APPENDIX A
MS4 PROGRAM PLAN

Virginia Stormwater Management Program MS4 Program Plan
City of Falls Church, Virginia
July 1, 2013
Amended June 30, 2014

Introduction

On July 1, 2013, the City of Falls Church was granted coverage under Virginia's General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) through the acceptance of the City's Registration Statement and accompanying stormwater management plan by the Virginia Department of Environmental Quality. The City's current Program Plan was initially an extension of the July 2009 Program Plan but has been updated to meet the scheduled requirements in Table 1 of 9VAC25-890-40. The current General Permit is set to expire on June 30, 2018.

The General Permit requires the City to address six minimum control measures designed to ensure the elimination of stormwater pollution to the maximum extent practicable (MEP). The six minimum control measures include:

- Public Education and Outreach on Stormwater Impacts;
- Public Involvement/Participation;
- Illicit Discharge Detection and Elimination;
- Construction Site Stormwater Runoff Control;
- Post-Construction Stormwater Management in New Development and Redevelopment; and
- Pollution Prevention/Good Housekeeping for Municipal Operations.

The City's approved plan addresses the six minimum control measures, as required, with a series of best management practices (BMPs), along with implementation timelines, measurable goals, responsible entity(ies) for implementation, and reporting requirements. Over past permit years, the City has successfully implemented numerous BMPs as part of its ongoing stormwater management program, as documented in the annual reports submitted to the permitting authorities.

This document represents the City's plan to comply with existing requirements and the required updates listed in 9VAC25-890-40 and are being submitted with the City's Annual Report for continued coverage under the current General Permit.

For each minimum control measure, the City has identified a series of BMPs, including the necessary documents, responsible party(ies), the objective/expected results, measurable goals, schedules and timelines for implementation, and the method utilized to determine the BMP's effectiveness. This document is organized into seven sections corresponding to the requirements for submission. The first section details the administrative BMPs of reevaluating the program once the reissued General Permit becomes effective. The next six sections describe the BMP regimen for each of the six minimum control measures.

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Program Administration

The City of Falls Church, Virginia (the City) will update and where necessary provide additional schedules to implement its MS4 Program and MS4 Program Plan including its best management practices (BMPs) and measurable goals in order to meet any new requirements included in the new General Permit for Discharges from Small Municipal Separate Storm Sewer Systems.

The City defines its MS4 Program Plan as its Registration Statement for Coverage under the General Permit for Discharges from Small Municipal Separate Storm Sewer Systems, approved by DEQ on July 1, 2013 and all documents, policies, procedures specified directly and those documents, policies, procedures necessary to implement all specified programs listed in the registration statement. The City realizes this is an ongoing process that must be evaluated and maintained throughout the permit cycle.

Necessary Documents: Updated Copy of this MS4 Program Plan, Annual Reports
Responsible Party: The City's MS4 Program is administered through the Department of Public Works. The Director is responsible for developing the updated MS4 Program Plan. The City Manager is responsible for providing the appropriate certification to any documents.
Objective/Expected Results: To maintain a consistent, compliant, and effective MS4 stormwater management program that considers the City's stormwater quality, level of service to City residents and businesses, and adheres to the City's environmental expectations.
Measurable Goals:

1. Annually review the MS4 Program Plan for program compliance and appropriateness of BMPs. Update as needed.
2. Submit an updated copy of this MS4 Program Plan to the Virginia Department of Environmental Quality in compliance with the schedule included in the General Permit.
3. Submit an annual report for the reporting period of July 1 through June 30 to DEQ by the following October 1. Each report shall include updates to the MS4 Program Plan completed during the reporting cycle.
4. Maintain records of documents pertaining to MS4 Program Plans for at least three years. Copies of such records will be made available to the public upon specific request. A copy of the most current MS4 Plan and supplemental annual reports will be posted on the City's website.

Schedule and Evaluation: Ongoing
Items Needed for the Annual Report:

1. Summary cover letter discussing current status of MS4 Program and, if needed, modifications to the MS4 Program Plan as required
2. Updated MS4 Program Plan, if needed

Method Utilized to Determine Effectiveness: Effectiveness will be determined by the outcomes of the assessment and the diagnosis of any gaps in the City's MS4 program as a result of annual self-evaluation. The City will also rely on Virginia DEQ review and approval of the MS4 Annual Report for feedback and confirmation of the City's intended actions in support of its MS4 Program Plan. In addition, the City will assess citizen feedback on its stormwater management program to determine whether the program is achieving what the City has proposed based on the BMP menu in the MS4 Program Plan.

MCM#1: Public Education and Outreach on Stormwater Impacts

BMP A. Draft and publish stormwater management/water quality-related articles in the Falls Church News-Press or locally distributed publication, with at least one article covering the hazards associated with illegal discharges, improper disposal of pet waste, and one article encouraging stormwater retrofits.
Necessary Documents: Articles for publication
Responsible Party: Department of Public Works
Objective/Expected Results: To inform the City's citizens and businesses on stormwater management/water quality issues and provide options demonstrating steps they can take to improve water quality in the City via print media.

Schedule and Evaluation: Beginning in PY1, the City of Falls Church will draft seasonal articles on water quality and/or stormwater management for publication in the Falls Church News-Press or locally distributed publication. The topics of these articles will track with the City's three high-priority water quality issue and may change as the City continues to evaluate topics and effectiveness.
Measurable Goals: In each permit year, the City will draft at least three articles for publication in the Falls Church News-Press or locally distributed publication.
Items to be reported in annual report: Title and subject of the articles published, including date of publication, the estimated number people reached, and an estimated percentage of the target audience reached to be included in an updated Education and Outreach Table.
Method Utilized to Determine Effectiveness: The City will track the distribution of the print media messages (i.e. document which articles ran in which publications and when) and document any noted changes recognizable inside the context of the MS4 program.

BMP B. Draft and publish stormwater management/water quality-related articles in the "Watershed News" section of the Department of Public Works online newsletter, The Falls Church Environment.
Necessary Documents: Articles for publication
Responsible Party: Department of Public Works
Objective/Expected Results: To inform the City's residents on stormwater management/water quality issues and provide options demonstrating steps they can take to improve water quality in the City via print media.
Schedule and Evaluation: Beginning in PY1, the City of Falls Church will draft one article on water quality and/or stormwater management for publication in The Falls Church Environment, which includes a circulation to 1,200 emails.
Measurable Goals: In each permit year, the City will draft one article for publication in The Falls Church Environment.
Items to be reported in annual report: Title and subject of the articles published, including date of publication, the estimated number people reached, and an estimated percentage of the target audience reached to be included in an updated Education and Outreach.
Method Utilized to Determine Effectiveness: The City will track the distribution of the messages (i.e. document web hits) and document any noted changes recognizable inside the context of the MS4 program.

BMP C. The City of Falls Church will post downloadable stormwater management and water quality information on the City's Internet web site (http://www.fallschurchva.gov). A priority will be given to the development and posting of materials with specifically targeted messages.
Necessary Documents: None.
Responsible Party: Department of Public Works, Engineering Division
Objective/Expected Results: To inform the City's constituents on stormwater management/water quality issues and provide options demonstrating steps they can take to improve water quality in the City via Internet media.
Schedule and Evaluation: Beginning PY1, ongoing through the permit period.
Measurable Goals: By the end of PY1, the City will have posted downloadable information on stormwater management and water quality on the City's Internet web site.
Items to be reported in annual report: Roster of materials posted, the number of website views, and an estimated percentage of the target audience reached to be included in an updated Education and Outreach Table.
Method Utilized to Determine Effectiveness: The City will develop targeted messages to address particular pollutants of concern or groups/industries whose activities/behavior may hinder surface water quality. The City will track the distribution of the messages (i.e. document web hits) and document any noted changes recognizable inside the context of the MS4 program.

BMP D. In conjunction with BMP C above, the City of Falls Church will include stormwater management and water quality information on the City's Internet web site (http://www.fallschurchva.gov) in a second language. A priority will be given to the development and posting of materials with specifically targeted messages.

Necessary Documents: None.
Responsible Party: Department of Public Works, Engineering Division
Objective/Expected Results: To inform the City's constituents on stormwater management/water quality issues and provide options demonstrating steps they can take to improve water quality in the City via Internet media.
Schedule and Evaluation: Beginning PY1, ongoing through the permit period.
Measurable Goals: By the end of PY1, the City will have developed and posted downloadable information on stormwater management and water quality on the City's Internet web site in a second language.
Items to be reported in annual report: Roster of materials posted, the number of website views, and an estimated percentage of the target audience reached to be included in an updated Education and Outreach Table.
Method Utilized to Determine Effectiveness: The City will develop targeted messages to address particular pollutants of concern or groups/industries whose activities/behavior may hinder surface water quality. The City will track the distribution of the messages (i.e. document web hits) and document any noted changes recognizable inside the context of the MS4 program.

BMP E. The City will develop targeted outreach material for pet owners on proper management of pet waste for the protection of water quality.
Necessary Documents: Document for publication
Responsible Party: Department of Public Works
Objective/Expected Results: To inform the City's pet owners on stormwater management/water quality issues and provide options demonstrating steps they can take to improve water quality in the City.
Schedule and Evaluation: Beginning in PY1, the City of Falls Church will develop one brochure for pet owners on proper management of pet waste for the protection of water quality and provide this material in both print and electronic format for posting to the City's Internet web site.
Measurable Goals: Develop and publish one brochure for pet owners on proper management of pet waste for the protection of water quality annually.
Items to be reported in annual report: Title of the brochure published, including date of publication, number of residents materials mailed to, and the percentage of the target audience reached to be included in an updated Education and Outreach Table.
Method Utilized to Determine Effectiveness: The City will track the distribution of the print publications (i.e. document the number of brochures distributed and where they were made available) and document any noted City policy or procedure changes recognizable inside the context of the MS4 program.

BMP F. Provide an opportunity for ongoing citizen input on stormwater management.
Necessary Documents: Report of water quality/stormwater management related inquiries via the City website.
Responsible Party: Department of Public Works, Office of Communications; City Manager's Office
Objective/Expected Results: Provide citizens access to the City of Falls Church Request Tracker (http://www.fallschurchva.gov/requesttracker.aspx) as an avenue to provide input on the City's MS4 Program.
Schedule and Evaluation: Ongoing
Measurable Goals: The City of Falls Church Request Tracker provides an opportunity for citizens to provide comments and feedback on issues and/or concerns. The City will document the water quality/stormwater management related inquiries received and report each year's activity in the annual report.
Items to be reported in annual report: Updated table of relevant inquiries/comments on water quality/stormwater management related concerns.
Method Utilized to Determine Effectiveness: The City will track the receipt of any public comments and inputs on stormwater management via Request Tracker to determine the effectiveness of this outreach mechanism and others listed in the Program Plan.

MCM#2: Public Involvement/Participation

BMP A. Follow public notice requirements for the City Council's meeting(s) regarding the implementation of the City's Phase II General Permit.
Necessary Documents: Public Notice of upcoming meetings.
Responsible Party: Department of Public Works, City Clerk's Office
Objective/Expected Results: To inform the City's citizens and businesses of the City's MS4 program and the components crafted in the program plan and to provide an opportunity for public input on the MS4 Program Plan.
Schedule and Evaluation: Ongoing
Measurable Goals: Provide public notice as required by the City Code.
Items to be reported in annual report: A table of City Council meetings held including the topic(s) of discussion.
Method Utilized to Determine Effectiveness: The City will track the receipt of any public comments, inputs and suggestions provided on the MS4 Program Plan via public hearings to determine the effectiveness of this outreach mechanism.

BMP B. Provide an opportunity for ongoing citizen input on stormwater management.
Necessary Documents: Report of water quality/stormwater management related inquiries via the City website.
Responsible Party: Department of Public Works, Office of Communications; City Manager's Office
Objective/Expected Results: Provide citizens access to the City of Falls Church Request Tracker (http://www.fallschurchva.gov/requesttracker.aspx) as an avenue to provide input on the City's MS4 Program.
Schedule and Evaluation: Ongoing
Measurable Goals: The City of Falls Church Request Tracker provides an opportunity for citizens to provide comments and feedback on issues and/or concerns. The City will document the water quality/stormwater management related inquiries received and report each year's activity in the annual report.
Items to be reported in annual report: Updated table of relevant inquiries/comments on water quality/stormwater management related concerns.
Method Utilized to Determine Effectiveness: The City will track the receipt of any public comments and inputs on stormwater management via Request Tracker to determine the effectiveness of this outreach mechanism and others listed in the Program Plan.

BMP C. Provide stormwater management/water quality informational updates to the citizen-based Environmental Services Council (ESC) and solicit input on the MS4 Program Plan and the Annual Reports from the ESC.
Necessary Documents: Report of water quality/stormwater management related topics addressed with the ESC.
Responsible Party: Department of Public Works
Objective/Expected Results: Provide MS4 Program Plan and Annual Report information to a citizen-based advisory council and solicit input on the Program Plan from the same council on a regular basis to ensure citizen input into the program.
Schedule and Evaluation: Ongoing, provide at least one briefing annually.
Measurable Goals: The City of Falls Church Environmental Services Council is a standing commission comprised of nine (9) citizens, who meet monthly to provide policy input to the City Council on Environmental issues, including stormwater. The City will document the water quality/stormwater management related briefings that staff provide to the ESC.
Items to be reported in annual report: List of water quality/stormwater management topics discussed with the ESC.
Method Utilized to Determine Effectiveness: The City will track the receipt of any comments, inputs and suggestions provided on the MS4 Program Plan and/or Annual Reports via the ESC to determine the effectiveness of this outreach mechanism.

BMP D. Schedule and hold Habitat Restoration Events in City parks and public right-of-ways in or near stream corridors and flood plains to remove harmful invasive species and replant with native species for the purpose of stormwater control, erosion control and habitat restoration.
Necessary Documents: Public notices for Events
Responsible Party: Department of Public Works
Objective/Expected Results: Provide a hands-on public involvement experience for the citizens of the City that allows for an educational opportunity for participants in the areas of environmental stewardship, with an emphasis on stormwater control, erosion control, and habitat restoration.
Schedule and Evaluation: Beginning in PY1, the City of Falls Church will hold at least two Habitat Restoration Events to include public participants.
Measurable Goals: The City will hold at least two Habitat Restoration Events annually.
Items to be reported in annual report: In each permit year, for each of the two events, the City will report the area of invasive plant removal and the number of participants.
Method Utilized to Determine Effectiveness: Effectiveness of this BMP will be measured by how many citizens, civic groups, etc. participate in the event.

BMP E. Promote Village Preservation and Improvement Society (VPIS) Neighborhood Tree Program planting events
Necessary Documents: Public notices for Events
Responsible Party: Department of Public Works
Objective/Expected Results: Promote a hands-on public involvement experience for the citizens of the City that allows for an educational opportunity for participants in the areas of environmental stewardship, with an emphasis on revegetation of the urban canopy and habitat restoration. City staff will attend to discuss the importance of trees to stormwater with public participants.
Schedule and Evaluation: Beginning in PY1, the City of Falls Church will promote at least one Neighborhood Tree Program planting event.
Measurable Goals: In each permit year the City will promote and attend planting events.
Items to be reported in annual report: Notification of the event, the number of trees planted, and the number of participants.
Method Utilized to Determine Effectiveness: Effectiveness of this BMP will be measured by how many citizens, civic groups, etc. participate in the event.

BMP F. Promote City-Wide Cleanups
Necessary Documents: Public notices for Events, tracking number of volunteers, and amount of debris collected
Responsible Party: Department of Public Works
Objective/Expected Results: Encourage and promote adopt a spot groups and citizens of the City to participate in the Fall and Spring City-Wide Cleanup. Cleanups remove litter from roadways, streambeds, and parks throughout the City as well as unwanted invasive species in a number of our City Parks. City staff attends and discusses the importance of properly disposing of refuse and recycling.
Schedule and Evaluation: Beginning in PY1, the City of Falls Church will promote two City-wide cleanups annually.
Measurable Goals: In each permit year the City will promote and attend cleanup events.
Items to be reported in annual report: Notification of the event, the amount of debris removed from the watershed, and the number of participants.
Method Utilized to Determine Effectiveness: Effectiveness of this BMP will be measured by how many citizens, civic groups, etc. participate in the event and the amount of debris removed.

BMP G. Provide the City's MS4 Program Plan on the City's Internet web site and provide hard copies of the MS4 Program Plan in select public buildings.
Necessary Documents: City of Falls Church MS4 Program Plan
Responsible Party: Department of Public Works

Objective/Expected Results: Provide citizens and City constituents with the opportunity to become more familiar with the City's MS4 Program Plan and increase awareness of the City's efforts to improve water quality.
Schedule and Evaluation: Ongoing, the City of Falls Church will post the MS4 Program Plan on its Internet web site (http://www.fallschurchva.gov) and will provide hard copies of the plan for viewing at the City Hall building.
Measurable Goals: Provide the MS4 Program Plan as indicated.
Items to be reported in annual report: Roster of materials posted to be included in an updated Education and Outreach Table.
Method Utilized to Determine Effectiveness: The City will track the distribution of the MS4 Program Plan via the Internet (i.e. document web hits) and document any comments and/or suggestions generated by publication of the document received via written or electronic communications.

BMP H. Develop and maintain a Public Education and Outreach Plan
Necessary Documents: Public Education and Outreach Plan
Responsible Party: Department of Public Works
Objective/Expected Results: Beginning in PY2, maintain a plan that focuses on the City's three high-priority water quality issues and works to reach at least 20% of the target audience with relevant messages and materials
Schedule and Evaluation: Ongoing, the City will evaluate and update the plan annually to meet its objective
Measurable Goals: The City will annually present outreach on the three high-priority water quality issues
Items to be reported in annual report: Table of outreach materials utilized and methods by which they were distributed
Method Utilized to Determine Effectiveness: The City will evaluate and determine if 20% of the target audience is being reached

MCM#3: Illicit Discharge Detection and Elimination

BMP A. Promote, publicize, and facilitate public reporting of illicit discharges.
Necessary Documents: Outreach materials for the City's website.
Responsible Party: Department of Public Works, Office of Communications
Objective/Expected Results: Promote the City's Request Tracker system in the community so residents can easily report illicit discharges.
Schedule and Evaluation: Ongoing
Measurable Goals: The City of Falls Church Request Tracker provides an opportunity for citizens to provide comments and feedback on issues and/or concerns via the website. The City will promote the service via the website and social media and then document the water quality/stormwater management related inquiries received and report each year's activity in the annual report.
Items to be reported in annual report: Updated table of relevant inquiries/comments on water quality/stormwater management related concerns.
Method Utilized to Determine Effectiveness: The City will track the receipt of any public comments and inputs on stormwater management via Request Tracker to determine the effectiveness of this outreach mechanism and others listed in the Program Plan.

BMP B. Complete an updated City storm drain map showing the City's storm water outfalls and State waters with HUCs and impairments to which those storm water outfalls discharge. Maintain the acreage and land use of watersheds for each outfall.
Necessary Documents: Updated maps.
Responsible Party: Department of Public Works, Engineering Division
Objective/Expected Results: Document the City's MS4 outfalls and locate them geographically.
Schedule and Evaluation: Annually, update storm drain maps to reflect new construction, modifications and field observations.

Measurable Goals: Completed mapping by the end of PY2. Afterwards update annually.
Items to be reported in annual report: Updates completed with new map and table.
Method Utilized to Determine Effectiveness: The City will rely on Virginia DEQ review of the MS4 outfall map and associated statistics gathered for feedback and confirmation of this component's compliance with the General Permit.

BMP C. Notify in writing the downstream MS4 of any known physical interconnection
Necessary Documents: Updated stormwater mapping
Responsible Party: Department of Public Works
Objective/Expected Results: Sharing of information between local MS4s for potential collaborative efforts.
Schedule and Evaluation: Ongoing
Measurable Goals: By the end of PY2, send written notification of known physical interconnections. Afterward, send written notification immediately after an update to stormwater mapping that contains a newly found interconnection.
Items to be reported in annual report: A copy of the letter to interconnected MS4s when applicable.
Method Utilized to Determine Effectiveness: The City will rely on Virginia DEQ review of the MS4 outfall map and associated statistics gathered for feedback and confirmation of this component's compliance with the General Permit

BMP D. Develop and implement a program for illicit discharge detection that includes written procedures to detect, identify, and address unauthorized nonstormwater discharges.
Necessary Documents: IDDE Manual and SOP; Table of observed outfalls in City streams, updated once per year.
Responsible Party: Department of Public Works, Engineering Division
Objective/Expected Results: Develop and implement a new program to identify potential illicit discharges into the City's MS4.
Schedule and Evaluation: By end of PY2, revise/update the existing IDDE Manual to comply with the new MS4 Permit requirements. Continue ongoing outfall inspections of the City's open channel stream reaches to examine the outfalls discharging directly to the stream
Measurable Goals: By the end of PY2 complete revisions to IDDE Manual and SOP. Annually conduct a stream walk of open channel streams to examine outfalls discharging directly to those streams.
Items to be reported in annual report: Updated Manual and SOP. Updated table of observed outfalls in City streams and a summary of the outcomes of any suspected illicit discharge investigations.
Method Utilized to Determine Effectiveness: The City will evaluate the number of potential illicit discharges identified each year and review how each was addressed.

BMP E. Develop targeted outreach materials for industries located in the City of Falls Church that are particularly susceptible to illicit discharges to the storm sewer system.
Necessary Documents: City IDDE evaluation noting industries of concern for illicit discharges. Printed outreach materials.
Responsible Party: Department of Public Works, Engineering Division
Objective/Expected Results: To inform the City's industries on the legal and environmental issues surrounding illicit discharges into the City's MS4 and to provide options demonstrating steps they can take to avoid illicit discharges in the City via print media.
Schedule and Evaluation: Develop a new printed outreach tool in PY2 for the automotive industry. Work with the Office of the Commissioner of Revenue to develop a good address list for the chosen industry.
Measurable Goals: By the end of PY2, develop, print, and disburse printed outreach materials to automotive industries located in the City of Falls Church.
Items to be reported in annual report: Copy of disbursement list for outreach materials.
Method Utilized to Determine Effectiveness: The City will evaluate the list of recipients of the targeted illicit discharge materials against those potential illicit discharges identified in BMP D. Where necessary, the City may then further refine the illicit discharge message's targeting.

BMP F. Adopt and evaluate City Code that clearly prohibits illicit discharges to the City's storm sewer system.
Necessary Documents: City Code
Responsible Party: Department of Public Works
Objective/Expected Results: To establish specific language in the City Code that prohibits illicit discharges to the City's storm sewer system and provides for civil and/or criminal remedies and enforcement of same.
Schedule and Evaluation: Complete Code amendment process by the conclusion of PY1.
Measurable Goals: By the end of PY1, the City will amend the City Code to clearly prohibit illicit discharges to the City's storm sewer system and provide for civil and/or criminal penalties and City enforcement capabilities for violation of the Code section.
Items to be reported in annual report: Copy of the amended Code section.
Method Utilized to Determine Effectiveness: The City will evaluate the number of potential illicit discharges identified each year and report on how each was addressed as required in the General Permit.

MCM#4: Construction Site Stormwater Runoff Control

BMP A. Maintain a consistently rated Erosion and Sediment (E&S) Control Program.
Necessary Documents: City Code; Notice of consistency from the Virginia Department of Environmental Quality.
Responsible Party: Department of Public Works, Engineering Division
Objective/Expected Results: To effectively manage erosion and sediment control on new and re-development projects disturbing 2,500 square feet or more of land or any land disturbance in the Resource Protection Area in order to protect the City's surface water quality.
Schedule and Evaluation: Beginning in PY1 and continuing throughout the permit cycle
Measurable Goals: The City will enforce Chapter 35 of the City Code with respect to E&S and maintain a consistently-rated Erosion and Sediment Control program. Track land disturbance, subsequent inspections, and enforcement actions.
Items to be reported in annual report: Consistency status with documentation will be noted in each annual report. Land disturbance reports, acres disturbed, number of inspections, and a summary of enforcement actions.
Method Utilized to Determine Effectiveness: Documentation received from DEQ through the agency's periodic review of the City's E&S program.

BMP B. Develop written policies and procedures for construction site stormwater runoff control
Necessary Documents: Falls Church Stormwater Management Handbook
Responsible Party: Department of Public Works, Engineering Division
Objective/Expected Results: To review existing City policies and procedures and then consolidate into a single document.
Schedule and Evaluation: Complete by the end of PY2.
Measurable Goals: The City will revise existing documents and combine into the Falls Church Stormwater Management Handbook by the end of PY2.
Items to be reported in annual report: A copy of the Falls Church Stormwater Management Handbook
Method Utilized to Determine Effectiveness: The City will rely on Virginia DEQ review of the handbook for feedback and confirmation of this component's compliance with the General Permit

BMP C. Promote, publicize, and facilitate public reporting of erosion and sediment concerns.
Necessary Documents: Outreach materials for the City's website.
Responsible Party: Department of Public Works, Office of Communications
Objective/Expected Results: Promote the City's Request Tracker system in the community so residents can easily report concerns regarding potential water quality and compliance issues.
Schedule and Evaluation: Ongoing

Measurable Goals: The City of Falls Church Request Tracker provides an opportunity for citizens to provide comments and feedback on issues and/or concerns via the website. The City will promote the service via the website and social media and then document the water quality/stormwater management related inquiries received and report each year's activity in the annual report.
Items to be reported in annual report: Updated table of relevant inquiries/comments on water quality/stormwater management related concerns.
Method Utilized to Determine Effectiveness: The City will track the receipt of any public comments and inputs on stormwater management via Request Tracker to determine the effectiveness of this outreach mechanism and others listed in the Program Plan.

MCM#5: Post-Construction Stormwater Management in New Development and Redevelopment

BMP A. Maintain a consistent rated Chesapeake Bay Preservation Program.
Necessary Documents: City Code; Notice of consistency from the Virginia Department of Environmental Quality.
Responsible Party: Department of Public Works
Objective/Expected Results: To effectively manage Chesapeake Bay Preservation regulations on new and re-development projects disturbing 2,500 square feet or more of land or any land disturbance in the Resource Protection Area in order to protect the City's surface water quality.
Schedule and Evaluation: Beginning in PY1 and continuing throughout the permit cycle
Measurable Goals: The City will enforce Chapter 35 of the City Code with respect to the Chesapeake Bay Preservation Program.
Items to be reported in annual report: Consistency status with documentation will be noted in each annual report.
Method Utilized to Determine Effectiveness: Documentation received from DEQ through the agency's periodic review of the City's Chesapeake Bay Preservation Area program.

BMP B. Maintain an inventory of all known stormwater management facilities
Necessary Documents: Spreadsheet with inventory of stormwater management facilities located in the City of Falls Church.
Responsible Party: Department of Public Works
Objective/Expected Results: Identify, geographically locate, and track all known stormwater management facilities and stormwater BMPs in the City so as to administer the requirements that ensure their proper operation and maintenance.
Schedule and Evaluation: Ongoing
Measurable Goals: The City will document the number of stormwater quality BMPs located in the City of Falls Church
Items to be reported in annual report: Updated list of current BMPs in the City.
Method Utilized to Determine Effectiveness: Implementation of the City's facility assessment program will determine BMP effectiveness.

BMP C. Require Stormwater BMP agreements are entered into and executed prior to issuing building permits where BMPs are required to meet the Chesapeake Bay Act requirements.
Necessary Documents: Spreadsheet with inventory of stormwater quality BMPs located in the City of Falls Church.
Responsible Party: Department of Public Works
Objective/Expected Results: Implementation will ensure that stormwater BMP owners are conducting appropriate maintenance on their facilities to ensure provision of stormwater quality treatment for all land disturbing projects greater than 2,500 square feet.
Schedule and Evaluation: Ongoing
Measurable Goals: The City will require 100% of new stormwater quality BMPs located in the City of Falls Church to have maintenance agreements.

Items to be reported in annual report: Updated list of current BMPs in the City.
Method Utilized to Determine Effectiveness: Documentation of BMPs implemented on each developed or re-developed parcel.

BMP D. Require adequate long-term operation and maintenance by the owner of stormwater management facilities
Necessary Documents: Spreadsheet with inventory of stormwater quality BMPs located in the City of Falls Church.
Responsible Party: Department of Public Works, Engineering Division.
Objective/Expected Results: Implementation will ensure that stormwater BMP owners are conducting appropriate maintenance on their facilities. The City will review existing City BMP inspection policies and procedures and then consolidate into a single document.
Schedule and Evaluation: Complete by the end of PY2
Measurable Goals: The City will revise existing documents and combine into the Falls Church Stormwater Management Handbook by the end of PY2. The City will continue to inspect all facilities at least once per permit cycle.
Items to be reported in annual report: Summary of stormwater management facilities inspected and enforcement actions.
Method Utilized to Determine Effectiveness: Documentation of maintenance activities performed and/or enforcement actions initiated by the City on each managed facility.

BMP E. Require adequate long-term operation and maintenance by operator-owned stormwater management facilities
Necessary Documents: Spreadsheet with inventory of stormwater quality BMPs owned by the City of Falls Church.
Responsible Party: Department of Public Works, Engineering Division.
Objective/Expected Results: Implementation will ensure that the City is conducting appropriate maintenance on their facilities annually. The City will review existing City BMP inspection policies and procedures and then consolidate into a single document.
Schedule and Evaluation: Complete by the end of PY2
Measurable Goals: The City will revise existing documents and combine into the Falls Church Stormwater Management Handbook by the end of PY2. The City will continue to inspect their facilities annually.
Items to be reported in annual report: Summary of stormwater management facilities inspected and enforcement actions.
Method Utilized to Determine Effectiveness: Documentation of maintenance activities performed and/or enforcement actions initiated by the City on each managed facility.

BMP F. Develop written policies and procedures for construction site stormwater runoff control
Necessary Documents: Falls Church Stormwater Management Handbook
Responsible Party: Department of Public Works, Engineering Division
Objective/Expected Results: To review existing City policies and procedures and then consolidate into a single document.
Schedule and Evaluation: Complete by the end of PY2.
Measurable Goals: The City will revise existing documents and combine into the Falls Church Stormwater Management Handbook by the end of PY2.
Items to be reported in annual report: A copy of the Falls Church Stormwater Management Handbook
Method Utilized to Determine Effectiveness: The City will rely on Virginia DEQ review of the handbook for feedback and confirmation of this component's compliance with the General Permit

MCM#6: Pollution Prevention/Good Housekeeping for Municipal Operations

BMP A. Conduct street sweeping for City streets to remove potential pollutants.

Necessary Documents: Municipal Pollution Prevention Activities Table
Responsible Party: Department of Public Works
Objective/Expected Results: To remove pollutants from roadways and parking areas that may otherwise be introduced into the City's MS4 during rainfall events.
Schedule and Evaluation: Beginning in PY1, the City of Falls Church will sweep City streets up to twice per year.
Measurable Goals: By the end of PY1, initiate biannual street sweeping for City streets.
Items to be reported in annual report: Documentation of street sweeping material removed each year will be reported in a Municipal Pollution Prevention Activities Table.
Method Utilized to Determine Effectiveness: Documentation of street sweeping materials removed each year. The quantity of materials removed will be calculated by multiplying the number of loads times the weight of the first load.

BMP B. Incorporate stormwater quality management information into ongoing employee training/safety programs. Document all water quality training activities.
Necessary Documents: Training Schedule and Program; Municipal Pollution Prevention Activities Table
Responsible Party: Department of Public Works
Objective/Expected Results: Ensure that City employees are trained on best practices in their operational areas of responsibility to reduce or eliminate stormwater pollution or other potential water quality impairments through the execution of their tasks and duties.
Schedule and Evaluation: Beginning in PY1, the City of Falls Church will provide water quality protection/pollution prevention training for all City operations employees whose job assignments have the potential to impact stormwater.
Measurable Goals: By the end of PY1, develop a Training Schedule and Program.
Items to be reported in annual report: Summary of training provided, including roster of training attendees.
Method Utilized to Determine Effectiveness: Documentation of training provided for City employees and tracking of any water quality compromising events caused by City staff will inform effectiveness and guide future training.

BMP C. Identify high-priority, City-owned and operated facilities with a specific emphasis on illicit discharges.
Necessary Documents: Facilities Assessment study
Responsible Party: Department of Public Works
Objective/Expected Results: Evaluate stormwater pollution potential posed by City-owned and operated facilities with respect to the new General Permit requirements
Schedule and Evaluation: Beginning in PY1, the City of Falls Church will conduct a City-owned and operated facilities assessment to document current practices, procedures, and program elements for stormwater pollution prevention in order to determine if the facility is a high-priority.
Measurable Goals: Identify high-priority City-owned and operated facilities by the end of PY1.
Items to be reported in annual report: Overview of findings from the Facilities Assessment study.
Method Utilized to Determine Effectiveness: Noted results of the City's investigation and eventual implementation of next steps.

BMP D. Develop and implement a Stormwater Pollution Prevention Plan (SWPPP) for high-priority, City-owned and operated facilities
Necessary Documents: Facilities Assessment study
Responsible Party: Department of Public Works
Objective/Expected Results: Evaluate stormwater pollution potential posed by City-owned and operated facilities with a specific emphasis on illicit discharges.
Schedule and Evaluation: Beginning in PY3, the City of Falls Church will conduct a high-priority, City-owned and operated facilities assessment to document current practices, procedures, and program elements for stormwater pollution prevention.
Measurable Goals: Complete and implement the SWPPP by the end of PY4.
Items to be reported in annual report: Final SWPPP report.

Method Utilized to Determine Effectiveness: Noted results of the City's assessment and eventual implementation of any necessary, remedial actions.

BMP E. Identify City-owned and operated facilities requiring nutrient management plans.
Necessary Documents: Nutrient Management Plan Study
Responsible Party: Department of Public Works
Objective/Expected Results: Identify City-owned and operated facilities with respect to the new General Permit requirements concerning nutrient management.
Schedule and Evaluation: Beginning in PY1, the City of Falls Church will conduct a City-owned and operated facilities study for nutrient management.
Measurable Goals: Identify high-priority City-owned and operated facilities by the end of PY1.
Items to be reported in annual report: Summary of findings from the study, including location and total acreage requiring a nutrient management plan.
Method Utilized to Determine Effectiveness: Noted results of the City's investigation and eventual implementation of next steps.

BMP F. Develop and implement a Nutrient Management Plan (NMP) for sites identified in BMP E directly above.
Necessary Documents: Nutrient Management Plan
Responsible Party: Department of Public Works
Objective/Expected Results: Evaluate stormwater pollution potential posed by City-owned and operated facilities with a specific emphasis on nutrient management.
Schedule and Evaluation: Beginning in PY4, the City of Falls Church will conduct a City-owned and operated facilities study for nutrient management.
Measurable Goals: Complete and implement the NMP by the end of PY5.
Items to be reported in annual report: Final NMP report.
Method Utilized to Determine Effectiveness: Noted results of the City's assessment and eventual implementation of any necessary, remedial actions.

BMP G. Maintain City Standard Operating Procedures (SOP) for the reduction of potential stormwater pollution and proper removal of waste materials.
Necessary Documents: Falls Church SOPs for Good Housekeeping
Responsible Party: Department of Public Works
Objective/Expected Results: Ensure that City SOPs are consistent with the need to reduce stormwater pollution potential and properly remove waste materials to the maximum extent practicable and that City employees are trained in the proper execution of these SOP.
Schedule and Evaluation: Ongoing. SOPs will be updated or added based on the final recommendations from the City's SWPPP to ensure proper procedures are in place.
Measurable Goals: By the end of PY4, evaluate and revise City SOPs upon completion of the SWPPP.
Items to be reported in annual report: Table outlining any SOP adjustments noted to City operations policies as noted during the review.
Method Utilized to Determine Effectiveness: Review of, and implementation of, City SOPs that ensure stormwater pollution potential reduction and proper waste disposal to the maximum extent practicable and that City employees are trained on the proper implementation of the SOPs outlined above.

APPENDIX B
CHAPTER 35, STORMWATER

ORDINANCE 1915

ORDINANCE TO CREATE CHAPTER 35 "STORMWATER," ARTICLE I "STORMWATER MANAGEMENT" OF THE FALLS CHURCH CITY CODE TO CLARIFY AND REORGANIZE EXISTING STORMWATER DEVELOPMENT CRITERIA; TO ADD NEW LANGUAGE REQUIRED BY THE STATE OF VIRGINIA.

THE CITY OF FALLS CHURCH, VIRGINIA, HEREBY ORDAINS THAT Chapter 14, Article IV "Erosion and Sediment Control" and Chapter 48, Article IV, Division 16 "CBPA, Chesapeake Bay Preservation Overlay District" be struck and replaced with the following new Chapter 35 below.

Chapter 35
STORMWATER

Charter reference – Power to make regulations for the preservation of the safety, health, peace, good order, comfort, convenience, morals, and welfare of the City and its inhabitants, §2.04.

State Law reference – State Water Control Law, Code of Virginia, §62.1-44.15:67 et seq.; Virginia Stormwater Management Act, Code of Virginia, §10.1-603.2 et seq.; Erosion and Sediment Control Act, Code of Virginia, §10.1-560 et seq.; Flood Damage Reduction Act, §10.1-600 et seq.

Article I. Stormwater Management

Sec. 35-1 Purpose and authority.
Sec. 35-2 Definitions.
Sec. 35-3 Administration; context of zoning and subdivision ordinances.
Sec. 35-4 Stormwater management permit required; exemptions.
Sec. 35-5 Stormwater management plan.
Sec. 35-6 Stormwater management technical standards.
Sec. 35-7 Stormwater management plan review.
Sec. 35-8 Stormwater pollution prevention plan.
Sec. 35-9 Pollution prevention plan.
Sec. 35-10 Chesapeake Bay preservation areas established.
Sec. 35-11 Chesapeake Bay preservation areas; administrative waivers, nonconformities, exemptions, and exceptions.
Sec. 35-12 Water quality impact assessment.
Sec. 35-13 Water quality impact assessment review.
Sec. 35-14 Erosion and sediment control plan.

Sec. 35-15 Erosion and sediment control technical standards.
Sec. 35-16 Erosion and sediment control plan review.
Sec. 35-17 Landscape conservation plan.
Sec. 35-18 Bonding requirements; installation and maintenance agreement.
Sec. 35-19 Appeals and hearings.
Sec. 35-20 Monitoring and inspections.
Sec. 35-21 Prohibition against illicit discharges.
Sec. 35-22 Failure to comply; penalties and other legal actions.
Sec. 35-23 Fees

Sec. 35-1. Purpose and authority.

The purpose of this article is to ensure that land is used, developed, and redeveloped in a manner that protects water quality and to prevent the degradation of properties, stream channels, waters, and other natural resources by prohibiting illicit discharges and providing that adequate stormwater management and erosion and sediment control measures are taken before, during, and after the period of land disturbance, development, and construction.

This article is adopted pursuant to the authority of the State Water Control Law (§62.1-44.15:67 et seq., Code of Virginia), the Virginia Stormwater Management Act (§10.1-603.2 et seq., Code of Virginia), the Erosion and Sediment Control Act (§10.1-560 et seq., Code of Virginia), and their attendant regulations.

In any case where the requirements of this article conflict with any other provision of this Code or existing state or federal regulations, whichever imposes the more stringent restrictions shall apply.

Sec. 35-2. Definitions.

As used in this article, unless the context clearly indicates otherwise, the following words and phrases shall have the meanings ascribed to them by this section:

Adequate channel means a watercourse that will convey a chosen frequency storm event without overtopping its banks or causing erosive damage to the bed, banks, and overbank sections of the same.

Agreement in lieu of a plan means a contract between the City and the owner that specifies erosion and sediment control measures and other conservation measures that must be implemented in the construction of a single-family residence in lieu of a formal site plan or a water quality impact assessment.

Applicant means any person submitting an application for a stormwater management permit, requesting issuance of a permit, or requesting an exemption or exception from the requirements under this article.

Best management practice or BMP means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices, including both structural and nonstructural practices, to prevent or reduce the pollution of surface waters and groundwater systems from the impacts of land disturbing activities. BMPs also include treatment

requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw materials storage.

Board or VSWCB refers to the Virginia Soil and Water Conservation Board.

Buffer area means an area of natural or established vegetation managed to protect other components of a resource protection area and state waters from significant degradation due to land disturbances.

Chesapeake Bay preservation area or CBPA means any land designated by the City pursuant to the Chesapeake Bay Preservation Area Designation and Management Regulations, 4VAC50-90-70 et seq., and the Chesapeake Bay Preservation Act, section 62.1-44.15:74. A Chesapeake Bay preservation area shall consist of a resource protection area and a resource management area.

Clean Water Act or CWA means the federal Clean Water Act (33USC §1251 et seq.) formerly referred to as the Federal Water Pollution Control Act or Federal Water pollution Control Act Amendments of 1972, Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483, and Public Law 97-117, or any subsequent revisions thereto.

Common plan of development or sale means a contiguous area where separate and distinct construction activities may be taking place at different times on different schedules. Separate land disturbing activities that take place on a single property that cumulatively exceed 2,500 square feet within a three year period shall be considered a common plan of development for the purposes of this article.

Control measure means any best management practice or stormwater facility, or other method used to prevent or reduce the discharge of pollutants to state waters.

Critical root zone or CRZ means the area beneath a tree that may extend well beyond the spread of its branches. The size of the critical root zone is a function of tree type, size, health and it's response to construction stresses. The size of the critical root zone should be adjusted according to the specific factors listed in this definition and site conditions, but generally can be calculated as one foot per inch of diameter at breast height (DBH) of the tree to be preserved. For example, a ten-inch diameter at breast height tree would have a critical root zone of ten feet from the tree trunk in all directions.

Dam means a barrier to confine or raise water for storage or diversion, to create a hydraulic head, to prevent gully erosion, or to retain soil, rock or other debris.

Denuded refers to a term applied to land that has been physically disturbed and no longer supports vegetative cover.

Department refers to the Virginia Department of Environmental Quality.

Development means land disturbance and the resulting landform associated with the construction of residential, commercial, industrial, institutional, recreation, transportation, or utility facilities or structures, or the clearing of land for non-agricultural or non-silvicultural purposes.

Diameter at breast height or DBH means the diameter of the tree measured outside the bark at a point four feet above the ground.

Dike means an embankment to confine or control water, especially one built along the banks of a river to prevent overflow of lowlands; a levee.

Director means the director of public works or his designee and is the representative of the City who has been appointed to serve as the agent of the City in administering this article.

Discharge means to dispose, deposit, spill, pour, inject, dump, leak, or place by any means, or that which is disposed, deposited, spilled, poured, injected, dumped, leaked, or placed by any means.

Disturbed acreage means that portion of the project that will be disturbed, denuded, graded, cut, or filled.

Diversion means a channel with a supporting ridge on the lower side constructed across or at the bottom of a slope for the purpose of intercepting surface runoff.

Dripline means a vertical projection to the ground surface from the furthest lateral extent of a tree or shrub's canopy.

Erosion impact area means an area of land not associated with current land disturbing activity but subject to persistent soil erosion resulting in the delivery of sediment onto neighboring properties or into state waters. This definition shall not apply to any lot or parcel of land of 10,000 square feet or less used for residential purposes or to shorelines where the erosion results from wave action or other coastal processes.

General permit means the Virginia Stormwater Management Program General Permit for Discharges of Stormwater from Construction Activities found at 4VAC50-60-1170 authorizing a category of discharges under the CWA within a geographical area of the Commonwealth of Virginia.

Impervious land cover means a surface composed of any material that significantly impedes or prevents natural infiltration of water into the soil. Impervious surfaces include, but are not limited to: nonvegetated roofs; buildings; streets; parking areas; sidewalks; driveways; swimming pools; recreational surfaces such as tennis courts or basketball courts; and, any concrete, asphalt, or compacted gravel surface.

Illicit discharge means any discharge to the stormwater management system that is not composed entirely of stormwater, except discharges pursuant to a VPDES or VSMP permit, discharges resulting from firefighting activities, or discharges expressly allowed under this article. Prohibited substances, whether liquid or solid, include, but are not limited to: waste, trash, and garbage; food and kitchen waste; leakage from dumpsters or trash containers; gasoline, waste oil, lubricants, grease, antifreeze, or any other automotive, motor, or equipment fluids; fertilizers, grass clippings, mulch, and any yard waste; any chemical or solvent; soluble and non-soluble metals; wash water, detergents, and cleaning agents; paints; plastics; soot, ash, and sludge; animal waste; eroded soils and sediment; carcasses; chlorinated swimming pool water; and, any material that impedes or interferes with the free flow of stormwater.

Land disturbing activity means a manmade change to the land surface that potentially changes its runoff characteristics including any clearing, grading, or excavation except that the term shall not include those exemptions specified in section 35-4.

Layout means a conceptual drawing sufficient to provide for the specified stormwater management facilities required at the time of approval.

Linear development project means a land disturbing activity that is linear in nature such as, but not limited to: the construction of electric and telephone utility lines, and natural gas pipelines; construction of tracks, rights-of-way, bridges, communication facilities and other related structures of a railroad company; highway construction projects; construction of stormwater channels and stream restoration activities; and, water and sewer lines. Private subdivision roads or streets shall not be considered linear development projects.

Minor modification means an amendment to an existing permit before its expiration not requiring extensive review and evaluation including but not limited to changes in EPA promulgated test protocols, increasing monitoring frequency requirements, changes in sampling locations, and changes to compliance dates within the overall compliance schedules. A minor permit modification or amendment does not substantially alter permit conditions, substantially increase or decrease the amount of surface water impacts, increase the size of the operation, or reduce the capacity of the facility to protect human health or the environment.

Natural channel design concepts means the utilization of engineering analysis and fluvial geomorphic processes to create, rehabilitate, restore or stabilize an open conveyance system for the purpose of creating or recreating a stream that conveys its bankfull storm event within its banks and allows larger flows to access its bankfull bench and its floodplain.

Natural stream means nontidal waterways that are part of the natural topography. Natural streams usually maintain a continuous or seasonal flow during the year and are characterized as being irregular in cross section with a meandering course. Constructed channels such as drainage ditches or swales are not to be considered as natural streams.

Nonpoint source pollution means pollution consisting of constituents such as sediment, nutrients, and organic and toxic substances from diffuse sources, such as runoff from agriculture and urban land development and use.

Nontidal wetlands means those wetlands, other than tidal wetlands, that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions, as defined by the U.S. Environmental Protection Agency, pursuant to section 404 of the Federal Clean Water Act, in 33 CFR 328.3b.

Operator means the owner or operator of any facility or activity subject to regulation under this article.

Owner means the owner of the freehold of the premises or lesser estate therein, a mortgagee or vendee in possession, assignee of rents, receiver, executor, trustee, lessee or other person, firm or corporation in control of a property.

Peak flow rate means the maximum instantaneous flow from a given storm condition at a particular location.

Person means any individual, partnership, firm, association, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, county, city, town, or other political subdivision of the commonwealth, any interstate body, or any legal entity.

Pervious land cover means a surface composed of any material that allows for natural infiltration of water into the soil in varying degrees.

Pre-development conditions refers to conditions at the time an applicant becomes subject to the provisions of this article. Where phased development or plan approval occurs (preliminary grading, roads and utilities, etc.), the existing conditions at the time the applicant first becomes subject to the provisions of this article shall establish pre-development conditions.

Public road means a publicly owned road designed and constructed in accordance with water quality protection criteria at least as stringent as requirements applicable to the Virginia Department of Transportation, including regulations promulgated pursuant to the Chesapeake

Bay Preservation Act (§10.1-2100 et seq., Code of Virginia), the Virginia Stormwater Management Act (§10.1-603.2 et seq., Code of Virginia), the Virginia Erosion and Sediment Control Act (§10.1-561 et seq., Code of Virginia), and their attendant regulations. This definition includes those roads where the Virginia Department of Transportation exercises direct supervision over the design or construction activities, or both, and cases where secondary roads are constructed or maintained, or both, by a local government in accordance with the standards of that local government.

Redevelopment means the process of developing land that is developed or has been previously developed.

