and its chemical and physical properties. If clippings must be collected, be sure to compost them and return that compost to the lawn. Where clippings are regularly collected, expect

there to be a need for higher rates of nitrogen and potassium in particular.

Micronutrients

By far the most effort is spent in detailing fertility programs for all the macronutrients — nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur — the elements required by plants in large quantities. However, the micronutrients — iron, manganese, copper, zinc, boron, etc. — are equally important for plant growth and development. They are required only in very small amounts and, as a rule of thumb, they are not needed in most lawn situations where the soil is heavy-textured and the pH is suitable. Micronutrient deficiencies are possible in sandy soils, so conduct more frequent soil tests if this describes the soil for your lawn; however, this would not be typical for most lawns in Virginia.

The micronutrient that gets the most use in home lawn management is iron (Fe). Foliar spray applications of iron on high-quality cool-season turf during the fall, winter, and summer seasons will improve color, vigor, and root growth without promoting excessive shoot growth. Similar darkening effects are possible on actively growing warm-season grasses, especially centipedegrass. Three to four foliar applications of labeled rates of iron sulfate or chelated iron products during fall and winter on cool-season grasses and another three to four applications at the same rate during the summer will give maximum results. Application of iron in the coldest parts of winter when cool-season turf is brownish in color may result in a gray-green appearance.

Fertilizer Application Equipment and Methods

Nitrogen fertilizer will “green up” a lawn; therefore, it is important to uniformly apply nitrogen-containing fertilizers. This will eliminate streaking caused by different shades of green turf in the lawn. Proper application of nitrogen fertilizers by hand is difficult — even for a trained professional — so drop-type or rotary spreaders should be used. When using drop-type spreaders, be sure to overlap the wheel tracks because all the fertilizer is distributed between the wheels. Drop-type spreaders are not as easy to maneuver around trees and shrubs as rotary spreaders are. Rotary

spreaders usually give better distribution where sharp turns are encountered because they tend to cover a broader swath and fan the fertilizer out at the edges of the swath.

Until you are experienced with a spreader, it is advisable to apply half the fertilizer in one direction and the other half in a perpendicular direction in order to minimize streaking. Avoid applying any fertilizer to non-turfed areas (driveways, roads, or bare soil) because it is then prone to run off into drainage ways where it can enter waterways and contaminate estuaries.

How Much Fertilizer to Apply per 1,000 Square Feet?

After you have calculated water-insoluble nitrogen and selected a fertilization program, use table 1 to find the correct amount of fertilizer to use on your lawn. Nitrogen recommendations are made in pounds of nitrogen per 1,000 square feet. Any fertilizer analysis can be used, but there is usually little reason to apply complete fertilizers that also contain phosphorus and potassium unless it is indicated on the basis of a soil test. Supplemental applications of potassium

do not have nearly the same environmental concerns as phosphorus in terms of water quality protection, so it is likely that you will find many standard lawn maintenance fertilizers at big-box retailers with analyses like 29-0-7. Lawn maintenance fertilizers are now phosphate-free, and if a soil test indicates no phosphorus is needed, these are the types of fertilizers you should select.

If the particular fertilizer you are using is not listed in the table, use the following calculation to determine the exact amount of fertilizer to apply per 1,000 square feet of lawn area:

$$\frac{\text{Desired lb N per 1,000 sq ft} \times 100}{\% \text{ N in fertilizer}} = \begin{matrix} \text{lb of fertilizer} \\ \text{needed per} \\ \text{1,000 sq ft} \end{matrix}$$

For example, if you want to apply 1.0 pound of nitrogen per 1,000 square feet using a 28-0-4 fertilizer,

$$(1.0 \div 28) \times 100 = 3.6 \text{ lb of 28-0-4 required per 1,000 sq ft.}$$

Applying these basic principles in the selection and application of fertilizers will help provide a healthy, attractive lawn and will also help protect water quality.

Table 1. The amounts of various types of fertilizers required to apply targeted levels of nitrogen (N) fertilizer per 1,000 square feet.

Fertilizer analysis	Pounds of nitrogen desired per 1,000 square feet				
	0.5	0.7	0.9*	1.0*	1.5**
6-2-0	8.3	11.7	15.0	16.6	25.0
10-10-10	5.0	7.0	9.0	10.0	15.0
16-4-8	3.1	4.4	5.6	6.2	9.3
24-25-4	2.1	2.9	3.8	4.2	6.3
28-0-4	1.8	2.5	3.2	3.6	5.4
32-0-10	1.6	2.2	2.8	3.2	4.8
20-0-0	2.5	3.5	4.5	5.0	7.5
38-0-0	1.3	1.8	2.4	2.6	3.9
45-0-0	1.1	1.6	2.0	2.2	3.3

* This level is recommended only for N sources containing 15-49% slowly available and/or water-insoluble N in the guaranteed analysis.

**This level is recommended only for N sources containing ≥50% slowly available and/or water-insoluble N in the guaranteed analysis.

Table 2. Program 1: Recommended monthly and seasonal nitrogen totals for Virginia’s primary turfgrasses when using predominantly water-soluble (<15% slowly available) nitrogen (N) sources.

Month of application	Pounds of N per 1,000 sq ft per active growing month to apply to tall fescue, perennial ryegrass, or Kentucky bluegrass	Pounds of N per 1,000 sq ft per active growing month to apply to fine-leaf fescue	Pounds of N per 1,000 sq ft per active growing month to apply to bermudagrass or St. Augustinegrass	Pounds of N per 1,000 sq ft per active growing month to apply to zoysiagrass or centipedegrass
Sept	0.7	0.7	0.5 ^y to 0.7 across the period	0.7
Oct	0.7			
Nov	0.5 ^z			
Apr	0.5 to 0.7 across the period	0.7	0.5	0.7
May			0.7	
June	0		0.7	0.7
July	0		0.7	
Aug	0		0.5	
Possible seasonal N totals per 1,000 sq ft ^x	2.0-3.5	1.0-2.0	2.0-4.0	1.0-2.0

^z Areas highlighted by green shading indicate optional fertility timing and N levels. Adjust use rates to meet site-specific needs of a particular grass based on the factors affecting nutrient management that are outlined in the Factors Affecting Nutrient Management section (e.g., higher quality, recovery from traffic, etc.).

^y Virginia Tech researchers discourage winter overseeding of all warm-season turfgrasses except for bermudagrass due to poor spring recuperation potential of the warm-season turf. If bermudagrass is overseeded, additional N (highlighted by the yellow shading) can be applied to support the establishment and development of the overseeded grass after the bermudagrass enters winter dormancy.

^x Seasonal totals are not necessarily intended as target levels, but the upper limits represent the maximum amount of N that should be applied during the growing season. Program 1’s recommended rates of water-soluble N do not always reach the seasonal totals maximums. The rates are lower to encourage the use of slowly available nitrogen sources (as seen in Program 2) that, when properly applied, can help protect against the loss of N to the environment.

Table 3. Program 2: Recommended monthly and seasonal nitrogen totals for Virginia’s primary turfgrasses when using nitrogen (N) sources that are 15-49% slowly available and/or water-insoluble N, according to the guaranteed analysis of the fertilizer.

Month of application	Pounds of N per 1,000 sq ft per active growing month to apply to tall fescue, perennial ryegrass, or Kentucky bluegrass	Pounds of N per 1,000 sq ft per active growing month to apply to fine-leaf fescue	Pounds of N per 1,000 sq ft per active growing month to apply to bermudagrass or St. Augustinegrass	Pounds of N per 1,000 sq ft per active growing month to apply to zoysiagrass or centipedegrass
Sept	0.9	0.9	0.5 ^y to 1.0 across the period	1.0
Oct	0.9			
Nov	0.5 ^z			
Apr	0.5 to 0.9 across the period	0.9	0.5	
May			1.0	1.0
June	0		1.0	
July	0		1.0	1.0
Aug	0		0.5	
Possible seasonal N totals per 1,000 sq ft ^x	2.0-3.5	1.0-2.0	2.0-4.0	1.0-2.0

^z Areas highlighted by green shading indicate optional fertility timing and N levels. Adjust use rates to meet site-specific needs of a particular grass based on the factors affecting nutrient management that are outlined in the Factors Affecting Nutrient Management section (e.g., higher quality, recovery from traffic, etc.).

^y Virginia Tech researchers discourage winter overseeding of all warm-season turfgrasses except for bermudagrass due to poor spring recuperation potential of the warm-season turf. If bermudagrass is overseeded, additional N (highlighted by the yellow shading) can be applied to support the establishment and development of the overseeded grass after the bermudagrass enters winter dormancy.

^x Seasonal totals are not necessarily intended as target levels. Adjust respective N application levels to ensure N fertilization levels do not exceed possible seasonal totals.

Table 4. Program 3: Recommended monthly and seasonal nitrogen totals for Virginia’s primary turfgrasses when using nitrogen (N) sources that are ≥50% slowly available and/or water-insoluble N, according to the guaranteed analysis of the fertilizer.

Month of application	Pounds of N per 1,000 sq ft per active growing month to apply to tall fescue, perennial ryegrass, or Kentucky bluegrass	Pounds of N per 1,000 sq ft per active growing month to apply to fine-leaf fescue	Pounds of N per 1,000 sq ft per active growing month to apply to bermudagrass or St. Augustinegrass	Pounds of N per 1,000 sq ft per active growing month to apply to zoysiagrass or centipedegrass
Sept	1.0 to 1.5	1.0	0.5 ^y to 1.0 across the period	1.0
Oct	1.0 to 1.5			
Nov	0			
Apr	0 ^z to 1.0 across the period	1.0	1.0 to 1.5 across the period	1.0
May				
June			1.0 to 1.5 across the period	
July	0			1.0
Aug	0		1.0	
Possible seasonal N totals per 1,000 sq ft ^x	2.0-2.8	1.0-2.0	2.0-3.2	1.0-2.0

^z Areas highlighted by green shading indicate optional fertility timing and N levels. Adjust use rates to meet site-specific needs of a particular grass based on the factors affecting nutrient management that are outlined in the Factors Affecting Nutrient Management section (e.g., higher quality, recovery from traffic, etc.).

^y Virginia Tech researchers discourage winter overseeding of all warm-season turfgrasses except for bermudagrass due to poor spring recuperation potential of the warm-season turf. If bermudagrass is overseeded, additional N (highlighted by the yellow shading) can be applied to support the establishment and development of the overseeded grass after the bermudagrass enters winter dormancy.

^x Seasonal totals are not necessarily intended as target levels, but the upper limits represent the maximum amount of N that should be applied during the growing season. Program 3’s seasonal totals are lower than those of Programs 1 and 2 because of the higher per-application rates that are recommended. Use the factors affecting nutrient management to determine if the less frequent and higher recommended rates per application meet the site-specific needs of a particular grass.

Maintenance Calendar for Cool-Season Turfgrass Lawns in Virginia^z

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Derik Cataldi and Chantel Wilson, Virginia Department of Conservation and Recreation

Maintenance activity ^y	Month													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Seeding^x (Initial establishment and/or renovation)			XXXXXXXXXXXXXXXXXXXX						XXXXXXXXXXXXXXXXXX					
N Fertilization^w			XXXXXXXXXXXXXXXXXXXX						XXXXXXXXXXXXXXXXXXXX					xxxxxx
PRE herbicides^v			XXXXXXXXXX					XXXXXXXXXX						
POST herbicides^u			XXXXXXXXXXXXXXXXXXXX						XXXXXXXXXXXXXXXXXXXX					
Cultivation/dethatching			XXXXXXXXXX						XXXXXXXXXXXXXXXXXX					

^z Predominant cool-season turfgrasses for Virginia lawns are Kentucky bluegrass, tall fescue, perennial ryegrass, and fine-leaf fescues

^y Preferred timing for maintenance activity is indicated by an upper case 'X'. Second best timing indicated by lower case 'x'.

^x Recommended seeding rates per 1000 sq ft are 2-3 lbs for Kentucky bluegrass; 4-6 pounds for tall fescue; 3-5 pounds for perennial ryegrass; 3-5 pounds for fine-leaf fescues. Sod is also available for most of these grasses and while these are preferred planting times, sod can be established year round as long as soils are not frozen and supplemental irrigation is available when necessary. Consult additional Virginia Cooperative Extension (VCE) publications at <http://www.pubs.ext.vt.edu/category/lawns.html> for more information.