Responsible land disturber means an individual from the project or development team, who will be in charge of an responsible for carrying out a land-disturbing activity covered by an approved plan or agreement in lieu of a plan who (a) holds a Responsible Land Disturber certificate of competence (b) holds a current certificate of competence from the Board in the areas of Combined Administration, Inspection, or Plan Review (c) holds a current Contractor certificate of competence for erosion and sediment control or (d) is licensed in Virginia as a professional engineer, architect, certified landscape architect or land surveyor pursuant to Article 1 (§54.1-400 et seq.) of Chapter 4 of Title 54.1 of the Code of Virginia.

Resource management area or RMA means that component of the Chesapeake Bay preservation area that is not classified as the resource protection area. The term resource management area includes land types that, if improperly used or developed, have the potential for causing significant water quality degradation or for diminishing the functional value of the resource protection area.

Resource protection area or RPA means that component of the Chesapeake Bay preservation area as defined in section 35-10(b). Resource protection areas consist of sensitive lands that have an intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may result in significant degradation to the quality of state waters.

Riparian Buffers Modification and Mitigation Guidance Manual means the Riparian Buffers Modification and Mitigation Guidance Manual, published in September 2003, written and published by the Chesapeake Bay Local Assistance Department, now the Virginia Department of Environmental Quality. The intent of the manual is to provide guidance and clarification for tidewater local governments, at their request, regarding the section of the Chesapeake Bay Preservation Act describing buffer exemptions and modifications.

Runoff volume means the volume of water that runs off the land development project from a prescribed storm event.

Sediment basin means a depression formed from the construction of a barrier or dam built to retain sediment and debris.

Shrub means any self-supporting woody plant which usually has multiple trunks. For preservation and canopy coverage calculation purposes, a shrub shall measure no less than five feet in height above ground level.

Site means the land or water area where any facility or activity is physically located or conducted, a parcel of land being developed, or a designated area of a parcel in which the land development project is located.

Stabilized means an area that can be expected to withstand normal exposure to atmospheric conditions without incurring erosion damage.

State means the Commonwealth of Virginia.

State Water Control Law means Chapter 3.1 (§62.1-44.2 et seq.) of Title 62.1 of the Code of Virginia.

State waters means all waters on the surface and under the ground wholly or partially within or bordering the Commonwealth of Virginia or within its jurisdiction, including wetlands.

Stormwater means precipitation that is discharged across the land surface through conveyances to one or more waterways and that may include stormwater runoff, snow melt runoff, and surface runoff and drainage.

Stormwater detention means the process of temporarily impounding runoff to reduce flood peaks.

Stormwater management review team or SMRT means a team composed of City staff, to include but not be limited to the director, a senior or principal planner from the development services department, the City engineer, and the City arborist.

Stormwater management system means the series of structural and nonstructural stormwater infrastructure established to manage the quantity and/or quality of stormwater runoff. The stormwater management system includes, but is not limited to, storm drains, catch-basins, inlets, pipes, open channels and ditches, facilities designed to control stormwater volume and velocity, and various best management practices designed to reduce stormwater pollution.

Stormwater Pollution Prevention Plan or SWPPP means a document that is prepared in accordance with good engineering practices that identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the construction site and otherwise meets the requirements of this article. In addition, the document shall identify and require the implementation of control measures, and shall include, but not be limited to the inclusion of, or the incorporation by reference of, an approved erosion and sediment control plan, and approved stormwater management plan, and a pollution prevention plan.

Stormwater retention means the process by which an impoundment structure stores the total runoff of a given storm and then releases the flow at a controlled rate over an extended period.

Subdivision means the same as defined in section 38-1.

Substantial alteration means the expansion or modification of a building or development that would result in a disturbance of land exceeding an area of 2,500 square feet in the resource management area only.

Total Maximum Daily Load, or TMDL, means the sum of the individual wasteload allocations for point sources, load allocations for nonpoint sources, natural background loadings and a margin of safety. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure. The TMDL process provides for point versus nonpoint source trade-offs.

Tree means any self-supporting woody plant which usually provides one main trunk and produces a more or less distinct and elevated head with many branches. For preservation purposes and canopy coverage calculation purposes, a tree shall measure no less than two inches in DBH.

Tree canopy means the branches, leaves, or other foliage from any tree measuring no less than two inches in DBH and shrubs measuring no less than five feet in height.

Tree canopy coverage means the area surrounding a tree or shrub located within the dripline.

Use means an activity on the land other than development including, but not limited to, commercial, residential, and industrial.

Virginia Stormwater Management Act means Article 1.1 (§10.1-603.1 et seq.) of Chapter 6 of Title 10.1 of the Code of Virginia.

Virginia Stormwater BMP Clearninghouse means a website of the same name that contains detailed design standards and specifications for control measures that may be used in the Commonwealth of Virginia to comply with the requirements of the Virginia Stormwater Management Act and associated regulations.

Water-dependent facility means a development of land that cannot exist outside of the resource protection area and must be located on the shoreline by reason of the intrinsic nature of its operation. The term water-dependent facilities includes, but is not limited to, the intake and outfall structures of water and sewer treatment plants and storm sewers, and public water oriented recreation areas.

Water quality volume means the volume equal to the first one-half inch of runoff multiplied by the impervious surface of the land development project.

Woody vegetation means and includes all trees and shrubs.

Sec. 35-3. Administration; context of zoning and subdivision ordinances.

(a) The director is charged with responsibility for the administration of this article unless the context clearly indicates otherwise. The director, at his or her discretion, may delegate authority to implement all, or specific parts, of this article.

(b) The stormwater management review team shall make a recommendation to approve, approve subject to conditions, or disapprove any land disturbing activity that is subject to this article and shall provide their findings to the director. Meetings of the SMRT will be advertised in compliance with applicable provisions of the Virginia Freedom of Information Act (§2.2-3700 et seq., Code of Virginia). Public comment will be received at such meetings and outside of these meetings in writing. Property owners within 150 feet of land disturbing activities that are the subject to review under this article will be mailed notification of applicable SMRT meetings at least 10 days prior to the meeting date.

(c) Administration of the site plan process shall be in accordance with article V, division 7 of this chapter, pertaining to site plans, or chapter 38, pertaining to subdivision.

(d) Permitted uses, conditional uses, special use permits, accessory uses, and special requirements shall be as established by the underlying zoning district, unless specifically modified or superseded by the requirements set forth in this article.

(e) Lot size shall be subject to the requirements of the underlying zoning district, provided that any lot shall have sufficient area outside the resource protection area established under this article to accommodate an intended development, in accordance with the criteria in section 35-10, when such development is not otherwise prohibited in the RPA.

Sec. 35-4. Stormwater management permit required; exemptions.

(a) *Stormwater management permit required.* Except as provided herein, no person may engage in any land disturbing activity, nor may any grading, building, or other permits for activities

involving land disturbing activities be issued, until a stormwater management permit has been issued by the director in accordance with the requirements set forth in this article.

(b) *Conditions of permit issuance.* No stormwater management permit shall be issued by the director until the following have been submitted to and approved by the director as prescribed herein:

(1) A site plan in accordance with the provisions of this article and chapter 48 and, if applicable a subdivision plan in accordance with the provision of this article and chapter 38.

(2) A general permit registration statement and evidence of general permit coverage.

(3) A stormwater management plan in accordance with section 35-5.

(4) An erosion and sediment control plan in accordance with section 35-14.

(5) A landscape conservation plan in accordance with section 35-17.

(6) For all development, redevelopment, or other land disturbing activity within an RPA, or within an environmentally sensitive area as determined by the director, or for an exception under section 35-11, a water quality impact assessment in accordance with section 35-12.

(c) *Relationship to floodplains.* Approval of a stormwater management permit shall not be construed to authorize the construction of any structure within the floodplain or to authorize any filling, grading or other change of the contour of such floodplain area without such permit, authorization or approval as may be required by section 48-612 et seq.

(d) *Stormwater pollution prevention plan.* The permittee must develop prior to the land disturbing activity, implement, and keep at the site for inspection a stormwater pollution prevention plan that meets the requirements set forth in section 35-8 and a pollution prevention plan that meets the requirements set forth in section 35-9.

(e) *Bonds, maintenance agreement, and fees.* No stormwater management permit shall be issued by the director until the bond and maintenance agreement requirements pursuant to section 35-18 have been met and the fees required to be paid pursuant to section 35-23 are received.

(f) *Exemptions for land disturbance of less than 2,500 square feet.* A land disturbing activity that results in a land disturbance of less than 2,500 square feet shall be exempt from this article except that the following shall apply:

(1) A land disturbing activity located within a resource protection area shall comply with the provisions of section 35-10.

(2) A land disturbing activity involving a direct connection to the City's stormwater conveyance system or the installation of a potable water or geothermal well shall obtain a stormwater management permit and may be subject to, at the discretion of the director, the provisions of section 35-5 (stormwater management plan) and section 35-14 (erosion and sediment control plan) or elements thereof.

(g) *Exemptions for land disturbance of less than one acre but 2,500 square feet or greater within the resource management area.* A land disturbing activity that results in a land disturbance of less than one acre but greater 2,500 square feet or greater within the resource management area shall be exempt from section 35-8 (stormwater pollution prevention plan), section 35-9 (pollution prevention plan), and the requirement to obtain a general permit in accordance with section 35-4(b)(2) unless otherwise required by the City Code or state or federal law.

(h) *Additional exemptions.* The following shall be exempt from the requirements of this article

unless otherwise required by the Falls Church Code or state or federal law:

(1) Discharges to a sanitary sewer.

(2) Routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original construction of a project. The paving of existing road with a compacted or impervious surface and re-establishment of existing ditches and shoulders is deemed routine maintenance if performed in accordance with this subsection.

(3) Conducting land disturbing activities in response to a public emergency where the related work requires immediate authorization to avoid imminent endangerment to human health or the environment. In such situations, the director shall be advised of the disturbance within seven days of commencing the land disturbing activity and compliance with this article shall be required within 30 days of commencing the land disturbing activity.

(4) Land disturbances associated with permitted or deep mining operations and projects, or oil and gas operations and projects conducted under the provisions of Title 45.1 of the Code of Virginia.

(5) Land clearing for agricultural or silvicultural purposes, and related activities, in accordance with section 10.1-603.8.C.2 of the Code of Virginia.

(6) Activities under a state or federal reclamation program to return an abandoned property to an agricultural or open land use.

Sec. 35-5. Stormwater management plan.

(a) *Plan contents.* The stormwater management plan must apply the stormwater management technical standards set forth in section 35-6 to the entire land disturbing activity, consider all sources of surface runoff and all sources of subsurface and groundwater flows converted to subsurface runoff, and include the following information:

(1) Information on the type and location of stormwater discharges; information on the features to which stormwater is being discharged including surface waters, and the pre-development and post-development drainage areas;

(2) Contact information including the name, address, and telephone number of the owner and the tax reference number and parcel number of the property or properties affected;

(3) A narrative that includes a description of current site conditions and final site conditions;

(4) A general description of the proposed stormwater management facilities and the mechanism through which the facilities will be operated and maintained after construction is complete;

(5) Information on the proposed stormwater management facilities including:

a. The type of facilities;

b. Location, including geographic coordinates;

c. Acres treated; and,

d. The surface waters into which the facility will discharge.

(6) Hydrologic and hydraulic computations, including runoff characteristics;

(7) Documentation and calculations verifying compliance with the water quality and quantity requirements of section 35-6;

(8) A map or maps of the site that depicts the topography of the site and includes:

a. All contributing drainage areas;

b. Existing streams, ponds, culverts, ditches, wetlands, other water bodies, and floodplains;

c. Soil types, forest cover, and other vegetative areas;

d. Current land use including existing structures, roads, and locations of known utilities and easements;

e. Sufficient information on adjoining parcels to assess the impacts of stormwater from the site on these parcels;

f. The limits of clearing and grading, and the proposed drainage patterns on the site;

g. Proposed buildings, roads, parking areas, utilities, and stormwater management facilities; and,

h. Proposed land use with tabulation of the percentage of surface area to be adapted to various uses, including but not limited to planned locations of utilities, roads, and easements.

(b) *Off-site compliance options.* If an operator intends to meet the water quality requirements set forth in section 35-6(b) through the use of off-site compliance options in accordance with section 35-6(c), then a letter of availability from the off-site provider must be included. Approved off-site options must achieve the necessary nutrient reductions prior to the commencement of the land disturbing activity except as otherwise allowed by §10.1-603.8:1 of the Code of Virginia.

(c) *Requirements for those preparing plans.* Elements of the stormwater management plans that include activities regulated under Chapter 4 (§54.1-400 et seq.) of Title 54.1 of the Code of Virginia shall be appropriately sealed and signed by a professional registered in the Commonwealth of Virginia pursuant to Article 1 (§54.1-400 et seq.) of Chapter 4 of Title 54.1 of the Code of Virginia.

(d) *Construction record drawing.* A construction record drawing for permanent stormwater management facilities shall be submitted to the director. The construction record drawing shall be appropriately sealed and signed by a professional registered in the Commonwealth of Virginia, certifying that the stormwater management facilities have been constructed in accordance with the approved plan.

Sec. 35-6. Stormwater management technical standards.

(a) *General stormwater management technical standards.* All land disturbing activities regulated pursuant to this article within the City shall comply with the following general technical standards.

(1) Land disturbance shall be limited to the area necessary to provide for the proposed use or development. In accordance with an approved grading plan, the limits of land disturbance, including clearing or grading, shall be strictly defined. These limits shall be clearly shown on submitted plans and physically marked on the development site.

(2) Existing indigenous vegetation and trees shall be preserved to the maximum extent practicable, consistent with the proposed use or development, in accordance with chapters 14 and 44, pertaining respectively to environment and vegetation, and as follows.

a. Existing trees over two inches in DBH and shrubs greater than five feet in height shall be preserved outside the approved construction footprint consistent with subsection (a)(1) of this section. Diseased or weakened trees, by age, storm, fire or other injury, may be required to be removed, by the director.

b. The regulation of any historic, specimen, street, park, memorial and other public trees shall be regulated in accordance with chapter 44, pertaining to vegetation. This may include the bonding of these types of trees in situations where the critical root zone (CRZ) or canopies extend onto the site.

c. Clearing shall be allowed only to provide necessary access, positive site drainage, water quality BMPs and the installation of utilities.

d. Tree preservation shall be in accordance with the City of Falls Church Tree Preservation Standards and Specifications. A copy of the approved plan and the specifications shall be kept on site at all times.

e. Prior to clearing and grading, tree preservation fencing, consistent with the City of Falls Church Tree Preservation Standards and Specifications, signs, or other such material may be required by the director. These preservation measures shall be installed to protect the CRZ of any woody vegetation to be preserved on the site, as well as to protect the CRZ of any woody vegetation trees on adjacent properties including rights-of-way that extend onto the site.

f. Tree preservation fencing shall remain in place throughout all phases of construction. Fencing shall not be removed until all construction equipment has left the site and written approval is granted by the director.

g. Exceptions may be granted to allow access to the site and work area, with specific conditions established by the director.

h. The storage of equipment, materials, debris, or fill shall not be allowed within the enclosure of the tree preservation fencing.

i. The applicant shall submit, in writing to the director, a verification that all required tree preservation fencing and required preservation measures have been completed. The director shall inspect and approve this verification, within three business days, prior to the issuance of any permits.

(3) Natural ground cover, especially woody vegetation, shall be used to the extent that is practicable, as it is most effective in holding soil in place and preventing site erosion. Adaptability to local conditions without the use of harmful fertilizers or pesticides, and the ability to filter runoff, make the use of indigenous vegetation preferable to non-indigenous plantings.

(4) Land development shall minimize impervious cover associated with the proposed use or development. Keeping impervious cover to a minimum enhances rainwater infiltration and effectively reduces stormwater runoff potential.

(b) *Water quality technical standards.* All land disturbing activities regulated pursuant to this article within the City shall comply with the following technical standards for water quality.

(1) New development. The total phosphorus load of a new development project shall not exceed 0.41 pounds per acre per year as calculated in accordance with this section.

(2) Development on prior developed lands.

a. Notwithstanding subsections b through f below, a regulated land disturbing activity involving a single family detached residential dwelling shall meet the applicable standard for new development.

b. For regulated land disturbing activities disturbing greater than or equal to one acre that result in no net increase in impervious cover from the pre-development condition, the total phosphorus load shall be reduced at least 20% below the pre-development total phosphorus load.

c. For regulated land disturbing activities disturbing less than one acre that result in no net increase in impervious cover from the pre-development condition, the total phosphorus load shall be reduced at least 10% below the pre-development total phosphorus load.

d. For land-disturbing activities that result in a net increase in impervious cover over the pre-development condition, the design criteria for new development shall be applied to the increased impervious area. Depending on the area of disturbance, the criteria of subdivisions b or c above shall be applied to the remainder of the site.

e. In lieu of subdivision d, the total phosphorus load of a linear development project occurring on prior developed lands shall be reduced 20% below the pre-development total phosphorus load.

f. The total phosphorus load shall not be required to be reduced below the applicable standard for new development.

(3) Compliance with subsections (1) and (2) above shall be determined using the Virginia Runoff Reduction Method and through the use of stormwater BMPs established in 4VAC50-60-65 or found at the Virginia BMP Clearinghouse website, except as may be limited by the director in accordance the provisions of 4VAC50-60-65.D.

(c) *Off-site water quality compliance options.*

(1) The director shall allow operators to utilize off-site compliance options to meet the requirements of subsection (b) above in accordance with 4VAC50-60-69 under the following conditions:

a. Less than five acres of land will be disturbed;

b. The post-construction phosphorus control requirement is less than 10 pounds per year; or,

c. At least 75% of the required phosphorus nutrient reductions are achieved on-site. If at least 75% of the required phosphorus nutrient reductions cannot be met on-site, and the operator can demonstrate to the satisfaction of the director that (i) alternative site designs have been considered that may accommodate on-site best management practices, (ii) on-site best management practices have been considered in alternative site designs to the maximum extent practicable, (iii) appropriate on-site best management practices will be implemented, and, (iv) full compliance with post-development nonpoint nutrient runoff compliance requirements cannot practicably be met on-site, then the required phosphorus nutrient reductions may be achieved, in whole or in part, through the use of off-site compliance options.

(2) The director may establish criteria in addition to those established in subsection (c)(1) of this section to allow an operator to use nutrient credits in accordance with §10.1-603.8:1 of

the Code of Virginia to meet required phosphorus reductions.

(3) Notwithstanding subsections (c)(1) and (c)(2) this subsection, offsite options shall not be allowed:

a. Unless the selected offsite option achieves the necessary nutrient reductions prior to the commencement of the land disturbing activity. In the case of a phased project, the operator may acquire or achieve offsite nutrient reductions prior to the commencement of each phase of land disturbing activity in an amount sufficient for each phase.

b. In contravention of local water quality-based limitations at the point of discharge that are consistent with the determinations made pursuant to subsection B of §62.1-44.19:7 of the Code of Virginia, contained in the City's MS4 program plan accepted by the Virginia Department of Environmental Quality, or as otherwise may be established or approved by the VSWCB.

(d) *Water quantity technical standards.* All land disturbing activities regulated pursuant to this article within the City shall comply with the following technical standards for water quantity.

(1) Channel protection. Concentrated stormwater flow shall be released into a stormwater conveyance system and shall meet the criteria in this section, where applicable, from the point of discharge to a point to the limits of analysis in subdivision d of this subsection.

a. Manmade stormwater conveyance systems. When stormwater from a development is discharged to a manmade stormwater conveyance system, following the land disturbing activity, either:

1. The manmade stormwater conveyance system shall convey the post-development peak flow rate from the two-year 24-hour storm event without causing erosion of the system. Detention of stormwater or downstream improvements may be incorporated into the approved land disturbing activity to meet these criteria, at the discretion of the director.

2. The peak discharge requirements for concentrated stormwater flow to natural stormwater conveyance systems in subdivision c shall be met.

b. Restored stormwater conveyance systems. When stormwater from a development is discharged to a restored stormwater conveyance system that has been restored using natural design concepts, following the land disturbing activity, either:

1. The development shall be consistent, in combination with other stormwater runoff, with the design parameters of the restored stormwater conveyance system that is functioning in accordance with the design objectives; or,

2. The peak discharge requirements for concentrated stormwater flow to natural stormwater conveyance systems in subdivision c shall be met.

c. Natural stormwater conveyance systems. When stormwater from a development is discharged to a natural stormwater conveyance system, the maximum peak flow rate from the one-year 24-hour storm following the land disturbing activity shall be calculated as follows:

$$Q_{Developed} \leq I.F*(Q_{Pre\text{-}developed}*RV_{Pre\text{-}developed})/RV_{Developed}$$

Under no condition shall $Q_{Developed}$ be greater than $Q_{Pre\text{-}developed}$ nor shall $Q_{Developed}$ be required to be less than that calculated in the equation $(Q_{Forest}*RV_{Forest})/RV_{Developed}$; where:

I.F. (Improvement Factor) equals 0.8 for sites > 1 acre or 0.9 for sites ≤ 1 acre.

$Q_{Developed}$ = The allowable peak flow rate of runoff from the developed site.

$RV_{Developed}$ = The volume of runoff from the site in the developed condition.

$Q_{Pre\text{-}developed}$ = The peak flow rate of runoff from the site in the pre-developed condition.

Q_{Forest} = The peak flow rate of runoff from the site in a forested condition.

RV_{Forest} = The volume of runoff from the site in a forested condition.

d. Limits of analysis. Unless subdivision c of this subsection is utilized to show compliance with the channel protection criteria, stormwater conveyance systems shall be analyzed for compliance with channel protection criteria to a point where either:

1. Based on land area, the site's contributing drainage area is less than or equal to 1.0% of the total watershed area; or,

2. Based on peak flow rate, the site's peak flow rate from the one-year 24-hour storm is less than or equal to 1.0% of the existing peak flow rate from the one-year 24-hour storm prior to the implementation of any stormwater quantity control measures.

(2) Flood protection. Concentrated stormwater flow shall be released into a stormwater conveyance system and shall meet one of the following criteria as demonstrated by use of acceptable hydrologic and hydraulic methodologies:

a. Concentrated stormwater flow to stormwater conveyance systems that currently do not experience localized flooding during the 10-year 24-hour storm event: The point of discharge releases stormwater into a stormwater conveyance system that, following the land disturbing activity, confines the post-development peak flow rate from the 10-year 24-hour storm event within the stormwater conveyance system. Detention of stormwater or downstream improvements may be incorporated into the approved land disturbing activity to meet this criterion at the discretion of the director.

b. Concentrated stormwater flow to stormwater conveyance systems that currently experience localized flooding during the 10-year 24-hour storm event: The point of discharge either:

1. Confines the post-development peak flow rate from the 10-year 24-hour storm event within the stormwater conveyance system to avoid the localized flooding. Detention of stormwater or downstream improvements may be incorporated into the approved land disturbing activity to meet this criterion at the discretion of the director.

2. Releases a post-development peak flow rate for the 10-year 24-hour storm event that is less than the pre-development peak flow rate from the 10-year 24-hour storm event. Downstream stormwater conveyance systems do not require any additional analysis to show compliance with flood protection criteria if this option is utilized.

c. Limits of analysis. Unless subsection b of this subsection is used to comply with the flood protection criteria, stormwater conveyance systems shall be analyzed for compliance with flood protection criteria to a point where:

1. The site's contributing drainage area is less than or equal to 1.0% of the total watershed area draining to a point of analysis in the downstream stormwater conveyance system;

2. Based on peak flow rate, the site's peak flow rate from the 10-year 24-hour storm event is less than or equal to 1.0% of the existing peak flow rate from the 10-year 24-hour storm event prior to the implementation of any stormwater quantity control measures; or,

3. The stormwater conveyance system enters a mapped floodplain or other flood-prone area, adopted in accordance with section 48-612 et seq.

(3) Increased volumes of sheet flow resulting from pervious or disconnected impervious areas, or from physical spreading of concentrated flow through level spreaders, must be identified and evaluated for potential impacts on down-gradient properties or resources. Increased volumes of sheet flow that will cause or contribute to erosion, sedimentation, or flooding of down gradient properties or resources shall be diverted to a stormwater management facility or a stormwater conveyance system that conveys the runoff without causing down gradient erosion, sedimentation, or flooding. If all runoff from the site is sheet flow and the conditions of this subsection are met, no further water quantity controls are required.

(4) For the purposes of computing pre-development runoff, all pervious lands on the site shall be assumed to be in good hydrologic condition in accordance with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) standards, regardless of conditions existing at the time of computation. Pre-development runoff calculations utilizing other hydrologic conditions may be utilized provided that it is demonstrated to and approved by the director that actual site conditions warrant such considerations.

(5) Pre-development and post-development runoff characteristics and site hydrology shall be verified by site inspections, topographic surveys, available soil mapping or studies, and calculations consistent with good engineering practices. Guidance provided in the Virginia Stormwater Management Handbook and by the Virginia Stormwater BMP Clearinghouse shall be considered appropriate practices.

(e) *Additional water quantity technical standards in the Four Mile Run watershed.* Notwithstanding the requirements of subsection (d), within the Four Mile Run watershed post-development peak runoff during a 100-year frequency storm shall not increase the peak runoff of the Four Mile Run Flood Control Channel as required by the City's contract with the United States Army Corps of Engineers.

(f) *Design storms and hydrologic methods.*

(1) The prescribed design storms are the one-year, two-year, and 10-year 24-hour storms using the site-specific rainfall precipitation frequency data recommended by the U.S. National Oceanic and Atmospheric Administration (NOAA) Atlas 14. Partial duration time series shall be used for the precipitation data.

(2) All hydrologic analysis shall be based on the existing watershed characteristics and how the ultimate development condition of the subject project will be addressed.

(3) The NRCS synthetic 24-hour rain distribution and models, including, but not limited to TR-55 and TR-20; hydrologic and hydraulic methods developed by the U.S. Army Corps of Engineers; or, other standard hydrologic and hydraulic methods, shall be used to conduct the analysis described in this section.

(4) For drainage areas of 200 acres or less, the Rational Method may be used for evaluating peak discharges. For drainage areas of 200 acres or less, the Modified Rational Method may be used for evaluating peak discharges.

(g) *Impounding structures.* Stormwater management wet ponds and extended detention dry ponds that are not covered by the Virginia Impounding Structure Regulations (4VAC50-20 et seq.) shall, at a minimum, be engineered for structural integrity for the 10-year storm event.

(h) *Grandfathering.* The following grandfathering shall apply to subsections (b) through (d) above as applicable.

(1) Until June 30, 2019, any land-disturbing activity for which a currently valid proffered or conditional zoning plan, preliminary or final subdivision plat, preliminary or final site plan or zoning with a plan of development, or any document determined by the director as being equivalent thereto, was approved by the director prior to July 1, 2012, and for which no coverage under the General Permit for Discharges of Stormwater from Construction Activities has been issued prior to July 1, 2014, shall be considered grandfathered and shall not be subject to the technical criteria of section 35-6, but shall be subject to the technical criteria in place at the time of approval for those areas of development that were included in the approval, provided that the director finds that such proffered or conditional zoning plan, preliminary or final subdivision plat, preliminary or final site plan or zoning with a plan of development, or any document determined by the director as being equivalent thereto, (i) provides for a layout and (ii) the resulting land-disturbing activity will be compliant with the requirements of the technical criteria in place at the time of approval. In the event that the director-approved document is subsequently modified or amended in a manner such that there is no increase over the previously approved plat or plan in the amount of phosphorus leaving each point of discharge of the land-disturbing activity through stormwater runoff, and such that there is no increase over the previously approved plat or plan in the volume or rate of runoff, the grandfathering shall continue as before.

(2) Until June 30, 2019, for locality, state, and federal projects for which there has been an obligation of locality, state, or federal funding, in whole or in part, prior to July 1, 2012, or for which the department has approved a stormwater management plan prior to July 1, 2012, such projects shall be considered grandfathered and shall not be subject to the technical criteria of section 35-6, but shall be subject to the technical criteria in place at the time of approval for those areas of development that were included in the approval.

(3) For land-disturbing activities grandfathered under subsections (1) and (2) of this section, construction must be completed by June 30, 2019, or portions of the project not under construction shall become subject to the technical criteria of section 35-6.

(4) In cases where governmental bonding or public debt financing has been issued for a project prior to July 1, 2012, such project shall be subject to the technical criteria in place at the time of approval.

(i) *Exceptions.* The director may grant exceptions to the technical requirements of this section provided that the exception is the minimum necessary to afford relief, reasonable and appropriate

conditions are imposed so that the intent of this article are preserved, granting the exception will not confer any special privileges that are denied in other similar circumstances, and exception requests are not based upon conditions or circumstances that are self-imposed or self-created. Economic hardship alone is not sufficient reason to grant an exception from the requirements of this article.

(1) Exceptions to the requirement that the land disturbing activity obtain required general permit shall not be given by the director, nor shall the director approve the use of a BMP not found on the Virginia Stormwater BMP Clearinghouse website, or any other control measure duly approved by the director of the Virginia Department of Environmental Quality.

(2) Exceptions to requirements for phosphorus reductions shall not be allowed unless offsite options otherwise permitted pursuant to subsection (c) and 4VAC50-60-69 have been considered and found not available.

Sec. 35-7. Stormwater management plan review.

(a) *Plan review.* The director shall review stormwater management plans and shall approve or disapprove a stormwater management plan according to the following:

(1) The director shall determine the completeness of a plan in accordance with section 35-5 and shall notify the applicant, in writing, of such determination, within 15 calendar days of receipt. If the plan is deemed to be incomplete, the above written notification shall contain the reasons the plan is deemed incomplete.

(2) The director shall have an additional 60 calendar days from the date of the communication of completeness to review the plan, except that if a determination of completeness is not made within the time prescribed in subdivision (1), then plan shall be deemed complete and the director shall have 60 calendar days from the date of submission to review the plan.

(3) The director shall review any plan that has been previously disapproved, within 45 calendar days of the date of resubmission.

(4) During the review period, the plan shall be approved or disapproved and the decision communicated in writing to the person responsible for the land-disturbing activity or his designated agent. If the plan is not approved, the reasons for not approving the plan shall be provided in writing. Approval or denial shall be based on the plan's compliance with the requirements of this article.

(5) If a plan meeting all requirements of this article is submitted and no action is taken within the time provided above in subdivision (2) for review, the plan shall be deemed approved.

(b) *Plan modifications.* Approved stormwater plans may be modified as follows:

(1) Modifications to an approved stormwater management plan shall be allowed only after review and written approval by the director. The director shall have 60 calendar days to respond in writing either approving or disapproving such request.

(2) The director may require that an approved stormwater management plan be amended, within a time prescribed by the director, to address any deficiencies noted during inspection.

Sec. 35-8. Stormwater pollution prevention plan.

(a) *Plan contents.* The SWPPP shall include the content specified by 4VAC50-60-54 and must also comply with the requirements and general information set forth in 4VAC50-60-1170, Section II of the general permit.

(b) *Plan amendments.* The SWPPP shall be amended by the operator whenever there is a change in design, construction, operation, or maintenance that has a significant effect on the discharge of pollutants to state waters which is not addressed by the existing SWPPP.

(c) *Location and availability of plan for review.* The SWPPP must be maintained by the operator at a central location onsite. If an onsite location is unavailable, notice of the SWPPP's location must be posted near the main entrance at the construction site. Operators shall make the SWPPP available for public review in accordance with Section II of the general permit, either electronically or in hard copy.

Sec. 35-9. Pollution prevention plan.

(a) *Plan contents, implementation, and amendments.* The pollution prevention plan shall include the content specified by 4VAC50-60-56, shall be developed, implemented, and updated as necessary, and must detail the design, installation, implementation, and maintenance of effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, such measures must be designed, installed, implemented, and maintained to:

(1) Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;

(2) Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater; and,

(3) Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

(b) *Prohibited discharges.* The pollution prevention plan shall include effective best management practices to prohibit the following discharges:

(1) Wastewater from washout of concrete, unless managed by an appropriate control;

(2) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials;

(3) Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and,

(4) Soaps or solvents used in vehicle and equipment washing.

(c) *Prohibitions on dewatering activities.* Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls.

Sec. 35-10. Chesapeake Bay preservation areas established.

(a) *Chesapeake Bay preservation areas.* All land within the City is designated as a Chesapeake Bay preservation area, which is divided into resource protection areas and resource management areas.

(b) *Resource protection areas.* Resource protection areas shall consist of the following lands described herein that have an intrinsic water quality value due to the ecological and biological processes they perform or are sensitive to impacts which may cause significant degradation to the quality of state waters:

(1) Nontidal wetlands connected by surface flow and contiguous to water bodies with perennial flow;

(2) Such other lands considered by the City to meet some or all of the criteria described in subsection (b) of this section, and considered to be necessary to protect the quality of state waters. Other lands to be included within the RPA are water bodies with perennial flow, all natural stream channels, and manmade open stream channels, as generally identified on the City's Chesapeake Bay preservation area (CBPA) map; and,

(3) A vegetated buffer area not less than 100 feet in width located adjacent to and landward of the components listed in subsections (b)(1) and (2) of this section, and along both sides of any water body with perennial flow. This distance shall be measured from the top of the stream bank or the edge of stream or wetland if there is no bank. Notwithstanding permitted uses, encroachments, vegetation clearing, waivers, nonconformities, exemptions, and exceptions as set forth in this section and section 35-11, the 100-foot-wide buffer area is never reduced in width.

The 100-foot buffer area shall be deemed to achieve a 75 percent reduction of sediments and a 40 percent reduction of nutrients.

(c) *Resource management areas.* Resource management areas shall consist of all land within the City’s corporate boundary that is not designated as resource protection areas.

(d) *Interpretation of resource protection area boundaries and delineation by the applicant.* The City's adopted CBPA map shows only the general location of the RPA and should be consulted by persons contemplating activities, modifications, or encroachments in the RPA. The specific boundaries of the RPA for each site or parcel shall be determined by the applicant as part of a stormwater management permit, water quality impact assessment, grading plan, demolition permit, building permit, site plan, subdivision plat, or any other application for land disturbance, and delineated on all submitted plans, subject to approval of the director and in accordance with this article. The identification of resource protection area boundaries shall be established by a land surveyor authorized to practice in the commonwealth, and be based on reliable, scientifically valid, and specific information, as approved by the director, from actual field evaluations of the site. The City CBPA map shall be used only as a guide to the general location of resource protection areas. The accuracy of the RPA boundary delineation submitted by the applicant, when in question, shall be verified by the director.

(e) *Permitted land disturbing activities within RPAs.* A land disturbing activity may be allowed in the resource protection area, subject to completion of a water quality impact assessment as required in section 35-12 and the approval of the director, only if it falls into one of the following use categories and meets all criteria and requirements of this article and those of the underlying zoning district and all other applicable city, state, and federal regulations:

(1) A new or expanded water-dependent facility may be allowed within a resource protection area provided that:

a. It does not conflict with the comprehensive plan;

b. Any nonwater-dependent component is located outside of resource protection areas; and,

c. Access will be provided with the minimum disturbance necessary, and where possible, a single point of access will be provided.

(2) Redevelopment shall be permitted in the resource protection area only if there is no increase in the amount of impervious cover and no further encroachment within the resource protection area.

(3) Roads and driveways not exempt in section 35-11 are not permitted unless each of the following conditions is met:

a. The director makes a finding that there are no reasonable alternatives to aligning the road or driveway in or across the resource protection area; and,

b. The alignment and design of the road or driveway are optimized, consistent with other applicable requirements, to minimize encroachment in the resource protection area and adverse effects on water quality.

(4) Flood control and stormwater management facilities that drain or treat water from multiple development projects or from a significant portion of a watershed may be allowed in resource protection areas, provided that:

a. The director has conclusively established that the location of the facility within the resource protection area is the optimum location;

b. The size of the facility is the minimum necessary to provide necessary flood control or stormwater treatment, or both;

c. The facility must be consistent with a stormwater management program that has been approved in accordance with 4VAC50-60-92 of the Virginia Stormwater Management Program permit regulations;

d. All applicable permits for construction in state or federal waters must be obtained from the appropriate state and federal agencies;

e. Routine maintenance is allowed to be performed on such facilities to assure that they continue to function as designed; and,

f. It is not the intent of this division to allow a best management practice that collects and treats runoff from only an individual lot or some portion of the lot to be located within a resource protection area.

(f) *Removal of vegetation in the resource protection area buffer area.* Indigenous vegetation may be removed from the RPA buffer area only as permitted by the director to provide for reasonable sight lines, access paths, general woodlot management, and best management practices, including those that prevent upland erosion and concentrated flows of stormwater, as follows. All requests for vegetation removal shall be submitted in writing to the director for evaluation.

(1) Trees may be pruned or removed as necessary subject to the written approval of the director to provide for sight lines and vistas, provided that, where removed, they shall be replaced with other vegetation that is equally effective in retarding runoff, preventing erosion, and filtering nonpoint source pollution from runoff.

(2) Any path shall be constructed and surfaced so as to effectively control erosion.

(3) Dead, diseased, or dying trees or shrubbery and noxious weeds (such as Johnson grass, kudzu, and multiflora rose) may be removed and thinning of trees may be allowed subject to the written approval of the director, pursuant to sound horticultural practice incorporated into locally adopted standards.

(4) For shoreline erosion control projects, trees and woody vegetation may be removed, necessary control techniques employed, and appropriate vegetation established to protect or stabilize the shoreline in accordance with the best available technical advice and applicable permit conditions or requirements.

(g) *Permitted encroachments into the buffer area.* Encroachments into the buffer area may be allowed only in accordance with this section.

(1) When the application of the buffer area would result in the loss of a buildable area or a lot or parcel recorded prior to October 1, 1989, encroachments into the buffer area may be allowed by the director, through an administrative process, and in accordance with the following criteria:

a. Encroachments into the buffer area shall be the minimum necessary to achieve a reasonable buildable area for a principal structure and necessary utilities;

b. Where practicable, a vegetated area that will maximize water quality protection, mitigate the effects of buffer encroachment, and is equal to the area of encroachment into the buffer area shall be established elsewhere on the lot or parcel; and,

c. The encroachment shall not extend into the seaward 50 feet of the buffer area.

(2) When the application of the buffer area would result in the loss of a buildable area on a lot or parcel recorded between October 1, 1989, and March 1, 2002, encroachments into the buffer area may be allowed by the director in accordance with the following criteria:

a. The lot or parcel was created as a result of a legal process conducted in conformity with the City's subdivision regulations;

b. Conditions or mitigation measures imposed through a previously approved exception shall be met;

c. If the use of a best management practice was previously required, the best management practice shall be evaluated to determine if it continues to function effectively, and if necessary, the best management practice shall be reestablished or repaired and maintained as required; and,

d. The criteria in subsection (g)(1) of this section shall be met.

(h) *Re-establishment of buffer areas.* The buffer area required in subsection (b)(2) of this section shall consist of vegetation that is effective in retarding runoff, preventing erosion, and filtering nonpoint source pollution from runoff. Where such vegetation is not sufficient to meet this purpose, it shall be established in accordance with this section.

(1) Where buffer areas are to be established, they shall consist of a mixture of shade trees, understory trees, shrubs and groundcovers. Density of the buffer shall be as described in the Riparian Buffers Modification and Mitigation Guidance Manual restoration and/or establishment tables.

(2) Vegetation shall be chosen from the City recommended lists of trees and/or native floodplain species. Wetland plantings, including herbaceous plantings, and/or wetland seed mix shall be

used where site conditions warrant. Plant materials and planting techniques shall be in accordance with The City of Falls Church Specifications for Planting.

(3) Where invasive plant species are present, the director may require their removal as part of the re-establishment of the buffer area.

Sec. 35-11. Chesapeake Bay preservation areas; administrative waivers, nonconformities, exemptions, and exceptions.

(a) *Limitations of this section.* The administrative waivers, nonconformities, exemptions, and exceptions in this section shall only apply to the requirements of section 35-10. All other requirements of this article shall apply unless otherwise exempted or granted an exception by the director.

(b) *Nonconforming structures.* Any structure or nonagricultural use that was legally established in accordance with the provisions of this Code and was in existence on the date of the adoption of the ordinance from which this article is derived, and made nonconforming by operation of this article, may continue and be maintained, but shall not be enlarged or expanded, with the exception that the director may grant a waiver for structures on legal nonconforming lots or parcels to provide for remodeling and alterations to such nonconforming structures. A nonconforming use development waiver shall become null and void if substantial work on the project has not commenced within 12 months of the date of permit issuance.

(c) *Reconstruction of preexisting structures.* It is not the intent of this division to prevent the reconstruction of preexisting structures within Chesapeake Bay preservation areas from occurring as a result of casualty loss, unless otherwise restricted by City ordinance. Such reconstruction shall occur within two years after the destruction or damage and there shall be no increase in the amount of impervious area and no further encroachment into the RPA, to the extent possible by sound engineering practices.

(d) *Administrative waivers for the expansion of preexisting structures.* An application for the expansion or modification of an existing legal principle structure on legal nonconforming lots or parcels may be approved by the director through an administrative process for additions to the existing legal principal structures, and additions of attached decks, garages, and other customary and incidental structures attached to the principal structure; provided the following findings are made:

(1) The request for the waiver is the minimum necessary to afford relief;

(2) Granting the waiver will not confer upon the applicant any specific privileges that are denied by this article to other property owners in similar situations;

(3) The waiver is in harmony with the purpose and intent of this article and does not result in a net increase in nonpoint source pollution load;

(4) The waiver is not based on conditions or circumstances that are self-created or self-imposed;

(5) Reasonable and appropriate conditions are imposed, as warranted, that will prevent the waiver from causing a degradation of water quality;

(6) Other findings, as appropriate and required by the City are met; and

(7) In no case shall this provision apply to accessory structures. Such requests shall be heard by the planning commission through the exceptions process described in subsection (g) of this section.

(e) *Exemptions for public utilities, railroads, public roads, and facilities.* The following shall be exempt provided that all state and federal requirements have been met.

(1) Construction, installation, operation, and maintenance of electric, natural gas, fiber-optic, and telephone transmission lines, railroads, and public roads and their appurtenant structures.

(2) The exemption of public roads and drives is further conditioned on the optimization of the road alignment and design, consistent with other applicable requirements, to prevent or otherwise minimize:

a. Encroachment in the resource protection area; and

b. Adverse effects on water quality.

(3) Construction, installation and maintenance of water, sewer, natural gas, and underground fiber-optic telecommunications and cable television lines owned, permitted, or both, by the city or regional service authority shall be exempt; provided that:

a. To the degree possible, the location of such utilities and facilities should be outside resource protection areas;

b. No more land shall be disturbed than is necessary to provide for the proposed utility installation; and,

c. All such construction, installation and maintenance of such utilities and facilities shall be in compliance with all applicable state and federal permits and designed and conducted in a manner that protects water quality.

(4) Passive recreation facilities such as boardwalks, trails and pathways; and historic preservation and archaeological activities may be exempt, as determined by the director, provided that any land disturbing activity exceeding an area of 2,500 square feet shall comply with the requirements of section 35-14.

(f) *Exceptions in Chesapeake Bay preservation areas.*

(1) *Requests for planning commission review.* Requests for exceptions to the requirements of section 35-10, permitted development or uses, modifications, and encroachments within resource protection areas, and requests for exceptions to modify nonconforming, or construct new, nonattached accessory structures and uses in the RPA buffer, as noted in subsection (d) of this section, shall be made, in writing, to the director within 30 calendar days of the director's official decision. This request shall identify the impacts of the proposed exception on water quality and on lands within the resource protection area through the performance of a water quality impact assessment, which complies with the provisions of section 35-12. The director will forward the request and the water quality impact assessment to the planning commission for its consideration. The City shall notify the affected public of any such exception requests and the planning commission shall consider these requests in a public hearing in accordance with Code of Virginia, §15.2-2204, except only one hearing shall be required.

(2) *Request for administrative review.* Requests for exceptions to provisions other than section 35-10, permitted development or uses, modifications, and encroachments within resource protection areas, and subsection (d) of this section. Exceptions to modify

nonconforming, or construct new nonattached accessory structures and uses in the RPA buffer, may be made in writing to the director for administrative review.

(3) *Evaluation criteria for administrative or planning commission review of exceptions as applied to subsections (f)(1) and (2) of this section*. The director or the planning commission shall review the request for an exception and the water quality impact assessment and may grant the exception with such conditions and safeguards as deemed necessary to further the purpose and intent of this division, and if the director or the planning commission finds that:

a. Granting the exception will not confer upon the applicant any special privileges denied by this article to other property owners in the overlay district;

b. The exception request is not based on conditions or circumstances that are self-created or self-imposed, nor does the request arise from conditions or circumstances either permitted or nonconforming that are related to adjacent parcels;

c. The exception request is the minimum necessary to afford relief;

d. The exception request will be in harmony with the purpose and intent of this article, not injurious to the neighborhood or otherwise detrimental to the public welfare, and is not of substantial detriment to water quality; and,

e. Reasonable and appropriate conditions are imposed which will prevent the exception request from causing a degradation of water quality.

If the director or the planning commission cannot make the required findings or refuses to grant the exception, the request for an exception together with the water quality impact assessment and the written findings and rationale for the decision shall be returned to the applicant.

Sec. 35-12. Water quality impact assessment.

(a) *When required.* A water quality impact assessment shall be required for any:

(1) Proposed land disturbance, development or redevelopment activity within the resource protection area;

(2) Buffer encroachment, as provided for in section 35-10; and,

(3) Other development in resource management areas if regarded as appropriate by the director due to unique site characteristics or the intensity of the proposed use or development and its potential impact on water quality.

(b) *Agreement in lieu of an assessment*. Where a land disturbing activity subject to this section results in less than 2,500 square feet of disturbance, an agreement in lieu of an assessment may be substituted for a water quality impact assessment if executed by the director.

(c) *Contents.* The requirements for the water quality impact assessment will vary depending on the magnitude of the proposed development project.

(1) The purpose of the water quality impact assessment is to identify the impacts of proposed development, redevelopment, or land disturbance on water quality, lands within the resource protection area, and other environmentally sensitive lands, and to determine specific measures for mitigation of these impacts. The water quality impact assessment must be of sufficient specificity to demonstrate compliance with the criteria of this article.

(2) A water quality assessment shall include a site drawing to scale which shows the following:

a. Location of the components of the RPA and the 100-foot buffer area measured from the top of the stream bank or edge of stream when there is no bank. The location of the RPA line shall be prepared and certified by a land surveyor authorized to practice in the commonwealth;

b. Location and nature of the proposed encroachment into the RPA buffer area, including:

1. Type of paving material;

2. Areas of clearing or grading;

3. Location of any structures, drives, or other impervious cover; and

4. Sewage disposal systems or other utilities;

c. Estimation of pre-development and post-development impervious surfaces on the site and stormwater calculations;

d. Type and location of proposed best management practices to mitigate the proposed encroachment and the location of existing and proposed runoff outfalls or drainage pathways from the property, including the location of erosion and sediment control devices such as silt fencing, stormwater inlet protection, and temporary soil storage; and

e. Pollutant load calculations to display that the vegetative buffer and/or best management practice will reduce the sediment load by 75 percent and nutrient load by 40 percent.

(3) Certain water quality impact requirements modifications are as follows:

a. Additional hydrogeological and other information may be required by the director if the size and scope of the proposed project is large enough to require additional analysis to ensure the protection of the CBPA.

b. Applicants for development and redevelopment of land or land disturbance within the RPA may apply, in writing, to the City engineer for a modification to the application requirements for a water quality impact assessment, described in this section.

Sec. 35-13. Water quality impact assessment review.

(a) *Submission and review.* Submission and review requirements for the water quality impact assessment are as follows:

(1) Five copies of all site drawings and other applicable information as required by this article shall be submitted to the director for review by the SMRT.

(2) All information required in this section shall be certified as complete and accurate by a professional engineer, architect, certified landscape architect or land surveyor licensed in Virginia pursuant to Article 1 (§54.1-400 et seq.) of Chapter 4 of Title 54.1 of the Code of Virginia.

(3) As part of any water quality impact assessment submittal, the SMRT may require review by the Northern Virginia Regional Commission or the Virginia Department of Environmental Quality. Any comments will be incorporated into the final review by the SMRT, provided that such comments are provided within 30 days of the request.

(b) *Evaluation.* The evaluation procedure for the water quality impact assessment is as follows:

(1) Upon the completed review of a water quality impact assessment and the landscape conservation plan, the SMRT will determine if any proposed encroachment into the buffer area is consistent with the provisions of this article and make a recommendation to the director based on the following criteria:

a. The necessity of the proposed encroachment and the ability to place improvements elsewhere on the site to avoid disturbance of the buffer area;

b. Impervious surfaces are minimized;

c. Proposed mitigation measures, including the landscape conservation plan and site design, result in minimal disturbance to all components of the RPA, including the 100-foot buffer area;

d. Proposed mitigation measures will work to retain all buffer are functions, pollutant removal, erosion and runoff control;

e. Proposed best management practices, where required, achieve the requisite reductions in pollutant loadings;

f. The development as proposed, meets the purpose and intent of this division;

g. The cumulative impact of the proposed development, when considered in relation to other development in the vicinity, both existing and proposed, will not result in a significant degradation of water quality;

h. Within any RPA, the proposed development is water-dependent or redevelopment; and

i. The development will not result in significant disruption of the hydrology of the site.

(2) The director shall require additional mitigation where potential impacts have not been adequately addressed. Evaluation of mitigation measures will be made based on the criteria listed in this subsection.

(3) The director shall find the proposal to be inconsistent with the purpose and intent of this article when the impacts created by the proposal cannot be mitigated.

Sec. 35-14. Erosion and sediment control plan.

(a) *Plan contents.* The erosion and sediment control plan shall be of sufficient detail to demonstrate, to the satisfaction of the director, compliance with the provisions of section 35-15 and with the Virginia Erosion and Sediment Control Handbook, whichever is more restrictive. The plan may be contained on a separate sheet or included with the drainage or grading plan submitted as a part of the development plans required in chapter 6, pertaining to buildings, chapter 28, pertaining to subdivisions, or chapter 48, pertaining to zoning.

(b) *Requirements for those preparing plans*. The plan must be prepared and certified by a professional engineer, architect, certified landscape architect or land surveyor licensed in Virginia pursuant to Article 1 (§54.1-400 et seq.) of Chapter 4 of Title 54.1 of the Code of Virginia.

(c) *Agreement in lieu of a plan*. Where a land disturbing activity results from the construction of a single-family residence, an agreement in lieu of a plan may be substituted for an erosion and sediment control plan if executed by the director.

(d) *Applicability to state agencies.* Any state agency that undertakes a project involving a land disturbing activity shall have the erosion and sediment control plan approved by the Virginia Soil and Water Conservation Board or Virginia Department of Environmental Quality, as appropriate.

(e) *Applicability to multi-jurisdictional activities*. Any person whose land disturbing activities involve lands which extend into the jurisdiction of another local erosion and sediment control program shall have either an erosion and sediment plan approved by the Virginia Soil and Water Conservation Board, or Fairfax County or Arlington County or the City. Such persons shall comply with the requirements of section 35-18 concerning an installation and maintenance agreement and bond.

(f) *Responsibility of owner of the land when activity is conducted by contractor.* Whenever a land disturbing activity is proposed to be conducted by a contractor performing construction work pursuant to a construction contract, the preparation, submission and approval of the required erosion and sediment control plan shall be the responsibility of the owner of the land.

(g) *Wetland mitigation banks.* In accordance with the procedure set forth in Code of Virginia, §10.1-563.E, any person engaging in the creation and operation of wetland mitigation banks in multiple jurisdictions, which have been approved and are operated in accordance with applicable federal and state guidance, laws or regulations for the establishment, use and operation of mitigation banks pursuant to a permit issued by the state department of environmental quality, the marine resources commission or the U.S. Army Corps of Engineers, may at the option of that person, file general erosion and sediment control specifications for wetland mitigation banks annually with the Virginia Soil and Water Conservation Board for review and approval consistent with guidelines established by the Virginia Department of Environmental Quality.

(h) *Responsible land disturber*. The responsible land disturber shall be designated prior to land disturbing activity. In addition, as a prerequisite to engaging in the land disturbing activities shown on the approved plan, the person responsible for carrying out the plan shall provide the name of an individual holding a certificate of competence to the program authority, as provided by Code of Virginia, §10.1-561, who will be in charge of and responsible for carrying out the land disturbing activity. However, the director may waive the certificate of competence requirement for an agreement in lieu of a plan for construction of a single-family residence. If a violation occurs during the land disturbing activity, then the person responsible for carrying out the agreement in lieu of a plan shall correct the violation and provide the name of an individual holding a certificate of competence, as provided by Code of Virginia, §10.1-561. Failure to provide the name of an individual holding a certificate of competence prior to engaging in land disturbing activities may result in revocation of the approval of the plan and the person responsible for carrying out the plan shall be subject to the penalties as provided in this article.

Sec. 35-15. Erosion and sediment control technical standards.

(a) *Applicability of Virginia Erosion and Sediment Control Regulations.* The more stringent of the erosion and sediment control performance standards contained in this section, or those contained in the Virginia Erosion and Sediment Control Regulations, 4VAC 50-30-40, shall apply to all applications for development, redevelopment, or land disturbance that will disturb 2,500 square feet of land or more. Such standards shall also apply to all applications for development, redevelopment, or land disturbance within RPAs, regardless of the amount of land disturbance.

(b) *Stabilization of denuded areas and soil stockpiles.*

(1) Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site. Temporary soil stabilization shall also be applied within seven days to denuded areas which may not be at final grade but will remain dormant (undisturbed) for longer than 30 days. Permanent soil stabilization shall be applied to areas that are to be left dormant for more than one year. Soil stabilization refers to measures which protect soil from the erosive forces of raindrop impact and flowing water. Applicable practices include vegetative establishment, mulching and the early application of gravel base on areas to be paved. Soil stabilization measures should be selected to be appropriate for the time of year, site conditions, and estimated duration of use.

(2) During construction of the project soil stockpiles shall be sterilized or protected with sediment-trapping measures to prevent soil loss. The applicant is responsible for the temporary protection and permanent stabilization of all soil stockpiles on site as well as soil transported from the project site.

(c) *Establishment of permanent vegetation.* A permanent and appropriate vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that, in the opinion of the director, is uniform enough to control soil erosion satisfactorily and to survive severe weather conditions.

(d) *Protection of adjacent properties.* Properties adjacent to the site of a land disturbance shall be protected from sediment deposition. This may be accomplished by preserving a well-vegetated buffer strip around the lower perimeter of the land disturbance, by installing perimeter controls such as sediment barriers, filters, dikes, sediment basins or by a combination of such measures. Vegetated buffer strips may be used alone only where runoff in sheet flow is expected. Buffer strips should be at least 20 feet in width. If at any time it is found that a vegetated buffer strip alone is ineffective in stopping sediment movement onto adjacent property, additional perimeter controls must be provided.

(e) *Timing and stabilization of sediment-trapping measures.* Sediment basins and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment on-site must be constructed as a first step in grading and be made functional before upslope land disturbance takes place. Earthen structures such as dams, dikes and diversions must be seeded and mulched immediately after installation.

(f) *Sediment basins.* Stormwater runoff from drainage areas with three acres or greater disturbed area must pass through a sediment basin. The sediment basin shall be designed and constructed to accommodate the anticipated sediment loading from the land disturbing activity. The outfall device or system design shall take into account the total drainage area flowing through the disturbed area to be served by the basin. The director may require sediment basins or traps for smaller disturbed areas where deemed necessary.

(g) *Cut and fill slopes.* Cut and fill slopes must be designed and constructed in a manner which will minimize erosion. Consideration must be given to the length and steepness of the slope, the soil type, upslope drainage area, groundwater conditions and other applicable factors. Slopes which are found to be eroding excessively within one year of permanent stabilization must be provided with additional slope stabilizing measures until the problem is corrected. Any bond may be held until the expiration of one year after permanent stabilization is established or longer, if the director determines further stabilization or measures are required. The following guidelines are provided to aid site planners and plan reviewers in developing an adequate design:

(1) Roughened soil surfaces are generally preferred to smooth surfaces on slopes.

(2) Diversions should be constructed at the top of long, steep slopes which have significant drainage areas above the slope. Diversion or terraces may also be used to reduce slope length.

(3) Concentrated stormwater should not be allowed to flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume or slope drain structure.

(4) Wherever a slope face crosses a water seepage plain which endangers the stability of the slope, adequate drainage or other protection should be provided.

(h) *Storm sewer inlet protection.* All storm sewer inlets which are made operable during construction shall be protected so that sediment-laden water will not enter the conveyance system without first being filtered or otherwise treated to remove sediment.

(i) *Working in or crossing watercourses.*

(1) Construction vehicles should be kept out of watercourses to the extent possible. Where in-channel work is necessary, precautions must be taken to stabilize the work area during construction to minimize erosion. The channel (including bed and banks) must always be restabilized immediately after inchannel work is completed.

(2) Where a live (wet) watercourse must be crossed by construction vehicles more than twice in any six-month period during construction, a temporary stream crossing constructed of nonerodible materials must be provided.

(3) When work in a live watercourse is performed, precautions shall be taken to minimize encroachment, control sediment transport and stabilize the work area to the greatest extent possible during construction. Nonerodible material shall be used for the construction of causeways and cofferdams. Earthen fill may be used for these structures if armored by nonerodible cover materials.

(4) All applicable federal, state, and local regulations pertaining to working in or crossing live watercourses shall be met.

(5) The temporary crossing shall be removed as soon as possible and the stream shall be restored to its pre-development state, or to a condition of appropriate vegetation, as established by the director and the director.

(j) *Underground utility construction.*

(1) The construction of nonexempt underground utility lines shall be subject to the following criteria:

a. No more than 100 feet of trench are to be opened at one time.

b. Where consistent with safety and space considerations, excavated material is to be placed on the uphill side of trenches.

c. Effluent from dewatering operations shall be filtered or passed through an approved sediment-trapping device, or both, and discharged in a manner that does not adversely affect flowing streams or off-site property.

d. Restabilization shall be accomplished in accordance with these regulations.

e. Applicable safety regulations shall be complied with.

(2) Nonexempt utility construction includes the installation, maintenance or repair of all utilities which disturb more than 10,000 square feet except:

a. Individual service connections.

b. Underground public utility lines under existing hard-surfaced roads, streets or sidewalks, provided such land disturbing activity is confined to the area which is hard-surfaced.

(k) *Construction access routes.* Wherever construction vehicle access routes intersect paved public roads, provisions must be made to eliminate the transport of sediment (mud) by runoff or vehicle tracking onto the paved surface. Where sediment is transported onto a public road surface, the roads shall be cleaned immediately and cleaned thoroughly at the end of each day. Sediment shall be removed from roads by shoveling or sweeping and be transported to a sediment controlled disposal area. Street washing shall be allowed only after sediment is removed in this manner. This provision shall apply to individual subdivision lots as well as to larger land disturbing activities.

(l) *Disposition of temporary measures.* All temporary erosion and sediment control measures shall be disposed of within 30 days after final site stabilization is achieved or after the temporary measures are no longer needed, unless otherwise authorized by the director. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

(m) *Maintenance.* All temporary and permanent erosion and sediment control practices must be maintained, inspected, and repaired as needed to assure continued performance of their intended function. A statement describing the maintenance responsibilities of the permittee shall be included in the approved erosion and sediment control plan.

(1) The Virginia Erosion and Sediment Control Handbook, Second Edition, 1980, or current edition shall be used by any applicant making a submittal under this article and by the director in review and consideration of the adequacy of any erosion and sediment control plan submitted.

(2) This article and the Virginia Erosion and Sediment Control Handbook, Second Edition, 1980, or current edition shall be an integral part of the City's erosion and sediment control program and shall comprise the City's Erosion and Sediment Control Handbook.

(n) *Dormant land use activities.* Should a land disturbing activity cease for more than 180 days, the director shall evaluate the existing approved erosion and sediment control plan to determine whether the plan still satisfies local and state erosion and sediment control criteria and to verify that all design factors are still valid. If the director finds the previously filed plan to be inadequate, a modified plan shall be submitted and approved prior to the resumption of land disturbing activity.

(o) *Exemptions for certain agricultural, horticultural, or forest management activities.* Any person who owns, occupies, or operates private agricultural, horticultural, or forest lands shall not be deemed to be in violation of this article for land disturbing activities, which result from the tilling, planting, or harvesting of agricultural, horticultural or forest crops or products or engineering operations such as the construction of terraces, terrace outlets, check dams, desilting basins, floodwater retarding structures, channel improvements, floodways, dikes, ponds, ditches and the like; the utilization of strip cropping, lister furrowing; land drainage; land irrigation, seeding and planting of waste, sloping, abandoned, or eroded lands and grasses; forestation and

reforestation; rotation of crops; soil stabilization with trees, grasses, legumes, and other thick growing, soil holding crops; retardation of runoff by increasing absorption of rainfall; and retirement from cultivation of steep, highly erosive areas and areas now badly gullied or otherwise eroded.

(p) *Exceptions and modifications.* The director may provide an exception or modification of the requirements of this section that are deemed inappropriate or too restrictive for site conditions. Exceptions may be granted under these conditions:

(1) At the time of plan submission, an applicant may request a modification to become part of the approved erosion and sediment control plan. The applicant shall explain the reasons for requesting modifications in writing. Specific modifications which are allowed by the director shall be documented in the plan.

(2) During construction, the person responsible for implementing the approved plan may request a modification in writing from the director. The director shall respond in writing either approving or disapproving such a request. If the director does not approve a modification within ten days of receipt of the request, the request shall be considered to be disapproved. Following disapproval, the applicant may resubmit a modification request with additional documentation.

(3) The director shall consider modification requests judiciously, keeping in mind both the need of the applicant to maximize cost effectiveness and the need to protect offsite properties and resources from damage.

(4) The department of public works shall file a quarterly report on significant complaints filed under this section and on any modifications granted. The report shall summarize the complaint, the determination of the director on its merits, and any required corrective action. A copy of the quarterly report shall be transmitted to the planning director who shall transmit it to the planning commission.

Sec. 35-16. Erosion and sediment control plan review.

(a) *Plan review.* The director shall approve, within 60 days, the erosion and sediment control plan if such plan satisfies the following standards:

(1) The development plan shall be fitted to the topography and soils so as to create the least erosion potential.

(2) Wherever feasible, allowing for development permitted in the zoning district in which the land is situated, natural vegetation shall be retained and protected. If necessary to accomplish the purposes of this section, the director may increase the coverage restrictions contained in other sections of this chapter to the extent necessary to accomplish the purposes of this section.

(3) Provisions shall be made to effectively accommodate the increased runoff caused by changed soil and surface conditions during and after development.

(4) Sediment basins and similar structural measures shall be installed below high sediment-producing areas to remove sediment from runoff waters from land undergoing development. The owner or his agent shall make provision for regular inspection of these devices after every period of heavy rainfall; if more than 30 percent of the collecting volume is used up, the owner or agent shall cause accumulated silt to be removed therefrom.

(5) The plan shall establish the construction schedule and the sequence for installing protective measures and facilities and shall include provisions for the following:

a. The smallest practicable area of land shall be exposed at any one time through appropriate planning and sequential phasing at development.

b. All erosion and siltation control structures shall be placed prior to or as the first step in grading.

c. Special measures shall be provided to protect any disturbed area not paved, sodded or built upon by the November 1 in each year by seeding, mulching or other appropriate means.

(6) Conservation practices for erosion and sediment control shall equal or exceed the specifications of those contained in the Virginia Erosion and Sediment Control Handbook and any amendments thereto.

(b) The director shall act on all plans submitted to it within 45 days from receipt thereof by either approving such plan in writing or by disapproving such plan in writing and giving the specific reasons for disapproval. When a plan submitted for approval, pursuant to this article, is found upon review by the director to be inadequate, the director shall specify such modifications, terms, and conditions as will permit approval of the plan and shall communicate these requirements to the applicant. If no action is taken by the director within the time specified in this section, the plan shall be deemed approved and the permit issued; provided, that the bond required in section 35-18 has been deposited.

(c) *Plan modifications.* An approved plan may be changed by the director in the following cases:

(1) Where inspection has revealed the inadequacy of the plan to accomplish the erosion and sediment control objectives of the plan, and appropriate modifications to correct the deficiencies of the plan are specified by the director; or

(2) Where the person responsible for carrying out the approved plan finds that because of changed circumstances or for other reasons the approved plan cannot be effectively carried out, and proposed amendments to the plan, consistent with the requirements of this article, are agreed to by the director and the person responsible for carrying out the plan.

Sec. 35-17. Landscape conservation plan.

(a) All development, redevelopment, or land disturbance subject to this article shall include a landscape conservation plan. No stormwater management permit shall be approved without an approved landscape conservation plan. The landscape conservation plan shall include a scaled drawing, shall meet all of the requirements of this section, and shall be prepared and/or certified by a landscape architect, arborist, and/or horticulturalist.

(b) *Preliminary vegetative survey.* The plan shall include a preliminary vegetative survey of all existing trees on the site, measuring at least two inches in DBH and shrubs that are greater than five feet in height. A chart shall be provided showing common and botanical name, size, condition, life expectancy, and required preservation measures of all woody vegetation. All trees shall be identified by an International Society of Arboriculture (ISA) certified arborist.

(c) *Existing vegetation preservation plan.* The plan shall include an existing vegetation preservation component that shall illustrate any grade changes or other work adjacent to trees that would affect them adversely. Specifications shall be provided showing how grade, drainage

and aeration will be maintained around vegetation to be preserved to ensure the protection of existing trees and other woody vegetation during clearing, grading and all phases of construction.

(1) Locations of tree preservation fencing, root pruning and other required tree preservation measures shall be shown on the plan.

(2) Proposed vegetation to be removed to create the desired construction footprint shall be clearly illustrated on the plan and labeled as "to be removed." Vegetation to be preserved outside the building envelope shall be shown on the plan and labeled as "to be preserved."

(3) The location of the critical root zone (CRZ) of any vegetation shown on the plan or located on adjacent properties, including City rights-of-way, where the critical root zone (CRZ) extends onto the site, shall be shown on the plan.

(4) Tree canopy coverage calculations provided by woody vegetation pre-development and post-development and/or redevelopment on the site shall be shown on the plan along with the driplines.

(5) The City of Falls Church Tree Standards and Specifications for Planting shall be included on the plan.

(6) Within the RPA buffer, trees and other woody vegetation to be removed for sight lines, vistas, access paths, best management practices, and shoreline stabilization projects shall be shown on the plan.

(d) *Landscape revegetation plan.* The plan shall include a landscape revegetation component that illustrates the proposed locations of vegetation that is required by this article and section 48-1180, tree canopy coverage required on residential lots zoned R1-A, low density and R1-B medium density.

(1) A chart shall be provided listing canopy coverage calculations and any required replacement canopy coverage vegetation pursuant to section 48-1180, tree canopy coverage required on residential lots zoned R1-A, low density and/or R1-B medium density.

(2) A landscape schedule shall be provided that lists species, size, quantity, root condition and any credited tree canopy coverage pursuant to section 48-1180, shall be shown on the plan.

(3) The planting of woody vegetation shall be in accordance with locally approved specifications and these specifications and details shall be included on the plan.

(4) Any required RPA buffer shall be clearly delineated and any woody vegetation to be added to establish, supplement or replace existing vegetation within the RPA buffer, as required under this Code, shall be shown on this plan.

Sec. 35-18. Bonding requirements; installation and maintenance agreement.

(a) *When bonds and inspections required pertaining to site plans*. All development, land disturbance, and redevelopment in an RPA or RMA shall be subject to the bond and inspection provisions, pursuant to sections 48-1143 and 48-1144, pertaining to site plans.

(b) *When bonds required pertaining to stormwater management permit*. Prior to approval of a stormwater management permit, there shall be executed by the owner or his agent and submitted with the permit an agreement in form and substance as approved by the City to establish the measures provided for on the stormwater management plan and erosion and sediment control

plan together with a cash bond to be deposited and held in escrow by the City, and no interest shall be paid by the City for any funds held in escrow. The agreement and bond shall be provided to ensure the installation, maintenance and performance of such measures. The bond shall be in the amount of the estimated cost of such measures as determined by certified cost estimates submitted by the applicant's engineer or land surveyor and approved by the director. The minimum amount of bond to be posted is to be $750.00. In any case where the director rejects any such agreement or bond, the owner or agent of the owner may appeal from such decision first to the City Manager and, if not resolved at that level, should then appeal to the City Council; provided the owner or agent of the owner has paid to the City the required filing fee.

(c) *When bond released.* After achieving the components required by the erosion and sediment control plan and stormwater management plan for which the City has issued a permit and received a bond as required by this section, the owner or agent of the owner may apply to the director in writing for a certificate of completion and discharge of the unexpended or unobligated portion of such bond. If the work is found by the director to conform to the approved plan provided for in section 35-5 and section 35-101 and other applicable regulations and City ordinances, such director shall issue the certificate and release of bond within 60 days of receipt of the application.

(d) *Stormwater management system maintenance.* The owner of any component of the stormwater management system shall provide adequate maintenance to ensure that the system functions as designed.

(1) The owner shall enter into a maintenance agreement with the City that outlines facility-specific maintenance requirements. The maintenance agreement shall be set forth in an instrument recorded in the land records and shall provide all necessary provisions to ensure compliance with this section, including all necessary access to the property for the purposes of maintenance and regulatory inspections. Maintenance agreement forms shall be prepared in a format acceptable to the Director and the City Attorney.

(2) The maintenance agreement shall require that the owner prepare and submit an annual certification of maintenance to the City.

a. Certification shall be made by a registered engineer or licensed surveyor (qualified to perform such routine inspections) using a certification of maintenance form provided by the director. However, the director may specify that other individuals other than a registered engineer or licensed surveyor may provide certification at his discretion.

b. Such certification shall state the general condition of the facility and also state whether the infrastructure is functioning properly as originally designed.

c. If the facility is not functioning as designed, a plan for proposed remedial actions and a timeline for completion shall be noted in the certification report. The plan and timeline for completion are subject to the approval of the director. If the director determines that the proposed plan and timeline for completion is insufficient to protect the public health, safety, and welfare, the owner of the facility must either submit a new plan and timeline, or alternatively, the director may take action in accordance with section 35-22. Once remedial actions have been completed, the owner shall submit a new certification in accordance with this subsection.

Sec. 35-19. Appeals and hearings.

(a) *Appeals.*

(1) Final decisions of the Director under this article shall be in writing and be subject to review by the City Manager. Any appeal shall be filed with the City Manager within 30 days from the date of any written decision by the director that adversely affects the rights, duties, or privileges of the persons engaging in or proposing to engage in land disturbing activities.

(2) All appeals must be written and must contain sufficient information to acquaint the City Manager with the facts involved.

(3) The City Manager, as part of his review, will notify and seek advice and recommendations from appropriate boards and commissions. The City Manager shall hear the appeal, and render a written decision within 30 working days of receipt of the notice of appeal. An appeal stays all compliance with the action being appealed, unless the director certifies to the City Manager that by reason of stated facts a stay would, in the opinion of the director, cause imminent endangerment to life or property. In such cases, compliance shall not be stayed other than by a restraining order which may be granted by the City Manager, or by a court of record, on application and on due cause shown.

(4) A final decision of the City Manager may be appealed to the City Council, provided that a written appeal is filed with the City Manager within 30 days after the date of his decision.

(5) An appeal by any person aggrieved by any decision of the City Council relative to the administration of this article shall be made to a court of record. An appeal shall be made within 30 working days from the date of the issuance of the City Council's written decision, by filing with a court of record.

(b) *Hearings.*

(1) Any applicant, or person subject to this article aggrieved by any action of the City taken without a formal hearing, or by inaction of the City, may demand in writing a formal hearing by the City Council, provided a petition requesting such hearing is filed with the director within 30 days after notice of such action is given by the director.

(2) The hearings held under this section shall be conducted by the City Council at a regular or special meeting of the City Council or by at least one member of the City Council designated by the City Council to conduct such hearings on behalf of the City Council at any other time and place authorized by the City Council.

(3) A verbatim record of the proceedings of such hearing shall be taken and filed with the City Council. Depositions may be taken and read as in actions at law.

(4) The City Council or its designated member, as the case may be, shall have power to issue subpoenas and subpoenas duces tecum, and at the request of any party shall issue such subpoenas. The failure of a witness without legal excuse to appear or testify or to produce documents shall be acted upon by the town whose action may include the procurement of an order of enforcement from the circuit court. Witnesses who are subpoenaed shall receive the same fees and reimbursements for mileage as in civil actions.

Sec. 35-20. Monitoring and inspections.

(a) *General monitoring and inspection requirements.* The director shall inspect any land-disturbing activity during construction for:

(1) Compliance with the approved stormwater management plan;

(2) Compliance with the approved erosion and sediment control plan;

(3) Development, updating, and implementation of a stormwater pollution prevention plan and pollution prevention plan; and,

(4) Development and implementation of any additional control measures necessary to address a TMDL.

(b) *Entry upon property; enforcement generally.* The director may, at reasonable times and under reasonable circumstances, enter any establishment or upon any property, public or private, for the purpose of obtaining information or conducting surveys or investigations necessary in the enforcement of this article.

(c) *Entry upon property; failure to take action after proper notice.* In accordance with a performance bond with surety, cash escrow, letter of credit, any combination thereof, or such other legal arrangement or instrument, the director may also enter any establishment or upon any property, public or private, for the purpose of initiating or maintaining appropriate actions which are required by the permit conditions associated with a land-disturbing activity when a permittee, after proper notice, has failed to take acceptable action within the time frame specified.

(d) *Furnishing materials, plans, specifications, etc.* Pursuant to section 10.1-603.12:2 of the Code of Virginia, the director may require every stormwater management permit applicant or permittee, or any such person subject to the requirements of this article, to furnish when requested such application materials, plans, specifications, and other pertinent information as may be necessary to determine the effect of his discharge on the quality of state waters, or such other information as may be necessary to accomplish the purposes of this article.

(e) *Additional requirements for erosion and sediment control.* The director may require at his sole discretion monitoring and reports from the person responsible for carrying out the erosion and sediment control plan, to ensure compliance with the approved plan and to determine whether the measures required in the plan are effective in controlling erosion and sediment. The owner, permittee, or person responsible for carrying out the plan shall be given notice of the inspection. If the director determines that there is a failure to comply with the plan, notice shall be served upon the permittee or person responsible for carrying out the plan by registered or certified mail to the address specified in the permit application or in the plan certification, or by delivery at the site of the land disturbing activities to the agent or employee supervising such activities. The notice shall specify the measures needed to comply with the plan and shall specify the time within which such measures shall be completed. Upon failure to comply within the time specified, the permit may be revoked and the permittee or person responsible for carrying out the plan shall be deemed to be in violation of this article and shall be subject to the penalties provided by section 35-22. The owner/occupant as operator shall be given an opportunity to accompany the inspector. The City shall be permitted to inspect the site at any time during the course of the project. Inspections are, at a minimum, to be made at the following times:

(1) Immediately following initial installation of erosion and sediment controls;

(2) At least once in every two-week period;

(3) Within 48 hours following a runoff producing storm event; and

(4) At the completion of the project prior to the release of any performance bonds.

(f) *Post-construction inspection of stormwater management facilities.* The director shall, at reasonable times and under reasonable circumstances, inspect post-construction stormwater management facilities required under the provisions of this article on a schedule determined sufficient by the director except that such an inspection shall occur at least once every five years.

Sec. 35-21. Prohibition against illicit discharges.

(a) *Prohibited discharges*. It shall be unlawful to:

(1) Cause or allow illicit discharges to the stormwater management system or state waters;

(2) Cause a connection to the stormwater management system that will or has the potential to allow for an illicit discharge to enter the system; or,

(3) Violate any permit granted for stormwater discharges.

(b) *Discharges permitted by a VPDES or VSMP permit or waiver*. The prohibition in subsection (a) shall not apply to a discharge permitted under a VPDES or VSMP permit or waiver, provided that the discharge is in full compliance with all requirements of the VPDES or VSMP permit or waiver as well as any other applicable laws or regulations pertaining to the discharge.

(c) *Unpermitted or unapproved connections.* Causing any new connection to the stormwater management system that is not approved in accordance with a stormwater management permit, or is not otherwise approved by the director if it is not part of a regulated land disturbing activity, shall be considered an illicit discharge for the purpose of this article.

(d) *Erosion impact areas.* Any land identified by the director as an erosion impact area shall be considered to be contributing an illicit discharge and be required to submit for approval and implement an erosion and sediment control plan. This shall be required whether or not there is any construction activity on the site. The plan shall be prepared as specified in section 35-14.

(e) *Inspections and monitoring.* The director shall have the authority to inspect and monitor discharges and sources of potential discharges to the storm drainage system to ensure compliance with this article, including the authority to enter upon private property to inspect or monitor such discharges or sources of potential discharge. The director shall also have the authority to initiate enforcement action in accordance with section 35-22.

Sec. 35-22. Failure to comply; penalties and other legal actions.

(a) *Notice of violation; stop work orders; reimbursement of costs.*

(1) In addition to all other remedies in this section, if the director determines that the stormwater management permit holder has failed to comply with any plan required under 35-7, the director shall immediately serve upon the permit holder, by registered or certified mail to the address specified by the permit holder in his permit application, a notice to comply. Such notice shall set forth specifically the measures needed to come into compliance with such plan or plans and shall specify the time within which such measures shall be completed. If the permit holder fails to comply within the time specified, he may be subject to revocation of the permit and/or the cash bond may be used by the City at the direction of the director to correct the noted deficiencies. Any person may file a complaint under this section. Upon receipt of a sworn complaint of a substantial violation of this section, the director may, in conjunction with or subsequent to a notice to comply as specified above, issue a stop work order requiring that all or part of the land disturbing activities permitted on the site be

stopped until the specified corrective measures have been taken or, if land disturbing activities have commenced without an approved plan, as provided in section 35-4, requiring that all of the land disturbing activities be stopped until an approved plan or any required permits are obtained. Where the alleged noncompliance is causing or is in imminent danger of causing harmful erosion of lands or sediment deposition in waters within the watersheds of the Commonwealth, such an order may be issued whether or not the alleged violator has been issued a notice to comply as specified above. Otherwise, such an order may be issued only after the alleged violator has failed to comply with a notice to comply. The order shall be served in the same manner as a notice to comply, and shall remain in effect for seven days from the date of service pending application by the director or the alleged violator for appropriate relief to the circuit court. If the alleged violator has not obtained an approved plan or any required permits within seven days from the date of service of the order, the director may issue an order to the owner requiring that all construction and other work on the site, other than corrective measures, be stopped until an approved plan and any required permits have been obtained. Such an order shall be served upon the owner by registered or certified mail to the address specified in the permit application or the land records of the locality in which the site is located. The owner may appeal the issuance of an order to the circuit court. Any person violating or failing, neglecting or refusing to obey an order issued by the director may be compelled in a proceeding instituted in the circuit court to obey same and to comply therewith by injunction, mandamus, or other appropriate remedy. Upon completion and approval of corrective action or obtaining an approved plan or any required permits, the order shall immediately be lifted.

(2) If the City takes action upon failure to do so by the permittee, the City may collect from the permittee for the difference should the amount of the reasonable cost of such action exceed the amount of the surety held. Furthermore, he could be deemed to be in violation of this article and upon conviction could be subject to the penalties provided by this article.

(3) In the event that the violation of the approved landscape conservation plan was an encroachment or evidence of an encroachment into a tree preservation area, the applicant shall submit a mitigation plan subject to the approval of the director. This plan shall list remedial measures and the time within which such measures shall be completed by the applicant to ensure the continued preservation of the existing trees. This may include, but is not limited to, pruning, vertical mulching, and aerating. Bonding of the existing vegetation, in accordance with chapter 44, article II, division 5, may be required by the director.

(4) The director may require the replacement of any vegetation damaged in violation of the approved landscape conservation plan as part of the mitigation plan. The size, species and quantity of the replacement trees shall be calculated by the director based on the value of the trees removed as calculated by the latest formula published by the International Society of Arboriculture. The required replacement trees shall be included in the "mitigation plan" submitted by the applicant. Bonding of the replacement vegetation, in accordance with section 48-1143(b), may be required by the director.

(b) *Failure to comply with stormwater management permit.*

(1) If the director determines that there is a failure to comply with the conditions of stormwater management permit conditions, notice shall be served upon the permittee or person responsible for carrying out the permit conditions by registered or certified mail to the

address specified in the permit application, or by delivery at the site of the development activities to the agent or employee supervising such activities.

a. The notice shall specify the measures needed to comply with the permit conditions and shall specify the time within which such measures shall be completed. Upon failure to comply within the time specified, a stop work order may be issued in accordance with subsection b or the permit may be revoked by the director. The director may also pursue enforcement in accordance with this section.

b. If a permittee fails to comply with a notice issued in accordance with this section within the time specified, the director may issue an order requiring the owner, permittee, person responsible for carrying out an approved plan, or the person conducting the land-disturbing activities without an approved plan or required permit to cease all land-disturbing activities until the violation of the permit has ceased, or an approved plan and required permits are obtained, and specified corrective measures have been completed.

Such orders shall be issued in accordance with (local procedures). Such orders shall become effective upon service on the person by certified mail, return receipt requested, sent to his address specified in the land records of the locality, or by personal delivery by an agent of the director. However, if the director finds that any such violation is grossly affecting or presents an imminent and substantial danger of causing harmful erosion of lands or sediment deposition in waters within the watersheds of the Commonwealth or otherwise substantially impacting water quality, it may issue, without advance notice or hearing, an emergency order directing such person to cease immediately all land-disturbing activities on the site and shall provide an opportunity for a hearing, after reasonable notice as to the time and place thereof, to such person, to affirm, modify, amend, or cancel such emergency order. If a person who has been issued an order is not complying with the terms thereof, the director may institute a proceeding for an injunction, mandamus, or other appropriate remedy in accordance with subsection 2.

(2) In addition to any other remedy provided by this article, if the director or his or her designee determines that there is a failure to comply with the provisions of this article, they may initiate such informal and/or formal administrative enforcement procedures in a manner that is consistent with [reference local public facilities/engineering manual and/or specific policy].

(3) Any person violating or failing, neglecting, or refusing to obey any rule, regulation, ordinance, order, or any permit condition issued by the director or any provisions of this article may be compelled in a proceeding instituted in any appropriate court by the town to obey same and to comply therewith by injunction, mandamus or other appropriate remedy.

(c) *Failure to comply with Chesapeake Bay preservation area requirements.* In addition to any other penalties that may apply in this section, any person, whether as an owner, lessee, principal, agent, employee or otherwise, who violates any of the provisions of section 35-10 or section 35-11 or permits any such violation, or fails to comply with any of the requirements shall be subject to a civil penalty not to exceed $2,500.00 for each violation. Each day upon which such violation continues shall constitute a separate violation. Furthermore, the director, through the City attorney, may apply to the circuit court of the county for injunctive relief to enjoin a violation or a threatened violation of this division.

(d) *Failure to comply with erosion and sediment control requirements*. In addition to any other penalties that may apply in this section, the following additional penalties may be applied to a person who violates the provisions of section 35-14.

(1) Violators under this section shall be guilty of a class 1 misdemeanor.

(2) Any person who violates any regulation or order of the board, any condition of a permit, any provision of its program, or any provision of this article shall, upon a finding of an appropriate general district court, be assessed a civil penalty in accordance with the schedule listed under subsection (9) of this section. A civil action for such violation may be brought by the locality wherein the land lies. In any trial for a scheduled violation, it shall be the burden of the locality to show the liability of the violator by a preponderance of the evidence. An admission or finding of liability shall not be a criminal conviction for purpose. Any civil penalties assessed by a court shall be paid into the treasury of the locality wherein the land lies, except that where the violator is the locality itself, or its agent, the court shall direct the penalty to be paid into the state treasury.

(3) The City may apply to the circuit court in any jurisdiction wherein the land lies to enjoin a violation or a threatened violation, under section 35-14, without the necessity of showing that an adequate remedy at law does not exist.

(4) In addition to any criminal or civil penalties provided under this section, any person who violates any provision of this article may be liable to the program authority, or the board, as appropriate, in a civil action for damages.

(5) Without limiting the remedies which may be obtained in this section, any person violating or failing, neglecting or refusing to obey any injunction, mandamus or other remedy obtained pursuant to this section shall be subject, in the discretion of the court, to a civil penalty not to exceed $2,000.00 for each violation. A civil action for such violation or failure may be brought by the locality wherein the land lies. Any civil penalties assessed by a court shall be paid into the treasury of the locality wherein the land lies, except that where the violator is the locality itself, or its agent, the court shall direct the penalty to be paid into the state treasury.

(6) With the consent of any person who has violated or failed, neglected or refused to obey any regulation or order of the board, or any condition of a permit or any provision of this article, the board, the director or plan approving or permit issuing authority may provide, in an order issued by the board or plan approving or permit issuing authority against such person, for the payment of civil charges for violations in specific sums, not to exceed the limit specified in subsection (5) of this section. Such civil charges shall be instead of any appropriate civil penalty which could be imposed under subsection (2) or (5) of this section.

(7) Upon request of the City, the attorney for the commonwealth shall take legal action to enforce the provisions of this article. Upon request of the board, the attorney general shall take appropriate legal action on behalf of the board to enforce the provisions of this article.

(8) Compliance with the provisions of this article shall be prima facie evidence in any legal or equitable proceeding for damages caused by erosion or sedimentation that all requirements of law have been met and the complaining party must show negligence in order to recover any damages.

(9) Any violations of any regulation or order of the board, any provision of its program, any condition of a permit, or any provision of this article shall be subject to a civil penalty. The

civil penalty for any one violation shall be not less than $100.00, nor more than $1,000.00. Each day during which the violation is found to have existed shall constitute a separate offense. In no event shall a series of specified violations arising from the same operative set of facts result in civil penalties which exceed a total of $10,000.00 except that a series of violations arising from the commencement of land disturbing activities without an approved plan for any site shall not result in civil penalties which exceed a total of $10,000.00. Adoption of such an ordinance providing that violations are subject to a civil penalty shall be in lieu of criminal sanctions and shall preclude the prosecution of such violation as a misdemeanor under subsection (1).

(10) Any person who violates any regulation or order of the board, any condition of a permit, any provision of its program, or any provision of this article shall, upon a finding of an appropriate general district court, be assessed a civil penalty in accordance with the schedule. A civil action for such violation may be brought by the locality wherein the land lies. In any trial for a scheduled violation, it shall be the burden of the locality to show the liability of the violator by a preponderance of the evidence. An admission or finding of liability shall not be a criminal conviction for any purpose. Any civil penalties assessed by a court shall be paid into the treasury of the locality wherein the land lies, except that where the violator is the locality itself, or its agent, the court shall direct the penalty to be paid into the state treasury.

Sec. 35-23. Fees.

(a) *Erosion and sediment control review and inspection fee.* An erosion and sediment control review and inspection fee of $100.00, plus $20.00 per acre, or any fraction thereof, shall be paid to the City at the time of submission of plans to the director.

(b) *Stormwater management permit fee.* A stormwater management permit fee shall be paid to the City at the time of submission for a stormwater management permit. No stormwater management permit shall be issued or effective until the fee is paid.

(1) Fees associated with an initial stormwater management permit issuance shall be in accordance with the table titled “Stormwater Management Fees – Initial Permit Issuance.” When a site or sites has been purchased for development within a previously permitted common plan of development or sale, the applicant shall be subject to fees in accordance with the disturbed acreage of their site or sites in the aforementioned table.

(2) Fees for the modification or transfer of general permit registration statements issued by the state board shall be imposed in accordance with the table titled “Stormwater Management Fees – Modifications or Transfers.” If the general permit modifications result in changes to stormwater management plans that require additional review by the City, such reviews shall be subject to the fees set out in the aforementioned table. The fee assessed shall be based on the total disturbed acreage of the site. In addition to the modification fee, modifications resulting in an increase in total disturbed acreage shall pay the difference in the initial permit fee paid and the permit fee that would have been applied for the total disturbed acreage in accordance with subsection (1).

(3) General permit coverage maintenance fees shall be paid annually to the City, by the anniversary date of general permit coverage, in accordance with the table titled “Stormwater Management Fees – Permit Maintenance.” No permit will be reissued or automatically continued without payment of the required fee. General permit coverage maintenance fees

shall be applied until the permit coverage is terminated. Permit maintenance fees shall apply to expired permits that have been administratively continued.

(4) Persons whose coverage under the general permit has been revoked shall apply to the Virginia Department of Environmental Quality for an Individual Permit for Discharges of Stormwater from Construction Activities.

(5) Fees shall not be assessed to the following:

a. Permittees who request minor modifications to general permits as defined in section 35-2. Permit modifications at the request of the permittee resulting in changes to the stormwater management plan that require additional review by the director shall not be exempt pursuant to this subsection.

b. Permittees whose general permits are modified or amended at the initiative of the Virginia Department of Environmental Quality, excluding errors in the registration statement identified by the director or errors related to the acreage of the site.

(6) All incomplete payments will be deemed as nonpayments, and the applicant shall be notified of any incomplete payments. Interest shall be charged for late payments at the underpayment rate set forth in Code of Virginia §58.1-15 and is calculated on a monthly basis at the applicable periodic rate. A 10% late payment fee shall be charged to any delinquent account, defined as over 90 days past due. The City is entitled to all remedies under the Code of Virginia in collecting any past due amount.

STORMWATER MANAGEMENT FEES – INITIAL PERMIT ISSUANCE:	Total Fee	Portion Paid to DEQ[1]
Chesapeake Bay Preservation Act Land Disturbing Activity (sites equal to or greater than 2,500 SF and less than 1 acre within Chesapeake Bay Preservation Areas but not subject to General Permit coverage)	$290	$0
General/Stormwater Management – Small Activity (areas within common plans of development or sale with land disturbance acreage less than 1 acre)	$290	$81
General/Stormwater Management – Small Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 1 acre and less than 5 acres)	$2,700	$756
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 5 acres and less than 10 acres)	$3,400	$952
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 10 acres and less than 50 acres)	$4,500	$1,260
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 50 acres and less than 100 acres)	$6,100	$1,708
General/Stormwater Management – Large Activity (sites or areas within	$9,600	$2,688

common plans of development or sale with land disturbance acreage equal or greater than 100 acres)	
STORMWATER MANAGEMENT FEES – MODIFICATIONS OR TRANSFERS:	Total Fee
General/Stormwater Management – Small Activity (areas within common plans of development or sale with land disturbance acreage less than 1 acre)	$20
General/Stormwater Management – Small Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 1 acre and less than 5 acres)	$200
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 5 acres and less than 10 acres)	$250
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 10 acres and less than 50 acres)	$300
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 50 acres and less than 100 acres)	$450
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 100 acres)	$700
STORMWATER MANAGEMENT FEES – PERMIT MAINTENANCE:	Total Fee
Chesapeake Bay Preservation Act Land Disturbing Activity (sites equal to or greater than 2,500 SF and less than 1 acre within Chesapeake Bay Preservation Areas but not subject to General Permit coverage)	$50
General/Stormwater Management – Small Activity (areas within common plans of development or sale with land disturbance acreage less than 1 acre)	$50
General/Stormwater Management – Small Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 1 acre and less than 5 acres)	$400
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 5 acres and less than 10 acres)	$500
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 10 acres and less than 50 acres)	$650
General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 50 acres and less than 100 acres)	$900

General/Stormwater Management – Large Activity (sites or areas within common plans of development or sale with land disturbance acreage equal or greater than 100 acres)	$1,400

[1]This is the portion of the total fee that is paid to the Virginia Department of Environmental Quality. If the project is completely administered by the Department such as may be the case for a state or federal project or projects covered by individual state permits, the entire applicant fee shall be paid to the Department.

Secs. 35-24--35-39. Reserved.

Chapter 48
ZONING

Article IV. Districts

Sec. 48-2. Definitions
Impervious land cover means a surface composed of any material that significantly impedes or prevents natural infiltration of water into the soil. Impervious surfaces include, but are not limited to:
(1) Nonvegetated roofs;
(2) Buildings;
(3) Streets;
(4) Parking areas;
(5) Sidewalks;
(6) Driveways;
(7) Any concrete, asphalt, or compacted gravel surface.
(8) Exception: Structures smaller than 200 square feet that do not require a building permit shall not count toward lot coverage or impervious lot coverage. For purposes of calculating impervious land cover, driveways walks and patios using pervious materials may be reduced by up to 25%. Materials eligible for a reduction in area include, but are not limited to, pervious pavers, “grasscrete”, “grassblock” or other similar material.

Sec. 48-238. Conditions applying to permitted uses.
Conditions applying to permitted uses in the R-1A, low density residential district are as follows:
(1)–(4) ….
(5) Maximum lot coverage by all buildings.
a. For residential use: 25 percent.
b. For other uses: 30 percent.
(6) Maximum impervious lot coverage shall be 35 percent, subject to the following provisions:
a: Maximum impervious coverage limits in this section shall be applied and enforced by the zoning administrator only when a grading plan is required pursuant to Chapter 35 of the City Code.
b: For purposes of calculating impervious lot coverage, uncovered driveways walks and patios using pervious materials shall be reduced by up to 25% of the entire pervious surface area.

Sec. 48-263. Conditions applying to permitted uses.
Conditions applying to permitted uses in the R-1B, medium density residential district are as follows:
(1)–(4) ….
(5) Maximum lot coverage by all buildings.
a. For residential use: 25 percent.
b. For other uses: 30 percent.
(6) Maximum impervious lot coverage shall be 35 percent, subject to the following provisions:

a: Maximum impervious coverage limits in this section shall be applied and enforced by the Zoning Administrator only when a grading plan is required pursuant to Chapter 35 of the City Code.

b: For purposes of calculating impervious lot coverage, uncovered driveways walks and patios using pervious materials shall be reduced by up to 25% of the entire pervious surface area.

1st Reading: 2-24-14
2nd Reading: 3-24-14
Adoption: 3-24-14
(TO14-04)

IN WITNESS WHEREOF, the foregoing was adopted by the City Council of the City of Falls Church, Virginia on March 24, 2014 as Ordinance 1915.

_____
Kathleen Clarken Buschow
City Clerk

APPENDIX C
REGIONAL MEETINGS ATTENDED

- VAMSA Meeting – July 18, 2013
- NVRC MS4 Workgroup Meeting – September 5, 2013
- VAMSA Meeting – October 24, 2013
- VLWA Conference – March 10-11, 2014
- VAMSA Meeting – April 30, 2014
- NVRC Clean Water Partners Meeting – May 13, 2014
- NVRC MS4 Workgroup Meeting – May 21, 2014

MEMBERSHIP MEETING
Thursday, July 18, 2013, 9:30 a.m. – 2:30 p.m.
Greater Richmond Convention Center, 403 North 3rd Street, Richmond

Agenda

Arrival/Sign-In/Coffee (9:00 – 9:30 a.m.)

1. Welcome & Introductions (Randy Bartlett, Fairfax Co.) (9:30 a.m.)

2. DEQ Corner: Regulatory & Grant Funding Update/Q&A
   (Water Division Director Melanie Davenport, Ginny Snead, and Walter Gills)

Morning Break (10:45 a.m.)

3. VAMSA Board Activities Report (11:00 a.m.)
   A. June 7 Meeting with DEQ Senior Management (Bartlett)
   B. June 7 Meeting with Chesapeake Bay Commission (Bartlett)

4. MS4 Permitting Update (11:15 a.m.)
   A. Arlington Co. Phase I MS4 Permit Issuance (Chris Pomeroy, AquaLaw)
   B. Prince William Co. Phase I MS4 Permit Development (Marc Aveni, Prince Wm. Co.)
   C. Other Developments / Roundtable Discussion

5. MS4 TMDL Action Plan Guidance Development (11:45 a.m.) (Grace LeRose, Richmond)

Lunch Break (Provided Onsite) (12:15 p.m.)

6. Consultant's Corner: An Approach to Meet the Challenges of Stormwater Management in Uncertain Times (Bill Spearman, Woolpert) (12:45 p.m.)