^w Applications of no more than 0.7 lb of readily available (i.e. water soluble) nitrogen /1000 sq ft per active growing month are recommend-ed during the preferred timing of fall. Use levels of 0.25-0.5 lb readily available N/1000 sq ft per growing month during secondary growing periods and never apply fertilizer to frozen soils. Consider the use of slowly available nitrogen (SAN) sources (those containing ≥ 15% water insoluble N) whenever possible (application levels of up to 0.9 lb SAN/ 1000 sq ft per active growing month) and apply other nutri-ents and/or lime based on soil test results. Note: it is recommended to test homelawn soils every 3-4 years.

^v Spring preemergent (PRE) herbicide applications are primarily targeting summer annual weeds such as crabgrass, goosegrass, or foxtails. Fall applications are primarily targeting annual bluegrass and winter annual broadleaves such as henbit, deadnettle, chickweed, and gerani-um. Before applying any PRE herbicide consider possible effects it will have on seeding desirable turfgrasses in the future.

^u Weeds must be actively growing to achieve control with postemergence (POST) herbicides. For cool-season weeds, treat when tempera-tures are ≥ 50° F. For warm-season weeds, temperatures ≥ 80° F are required for maximum control. Proper identification of the weed is critical in selecting appropriate control strategies. Consult VCE resources for assistance in weed identification. For chemical recommenda-tions, refer to the "Home Grounds and Animals" Pest Management Guide by VCE (www.ext.vt.edu/pubs/pmg/).

www.ext.vt.edu

Produced by Communications and Marketing, College of Agriculture and Life Sciences, Virginia Tech, 2015

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VT/0116/430-523/CSES-153NP

Calibrating Your Lawn Spreader

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There are two basic types of fertilizer spreaders for use on the home lawn: the drop and the broadcast.

The drop type spreader (shown at left) “drops” a set rate of fertilizer. This type is best suited for a limited space in order to avoid wide dispersal on sidewalks and driveways. The amount of fertilizer that is spread depends on the opening setting, the type of fertilizer used, and the speed at which the spreader is pushed.

The broadcast type, also called the rotary or cyclone type, (shown at right), has a rotating disc that “throws out” a circular pattern of fertilizer as it is pushed. This type is best suited for large areas with a wide dispersal range to cover. Both types of spreaders have opening settings for different fertilizer formulations. The settings are only approximate at best, and it is important to calibrate the spreaders before they are used.

Too much fertilizer can be harmful to the lawn and may lead to water pollution through run-off or leaching of nutrients. Some brands of fertilizers have setting information on the bag; other brands don't. Since the amount of nitrogen in fertilizers varies, remember that you should be figuring your application rates from pounds of nitrogen needed, not just pounds of product.

Using the percentage of nitrogen from the fertilizer analysis on the bag, you can accurately figure how much to apply by using the formula:

Desired lbs. of Nitrogen

$$\frac{\text{per 1,000 sq. ft. x 100}}{\% \text{ Nitrogen in fertilizer}} = \frac{\text{lbs. of fertilizer}}{\text{to apply desired lbs. of Nitrogen to 1,000 sq. ft.}}$$

For example, if you want to apply 1.0 lb. of nitrogen per 1,000 sq. ft. using a 29-4-8 fertilizer you would set up the formula as shown here:

$$\frac{1.0 \times 100}{29} = \frac{3.44 \text{ lb. of 29-4-8 required}}{\text{to apply 1.0 lb. of Nitrogen to 1,000 sq. ft.}}$$

Before calibrating your spreader, walk off or measure the length and width of your lawn. Multiply length x width to get area in sq. ft. If you have several smaller areas, simply add them up to get your total lawn area. Record this number for future reference. This number is important to check for accurate fertilizer application.

If you know how much lawn area you have and how much fertilizer to apply per 1,000 sq. ft., you can then determine the total amount of fertilizer to purchase and apply.

For example, if your lawn area is 5,000 sq. ft. and you want to apply 1 lb. of nitrogen per 1,000 sq. ft. using 29-4-8:

$$\frac{3.44 \text{ lb.}}{1,000 \text{ sq. ft.}} = \frac{17.20 \text{ lbs.}}{5,000 \text{ sq. ft.}}$$

Next, you must actually calibrate the spreader so it will spread the fertilizer at the correct rate. For the calibration of a drop type spreader, make a V-shaped or box-

shaped trough out of heavy cardboard or a piece of aluminum guttering; attach it beneath your spreader to catch the fertilizer as it comes out. Set the spreader on the manufacturer's suggested number, put the fertilizer into the spreader and push it over a 100 sq. ft. area.

If your spreader is:

1.5 ft. wide go forward 66.6 ft.

2 ft. wide go forward 50 ft.

3 ft. wide go forward 33.3 ft.

Weigh the collected material and multiply by 10. This will give you the amount that would be applied for 1,000 sq. ft. Most fertilizer recommendations are given on a 1,000 sq. ft. basis. If you applied the incorrect amount, too much or too little, adjust the setting number appropriately and try again. When you get the correct amount of fertilizer pouring through the spreader, record the setting number so you don't forget it next time.

A broadcast spreader is a bit more difficult to calibrate since you can't catch the fertilizer as it's being thrown out. In this case, first weigh out an amount of fertilizer to cover a specific size test area; for instance, enough for a 200 sq. ft. area.

Note that this area is 1/5 of the area in which you did the fertilizer calculation. Therefore, in the example we have been using, you would only need to put $3.44/5 = 0.69$ lb. of 29-4-8 fertilizer in the spreader to apply the correct amount of nitrogen to the 200 sq. ft. area. Mark a starting point, then push the spreader several feet to measure the width over which the fertilizer is effectively spread. Now calculate and mark off a 200 sq. ft. area from the original starting point. For example, if your spreader throws out a 10 ft. effective width, mark off a total of 20 ft. ($10 \times 20 = 200$ sq. ft.), and complete spreading the fertilizer over 200 sq. ft.

Increase the setting number if there is still fertilizer in the hopper. If you ran out of fertilizer before finishing, close down the setting. Repeat the tests to get it just right. Move across your lawn as you do this to avoid overfertilizing. Once you get an accurate setting, record the setting number for future use.

Another point to remember is to calibrate the spreader over the lawn area, not on the driveway or street. Not only are you wasting money, the fertilizer will be washed into storm drains or creeks and other water systems.

Never leave unused fertilizer in the hopper. Fertilizer salts are corrosive and could ruin the spreader. Be sure to collect unused fertilizer and pour it back into the bag, not on the driveway or road. The spreader should be rinsed thoroughly with water and allowed to dry. Oil the spreader with a light machine oil to prevent rusting and keep the working parts in good condition.

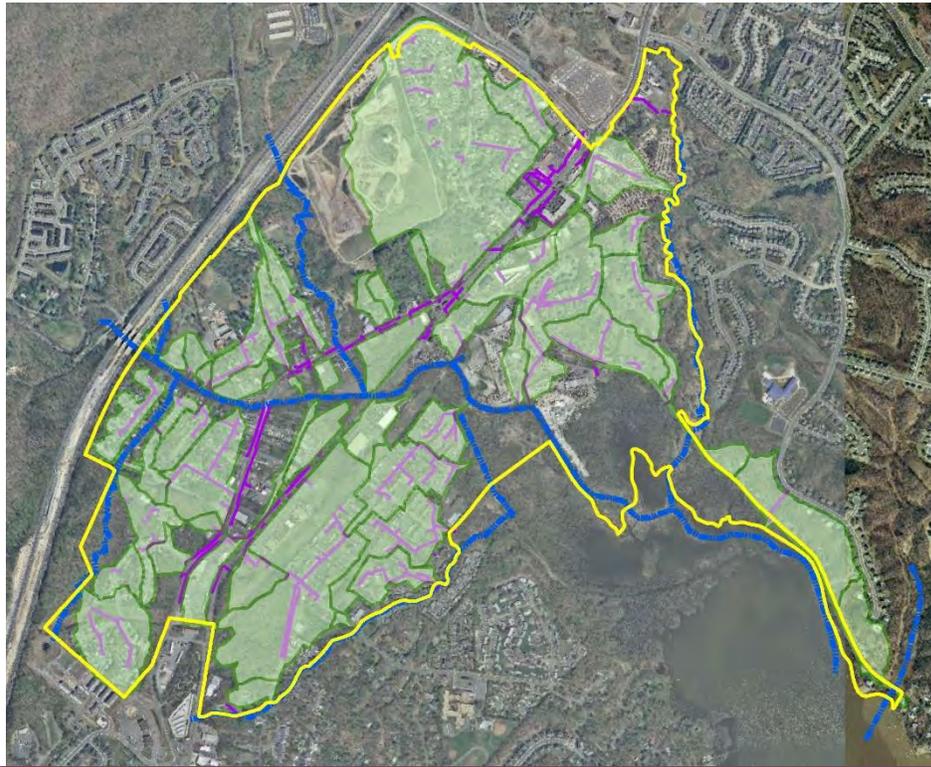
This publication was developed at Virginia Polytechnic Institute and State University through a grant from the Virginia Department of Conservation and Historic Resources, Division of Soil and Water Conservation.

Reviewed by Mike Goatley, Extension specialist, Crop and Soil Environmental Sciences

Appendix D – Total Maximum Daily Load (TMDL) Action Plans

CHESAPEAKE BAY TMDL ACTION PLAN

MS4 Permit Cycle 2013 - 2018
Town of Dumfries



PREPARED FOR:

Town of Dumfries
17755 Main Street
Dumfries, Virginia 22026

April 4, 2015

Revised April 25, 2016



DAA Project Number: **B15147-01**

3RD PARTY REVIEW

This Report has been subjected to technical and quality reviews by:


Name: Clint Pendleton, EIT Signature Date
Project Engineer


Name: Carolyn A. Howard, PE Signature Date
Project Manager


Name: Lindsay B. Lally, PE Signature Date
Quality Reviewer

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APPENDICIES

- A Town of Dumfries MS4 Program Plan, December 2015
- B Summary of Public Comments (to be provided at a later date)
- C BMP-A - Existing Bioretention Basin

1.0 INTRODUCTION

Since 2003, the Town of Dumfries (Town) has been subject to the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 Permit). The Town's most recent permit (VAR040117) was issued by the Virginia Department of Environmental Quality (DEQ) effective July 1, 2013 and will expire June 30, 2018; this permit time period is hereinafter referred to as the first permit cycle.

In general, the MS4 permit regulates existing storm sewer systems to reduce the amount of stormwater pollution discharged into a waterbody. The permit also requires compliance for MS4 systems discharging to a waterbody with a Total Maximum Daily Load (TMDL) and an assigned Waste Load Allocation (WLA). The permit holder must prepare a TMDL Action Plan to reduce the applicable pollutants of concerns (POC) through the construction of structural stormwater best management practices (BMPs), non-structural operational measures, or a combination of the two.

Currently, there are two waterbodies with TMDLs and WLA reduction requirements for the Town – 1) the Chesapeake Bay TMDL and 2) an E. coli TMDL for Quantico Creek. The Chesapeake Bay TMDL was established by the U.S. Environmental Protection Agency in 2010; its POCs are nitrogen (N), phosphorus (P), and total suspended solids (TSS). The Town's total Chesapeake Bay WLAs and required POC reductions are based on the impervious and pervious (managed turf) acreage within the MS4 service area and the required reduction in loading rates for the Potomac River Basin; refer to Table 3b found in the Department of Environmental Quality's (DEQ) Chesapeake Bay TMDL Special Condition Guidance document dated 05/18/2015 (DEQ Guidance).

As required by the MS4 permit, this document is the Town's Chesapeake Bay TMDL Action Plan (Action Plan) documenting the first permit cycle required POC reductions and proposed compliance means and methods. A separate Action Plan is provided for the Quantico Creek TMDL.

Note: MS4 Permit regulation references are provided in [].

2.0 MS4 PERMIT AUTHORITY & IMPLEMENTATION PROGRAM

2.1 Current MS4 Implementation Review

[9VAC25-890-40 Section 1 C.2.a.(1)]

The Town adopted an MS4 Program Plan that documents compliance with the six minimum control measures (MCMs) identified in the MS4 Permit. The MS4 Program Plan is provided in Appendix A and can be found at the Town's website.