7. Stormwater Regulation Rollout: DCR Checklist for Local Ordinance Review (1:15 p.m.)

8. Other Policy Updates (1:30 p. m.)
   A. DEQ Nutrient Credit Certification Rulemaking (Pomeroy)
   B. Trading Litigation: *Food & Water Watch v. EPA* and *MDE v. GenOn* (Pomeroy)
   C. Bay TMDL Litigation Update: *American Farm Bureau v. EPA* (Pomeroy)
   D. EPA Enforcement Update (Lisa Ochsenhirt, AquaLaw)
   E. Potential New Chesapeake Bay Agreement (Ochsenhirt)

9. Member Roundtable / Other Issues (2:15 p.m.) (Bartlett)

Professional Engineer CEUs: 2.0 Hours

Next VAMSA Member Meeting: October 24 (Greater Richmond Convention Center)

MEMBERSHIP MEETING
Thursday, October 24, 2013, 9:30 a.m. – 2:30 p.m.
Greater Richmond Convention Center, 403 North 3rd Street, Richmond

Agenda (as of 10/16/13)

Arrival/Sign-In/Coffee (9:00 – 9:30 a.m.)

1. Welcome & Introductions (Randy Bartlett, Fairfax Co.) (9:30 a.m.)

2. DEQ Corner: Regulatory & Grant Funding Update/Q&A (Melanie Davenport & Ginny Snead)

3. VIRGINIAforever Five Year Funding Plan (Bob Dunn, Chair; Nikki Rovner/TNC, Vice Chair)

4. Guest Speaker: Creating Clean Water Cash Flows (Charlotte Kaiser, TNC/NatLab)

Morning Break (10:45 a.m.)

5. 2014 General Assembly Session & VAMSA Activities/Initiatives (Chris Pomeroy, AquaLaw)
   A. Grant Funding: Stormwater Local Assistance Fund Appropriations
   B. VSMP Rollout: Local Hearings

6. New Chesapeake Bay Agreement (Lisa Ochsenhirt, AquaLaw)

7. Virginia Water Quality Standards Triennial Review (Pomeroy)

8. Total Maximum Daily Loads
   A. Chesapeake Bay TMDL Litigation: *American Farm Bureau v. EPA* (Pomeroy)
   B. MS4 TMDL Action Plan Guidance Development (Grace LeRose, Richmond)

Lunch Break (Provided Onsite) (12:15 p.m.)

9. Consultant's Corner: Sustainability: Community Challenges to Planning for the "Big One" (John Henz, Dewberry) (12:45 p.m.)

10. Phase I MS4 Permit Reissuance Update (Roundtable)

11. Construction
    A. VSMP Common Plan of Development Permitting (Barbara Brumbaugh, Chesapeake)
    B. VSMP Roll-out / Local Ordinance Development Update (Pomeroy/Roundtable)

12. Nutrient Trading Update
    A. Virginia Nutrient Credit Certification Regulation (Pomeroy)
    B. Trading Litigation Update: *Food & Water Watch v. EPA* & *MDE v. GenOn* (Pomeroy)

13. EPA Enforcement Update / Roundtable (Ochsenhirt)

14. Member Roundtable / Other Issues (2:15 p.m.) (Bartlett)

Professional Engineer CEUs: 2.0 Hours
2014 VAMSA Member Meetings: April 30, July 23, October 23

Virginia Lakes and Watersheds Association

DRAFT PROGRAM

SATURDAY, MARCH 8, 2014

9:30 AM – 10:00 AM	Registration for Dam Owner Training Session
10:00 AM – 4:00 PM	Dam Owner Training Session (DoubleTree by Hilton Richmond-Midlothian, James River Ballroom Parlor G)

SUNDAY, MARCH 9, 2014

1:30 – 5:00 PM	Exhibitors' Display Set Up (Exhibitors' Area)
2:00 – 5:00 PM	Registration (Conference Reception Desk)
4:00 – 5:00 PM	Meeting of VLWA Board of Directors
5:30 – 7:00 PM	Exhibitor and Early Registrants' Reception (James River Ballroom Parlor H)

MONDAY MORNING, MARCH 10, 2014

7:00 – 8:00 AM	Registration and Check-In (Conference Reception Desk)
7:30 AM	Coffee and Pastries
7:45 – 9:00 AM	Welcome to the Conference, Stuart Stein, Conference Chair

Keynote Address – The September 2013 Flooding in Colorado: Causes and Consequences, Chris Holdren, Manager of the Environmental Applications and Research Group with the Bureau of Reclamation in Denver, CO

Track A–Parlor A | Track B–Parlor B | Track C–Parlor F | Track D–Parlor G | Track E–Parlor E

9:15 – 10:30 AM First Concurrent Sessions

Session 1A • Stormwater Programming 1 • Moderator – Catherine Eichel, Brown and Caldwell

Panel Discussion: Virginia Stormwater Management Program – Strategies and Challenges

(1) Jonét Prévost-White, City of Richmond Department of Public Utilities
(2) J. Michael Flagg, Hanover County
(3) Joan Salvati, Virginia DEQ
(4) Catherine Eichel, Brown and Caldwell

Session 1B • Dam Safety 1 • Moderator – Michael J. Barbachem, PE, BCEE, URS Corporation

(1) **Town of Clifton Forge Smith Creek LOMR Request: A Story of History, Improvements, and Conflicts,** Carolyn A. Howard, PE, CFM, Draper Aden Associates; Matthew B. James, PE, Draper Aden Associates
(2) **A Dam Failure Analysis Utilizing Un-Steady Flow Methodology – Wyndham Lake Dam,** David P. Wilmoth, PE, CFM, PH, Timmons Group.; Michael L. Claud, PE, CFM, Timmons Group; Alex C. Lucado, EIT, Timmons Group
(3) **GIS Hydrology – 101,** Alexander B. Robinson, EIT, Froehling & Robertson, Inc.
(4) **An Exploration of Extreme Rainfall Trends in Virginia,** Michael J. Barbachem, PE, BCEE, URS Corporation

Session 1C • Stormwater Management • Moderator – Deva Borah, Ph.D., PE, Old Dominion University and Borah Hydro-Environmental Modeling LLC

(1) **Runoff Reduction Analysis Made Easy; SWMSoft: A BMP Design Software for Water Quality and Quantity Control,** Partha Sarathi, PE, ENSOFTEC; Gamal Hassan, PE, HWR
(2) **The Use of 1D and 2D Modeling to Develop Solutions for Flooding in the Glenwood Neighborhood of Norfolk, Virginia,** Steve Godfrey, PE, CFM, Woolpert; Jim Ewing, PE, Woolpert; Reynaldo Hernandez, Jr., PE, City of Norfolk

(3) **Stormwater Inventory, Basin Delineation of Condition Assessment to Build a GIS-based Asset Management System, City of Fairfax, Virginia,** Jim Ewing, PE, Woolpert; Christina Alexander, Woolpert; Travis Davis, Woolpert

(4) **Biochar for Removing Metal Contaminants from Water and Carbon Sequestration,** Sandeep Kumar, Ph.D., Old Dominion University; Matthew D. Huff, Old Dominion University; James W. Lee, Old Dominion University; Tarek M. Abdel-Fattah, Christopher Newport University

Session 1D • TMDLs and Water Quality Modeling 1 • Moderator – Clifton F. Bell, PE, PG, Brown and Caldwell

(1) **Setting the Stage for TMDL Action Planning in Petersburg, Virginia,** Aislinn T. Creel, PE, LEED AP, Timmons Group; Tennille Wade, City of Petersburg; Darryl Walker, City of Petersburg

(2) **Model Calibration of Multiple Reservoirs in an Aqueduct System,** Benjamin R. Martin, PE, Flow Science Incorporated; Kristen B. Kavanagh, Flow Science Incorporated; Al Preston, Ph.D., PE, Flow Science Incorporated; E. John List, Ph.D., PE, Flow Science Incorporated

(3) **Local Watershed Improvement Planning Methods: The Chevy, Cadillac, and Lamborghini,** Clifton F. Bell, PE, PG, Brown and Caldwell

Session 1E • Floodplain Management 1 • Moderator – M. Tariq Makhdoom, Ph.D., CFM, Dewberry

(1) **Mitigation Funding for Your Projects – Not Just Your Grandfather's Lift: Successful Uses of FEMA HMA Funds in Virginia,** Michael Paul Dodson, CFM, Community Planning Partners, Inc.

(2) **Using Stormwater Master Planning to Build Community Resiliency,** James Latchaw, PE, CFM, Dewberry Engineers, Inc.

(3) **DMA 2000 Hazard Mitigation Plan Updates,** Stuart Wallace, CFM, Stuart Wallace, LLC

(4) **Building More Resilient Coastal Communities: Insurance Claims in Pre- and Post-LiMWA Mississippi,** Sara M. DeGroot, PE, CFM, Michael Baker Jr., Inc.

10:30 – 10:45 AM Coffee Break

10:45 AM – 12:00 PM Second Concurrent Sessions

Session 2A • Stormwater Programming 2 • Moderator – J. Douglas Fritz, CPESC, GKY & Associates, Inc.

(1) **The MS4 Program Plan Makeover,** Joni M. Calmbacher, PE, CFM, Michael Baker Jr., Inc.; Dialis Figueroa Arriaga, NAVFAC Mid-Atlantic; Phillip Winslow, NAVFAC Mid-Atlantic

(2) **Coping with Change: Strategies for a GIS-based MS4 Permit Management System,** Pam Cowher, GISP, Kimley-Horn & Associates, Inc.

(3) **Stormwater Infrastructure Data Development and Uses – An Overview for Municipalities,** Brent Reeves, KCI Technologies, Inc., Resource Management Group, Geospatial Solutions Practice

(4) **Coordinating Stormwater Management Requirements with Comprehensive Municipal Planning,** J. Douglas Fritz, CPESC, GKY & Associates, Inc.; Douglas H. Moseley III, AICP CFM, GKY & Associates, Inc.

Session 2B • Dam Safety 2 • Moderator – Amanda S. Pennington, PE, DCR Division of Dam Safety and Floodplain Management

(1) **Assessing Landscape Capacity to Regulate Floods in Selected Watersheds Across North Carolina and Virginia,** Beatriz Mogollón, MS Candidate, Department of Fish and Wildlife Conservation, Virginia Tech; Paul Angermeier, Ph.D., U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech

(2) **Dam Restoration vs. Removal Considerations – Lower Melzingah Dam,** N. Johan Anestad, PE, O'Brien & Gere; Robert R. Bowers, PE, O'Brien & Gere

(3) **Dam Safety Project Experiences and Lessons Learned,** Kateri S. Shreve, PE, VCCO, Virginia Department of Game and Inland Fisheries

(4) **Emergency Action Planning, Table Top Exercises – Will You Be Ready?,** Amanda S. Pennington, PE, DCR Division of Dam Safety and Floodplain Management

Session 2C • Drainage and Tidal Flooding • Moderator – Seshadri Iyer, Ph.D., PE, URS Corporation

(1) **Stormwater Planning and Design in Lusaka, Zambia,** Tim Hare, PE, CH2M Hill

(2) **Drainage Master Planning in Rockingham County, VA,** Gregor Patsch, PE, Timmons Group

(3) **Tides Up: A Case Study of Tidal and Rainfall Flooding Solutions in a Developed Beach Community,** Taylor A. Jones, EIT, Parsons Brinckerhoff; Beth Arnold, PE, LEED AP, ENV SP, Parsons Brinckerhoff

(4) **Importance and Implementation of a Tide Gauge Network in Coastal Plains,** Seshadri Iyer, Ph.D., PE, URS Corporation; Jeffrey Waller, PE, City of Virginia Beach Public Works/Engineering

Session 2D • TMDLs and Water Quality Modeling 2 • Moderator – Deva Borah, Ph.D., PE, Borah Hydro-Environmental Modeling LLC

(1) **Estuary Number, η and Modeling Dispersion of Chlorophyll-a in the Upper James River,** Ben Chester, Old Dominion University; John McKenney, Old Dominion University; Jaewan Yoon, Ph.D., Old Dominion University

(2) **Effects of Estuarine Point Source and Nonpoint Source Total Nitrogen Loadings on the James River,** Jon DeArmond, Old Dominion University; Johnnie Godwin, Old Dominion University; Jaewan Yoon, Ph.D., Old Dominion University

(3) **Assessment of Phosphorus Concentration in Robeson Creek of Haw River, NC,** Arash Niroomandi, Old Dominion University; Baljit Kaur, Old Dominion University; Jaewan Yoon, Ph.D., Old Dominion University

(4) **Total Maximum Daily Load Analysis Methods: State-of-the-Art Reviews,** Bill Frost, PE, D.WRE, KCI Technologies, Inc., Deva Borah, Ph.D., PE, Borah Hydro-Environmental Modeling LLC

Session 2E • Floodplain Management 2 • Moderator – David Preusch, WEST Consultants

(1) **Developing Stationary Floodplains in the Vicinity of Stream Gages Using FEMA Hydraulic Models,** Krista Rand, EIT, CFM, Dewberry; M. Giovanni Prieto, CFM, Dewberry

(2) **Updating FEMA Maps Using Two-Dimensional Models,** Cheryl B. Hannan, PE, CFM, LEED AP, Dewberry

(3) **Representing Flooding Accurately & Effectively,** John Paine, PE, PH, CFM, URS Corporation

(4) **Fairfax County's Advanced Flood Warning System – Lessons Learned and Shared,** Donald R. Demetrius , Ph.D., Fairfax County, VA, Stormwater Planning Division; Camylyn Lewis, Aqua-Assets, LLC

12:15 – 1:15 PM Luncheon

Keynote Address – Stronger Together: Finding Common Ground to Improve the Waters of Our Commonwealth, Ralph S. Northam, Lieutenant Governor, Commonwealth of Virginia

MONDAY AFTERNOON, MARCH 10, 2014

1:30 – 2:45 PM Third Concurrent Sessions

Session 3A • Stormwater Programming 3 • Moderator – Seth Brown, PE, Water Environment Federation

(1) **Policies, Financing Innovations and Tipping Points in Stormwater,** Seth Brown, PE, Water Environment Federation

(2) **Big, Bad Stormwater: How the Commonwealth Compares in Region III,** Ginny Snead, PE, Louis Berger Group

(3) **Exploring the Need for a National Stormwater BMP Testing and Verification Stormwater Program,** Chris French, Filterra Bioretention Systems

(4) **What to Expect When You're Expecting an MS4 Audit,** Maxwell Kuker, GKY & Associates, Inc.

Session 3B • Dam Safety 3 • Moderator – David Gunn, PE, CFM, Henrico County, VA, Department of Public Works

(1) **Timberlake – A Case Study (Construction – Failure – Rebuild – Regulation Changes – Future),** Mike Wilson, PE, Hurt and Proffitt, Inc.

(2) **How Retrofitting Affects Flood Insurance and Sustainability,** David Sonner, CFM, Smart Vent Products, Inc.

(3) **Frequently Misunderstood Requirements for Levee Accreditation,** M. Tariq Makhdoom, Ph.D., CFM, Dewberry

(4) **Changing FEMA Floodplains – A Review of LOMC Processes and Recent Changes,** David Gunn, PE, CFM, Henrico County, VA, Department of Public Works

Session 3C • Stormwater and CSO Design Challenges • Moderator – Amelia Wehunt, PE, Timmons Group

(1) **Alternative to Gravity Drainage in Coastal Plains – Stormwater Pumping,** Craig Pearson, EIT, CNMP, URS Corporation; Seshadri Iyer, Ph.D., PE, URS Corporation; Mike Bumbaco, PE, City of Virginia Beach Public Works/Engineering; Jeff Waller, PE, City of Virginia Beach Public Works/Engineering

(2) **City of Falls Church – Challenges of Stormwater Infrastructure Retrofits in an Urban Environment (Part 1),** Aaron S. George, PE, GKY & Associates, Inc.; Brett L. Martin, PE, GKY & Associates, Inc.; Brice R. Kutch, PE, LEED BD+C, GKY & Associates, Inc.; Stuart M. Stein, PE, D.WRE, GKY & Associates, Inc.; Jason Widstrom, PE, City of Falls Church

(3) **City of Falls Church – Challenges of Stormwater Infrastructure Retrofits in an Urban Environment (Part 2),** Brice R. Kutch, PE, LEED BD+C, GKY & Associates, Inc.; Aaron S. George, PE, GKY & Associates, Inc.; Stuart M. Stein, PE, D.WRE, GKY & Associates, Inc.; Brett L. Martin, PE, GKY & Associates, Inc.; Jason Widstrom, PE, City of Falls Church

(4) **Design and Construction Challenges with Combined Sewer Relocation,** Drew Gould, PE, Timmons Group; Amelia Wehunt, PE, Timmons Group

Session 3D • Watershed Management • Moderator – Melissa J. Pritchard, PE, Parsons Brinckerhoff

(1) **Stormwater Master Planning: Harmonizing Asset Renewal with Water Quality Compliance,** Allen Townsend, EIT, Brown and Caldwell

(2) **Watershed-Scale Water Quality Improvement Projects in Coastal Plains,** Daniel Rickmond, PE, URS Corporation; Craig Pearson, EIT, CNMP, URS Corporation; Seshadri Iyer, Ph.D., PE, URS Corporation; Steve McLaughlin, PE, City of Virginia Beach Public Works/Engineering

(3) **Watershed Action Plans: Identifying Opportunities to Reduce Flooding and Restore Water Quality in a Watershed,** Melissa J. Pritchard, PE, Parsons Brinckerhoff

(4) **Adopting Higher Standards: Helping Localities Incorporate CRS Activities into Ordinance Language and Community Practice,** Mary-Carson S. Stiff, Virginia Coastal Policy Clinic at William & Mary Law School

Session 3E • Floodplain Management 3 • Moderator – Jeff Smith, PE, PMP, CSM, CSPO, CFM, Accenture Federal Services

(1) **FEMA Region III Coastal Hazard Study Impacts & Rollout in Virginia,** Christine Worley, PE, CFM, RAMPP; Robin Danforth, PE, CFM, FEMA Region III; David Bollinger, FEMA Region III

(2) **Limit of Moderate Wave Action Mapping Based on Latest FEMA Guidance,** Nader Mahmoudpour, PE, Ph.D., CFM, CDM Smith

(3) **Preparing for the Next Big One... What Floodplain Managers Can Do Before, During, and After a Flood Event,** Mari W. Radford, CFM, FEMA Region III; Charley Banks, CFM, Virginia Department of Conservation & Recreation – Division of Water and Soil

(4) **What is Critical Infrastructure and Why Is It Important?,** Mark Slauter, CFM, Virginia Department of Emergency Management

2:45 – 3:15 PM Coffee Break

3:15 – 4:30 PM Fourth Concurrent Sessions

Session 4A • Green Infrastructure 1 • Moderator – Charlene Harper, PE, LEED AP, Geosyntec Consultants, Inc.

(1) **Green Up DC – DC's Web Site for Stormwater Evaluations by Property Owners,** Jennifer Hatchett, PE, CH2M HILL; Laurens van der Tak, PE, CH2M HILL; Bruce Taylor, Critigen

(2) **Finding the Balance of Green and Grey Infrastructure to Meet Multiple Stormwater Objectives,** Cheri L. Salas, PE, CH2M HILL, Inc.; Kate Marney, CH2M HILL, Inc.; Laurens van der Tak, PE, CH2M HILL, Inc.; Andrew Potts, PE, CH2M HILL, Inc.; Brian Rahal, PE, City of Alexandria, VA

(3) **Green Infrastructure Assessment, Prioritization, and Design,** Scott C. Blossom, PE, CFM, Williamsburg Environmental Group; Alex Forasté, PE, Williamsburg Environmental Group

(4) **High Performance Green Infrastructure: Distributed Real-Time Monitoring and Control,** Charlene Harper, PE, LEED AP, Geosyntec Consultants, Inc.; Marcus Quigley, PE, D.WRE, CPESC, Geosyntec Consultants, Inc.

Session 4B • Dam Safety 4 • Moderator – Bradford Cooley, PE, Watershed Geosynthetics LLC

(1) **Trash Rack Rail System Rehabilitation Using an Asymmetrical Cofferdam,** David B. Mrowiec, PE, Crofton Industries; Kurt Feairheller, Crofton Industries; Todd M. Rudolph, PE, Ayres Associates

(2) **Diver Safety for: Dam Rehabilitation, Trash Rack Replacement, Underwater Construction and ADCI Member Companies Use in Inland Waterways,** John Davis, Crofton Diving Inc.

(3) **St. Mary's River State Park Dam Safety Repairs and Rehabilitation Callaway, St. Mary's County, Maryland,** Kofi B. Acheampong, Ph.D., PE, KCI Technologies, Inc.

(4) **Concrete-Enhanced Synthetic Turf Revetment Systems – An Innovative Technology for Dam and Levee Overtopping Protection,** Bradford Cooley, PE, Watershed Geosynthetics LLC; Jim Nadeau, ACF Environmental

Session 4C • BMP Design • Moderator – Virginia Long, EIT, URS Corporation

(1) **Innovative Stormwater Design for Transportation Projects,** Megan A. McCollough, PE, CFM, Williamsburg Environmental Group, Inc.; Glenn Muckley, PE, Williamsburg Environmental Group, Inc.

(2) **Riverland Road SWM Basin Retrofit,** Michael Hogan, PE, RK&K

(3) **Challenges of LID BMP Design in Clayey Soils,** Virginia Long, EIT, URS Corporation; Seshadri Iyer, Ph.D., PE, URS Corporation; Jeffrey Waller, PE, City of Virginia Beach Public Works/Engineering

Session 4D • Spill Prevention, Industrial, and MS4 Compliance • Moderator – Elizabeth Krousel, PE, Michael Baker Jr., Inc.

(1) **SPCC Planning to Prevent Oil Spills to U.S. Waterways,** Michael Hare, PE, URS Corporation

(2) **Solutions and Synergies of the Navy's Phase 1 Industrial, Phase 2 Municipal, and Chesapeake Bay (EO 13508) Stormwater Programs,** Elizabeth Krousel, PE, Michael Baker Jr., Inc.; David Cotnoir, PE, NAVFAC Mid-Atlantic

Session 4E • Floodplain Management 4 • Moderator – John Paine, PE, PH, CFM, URS Corporation

(1) **The ASFPM Foundation,** Grant Smith, PE, PMP, CFM, Dewberry

(2) **The Biggert-Waters Flood Insurance Reform Act of 2012 – Overview and Implementation Update,** Richard J. Sobota, CFM, CPCU, FEMA Region III

(3) **Model Agreements for Intergovernmental Cooperation on NFIP Programs,** Melissa Hall, Virginia Department of Conservation & Recreation – Division of Water and Soil

(4) **Reframing BW-12 Conversations with Communities and Property Owners to Offer Options,** Bill Malyszka, Accenture

MONDAY EVENING, MARCH 10, 2014

4:45 – 6:00 PM Reception (James River Ballroom Parlor H)

6:00 – 6:30 PM Virginia Lakes and Watersheds Association Business Meeting

TUESDAY MORNING, MARCH 11, 2014

7:15 – 8:15 AM Virginia Floodplain Management Association Meeting, Parlor E

8:30 – 9:45 AM Fifth Concurrent Sessions

Session 5A • Green Infrastructure 2 • Moderator – Don Rissmeyer, PE, CFM, A. Morton Thomas and Associates, Inc.

(1) **Use of Compost Based Best Management Practices (BMP) Utilization in Green Infrastructure,** Jeffrey Opel, Filtrexx International; Dr. Britt Faucette, Ph.D., Filtrexx International

(2) **Using Green Infrastructure in Your Watershed Assessments to Reduce Stormwater Runoff and Improve Water Quality,** Melissa Bernardo Hess, PE, CFM, URS Corporation

(3) **Using Green Infrastructure to Mitigate Combined Sewer Overflows: Modeling Insights for Design and Management Consideration,** John Riverson, Tetra Tech; Khalid Alvi, PE, Tetra Tech; Jenny Zhen, Ph.D., PE, Tetra Tech; Ryan Murphy, Tetra Tech

(4) **Expanding a Green Parking Lot Into a Green Street Solution,** Don Rissmeyer, PE, CFM, A. Morton Thomas and Associates, Inc.

Session 5B • Lake Oxygenation • Moderator – Mark H. Mobley, PE, Mobley Engineering, Inc.

(1) **Hypolimnetic Oxygenation Systems in Five Virginia Water Supply Reservoirs,** Mark H. Mobley, PE, Mobley Engineering, Inc.; Cayelan C. Carey, Ph.D., Department of Biological Sciences, Virginia Tech; Paul A. Gantzer, Ph.D., PE, Gantzer Water Resources Engineering, LLC; Alexandra B. Gerling, Department of Biological Sciences, Virginia Tech; Thomas J. Grizzard, PE, Ph.D., Virginia Tech College of Engineering; Jamie Morris, Western Virginia Water Authority; Gregory J. Prelewicz, PE, Fairfax Water; Niffy Saji, Fairfax Water

(2) **Oxygenation Design; Developing a Strategy to Accommodate the Uncertainty from Induced Oxygen Demand,** Paul A. Gantzer, Ph.D., PE, Gantzer Water Resources Engineering, LLC; John Little, Ph.D., PE, University of Sydney; Bob Benninger, PE, Western Virginia Water Authority; Mark Mobley, PE, Mobley Engineering, Inc.; Niffy Saji, Fairfax Water; Alexandra B. Gerling, Virginia Tech; Cayelan C. Carey, Ph.D., Virginia Tech

(3) **Aeration, Oxygenation, or Both? A Demonstration of How These Dual Strategies are Being Integrated to Improve Water Quality,** Cayelan C. Carey, Ph.D., Virginia Tech; Paul A. Gantzer, Ph.D., PE, Gantzer Water Resources Engineering, LLC; Mark Mobley, PE, Mobley Engineering, Inc.; Alexandra B. Gerling, Virginia Tech; Jamie Morris, Western Virginia Water Authority; Chris Edwards, Spotsylvania County Utility Dept.

(4) **The Viability of Hypolinmetic Oxygenation and Its Effects on Nutrient Cycling in a Shallow, Eutrophic Drinking Water Reservoir,** Alexandra B. Gerling, Virginia Tech; Richard G. Browne, M.S., Virginia Tech; Paul A. Gantzer, Ph.D., PE, Gantzer Water Resources Engineering, LLC; Mark H. Mobley, PE, Mobley Engineering, Inc.; John C. Little, Ph.D., PE, Virginia Tech; Cayelan C. Carey, Ph.D., Virginia Tech

Session 5C • University Research • Moderator – Martin Firth, Lake Services

(1) **Phytoplankton Consumption and Microcystin Assimilation by Fishes of the Tidal Fresh James River,** Joe Wood, Ph.D. Candidate, Virginia Commonwealth University; Paul Bukaveckas, Ph.D., Virginia Commonwealth University; Rima Franklin, Ph.D., Virginia Commonwealth University; Gregory Garman, Ph.D., Virginia Commonwealth University; Stephen McInInch, Ph.D., Virginia Commonwealth University; Aaron Porter, M.S., Virginia Commonwealth University

(2) **Commercial Harvest of Snapping Turtles (Chelydra Serpentina) in the Mid-Atlantic: International Export, Harvest Pressure, and Regulatory Strategies**, Benjamin C. Colteaux, Integrative Life Sciences, Virginia Commonwealth University; Derek M. Johnson, Department of Biology, Virginia Commonwealth University

(3) **Research Activities at Virginia Commonwealth University's Rice Rivers Center,** Greg C. Garman, Ph.D., Virginia Commonwealth University Center for Environmental Studies

Session 5D • Environmental Restoration 1 • Moderator – Carey Burch, AICP, Program Manager, HDR Engineering

(1) **"Hoehns Lake Stream Restoration"; County of Henrico, Virginia,** Michael L. Claud, PE, CFM, Timmons Group; Rebecca Napier, PE, Timmons Group

(2) **Mixing Natural Channel Design with Traditional Drainage Design for Stabilization: Willow Oaks Neighborhood Drainage Improvements,** Amelia C. Wehunt, PE, Timmons Group

(3) **Stream Restoration Nutrient and Sediment Reduction Calculations - Mill Dam Creek, A Case Study of Virginia Beach,** Patrick Shearer, EIT, Kerr Environmental Services Corp.

(4) **Restoration of Lake Kittamaqundi and Isthmus Protection,** Carey Burch, AICP, Program Manager, HDR Engineering; Pieter Dahmen, PE, Project Manager, HDR Engineering

Session 5E • Floodplain Management 5 • Moderator – Don Rissmeyer, PE, CFM, A. Morton Thomas and Associates, Inc.

(1) **Use of Satellite and Radar Data for Real Time and Forecast Modeling: Applications in Flood Warning, Flood Emergency Response and Reservoir Operation,** Mathini Sreetharan, Ph.D., PE, CFM, Dewberry; Prabha Madduri, PE, CFM, Dewberry

(2) **Dynamic Radar Rainfall-Based Design Storms and Implications for Infrastructure Design,** David C. Curtis, Ph.D., WEST Consultants, Inc.

(3) **Techniques for Modeling Climate Change Impacts on Floodplain Mapping,** Shane Parson, Ph.D., PE, CFM, URS Corporation

(4) **Case Study – Kingdom of Jordan, Preparing Flood Risk Information in a Data Poor Environment,** David Preusch, PE, PH, CFM, WEST Consultants, Inc.; Varut (Dua) Guvanasen, Ph.D., PE, HydroGeologic, Inc.; Suresh R. Kikkeri, PE, PMP, US Army Corps of Engineers

9:45 – 10:15 AM Coffee Break

10:15 – 11:30 AM Sixth Concurrent Sessions

Session 6A • Innovative Stormwater Treatment • Moderator – William E. Nell, PE, Thirsty Duck

(1) **Performance Monitoring of a High Flow Bioretention System in Washington State for Basic and Phosphorus Treatment Under the Technology Assessment Protocol – Ecology,** Mindy Hills, Filterra Bioretention Systems

(2) **Design Considerations, Pollutant Removal Performance, and Hydrologic Mitigation Evaluations of Permeable Interlocking Concrete Paver System and Bioretention Retrofits,** Jodi Mills, PE, CPSWQ, M. ASCE, Filterra Bioretention Systems

(3) **Paving the Way to Stormwater Management,** Steve Sunderman, Registered Architect, LEED AP BD+C, BPI Analyst, Noesis Energy Advisor, Terrazia PC

(4) **Maximize Water Quality Volumes with Innovative Flow Control,** William E. Nell, PE, Thirsty Duck

Session 6B • Virginia Beach Issues • Moderator – Steve McLaughlin, PE Virginia Beach Public Works/Engineering

(1) **Owls Creek Boat Pump-Out Facility in the City of Virginia Beach Function, Use and Expectations,** Greg Johnson, PE, Virginia Beach Public Works/Engineering; Tom Langley, PE, LS., Langley and McDonald

(2) **Adoption of New Stormwater Regulations for VSMP/CGP Compliance,** William J. Johnston, PE, City of Virginia Beach, VA

(3) **City of Virginia Beach Rain Gauge Network Project,** Jeffrey S. Waller, PE, City of Virginia Beach Public Works/Engineering

(4) **Nutrient and Sediment Fraction Content of a Dredged, Coastal-Plain, Urban Lake's Sediment,** Steve McLaughlin, PE Virginia Beach Public Works/Engineering

Session 6C • Soil, Water, and Groundwater Quality • Moderator – Kenneth A. Dierks, Kimley-Horn and Associates, Inc.

(1) **Denitrification in the Hyporheic Zone: Natural Attenuation of Contaminant Sources from Upstream Watersheds and Deeper Groundwater,** Erich T. Hester, Ph.D., PE, Civil and Environmental Engineering, Virginia Tech; Katie I. Young, M.S., EIT, Civil and Environmental Engineering, Virginia Tech; Mark A. Widdowson, Ph.D., PE, Civil and Environmental Engineering, Virginia Tech

(2) **Evaluating Leachability of Residual Solids from Hydraulic Fracturing,** Stephanie Countess, NETL-RUA Virginia Tech; Greg Boardman, Ph.D., NETL-RUA Virginia Tech; Richard Hammack, NETL; Alexandra Hakala, Ph.D., NETL

(3) **The First Flush: Studying Soil Nutrient Dynamics in Restored Floodplain,** Dylan M Cooper, Department of Biological Systems Engineering at Virginia Tech

(4) **Preparing for Contaminated Groundwater During Construction; How a Pre-Positioned Plan can Save Time and Money,** Michelle Wharton, Kimley-Horn and Associates, Inc.

Session 6D • Environmental Restoration 2 • Moderator – Eliana Rios, RK&K

(1) **Nutrient Reductions from Individual Stream Restoration Projects Using the Chesapeake Bay Protocols,** J. Alex Forasté, PE, Williamsburg Environmental Group, Inc.; Doug Beisch, PE, Williamsburg Environmental Group, Inc.

(2) **Drivers of Woody Species Recruitment and Distribution Patterns Following Dam Removal in a Tidal Freshwater Wetland of the Mid-Atlantic Coastal Plain,** Richard E. Ward, Virginia Commonwealth University; Edward Crawford, Ph.D., Virginia Commonwealth University

(3) **Managing Water Quality in Huntsman Lake (Virginia, USA) – Development and Implementation of Restoration Strategies,** David A. Tomasko, Ph.D., Atkins; Emily Keenan, Atkins; Shannon Curtis, Fairfax County, VA, Stormwater Planning Division – Watershed Planning & Assessment Branch

(4) **Four Mile Run, Determining Water Quality Benefits to Meet TMDL Requirements for a Wetland Restoration,** Eliana Rios, RK&K

Session 6E • Floodplain Management 6 • Moderator – Mark Slauter, CFM, Virginia Department of Emergency Management

Panel Discussion: Recurrent Flooding and Adaptation Strategies

(1) Kenneth M. Somerset, City of Poquoson, VA

(2) James Redick, City of Norfolk, VA, Emergency Preparedness and Response

(3) Molly Mitchell (Roggero), Center for Coastal Resources Management – Virginia Institute of Marine Science

(4) Charley Banks, CFM, Virginia Department of Conservation & Recreation – Division of Water and Soil

11:45 – 1:00 PM Luncheon

VLWA Dam Safety Committee Dam Awards:

Best Maintained Dam, Privately Owned – Lake Serene Dam in Frederick County owned by Lake Serene, Inc.

Best Maintained Dam, Publically Owned – Falling Creek Reservoir Dam in Chesterfield County owned by Chesterfield County Utilities Department

Best Maintained Dam, Publically Owned – South River Dam #25 in Augusta County owned by Headwaters SWCD

Best Major Construction or Rehabilitation Projects – Lake Holiday Dam Major Construction in Frederick County owned by Lake Holiday Country Club, Inc.

Most Improved Dam – Lake Barton Dam in Fairfax County owned by Fairfax County

Keynote Address: Recurrent Flooding and Adaptation Strategies, James Redick, Director, Emergency Preparedness and Response, City of Norfolk

MEMBERSHIP MEETING
Wednesday, April 30, 2014, 9:30 a.m. – 2:30 p.m.
Greater Richmond Convention Center, 403 North 3rd Street, Richmond

Agenda

Arrival/Sign-In/Coffee (9:00 – 9:30 a.m.)

1. Welcome & Introductions (Randy Bartlett, Fairfax Co.) (9:30 a.m.)

2. MS4 Permitting
   - A. VAMSA Alternative to VDOT MOU Concept (Chris Pomeroy, AquaLaw)
   - B. Permitting Status Update (Roundtable)

3. MS4 TMDL Action Planning
   - A. Stream Restoration Credits (Mike Flagg, Hanover Co.)
   - B. Protecting Localities from Sudden Crediting Changes (Pomeroy)
   - C. TMDL Action Plan Drafting (Pomeroy)

4. Stormwater Program Funding (Pomeroy)
   - A. Stormwater Local Assistance Fund Update
   - B. Stormwater Utility Financial Reporting (Senate Budget Language)
   - C. Stormwater Utility Legislative Issues Management
   - D. Green Infrastructure Tax Issues

5. Annual Member Business (Officers)
   - A. Report of VAMSA Board Retreat Planning
   - B. Strategic Priorities
   - C. FY15 Dues (4% Increase)
   - D. Annual Board Elections

Lunch Break (Provided Onsite) (12:00 p.m.)

6. DEQ Corner: Regulatory Programs & Grant Funding Update/Q&A (DEQ Water Division)

7. Consultant's Corner: MS4 Compliance Tools (John Paine & Mike Barbachem, URS)

8. Other Policy Updates
   - A. HB 1173 / SB 423 Rulemaking (Lisa Ochsenhirt, AquaLaw)
   - B. New Chesapeake Bay Agreement (Ochsenhirt)
   - C. EPA "Waters of the U.S." Proposal (Justin Curtis, AquaLaw)
   - D. Chesapeake Bay TMDL Litigation Update (Curtis)
   - E. Virginia Nutrient Credit Certification Regulation (Pomeroy)
   - F. Virginia Water Quality Standards Triennial Review (Pomeroy)
   - G. Enforcement Update (Pomeroy)

9. Member Roundtable / Other Issues (2:15 p.m.) (Bartlett)

Professional Engineer CEUs: 2.0 Hours
Upcoming 2014 VAMSA Member Meetings: July 23 and October 23

Northern Virginia Clean Water Partners

SPRING 2014 CAMPAIGN PLANNING MEETING
Tuesday, May 13, 2014
11:30 – 1:00
Main Conference Room
Northern Virginia Regional Commission
3060 Williams Drive – Suite 510
Fairfax, VA 22031

The purpose of this meeting is to review 2014 campaign activities and plan for 2014 annual report

AGENDA

1. **Introductions, Updates, News Items**
   a. Pet Waste Bag Dispensers-all delivered? Extras?
   b. Invoices – everyone receive? Any issues?
   c. Stormwater Door Hangers
   d. Dog waste post cards
   e. Charity Car Washes Update from Arlington

2. **2014 Comcast Advertising Update**
   a. Ads aired through April
   b. Taggable Spot (show spot)

3. **Discussion of needs for Annual Reports**
   a. Survey to be done in August- should we expand it to include some number of Spanish speakers?
   b. MS4's timeline for education and outreach plans and reports
   c. How are we reaching 20% of each high priority issue target audience
   d. Send Corey the number of promotional items that were handed out so she can include in Annual Report

4. **2015 Campaign Plan**
   a. New Ads? (show Excal video sample)

5. **Wrap-up**
   a. Schedule next meeting

APPENDIX D
OUTREACH MATERIALS

- Falls Church News-Press – March 27, 2014
- Falls Church News-Press – April 17, 2014
- Falls Church News-Press – May 8, 2014
- The Environment – Spring 2014
- Pet Waste Postcard
- City of Falls Church Website www.fallschurchva.gov/Stormwater
    - MS4
    - After the Storm
    - After the Storm (Spanish)
    - Stormwater homepage
    - Stormwater homepage (Spanish)
- Downloadables found on the City of Falls Church Website
    - Cisterns
    - Conservation Landscapes
    - Downspout Disconnection
    - Downspout Redirection
    - Green Roofs
    - Homeowner Guide for a More Bay-Friendly Property
    - How Can I Make a Rain Barrel?
    - Infiltration Trench
    - Native Plants for City of Falls Church
    - Permeable Pavement Specifications – VA DEQ
    - Pervious Pavers
    - Rain Barrels
    - Rain Gardens
    - Rain Garden – Design & Construction

Del. Simon Catches & Reverses Bill in His 1st Session

Continued from **Page 1**

The unanimous House subcommittee vote on Feb. 20 included four "yea" votes from prominent Northern Virginia Democrats.

However, as is too often the case when a veritable blizzard of bills gets introduced to be dispatched in a two-month session, almost no one read beyond the title of this one, Simon suggested. "It seemed simple enough to be against censorship."

But by the time the bill came before the full Militia, Police and Public Safety committee (one of those committees that freshmen legislators get assigned to, Simon noted) the next day, something changed. The bill there, in the overwhelmingly Republican controlled body, received its first "no" votes, six of them.

That's because, Simon explained, in the meantime, he'd had some spare time on his hands, and decided to actually read and think about the bill.

"Well," he recounted, "It became pretty self-evident that the bill would allow for active proselytizing within the ranks by a chaplain, and if that chaplain was a strident evangelical, for example, it could create a very coercive environment."

So, Simon got five Democratic colleagues to vote "no" with him when the bill came before the full committee.

Then, in the week before it came before the full House, he rallied civil liberties groups like the ACLU along with Jewish and Islamic advocacy groups to weigh in against it.

There was no doubt the bill would pass the full House, with its 68-32 Republican majority, as it did handily. The margin was 69-29 on February 25.

But the strong opposition by the Democrats in the House, rallied by Del. Simon's initiative, caught the attention of Governor Terry McAuliffe, and he vetoed it on April 1.

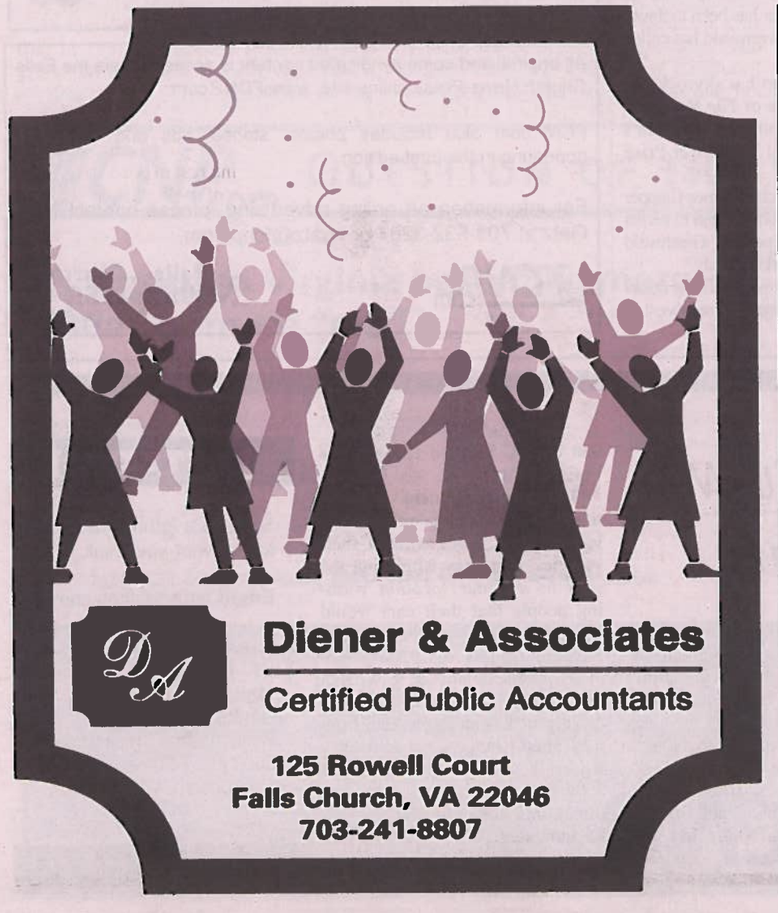
It is unlikely a bill like that will come to close to passage in Richmond again, at least as long as a Democrat is in the state house and someone in the House or Senate is paying attention.

Del. Simon told of other accomplishments in the legislative session, the ones he'd prepared to talk about, including the bill to allow hunting on Sundays. He warned of the consequences of the continuing Republican intransigence to allow the Medicaid gap to be closed in Virginia, such as the closing of rural hospitals.

He said the legislature is caught in a partisan vice whereby any moderation in the GOP threatens a legislator with a right wing primary challenge. He said it will take the effects of "demographic shifts" to change the current deadlock, citing the shift away from the far right already evident in Prince William County, for example.

He said that the growing numbers of "new Americans" in the state will make a difference, but that the next state legislative elections in 2015 will be in a "dead" political year, when no other candidates will be on the ballots, making it doubly difficult to get out the vote.

DEL. MARCUS SIMON spoke to the Falls Church Chamber of Commerce at its monthly luncheon Tuesday. (PHOTO: NEWS-PRESS)



A Homeowner's Guide to a Healthy Watershed

The City's Department of Public Works is dedicated to keeping pollutants from entering the City's stormwater system. Water pollution preventions save resources, time, and money by acting on the root cause of a problem. These actions help protect our local water bodies, Potomac River, the Chesapeake Bay, and the health of all living things that come in contact with these waters.

What can Falls Church residents do to help?

- Keep litter, pet wastes, leaves, and debris out of street gutters and storm drains – these outlets drain directly to lakes, streams, rivers, and wetlands.
- Apply lawn and garden chemicals sparingly and according to directions – and never before or during a rain event.
- Dispose of used oil, antifreeze, paints and other household chemicals properly – not in storm sewers or drains. The City's Household Hazardous Waste collection is on August 23 at the City's Property Yard.
- Clean up spilled brake fluid, oil, grease, and antifreeze. Do not hose them into the street where they will eventually reach our water bodies.
- Control soil erosion on your property by planting native ground cover and stabilizing erosion-prone areas. The City offers advice on how to do this in a cost effective manner.
- Reduce the amount of impervious area and increase the amount of vegetated area in your yard. Using native plants in your landscaping will reduce the need for watering during dry periods. Consider measures to increase infiltration and reduce polluted runoff, such as directing downspouts away from impervious surfaces and onto lawns.

For further information concerning stormwater runoff and pollutants, please contact Jason Widstrom, P.E., Civil Engineer with the Department of Public Works at 703-248-5350 or by email at jwidstrom@fallschurchva.gov.

The City of Falls Church is committed to the letter and spirit of the Americans with Disability Act. To request a reasonable accommodation for any type of disability call 703-248-5350 (TTY 711).

APRIL 3RD COMMUNITY FORUM

Sharpening Our Pencils for Sustainable Schools

Falls Church City has announced a new property tax rate of $1.35 and Falls Church City Schools have asked for a 10% budget increase. Is this affordable? Is this enough? How will this affect not just your taxes, but property values too? Is this sustainable?

Come join us & find out. And share what YOU think.

Join us and be the sharpest pencil in the bunch!

Sponsored by the Falls Church Republican Committee and Falls Church Democratic Committee, American Legion Post 130, and Citizens for a Sustainable City

LOVE OUR SCHOOLS?

HATE OUR TAXES?

HAPPY WITH BOTH?

COME HEAR & BE HEARD

FEATURING:
SUSAN KEARNEY, CHAIR, FALLS CHURCH CITY SCHOOL BOARD

LAWRENCE WEBB, FALLS CHURCH CITY SCHOOL BOARD

PHIL DUNCAN, FALLS CHURCH CITY COUNCIL

SALLY EKFELT, MODERATOR & CAROL LOFTUR-THUN, FORUM CHAIR

THURSDAY APRIL 3, 2014 7:30-9:00 PM

CITY COUNCIL CHAMBERS

Announcing *The Inaugural Concert in the*

COMMUNITY CONCERT SERIES

The Thirteen

An elite ensemble performing music of the Renaissance and Baroque Period

April 7, 2014 at 7:30 p.m.
115 E. Fairfax Street, Falls Church, Virginia 22046

The Concert is Free *(Donations welcome to support the Young Musicians Scholarship Fund)*
Information and Advance Reservations: concerts@tfce.us

THE FALLS CHURCH EPISCOPAL
FOUNDED 1732

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www.thefallschurch-episcopal.org

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NOTICE OF PROPOSED REAL PROPERTY TAX INCREASE

(TO14-17) ORDINANCE SETTING THE RATE OF TAX LEVY ON REAL ESTATE, PERSONAL PROPERTY, MACHINERY AND TOOLS AND ALL OTHER PROPERTY SEGREGATED BY LAW FOR LOCAL TAXATION IN THE CITY OF FALLS CHURCH VIRGINIA FOR TAX YEAR 2014 AND SHORT TAX YEAR 2015.

The City of Falls Church proposes to increase property levies.

1. Assessment Increase. Total assessed value of real property, excluding additional assessments due to new construction or improvements to property, exceeds last year's total assessed value of real property by 6.73 percent

2. Lowered Rate Necessary to Offset Increased Assessment. The tax rate which would levy the same amount of real estate tax as last year, when multiplied by the new total assessed value of real estate with the exclusions mentioned above would be $1.22 per $100 of assessed value. This rate will be known as the "lowered tax rate."

3. Effective Rate Increase. The City of Falls Church proposes to adopt a tax rate of $1.35 per $100 of assessed value. The difference between the lowered tax rate and the proposed rate would be $0.13 per $100, or 10.66 percent. This difference will be known as the "effective tax rate increase."

4. Proposed Total Budget Increase. Based on the proposed real property tax rate and changes in other revenues, the total budget of the City of Falls Church will exceed last year's by 7.15 percent.

Public hearings on the increase will be held on April 14 and April 28, 2014 at 7:30 p.m., or as soon thereafter as they may be heard, in the Council Chambers, 300 Park Avenue, Falls Church, Virginia. The hearings shall be open to the public. The Governing Body shall permit persons desiring to be heard an opportunity to present oral testimony within such reasonable time limits as shall be determined by the Governing Body.

A Homeowner's Guide to a Healthy Watershed

Spring cleaning is just around the corner – Be SMART. Many items found in the corners of the garage, back of the cabinets, and on long forgotten shelves cannot be disposed of in the curbside garbage pick-up.

Hazardous Waste: oil & lead-based paints; stains, thinners, solvents; spray cleaner with flammable propellant; degreasers, oven cleaner; fluorescent bulbs; bleach, drain cleaner; pesticides, herbicides, rodenticides, fungicides; automotive fluids; rechargeable batteries; pool chemicals; floor care products; furniture polish & strippers

Electronics: computers, cell phones, digital cameras, printers, fax machines, televisions, answering machines, tablets, telephones, copiers, VCRs

Please make sure you read and follow label instructions for proper use and disposal in order to protect yourself and the environment. Always store products in their original containers. Never mix them. When spills occur be sure to clean them up promptly. The kitty litter or quick dry that is used to clean them up is then also treated as hazardous waste. Never pour or wash household chemicals or automotive fluids into the street or down a storm drain! Storm drains flow directly into our local streams.

Residents can drop off hazardous materials at the City's Property Yard during Household Hazardous Waste collection on August 23. Residents can also bring materials to the I-66 Transfer Station, 4618 West Ox Road, Fairfax, VA 22030, Thursday thru Sunday throughout the year.

Residents can recycle all electronics at the City's Recycling Center during the Recycling Extravaganza on April 26 and September 6 or schedule a special collection by calling 703-248-5160. Rechargeable batteries and cell phones may be dropped off at City Hall Monday-Friday for recycling. Bins are located in the west wing outside Suite 100W and Police Dispatch. Electronics can also be recycled at the I-66 Transfer Station on Electric Sundays (3/23, 4/27, 5/18, 6/22).

For further information concerning stormwater runoff and pollutants, please contact Jason Widstrom, P.E., Civil Engineer with the Department of Public Works at 703-248-5160 or via email at jwidstrom@fallschurchva.gov.

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Kensington Senior Assisted Living Project Moves Forward at Last

Continued from **Page 1**

than later. The Council gave a preliminary OK to the plan in March, but in the minds of most of them did so only to allow further discussion. Now the Council seems poised to approve it.

An almost four-hour long sequence of meetings at City Hall Monday night culminated with the unanimous vote by the Planning Commission to recommend approval of the project. The Planners' recommendation of approval was a key step to getting final approval from the Falls Church City Council, which sat with the Planners through the first nearly three hours of a work session deliberation Monday.

Following the joint work session, the Planners went into formal session in the Council chambers awaiting some last-minute clarification language on the 18 proffers offered by Novak and Cook, and when they were hammered out, and signed off on by the developers, it then did not take long for the Planners to finish the night's work with their unanimous vote.

The key to overcoming concerns by some on both the Council and Planning Commission that persisted to Monday had to do with additional language added to the Kensington's proffer package that served to insure the project would yield significant new revenues to the City annually.

Notwithstanding that the change was more semantic than substantive, it worked to make it clear the project is not seeking some sort of special subsidy, but on the contrary is willing to make "supplemental payments" on its tax obligations to, as City Manager Wyatt Shields said, "pay its fair share of taxes."

The "supplemental payments" offer was to counter the precedent set by another assisted living facility in the City which pays a fraction of "a fair share."

In an effort to underscore this, the project developers were willing to submit to a tax payment schedule annually equal to a basket, as it was characterized, of comparable average tax payments of the 10 highest-taxed commercial entities in the City in any given year going forward.

As a result of this commitment, the project's .78 acres will rank as the second highest in the entire City in terms of "estimated net annual revenue per acre," bringing to the City a net-net positive of $403,794 per acre, second only to the soon-to-be-completed Hilton Garden Inn next door, estimated to bring in $460,000 per acre on its 1.12 acres.

As Councilman Phil Duncan pointed out, the "net net" yield from the project would be even higher in comparison to other parcels in the City but for the fact it would be replacing a going concern in the Burger King, whose own annual revenues were contributing to the City, if nowhere near the level projected for The Kensington.

With this newly affirmed commitment, the Kensington "is now a purely commercial facility," commented Councilman Dan Sze during the work session, indicating he was willing to move ahead with it.

In addition, the Falls Church Chamber of Commerce also "got it" last week, dropping its earlier reticence to emphatically endorse the project. That news also played well at Monday's work session.

Novak told the joint session that he and Cook have met with neighbors to the site, specifically residents of condominiums at The Broadway, the City's first new mixed-use project that came on line in 2003. Novak said that none of The Broadway residents objected to losing the Burger King on the site, but were mostly concerned that there would not be provision for sufficient parking there.

Novak explained that few if any of the residents of the assisted living building would be using cars, and that the main access by emergency vehicles would be inside the interior parking on lanes wide and high enough to accommodate them comfortably. He also said that "first responders" to medical emergencies in the project would be the staff on duty, limiting the need for frequent arrival of ambulances.

A new proffer added Monday night prohibited personnel working at the facility from parking on the street, requiring them to park inside the project, although everyone agreed that when they were not on duty, they'd be welcomed to park anywhere to spend their hard-earned dollars at City establishments.

Novak said he'd particularly welcome them to park near Mad Fox, where he has a financial stake. Novak has long been an important player in the economic development of Falls Church, working on projects that resulted in The Broadway and The Byron, among others.

VISIT US ONLINE
www.fcnp.com

How Well Do You Know Your Watershed?

May is Watershed Awareness Month and the City's Department of Public Works is dedicated to keeping pollutants from entering the City's stormwater system. By better understanding our local watershed it will assist everyone in protecting our local water bodies, Potomac River, the Chesapeake Bay, and the health of all living things that come in contact with these waters. How well do you really know your watershed? Test your knowledge!

1. What two streams make up the City of Falls Church watershed?
   a. Donaldson Run & Tripp's Run c. Pimmit Run & Four Mile Run
   b. Tripp's Run & Four Mile Run d. Holmes Run & Tripp's Run

2. The most common water quality problem today is _____ pollution.
   a. point source c. nonpoint source
   b. intentional d. piped

3. Nonpoint source pollution cannot be traced back to a _____.
   a. starting place c. single source
   b. pipe d. all of these

4. Sediment and _____ are the most common things carried in runoff.
   a. chemicals c. nutrients
   b. oil d. pesticides

5. Nutrients can come from _____.
   a. pet waste b. erosion
   c. commercial fertilizer d. all of these

Answers: 1) b 2) c 3) d 4) c 5) d

For further information concerning stormwater runoff and pollutants, please contact Jason Widstrom, P.E., Civil Engineer with the Department of Public Works at 703-248-5350 or by email at jwidstrom@fallschurchva.gov.

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Under Contract

154 Haycock Rd. B-3
Falls Church, VA 22046
$300,000

Ready to go! Move-in ready! Walk to WFC Metro, shopping, retail, schools. Completely remodeled Kit. w/ granite counter tops, custom cabinets, full extension drawers/pantry, Bosch/Jen Air SS appliances, gas range,custom pendant lighting, tons of light, freshly painted, spacious main living area, separate dining space. 2BR/1BA, 2 parking spots, storage, laundry, patio, water/gas incl.w/condo fees.

Laurie Mensing
Long & Foster
1355 Beverly Road, Suite 109
McLean, VA 22101
Licensed in VA, MD and DC
703-873-5193
703-965-8133 *(Cell)*
laurie.mensing@longandfoster.com
www.lauriemensing.com
Remember, I treat every transaction as if it was my own.

The Environment Newsletter Spring 2014 Edition

Stories in this edition.

•How to Buy the Right Amount of Paint

•Explaining the Stormwater Utility

•Keep these Items out of the Trash

•Yard Waste Composting

•Styrofoam: Recyclable or Trash?

•Rain Barrel Distribution Event: March 22

Latex Paint How to Buy the Right Amount of Paint

Tired of having half-empty paint cans taking up space?

When buying paint for your home, measuring the square footage of the room will reduce paint waste and save money. The math is simple:

Height x Width = Total Square Feet

One gallon of paint covers about 300 square feet.

The benefit of buying only what you need means you will have less paint to store, or dispose of and you'll save money up front by buying less paint in the first place.

Other painting tips:

1. Purchase water-based paint, stains, finishes and paint stripper. Water-based products will lead to easier disposal if there is any product left over.

2. To prevent leftover paint from drying out, cover the paint can with plastic wrap, replace the lid securely and store the paint upside down. use paint for touch-ups or smaller projects.

3. Store leftover paint in a temperature controlled area to ensure the paint will not freeze.

How to Dispose of Paint:

Do not put liquid paint in the trash or pour it down the drain. Leave paint in its original container so it is easily identified.

Oil-based paint: Oil-based paint contains hazardous materials and should not be disposed of in the regular trash. Take paint to the Fairfax County Permanent HHW Facility or save for our annual Household Hazardous Waste Day in Falls Church.

Water-based paint: Dry paint with kitty litter or sand. Place paint can in trash cart or next to trash cart. Leave the lid off of the can. Disposal personal will not pick up paint if the lid is on the can.

Explaining the Stormwater Utility

Stormwater management in the Little City has been a hot topic over the last three years. Storm events like the one we experienced in

September 2011 remind us that maintaining our stormwater infrastructure is important to the general health and safety of those that live, work, and play in the City of Falls Church. The recent tightening of state and federal environmental policy has also raised awareness about the health of the Chesapeake Bay and its tributaries. Understandably, what we do today has an immediate and lasting impact on our local natural resources like our streams, Tripp's Run and Four Mile Run.

The solutions to our drainage, water quality, and maintenance problems are not simple or inexpensive. Because of this, the City adopted a strategic Watershed Management Plan in 2012 that took a holistic look at effectively managing our stormwater. The plan outlined the issues we're facing and set a path to achieve the goals of the community. The array of actions proposed by the plan included: policy and ordinance changes; staff additions; programmatic changes to the city's stormwater program; design and construction of 11 projects around the City; and creation of a dedicated funding stream for the City's stormwater program. In response to the needs identified in the plan, the City Council passed an ordinance in April 2013 that created the Stormwater Utility.

The purpose of the Stormwater Utility is to provide an adequate, sustainable source of revenue for stormwater management in order to maintain the service level that is necessary to protect the health, safety, and welfare of the residents of the city. The City Council weighed options for addressing the fact that higher amounts of impervious area like roofs, driveways, parking lots, sidewalks, and patios contribute greater amounts of stormwater and pollutants to our streams, and ultimately the Chesapeake Bay. The City Council determined after much deliberation that it is in the best interest of the public, and most equitable, to enact a stormwater utility fee that allocates stormwater management program costs to property owners based on impervious area.

Revenue collected by the utility fee is placed in a stormwater management enterprise fund that can only be used for the City's stormwater management program. The funds pay for City staff (e.g. engineers, inspectors, maintenance crew, and supervisor) to clean and repair 27 miles of stormwater pipes, 1.5 miles of open stream, 1400 inlets and manholes; to design and oversee the construction of capital projects; and to manage the City's state-required stormwater permit and floodplain program. Additionally, the fund is used to purchase construction materials for repairs and new infrastructure.

The City also has a credit program readily available for all property owners. A credit is a reduction in impervious area due to implementation of a stormwater management facility. A credited area is subtracted from a property's total impervious area prior to calculating the fee for the stormwater utility. In all cases a property can achieve no more than a 95% credit. Stormwater management facilities are given credits because, when operated and maintained properly, they reduce the quantity and improve the quality of stormwater runoff. This in turn reduces the need for capital investment in new infrastructure. In order to participate in the program an application must be submitted to the City and renewed on a yearly basis. Further information is available on the website listed below and will be included in the mailing that will be sent out in the next few weeks.

When you receive the mailing, take a look at the sample bill and how the City arrived at the calculation. We encourage property owners to make a thorough review and apply for credits now. The first official billing will be a part of the June 2014 property tax bill.

The Stormwater Utility Fee is an important program for the health and safety of our community. For more information, please visit the City's Stormwater page at www.fallschurchva.gov/Stormwater.

Keep these items out of the Trash

When it comes to getting rid of things like plastic bottles or apple cores, there is not a lot of mystery involved: recycle, trash or compost. But there are a number of common household items that are a bit more complicated and do not belong in your trashcan.

1. Rechargeable batteries: Batteries are small; therefore it is tempting to toss rechargeable batteries in the trash. Do not do it! Instead, bring your rechargeable batteries to our drop off locations in City Hall, or the Fairfax County Permanent HHW Facility. If you have alkaline batteries to dispose of, MOMS Market, and Home Depot have drop off programs.

2. Electronics: Electronic products are made from valuable resources and materials, including metals, plastics, and glass. All of these materials require energy to mine and manufacture into usable electronics. Donating of recycling electronics conserves natural resources and limits air pollution. There are numerous options for recycling electronics.
a. Recycling Extravaganza: Free, twice yearly event. The spring 2014 event is on April 26 from 9 a.m. until 2 p.m. at 217 Gordon Road.
b. E-Asset Solutions: A local R2 certified electronics recycler. Some fees may apply.
c. Special Collection: Must be a City of Falls Church curbside customer to apply. City crews pick up electronics curbside. A fee of $30 per appliance is charged. Call 703-248-5160 to schedule.
d. Big Box Store drop-off: Stores such as Best Buy and Staples will take used electronics.

3. CFL Light Bulbs: CFL light bulbs contain a bit of mercury and are not safe to throw in the regular trash. Save CFL light bulbs for our once yearly Household Hazardous Waste Day or take to the Fairfax County Permanent HHW facility.

4. Oil-based Paint: Oil-based paint contains a number of chemicals that have special disposal needs. Save oil-based paint for our once yearly Household Hazardous Waste Day or take to the Fairfax County Permanent HHW facility.

Yard Waste Composting

The City of Falls Church offers leaf mulch to residents free of charge. Those interested may stop by the Recycling Center between 7 a.m. and dusk, seven days a week with their own containers, shovels or pitchforks to haul away the mulch. Residents are also able to compost leaves on their own property.

Leaves are one of the best things to add to your compost bin or pile. They contain many nutrients gathered from a tree's root system and surrounding soil. As they compost, the nutrients spread throughout the pile. Just about any type of leaf will work. There are two things to remember to do to make sure your leaves compost correctly: always shred the leaves before you compost them, and turn the pile

once a week to make sure the pile receives air and stays fairly damp.

Other organic materials are also suitable for composting in your yard. On April 5, 2014 the City of Falls Church in collaboration with Master Gardener Sandy Tarpinian, will host a Yard Waste Composting Class in which participants will receive a free compost bin. At the class, participants will learn how to add in grass clippings, straw, and non-woody plant trimmings to your yard waste compost pile.

If you are not ready to begin yard waste composting at home, the Falls Church yard waste program runs year round. A few reminders about how to prepare yard waste and brush for curbside collection are below.

Yard Waste- Grass, leaves, small plant trimmings and other small debris must be place in 30 gallon brown paper Kraft bags with $1.00 yellow collection stickers. Stickers are available at City Hall, Browns Hardware and Giant Food Store. Brown bags are available at local hardware and grocery stores.

Brush- branches must be bundled with twine or neatly stacked in a rigid container (such as a tote, bin, or old trash container) sized less than 30 gallons, less than 50 pounds, and labeled "brush". Branches must not exceed five feet in length or six inches in diameter.

Unbundled Brush- requires a special bulk collection at a cost of $75 per 2 cubic yards. Call 703-248-5160 to schedule.

Styrofoam: Recyclable or Trash?

Styrofoam is everywhere. Styrofoam cups, plates, packing peanuts, and packing in appliance boxes. The sheer volume of styrofoam in products does not mean that styrofoam, technically known as expanded polystyrene, is recyclable. The City of Falls Church does not accept styrofoam in its curbside or drop off recycling programs.

Although it is not recyclable, packaging pieces, styrofoam cups and styrofoam plates are ending up at the curb in City of Falls Church green recycling carts. At this time, styrofoam is not accepted at the curb for recycling collection. Please place styrofoam in the trash. Styrofoam will end up as litter at the recycling facility and the City of Falls Church could be assessed a fee for sending non-recyclables to the recycling plant. The best approach for Styrofoam is to avoid it or reduce the need for it. DPW encourages residents to:

1. Ask for non-styrofoam takeout containers such as foil or plastic at restaurants, or bring reusable containers from home

2. Choose grocery and retail products that do not have Styrofoam packaging (Paperboard egg cartons rather than Styrofoam cartons).

3. Send letters to ask manufacturers and restaurant to replace Styrofoam with more recyclable alternatives such as paperboard.

Some local packaging and shipping companies will take styrofoam peanuts, the small soft packaging material. Locally, UPS will accept peanuts. If you have any further questions regarding styrofoam disposal, please call the Recycling Office at 703-248-5456

Rain Barrel Workshop Rain Barrel Distribution Event: March 22

The City of Falls Church provides low cost rain barrels to residents through a partnership program with the Northern Virginia Rain Barrel Program. Currently the program has distributed over 3,200 rain barrels since the program's inception in 2007. Residents can participate by building their own rain barrel during in a two-hour workshop, or by purchasing a pre-made barrel. All events require registration. The next rain barrel distribution event in Falls Church is scheduled for March 22 from 1:00 p.m. until 4:00p.m. Follow the link to register.

Rain barrels are containers placed under a downspout to collect water from your roof. Rainwater collection can help you save water for use in your yard, eliminate potential flooding in your basement, and reduce stormwater management costs. Prior to ordering you rain barrel there are a few things to think about:

1. Where am I going to put the rain barrel? Or, which downspout will I place the barrel under?

2. How do I want to direct the overflow water from my barrel?

3. Do I want to connect two barrels together?

For help in answering the above questions, visit the Northern Virginia Rain Barrel website. All events will include instructions regarding installation and maintenance.

Installing a rain barrel on a residential property can reduce your stormwater utility fee if coupled with other pollution prevention practices called a Stormwater Pollution Prevention Plan (SWPPP). Under the approved SWPPP the City will award two points for each rain barrel that captures stormwater from a separate downspout. A property owner achieving 10 points or more will receive the SWPPP credit of 10 percent off of the annual stormwater fee. SWPPP's must be submitted to the City per the regulations listed in the Stormwater Utility Fee Credits Manual.

For questions regarding the Stormwater Utility Fee Credit Manual or Residential SWPPP Application Form, contact the Stormwater Division at 703-248-5466.

Events:
Habitat Restoration Events: March 8, April 5, May 10 For details call: 703-248-5456
Leaf Mulch Loading: March 22 8am-2pm Contact: 703-248-5456
Rain Barrel Distribution: March 22 1pm-4pm 7100 Gordon Road. 703-248-5456
Yard Waste Composting: April 5, 10am-2pm
Spring Cleanup: April 12. 10am-noon. 223 Little Falls. Call 703-248-5456 to reserve your spot.
Recycling Extravaganza: April 26, 9am-2pm. Recycle computers, clothes and more. 703-248-5456

KNOW WHAT'S YUCKIER THAN PICKING UP DOG POOP?

PLEASE PICK UP MY POOP.

Stepping in it.

Know what's even more disgusting than that? Swimming in, fishing from or treating our drinking water from sources that have dog poop in them!

Please pick up after your pooch.

Cleaning up pet waste is good for your health and the environment! Seriously. Pet waste left on the ground, especially near streets and sidewalks, gets washed into storm drains and drainage ditches which flow to your local waterway…without being treated! Bacteria, parasites, and viruses found in pet waste can be harmful to water quality and human health. Not only is picking up after your pooch the neighborly thing to do, it's the healthy thing to do…for you and the environment!

Visit the Northern Virginia Clean Water Partners web site at www.onlyrain.org

CITY OF FALLS CHURCH

Department of Public Works
300 Park Avenue
Suite 100W
Falls Church, VA 22046

The City of Falls Church is committed to the letter and spirit of the Americans with Disability Act. To request a reasonable accommodation for any type of disability call 703-248-5030. (TTY 771)

Yearly Permits

Municipal Separate Storm Sewer System (MS4) Permit

Purpose

The City of Falls Church is currently authorized to discharge stormwater under a Virginia Pollutant Discharge Elimination System (VPDES) general permit regulated by the Virginia Department of Environmental Quality (DEQ). Without this permit the City would be in violation of State and Federal laws created by the Clean Water Act.

The MS4 Permit is a planning document in which the city must outline activities that will reduce stormwater runoff pollution to the maximum extent practicable. These activities are commonly referred to as Best Management Practices (BMPs).

Minimum Control Measures

The state requires localities to focus on 6 minimum control measures, which are:

- Construction Site Stormwater Runoff Control
- Illicit Discharge Detection and Elimination
- Pollution Prevention / Good Housekeeping for Municipal Operations
- Postconstruction Stormwater Management in New Development and Redevelopment
- Public Education and Outreach on Stormwater Impacts
- Public Involvement / Participation

Effects of Pollution
Pollution Solutions
Después de la Tormenta

After the Storm

Definition of Stormwater Runoff

Stormwater runoff is rainwater that does not soak into the ground but instead runs off buildings, streets, parking lots, and other surfaces. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater runoff from naturally soaking into the ground.

The Problem with Stormwater Runoff

Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

Después de la Tormenta

¿Qué es la escorrentía de aguas pluviales?

Escorrentía de aguas pluviales ocurre cuando la precipitación de la lluvia o deshielo fluye sobre el suelo. Las superficies impermeables como calzadas, aceras y calles evitan la escorrentía de forma natural empapando la tierra.

¿Por qué es la escorrentía de aguas pluviales un problema?

Aguas pluviales pueden recoger escombros, productos químicos, suciedad y otros contaminantes y flujo en un sistema de alcantarillado pluvial o directamente a un lago, arroyo, río. Todo lo que entra en un sistema de alcantarillado pluvial se descarga sin tratamiento en los cuerpos de agua que utilizamos para nadar, pescar y el abastecimiento de agua potable.

Los efectos de la contaminación

Escorrentía de aguas pluviales contaminadas pueden tener muchos efectos adversos en plantas, peces, animales y personas.

Los sedimentos pueden enturbiar el agua y hacen que sea difícil o imposible que las plantas acuáticas cultivar. Los sedimentos también pueden destruir los hábitats acuáticos.

El exceso de nutrientes puede causar la proliferación de algas. Cuando las algas mueren, se hunden hasta el fondo y se descomponen en un proceso que elimina el oxígeno del agua. Los peces y otros organismos acuáticos no pueden existir en el agua con bajos niveles de oxígeno disuelto.

Las bacterias y otros patógenos pueden lavar en zonas de baño y crear riesgos para la salud, a menudo haciendo necesario el cierre de playas.

Los escombros - bolsas de plástico, anillos de latas, botellas y colillas de cigarrillos - lavados en cuerpos de agua pueden ahogar, sofocar o inhabilitar los organismos acuáticos, como patos, peces, tortugas y aves.

Desechos domésticos peligrosos como insecticidas, pesticidas, pinturas, solventes, aceite de motor usado y otros fluidos de automóviles pueden envenenar la vida acuática. Los animales terrestres y las personas se pueden enfermar por comer pescado y mariscos enfermos o ingerir agua contaminada.

Aguas pluviales contaminadas a menudo afectan las fuentes de agua potable. Esto, a su vez, puede afectar a la salud humana y aumentar los costos de tratamiento de agua potable.

After the Storm
Capital Projects
Educational Materials
Floodplain
Municipal Separate Storm Sewer System (MS4) Permit
Ordinance
Stream Restoration Projects
Stormwater Utility Fund
Resource Protection Areas
Watershed Management Plan
Aguas pluviales y planicie inundable

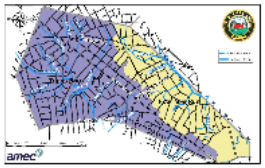
Stormwater and Floodplain

The Department of Public Works (DPW) manages, maintains, and repairs the City's stormwater system, which includes 140,000 linear feet of storm drain, 1,400 appurtenances, and 8,100 feet of stream channel in the Four Mile Run and Tripp's Run watersheds.

Definition

Stormwater is rainwater that does not soak into the ground but instead, runs off buildings, streets, parking lots, and other surfaces. Stormwater is collected in gutters and flows to storm drain inlets and into the city's storm drain system. This water then flows - untreated - to tributaries and to either Tripp's Run or Four Mile Run, then to the Potomac River and out to the Chesapeake Bay.

Falls Church Watershed



Polluted runoff is the number one cause of water pollution in Northern Virginia. The same rain that washes streets, yards, and parking lots clean is sending chemicals, germs, and trash down the drain. All of the storm drains in the City of Falls Church lead directly to streams and rivers.

Stream Restoration Projects

The City of Falls Church is entering the construction phase of the restoration of Coe Branch & Pearson Branch. The project is expected to take up to six months to construct if the weather cooperates. For more information on these projects please visit the individual project pages.

Stormwater Ordinance Changes

As of July 1, 2014, Chapter 35 Stormwater has replaced code in Chapter 14, Environment, Article IV, Erosion and Sediment Control and Chapter 48, Zoning, Article IV, Districts, Division 16, Chesapeake Bay Preservation Area (CBPA) Overlay District.

For more information on how this impacts development projects please read the Stormwater Permit guidance document.

Only Rain Down the Drain

This is the motto of the Northern Virginia Clean Water Partners (NVCWP), which represents 11 northern Virginia local governments (including the City of Falls Church), independent water and sanitary sewer authorities, and local businesses who care about the quality of our waterways and the region's quality of life.

Contact Us

Engineering
Email

300 Park Ave.
Suite 100 West
Falls Church, VA 22046

Ph: 703-248-5350 (TTY 711)
Fx: 703-248-5336

Hours
Monday - Friday
8 a.m. - 5 p.m.

Staff Directory

Related Documents

- Construction General Permit Registration Statement
- Construction General Permit Registration Statement - Notice of Termination
- Stormwater Permit Guidance Document
- VRRM New Development Compliance Spreadsheet
- VRRM ReDevelopment Compliance Spreadsheet

Aguas pluviales y planicie inundable

El Department of Public Works (Departamento de Obras Públicas) administra, mantiene y repara el sistema de aguas pluviales de la Ciudad, el cual abarca 140,000 pies lineales de drenajes pluviales, 1,400 accesorios y 8,100 pies de canales de arroyo en las cuencas hidrológicas de Four Mile Run y Tripp's Run.

Definición

Las aguas pluviales son agua de lluvia que no es absorbida por el suelo, sino que escurre de edificios, calles, estacionamientos y otras superficies. Las aguas pluviales se recolectan en alcantarillas y fluyen a colectores pluviales y al sistema de drenaje pluvial de la ciudad. Del drenaje pluvial, estas aguas fluyen –sin tratamiento alguno– a afluentes o ríos tributarios y a las cuencas ya sea de Tripp's Run o de Four Mile Run, después al Río Potomac y por último a la Bahía de Chesapeake.

Los escurrimientos contaminados constituyen la principal causa de contaminación del agua en el norte del estado de Virginia. La misma agua que limpia calles, patios y estacionamientos arrastra sustancias químicas, gérmenes y basura al drenaje pluvial. Todos los drenes pluviales de la Ciudad de Falls Church desembocan directamente en arroyos y ríos.

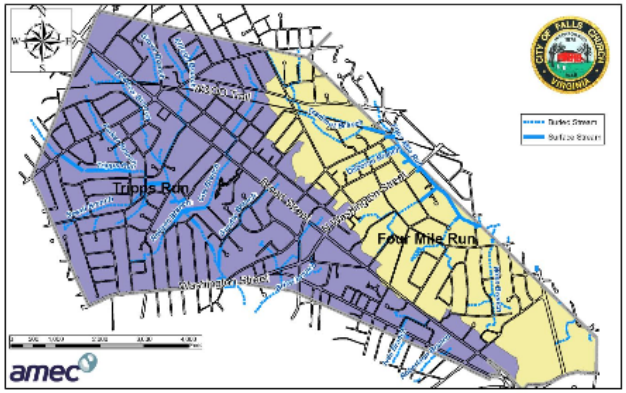
Proyectos de restauración de arroyos

La Ciudad de Falls Church está a punto de iniciar la fase de construcción del proyecto de restauración de los afluentes Coe y Pearson. Se calcula que la fase de construcción del proyecto durará hasta seis meses, si las condiciones climáticas lo permiten. Para obtener más información sobre estos proyectos por favor visite las páginas específicas de cada proyecto.

Only Rain Down the Drain

Only Rain Down the Drain (Únicamente agua de lluvia al drenaje) es el lema de la organización Northern Virginia Clean Water Partners o NVCWP (Aliados por el Agua Limpia en Virginia), que representa a 11 gobiernos locales del Estado de Virginia (entre ellos la Ciudad de Falls Church), autoridades independientes encargadas de drenajes sanitarios y pluviales, y empresas locales interesadas en la calidad del agua de nuestros cauces fluviales y en la calidad de vida de la región.

Cuenca hidrográfica de Falls Church



Cuenca hidrográfica de la Bahía de Chesapeake

Cisterns

A cistern is a large tank that collects rain water from your roof. Cisterns are most appropriate when there are significant outdoor water needs. They can be above ground, connected to a downspout, or buried under ground. The rain water can be used for many activities including:

- Watering plants (gardens, lawn)
- Washing your car
- Washing the dog
- Flushing toilets (requires additional permits and plumbing)

The benefits of a cistern include:

- Savings on your water bill by using rain water instead of drinking water for irrigation.
- Relief from drainage problems and basement flooding issues by collecting and containing much of the roof runoff.
- A reduction in stormwater runoff from your property, which reduces the amount of sediment and other pollutants that would be washed away with the runoff into nearby storm drains and local streams.
- Groundwater recharge. The slow release of the water allows it to soak into the ground, which supplies water to local streams in between storms.

Cisterns come in a variety of sizes. Select a cistern based on an estimate of how much runoff is generated by your home and how much water you can reuse on your property. Most cistern systems include a pump to provide sufficient water pressure to use the water. It is best to regularly use the water in your cistern to keep the system operating well and ensure there is capacity to store water from the next rain storm. Locate the cistern in a shady or protected location to deter algae growth in the tank. Darker colored tanks also help prevent algae growth. It is recommended to disconnect and drain the tank prior to the first winter freeze.

The Langston-Brown Community Center cistern (top) can hold 11,000 gallons of water.

This cistern at the County Trades Center (bottom) can hold 2,000 gallons of water.

Top banner: Cisterns come in a variety of shapes and sizes.

Learn more about cisterns at
www.bae.ncsu.edu/stormwater/PublicationFiles/WaterHarvestHome2008.pdf

Arlington's StormwaterWise Landscapes Program
www.arlingtonva.us/stormwaterwise

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Conservation Landscapes

Conservation landscapes are designed, planted and maintained to benefit people, the local streams and the Chesapeake Bay. Conservation landscapes use native plants as a low-cost alternative to traditional landscapes, which use turf grass and ornamental plantings.

The benefits of conservation landscapes include:

- A unique, aesthetic beauty.
- Minimized need for mowing, pruning, irrigation, pesticides and fertilization, saving you time when compared to traditional lawn maintenance.
- Costs typically half or as little as one-fifth the cost of conventional landscapes.
- Creative and fun designs with plants of your choice.
- Absorption of more stormwater than a conventional landscape.

Native plants used in a conservation landscape:

- Are relatively low maintenance and better adapted to local climate conditions than conventional landscapes, resulting in less need (and cost) for herbicides, fertilizers, pesticides or soil conditioning.
- Help to remove suspended solids and heavy metals from groundwater.
- Stabilize soils and prevent erosion.
- Provide food and habitat for local wildlife such as beneficial pollinators, songbirds, and migrating birds and butterflies.

To install a conservation landscape:

1. Select an area where you would like to create a conservation landscape. It can be in an existing garden bed, or you can replace an area of lawn. Native plants flourish in local soils—even clay– but working leaf mulch or compost into the soil can improve drainage.

Some native plants options will attract butterflies and birds to your yard.

2. Select the plants and get started creating! Landscapes that include trees or shrubs provide the most benefits for water quality and wildlife, but beds of flowering native perennials will attract pollinators like butterflies and bees. County staff can provide you with information on appropriate plants for a conservation landscape.
3. Plant your landscape!

Conservation landscape maintenance in the first year after installation may require the new plants to be watered if it doesn't rain for an extended period of time. Mulching can help improve soil health and limit weed growth. Occasional weeding may be needed. Trees and shrubs may need pruning and perennials may need deadheading, depending on species. Replacement of diseased or dying vegetation, or reseeding, may also be required.

Learn more about conservation landscapes at:

- www.nps.gov/plants/pubs/chesapeake
- www.chesapeakelandscape.org
- www.dcr.virginia.gov/natural_heritage/nativeplants.shtml
- http://audubonva.org

Arlington's StormwaterWise Landscapes Program
www.arlingtonva.us/stormwaterwise

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DISTRICT DEPARTMENT OF THE ENVIRONMENT

Downspout Disconnect

Downspout Disconnection Defined

A downspout is a pipe that carries rainwater off of rooftops. Some downspouts drain into yards or other vegetated surface, while others drain directly into the sewer. Even during very short rains, downspouts that are connected to the sewer contribute to sewer overflows. When the sewer system fills up with rainwater, sewage overflows into the Rock Creek, Potomac, and Anacostia Rivers.

Disconnecting downspouts and diverting rain water onto your lawn or garden is an easy way to keep water out of the sewer system, keeping local rivers cleaner and our environment healthier.

Stormwater Runoff and the District of Columbia

Stormwater runoff is rainwater that flows off impervious surfaces such as rooftops, driveways, roads, sidewalks and sometimes even lawns. Stormwater runoff travels from these surfaces to our streams, picking up pollutants such as oil and grease from our roadways and driveways as it goes. Nutrients from lawn fertilizers and bacteria from pet waste may also be picked up by stormwater and carried to our streams.

RiverSmart Homes

clean water starts here

A program of the District Department of the Environment

The District Department of the Environment (DDOE) RiverSmart Homes District-wide program offers incentives to homeowners interested in reducing stormwater pollution from their properties.

Find more information visit:
ddoe.dc.gov/riversmarthomes or
call 202-535-2240

How to Disconnect Downspouts

Step 1: Observe your Site

Observe your site to ensure that water infiltrates into the ground in such a way that will not damage your foundation.

- Make sure water flows away from the house or other structures.
- Discharge water 5’ feet from the house.
- Do not disconnect downspouts on slopes over 10%, into areas too small for good drainage, or where water will flow to a neighboring property
- Do not discharge water within 10 feet of a retaining wall.
- The end of the downspout extension should be 5 feet from your house, neighboring properties, and the sidewalk.

Step 2: Design and Disconnect

- Secure downspout to the exterior of the building.
- **Measure** the downspout. Mark the downspout at 4’ and 14’ from the ground (or sewer pipe).
- **Cut** the downspout at the markings and remove the cut piece.
- **Cap** the sewer pipe and secure pipe with a hose clamp.
- Place an elbow extension over the edge of the downspout and secure with sheet metal screws or pop rivets.
- **Attach** the downspout extension and elbow to the cut downspout. **Screw** to secure
- Cut the downspout extension to the desired length. (Note: Some corrugated pipes can be breading grounds for mosquitoes. Be sure to use a pipe that will not hold water.)
- **Place** a splash block and river rock at the end of the extension to prevent erosion.

** Necessary tools and materials (listed below) can be found at your local hardware store.*

Step 3: Maintain

- Clean gutters at least twice per year.
- Reinforce low spots along gutter with new hangers.
- Check that all elbows and extensions are securely fastened.
- Check and clear elbows in downspouts.
- Do not drain water onto impervious surfaces.
- Make sure water flows away from the house.

Tools and Materials:

- **Hacksaw**
- **Gloves**
- **Drill**
- **Tape measure**
- **Screwdriver**
- **Pipe cap and clamp**
- **Downspout extension and elbow (aluminum, steel, copper, or vinyl)**
- **Sheet metal screws or pop rivets**
- **Aluminum shears (optional)**

Measure

Cut

Cap

Attach

Screw

Place

Downspout Redirection

Redirecting your downspout to gravel, to a vegetated area such as a rain garden, or to a cistern or rain barrel helps reduce the volume of runoff and the amount of pollutants that are washed into the storm drain.

When downspouts are pointed towards paved areas (like a driveway or street), or are connected with underground pipes directly to the storm sewer system, water isn't able to soak into the ground. Water moves very quickly from the roof to local streams causing erosion and destroying sensitive stream habitat. Water flowing over paved areas also washes sediment and other pollutants into the storm drain and local streams.

It is best to direct your downspouts to a vegetated area such as a rain garden or conservation landscape or to an underground gravel storage area like an infiltration trench. These features slow runoff down and help it soak into the ground. Another alternative is to direct the water from downspouts to a cistern or rain barrel for irrigation or washing uses later.

Prior to disconnecting your downspout, consider:

- Where you are directing the water. Direct the downspout extension away from the building's foundation and adjacent properties, into a landscaped area. The extension should end at least 3 feet away from the basement foundation, and directed towards a slope that is downward and away from your foundation.
- Ice could form during cold weather. Do not direct runoff to areas that are frequent pathways.
- The completed project should be a permanent solution which is beneficial to your grass, flowers, shrubbery and trees.
- Firmly anchored splashblocks should be installed if the downspout drainage is traveling over landscape or dirt.

Information about downspout redirection can be found on the StormwaterWise Landscapes website at www.arlingtonva.us/stormwaterwise

A disconnected downspout can be directed to a gravel or vegetated area to capture the water. It is important to direct the downspout away from the house to ensure that water does not pool next to your foundation.

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Green Roofs

A green roof includes layers of soil and plants on top of the roof. Like a traditional roof, there is a waterproofing layer under the soil and plants. Rain water that falls on the roof is absorbed by the soil and taken up by the plants. As a result, less rain water runs off of the roof and into the nearby storm drains and streams.

The benefits of a green roof include:

- Extending the life of your roof by reducing temperature fluctuations that can damage roofing materials.
- Providing additional insulation for your home, which conserves energy, and saves you money.
- Reducing runoff from your home, which can help alleviate any drainage or runoff problems that occur in your yard.
- Reducing the quantity of runoff, sediment, and pollutants that wash into local streams.
- Improving air quality. The plants take up carbon dioxide and release oxygen.

Green roof plants are low growing and do not need mowing or trimming. Your roof may need to be weeded a few times per year. You may also need to inspect the waterproofing layer and drains periodically. The company that installs your green roof will have recommendations for maintaining it in good condition.

Learn more about green roofs at
www.toolbase.org/Technology-Inventory/Roofs/green-roofs

Arlington's StormwaterWise Landscapes Program
www.arlingtonva.us/stormwaterwise

Sedums (top) are a common choice for green roof plantings.

Arlington County Courthouse Plaza (middle) and Walter Reed Community Center (bottom).

Top banner: Private residence green roof North 16th Street.

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Homeowner Guide
For a More Bay-Friendly Property

October 1, 2013

This document was produced by the Chesapeake Stormwater Network in association with the Chesapeake RiverWise Communities Program and the following collaborators:

Nissa Dean, Anna Mathis, Jacob Bauckman, Donna Morelli, Drew Siglin, Alliance for the Chesapeake Bay; Suzanne Etgen, Jennifer Vaccaro and Lara Mulvaney Anne Arundel County Watershed Stewards Academy; Tom Schueler, Cecilia Lane, Anne Guillette and Rupert Rossetti, Chesapeake Stormwater Network; Bryan Seipp, Center for Watershed Protection; Jen Dindinger, UMD Sea Grant Extension Program; Sarah Lane, UMCES, DNR; Shereen Hughes, Wetlands Watch

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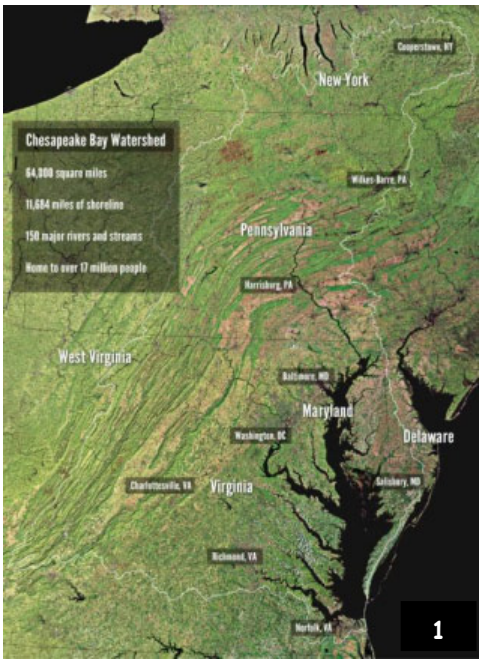
Homeowner Guide Photo/Schematic Credits: 1. Chesapeake Bay Program, 2. Christin Jolicoeur, Arlington County, VA, 3. Philadelphia Water Department, 4. Rain Garden Handbook for Western Washington Homeowners, WSU Extension, 5. Rain Garden Handbook for Western Washington Homeowners, WSU Extension, 6. Ted Scott, 7. Rain Garden Handbook for Western Washington Homeowners, WSU Extension, 8. Anne Guillette, Low Impact Design Studio, 9. Kara Crissey, Good Earth Gardeners, 10. Abbey Associates Inc., 11. John Dawson, Master Steward, 12. International Society of Arborculture, 13. Maryland Department of Natural Resources, 14. Aaron's Rain Barrels, 15. Garden Water Saver, 16. Interlocking Concrete Paver Institute. All other photos and diagrams are from the Chesapeake Stormwater Network.

Introduction

In the Chesapeake Bay watershed, one of the greatest threats to the health of the Bay comes from increased development of the land. Increased development and transformation of the landscape leads to less rainwater soaking into the ground where it is naturally filtered before returning to our streams and rivers. Instead, more water "runs off" our properties and travels along our impervious corridors of driveways and streets picking up pollutants along the way which are then delivered to our streams and ultimately the Chesapeake Bay.

So what can YOU do? Every parcel of land in the watershed impacts the quality of the Bay including your individual property. You can decrease the impact that your property has on the Bay by reducing the amount of pollutants and stormwater generated from your lot.



This guide presents a step by step approach for analyzing your property to find out whether it makes sense to install a rain garden or other residential stewardship practices. We then take you through the design and installation of several of the homeowner practices, so that you can install them on your own. Many Bay communities offer technical and financial assistance to help you install stewardship practices on your lot. Check out Appendix D for a list of links to these programs.

Practices for a "Bay-Friendly" Property

The goal is to reduce the volume of stormwater that runs off your individual property so as to remove pollutants, such as nitrogen, phosphorus and sediment, before they are delivered to local streams and eventually reach the Chesapeake Bay. There are multiple practices that a homeowner can do to accomplish this. The following homeowner practices can be employed to reduce runoff and pollutants coming off of their property.

Rain Gardens

Rain gardens accept runoff from a roof, driveway, or parking lot that would otherwise go to the street or storm drain. The garden has a shallow depression that allows stormwater to collect and pool. Natural soils are replaced with sandier ones to allow the water to soak into the ground instead of running "off" into the storm sewer system or stream. The garden is planted with a mix of native plants that filter out pollutants and attract wildlife.

Conservation Landscaping

Conservation landscaping is the creation of mulched beds that are planted with perennial plants, shrubs and/or small trees that retain rainfall and absorb runoff from adjacent turf or paved surfaces. Native plants are preferred, but ornamental plants are acceptable if they are adapted to regional climates and are not invasive spreaders.

Tree Planting

Tree planting is the practice of planting deciduous or evergreen trees in grassy areas that will grow and create a leafy canopy that intercepts rainfall and reduces runoff. Native tree species are preferred. Trees can be planted by the owner or a contractor, but species should be selected that will grow best given a variety of conditions, including the soil conditions and solar exposure at your planting site.

Cisterns and Rain Barrels

Cisterns and rain barrels are used to capture roof runoff in a barrel or tank which can then slowly empty into the lawn or landscape or be reused for outdoor irrigation/watering and/or for selected indoor uses. While rain barrels can be installed by a homeowner, larger tanks and cisterns require a qualified design and installation professional. If stored runoff is used for indoor purposes, special measures may need to be taken to improve water quality.

Permeable Hardscapes

Permeable hard-scapesrefers to the installation of pavers on driveways and sidewalks that allow rainfall to rapidly pass through the paver and into a shallow stone reservoir that allows the water to soak into the ground. The practice applies to both residential and non-residential paved areas, and may be a great option to replace deteriorating pavement. Most permeable pavers require the assistance of an experienced designer and pavement installation contractor.

Impervious Cover Removal

Impervious cover removal consists of the breaking up of existing hard surfaces and proper disposal or recycling of the asphalt or concrete, followed by roto-tilling of the underlying soils to relieve compaction, and planting them with grass or other vegetation. Pavement removal can occur on residential or non-residential properties. Some owners may be able to remove pavement, but it is often a good idea to hire a contractor to do the job.

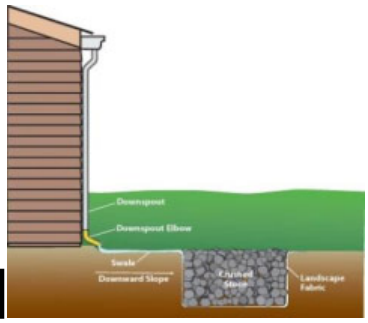
Green Roof

2

Green roofs are systems that store and filter rainfall that lands on the roof through a thin layer of soil media and specialized vegetation. These practices can sometimes be applied on residential rooftops, but must be designed and installed by a qualified designer/contractor. A fun fact is that Washington, D.C. now has more green roofs than any other city in our nation!

Dry Wells

Dry wells are created by excavating a shallow trench that is filled with stone and used to temporarily store runoff so it can soak into the ground. Dry wells can be designed and installed by the owner, although some technical assistance may be needed if they are located close to a basement



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Several other environmental site design practices may be used to treat runoff from some properties, such as bioswales, landscape infiltration, submerged gravel wetlands, rooftop disconnection and stormwater planters. In addition, property owners can reduce their impact on local streams and the Bay by using Bay-friendly lawn care.

Bay-Friendly Lawn Care

Lawns make up a significant portion of individual properties and have been shown to produce more runoff than their forested counterparts. A recent research report by the Chesapeake Bay Program recommends ten practices that can make your lawn more Bay-friendly (USWG, 2013: http://chesapeakestormwater.net/training-library/urban-restoration-techniques/urban-nutrient-management/).

1. Maintain a dense cover of grass or conservation landscaping to reduce runoff, prevent erosion, and retain nutrients

Dense grass or plant cover helps to reduce surface runoff. Regardless of whether it is fertilized or not, lawns with poor turf cover have a high risk for nutrient loss, especially if soils are compacted or slopes are steep. Any bare spots or eroding areas should be re-seeded, and may require some soil amendments, spot fertilization and, in extreme cases, stabilization with a biodegradable erosion control cover.

2. Reduce or Eliminate Fertilizer:

- ***Choose not to fertilize, OR***
- ***Adopt a Reduce Rate/Monitor Strategy, OR***
- ***Apply less than a pound of Nitrogen per 1000 square feet per each individual application.***

You have three fertilization options to reduce the risk that fertilizer from your lawn will reach the Bay, depending on the conditions of your lawn and your aesthetic preferences.

The easiest strategy is to not fertilize at all, which make sense for lawns that are relatively flat and mature, and have a dense grass cover. This strategy relies on soil mineralization, lawn clippings and atmospheric deposition to supply the nutrients needed for growth, but should NOT be used on lawns that have poor turf cover or exposed soils.

The second strategy relies on a "reduced rate and monitor" fertilization approach. In this strategy, you only apply one-third to one-half of the recommended application rate on the fertilizer bag label, and then monitor how your lawn responds over the next couple of

months. If you are unsatisfied with the look of your lawn at that point, you can always re-apply fertilizer at the smaller dose. More is not always better; your lawn may look just as healthy as it does at the full application rate.