Additionally this Action Plan documents compliance with the Special Condition for the Chesapeake Bay TMDL requirements included in the MS4 permit.

2.2 Existing Legal Authority Review

[9VAC25-890-40 Section 1 C.2.a. (1)]

Based upon a review of the Town's ordinances, the Town has sufficient legal authority to meet the requirements of the MS4 Permit and execute the compliance objectives included in this Action Plan.

2.3 New or Modified Legal Authorities

[9VAC25-890-40 Section 1 C.2.a. (2)]

The Town does not anticipate any new or modified legal authorities to be implemented in the future to maintain compliance with the MS4 permit.

2.4 Means and Methods to Address New Sources of POCs

[9VAC25-890-40 Section 1 C.2.a. (3)]

The Town will address new discharges and sources of POCs into the Town's MS4 through its existing legal authorities and its Illicit Discharge Detection & Elimination Program.

2.5 Modifications to Action Plan

[9VAC25-890-40 Section 1 C.2.a. (9)]

Any modification to the Action Plan that occurs during the term of this MS4 Permit as part of its permit reapplication and not during the term of this state permit will be addressed at the time of permit reapplication.

3.0 PUBLIC COMMENT PROCESS AND PERIOD

[9VAC25-890-40 Section 1 C.2.a. (12)]

The Town's MS4 Permit requires a draft version of the Action Plan be made available to the public for review and comment. The plan was presented at the March 15, 2016 Town Council meeting. Town advertised a 30-day public comment period for April 5, 2016 through May 5, 2016 on the Town's TV channel, website, Facebook, and Twitter page. When the comment period ends, public comments will be compiled, reviewed, and addressed, as appropriate, in an updated draft of the Action Plan. A summary of the public comments will be provided in Appendix B.

4.0 MS4 PERMIT REQUIREMENTS

4.1 MS4 Service Area Delineation

[9VAC25-890-40 Section II B.3.a. (1)]

As required by the MS4 Permit, the Town's MS4 service area was delineated using 2013 VGIN Aerial Imagery, 2011 LiDAR topographic information and other GIS data provided by the Town of Dumfries and Prince William County. Additionally, storm sewer information included in the September 2004 USACE Report "Stream Restoration and Stormwater Management Study for Quantico Creek," and a working AutoCAD drawing provided by the Town in September 2015 was used to further define the MS4 areas. To mitigate inconsistencies and gaps in the available storm sewer information, Bing Streetside was utilized and a site visit was conducted to locate structures and determine existing drainage patterns, where possible. The Town's entire MS4 area is within the Quantico Creek and Chesapeake Bay watershed. Figure 1 below shows the Town's MS4 service area shaded in green.

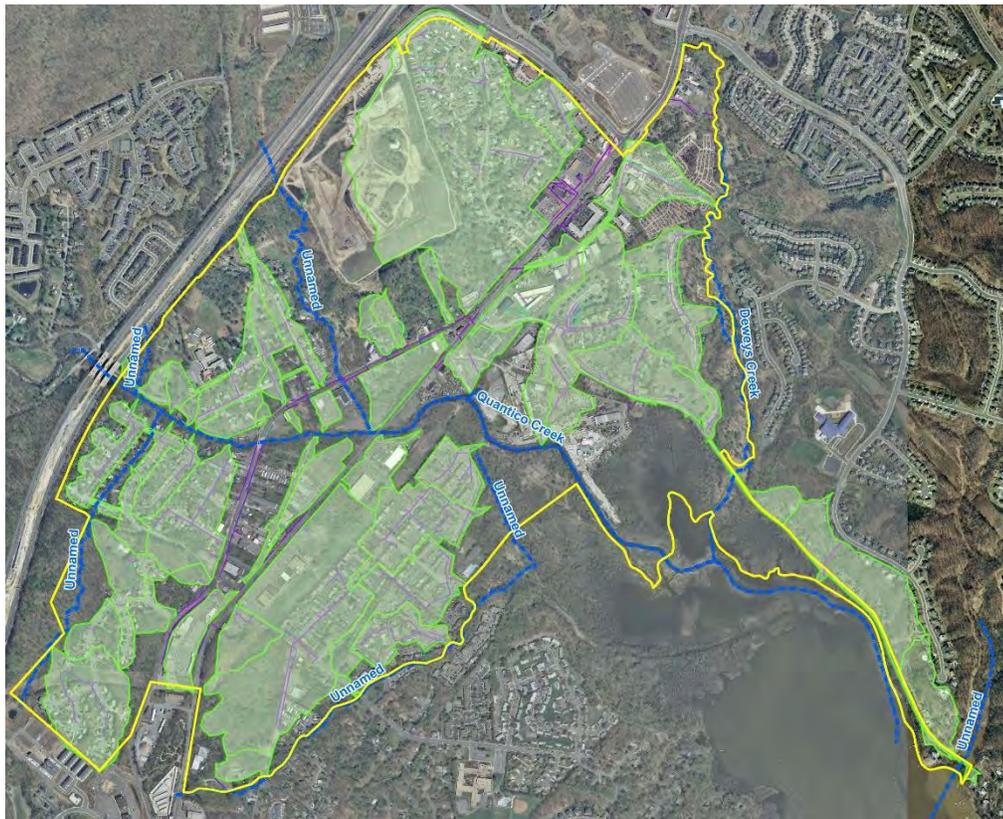


Figure 1: Town of Dumfries MS4 Service Area

Note: MS4 Service Area is shown in green. Corporate boundary is shown in yellow.

As per DEQ’s Guidance, the following areas were excluded from the Town’s MS4 service area:

1. Concentrated flows from properties owned and/or maintained by other MS4 permit holders—the Virginia Department of Transportation (VDOT) and Prince William County;
2. The VDOT maintained US Route 1 (Main Street and Fraley Boulevard); and
3. Privately owned areas within the Town that drain directly to streams and do not drain into or provide conveyance for the Town’s MS4 system.

The Town may also exclude from its MS4 service area land regulated under any general VPDES permit that addresses industrial stormwater; however, these areas were not excluded in the initial mapping. Areas of sheet flow from other MS4 jurisdictions crossing into the Town’s corporate limits were included in the Town’s MS4 area, as per the DEQ Guidance.

As a result of the MS4 system delineation, Dewey’s Creek, a tributary of Quantico Creek that runs north-south through the Town, does not have connections from the MS4 system, and, therefore, the creek and the adjacent privately-owned areas are outside the MS4 area.

GIS data and aerial imagery were used to determine the Town’s regulated impervious and pervious acres. Impervious areas include buildings, roads, parking lots, sidewalks, recreational surfaces, and other similar features. Once the impervious areas were delineated, the features were clipped using the MS4 service area layer and resulting acreages were calculated.

Corporate Limits	986.9	Acres	
MS4 Service Area	575.6	Acres	
Impervious Area	182.3	Acres	32%
Pervious Area	345.4	Acres	60%
Forest Area	47.9	Acres	8%
MS4 Area of Total Corporate Limits	58.3%		

Table 2A: Town of Dumfries MS4 Service Area Summary

The extent of the MS4 service area and the land cover shown in this Action Plan are based on the latest GIS information dated 2013, not the July 1, 2009 condition. The Town reserves the right to make future adjustments to the MS4 service area and its land cover condition as more detailed and reliable information becomes available including but not limited to the following:

1. Removing areas of the MS4 service area that were created after June 30, 2009;
2. Adjusting the land cover condition in areas that were developed/redeveloped after June 30, 2009; and
3. Refining the MS4 service area as new data is made available to the Town.

4.2 Chesapeake Bay Action Plan Development

[9VAC25-890-40 Section I C.2.a]

The MS4 permit requires the Action Plan must show compliance with the following Special Conditions.

Special Condition 4 POC load estimate from existing sources (i.e. constructed prior to 7/1/2009)

Special Condition 5 1st permit cycle POC load reduction requirement from existing sources

Special Condition 6 Means and methods to meet POC load reduction requirements from existing sources

Special Condition 7 Means and methods to meet POC load reduction requirements from new sources (i.e. constructed between 7/1/2009 and 6/30/2014)

Special Condition 8 Means and methods to meet POC load reduction requirements from grandfathered projects constructed after 6/30/2014

The tables for the Potomac River basin included in the DEQ Guidance document were used in the development of this Action Plan.

5.0 POC REQUIRED OFFSETS FOR EXISTING & NEW SOURCES

5.1 Special Condition 4: POC Load Estimate from Existing Sources

[9VAC25-890-40 Section 1 C.2.a. (4)]

The POC Edge of Stream (EOS) loading rate for the Potomac River Basin is as provided in Table 2b in the DEQ Guidance. A summary of the Town's estimated POC load is provided in Table 5A below.

Pollutant	Subsource	Total Existing (Est.) Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate	Estimated Total POC Load Based on 2009 Progress Run
Nitrogen	Regulated Urban Impervious	182.3	16.86	3,073.58
	Regulated Urban Pervious	345.4	10.07	3,478.18
	Total:			6,551.76
Phosphorous	Regulated Urban Impervious	182.3	1.62	295.33
	Regulated Urban Pervious	345.4	0.41	141.61
	Total:			436.94
Total Suspended Solids	Regulated Urban Impervious	182.3	1171.32	213,531.64
	Regulated Urban Pervious	345.4	175.80	60,721.32
	Total:			274,252.96

Table 5A: Town of Dumfries Estimate of Existing Source Loads

5.2 Special Condition 5: 1st Permit Cycle POC Load Reduction Requirement From Existing Sources

[9VAC25-890-40 Section 1 C.2.a. (5)]

First permit cycle required reduction loading rate from existing sources is as provided in Table 3b in the DEQ Guidance. A summary of the Town’s estimated POC reductions required for the first permit cycle is provided in Table 5B below.

Pollutant	Subsource	Total Existing (Est.) Acres Served by MS4 (06/30/09)	Est. Required Reduction in Loading Rate (lbs/acre/yr)	Total Est. Reduction Required (lbs/yr)
Nitrogen	Regulated Urban Impervious	182.3	0.07587	13.831
	Regulated Urban Pervious	345.4	0.03021	10.435
				24.266
Phosphorous	Regulated Urban Impervious	182.3	0.01296	2.363
	Regulated Urban Pervious	345.4	0.00149	0.513
				Total: 2.876
Total Suspended Solids	Regulated Urban Impervious	182.3	11.71320	2135.316
	Regulated Urban Pervious	345.4	0.76913	265.656
				Total: 2400.972

Table 5B: Total 1st Permit Cycle POC Estimated Reductions Required from Existing Sources

5.3 Special Condition 7: 1st Permit Cycle POC Load Reduction Requirement From New Sources

[9VAC25-890-40 Section 1 C.2.a. (7)]

This special condition applies to those permittees that have 1) adopted an average impervious land cover condition greater than 16% for the design of post-development stormwater management facilities under the Chesapeake Bay Preservation Act, or 2) allowed projects to be built with an impervious land cover condition greater than 16% for the design of post-development stormwater management (SWM) facilities through a “fee-in-lieu of” or similar program.

The Town does not utilize an average land cover condition greater than 16% in the design of post-development stormwater management facilities and does not have projects developed with a “fee-in-lieu of” or similar program; therefore, Special Condition 7 is not applicable.

5.4 Special Condition 8: 1st Permit Cycle POC Load Reduction Requirement From Grandfathered Projects

[9VAC25-890-40 Section 1 C.2.a. (8), (10)]

The Town is required to calculate new POC loads from grandfathered projects initiating construction after July 1, 2014, disturbing one acre or greater and with water quality requirements less stringent than 16% impervious cover. Unlike POCs from sources in Special Condition 7, loads from grandfathered projects must be 100% offset prior to the completion of the project. The Town does not utilize an average land cover condition greater than 16% in the design of post-development stormwater management facilities; therefore, Special Condition 8 is not applicable.

The Town is aware of one (1) grandfathered project located at 17733 Main Street (GPIN 8189-81-7785) to be redeveloped for commercial uses; the project area is approximately 0.7 acres.