The third strategy is to fertilize at the recommended nitrogen fertilization rate but split it into 3 or 4 small doses during the growing season. Individual application rates should be no more than 0.9 pound of nitrogen per 1000 square feet of lawn in most parts of the Bay watershed

When assessing your property, we recommend that you measure your lawn area which will help you to figure out how much fertilizer you will need to apply.

If you choose to fertilize, the following practices can further reduce the risk that fertilizer you do apply ever reaches the Chesapeake Bay.

3. Do not apply fertilizers before spring green up or after the grass becomes dormant

Researchers have concluded that the highest fertilizer loss occurs in the winter when grass is dormant. In the northern part of the Bay watershed, dormancy usually begins around Halloween, whereas it begins around Thanksgiving in the southern part of the watershed.

4. Maximize use of slow release N fertilizer

The risk of nutrient loss during the growing season can be further reduced if you buy slow release fertilizer products. Check the bag label when you shop to see how much water insoluble nitrogen or WIN it contains -- at least 20 to 50% of WIN is generally desirable.

5. Immediately sweep off any fertilizer that lands on a paved surface

Rotary spreaders are the most common method to apply fertilizers and can broadcast fertilizer granules beyond the lawn and onto the street or driveway where they can be washed away in the next storm. Some experts think as much as 2 to 4% of applied fertilizer can be washed away in this manner. If you are buying a new spreader, consider models that have side broadcast deflectors that can sharply reduce off-target fertilization.

6. Never apply fertilizer within 15 to 20 feet of any water feature and manage this zone as a grass, meadow, or forest buffer.

The risk of nutrient loss is also high when fertilizer is applied close to water features such as swales, drainage ditches, streams, shorelines, sinkholes and wetlands. So it is a real good idea to create a "fertilizer-free" buffer zone around these water features, and manage this area as a conservation landscape.

Even if you don't fertilize your lawn, there are still other good practices to make your yard more Bay-friendly.

7. Keep clippings and mulched leaves on the lawn and keep them out of streets and storm drains

Lawn clippings are an important nutrient and organic matter source which can enhance the health of your soils and your lawn. Using a composting lawn mower to keep the clippings on your lawn adds about one pound of N per 1000 square feet of natural (and free) fertilizer to your lawn each year.

You should treat lawn clippings and tree leaves as if they were a bag of fertilizer, and strive to keep them on your lawn, and out of the gutter, street or storm drain system and never, ever dispose of yard waste in a ravine or near a stream.

When you rake your leaves in the Fall, it is good practice to run over them with your composting mower to mulch them into small fragments and add them to your compost pile in the backyard. Come late Spring, they will decompose into a fine organic mulch that you can add to your rain garden or conservation landscape as a top dressing (assuming that you turn over the pile every couple of months).

8. Set mower height at 3 inches or taller

Maintaining taller grass produces a deeper and more extensive root system which allows for increased nutrient uptake and reduced lawn runoff volume. The deeper roots also reduce the need for supplemental irrigation during times of drought, suppress weeds and increase turf density.

9.Use other practices to increase the porosity and infiltration capability of your lawn to treat stormwater.

Disconnecting your rooftop downspouts and installing practices like rain gardens have been shown to increase your lawn's ability to retain and manage stormwater on-site.

10. Consult with your local extension service office or lawn care company to get the best advice on how to have a Bay-friendly lawn, which might involve a soil test analysis.

Many lawn care professionals can help you achieve an attractive and Bay-friendly lawn, given your type of grass, soil conditions, shading, and your landscape preferences. Some good links to for expert help to reach your lawn goals can be found in Appendix E.

Finally, if grass doesn't grow well in portions of your yard, then consider mulching or conservation landscaping. Check to see if you have invasive ground covers such as English ivy and periwinkle that can quickly spread into natural areas and are so shallow-rooted that they can't prevent soil erosion. If possible, try to remove these invasive spreaders and replace them with turf or conservation landscaping.

Conservation landscaping provides colors throughout the year

Assessing Your Property

A good first step to helping the Chesapeake Bay is to walk around your lot and assess the site conditions. This simple and fast assessment of your site will help you determine which stewardship practices are best for your property.

Image of a typical suburban lot in Maryland with the planned stewardship practices plotted out (CL= Conservation Landscaping, BR = Rain Garden, PP = Permeable Hard-scapes, Green Dots = Trees).

Step 1. Map your Lot

Begin by obtaining a recent aerial photo of your property. You can do this by using Google Earth or http://landserver.org/ also, many localities have great online resources for mapping your property. In some cases, you may want to simply pace off the boundaries of your property.

You can take the roof dimensions directly off your property deed. Most homes have a roof area around 1500 to 2500 square feet.

Next, draw the boundary dimensions of your property from above on a piece of graph paper (Appendix A), and then sketch in the roof, any decks, sheds or pools, the driveway and sidewalks, major trees, and any landscaping beds. The rest is usually turf.

You don't need to be a Rembrandt, but try to draw it to scale, using five or ten feet per square on the graph paper, depending on the size of your lot. Next, pace off (or measure) the approximate dimensions of all your hard surfaces and landscaping areas, and enter them into the table provided in Box A to determine how much hard surface you have.

Box A. Basic Data on Lot Cover for My Home and Impressive Sketch			
LOT COVERAGE	Area: Square Feet	% of Lot	Sketch of Property
Hard Surfaces		28%	
Roof-tops	3360		
Driveway/Sidewalk	2790		
Pervious Cover		72%	
Trees/Landscaping	5500		
Lawn	10,130		
TOTAL	21,780		
Note: 43,560 square feet = one acre			

Step 2. Figure Out Your Natural Plumbing

It's pretty simple, water flows downhill. Most lots are graded to move rainwater away from the home and down to the street, or in some cases, the back yard. So your job is to define the flow path of runoff in your lot.

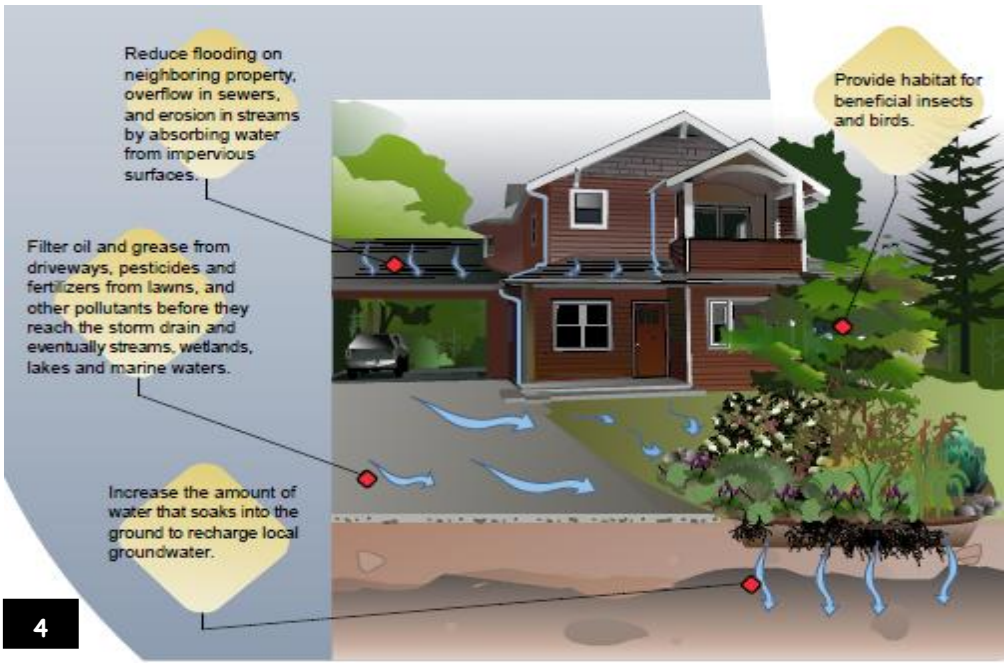
Start at the downspout to find its flow pathway across your property

Most lots have multiple flow paths, so start out by finding each of your downspouts, and look down slope to see where the water goes. Pay special attention to see if the flow path extends to your driveway and from there to your street. These areas are usually great candidates for stewardship practices because you can divert the runoff to them to soak up runoff and remove pollutants.

Some downspouts already flow over lawn, landscaping or trees and infiltrate into the ground. These downspouts are good, as the runoff is disconnected and never reaches the street or stream.

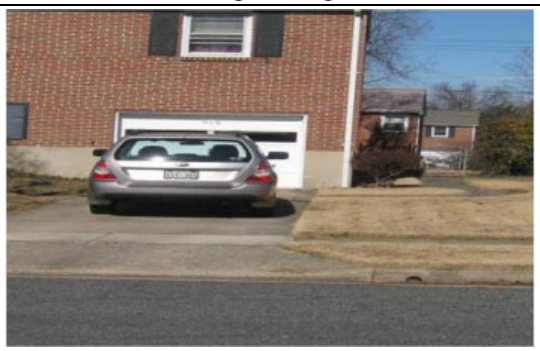
In other cases, the flow path from the downspout runs over a few feet of grass before reaching the street or driveway. These are often excellent locations for stewardship practices, such as rain gardens.

Lastly, there are a few cases where the downspout is plumbed directly to the street via an underground pipe (see Box B). With a bit of ingenuity, the underground pipe can be partially dug out, and replaced with a rain garden.

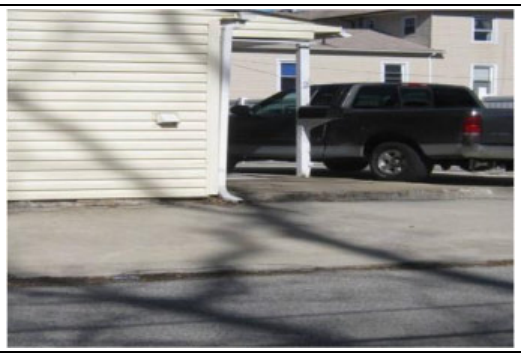


Box B. Be a Downspout Detective

Downspouts discharging near driveways are usually connected to the street, and are prime candidates for locating a rain garden



This downspout is plumbed directly to the street, and would be quite easy to retrofit with a rain garden



This downspout is too far away from any pervious areas for a rain garden, but a rain barrel might work

Runoff from both of these downspouts travels at least 40 feet over grass which will usually disconnects them unless your lawn is very steep, These disconnected downspouts are often a poor candidate for a rain garden

Step 3. Figure Out Your Other Plumbing

Underground utilities are definitely one of the great inventions of the 20th century, but they can complicate the design of your residential stewardship practices.

Things to locate on your lawn and avoid (and add to your sketch)		
Natural gas feeder line	Underground electric lines	Street right of way
Sewer lateral and cleanout	Cable and fiber optic lines	Septic field (if present)
Water lines and wells	Sump pump discharges	Overhead forest canopy

After all, you probably wouldn't want to blow up your house, create a gusher, back up sewage into your basement, electrocute yourself, or cutoff cable access to your entire neighborhood. I bet you didn't think a little digging could be so dangerous!

State	Resource	Contact Information
MD	Miss Utility of Maryland*	811 or 1-800-257-7777**
DE	Miss Utility of Delmarva	811 or 1-800-282-8555
DC	District One Call	811 or 1-800-257-7777
PA	Pennsylvania One Call System, Inc.	811 or 1-800-242-1776
VA	Virginia 811	811 or 1-800-552-7001
WV	WV811	811 or 1-800-245-4848
* For the Eastern Shore of MD call Miss Utility of Delmarva ** or use website link http://www.missutility.net/homeowners/		

Most states have "call before you dig" rules and provide a hotline to help you locate your underground utilities. The following table provides the contact information for individual Chesapeake Bay states however, in any state you can call "811" and you will be directed to your local call center.

In many cases you will need to call several days in advance so you should check with your specific state. More information about this free resource can be found: http://www.call811.com/state-specific.aspx

Please note that Miss Utility and similar hotlines do not mark private utilities. You will need to scout your lawn to locate where utilities leave the street or right of way, and cross your yard to enter or leave your home. Box C provides some examples of "visual indicators" for locating underground utilities. You should try to mark these on your property sketch and work around them when locating the best area for your stewardship practices. In general, it is not advisable to install practices in your street right of way,

since your local government and utilities have the right to dig it up for street improvements and utility repairs.

Box C. Visual Indicators for Areas to Avoid When Assessing Your Yard for Stewardship Practices		
Water Lines	Natural Gas Lines	Sewer Lines
Underground Cable	Storm Drain Manhole	Sewage Pipe Cleanout
Basement	Sump Pump Discharge	Street Right of Way

Step 4. Assess Soil Quality in Your Yard

Healthy soils are the foundation for any vigorous lawn, conservation landscape, or rain garden, so it is a good idea to do some simple tests to assess your soil quality.

Take a soil test in the areas of your lawn where grass doesn't grow very well. Take a trowel and dig 8 or 10 thin slices from the top 2 or 3 inches of soil in your lawn "problem areas". Mix the slices together so that you have a total sample of between 1 and 2 cups. Remove any rocks, debris or grass thatch, and put them into the sample bag provided by the testing lab.

A list of testing labs in the Bay watershed can be found at the end of the following link. http://www.hgic.umd.edu/content/documents/SelectingandUsingaSoilTestLabwithchart2_09.pdf.

The cost for most soil tests is about $10 to $12, and most labs can e-mail you the results in less than a week and recommend any needed soil amendments (such as lime) to improve growing conditions.

Additional soil information may be necessary for implementing specific stewardship practices and can be found in those sections of the document.

Step 5. Check Your Solar Exposure and Tree Canopy

Go back to your aerial photo of your yard that you retrieved in Step 1, and check to see how much tree canopy exists over your yard. If you have less than 25% tree canopy, you may want to consider planting more trees, since they add to the market value of your home and can help reduce your heating and cooling costs. Some localities and states have tree planting programs that will pay you to plant more trees. More information can be found in the Tree Planting section of this document.

There are a few tips to locate the best spots to plant a tree and figure out which tree species will grow best under your yard conditions and landscaping preferences. Not to worry, the Center for Watershed Protection has a handy reference called *Part 3 Urban Tree Planting Guide* which can help you quickly figure out which tree species you want and where to plant them. The guide can be accessed at: http://www.na.fs.fed.us/pubs/uf/watershed3/urban_watershed_forestry_manual_part3.pdf

The next task is to determine the solar exposure of your property to see if the plants will receive full sun or will be partially shaded. Your solar exposure is determined by three factors: the orientation of your property in relation to the east-west path of the sun, shading by the existing tree canopy in your yard (and often your neighbors), and the shading effect of your home.

Often, North or West-facing areas of your yard will be shadier, but you can do a quick shade analysis and add it your property sketch by clicking: http://www.thegardencontinuum.com/blog/bid/28513/How-much-sun-does-your-garden-have. The shade analysis will help you decide to buy sun or shade tolerant plants for your yard.

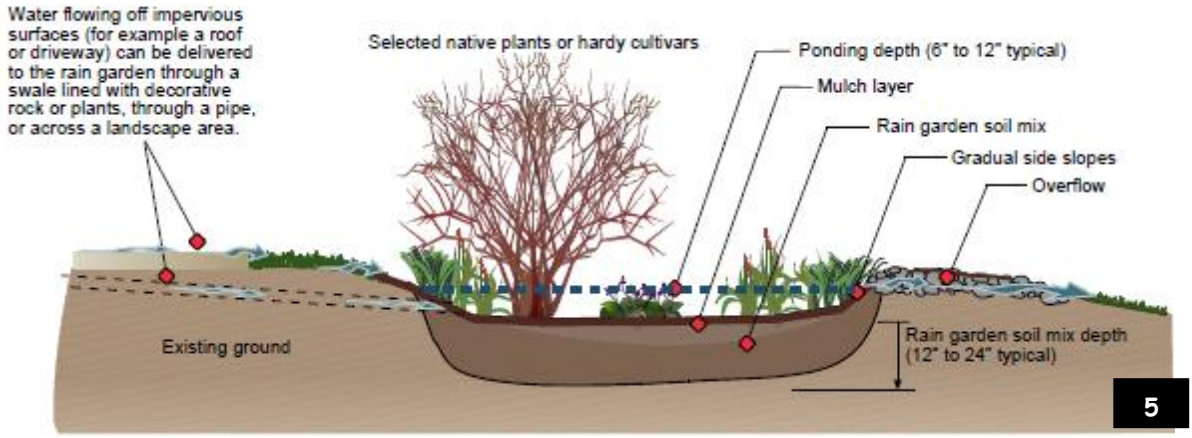
Step 6. Pulling it all Together in a Plan

Now you have all the basic data needed to make your property more Bay friendly, and to choose the right stewardship practices that meet your environmental objectives and your lawn and landscaping preferences. The next several sections describe how to design and install the different options for residential stewardship practices.

Rain Gardens

Rain gardens treat stormwater runoff generated by your property by acting like a native landscape and filtering runoff and pollutants through the soils and plants.

A rain garden works by collecting stormwater runoff from a roof, driveway, or parking lot that would otherwise go to the street or storm drain. The water temporarily ponds on the surface of the garden and then slowly filters through the soil media and/or is taken up and used by the plants. The garden is planted with a mix of native plants that filter out pollutants and attract wildlife.



Cross Section of a Rain Garden

Test Your Soils to See if a Rain Garden Will Work

You will need to run some additional soil "tests" in order to design and build your rain garden.

Step 1: Figure out your maximum digging depth and get a better sense of the actual soil properties where you intend to dig your rain garden. Using a post hole digger, do a penetration test to see how deep into the soil profile you can physically dig. The goal is to see if you can make a hole that is at least two feet deep, although sometimes tree roots, clay layers or even bedrock can prevent you from reaching that far.

If you do encounter bedrock or the hole fills up with water, then it may not be feasible to install a rain garden in that location. In general, you need a digging depth of at least 18 to 24 inches to make a rain garden work.

Step 2: Examine your soil properties. Next, look at the profile of soils that you have excavated to see the break between your topsoil layer and the underlying sub soils which you will need to remove during construction (Box D).

Box D. Use Your Hole Digging to Check Out Soil Quality

The first six inches or so of soil are usually dark, loamy and rich in organic matter and nutrients

As you go farther down into the sub soils, soil quality gets poorer, and often has more clay. The soils in the bottom 6 to 12 inches of soil are always removed from the rain garden and disposed of somewhere on your yard. This can be a lot of dirt -- 4 to 6 cubic yards -- for a typical rain garden, so have a plan where you can fill depressions, holes or create berms somewhere on your property

Box D. Use Your Hole Digging to Check Out Soil Quality

Otherwise, you end up like I did, and have a pile of dirt that is extremely hard to grow anything on. I intend to mix the fill soil with a lot of leaf compost and eventually spread it over a conservation landscaping area

Step 3: Do a simple infiltration test in your hole to see how quickly water will soak into the bottom of your planned rain garden. Simply follow the procedures shown in Box E and you can calculate the soil infiltration rate (in inches per hour). Once again, you should jot this number down, as you will need it later in the design stage.

Box E. The Post Hole Digger Method to Measure Your Soil Infiltration Rate

Using the post hole digger, make a hole about two feet deep

Fill bucket of water and fill hole to brim

Note the time that you started

Box E. The Post Hole Digger Method to Measure Your Soil Infiltration Rate	
	Note the number of hours it takes for the hole to completely drain Divide the depth of the hole (inches) by the number of hours to drain In this case, 24 inches/12 hours = 2 inches/hour, which is a good infiltration rate If your infiltration rate is less than 0.5 inches/hr, you will need to increase the surface area of the rain garden by 50%.

You now have all of the information you need to design your rain garden, so grab a calculator and tape measure, and get cracking.

Designing Your Rain Garden

Step 1: Estimate rooftop area draining to each of your most promising downspout(s). Simply, take the total rooftop area you entered in Box A of the property assessment section, and divide by the total number of downspouts at your home:

Total Roof Area	No. of Downspouts	Area Draining to Rain Garden
2650 sf	5	530 sf
Note: For the most accurate estimate, you can measure the actual roof area draining to each downspout		

Step 2: Determine minimum surface area for rain garden. Assume that the ponding area of your garden will be at least 6 inches deep, and will capture the first inch of rainfall that lands on your roof. The minimum surface area for your rain garden is computed using the following equation:

Surface Area Draining to the Rain Garden	"Engineering Factor" (multiply by 0.12)	Minimum Surface Area For Rain Garden
530	0.12	64 square feet
Note that one 4 by 8 tarp would be 32 square feet, so you would need an area equivalent to two tarps to locate a rain garden at this downspout		
The engineering factor computes how much surface area is needed in your rain garden to capture one inch of rainfall that falls on your roof.		

Step 3. Go outside to your downspout with some tent stakes and mark out the potential surface area available for your rain garden. Place the first stake at least 5 feet away from the downspout (if you don't have a basement) or 10 feet (if you do).

Check your property sketch to see if there are any underground utilities in the vicinity of your planned rain garden and then stake out a line at least two feet away from them. Contact Miss Utility to request an on-site utility check: they will usually come to your home within a few business days to confirm that your proposed digging area is utility free (see page 15 for hotline numbers).

Walk in a downhill direction until you reach the bottom of the hill or your property boundary (whichever comes first) and place a stake there. The line from your downspout to this stake is called the plumb line. Tie a string to the stake and then run it back to the bottom of the downspout so that the string is level. The vertical distance between the level of the string at your stake and the lawn surface is where you measure how many inches of drop you have.

If you have more than six inches of drop, you will be able to construct a soil berm on the downstream end of the rain garden to increase the ponding area.

Walk in a perpendicular direction on each side of the plumb line until you reach a major tree (think roots), hard surface, or start going seriously uphill. Stake out the lateral boundaries, and you have now defined the maximum envelope that is available for digging your rain garden.

Go out to your garage and get a small tarp and multiply its length and width to see how many square feet it covers. I use a 4' by 8' tarp that is 32 square feet in area. If I can get the equivalent of two tarps within the envelope defined by the stakes, then I am good to go (e.g. minimum area needed = available area).

You can still make a rain garden work with only half of the recommended minimum surface area, but you should expect that your rain garden will be wet-footed (see planting guide).

If you still can't make it work, consider another practice, such as a rain barrel with the overflow directed to a conservation landscape...especially if you have an infiltration rate of less than a quarter inch per hour. Some tips for installing rain barrels can be found in the Rain Barrel Design Section.

Step 4: The last step is to figure out how much excess fill needs to be disposed of, and how much sand and mulch to order. So we go back to our earlier measurements of the maximum digging and topsoil depth, and use the calculator provided below (also provided in Appendix B).

Calculator to Estimate Excess Fill and Materials to Buy		
Design Factor	Example	Your Calculation
EXCESS FILL		
Max Digging Depth	24 inches	
Ponding Depth	6 inches	
Top Soil Depth	6 inches	
Subsoil Depth	12 inches	
Divide Subsoil Depth by 2, and then divide this by 12	[12 inches/2] /12 X = 0.5 feet	
Garden Surface Area	64 square feet = Y	
Z = Multiply X and Y and divide the product by 27	[(64)(0.5)] / 27 = 1.2 cubic yards	
Note: About 6 Wheelbarrow loads per cubic yard	**About 7 loads of subsoil to dispose of elsewhere on your lawn**	
MULCH CALCULATOR		
Garden Surface Area	64 square feet	
1 cubic yard for each 64 square feet of garden area	1 cubic yard of mulch to order [1]	
SAND CALCULATOR		
Take Z and multiply by 1.4	= 1.7 tons of sand to order (round up to 2 tons)	
RIVER STONE CALCULATOR		
Assume 0.2 tons per inlet	0.2 tons (400 pounds) [1]	
[1] Most bulk orders must be done in one cubic yard or ton increments. Last time I checked, the delivered price of sand is about $45, double shredded hardwood mulch costs around $35 a cubic yard and river stone runs $100/ton. You may want to budget about $250 for plants, the connector pipe and other stuff.		

Some Cool Rain Garden Design Solutions

Not every rain garden design is the same; Box F demonstrates some creative ways to fit in a rain garden in a specific design situation.

Box F. Some Cool Rain Garden Design Solutions	
Two downspouts, one rain garden and a large area of conservation landscaping	Stone walkway over rain garden
Narrow stone trench across driveway leads to rain garden on the other side	Under drain pipe collects runoff from the bottom of the rain garden and discharges it down-gradient (which may be a good option if you have poor infiltration rates)

Constructing Your Rain Garden

Now it's time to order your bulk supplies for your rain garden, after a brief break to partake of a cold beverage. You will need a series of hand tools, tarps and wheelbarrows to install your rain garden, as shown in Box G.

Box G. The Tools of the Rain Garden Trade	
Post Hole Digger for Soil Test	The axe helps to whack pesky tree roots
Two tarp method: one for topsoil and one for subsoil. May need a third for your sand/mulch	You will be moving a few tons of soil and other materials, so make sure to get a sturdy wheel barrow
You need more than just a shovel to install a rain garden. In addition to what is shown above, make sure to get a can of spray paint, some 2 ml black plastic, and a flexible downspout connector.	

Step 1: Use a hose, heavy rope or can of spray paint to delineate where you plan to dig, keeping at least 3 feet from any known utilities and out of the street right of way. If you have not yet called Miss Utility, get on the phone now.

Step 2: Connect a flexible connector pipe to your downspout and use it to move the rainwater where you won't be digging. Dig a shallow trench at least a foot wide and six inches deep that extends at least ten feet from the foundation of your house to the head of the rain garden. Make sure that you have enough slope to move runoff away from the house...3 to 6 inches of drop from the downspout to the head of the rain garden is usually enough.

Box H. Options for Your Rain Garden Inlet

Attach Flexible Connector Pipe to Downspout

Make Sure it Extends 10 feet if you have a basement

Black plastic to line the bottom of inlet trench

Example of River Stone Inlet

Step 3: Line the trench with plastic sheeting that can be purchased at any home and garden store. The impermeable black plastic (3 to 5 ml thick) is used to wrap the bottom and sides of the inlet channel to make sure runoff gets to your rain garden and not in your basement. You can test how water-tight your inlet is by running a garden hose to make sure water quickly reaches the downstream end of your inlet trench.

Step 4: You have two options at this point (Box H). You can either bury the connector pipe in the shallow trench and cover it with soil up to the existing lawn grade, or you can create a river stone channel, which is my preference.

Step 5: Now is the time for some serious digging. The first part is pretty tedious...separating the turf from your topsoil and throwing each onto Tarp 1. You may need to use the root axe to get around underground tree roots, but keep going until you dig down about 9 to 12 inches, where you will reach your poorer sub-soils or clay layer (see Box D).

Step 6: At this point you will need to use a pick or adze to break up these compacted soils. Make sure to separate these lousy soils from the good ones by throwing them onto Tarp 2. Keep on digging until you reach your maximum possible digging depth, which is usually around 18 to 24 inches.

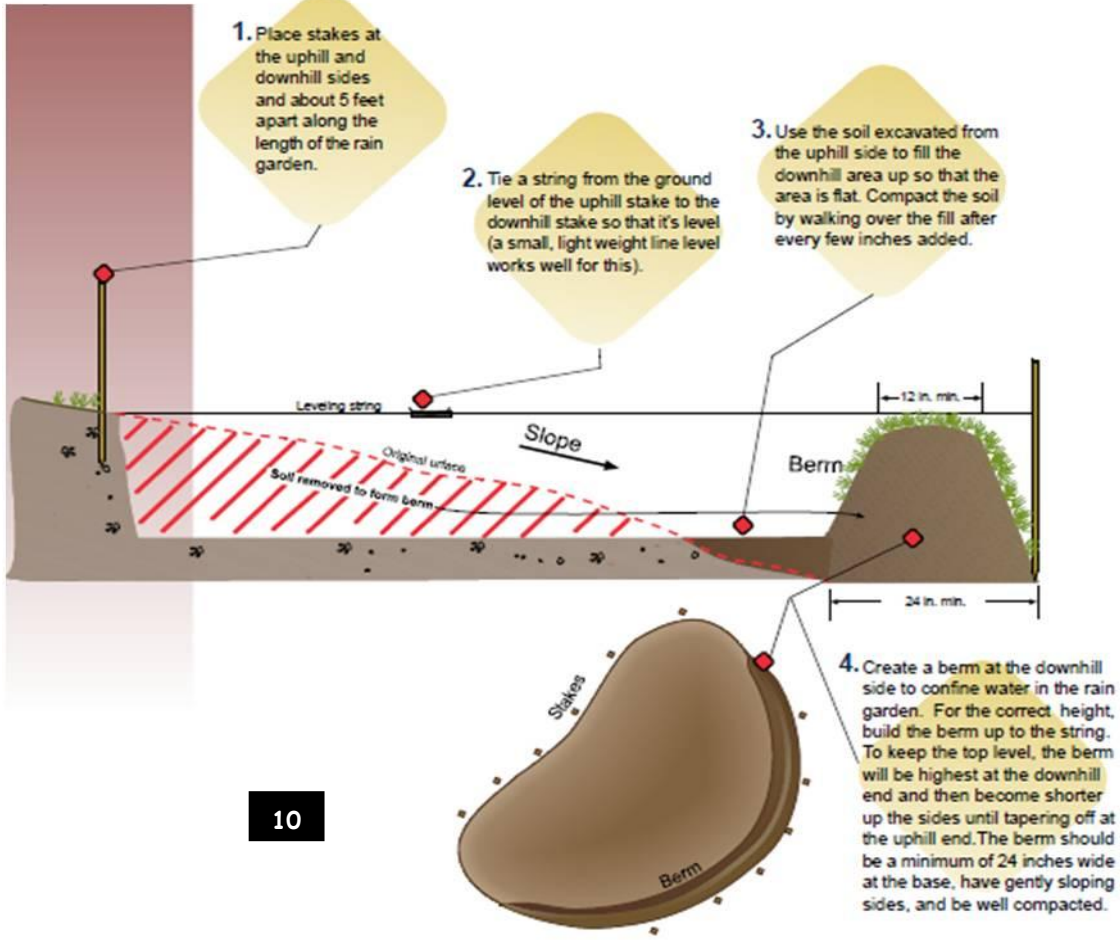
Step 7: The bottom of the bed should generally be flat, although it is OK to have a few inches of drop going in a downhill direction. At this point, you want to take a pick or a hoe and loosen up the subsoil at the bottom of your rain garden to improve infiltration.

Step 8: Install a ponding berm (optional). If you measured more than six inches of drop from your original plumb-line, you can take some of your lousy dirt from Tarp 2 and form a soil berm nine inches wide and six inches high (or level with the bottom of the downspout) around the perimeter of your rain garden. Make sure to tamp the berm down so it can hold water during a storm. More details on ponding berm are provided in the graphic on the next page.

Step 9: Install a surface overflow channel. Remember that your rain garden is only designed to capture one inch of rain, so larger storms must be able to find an easy downhill exit out of the rain garden. I usually dig a small overflow channel at the down-gradient end of the rain garden that is about three inches below the grade of the bottom of the garden.. The overflow channel should connect the bottom of the garden, extend through the berm (if present), and discharge directly to the street or right of way.

The channel can be back-filled with river stone prevent erosion and make it more attractive.

Installing a Ponding Berm



Example of an River Stone Overflow Channel From a Rain Garden

Step 10: You can backfill now by alternating a shovelful of sand with a shovelful of your good Tarp 1 topsoil until you are about six inches below the grade of your lawn. The goal is to have at least a 50:50 mix of good topsoil and sand (it's OK to have more sand than soil). Over the next month or so, it will settle a few more inches, but don't worry about that. You can also add leaf mulch or compost in the areas you plan to dig planting holes.

Step 11: Spread no more than 2 or 3 inches of double shredded hardwood mulch on the bed.

Step 12: You can then dispose of your fill soils elsewhere on your yard to fill holes, depressions or gullies. It is a good idea to amend the soils with compost, and re-seed them with a grass or conservation landscaping seed mix. You may also need to reseed the turf underneath your tarps if they were on the ground long enough to kill the grass. You can now retire to your deck, partake of another cold beverage and admire your work.

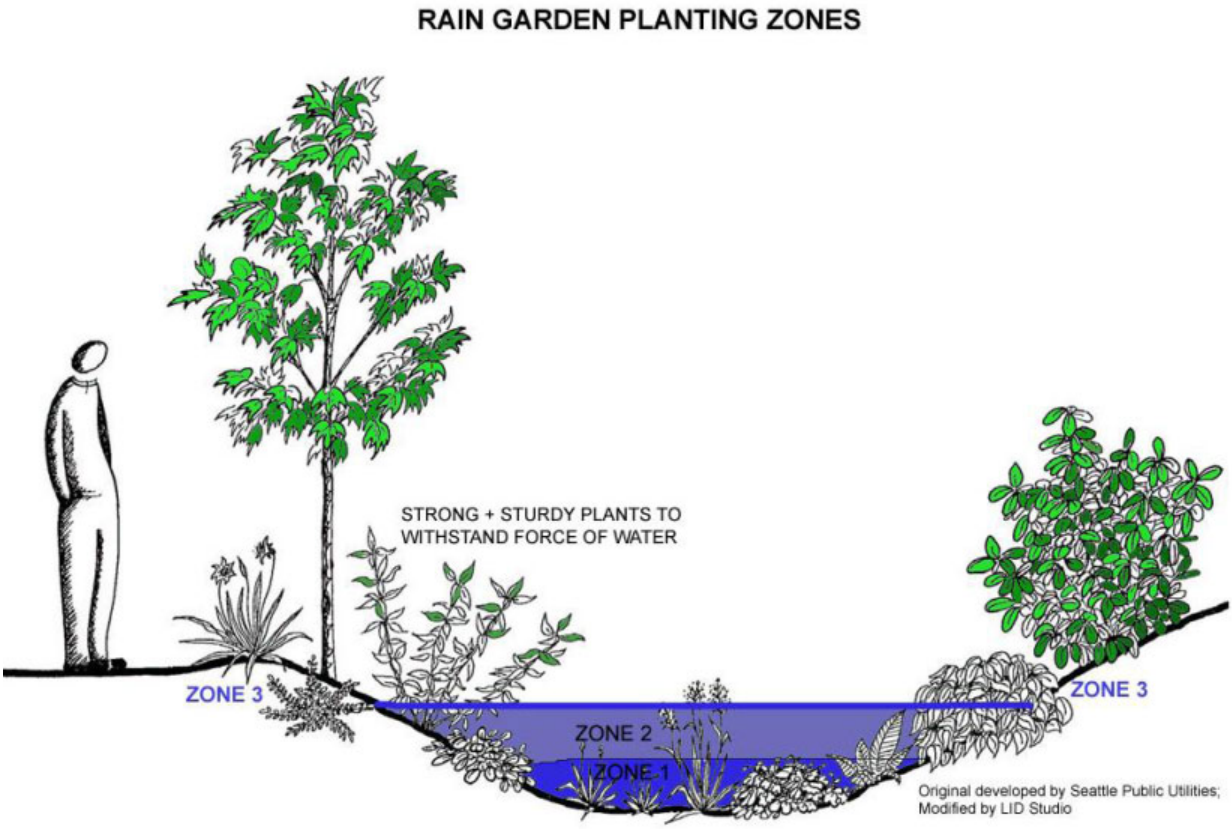
Planting Your Rain Garden

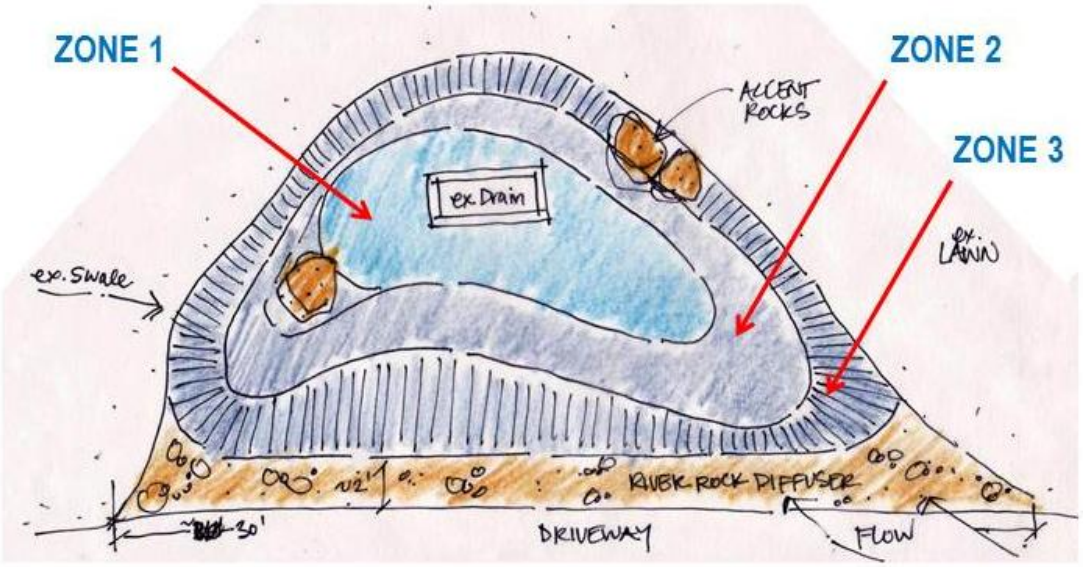
It is easiest to design a successful and flourishing rain garden if you think about the anatomy of a rain garden, how they retain water, and how plants are selected and planted in three types of zones. Rain Gardens are planted with various types of plants because some plants tolerate sitting in water for an extended time (Zone 1), some tolerate sitting in water for a shorter time (Zone 2), and other plants do not like sitting in water at all (Zone 3).

In the plant world, scientists determine plants tolerance for 'wet feet' which means how much they like their roots to be wet. The plants in Zones 1 and 2 are more 'wet footed' and Zone 3 plants are edge plants. Edge plants are essentially plants which can be used everywhere in your landscape. Interestingly enough many 'wet footed' Zone 1 plants also thrive during times of drought and heat. The wonders and resilience of nature!

Some homeowners may choose to wait a few weeks after construction before developing a planting plan in order to see where the water settles (literally) and more importantly, observe the water zones that are created in the rain garden. Water seeks its own level, and there will be some areas of the rain garden which hold water and are more saturated than others. Understanding these planting zones is critical to picking the native plants which will thrive best in your rain garden. Box I shows the water zones that can be found in a rain garden.

Box I. The Water Zones in a Rain Garden and What they Mean (profile and plan)





Source: Anne Guillette, Low Impact Design Studio

8

Planting Design

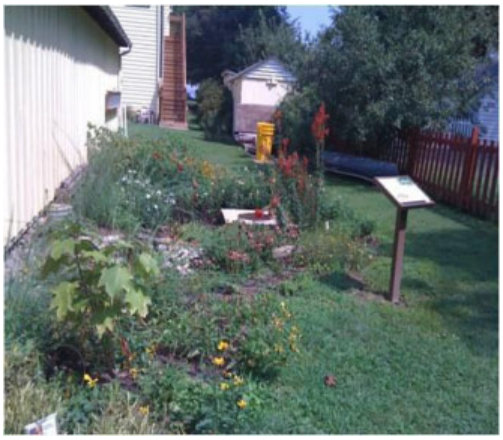
Now that you have assessed your property and you understand the soils, the amount of sun, the amount of rainwater coming to your rain garden, etc. you are now ready to prepare your planting design. When preparing your planting plan consider a few design principles…

Group plants together in a series as they will have more visual impact.

Your design is a "composition" – like a painting or a group of objects on a shelf.

Use the 'Rule of Thirds" to make it more dynamic. This means placing an odd number of plants together in a grouping (1, 3, 5, etc.) rather than even numbers. The odd numbers lead your eyes to move through your composition (your rain garden!) because the brain can't "pair them." This principle creates visual interest and harmony.

Vary plants heights, textures, colors, shapes, and sizes throughout the garden



If you seek a garden which is more random, consider a variation on this theme: place seven cardinal flowers in one location of the garden and then spot one additional cardinal flower in another part of the garden. This 'breaks' the rules, so to speak, and creates a more lively composition.

Try creating a garden which is not symmetric, especially if you are used to a lot of order in your life…random organization can be interesting!

Now for the practical steps:

1) Considering the planting zones: Make sure you locate Zone 1 plants in the basin, Zone 2 plants in the sides, and Zone 3 plants on the edge. Separate them out accordingly.

2) Think about the "structural" components of the garden first:
    - What will it look like in the winter when all of the perennials have died back?
    - Do you have any evergreen plants?
    - Are there any grasses, rushes or sedges that have winter interest (something that looks good in winter)?

This will help you locate plants with winter interest first. As a note, sometimes people place accent stones and/or river rock through the middle of the rain garden so that there is more visual interest in the winter. A focal element such as a sculpture or garden ornament is also an option.

3) Locate the taller plants along the back or the edges, such as shrubs, hibiscus, or ironweed.

4) Place sturdy plants near where the water flows into the rain garden. Blue flag iris, soft rush, and white turtlehead are good candidates as they will withstand some velocity of water.

5) Think about the visual characteristics of the plants you would like to use to include their leaf structure (whether rounded or grass-like), bloom color, height and width. ***The most important aspect here is that you place taller growing plants behind shorter plants.*** Other than that there are no rules. Place them in an arrangement which pleases you.

6) Consider the bloom time of the plants as it is rewarding to have a garden with spring, summer and fall blooms spotted throughout the garden.

In summary, have fun designing the plants where you want! Aside from placing them in the right zones there is no right way or wrong way. Besides, you can always move them around! Enjoy!