5.5 Total 1st Permit Cycle POC Load Reduction Requirements

[9VAC25-890-40 Section 1 C.2.a. (5), (7), (8)]

The total POC load reduction requirements for the first permit cycle to meet Special Conditions 5, 7, and 8 are summarized in Table 5C below.

Pollutant	Subsource	<i>Est. Reduction Required (lbs/yr)</i>			TOTAL
		Existing Sources	New Sources	Grandfathered Projects	
<i>Nitrogen</i>	Regulated Urban Impervious	13.831	0.0	0.0	13.831
	Regulated Urban Pervious	10.435	0.0	0.0	10.435
Total:					24.266
<i>Phosphorous</i>	Regulated Urban Impervious	2.363	0.0	0.0	2.363
	Regulated Urban Pervious	0.513	0.0	0.0	0.513
Total:					2.876
<i>Total Suspended Solids</i>	Regulated Urban Impervious	2135.316	0.0	0.0	2,135.316
	Regulated Urban Pervious	265.656	0.0	0.0	265.656
Total:					2,400.972

Table 5C: Total 1st Permit Cycle POC Load Reduction Requirements

6.0 MEANS & METHODS TO MEET THE POC LOAD REDUCTIONS

[9VAC25-890-40 Section 1 C.2.a. (6), (7), (8)]

6.1 Street Sweeping

The Town will take credit for its existing street sweeping program to meet required POC reductions for the first permit cycle. As noted in Town’s MS4 Program Plan dated 12-1-15, the Town maintains a schedule to sweep every street, approximately 21.7 curb miles, at least monthly using a regenerative sweeper. Approximately half the streets are swept more than once per month, depending on the weather conditions. The Town will maintain this level of effort for each MS4 permit cycle and revise documentation of the amount of debris collected, as needed and as additional lane miles may be added to the street sweeping program.

Using the Qualifying Street Lanes Method outlined in the TMDL Guidance, the following Table 6A summarizes reductions achieved through the Town’s street sweeping program.

Lane Miles Swept:	21.67 miles			
Acres Swept:	26.27 acres			
Regenerative/Vacuum Street Sweeping				
	Estimated Pre-Sweep Annual Nutrient Loading Rate (lbs/acre/yr)	Pre-Sweep Annual Baseline Load (lbs/yr)	Pick-up Factors	Total Credit (lbs/yr)
Pollutant				
Nitrogen	15.4	404.51	0.05	20.23
Phosphorous	2.0	52.53	0.06	3.15
Total Suspended Solids	1300	34,146.67	0.25	8536.67

Table 6A: Estimate of Current Street Sweeping Reductions

The Town’s current street sweeping program provides an excess of the first permit cycle’s required reductions for phosphorous and total suspended solids as shown in Table 6C below; however, the nitrogen removal requirement is not met.

6.2 Credit for BMPs Installed Prior to July 1, 2009

The Town proposes to utilize credit from an existing bioretention basin east of Town Hall to meet the first permit cycle POCs removal requirements; refer to Appendix C for Figure BMP-A showing the location of the existing bioretention facilities. BMP-A was completed in 2008. Calculations assume the bioretention facility is a Level 1 facility. Refer to Table 6B for a summary of BMP-A POC load reductions.

Pollutant	Subsource	Total Existing (Est.) Acres Served by BMP-1	2009 EOS Loading Rate (lbs/acre/yr)	Estimated Total POC Load	VA SW BMP Clearinghouse Efficiency for Bioretention Level 1	Total Est. Reduction Achieved (lbs/yr)
Nitrogen	Regulated Urban Impervious	0.64	16.86	10.77	64%	6.895
	Regulated Urban Pervious	0.08	10.07	0.80	64%	0.509
Total:				11.57		7.404
Phosphorous	Regulated Urban Impervious	0.64	1.62	1.04	55%	0.569
	Regulated Urban Pervious	0.08	0.41	0.03	55%	0.018
Total:				1.07		0.587
Total Suspended Solids	Regulated Urban Impervious	0.64	1171.32	748.47	55%	411.660
	Regulated Urban Pervious	0.08	175.80	13.89	55%	7.639
Total:				762.36		419.299

Table 6B: Total POC Estimated Load Reductions from Existing BMP-A

6.3 Additional Means and Methods

The Town reserves the right to implement and take credit for additional facilities or practices as provided for in the Chesapeake Bay TMDL Special Condition Guidance. Reductions achieved will be documented to DEQ in the Town's annual report.

6.4 POC Reduction Goals through Action Plan Implementation

		<i>BMP Implementation</i>				
		<i>Estimated Reduction of POC (lbs/yr)</i>				
Pollutant	Subsource	1st Permit Cycle Total Est. Reduction Required (lbs/yr)	Street Sweeping	Exist. BMP A - Bioretention	Total Est. Acheived	Total Add'l Required for 1st Permit Cycle (lbs/yr)
Nitrogen	Regulated Urban Impervious	13.831	20.225	6.895	27.120	-13.289
	Regulated Urban Pervious	10.435	0.000	0.509	0.509	9.925
Totals:		24.266	20.225	7.404	27.630	-3.364
Phosphorous	Regulated Urban Impervious	2.363	3.152	0.569	3.721	-1.359
	Regulated Urban Pervious	0.513	0.000	0.018	0.018	0.496
Totals:		2.876	3.152	0.587	3.739	-0.863
Total Suspended Solids	Regulated Urban Impervious	2135.316	8536.667	411.660	8948.327	-6813.011
	Regulated Urban Pervious	265.656	0.000	7.639	7.639	258.017
Totals:		2400.972	8536.667	419.299	8955.966	-6554.993

Table 6C: Total Estimated POC Reductions Achieved with Action Plan Implementation in the 1st Permit Cycle

7.0 ESTIMATED COSTS FOR ACTION PLAN IMPLEMENTATION

[9VAC25-890-40 Section 1 C.2.a. (11)]

Since street sweeping is incorporated into the Town's current budget and the bioretention is an existing facility, no significant capital expenditures are anticipated to comply with the first permit cycle requirements for POC reductions.

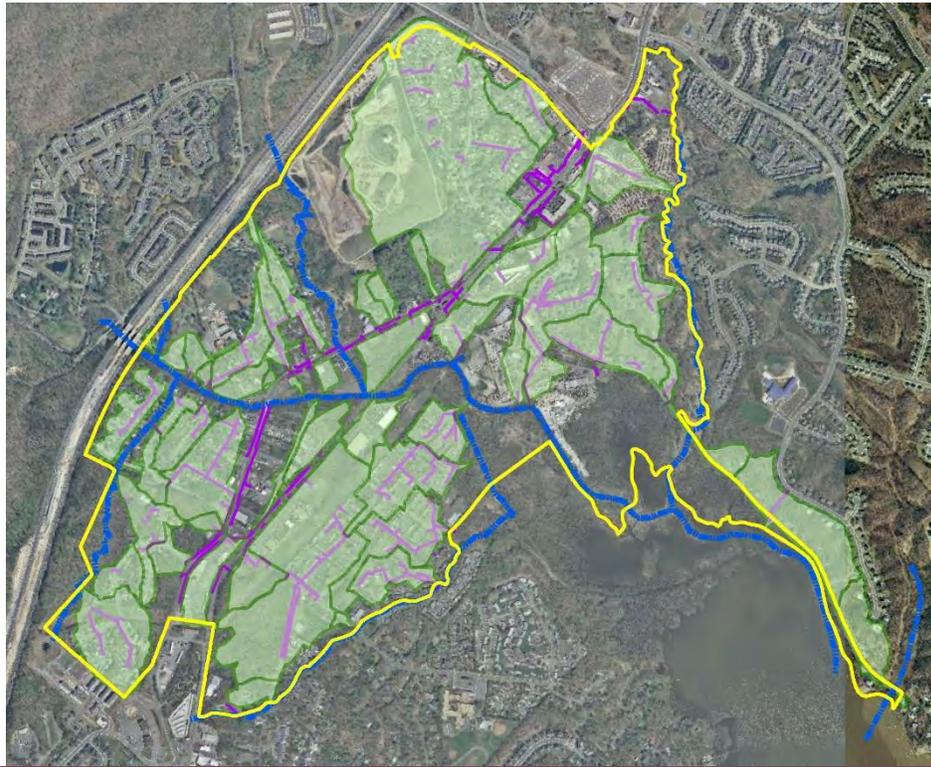
APPENDIX A – MS4 PROGRAM PLAN

APPENDIX B – PUBLIC COMMENTS

APPENDIX C – BMP-A EXISTING BIORETENTION BASIN

CHESAPEAKE BAY TMDL ACTION PLAN

MS4 Permit Cycle 2018 - 2023
Town of Dumfries



PREPARED FOR:

Town of Dumfries
17755 Main Street
Dumfries, Virginia 22026

April 4, 2016
Revised April 25, 2016



DAA Project Number: **B15147-01**

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APPENDIX

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1.0 INTRODUCTION

Since 2003, the Town of Dumfries (Town) has been subject to the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 Permit). The Town's most recent permit (VAR040117) was issued by the Virginia Department of Environmental Quality (DEQ) effective July 1, 2013 and will expire June 30, 2018; this permit time period is hereinafter referred to as the first permit cycle.

The second MS4 permit cycle will be effective July 1, 2018 and will expire June 30, 2023. As of the date of this report, it is anticipated the second permit cycle will require an additional 35 percent pollutant reductions for nitrogen (N), phosphorus (P), and total suspended solids (TSS). The required pollutant of concern (POC) reductions are based on the impervious and pervious (managed turf) acreage within the MS4 service area and the required reduction in loading rates for the Potomac River Basin based on Table 3b found in the Department of Environmental Quality's (DEQ) Chesapeake Bay TMDL Special Condition Guidance document dated 05/18/2015 (DEQ Guidance).

This Action Plan recommends implementation of stormwater best management practices (BMPs) to reduce the applicable pollutants of concerns (POC) as currently required for the second permit cycle.

2.0 POC REQUIRED OFFSETS

2.1 Estimated 2nd Permit Cycle POC Load Reduction Requirement

During the first permit cycle, the proposed best management practice (BMP) implementation plan as outlined in the Town's Action Plan results in a 'credit' of pollutant removal for the POCs, as shown in Table 2A below.

			<i>BMP Implementation</i>			
			<i>Estimated Reduction of POC (lbs/yr)</i>			
Pollutant	Subsource	1st Permit Cycle Total Est. Reduction Required (lbs/yr)	Street Sweeping	Exist. BMP A - Bioretention	Total Est. Acheived	Total Add'l Required for 1st Permit Cycle (lbs/yr)
Nitrogen	Regulated Urban Impervious	13.831	20.225	6.895	27.120	-13.289
	Regulated Urban Pervious	10.435	0.000	0.509	0.509	9.925
Totals:		24.266	20.225	7.404	27.630	-3.364
Phosphorous	Regulated Urban Impervious	2.363	3.152	0.569	3.721	-1.359
	Regulated Urban Pervious	0.513	0.000	0.018	0.018	0.496
Totals:		2.876	3.152	0.587	3.739	-0.863
Total Suspended Solids	Regulated Urban Impervious	2135.316	8536.667	411.660	8948.327	-6813.011
	Regulated Urban Pervious	265.656	0.000	7.639	7.639	258.017
Totals:		2400.972	8536.667	419.299	8955.966	-6554.993

Table 2A: Total POC Estimated Reductions Achieved during the 1st Permit Cycle

The resulting estimated pollutant removals for the second permit cycle are shown in Table 2B below.

		A	B	C	D
Pollutant/Subsource		1st Permit Cycle Total Est. Reduction Required (lbs/yr)	Total Est. Acheived Reduction with 1st Permit Cycle BMPs (lbs/yr)	Total Est. 2nd Permit Cycle Reduction Required (lbs/yr)	Total Add'l Required for 2nd Permit Cycle (lbs/yr): (A+C)-B
Nitrogen					
	Regulated Urban Impervious	13.831	27.1204	96.817707	83.5284
	Regulated Urban Pervious	10.435	0.5091	73.041738	82.9671
Totals:		24.266	27.6295	169.859445	166.4955
Phosphorous					
	Regulated Urban Impervious	2.363	3.7213	16.538256	15.1795
	Regulated Urban Pervious	0.513	0.0178	3.593455	4.0890
Totals:		2.876	3.7392	20.131711	19.2685
Total Suspended Solids					
	Regulated Urban Impervious	2135.316	8948.3271	14947.214520	8134.2038
	Regulated Urban Pervious	265.656	7.6385	1859.590425	2117.6077
Totals:		2400.972	8955.9656	16806.804945	10251.8115

Table 2B: Total Additional Estimated POC Reductions Required for 2nd Permit Cycle

3.0 MEANS & METHODS TO MEET POC LOAD REDUCTIONS

3.1 Potential BMPs

Various potential BMPs were reviewed and evaluated throughout the Town, including new BMPs, retrofitting existing features, and stream restoration to comply with the second permit cycle pollutant removal requirements. The main criteria for determining whether a BMP is viable and cost-effective is the size and characteristics of the BMPs contributing drainage area (CDA). The BMPs CDA must be within the MS4 area and include a substantial impervious area. For the purposes of this plan, Town-owned properties were first evaluated; refer to Appendix A for figures of each area described below.

1. Dominion Drive: This parcel (GPIN 8189-61-4333) located adjacent to Dominion Drive between Curtis Drive and Lyda Lane was considered for a BMP location; however, the Lyda Lane stream restoration provided significantly more POC reductions to meet the second permit cycle requirements (refer to Section 3.1).
2. Merchant Park: The park site has a small MS4 CDA with a limited amount of impervious area. The cost of BMP implementation would outweigh the pollutant removal realized, and, therefore, this site was deemed not viable.
3. Tebbs Lane: This parcel (GPIN 8188-69-1470) located north of Tebbs Lane and west of Wilmer Porter Court was considered for a BMP retrofit; however, due to the steep topography, there is limited space for improvements. There is also high potential for encountering existing emergent wetlands; therefore, this site was deemed not viable.
4. Ginn Memorial Park: The park site has a small MS4 CDA and limited amount of impervious area. The cost of BMP implementation would outweigh the pollutant removal realized, and, therefore, this site was deemed not viable.
5. Old Dumfries Waste Water Treatment Plant (WWTP): The old WWTP site has a small contributing MS4 drainage area. The cost of BMP implementation would outweigh the pollutant removal realized, and, therefore, this site was deemed not viable.

3.2 Nutrient Credit Purchase Option

In accordance with § 62.1-44.19:21 of the Code of Virginia, “an MS4 permittee may acquire, use, and transfer nutrient credits for purposes of compliance with any waste load allocations established as effluent limitations in an MS4 permit” This applies to POCs for phosphorous, nitrogen, and sediment; purchase of sediment reduction credits was signed into law by the Governor on March 1, 2016.

The permittee may use such credits for compliance purposes only if (i) the credits, whether annual, term, or perpetual, are generated and applied for purposes of compliance for the same calendar year; (ii) the credits are acquired no later than a date following the calendar year in which the credits are applied as specified by the Department consistent with the permittee's Virginia Stormwater Management Program (VSMP) permit annual report deadline under such permit; (iii) the credits are generated in the same locality or tributary, ...; and (iv) the credits either are point source nitrogen or point source phosphorus credits generated by point sources covered by the general permit issued pursuant to § 62.1-44.19:14, or are certified pursuant to § 62.1-44.19:20. An MS4 permittee may enter into an agreement with one or more other MS4 permittees within the same locality or within the same or adjacent eight-digit hydrologic unit code to collectively meet the sum of any waste load allocations in their permits. Such permittees shall submit to the Department for approval a compliance plan to achieve their aggregate permit waste load allocations.

Currently, there is one non-point source nutrient credit bank within the Town’s HUC code 02070011 with 33 and 516 available nutrient credits for phosphorous and nitrogen, respectively. There are three (3) non-point source nutrient credit banks within the adjacent HUC. Refer to Appendix B. The cost per pound of POC removal for phosphorus and nitrogen as of this date is approximately \$25,000. Information regarding sediment reduction credit costs have not been released as of this date.

If the Town selected this option, it would cost the Town approximately \$4.7 million (based on the market as of this date) for the required second permit cycle pollutant reductions for phosphorous and nitrogen only. This option is not recommended due to its high cost and the additional cost required to implement BMPs or purchase future credits for sediment removal. It is more cost-effective and efficient for the Town to implement BMPs that address the three POCs.

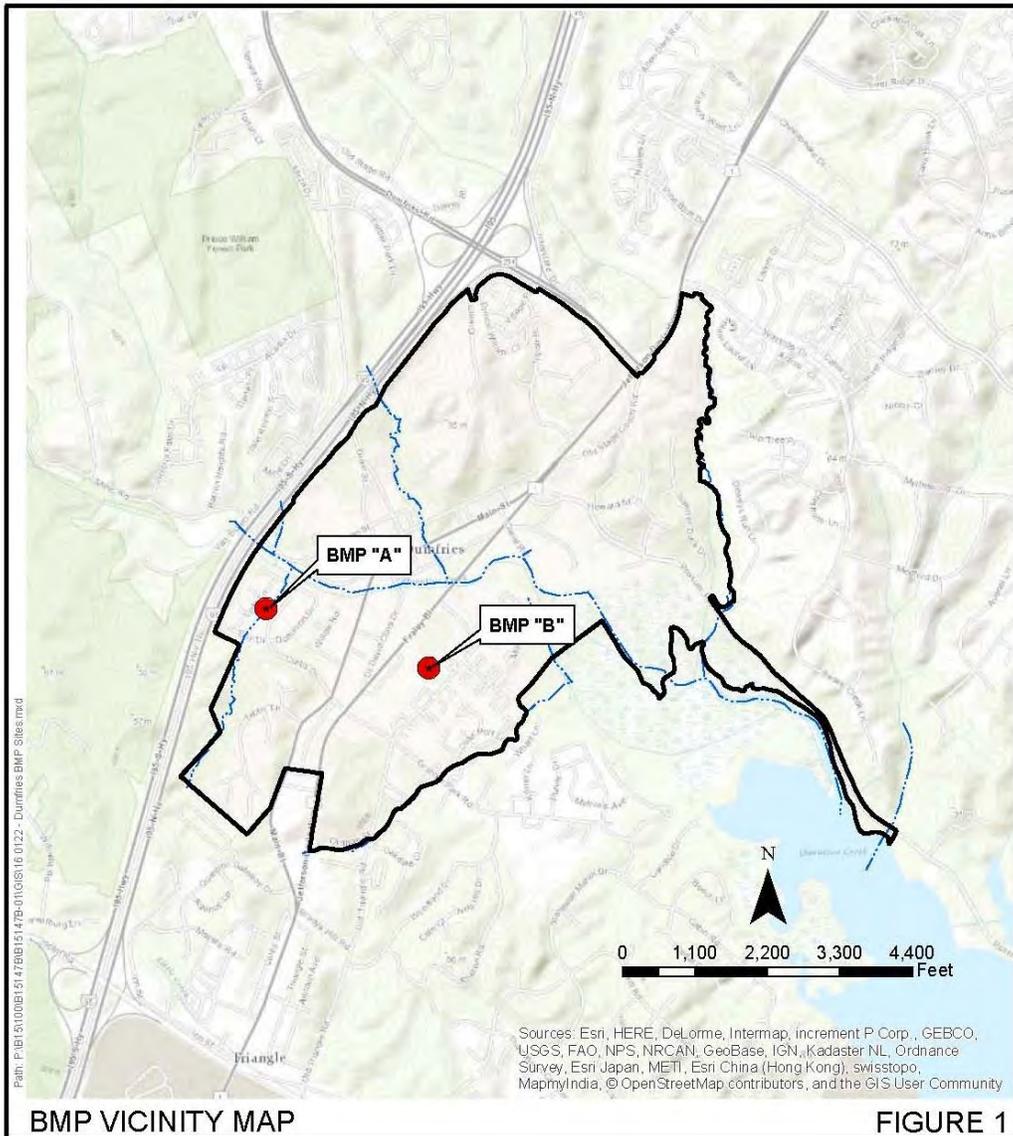
3.3 Recommended BMPs

The following are recommended BMPs based on a desktop review and our knowledge of the Town and its infrastructure; other BMP opportunities may be available in addition to those provided below to meet the required POC reductions for the second permit cycle. The BMPs suggested below will require easements and/or purchase of parcels, and perpetual maintenance of the BMPs.

The recommended BMPs are listed below; the location of each BMP is shown on Figure 1.

BMP A: Lyda Stream Restoration

BMP B: Old Triangle Road New Wet Pond



A summary of compliance with the second permit cycle anticipated requirements are shown in Table 3A.

		<i>2nd Permit Cycle BMP Implementation</i>				<i>Estimated Reduction of POC (lbs/yr)</i>	
Pollutant	2nd Permit Cycle Total Est. Reduction Required (lbs/yr)	A - Lyda Stream Restoration	B - Old Triangle Rd New Wet Pond	Total Est. Acheived	Required for 2nd Permit Cycle		
Nitrogen	166.4955	66.65	131.80	198.45	-31.95		
Phosphorous	19.2685	64.13	14.78	78.91	-59.64		
Total Suspended Solids	10251.8115	42263.77	11179.30	53443.07	-43191.26		

Table 3A: Summary of Estimated POC Achieved with Recommend 2nd Permit Cycle BMP Implementation

The nitrogen reduction requirements for the second permit cycle necessitated the recommendation for BMP B; BMP A exceeds requirements for P for both the second and third permit cycles, and TSS removal for the second cycle.

3.4 Lyda Stream Restoration & Outfall Regeneration

A stream lies southeast of Lyda Lane and northwest of Curtis Drive running parallel to both roads in the rear yards of a single-family residential subdivision. This channel is a tributary to Quantico Creek. The recommended limits of the restoration are from the edge of the forested area south of Eby Drive northeast parallel to Lyda Lane, to and including the outfall of culvert under Dominion for a distance of approximately 950 feet; refer to Figure 2.

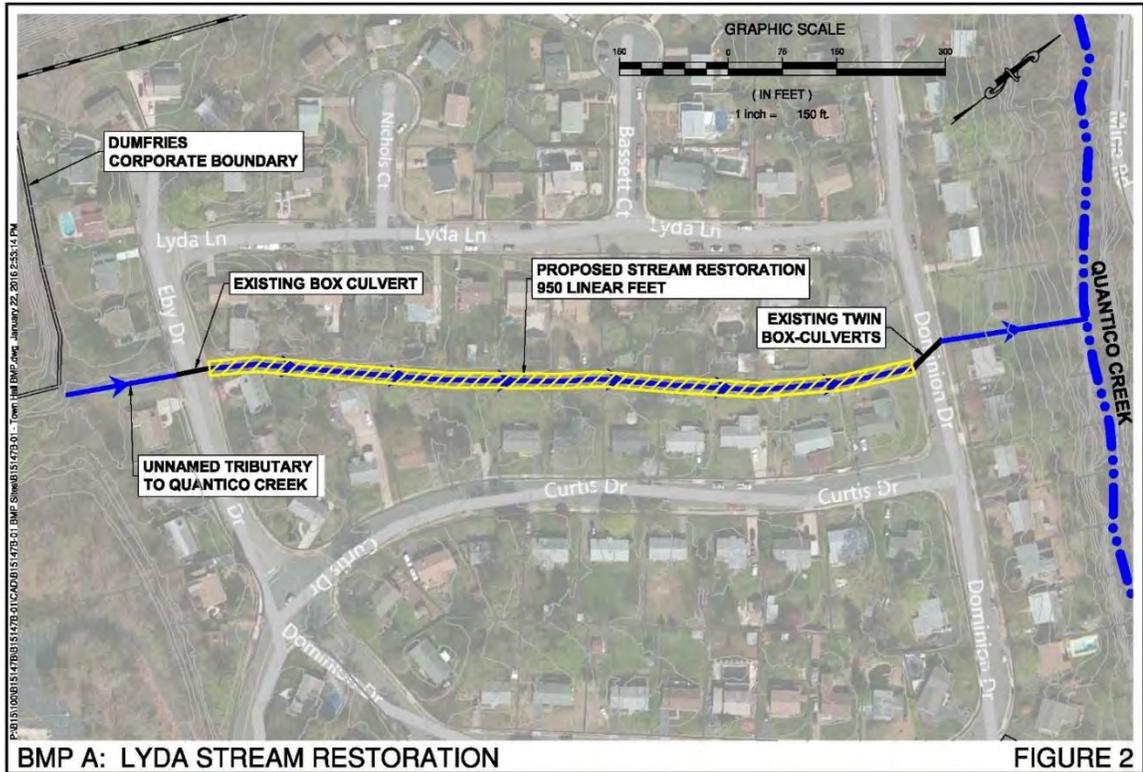


Table 3B summarizes the CDA characteristics to this portion of the stream.