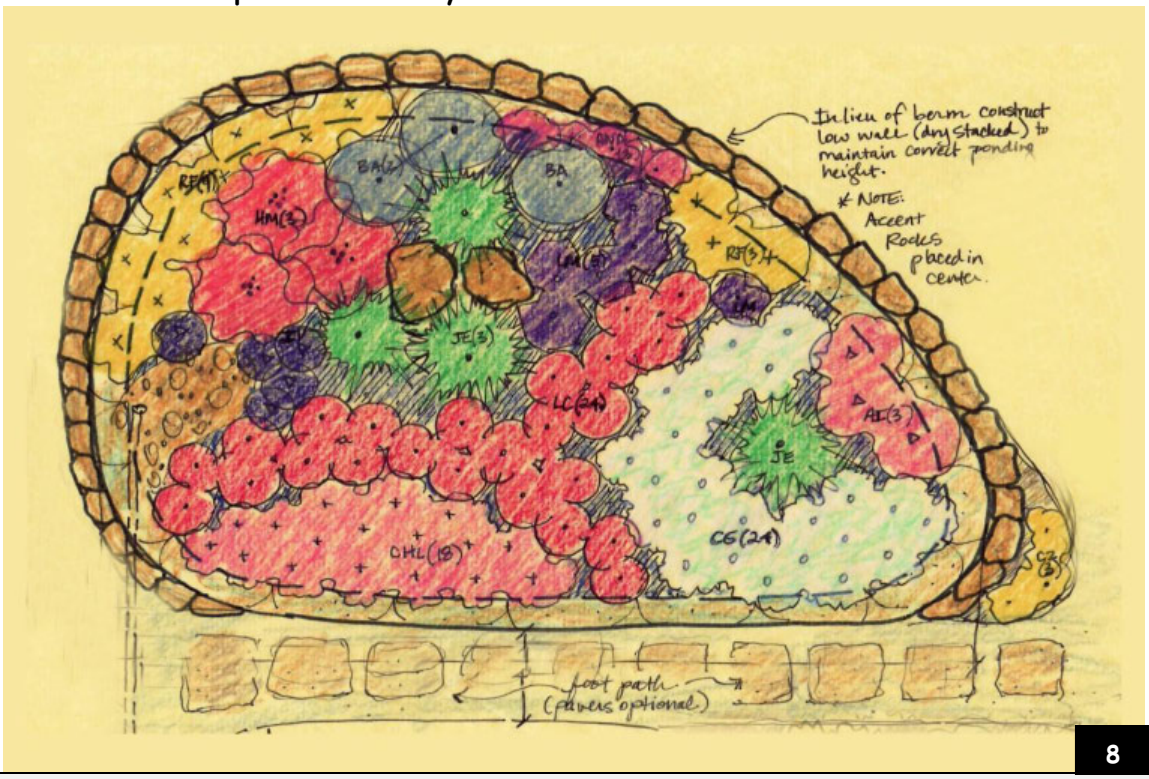
Sample Planting Plans

This section offers some sample planting plans for rain gardens based on the amount of sun they receive. Each planting plan includes and overhead view of the design followed by a table providing the plant list complete with common names, the number of plants needed for the sample design and the zones where the plants can best thrive. Planting plans are provided for rain gardens that:

- Receive full sun
- Are partially shaded, or
- Are in full shade

The planting plans can give you some good ideas of perennials, shrubs and tree species that work well in rain gardens across the Bay watershed

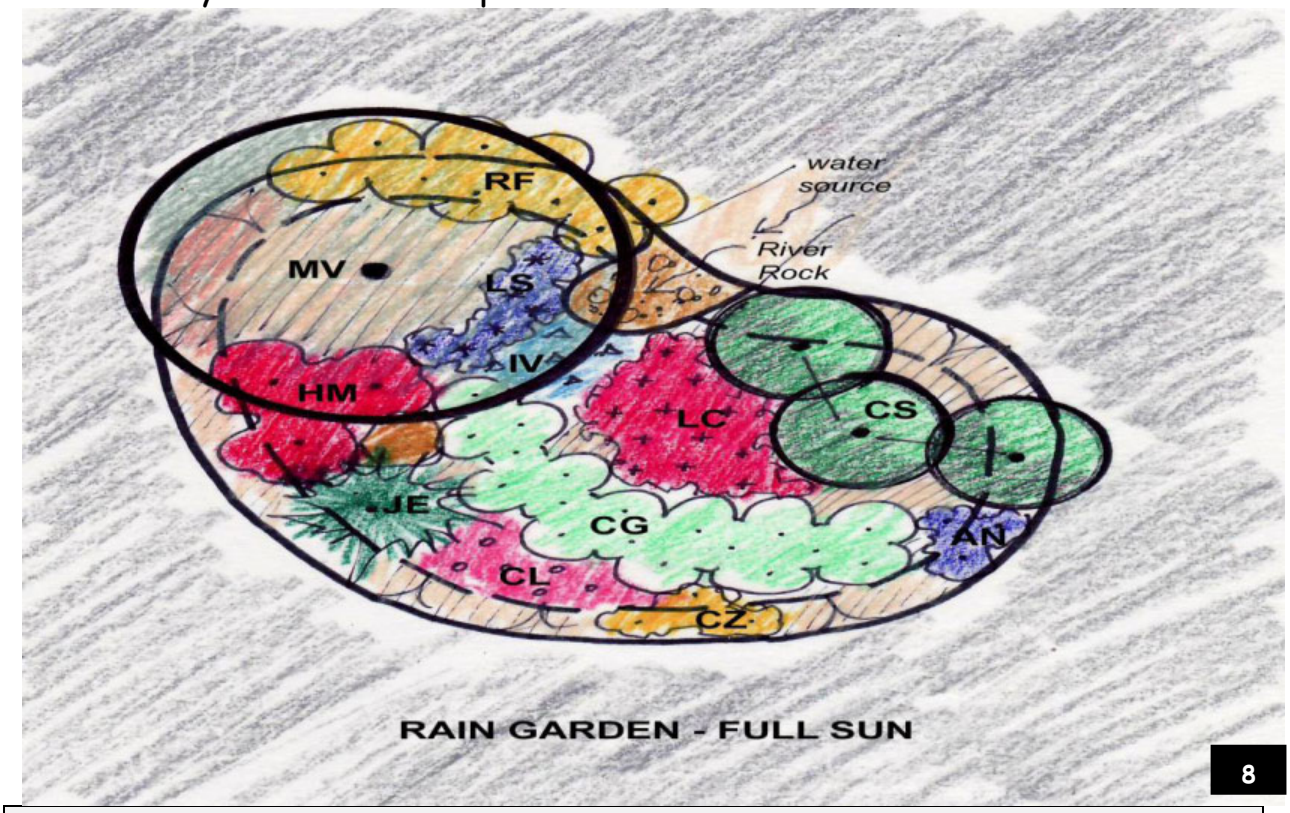
Option 1 Sunny Rain Gardens w/ Perennials



8

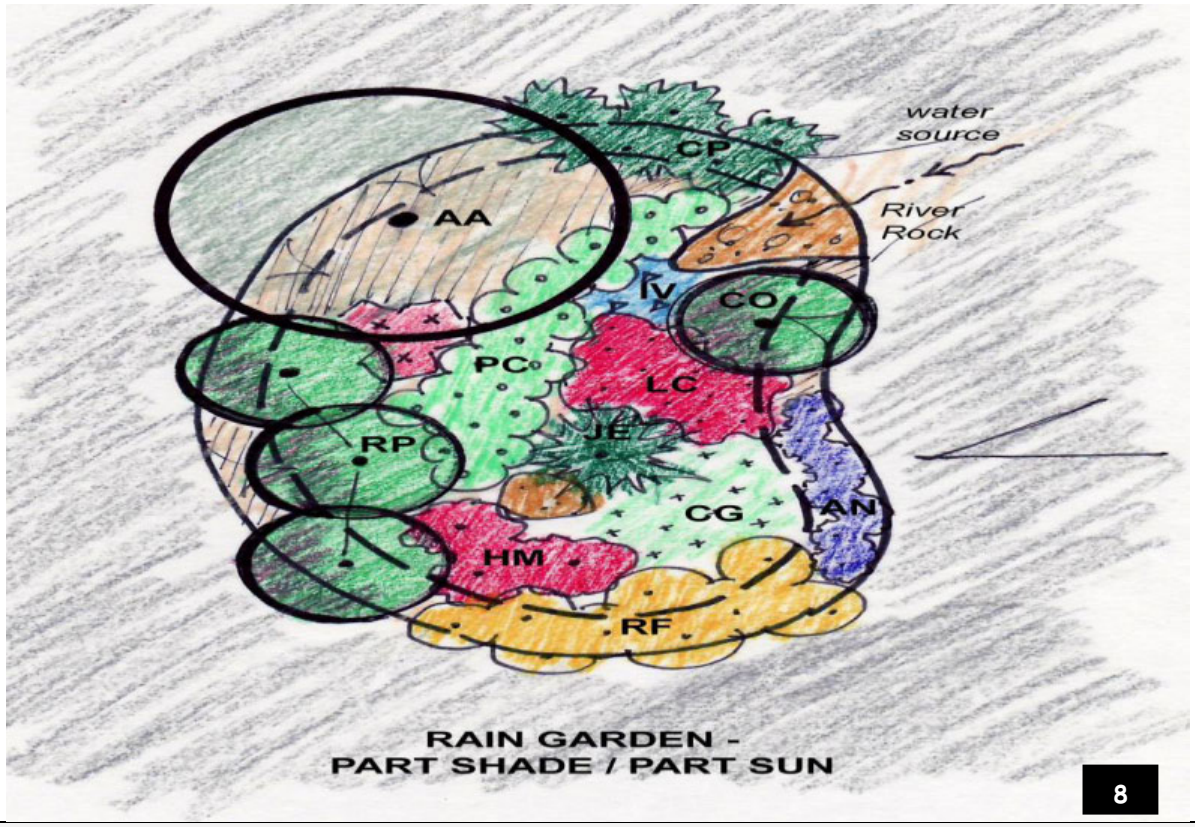
Plant List for a Sunny Rain Garden with Perennials							
LABEL	LATIN NAME	COMMON NAME	SIZE[1]	QTY	PLANTING ZONE		
					1	2	3
PERENNIALS, SEDGES + GRASSES							
ANA	Anemone Canadensis	Windflower	#1	3			◆
AT	Asclepias incarnata	Swamp Milkweed	#1	3	◆	◆	
BA	Baptisia australis	False Indigo	#1	3	◆	◆	
CG	Chelone glabra	White Turtlehead	QT	24	◆	◆	
CHL	Chelone 'Hot Lips'	Pink Turtlehead	QT	18	◆	◆	
CZ	Coreopsis 'Zagreb'	Tickseed Coreopsis	#1	3			◆
EP	Echinacea purpurea 'Magnus'	Coneflower	#1	12		◆	◆
HM	Hibiscus coccineus 'Blaze Star'	Rose Mallow	#1	3	◆	◆	
IC	Iris cristata	Crested Iris	QT	6	◆	◆	
IV	Iris versicolor	Blue Flag Iris	#1	5	◆	◆	
JE	Juncus effuses	Soft Rush	#1	4	◆	◆	
LM	Liatris microcephela	Gayfeather	#1	6		◆	
LC	Lobelia cardinalis	Cardinal Flower	QT	24	◆	◆	
RF	Rudbeckia fulgida	Black Eyed Susan	#1	12		◆	◆
SL	Sisyrychium ang. 'Lucerne'	Blue Eyed Grass	QT	6	◆	◆	
[1] Refers to the size of the container: gallon (#1) or quart							

Sunny Rain Garden Option with Perennials/Shrubs and Trees



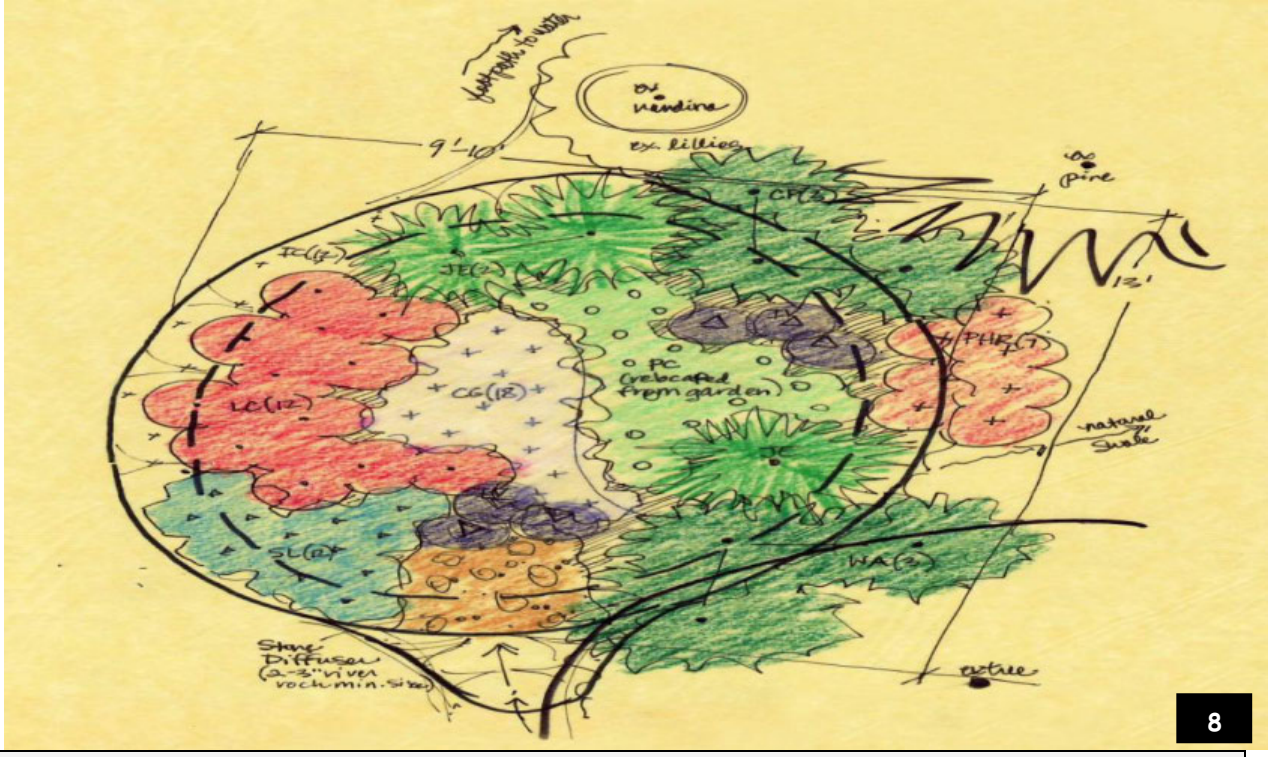
Plant List for a Sunny Rain Garden with Perennials, Shrubs and Trees							
LABEL	LATIN NAME	COMMON NAME	SIZE[1]	QTY	PLANTING ZONE		
					1	2	3
TREE and SHRUB							
MV	Magnolia virginiana	Sweetbay Magnolia	8-10'	1	◆	◆	◆
CS	Cornus sericea	Red Osier Dogwood	5 gal	3	◆	◆	◆
PERENNIALS, SEDGES + GRASSES							
AN	Aster novae-angliae	New England Aster	QT	3			◆
CG	Chelone glabra	White Turtlehead	QT	18	◆	◆	
CL	Chelone llyoni	Pink Turtlehead	QT	9	◆	◆	
CZ	Coreopsis 'Zagreb'	Tickseed Coreopsis	QT	3			◆
HM	Hibiscus coccineus	Rose Mallow	#1	3	◆	◆	
IV	Iris versicolor	Blue Flag Iris	#1	5	◆	◆	
JE	Juncus effuses	Soft Rush	#1	1	◆	◆	
LC	Lobelia cardinalis	Cardinal Flower	QT	12	◆	◆	
LS	Liatris spicata	Gayfeather	#1	6	◆	◆	
RF	Rudbeckia fulgida	Black Eyed Susan	#1	9	◆	◆	◆
[1] Refers to the size of the container: gallon (#1) or quart							

Partial Shade Rain Garden



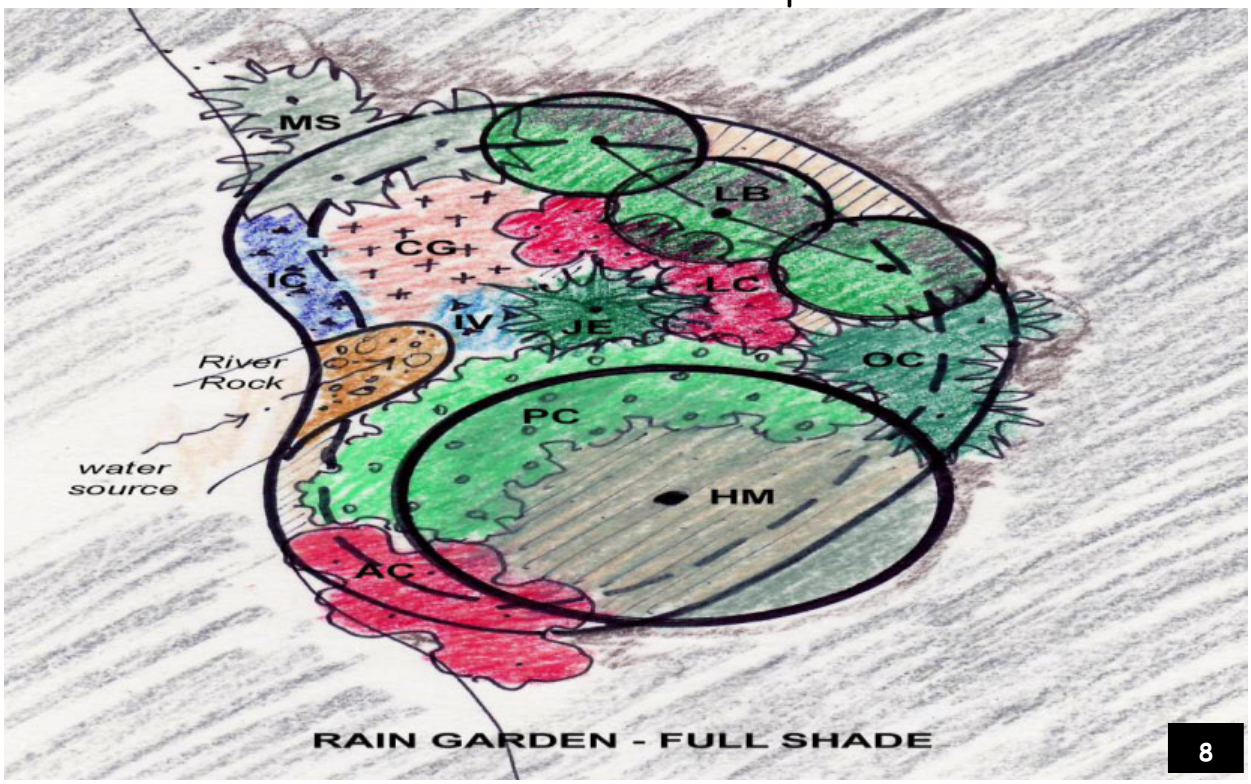
Plant List for a Partially Shaded Rain Garden with Perennials, Shrubs and Trees							
LABEL	LATIN NAME	COMMON NAME	SIZE[1]	QTY	PLANTING ZONE		
					1	2	3
TREE and SHRUBS							
AA	Amelanchier arborea	Downy Serviceberry	8-10'	1	◆	◆	◆
CO	Cephalanthus occidentalis	Buttonbush	5 gal	1	◆	◆	◆
RP	Rhododendron periclymenoides	Pinxterbloom Azalea	5 gal	3	◆	◆	◆
PERENNIALS, SEDGES + GRASSES							
AC	Aquilegia Canadensis	Columbine	QT	3	◆	◆	◆
AN	Aster novae-angliae	New England Aster	QT	7			◆
CG	Chelone glabra	White Turtlehead	QT	12	◆	◆	
CP	Comptonia peregrina	Sweet Fern	#1	5		◆	
HM	Hibiscus coccineus	Rose Mallow	#1	3	◆	◆	
IV	Iris versicolor	Blue Flag Iris	#1	3	◆	◆	
JE	Juncus effuses	Soft Rush	#1	1	◆	◆	
LC	Lobelia cardinalis	Cardinal Flower	QT	12	◆	◆	
PC	Polygonatum commutum	Solomon's Seal	#1	18	◆	◆	
RF	Rudbeckia fulgida	Black Eyed Susan	#1	9	◆	◆	◆
[1] Refers to the size of the container: gallon (#1) or quart							

Full Shade Rain Gardens



Option 1: Plant List for a Shaded Rain Garden with Perennials							
LABEL	LATIN NAME	COMMON NAME	SIZE[1]	QTY	PLANTING ZONE		
					1	2	3
PERENNIALS, SEDGES + GRASSES							
CG	Chelone glabra	White Turtlehead	QT	18	◆	◆	
CP	Comptonia peregrina	Sweet Fern	#1	3		◆	
IC	Iris cristata	Crested Iris	QT	12	◆	◆	
IV	Iris versicolor	Blue Flag Iris	#1	6	◆	◆	
JE	Juncus effuses	Soft Rush	#1	3	◆	◆	
LC	Lobelia cardinalis	Cardinal Flower	QT	12	◆	◆	
PHR	Penstemon 'Husker Red'	Beardtongue	#1	7			◆
PC	Polygonatum commutum	Solomon's Seal	#1	18*	◆	◆	
SL	Sisyrychium ang. 'Lucerne'	Blue Eyed Grass	QT	12	◆	◆	
WA	Woodwardia areolata	Netted Chain Fern	#1	3		◆	◆
[1] Refers to the size of the container: gallon (#1) or quart							

Full Shade Rain Garden Option 2



Option 2: Plant List for a Shaded Rain Garden with Perennials, Shrubs and Trees							
LABEL	LATIN NAME	COMMON NAME	SIZE[1]	QTY	PLANTING ZONE		
					1	2	3
TREES and SHRUBS							
HM	Hamamelis virginiana	Witchhazel	7 gal	1	◆	◆	◆
LB	Lindera benzoin	Spicebush	5 gal	3	◆	◆	◆
PERENNIALS, SEDGES + GRASSES							
AC	Aquilegia Canadensis	Columbine	QT	5	◆	◆	◆
CG	Chelone glabra	White Turtlehead	QT	12	◆	◆	
MS	Matteuccia struthiopteris	Ostrich Fern	#1	3	◆	◆	◆
IC	Iris cristata	Crested Iris	QT	7	◆	◆	
IV	Iris versicolor	Blue Flag Iris	#1	3	◆	◆	
JE	Juncus effuses	Soft Rush	#1	1	◆	◆	
LC	Lobelia cardinalis	Cardinal Flower	QT	12	◆	◆	
OS	Osmunda cinnamomea	Cinnamon Fern	#1	3		◆	◆
PC	Polygonatum commutum	Solomon's Seal	#1	18	◆	◆	
SL	Sisyrychium ang. 'Lucerne'	Blue Eyed Grass	QT	6	◆	◆	◆
[1] Refers to the size of the container: gallon (#1) or quart							

Rain Garden Upkeep Over Time

Right now, you have a fine mulch pit with a few puny plants. That's OK, as it takes a few years before your rain garden fills in and becomes the envy of your neighborhood. The following tips are offered to keep your rain garden healthy and functional as the years go by.

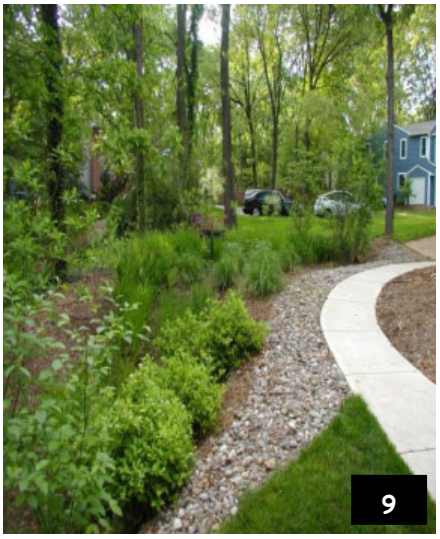
First Growing Season

You will need to water your rain garden after it has been planted if it has been more than a week since it last rained or after very hot conditions. Give your rain garden a good soaking from your sprinkler in the early morning or late afternoon if possible. Try to avoid watering in the heat of the day or watering too late at night. You want the plants to have enough time for their leaves to dry before the temperature drops – wet leaves overnight can lead to the development of molds and fungi.

Although the mulch should suppress most weeds, expect to have to do a bit of spot weeding in the first year.

Otherwise you can pretty much leave it alone.

First Winter and Start of Second Growing Season



You may want to cut back your perennials, although some folks choose to wait until later in the winter so that birds can eat the seeds.

In early Spring, you may want to rake the existing mulch evenly over the bed, and make sure any mulch or debris is removed from the inlet and outlet of the rain garden.

Once you see which plants have survived, you may want to think about adding some more plants to fill out the rain garden.

Another planting strategy is to divide your perennials and replant them to get more surface cover.

Your mulch will be decomposing a bit, and should be good for the year, but you may have to do a bit more weeding.

Also, remember to check your gutters and downspouts at least twice a year to make sure they are not clogged by sticks, decomposing organic matter or bird nests. Clogged gutters may prevent runoff from getting into your rain garden, and are common if you have tree canopy over your roof.

Check inlet and overflow for sediment deposits. Use a Shop-Vac to suck up debris or dig it out. This needs to be repeatedly on annual basis.

Start of Third Growing Season

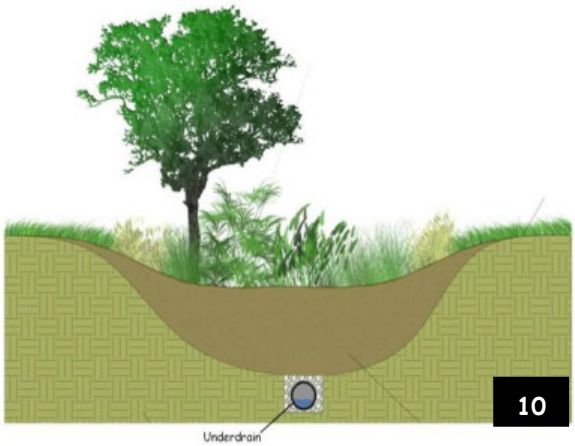
By now your rain garden should be looking fine, although your mulch layer will be getting thin, and may need to be replaced (although you will have a lot more plant cover and will therefore need to buy less mulch). You will still need to do the normal rain garden upkeep during the spring and the rest of the growing season.

Thereafter

As the years go by, many rain gardens get a bit bushy, so expect to add more weeding, thinning and pruning to your upkeep list.

Troubleshooting for Rain Gardens

Most rain gardens work well, as long as you keep up with the plant maintenance. Most of the common problems encountered with rain gardens are easy to remedy, as shown in Box J.

Box J. Troubleshooting for Rain Gardens	
Problem: Too bushy or overgrown **Solution**: Trim and prune the trees and shrubs or learn to love it as a privacy barrier and source of habitat.	
Problem: Wetter conditions than anticipated so plants don't grow **Solution**: Re-plant with more wet-footed plants like ferns, sedges and rushes (Zone 1 plants). If surface ponding persists for more than a day, you should construct a surface overflow so the rain garden can drain faster.	
Problem: Standing water or really soggy soils present several days after a storm **Solution**: Dig a test hole with your post hole digger to see if soils are saturated all the way to the bottom of the rain garden. If so, install a perforated underdrain on the bottom and daylight the pipe so it drains better	

Box J. Troubleshooting for Rain Gardens	
Problem: Plants die: drier conditions than anticipated **Solution**: First, check rain gutters and downspout to make sure water is getting to the rain garden. Re-plant with more drought tolerant plant species.	
Problem: Over-mulching in the rain garden **Solution**: Remove excess mulch so that the rain garden has a mulch layer no deeper than 2 inches. Spread excess mulch elsewhere on your yard.	
Problem: Mulch shifts or floats away after a big storm **Solution:** Simply rake the mulch back to the original depth of two inches. Place more river-stone near the inlet to reduce flow velocity into the rain garden.	

Box J. Troubleshooting for Rain Gardens	
Problem: Sediment caking or erosion within the rain garden (usually near the inflow) **Solution:** Rake or shovel out the surface sediment layer and dispose of in a planting bed. Back-fill any gullies with top-soil, re-mulch and provide some stone protection near the downspout to reduce flows.	
Problem: Deer and wildlife eating your rain garden plants **Solution:** Buy deer repellent or install guard flamingos.	
Problem: Overflow channel is plugged or obstructed **Solution:** Clean out the sediment, debris and mulch that are blocking the overflow channel.	

Resources

- Rain Gardens Across Maryland (University of Maryland) http://extension.umd.edu/sites/default/files/_docs/articles/Rain_Gardens_Across_MD.pdf
- Rain Garden Design Templates (Low Impact Development Center) http://www.lowimpactdevelopment.org/raingarden_design/templates.htm
- Rain Garden Manual, RainScapes Program (Montgomery County, MD) http://www6.montgomerycountymd.gov/content/dep/downloads/Rainscapes/MocoRainGardens.pdf
- Rainscaping.org http://www.rainscaping.org/

Conservation Landscaping

Most yards have beds that contain plantings of perennial herbaceous plants, shrubs and small trees to provide landscape interest. With a little shovel work, you can transform them into conservation landscapes that retain rainfall and adsorb runoff generated from adjacent turf or hard surfaces.

Conservation Landscaping is the replacement of turf grass with vegetation which is native to the Chesapeake Bay region. It so happens that while you are improving the aesthetics of your yard by creating a dynamic and changing seasonal landscape, you are also improving the quality of water in your closest stream and the Bay by increasing rainwater infiltration on your property. This practice is sometimes referred to as Bayscaping.

Once again, you will want to look at the flow paths to your bed, and make sure the bed is a few inches lower than the rest of the lawn, and use any extra soil to form a small berm on the opposite side to make sure water is retained during a storm.

Conservation Landscaping also plays an important role in ensuring the region's biological diversity and the viability of native plant and animal communities.

Many of the plants you could select have the ability to host wildlife and support valuable beneficial insects and pollinators. Did you know that there are a lot of endangered native plants? Interestingly enough native plant growers have been working to ensure that some endangered species continue to survive. Pink Muhly Grass (Muhlengergia capillaris) is still on the endangered list however, it has become more readily available in local nurseries.

Where should I put my conservation landscaping?

Before you can install your conservation landscape there are few things to consider such as what are your objectives for the landscape which will help you decide where to locate it.

Choose Your Landscape Objectives
You have a lot of choices as to the planting objective for your new conservation landscape. For example, you may want to choose plants that:

- Attract pollinators such as butterflies and bees, and the occasional hummingbird
- Provide berries and seeds and nesting habitat for song birds
- Create seasonal color throughout the year by selecting different wildflowers, grasses and shrubs
- Create ideal growing conditions for some tasty heirloom tomatoes, melons, squash or that monster pumpkin you have been dreaming about
- Provide wetland habitat or a fern garden
- Screen your yard from your prying neighbors

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Conservation landscapes are an especially good idea for:

- "Fertilizer-free" buffers around water features or shoreline on your property
- Lawn areas that can capture runoff from small areas of hard surfaces (e.g., sidewalks)
- Areas next to roof downspouts that are not treatable by a rain garden

In general, native plant species are preferred, but ornamental or garden plants are acceptable if they are adapted to regional climates. More resources on choosing the right plants for you and your conservation landscape can be found in Appendix C.

It is important to decide how much care you want to give this new landscape bed. Some people believe that Conservation Landscaping requires less maintenance than turf grass. Turf grass does require weekly/bi-weekly cutting, but conservation landscapes require

more weeding. A more maintenance-free approach may be to plant primarily with trees, shrubs and grasses.

NOTE: If you already have a landscape contractor, make sure your contractor understands the new planting plan. Many contractors are still unfamiliar with native plant material and you don't want them to pull your new plants out thinking they are weeds.

Locate Your Conservation Landscaping

There are several things to consider when deciding where to locate your conservation landscaping.

- Is it an extension of your "structural planting" around the house?
- Is it an extension of the neighbor's landscape? If so, very cool – by linking together landscapes that support nature you are creating a "Habitat Corridor"! You get extra eco-points for that!

It is recommended that your practice "connects" to a bed or a tree already planted in the landscape rather than be arbitrarily located on the site.

Select a location which does not conflict with another use of your property, such as play and pet roaming areas.

You should go back to your property assessment and determine your solar exposure. How many hours of sun/part shade/shade in the particular area to choose the right plants?

Make note of windy areas as some plants are less tolerant of exposure to wind. Also, if you are interested in a 'Wind Break' or a 'Sound Break', your conservation landscape can be designed as a vegetative screen to block wind and absorb noise.

Also look for the view-sheds on your property. You may drink coffee every morning from a particular room, and look for the views you are fond of or would like to screen.

Do deer, rabbits, voles, moles frequent your site? This will affect the type of vegetation you plant. Many people do not think of their property as a wildlife habitat, however many animals have adapted to living in your realm, whether urban or rural. Do cats frequently roam your property? If so, you may want to reconsider drawing birds and/or hummingbirds.

Do not locate over infrastructure (light poles, pipes, cables, FIOS, etc.) and do not hinder access to fuel tanks, well heads, septic tanks or septic fields. If you site a bed in the Right of Way, be aware that the County/City may own that property and can tear it up for

maintenance without prior permission. And of course, always be aware of planting near power lines.

Make sure there is an accessible water source. Your plants will need to be watered until they are established in the first several months after installation. That is the case for native plants as well. Once established they should do fine with what nature supplies, except in case of extreme drought. Conservation landscaping can be used in concert with other practices such rain barrels that can water your conservation landscaping bed.

If you are working under any existing trees be sure to protect root zones. Many trees have shallow root systems which extend out to their canopy or beyond. It is best to stay out of the "drip line" of the tree.

How do I install my conservation landscape?

Creating a Design Plan

In this step you need to choose whether you want to handle the design or hire a professional landscape designer or landscape architect. A professional will have the expertise to consider all of the factors mentioned above and will be able to develop a design plan which has seasonal variety and dimension and most importantly meets your objectives. In some areas of the Bay, a Watershed Steward or Master Gardener may be available who also possesses this expertise.

Some owners may want to have the project designed and constructed, while others may want to do the job themselves.

If you plan to do the job yourself, start out by retrieving the basemap of your property you developed earlier.

Sketch out a design plan. Remember that in addition to trees and shrubs consider perennials to provide ground cover (ferns, forbs, grasses, sedges, rushes).

- Perennial: a plant that comes back every year
- Annual: a plant that lives only one year and so will have to be replanted every year
- Deciduous: a shrub or tree that loses its leaves
- Evergreen: a tree or shrub that holds its leaves all year

Research plant materials by visiting your local nursery to see what vegetation is available to purchase. As a note, nurseries sometimes do not have an extensive native plant selection; however a lot of native material is available. Refer to the Resource List in Appendix C for nurseries in your area. A designer and contractor will have access to more varieties of native plant material. In addition, many native plant societies have annual sales.

Avoid "invasive plants" which can spread and crowd out turf or native vegetation. Examples of invasive plants include English ivy, bamboo, and lesser celandine. For a good guide on how to identify and remove these invasive spreaders, consult the link to *Plant Invaders of Mid-Atlantic Natural Areas* http://www.nps.gov/plants/alien/pubs/midatlantic/toc.htm

If you hire a designer and contractor, make sure they utilize eco-practices. Not all designers and contractors are skilled in this area of work although many claim to have the expertise. Get recommendations. Call your local watershed organization as they have a list of professionals with extensive experience.

Some things you will want from your designers and contractors: a) understand the need for the use of organic soil amendments in lieu of fertilizer; b) have a knowledge of native plants to include for wildlife benefits; c) be able to purchase native plant material; and d) the ability to assess whether you can add a cistern/rain barrel to reuse rainwater from your roof in your conservation landscape.

How do I care for my conservation landscape?

Once your Conservation Landscape has been installed, you will need to maintain it over the year. Some common tasks are:

Weeding
Your new planting will need to be weeded from time to time. In a few years you will find the plants will spread, filling in the spaces and you will have less weeding to do.

Use of Herbicides and Pesticides
Assess if you can transfer over to natural pesticides and herbicides (praying mantus, lady bugs, bat houses, homemade chemical free pesticides). If you need to use pesticides, use them wisely as pesticides can harm beneficial organisms in your landscape. One of the side benefits of creating wildlife habitat is that you create and introduce more species resulting in a more balanced ecosystem on your property.

Mulch
Mulch helps to retain moisture and prevent weeds and erosion, however, too much can rob plants of water. Be sure to use three inches or less. Always used aged leaf compost and aged wood mulch. Mulch around trees should be flush with the landscape and not piled high in “tree volcanoes” because that encourages a shallow root structure and can smother the roots of the tree.

Fall Maintenance

Ground up leaves are a great fertilizer. Rather than bagging up leaves, mow over them two times and let the leaves sit on the lawn over the winter. Excess leaves can be put into your compost pile to be used later in your gardens.

Resources

- BayScapes program (Alliance for the Chesapeake Bay) http://allianceforthebay.org/resources/publications/bayscapes/
- Bay-Wise Certification Program (University of Maryland Extension) http://extension.umd.edu/baywise
- "Eight Essential Elements of Conservation Landscaping" (Chesapeake Conservation Landscaping Council) http://chesapeakelandscape.org/eight-essential-elements
- "Gardener for the Bay" program (Chesapeake Bay Foundation) http://www.cbf.org/join-us/more-things-you-can-do/gardeners-for-the-bay
- The Green Book for the Buffer (Maryland Department of Natural Resources) http://www.dnr.state.md.us/criticalarea/pdfs/GreenBook_Buffer_sm.pdf
- "Habitat At Home" Guide (Virginia Department of Game and Inland Fisheries) http://www.dgif.virginia.gov/habitat/wild-in-the-woods/habitat-at-home.pdf
- Home and Garden Information Center (University of Maryland) http://extension.umd.edu/hgic
- "Landscapes for Life" Workbook (American Society of Landscape Architects) http://www.landscapeforlife.org/publications/LFL_Workbooks_Print_downloadable.pdf

Tree Planting

Planting native trees and shrubs to restore a portion of your property to forested conditions is good for your property values, good for native wildlife, good for your local watershed and good for the Bay.

- Landscaping can add 10 to 20 percent more value to a property – especially landscaping that incorporates mature trees[1].
- Using native plant material is ideal because they tend to thrive when planted in our home gardens.
- Plants are not optional — we can't live without them. By gardening with native plants — no matter where you live or how small or large your space is — you can help sustain wildlife.[2]
- Trees and shrubs increase infiltration and evapotranspiration of stormwater and remove pollutants, which improves water quality.

Small bare root trees and shrubs are relatively inexpensive and can be installed by the home-owner by hand. Large ones, such as the 2 inch caliper oak being planted in the picture, may cost $150 - $200 and may require some heavy equipment and the help of experts.

Where should I plant my tree?

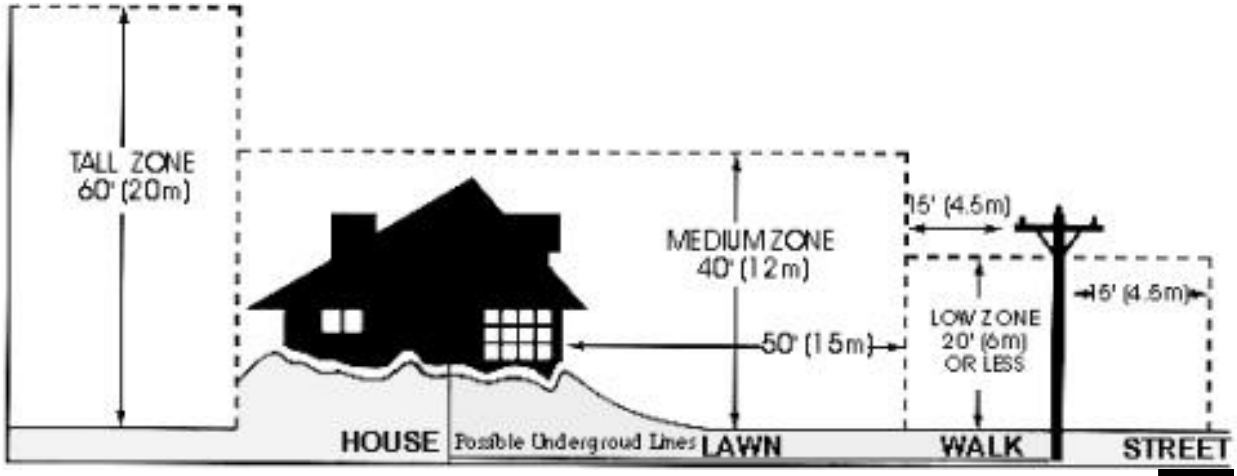
a. Choose an area with adequate space for the tree to grow.
b. Consider the soil conditions. Is it wet or dry? Consider the soil pH and texture.
c. Choose native plant material whenever possible
d. Select your tree size.
e. Determine sun and wind conditions on your property.
f. Avoid planting above underground utilities (Step 3 in "Assessing Your Property") and below transmission lines (large trees only).

Proper Places for Trees around Homes

[1] www.realty101.com/value-of-a-tree-in-your-yard; www.arborday.org/trees/benefits.cfm

[2] Doug Tallamy, Bringing Nature Home www.plantanative.com/

Not everywhere in your yard is appropriate for planting a tree. Save yourself time and money by planting your tree in the right location. The following illustration indicates approximately what types of trees should be planted in relation to your home and utility lines.



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Tree selection is one of the most important investment decisions a home owner makes when landscaping a home or replacing a tree lost to damage or disease. Considering that most trees have the potential to outlive the people who plant them, the impact of this decision is one that can influence a lifetime. Match the tree to the site, and both lives will benefit.

When choosing the type of tree you are going to plant, think about the following questions:

- Why is the tree being planted?
- What is the size and location of the planting site?
- What is the ultimate size of the tree (i.e., is there enough room for the tree to grow?)
- Which type of soil conditions exist? Some trees are better suited for particular soils. Consult with your nursery before purchasing your tree.
- Which type of maintenance are you willing to provide?

Asking and answering these and other questions before selecting a tree will help you choose the "right tree for the right place." Local nurseries or garden centers can provide some insight into which tree is best suited for your site.

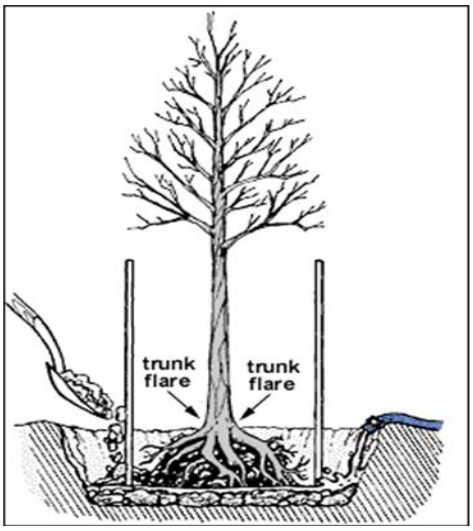
How do I plant my tree?

Step 1: Mark the space(s) where trees will be planted

Mark each location where a tree will be planted ahead of time. This certainly makes the planting easier if multiple people are working together on getting the trees in the ground.

Step 2: Planting

- Size the hole according to the dimensions of the root ball and the type of container (bare root, containerized or balled & burlapped). The hole should be twice the size of the diameter and the same depth as the root ball so that when you place the tree in the hole, the basal trunk flare is flush with the ground level.
- Backfill with native soil, adding small amounts of mulch or shredded mulch if desired.
- Apply 2-3 inches of mulch, keeping away from the trunk. A common practice for applying mulch is 3"x3"x3" which means: 3" from the base of the tree, 3" deep and 3" around the tree
- Do not stomp on soil to pack it down. Watering the tree will remove the air packets.
- If necessary, stake for support, using breakaway tree ties or a piece of rubber hose to minimize chaffing and scaring of the tree trunk.
- Protect young tress from being nibbled on by using tree shelters (tubes) or fencing (as seen in the picture below).
- Water deep and generously.



How do I care for my tree?

- Water is the critical factor for tree survival after planting. Deep water regularly throughout the first growing season. Allow water to run slowly, soaking the soil, once or twice a week. You can use tree watering bags or 5 gallon buckets with small holes drilled in the bottom. Water at the perimeter or edge of planting site. Deep watering will encourage the development of deep tree roots.

- Newly planted trees should be watered from May to October. At least 15 gallons is needed each time you water. As a general rule, at least 1" of rain will provide sufficient rain for a newly planted tree. Water young trees weekly when the ground is dry. Do not over water.

- Keep lawn mowers and string trimmers away from tree to avoid wounding trunk. Reduce herbicide use near tree and in surrounding lawn.

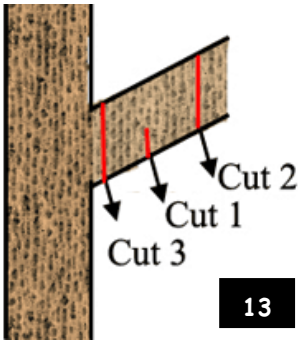
- Never fertilize stressed trees. Fertilizer is not tree food. It should be applied (if absolutely necessary) only after first year. Consider applying a layer of compost or leaf mulch first. When used, fertilizer should be applied at the perimeter edge of the planting site.

- Start an annual tree inspection program while tree is young to head off problems early.

- Replace mulch as needed, as mulch will help retain moisture for the tree. Keep grass and weeds out of mulched area. They compete for the same water and elements as tree.

- Remove stakes and strapping after one year unless site is extremely windy. Do not stake longer than two years. Remove tree tubes when trees reach about 3 inches in diameter at the base.

- Prune while young to maintain size and shape beginning in the second growing season. Prune dead or injured branches immediately. The picture to the right demonstrates the proper way to prune a tree



- Do not top trees to reduce height (remove large branches from a tree's canopy).
- Call a licensed arborist for advice on large pruning jobs, hazard trees, and insect or disease problems. Nonprofessionals should never prune near utility wires.
- Do not plant flowers under a tree. Do not cultivate soil under the tree.
- Continue deep watering for five years after planting.
- Finally, if you plant a tree – register it!!

Resources

There are a lot of on-line resources available which provide a lot of detail about planting trees. For this overview, we have drawn upon the following websites:

- For Design, Installation and Maintenance: http://pubs.cas.psu.edu/freepubs/pdfs/uh143.pdf
- For Selection, Purchasing and Avoiding Tree & Utility Conflicts: www.treesaregood.com/treecare/treecareinfo.aspx
- Aftercare, plus great set of checklists: http://na.fs.fed.us/spfo/pubs/uf/plant_trees/planting_trees.htm

There are a number of local urban forestry programs that promote tree planting and provide assistance and incentives to homeowners planting trees. Check with your local government or watershed group for more information.

- "Marylanders Plant Trees" program http://www.trees.maryland.gov/register.asp
- Richmond Tree Stewards http://richmondtreestewards.org/

Rainwater Harvesting Devices
(Rain Barrels, Cisterns, Tanks)

A rain barrel/cistern is a water holding device which is placed at the base of a roof downspout with the purpose of collecting rainwater for a specific use. The reuse of rainwater can be either active or passive.

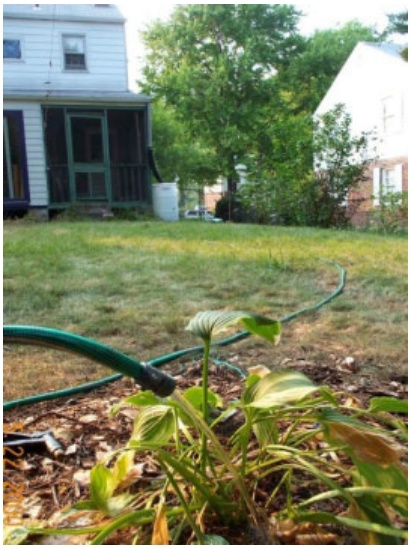
Active Reuse: This is the reuse of rain barrel water for either non-potable (cannot drink) or potable (for drinking) uses.

Non-Potable Uses include:

- Irrigating your landscape (typically using a filter and pump system);
- Car washing;
- Cleaning off a deck or patio;
- Flushing toilets (filtration, pump and secondary plumbing required).

Potable reuse or the use of the rain barrel water for drinking requires filtration, disinfection and permits.

If rainwater is stored for resuse, the barrel will not be empty for the next storm. Long-term storage of rainwater should be avoided.



Passive Reuse: Watering plants in the landscape utilizing natural slope and/or gravity. This system is typically designed to release rainwater slowly into a landscape bed or the landscape via a soaker hose.

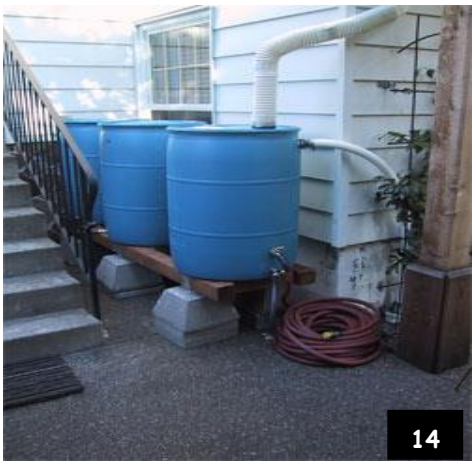
Contact a Rainwater Harvesting professional, Landscape Architect, Civil Engineer, Low Impact Development (LID) specialist, Watershed Steward, or Master Gardener for information.

Sizing Your Rain Water Harvesting Device

A rain barrel should be sized according to the drainage area of the roof.

During a 1-inch rain a house which is 1,000 sf will yield approximately 600 gallons of runoff. The average storm in Maryland is ½ inch. Typically a 1,000 square foot house has four (4) downspouts where each downspout serves roughly 250 square feet of roof area. Thus one downspout yields approximately 75 gallons of rainfall in a ½ inch rain.

So if you desire to reduce your stormwater utility fee it is imperative to size your device to handle at least the 1/2 –inch storm in order to get credit, and preferably capture the one-inch storm (Make sure to check with your locality to see if a stormwater utility fee credit is available).



The 55 gallon rain barrels fill up fast! However you can "daisy chain" barrels together or purchase a larger rain barrel or cistern.

Design Considerations
The following are some things to consider before settling on your rain barrel or cistern.

- Tanks or cisterns should not be installed over utilities, easements, or other infrastructure. Also do not install them over septic systems, sand filters or other underground structures. Rain barrels can be installed in any location as they are more temporary devices.
- Ensure that location is level (flat).
- Stabilize the base with pavers, flagstone or gravel.
- The device must be 12-18 inches above the ground if utilizing gravity to drain the water.

Design Variations
Not all rain barrels and cisterns are created equal. There are design variations depending on the type of practice you want to use and the look you are going for.

Above Ground

- A rain barrel/cistern placed at the base of the downspout (gutter cut off and overflow pipe to safe location);
- A rain barrel/cistern placed around the corner (gutter cut off, an elbow attached; overflow pipe to safe location);
- A rain barrel/cistern placed under a deck;

Below Ground

A cistern/tank buried below the ground. Be sure to purchase a device which is designed to not heave out of the ground (a very natural occurrence) or is able to be strapped down. These systems typically require a filtration and pump system. Typically you will want to engage a Rainwater Harvesting professional if you are burying a cistern or tank. You can find certified designers and installers at the American Rainwater Catchment Systems Association (ARCSA.org).

How do I install my above ground rainwater harvesting device?

Follow the rain barrel or cistern manufacturer's installation guidelines. A typical installation requires that you:

1) Shorten the downspout and direct into opening of the barrel.
2) Make sure the device is level.
3) Make sure the screen is in place.
4) Secure the downspout to the device with screws, if appropriate.
5) Attach overflow pipes and be sure that the overflow can drain safely away from your house or downhill to a landscape bed. Be sure not to direct the overflow towards a neighbor's house or to a sidewalk.
6) Connect the hoses to your device and you are ready to go!

Materials to Have On Hand during Installation

- Extra gutter (Straight, Elbows)
- Wire mesh screen for keeping debris out
- A lid for safety if the mesh screen is attached to the gutter directly
- Overflow hose
- Handsaw
- Screws
- Level
- Soaker hose – if you are going to do a slow drawdown of the barrel over time

How do I care for my above ground rainwater harvesting device?

Empty your device during the winter by disconnecting the hose or opening all of the spigots to let water run freely through the barrel. There is no need to detach it from the downspout. This will prevent water freezing in the device over the winter.

Other Tips

- Sometimes there is not an opportunity to reuse rainwater. It is recommended to capture water only if you intend to reuse it! Keeping the faucet open or using a soaker hose to slowly drawdown the rain barrel and irrigate your surrounding landscape is a good option.
    - If you are connecting a soaker hose, drill $\frac{1}{4}$" holes every 6-8 inches in the rain barrel to help the water drain.

- Raise the height of the barrel so that there is sufficient water pressure to use a hose.

Unsightly cinder blocks can be camouflaged with flagstone or rocks.

- Always have the overflow going to a safe place in the event that the barrel/cistern fills up – make sure it will not deliver water too close to the house.

- Always use some kind of screen to prevent organic debris from entering the barrel. The debris will settle at the bottom of your barrel and eventually clog the outflow. A removable wire mesh screen is all you really need, either mounted on top of the rain barrel or attached to the end of your downspout. A well-fitting lid is also important to protect children and prevent mosquitoes from breeding in the water.

- Put a brick or a large rock in the bottom of the rain barrel so that it does not blow around on a windy day.

- One gallon of water weighs approximately 8.35 lbs, so make sure your device is level and stable. A 55 gallon barrel can weigh upwards of 459 lbs when it is full!

- It is recommended to purchase brass fittings at the outset of installation as they will last longer.