	Urban Impervious Acres	Urban Pervious Acres	Total Urban Acres	Forested Acres	Overall Total
Regulated Land	11.5	27.7	39.2	5.8	45.0
Unregulated Land	1.3	4.4	5.7	37.5	43.2
Total:	12.8	32.1	44.9	43.3	88.2

Table 3B: Contributing Drainage Area Characteristics

Using the protocols provided in the DEQ Guidance, Appendix V.J. – Urban Stream Restoration, the initial POC reductions are calculated by multiplying the length of the restoration by the interim approved removal rates for each POC, as provided in Table V.J.1 of the Guidance document, and by the ratio of the land type with the CDA. Table 3C summarizes the initial POC reductions from the proposed stream restoration.

Pollutant	Interim Approved Removal Rates (lbs/LF)	POC Reductions (lbs/yr)	Acreage Ratio	Initial Reductions (lbs/yr)
Nitrogen	0.075	71.25		
<i>Regulated Land</i>			0.4444444	31.667
<i>Unregulated Land</i>			0.0646259	4.605
<i>Forested</i>			0.4909297	34.979
Phosphorous	0.068	64.60		
<i>Regulated Land</i>			0.4444444	28.711
<i>Unregulated Land</i>			0.064626	4.175
<i>Forested</i>			0.490930	31.714
Total Suspended Solids	44.88	42636.00		
<i>Regulated Land</i>			0.4444444	18949.333
<i>Unregulated Land</i>			0.064626	2755.388
<i>Forested</i>			0.490930	20931.279

Table 3C: Initial POC Reductions from the Proposed Stream Restoration

The baseline POC loading for all three permit cycles from unregulated urban impervious and pervious areas within the CDA must be calculated; refer to Table 3D below.

Pollutant	1st Permit Cycle Loading Rate (lbs/ac/yr)	Total Baseline Loading Rate (lbs/ac/yr)	Area (acres)	Total Baseline Loading (lbs/yr)
Nitrogen				
<i>Unregulated Urban Impervious</i>	0.076	1.517	1.300	1.973
<i>Unregulated Urban Pervious</i>	0.030	0.604	4.400	2.658
Phosphorous				
<i>Unregulated Urban Impervious</i>	0.013	0.259	1.300	0.337
<i>Unregulated Urban Pervious</i>	0.001	0.030	4.400	0.131
Total Suspended Solids				
<i>Unregulated Urban Impervious</i>	11.713	234.264	1.300	304.543
<i>Unregulated Urban Pervious</i>	0.769	15.383	4.400	67.683

Table 3D: Total Baseline Reductions from the Proposed Stream Restoration

The total allowable reductions from unregulated urban areas is determined by subtracting the baseline loading from the initial reductions; refer to Table 3E below.

Pollutant	Initial Reductions (lbs/yr)	Total Baseline Loading (lbs/yr)	Total Allowable Reductions (lbs/yr)
Nitrogen			
<i>Unregulated Urban</i>	4.605	4.631	0.000
Phosphorous			
<i>Unregulated Urban</i>	4.175	0.468	3.707
Total Suspended Solids			
<i>Unregulated Urban</i>	2755.388	372.226	2383.162

Table 3E: Total Allowable Unregulated Area Reductions

The total POC reductions resulting from the stream restoration is the sum of the initial reductions from regulated and forested areas and the allowable unregulated reductions for the CDA; refer to Table 3F below.

Pollutant	Regulated Areas (lbs/yr)	Un-regulated Urban Areas (lbs/yr)	Forested Areas (lbs/yr)	Total Reductions (lbs/yr)
<i>Nitrogen</i>	31.667	0.000	34.979	66.645
<i>Phosphorous</i>	28.711	3.707	31.714	64.132
<i>Total Suspended Solids</i>	18949.333	2383.162	20931.279	42263.774

Table 3F: Total Allowable Reductions from CDA

3.5 Old Triangle Road New Wet Pond

There are two culverts that discharge into the Dominion Power right-of-way northeast of Kilpatrick Place and north of Old Triangle Road. If an easement could be negotiated with Dominion, a wet pond could be constructed to provide additional POC removal from the MS4 area. Refer to Figures 1 and 3. The wet pond (level 1 minimum) shall be designed and constructed as per the criteria found in the Virginia DEQ Stormwater Design Specification No. 14 – Wet Pond.

		Urban Impervious Acres	Urban Pervious Acres	Total Urban Acres	Forested Acres	Overall Total
Regulated Land		12.5	22.7	35.2	15.3	50.5
Unregulated Land		0.0	0.0	0.0	0.0	0.0
Total:		12.5	22.7	35.2	15.3	50.5

Table 3G: Contributing Drainage Area Characteristics

	Total Existing (Est.) Acres Served by Basin	2009 EOS Loading Rate (lbs/ac/yr)	Estimated Total POC Load (lbs/yr)
Nitrogen			
Urban Impervious	12.50	16.86	210.75
Urban Pervious	22.70	10.07	228.59
Totals:	35.20	26.93	439.34
Phosphorous			
Urban Impervious	12.50	1.62	20.25
Urban Pervious	22.70	0.41	9.31
Totals:	35.20	2.03	29.56
Total Suspended Solids			
Urban Impervious	12.50	1171.32	14641.50
Urban Pervious	22.70	175.80	3990.66
Totals:	35.20	1347.12	18632.16

Table 3H: Estimated POC Load from CDA

Nutrient	Estimated Total POC Load (lbs/yr)	Efficiency Removal Rate	Estimated POC Reduction (lbs./yr.)
Nitrogen	439.34	30%	131.80
Phosphorus	29.56	50%	14.78
Sediment	18632.16	60%	11179.30

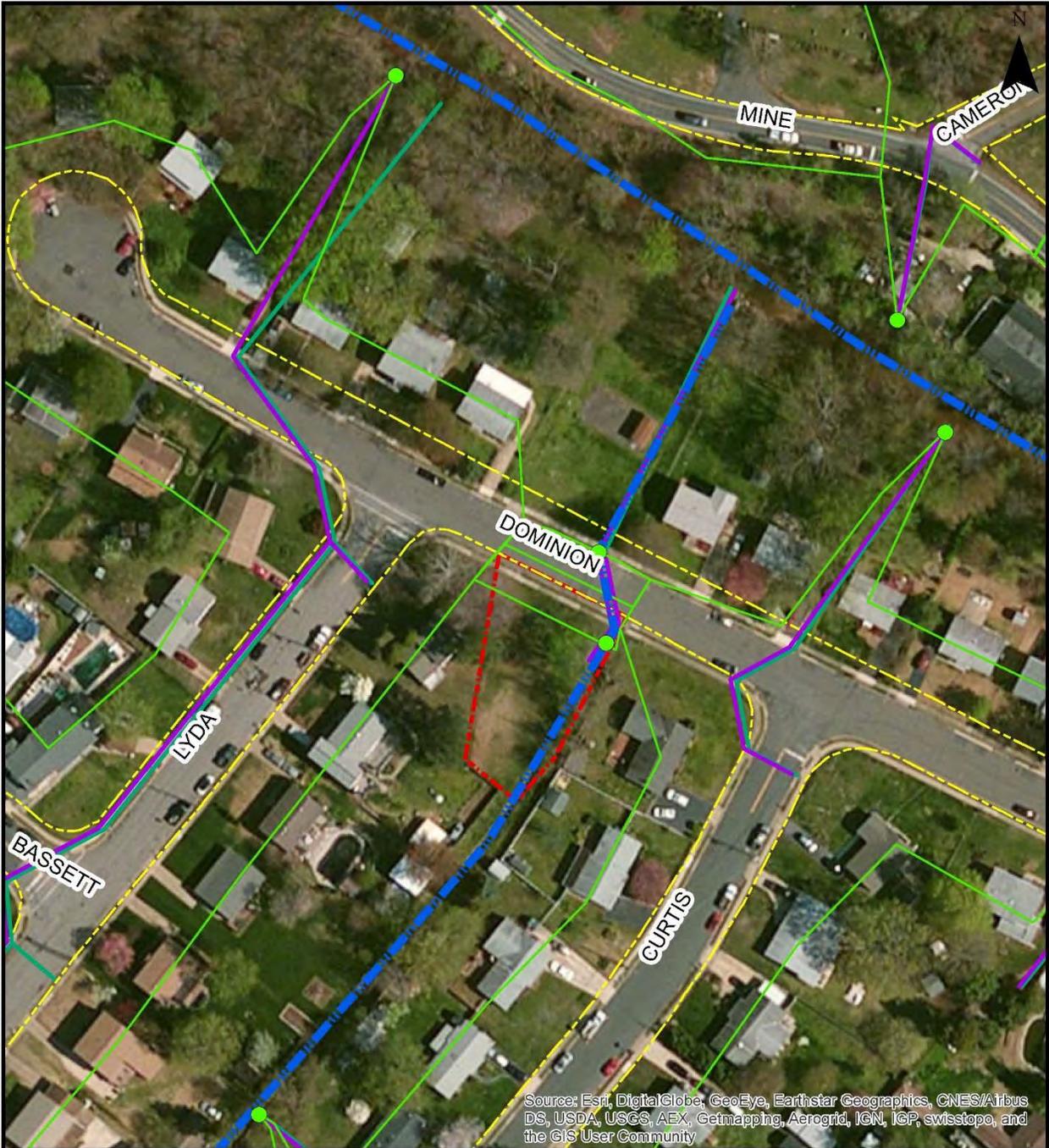
Table 3I: Estimated POC Reduction from Wet Pond (Level 1)

4.0 ESTIMATED COSTS FOR IMPLEMENTATION

Using best available information and recent bids for similar projects, the following estimated range of probable project costs, including design, permitting, easement / rights-of-way acquisition, and construction, are provided for each BMP.

- A. Lyda Stream Restoration and Outfall Regeneration\$ 400,000 – 520,000
- B. Old Triangle Road New Wet Pond\$ 760,000 – 900,000

APPENDIX A – EVALUATED BMPS



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Dominion Drive - 8189-61-4333

SCALE: 1" = 100'

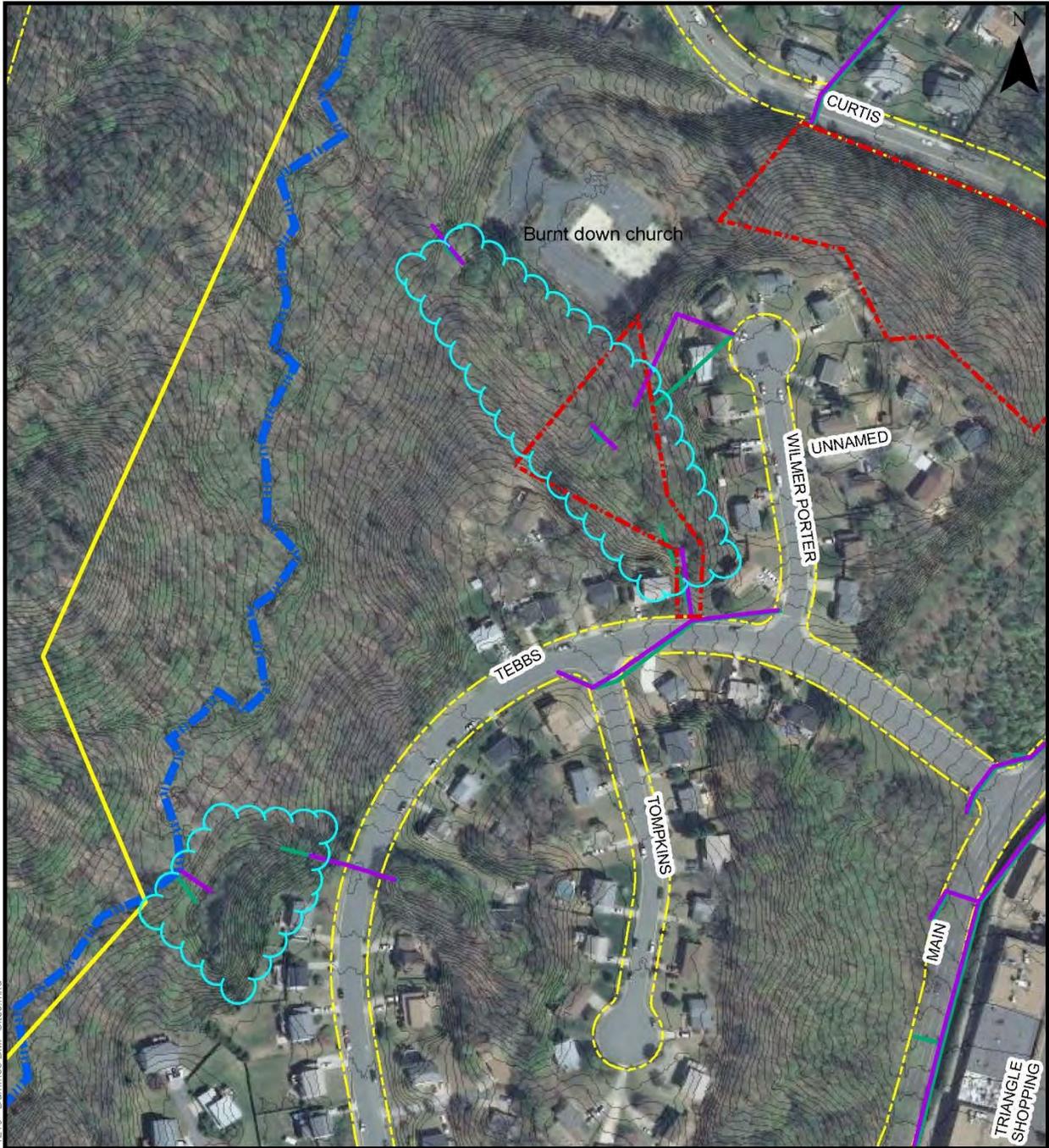
PLAN NO.: B15147B-01



Cameron Street - 8189-72-3626 and 8189-72-5227

SCALE: 1" = 100'

PLAN NO.: B15147B-01



**18086 Tebbs Ln - PIN 8188-69-1470 and
Behind church on Curtis Drive**

SCALE: 1" = 200'

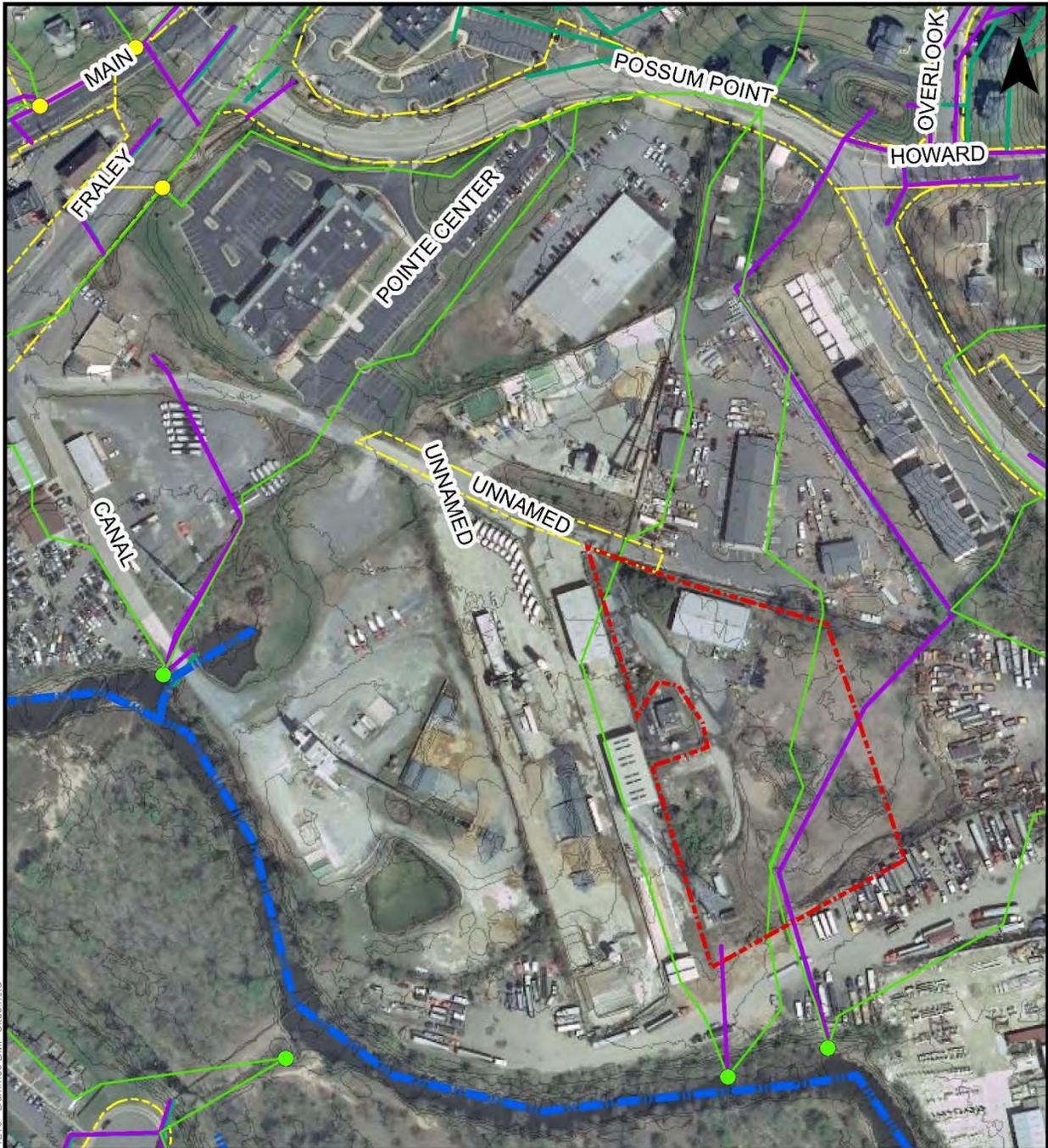
PLAN NO.: B15147B-01



Graham Park Rd - 8188-88-5393

SCALE: 1" = 100'

PLAN NO.: B15147B-01



Canal Street - 8289-01-9266

SCALE: 1" = 200'

PLAN NO.: B15147B-01

**APPENDIX B – VIRGINIA NONPOINT SOURCE
NUTRIENT CREDIT REGISTRY, 2/12/2016**

LOCAL TMDL ACTION PLAN E. COLI/TMDL FOR QUANTICO CREEK

Town of Dumfries



PREPARED FOR:

Town of Dumfries
17755 Main Street
Dumfries, Virginia 22026

August 2, 2016



DAA Project Number: **B15147-01**

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2.0	WATERSHED ANALYSIS	2
3.0	SOURCE ANALYSIS	3
3.1	Local E. Coli Sampling.....	3
3.2	Residential Waste.....	4
3.3	Wildlife	4
4.0	ACTION PLAN COMPONENTS.....	5
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APPENDICIES

- A** Town of Dumfries MS4 Service Area Map
- B** Town of Dumfries Onsite Sewer Review Map
- C** Public Education and Outreach Program, December 2015
- D** Town of Dumfries MS4 Program Plan, December 2015

1.0 INTRODUCTION

Since 2003, the Town of Dumfries (Town) has been subject to the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 Permit). In general, the MS4 permit regulates existing storm sewer systems to reduce the potential for stormwater pollution. The permit also requires compliance for systems discharging to a waterbody with a Total Maximum Daily Load (TMDL) that assigns a Waste Load Allocation (WLA) to the permit holder. The permit holder must prepare a TMDL Action Plan to reduce the applicable pollutants of concerns (POC) through the construction of structural stormwater BMPs, non-structural operational measures, or a combination of the two.

Currently, there are two TMDLs with WLA reduction requirements for the Town – 1) the Chesapeake Bay TMDL and 2) an *E. coli* TMDL for Quantico Creek- “Bacteria Total Maximum Daily Load (TMDL) Development for Tributaries to the Potomac River: Prince William and Stafford Counties” report, which includes the TMDL for Quantico Creek. This report assigned the WLA for *E. coli* to the Town and specifies that the load from the Town includes VDOT to meet water quality standards. The Town will address the TMDL WLAs for stormwater through BMPs are described in this TMDL Action Plan, specifically to their application to reductions in *E. coli* discharges to the MS4. Compliance to the MS4 special conditions is demonstrated through:

1. Implementation of best management practices (BMPs) and associated policies and procedures found in the Town’s MS4 Program Plan (Appendix D);
2. BMPs beyond those required by the MS4 General Permit;
3. Enhancement of the Town’s MS4 Public Education and Outreach and Training Plans; and
4. A methodology to measure Action Plan effectiveness through MS4 annual reporting.

DEQ issued a guidance document for compliance with local TMDLs. “Local TMDL MS4 Guidance” was issued May 29, 2015 as a draft. This document was prepared in compliance with the guidance.

2.0 WATERSHED ANALYSIS

The Quantico Creek watershed and its relation to the Town is shown in Figure 1.

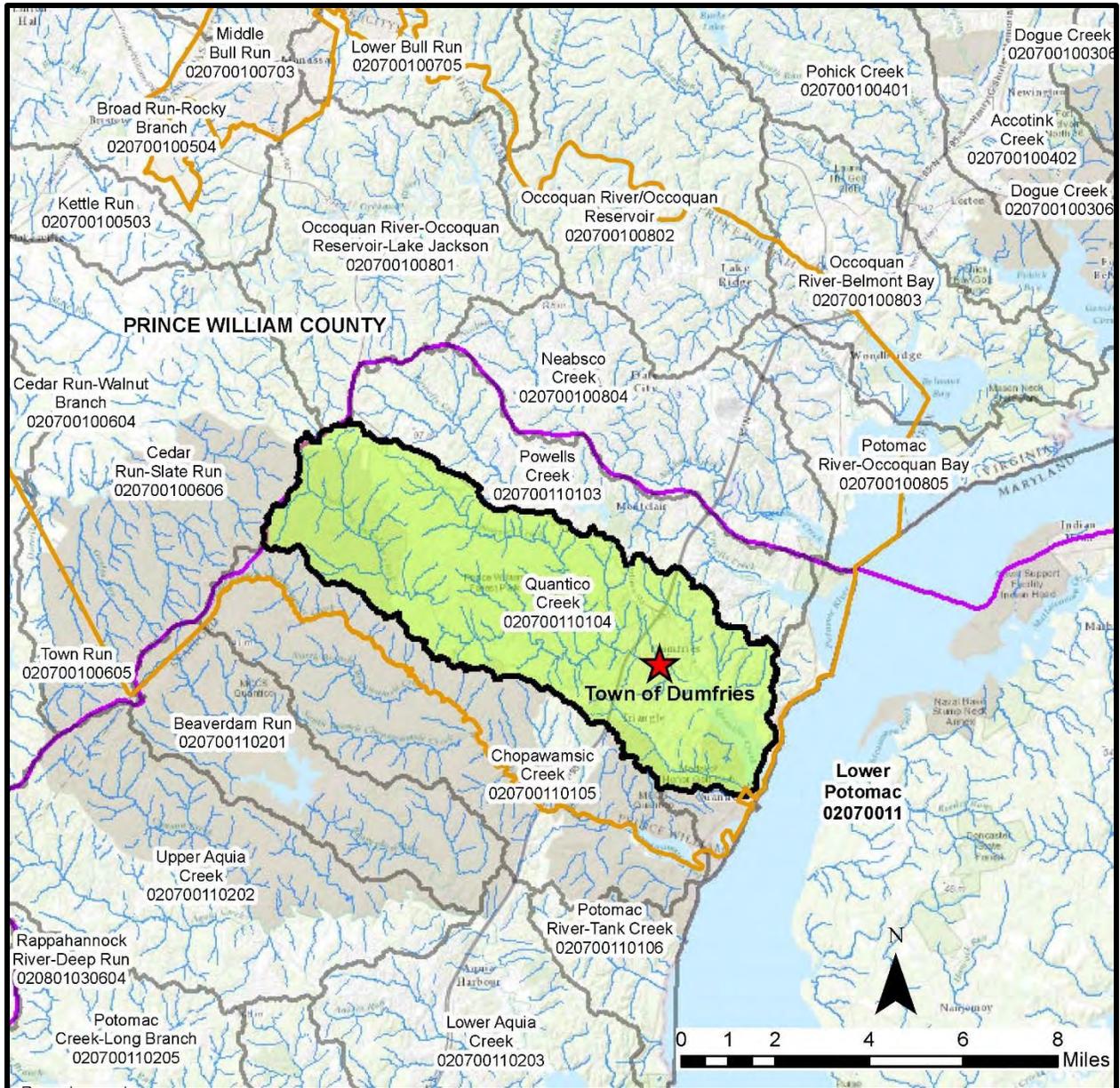


Figure 1: Quantico Creek Watershed

A map of the Town and MS4 service area within the TMDL watershed is attached in Appendix A. Approximately 986.93 acres of the Quantico Creek Watershed lies within the Town's boundary, of which 575.57 acres is within the Town's MS4 service area.

3.0 SOURCE ANALYSIS

The TMDL included data from one (1) sampling point - Station1aQUA004.46 - located at the Route 1 (Business) bridge crossing of Quantico Creek. 27 samples were taken at this station from January 1, 2003 – December 31, 2008; 7 out of 27 samples (26%) exceeded the maximum water quality assessment criterion (235 cfu/100ml) for E. coli.

According to the TMDL Report Section 1.4.2.2, the primary sources of E. coli are wildlife and residential waste under both wet weather, high flow and dry weather, low flow conditions. Therefore, the Action Plan must address both conditions.

3.1 Local E. Coli Sampling

The Prince William County Soil & Water Conservation District collects and reports the results of E. coli sampling along Quantico Creek. There are four (4) sampling locations adjacent to or within the Town limits; refer to Figure 1 taken from page 15 of the Town of Dumfries MS4 Annual Report dated November 10, 2014.

- D1: Upstream of I-95
- D2: Downstream of I-95
- D3: Downstream of southbound US Route 1
- D4: Downstream of northbound US Route 1

Of the 100 samples taken from July 1, 2013 to June 22, 2014, 24 (16 from D3 and D4) exceeded the maximum water quality assessment criterion (235 cfu/100ml) for E. coli.

Coliscan Sampling Results					
Site	D1	D2	D3	D4	Rainfall past 24 Hours (")
Lat	38.56861	38.56775	38.56586	38.5661	
Long	-77.33592	-77.33481	-77.329	-77.32437	
	E coli Colony Forming Units per 100 mL				
7/1/2013	125	100	950	775	0.53
7/17/2013	175	125	325	850	none
8/5/2013	25	50	50	50	none
8/19/2013	200	350	150	100	0.84
9/2/2013	20	20	20	20	0.1
9/7/2013	25	50	300	275	none
10/11/2013	1950	1750	3200	3050	0.9
10/28/2013	20	20	20	25	none
11/17/2013	50	20	25	20	0.3
12/15/2013	50	50	75	175	0.3
12/29/2013	1200	750	1125	975	1.31
1/15/2014	50	20	75	25	0.2
1/26/2014	20	20	20	20	0.02
2/1/2014	20	20	20	20	none
2/17/2014	20	25	20	20	none
3/16/2014	20	20	25	75	none
3/29/2014	50	20	100	25	0.22
4/14/2014	25	20	20	50	0.16
4/15/2014	950	650	925	975	0.67
4/29/2014	100	75	150	600	0.38
4/30/2014	350	20	325	375	2.6
5/21/2014	75	75	25	25	0.02
6/3/2014	50	25	50	20	none
6/14/2014	75	75	200	250	0.56
6/22/2014	20	20	25	25	0.16

Figure 1

3.2 Residential Waste

3.2.1 Septic Systems

Leaks, overflows, and illicit connections from sanitary sewers are a potential source of observed bacteria. There are no known overflows or illicit discharges within the Town limits. There are some parcels within the Town without connection or without record of connection to the Prince William County Service Authority's public sanitary sewer systems. These parcels are noted in Appendix B - Town of Dumfries Onsite Sewer Review Map and summarized below.

- 25 parcels with buildings **constructed prior to 1950** are presumed to have onsite septic systems; the Service Authority does not have record of connection to the public sewer system for these parcels.
- Two (2) parcels with buildings have known **onsite sewer** systems.

Note: Appendix B labels some parcels as 'public sewer'; connections to the public sewer for these parcels were previously unknown and were verified by the Prince William County Service Authority to have a connection to the public sewer. Undeveloped parcels are excluded from the mapping.

3.2.2 Pet Waste

Additionally, improper disposal of pet waste can be a potential source of observed bacteria in the watershed. The Town has a detailed Public Education and Outreach Program (Appendix C) specifically designed to address and minimize impacts of pet waste on Quantico Creek. The plan incorporates written material and active engagement of citizens.

The brochure will address pet waste as a major source of the bacteria found in waters within the Town that needs to be reduced. Topics that will be addressed: Why pet waste is a concern; how it can impact local water by affecting bacteria levels; and simple ways to keep pet waste out of water. Local contact information and sources for additional information will be included.

Brochures will be distributed to HOAs within the MS4 permit area along with a cover letter explaining the importance of the brochure and its intended use. Follow-up with communication with HOA points of contact will be critical to ensuring effectiveness.

3.3 Wildlife

The TMDL specifically cites wildlife as a potential source of observed bacteria in the watershed. There are no known elimination programs through DEQ or EPA to eliminate the wildlife source of E. coli. Therefore, this Action Plan will focus on reducing residential / pet waste sources.

4.0 ACTION PLAN COMPONENTS

4.1 General

The following is a summary of the required Local TMDL Action Plan components as provided in the latest DEQ guidance document.

- 4.1.1 The name(s) of the Final TMDL report(s): Bacteria Total Maximum Daily Load (TMDL) Development for Tributaries to the Potomac River: Prince William and Stafford Counties
- 4.1.2 The pollutant(s) causing the impairment(s): E coli.
- 4.1.3 The WLA(s) assigned to the MS4 as aggregate or individual WLAs: 3.37E+09 cfu/day or 1.23E+12 cfu/year for E. coli shared by the Town and the Virginia Department of Transportation (VDOT).

As noted in Section 5.3.1 of the Final TMDL Report, “implementation of the WLAs for MS4 permits will focus on achieving the percent reductions required by the TMDL, rather than the individual numeric WLAs. The MS4 WLAs are aggregated by geographic boundary. It is not intended that individual numeric WLAs will be applied towards each permit. Rather, the MS4 permittees are expected to implement programmatic controls aimed at achieving the pollutant reductions identified in this TMDL. Additionally, it is anticipated that the implementation of MS4 WLAs will focus on reducing anthropogenic sources of the pollutant of concern.” Anthropogenic sources of pollutants are those that originate from human activity.

The percent reduction required by the TMDL from urban (human and non-point) sources is 92.1%.

- 4.1.4 Significant sources of POC(s) from facilities of concern owned or operated by the MS4 operator that are not covered under a separate VPDES permit. A significant source of pollutant(s) from a facility of concern means a discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL.

Based on an analysis of the Town’s property located within the TMDL watershed, there are no significant sources of E coli, other than the two (2) existing public parks, where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL.

4.1.5 Existing or new management practices, control techniques, and system design and engineering methods, that have been or will be implemented as part of the MS4 Program Plan that are applicable to reducing the pollutant identified in the WLA.

A. Public Education and Outreach Program: Refer to Appendix C. This existing program is specifically designed to address and minimize impacts of pet waste on Quantico Creek. The plan incorporates distribution of written material and active engagement of citizens.

B. E. Coli Sampling: Refer to section 3.1 of this Action Plan. The Town currently and will continue to test for E. coli a minimum of once per month at four (4) sampling points within the Town. Sampling results are found in the Town's MS4 Annual Report. This information will be used to measure the effectiveness of this Action Plan.

C. Sewer Connections / Septic Repair: A primary source of E. coli is residential waste. From information provided by Prince William County Service Authority, there are approximately 27 parcels within the Town that are suspected to have septic systems or unknown connections. The Town will work with the Prince William County Service Authority to incentivize and/or provide connections to public sewer systems, if possible, for these facilities, or test and repair, if needed, existing septic systems.

D. Pet Waste Collection: There are two (2) public parks, which are potentially significant contributors, located in the Town: Ginn Memorial Park and Weems-Botts. During this permit cycle, the Town will evaluate the potential for adding pet waste stations at these parks.

4.1.6 Legal authorities such as ordinances, state and other permits, orders, specific contract language, and interjurisdictional agreements applicable to reducing the POCs identified in each respective TMDL.

The Town currently has no additional legal authorities applicable to reducing E. coli within the Quantico Creek watershed.

4.1.7 Enhancements to public education, outreach, and employee training programs to also promote methods to eliminate and reduce discharges of the POC(s) for which a WLA has been assigned.

A. Enhanced Public Education and Outreach Program: As previously referenced, the Town's Public Education Outreach Program lists bacteria from pet waste as a high-priority issue. The Program includes written materials and active engagement. During this permit cycle, the Town will update the materials to incorporate general information

regarding the TMDL and E. coli identification, risk factors, and significant sources within the Town.

B. Enhanced Public Participation: The Town will post this Action Plan on their MS4 Program web page. Availability of the Action Plan will increase awareness of the TMDL with web page visitors.

C. Enhanced Employee Training Program: Information regarding E. coli identification, risk factors, and significant sources within the Town will be incorporated into the biannual training events for Town employees. Training will also incorporate an overview of the TMDL, the Town’s WLA, and Action Plan.

4.1.8 A schedule of interim milestones and implementation of the items in 4.1.5, 4.1.6, and 4.1.7.

BMP ID	Milestones	Implementation Date
4.1.5 A	Public Education and Outreach Program	Ongoing / Annual (Refer to Appendix B)
4.1.5 B	E. Coli Sampling Reporting	Ongoing / Annual
4.1.5 C	Sewer Connections / Septic Repair - Feasibility Study	30-Jun-17
	Sewer Connections / Septic Repair - Completion for All Parcels within the Town	30-Jun-23
4.1.5 D	Pet Waste Collection at Parks - Evaluation Completed	30-Jun-17
4.1.6	Legal Authorities	N/A
4.1.7 A	Enhanced Public Education and Outreach Program - Complete Development	30-Jun-18
4.1.7 B	Enhanced Public Participation - Post Action Plan to MS4 Web Page	Completed / Updated Annually as needed
4.1.7 C	Enhanced Employee Training Program - Complete Development	30-Jun-18

4.1.9 Methods to assess TMDL Action Plans for their effectiveness in reducing the pollutants identified in the WLAs.

In addition to the methods outlined in Appendix C – Town of Dumfries Public Education Outreach Program dated 12-01-15, Section 5.5, the results of the E. coli sampling will assist in assessing the Action Plan effectiveness.

4.1.10 Measurable goals and the metrics that the permittee and Department will use to track those goals (and the milestones required by the permit). Evaluation metrics other than monitoring may be used to determine compliance with the TMDL(s).

The TMDL aggregates Town's WLA with that of VDOT; there is no practical way to determine a numerical load assigned to the Town as part of the total WLA. Measureable goals will include items such as number of written materials distributed, number of outreach programs provided, numbers of citizens and businesses in attendance at outreach programs, number of septic systems connected to sewer systems or repaired, and number of pet waste collection stations installed. Compliance with the TMDL will be also be tracked by the continuation of the programs described in this document and the results of the E. coli sampling.

**APPENDIX A – TOWN OF DUMFRIES MS4
SERVICE AREA MAP**

**APPENDIX B – TOWN OF DUMFRIES
ONSITE SEWER REVIEW MAP**

APPENDIX C - PUBLIC EDUCATION AND OUTREACH PROGRAM

**APPENDIX D – TOWN OF DUMFRIES MS4
PROGRAM PLAN**