Resources

- American Rainwater Catchment Systems Association (ARCSA) www.arcsa.org
- A fun calculator that will help you estimate the amount of rainwater you can collect in your barrel: http://www.gardeners.com/Rain-Barrel-How-To/5497,default,pg.html

Permeable Hard-scapes

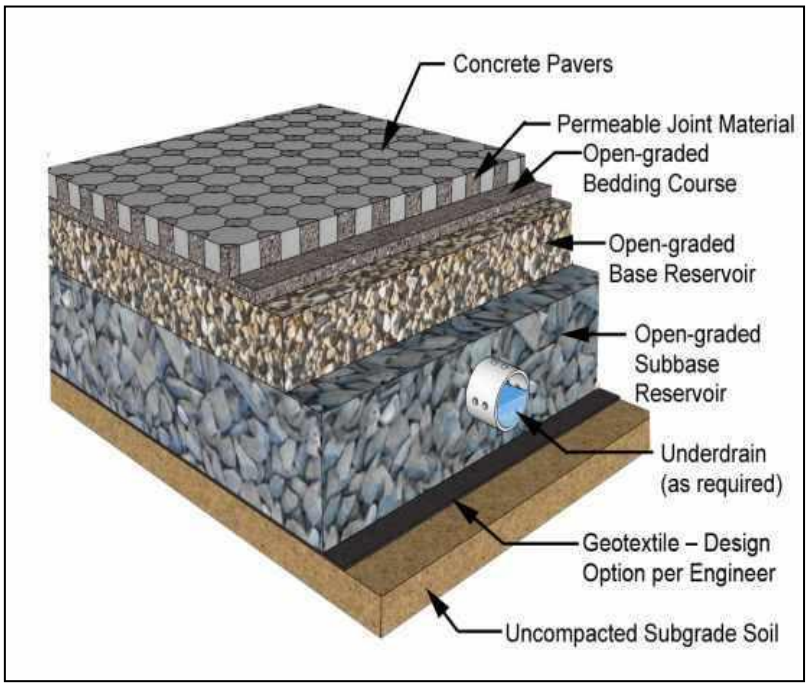
Permeable Hard-scapes are alternative paving surfaces that capture and temporarily store stormwater by filtering runoff through holes in the pavement surface into an underlying stone reservoir. Filtered runoff may be collected and returned to the stormwater system, or allowed to partially soak into the soil. "Permeable Hard-scapes" refers to Pervious Concrete, Porous Asphalt, Concrete Grid Pavers, Permeable Interlocking Concrete Pavers and other products and configurations that are designed to infiltrate water.

- Permeable hard-scapes will reduce the amount of runoff when they replace existing hard surfaces. (i.e. an existing patio or driveway).
- If the permeable hard-scape is a NEW hard surface, it will help prevent the site from increasing stormwater runoff but does not reduce stormwater runoff from the prior condition.
- Permeable hard-scapes allow homeowners to reduce overall imperviousness and stormwater runoff while continuing to maintain hardened areas such as driveways, sidewalks, and patios.

Practice Considerations	
Cost	High
Installation Difficulty	High
Effectiveness for reducing runoff	Medium

Concrete Grid Pavers

Permeable Interlocking Concrete Pavers



Schematic Profile for Typical Permeable Pavement Section

Where should I put my permeable hard-scape?

The following table discusses several site conditions that need to be considered prior to determining whether a particular location is suitable for a permeable hard-scape.

Site Considerations		
Site Condition	**Feasible**	**Notes**
Steep Slopes	No	Steep pavement surface slopes may cause shifting of the pavement surface and base materials. In general, slopes greater than 5% do not make good candidates for permeable hard-scapes.
External Drainage	Yes	The area of pavement or rooftop draining onto ("run-on") should be no more than 2 times the area of permeable hard-scape. *
High Water Table	No	The bottom of the permeable hard-scape installation (i.e., the bottom of the excavated area) must be at least 2 ft. above the seasonal high water table.
Poor Soil Condition	Yes	Soil conditions do not typically constrain the use of permeable hard-scape although they do determine whether an underdrain is needed. This practice is best if the soil has good drainage.
Floodplain	No	Permeable hard-scape should not be constructed within the 100-year floodplain
Adjacent Structures	Yes	To avoid the risk of seepage, permeable hard-scapes should not be connected to structures so that water cannot seep into basements or damage foundations.
Utilities	Yes/No	Interference with underground utilities should be avoided whenever possible. Approval from the applicable utility company or agency is required if utility lines will run below or immediately adjacent to a permeable hard-scape.
***Only paved or stable impervious surfaces should be allowed to drain onto ("run-on") pervious hard-scape. Turf, mulch, and other non-paved areas contribute large amounts of sediment to the pervious hard-scape which can increase the likelihood of clogging and the need for vacuum maintenance. Look at the existing surface, if it is covered in organic material (from overhead trees or similar) it may not be a good candidate for a permeable hard-scape.*		

How do I install (or use) my permeable hard-scape?

Due to the increased complexity of permeable hard-scapes and the need for some specialty equipment **it is strongly recommended that homeowners work with a trained and certified contractor** (Pervious Concrete Contractor Certification Program or PICP Installer Technician training program, etc.) to implement this type of project.

Step 1: Construction of the permeable hard-scape shall only begin after the area surrounding the pervious hard-scape has been stabilized. The proposed site should be checked for existing utilities prior to any excavation. Do not install the system in rain or snow, and do not install frozen aggregate materials.

Step 2: Temporary erosion and sediment controls are needed during installation to divert stormwater away from the permeable hard-scape until it is completed. The proposed permeable hard-scape must be kept free from sediment during the entire construction process. Construction materials contaminated by sediments must be removed and replaced with clean materials.

Step 3: Compaction of the bottom of the permeable hard-scape should be avoided to the extent possible. Excavators or backhoes should work from the sides to excavate to the appropriate design depth and dimensions.

Step 4: The native soils along the bottom of the permeable hard-scape should be scarified or tilled to a depth of 3 to 4 inches prior to the placement of stone.

Step 5: Filter fabric should be placed only as required by the design.

Step 6: Moisten and spread the appropriate clean, washed stone aggregate (usually No. 2 or No. 57 stone) 6-inches at a time to the desired depth. Place at least 2 inches of additional aggregate above the underdrain, and then compact it.

Step 7: Paving materials shall be installed in accordance with manufacturer or industry specifications for the particular type of pavement.

- Pavers may be placed by hand or with mechanical installers.
- Fill gaps at the edge of the paved areas with cut pavers or edge units.
- Fill the joints and openings with stone. Joint openings must be filled per the paver manufacturer's recommendation.
- Compact and seat the pavers into the bedding course.
- Thoroughly sweep the surface after construction to remove all excess aggregate.

Step 8: Inspect the area for settlement. Any pavers that settle or are not level must be inspected and reinstalled.

Step 9: Within 6 months, top up the paver joints with stones.

How do I care for my permeable hard-scape?

Maintenance is a crucial element to ensure the long-term performance of permeable hard-scape. The most frequently cited maintenance problem is surface clogging caused by organic matter (leaves, grass clippings, etc.) and sediment. Periodic sweeping will remove accumulated sediment and help prevent clogging; however, it is also critical to ensure that surrounding land areas remain stabilized.

The following tasks must be avoided on ALL permeable hard-scapes:

- Sanding
- Re-sealing
- Re-surfacing
- Power washing
- Storage of snow piles containing sand
- Storage of mulch or soil materials

Maintenance Frequency of Permeable Hard-scapes Based on Type of Application and Maintenance Method		
Maintenance Task	**Type of Application**	**Frequency**
Dry Sweeping	Patio	Seasonally (4 X per year)
Dry Sweeping	Driveway	Monthly
Vacuum	Patio	Every 2 years
Vacuum	Driveway	Once per year
**This table is intended as guidance only; the frequency should be adjusted based on conditions and the surrounding land cover (e.g. pavement, turf, trees) and level of detritus and sediment on the pavement surface.*		

The frequency of maintenance will depend largely on the pavement use (patio vs. driveway) and traffic loads (foot vs. vehicle). Dry-weather sweeping in the spring and fall months is important. For peak performance, every few years sweep with a dry vacuum sweeper. Do not use a pressure washer or high pressure water spray, since spraying may lead to subsurface clogging.

Resources

The following are several permeable hard-scape resources for homeowners.

- NRMCA Certified Professional Pervious Concrete Contractor Database: http://nrmca.org/Education/Certifications/Certs_DB_Disclaimer.htm
- Interlocking Concrete Pavement Institute Certified Contractor Member Search: http://www.icpi.org/directory-search?search=contractor
- Permeable Pavers Factsheet Montgomery County, MD: http://www6.montgomerycountymd.gov/content/dep/downloads/Rainscapes/MocoPermPavers.pdf
- Previous Surfaces Factsheet Arlington County, VA: http://www.arlingtonva.us/departments/EnvironmentalServices/Sustainability/PDFfiles/file84390.pdf

Appendix A

Graph Paper for Property Sketch

Appendix B

Quantity Calculator Worksheet for Rain Garden Bulk Materials

Calculator to Estimate Excess Fill and Materials to Buy		
Design Factor	Example	Your Calculation
EXCESS FILL		
Max Digging Depth	24 inches	
Ponding Depth	6 inches	
Top Soil Depth	6 inches	
Subsoil Depth	12 inches	
Divide Subsoil Depth by 2, and then divide this by 12	[12inches/2]/12 X = 0.5 feet	
Garden Surface Area	64 square feet = Y	
Z = Multiply X and Y and divide the product by 27	[(64)(0.5)]/27 = 1.2 cubic yards	
Note: About 6 Wheelbarrow loads per cubic yard	**About 7 loads of subsoil to dispose of elsewhere on your lawn**	
MULCH CALCULATOR		
Garden Surface Area	64 square feet	
1 cubic yard for each 64 square feet of garden area	1 cubic yard of mulch to order [1]	
SAND CALCULATOR		
Take Z and multiply by 1.4	= 1.7 tons of sand to order (round up to 2 tons)	
RIVER STONE CALCULATOR		
Assume 0.2 tons per inlet	0.2 tons (400 pounds) [1]	

[1] Most bulk orders must be done in one cubic yard or ton increments. Last time I checked, the delivered price of sand is about $45, double shredded hardwood mulch costs around $35 a cubic yard and river stone runs $100/ton. You may want to budget about $250 for plants, the connector pipe and other stuff.

Appendix C

List of Plant Resources

Here we have compiled a list of helpful resources within the Chesapeake Bay Watershed for planting your tree, rain garden or conservation landscape. You will find that the resources have been listed by type of resource and jurisdiction.

NATIVE PLANT VENDORS (RETAIL AND WHOLESALE)

- U.S. Fish and Wildlife, list of native plant suppliers in the Chesapeake Bay Region, www.fws.gov/chesapeakebay/bayscapes.htm

Maryland

- American Natives Plants (Maryland Natives Nursery, Inc.), (Perry Hall, MD) www.americannativeplants.net
- Ayton State Tree Nursery (Maryland) www.dnr.state.md.us/forests/nursery
- Babikow Greenhouses (Baltimore, MD) www.babikow.com/ Wholesale
- Bay Ridge Nursery (Annapolis, MD) www.BayRidgeNursery.com
- Cavano's Perennials, Inc., (Kingsville, MD) www.cavanos.com Primarily wholesale, open to the public on Saturdays during the planting season
- Chesapeake Natives (Silver Spring, MD) www.chesapeakenatives.org Limited supply of native plants propagated from indigenous seed sources. Seeds, bare root plants, plugs, and pots available
- Classic Groundcovers www.classic-groundcovers.com (Wholesale only)
- Clear Ridge Nursery (Union Bridge, MD) www.gonative.us native trees and shrubs for conservation
- Davidsonville Nursery (Davidsonville, MD) www.davidsonvillenursery.com
- Environmental Concern (St. Michaels, MD) www.wetland.org Retail nursery (open by appointment) for riparian trees and wetland shrubs, education and research facility
- Greenstreet Gardens (Lothian, MD) www.greenstreetgardens.com/
- Herring Run Nursery (Baltimore, MD) www.bluewaterbaltimore.org/herring-run-nursery/
- Homestead Gardens (Davidsonville, MD) www.homesteadgardens.com Limited natives available
- Lower Marlboro Nursery (Owings, MD) www.lowermarlboronursery.com Native perennials, wildflowers, shrubs. The nursery is open to visitors by appointment during the spring and fall planting seasons.
- Patuxent Nursery (Bowie, MD) www.patuxentnursery.com/

- Signature Horticultural Services (Freeland, MD) www.signaturehort.com/ Specializes in Northeastern native herbaceous plants for wetland mitigation, landscape design, restoration, and wildlife habitat enhancement
- Tidewater Growers: wholesale suppliers of trees and shrubs, 757-787-4079, TidewaterGrowers@comcast.net, http://www.tidewatergrowers.com/
- Treessentials (Roseville, MN) www.tubexusa.com/ Tree tubes and deer repellent for tree seedlings,

New Jersey

- New Moon Nursery (Bridgeton, NJ) www.newmoonnursery.com Native perennials (deep plugs), (Wholesale only)
- Pinelands Nursery, Inc. (Columbus, NJ) www.pinelandsnursery.com (wholesale only) Wetland trees, shrubs, herbaceous plants

New York

- Fort Pond Native Plants (Montauk, New York) http://nativeplants.net/

Pennsylvania

- Appalachian Nursery (Chambersberg, PA) www.appnursery.com
- Keystone Wildflowers (Robesonia, PA) www.keystonewildflowers.com/ Native herbaceous perennial flowers and grasses for wildlife, habitat, naturalistic landscaping and restoration work
- North Creek Nurseries (Landenberg, PA) www.northcreeknurseries.com Native perennials (deep plugs) (Wholesale only)
- Octoraro Native Plant Nursery(Kirkwood, PA) www.octoraro.com Native trees, shrubs and herbaceous plants for reforestation and streambank restoration (Wholesale only)
- Redbud Native Plant Nursery (Glen Mills, PA) www.redbudnativeplantnursery.com
- Sylva Native Nursery and Seed Co., (Glen Rock, PA) www.sylvanative.com Native trees and shrubs

Virginia

- Colesville Nursery (Ashland, VA) http://www.colesvillenursery.com/
- Earth Sangha (Fairfax, VA) http://www.earthsangha.org/
- Forest Lane Botanicals (Williamsburg, VA) http://www.forestlanebotanicals.com/
- Go Native Grow Native, Northern Neck Chapter of the Virginia Native Plant Society http://www.nnnps.org/Go_Native_Grow_Native.html
- James River Association (Richmond, VA) http://www.jamesriverassociation.org/what-we-do/watershed-restoration/Native%20Plants.pdf
- Lancaster Farms, Inc. (Suffolk, VA) www.lancasterfarms.com
- Nature by Design (Alexandria, VA) www.nature-by-design.com

- Piedmont Nursery (The Plains, VA) http://www.piedmontnursery.com/
- Sandy's Plants, Inc. Rare and Unusual Perennials (Mechanicsville, VA) http://www.sandysplants.com/
- Sassafras Farm (Hayes, VA) sassafrasfarm@verizon.net
- Southern Branch Nursery (Chesapeake, VA) http://www.southernbranchnursery.com
- Virginia Coastal Zone Management Program Plant Eastern Shore Natives Campaign http://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/NativePlants/PlantsESNativesCampaignPartners.aspx

West Virginia

- Enchanter's Garden (Hinton, WV) www.enchantersgarden.com
- Sunshine Farm and Gardens (Renick, WV) www.sunfarm.com

OTHER PLANT PROGRAMS AND RESOURCES

Anne Arundel County Planning and Zoning (Annapolis, MD) Will provide free marsh grasses (*Spartina alterniflora*) to AACO residents 410-222-7441.

SEEDS

- Ernst Conservation Seeds, 800-873-3321. 9006 Mercer Pike, Meadville, PA 16335, seeds of native grasses, wildflowers, wetland plants and shrubs; live stakes for streambank restoration, www.ernstseed.com
- Sylva Native Nursery and Seed Co., (Glen Rock, PA) www.sylvanative.com Native trees and shrubs

REGIONAL PLANT GUIDES

- National Wildlife Federation, searchable database by plant types and by state, with photos and detailed plant descriptions: http://enature.com/native_invasive/natives.asp
- Chesapeake Ecology Center, *Ecoscaping Back to the Future: Restoring Chesapeake Landscapes* (with examples of native plant gardens, rain gardens, xeriscapes), found under "EcoScaping:" www.chesapeakeecologycenter.org.
- U.S. Fish and Wildlife Service, Maryland native plant lists to download: www.nps.gov/plants/pubs/nativesMD/
- *"Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed". On-line PDF* http://www.nps.gov/plants/pubs/chesapeake/
- Society for Ecological Restoration (Mid Atlantic Chapter) http://chapter.ser.org/midatlantic/

- Native Plant Center, Here you can find native plants of the same type, shape, color, size, and other desirable plant characteristics for creating attractive and more natural landscapes in your yard http://www.nativeplantcenter.net/
- Plant Native: a regional plant list for Maryland, Virginia and West Virginia. http://www.plantnative.org/rpl-mdvawv.htm

NATIONAL PLANT GUIDES

- Lady Bird Johnson Wildflower Center http://www.wildflower.org/ladybird/
- USDA Natural Resources Conservation Service, http://plant-materials.nrcs.usda.gov
- USDA PLANTS Database, (searchable), http://plants.usda.gov/index.html
- Society for Ecological Restoration http://www.ser.org/home
- Plant Native (searchable) http://www.plantnative.org/

STATE AND COUNTY GUIDES

District of Columbia

- The Botanical Society of Washington http://www.wvnps.org/
- Smithsonian National Museum of Natural History, Department of Botany http://apsdev.org/welcome.html
- National Arboretum, 3501 New York Avenue, NE, Washington, DC 20002, (202) 245-2726
- *Native Plants*: www.usna.usda.gov/Gardens/faqs/nativefaq2.html

Delaware

- Delaware Native Plant Society www.delawarenativeplants.org
- University of Delaware, "Plants for a Livable Delaware" http://ag.udel.edu/extension/horticulture/pdf/PLD.pdf

Maryland

- Maryland Native Plant Society, P.O. Box 4877, Silver Spring, MD 20914, www.mdflora.org
- *Native Plant Sources:* http://www.mdflora.org/publications/nurseries.html
- Anne Arundel County Native Plant Guide: http://www.aacounty.org/IP/Resources/AANativePlants.pdf
- *Native Plants of Maryland: What, When, and Where:* http://hgic.umd.edu/_media/documents/NativePlantsofMD.pdf
- Calvert County (Maryland) Native Plant Guide: www.co.cal.md.us/assets/Planning_Zoning/Environmental/NativePlantGuideOct07.pdf

- Maryland Department of National Resources, State Forest Tree Nursery, 1-800-TREESMD www.dnr.state.md.us/forests/nursery
- Home and Garden Information Center, University of Maryland Extension, 800-342-2507, Available online, http://www.hgic.umd.edu/

New York

- New York Flora Association http://www.nyflora.org/
- Torrey Botanical Society http://www.torreybotanical.org/
- The Finger Lakes Native Plant Society of Ithaca http://flnps.org/
- The Native Plant Center at Westchester Community College www.naiveplantcenter.org

Pennsylvania

- Pennsylvania Native Plant Society (State College, PA) www.pawildflower.org
- Botanical Society of Western Pennsylvania http://www.botsocwpa.org/
- Delaware Valley Fern & Wildflower Society http://www.dvfws.org/

Virginia

- Virginia Native Plant Society (Boyce, VA) www.vnps.org/
- Virginia Native Plants for Conservation, Restoration, and Landscaping http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml
- Piedmont Virginia Native Plant Database (Albemarle County, VA) http://www.albemarle.org/nativeplants/
- Virginia Eastern Shore Native Plant List http://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/NativePlants/NativePlantList.aspx

West Virginia

- West Virginia Native Plant Society www.wvnps.org

NON-NATIVE / INVASIVE PLANT RESOURCES

- National Park Service, "Plant Invaders of Mid-Atlantic Natural Areas:" http://www.nps.gov/plants/alien/pubs/midatlantic/toc.htm
- Ecology and Management of Invasive Plants Program, Cornell University, website with information on invasive plants, their impact on native species, and their control (particularly biological control) www.invasiveplants.net
- "*Invasive Species of Concern in Maryland:*" (Home and Garden Information Center, University of Maryland Extension) www.hgic.umd.edu/_media/documents/publications/invasive_species_list.pdf

- Maryland Native Plant Society - Information on controlling non-natives, with lists of native plant alternatives, http://www.mdflora.org/publications/invasiveshandbook.html
- The Nature Conservancy (Maryland Chapter) Information on the removal of specific non-native invasive plants, http://www.imapinvasives.org/GIST/ESA/index.html

Appendix D

Directory of Local Programs in the Chesapeake Bay Watershed that Provide Technical and Financial Assistance to Homeowners

The following is a list of programs in the Chesapeake Bay Watershed that provide technical (T), financial (F) or other (O) types of assistance to homeowners installing stewardship practices on their residential property. Since several of the programs provide assistance on a watershed basis, multiple communities may benefit from a particular program and so the programs have been grouped geographically rather than alphabetically.

Organization	Name of Program	Website	Type of Assistance		
			F	T	O
Alliance for e Chesapeake Bay	Chesapeake Riverwise Communities	https://allianceforthebay.org/category/our-work/riverwise/	x	x	x
MARYLAND					
Blue Water Baltimore	Blue Water Audit	http://www.bluewaterbaltimore.org/programs/clean-waterways/waterauditprogram/		x	x
Baltimore County Environmental Protection and Sustainability	Stormwater Retrofit Management Program	http://www.baltimorecountymd.gov/Agencies/environment/watershedrestoration/retrofits.html			
Gunpowder Conservancy	Clear Creeks Project	http://www.gunpowderfalls.org/bay-wise-practices.html			x
Pretty Boy Watershed Alliance		http://www.prettyboywatershed.org/educational-materials			x
Frederick County Sustainability Office	Green Homes Challenge , Green Leader	https://www.frederickgreenchallenge.org/		x	x
Monocacy and Catoctin Watershed Alliance		http://www.watershed-alliance.com/mcwa_restore.html			x
City of Gaithersburg	RainScapes Rewards	http://www.gaithersburgmd.gov/poi/default.asp?POI_ID=1758&TOC=107;81;388;1758;	x	x	x

Organization	Name of Program	Website	Type of Assistance		
			F	T	O
City of Rockville	RainScapes Rewards	http://www.rockvillemd.gov/environment/watersheds/rainscapes.html	x	x	x
Montgomery County DEP	RainScapes Rewards	http://www6.montgomerycountymd.gov/dectmpl.asp?url=/content/dep/water/rainscapes.asp	x	x	x
Anacostia Watershed Society		http://www.anacostiaws.org/			x
National Capital Region Watershed Stewards Academy		http://www.anacostiaws.org/programs/education/watershed-stewards-academy		x	x
Prince George's County DER		http://www.princegeorgescountymd.gov/Government/AgencyIndex/DER/index.asp	x		x
Howard County Government	Clean Water Howard	www.cleanwaterhoward.com	x	x	
Howard County Watershed Stewards Academy		http://wsahoco.weebly.com/		x	x
Midshore RiverKeeper Conservancy		http://midshoreriverkeeper.org/		x	
Chester River Association		http://www.chesterriverassociation.org/			
Corsica River Conservancy		http://www.corsicariverconservancy.org/activities		x	x
Sassafras River Association		http://www.sassafrasriver.org/			x
Anne Arundel Watershed Stewards Academy		http://www.aawsa.org/		x	x
Anne Arundel County WERS		www.aacounty.org/DPW/Highways/RainGarden.cfm	x		x
South River Federation		www.southriverfederation.net	x		x

Organization	Name of Program	Website	Type of Assistance		
			F	T	O
Severn River Association		www.severnriver.org/	x		x
West Rhode RiverKeeper		www.westrhoderiverkeeper.org/			x
RainScaping Campaign		http://www.rainscaping.org/			x
University of Maryland SeaGrant Extension	Watershed Restoration Specialists	http://www.mdsg.umd.edu/programs/extension/communities/watershed/specialists/		x	x
University of Maryland Extension	Bay-Wise Certification Program	http://extension.umd.edu/baywise		x	
Bay-wise Master Gardeners	Bay-wise Yard Visits	http://extension.umd.edu/baywise/program-certification		x	x
Local Watershed Groups		http://www6.montgomerycountymd.gov/dectmpl.asp?url=/Content/dep/water/localgroups.asp			x
DISTRICT OF COLUMBIA					
National Capital Region Watershed Stewards Academy		http://www.anacostiaws.org/programs/education/watershed-stewards-academy		x	x
District DDOE	RiverSmart Homes	http://green.dc.gov/riversmarthomes	x	x	
PENNSYLVANIA					
Conewago Creek Watershed	Conewago Creek Initiative	http://www.conewagoinitiative.net/		x	x
Little Conestoga Partnership		http://www.littleconestoga.org/	x	x	x
Blair Conservation District		http://www.blairconservationdistrict.org		x	x
Altoona, PA		http://www.altoonapa.gov/Pages/StormwaterInformation.aspx		x	x

Organization	Name of Program	Website	Type of Assistance		
			F	T	O
VIRGINIA					
Lynchburg, VA	Residential Credit Program	http://www.lynchburgva.gov/stormwater-credit-program	x	x	
James River Association	River Hero Homes	http://www.jrava.org/what-we-do/river-hero/		x	
Elizabeth River Project	River Star Homes	http://www.elizabethriver.org/RiverStars/default.aspx	x	x	
Richmond, VA	Residential Credit	http://www.richmondgov.com/PublicUtilities/documents/SWcreditmanual.pdf	x		
Arlington, VA	StormwaterWise	http://www.arlingtonva.us/departments/EnvironmentalServices/Sustainability/page87833.aspx	x	x	
Lynnhaven River Now	Pearl Homes	http://www.lynnhavenrivernow.org/gardening.aspx		x	
Friends of the Rappahannock	Rainscape Retrofits	http://www.riverfriends.org/OurPrograms/MiddleandUpperWatershed/tabid/607/Default.aspx#LiveTabsContent171922-lt			
James City County	PRIDE	http://www.jamescitycountyva.gov/jccpride/	x	x	
Reedy Creek Coalition		http://reedycreekcoalition.org/financial-incentive-program/	x	x	
City of Fredericksburg		http://www.riverfriendlyyard.com/			x
Chesterfield County		http://www.chesterfield.gov/content2.aspx?id=8589944309			x
Hanover-Caroline SWCD		http://www.co.hanover.va.us/soilandwater/urban.htm			x
Colonial SWCD		http://colonialswcd.net/about/	x	x	x
Master Gardeners of Virginia		http://vmga.net/Links.htm			

Appendix E

List of Bay-Friendly Lawn Care Experts

The following is a list places within the watershed where you can get a soil test analysis to see what if any fertilizer is required for your lawn.

Delaware	http://ag.udel.edu/dstp/index.html
Maryland	http://extension.umd.edu/hgic
Pennsylvania	http://www.aasl.psu.edu/ssft.htm
Virginia	http://pubs.ext.vt.edu/452/452-129/452-129.html http://www.soiltest.vt.edu/ http://www.al-labs-eastern.com/ Lynnhaven River NOW and Elizabeth River Project have developed a form for A&L Eastern Labs to provide Bay-friendly recommendations (i.e., low Nitrogen): http://www.lynnhavenrivernow.org/files/pages/Soil_sample_April_2010.pdf
West Virginia	http://www.caf.wvu.edu/~forage/Sampling_Soils.htm

United States Environmental Protection Agency
August 2009

How Can I Make a Rain Barrel?

Environmental Assessment & Innovation Division
EPA Region 3, Philadelphia, PA

A rain barrel is a system that collects and stores rain-water from your roof that would otherwise be lost to runoff and diverted to storm drains and streams. Usually a rain barrel is composed of a 55 gallon drum, a vinyl hose, PVC couplings, a screen grate to keep debris and insects out, and other off-the-shelf items. A rain barrel is relatively simple and inexpensive to construct.

Materials

- 1 - 55 gallon polyethylene plastic barrel (may be available for free or low cost from commercial car washes, bottling companies or other food businesses that use liquids.)
- 1 - 10 foot length of 2 inch PVC pipe
- 1 - 2 inch PVC elbow
- 1 - 2 inch female threaded by 2 inch PVC elbow
- 1 - 2 inch male threaded by 2 inch pipe adapter
- 1 - tube silicone sealer/cement
- 1 - 1/2 inch female threaded silcock (aka outdoor faucet or hose bib)
- 1 - 1/2 inch threaded bushing
- 1 - 1/2 inch female threaded socket
- 1 - roll teflon tape
- 1 - 1 foot by 2 foot piece of old or new screen fabric
- 1 - 1gallon plastic bucket, tub or flowerpot
- 4 - cinder blocks
- Optional - paint to match your house color

Tools

- Jig Saw
- Power Drill with 3/4 inch Spade Bit
- Scissors
- Pipe Wrench and Pump Pliers
- Screw Driver
- Hack Saw
- Tape Measure and Level

Step 1 - Inflow - Cut a hole in the top of barrel to allow rainwater to enter the barrel and to access the inside of the barrel. The hole should be just large enough to snugly fit the 1 gallon plastic bucket, tub or flowerpot. The bucket will be used to support a screen to keep mosquitoes and debris out. Cut a 3/4 inch hole in the bucket.

Step 2 - Spigot - Drill a 3/4 inch hole close to bottom of the 55 gallon barrel. (Don't drill the hole too far down inside the barrel where you can't reach it from the access hole on top or else you may need the help of a friend with very long arms!) Put teflon tape on the 1/2 inch bushing and thread it into the silcock or hose bib. Now carefully thread the other end of bushing into the 3/4 inch hole in bottom of barrel. It should fit snugly in the hole and cut threads in the plastic as you screw it in. Now unscrew it from the barrel, apply teflon tape to the threads of the bushing and apply silicone to the outside of the flange on the silcock. Screw it back into the hole and into a 1/2 inch socket on the inside of the barrel.

Step 3 - Down Spout Modification - Prepare the area under the down spout where you want to install the rain barrel. Remove the old down spout and splash block and level the area where the barrel will sit. Place the concrete blocks so they are sloped slightly downward away from the house. Set the barrel on the blocks. With a hacksaw cut the down spout so it is just long enough to fit into the bucket on top of the rain barrel.

Step 4 - Overflow - You should provide an overflow for water if the barrel fills to the top. With a jig saw, cut a hole in the side of the barrel large enough to fit the 2 inch male threaded by 2 inch pipe adapter. Place this fitting inside the barrel and thread it into the 2 inch female threaded by 2 inch PVC elbow on the outside of the barrel. Seal with silicone. Cut a length of 2 inch PVC pipe long enough to reach the ground. Attach a 2 inch PVC elbow to the bottom of this pipe and cut another length of 2 inch pipe to connect to a splash block.

Infiltration Trenches and Dry Wells

Infiltration trenches and dry wells are gravel-filled areas in your yard that store rainwater underground, allowing for more storage and infiltration of runoff than the original soil allowed. Their location is flexible and does not need to interfere with the use of your yard. Possible locations include under your lawn or patio, adjacent to your driveway, or other areas of your yard.

The benefits of an infiltration trench and dry well include:

- A reduction in stormwater runoff from your property. This also reduces the amount of sediment and other pollutants that would be washed away with the runoff into nearby storm drains and local streams.
- Groundwater recharge. The slow release of the water allows it to soak into the ground, which supplies water to local streams in between storms.

To create an infiltration trench, the existing soil is removed from an area of your yard, and then filled with gravel. Sod or other pervious materials can be placed on top of the infiltration trench. A PVC pipe may be installed in the infiltration trench to allow for maintenance, but this is the only visible marker of the trench. A dry well is very similar to an infiltration trench, but includes an underground, perforated pipe or container surrounded by gravel in its design.

When serving a single-family home, these practices typically need little special maintenance, particularly if it is covered by lawn or located beneath a patio. It's a good idea to check after a major storm to make sure the drains are functioning. If a trench is surfaced with gravel, accumulated sediment must be removed along with any weeds.

Learn more about infiltration trenches and dry wells through the links on the StormwaterWise Landscapes webpage.

Arlington's StormwaterWise Landscapes Program
www.arlingtonva.us/stormwaterwise

ARLINGTON VIRGINIA

Department of Environmental Services
2100 Clarendon Blvd, Arlington VA 22201
703/228-4488/TTY/TDD 703/228-4611
des@arlingtonva.us

Once installed, the infiltration trench is invisible except for a short portion of PVC pipe used to maintain the trench.

RECOMMENDED NATIVE FLOODPLAIN SPECIES
THE CITY OF FALLS CHURCH, VIRGINIA
URBAN FORESTRY DIVISION

CANOPY TREES

	SCIENTIFIC NAME	COMMON NAME
+	*Acer rubrum*	Red Maple
*	*Betula nigra*	River Birch
*	*Fagus grandifolia*	American Beech
*	*Fraxinus americana*	White Ash
+	*Liquidamber styracifiua*	Sweet Gum
*	*Nyssa sylvatica*	Black Gum
*	*Ouercus phellos*	Willow Oak
+	*Quercus bicolor*	Swamp White Oak

UNDERSTORY TREES

*	*Aesculus pavia*	Red Buckeye
*	*Amelanchier canadensis*	Shadblow Serviceberry
*	*Carpinus carolinia*	Ironwood
*	*Chionanthus virginicus*	Fringetree
*	*Magnolia virginiana*	Sweetbay

EVERGREEN TREES

*	*Ilex opaca*	American Holly
	Juniperus virginiana	Eastern Red Cedar
	Pinus virginiana	Virginia Pine
	Pinus rigida	Pitch Pine

SHRUBS

*	*Aesculus parviflora*	Bottlebrush Buckeye
+	*Alnus serrulata*	Smooth Alder
+	*Aronia arbutifolia*	Red Chokeberry
*	*Calycanthus florida*	Sweetshrub
+	*Cephalanthus occidentalis*	Button Bush
+	*Clethra alnifolia*	Summersweet
+	*Cornus amonum*	Silky Dogwood
+	*Cornus serica*	Red-Stem Dogwood
*	*Hammamelis virginiana*	Witch Hazel
*	*Hydrangea arborescens*	Smooth Hydrangea
+	*Hypericum kalmianum*	St. John’s Wort

+	*Ilex glabra*	Inkberry
+	*Ilex verticilata*	Winterberry
+	*Itea virginica*	Virginia Sweetspire
*	*Lindera benzoin*	Spice Bush
+	*Myrica pennsylvaitica*	Northern Bayberry
+	*Rhododendron viscosum*	Swamp Azalea
*	*Rosa palustrus*	Swamp Rose
*	*Sambucus canadensis*	Elderberry
*	*Viburnum cassanoides*	Witherod
*	*Viburnum dentatum*	Arrow Wood
*	*Viburnum lentago*	Nannyberry
*	*Viburnum triboltirn*	American Cranberry

HERBACEOUS PERENNIALS

*	*Aster novae angliae*	New England Aster
*	*Baptisia pendula*	False Indigo
*	*Chelone glabra*	Turtlehead
*	*Echinacea purpurea*	Purple Cornflower
+ *	*Eupatorium fistulosum*	Hollow Joe Pye Weed
+ *	*Iris pseudocaris*	Yellow Iris
+	*Iris vericolor*	Blue Flag
+ *	*Lobelia cardinalis*	Cardinal Flower
+ *	*Lobelia siphilitica*	Blue Lobelia
*	*Monarda didyma*	Bee Balm
*	*Osmunda regalis*	Royal Fern
*	*Tiarella cordifolia*	Foam Flower
+	*Tradescantia andersoniana*	Spiderwort
+	*Typha angustifolia*	Narrowleaf Cattail
+	*Typha latifolia*	Common Cattail
+ *	*Vernonia noveboracensis*	New York Iron Weed

NATIVE GRASSES

*	*Andropogon gerardi*	Big Bluestem
*	*Andropogon virginicus*	Broomsedge
*	*Chasmanthium lotifolium*	Indian woodoats
*	*Panicum amarum*	Coastal panic grass
*	*Panicum virgatum*	Switch grass
*	*Schizachyrium scoparium*	Little bluestem
*	*Sorghastrum nutans*	Indian grass
*	*Tripsacum dactyloised*	Eastern gama grass

* *Suitable for usually well drained occasional flooding*
\+ *Suitable for permanently wet areas*

VIRGINIA DEQ STORMWATER
DESIGN SPECIFICATION No. 7

PERMEABLE PAVEMENT

VERSION 1.8
March 1, 2011

SECTION 1: DESCRIPTION

Permeable pavements are alternative paving surfaces that allow stormwater runoff to filter through voids in the pavement surface into an underlying stone reservoir, where it is temporarily stored and/or infiltrated. A variety of permeable pavement surfaces are available, including **pervious concrete**, **porous asphalt** and permeable **interlocking concrete pavers**. While the specific design may vary, all permeable pavements have a similar structure, consisting of a surface pavement layer, an underlying stone aggregate reservoir layer and a filter layer or fabric installed on the bottom (See **Figure 7.1** below).

The thickness of the reservoir layer is determined by both a structural and hydrologic design analysis. The reservoir layer serves to retain stormwater and also supports the design traffic loads for the pavement. In low-infiltration soils, some or all of the filtered runoff is collected in an underdrain and returned to the storm drain system. If infiltration rates in the native soils permit, permeable pavement can be designed without an underdrain, to enable full infiltration of runoff. A combination of these methods can be used to infiltrate a portion of the filtered runoff.

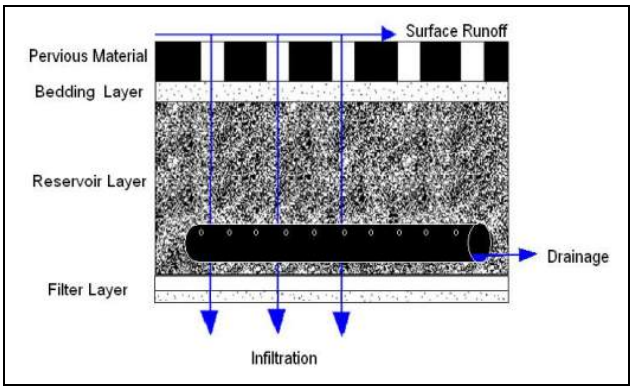


Figure 7.1. Cross Section of Typical Permeable Pavement (Source: Hunt & Collins, 2008)

Permeable pavement is typically designed to treat stormwater that falls on the actual pavement surface area, but it may also be used to accept run-on from small adjacent impervious areas, such as impermeable driving lanes or rooftops. However, careful sediment control is needed for any run-on areas to avoid clogging of the down-gradient permeable pavement. Permeable pavement has been used at commercial, institutional, and residential sites in spaces that are traditionally impervious. Permeable pavement promotes a high degree of runoff volume reduction and nutrient removal, and it can also reduce the effective impervious cover of a development site.

SECTION 2: PERFORMANCE

The overall stormwater functions of permeable pavement are shown in **Table 7.1**.

Table 7.1. Summary of Stormwater Functions Provided by Permeable Pavement

Stormwater Function	Level 1 Design	Level 2 Design
Annual Runoff Volume Reduction (RR)	45%	75%
Total Phosphorus (TP) EMC Reduction[1] by BMP Treatment Process	25%	25%
Total Phosphorus (TP) Mass Load Removal	59%	81%
Total Nitrogen (TN) EMC Reduction[1]	25%	25%
Total Nitrogen (TN) Mass Load Removal	59%	81%
Channel Protection	● Use RRM spreadsheet to calculate a Curve Number (CN) adjustment; ***OR*** ● Design extra storage (optional, as needed) in the stone underdrain layer to accommodate larger storm volumes, and use NRCS TR-55 Runoff Equations [2] to compute a CN adjustment.	
Flood Mitigation	Partial. May be able to design additional storage into the reservoir layer by adding perforated storage pipe or chambers.	

[1] Change in event mean concentration (EMC) through the practice. Actual nutrient mass load removed is the product of the removal rate and the runoff reduction rate (see Table 1 in the *Introduction to the New Virginia Stormwater Design Specifications*).
[2] NRCS TR-55 Runoff Equations 2-1 thru 2-5 and Figure 2-1 can be used to compute a curve number adjustment for larger storm events based on the retention storage provided by the practice(s).

Sources: CWP and CSN (2008) and CWP (2007)

The choice of what kind of permeable pavement to use is influenced by site-specific design factors and the intended future use of the permeable surface. A general comparison of the engineering properties of the three major permeable pavement types is provided in **Table 7.2**, although designers should check with product vendors and their local review authority to determine their specific requirements and capabilities. Designers should also note that there are other paver options, such as concrete grid pavers and reinforced turf pavers, that function in the same general manner as permeable pavement.

Table 7.2. Comparative Properties of the Three Major Permeable Pavement Types

Design Factor	Porous Concrete (PC)	Porous Asphalt (PA)	Interlocking Pavers (IP)
Scale of Application	Small and large scale paving applications	Small and large scale paving applications	Micro, small and large scale paving applications
Pavement Thickness [1]	5 to 8 inches	3 to 4 inches	3 inches [1, 8]
Bedding Layer [1, 8]	None	2 inches No. 57 stone	2 inches of No. 8 stone
Reservoir Layer [2, 8]	No. 57 stone	No. 2 stone	No. 2 stone 3-4 inches of No.57 stone
Construction Properties [3]	Cast in place, seven day cure, must be covered	Cast in place, 24 hour cure	No cure period; manual or mechanical installation of pre-manufactured units, over 5000 sf/day per machine
Design Permeability [4]	10 feet/day	6 feet/day	2 feet/day
Construction Cost [5]	$ 2.00 to $6.50/sq. ft.	$ 0.50 to $1.00/ sq. ft.	$ 5.00 to $ 10.00/ sq. ft.
Min. Batch Size	500 sq. ft.		NA
Longevity [6]	20 to 30 years	15 to 20 years	20 to 30 years
Overflow	Drop inlet or overflow edge	Drop inlet or overflow edge	Surface, drop inlet or overflow edge
Temperature Reduction	Cooling in the reservoir layer	Cooling in the reservoir layer	Cooling at the pavement surface & reservoir layer
Colors/Texture	Limited range of colors and textures	Black or dark grey color	Wide range of colors, textures, and patterns
Traffic Bearing Capacity [7]	Can handle all traffic loads, with appropriate bedding layer design.		
Surface Clogging	Replace paved areas or install drop inlet	Replace paved areas or install drop inlet	Replace permeable stone jointing materials
Other Issues		Avoid seal coating	Snowplow damage
Design Reference	American Concrete Institute # 522.1.08	Jackson (2007) NAPA	Smith (2006) ICPI

[1] Individual designs may depart from these typical cross-sections, due to site, traffic and design conditions.
[2] Reservoir storage may be augmented by corrugated metal pipes, plastic arch pipe, or plastic lattice blocks.
[3] ICPI (2008)
[4] NVRA (2008)
[5] WERF 2005 as updated by NVRA (2008)
[6] Based on pavement being maintained properly, Resurfacing or rehabilitation may be needed after the indicated period.
[7] Depends primarily on on-site geotechnical considerations and structural design computations.
[8] Stone sizes correspond to ASTM D 448: *Standard Classification for Sizes of Aggregate for Road and Bridge Construction*.

SECTION 3: DESIGN TABLE

The major design goal of Permeable Pavement is to maximize nutrient removal and runoff reduction. To this end, designers may choose to use a baseline permeable pavement design (Level 1) or an enhanced design (Level 2) that maximizes nutrient and runoff reduction. To qualify for Level 2, the design must meet all design criteria shown in the right hand column of **Table 7.3**.

Table 7.3. Permeable Pavement Design Criteria

Level 1 Design	Level 2 Design
Tv = (1)(Rv)(A) / 12 – the volume reduced by an upstream BMP [1]	Tv = (1.1)(Rv)(A) / 12
Soil infiltration is less than 0.5 in./hr.	Soil infiltration rate exceeds 0.5 in./hr.
Underdrain required	Underdrain not required; ***OR*** If an underdrain is used, a 12-inch stone sump must be provided below the underdrain invert; ***OR*** The Tv has at least a 48-hour drain time, as regulated by a control structure.
CDA = The permeable pavement area plus upgradient parking, as long as the ratio of external contributing area to permeable pavement does not exceed 2:1.	CDA = The permeable pavement area
[1] The contributing drainage area to the permeable pavements should be limited to paved surfaces, to avoid sediment wash-on, and sediment source controls and/or a pre-treatment strip or sump should be used. When pervious areas are conveyed to permeable pavement, pre-treatment must be provided, and the pre-treatment may qualify for a runoff reduction credit.	

SECTION 4: TYPICAL DETAILS

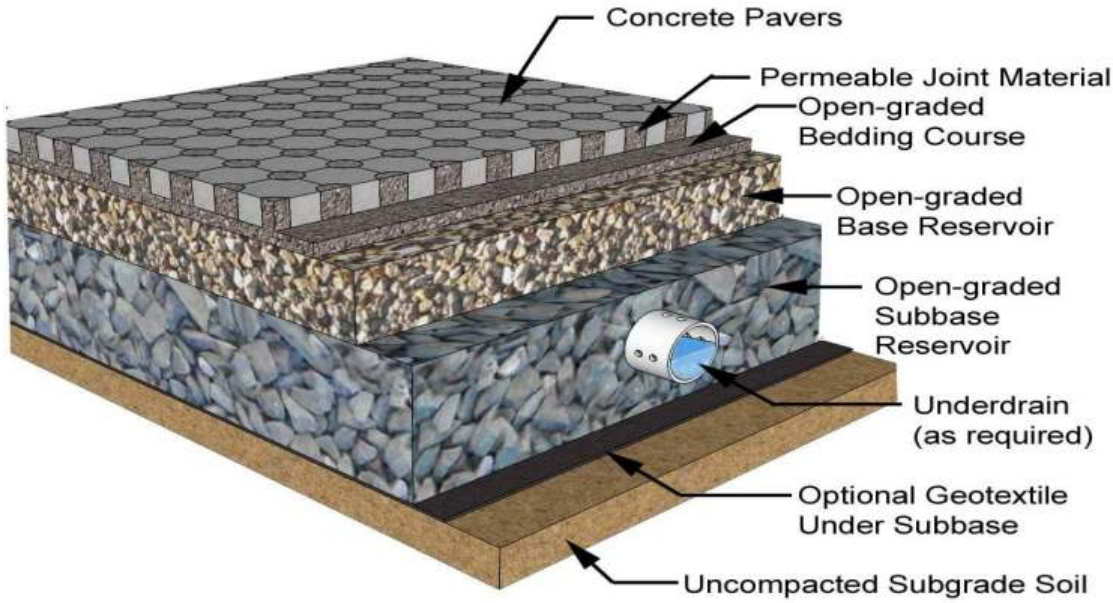


Figure 7.2. Typical Detail (Source: Smith, 2009)

SECTION 5: PHYSICAL FEASIBILITY & DESIGN APPLICATIONS

Since permeable pavement has a very high runoff reduction capability, it should always be considered as an alternative to conventional pavement. Permeable pavement is subject to the same feasibility constraints as most infiltration practices, as described below.

Available Space. A prime advantage of permeable pavement is that it does not normally require additional space at a new development or redevelopment site, which can be important for tight sites or areas where land prices are high.

Soils. Soil conditions do not constrain the use of permeable pavement, although they do determine whether an underdrain is needed. Impermeable soils in Hydrologic Soil Groups (HSG) C or D usually require an underdrain, whereas HSG A and B soils often do not. In addition, permeable pavement should never be situated above fill soils unless designed with an impermeable liner and underdrain.

If the proposed permeable pavement area is designed to infiltrate runoff without underdrains, it must have a minimum infiltration rate of 0.5 inches per hour. Initially, projected soil infiltration rates can be estimated from USDA-NRCS soil data, but they must be confirmed by an on-site infiltration measurement. Native soils must have silt/clay content less than 40% and clay content less than 20%.

> ***Designers should also evaluate existing soil properties during initial site layout, and seek to configure the site to conserve and protect the soils with the greatest recharge and infiltration rates. In particular, areas of HSG A or B soils shown on NRCS soil surveys should be considered as primary locations for all types of infiltration.***

External Drainage Area. Any external drainage area contributing runoff to permeable pavement should generally not exceed twice the surface area of the permeable pavement, and it should be as close to 100% impervious as possible. Some field experience has shown that an upgradient drainage area (even if it is impervious) can contribute particulates to the permeable pavement and lead to clogging (Hirschman, et al., 2009). Therefore, careful sediment source control and/or a pre-treatment strip or sump (e.g., stone or gravel) should be used to control sediment run-on to the permeable pavement section.

Pavement Slope. Steep slopes can reduce the stormwater storage capability of permeable pavement and may cause shifting of the pavement surface and base materials. Designers should consider using a terraced design for permeable pavement in sloped areas, especially when the local slope is several percent or greater.

The bottom slope of a permeable pavement installation should be as flat as possible (i.e., 0% longitudinal slope) to enable even distribution and infiltration of stormwater. However, a maximum longitudinal slope of 1% is permissible if an underdrain is employed. Lateral slopes should be 0%.

Minimum Hydraulic Head. The elevation difference needed for permeable pavement to function properly is generally nominal, although 2 to 4 feet of head may be needed to drive flows through underdrains. Flat terrain may affect proper drainage of Level 1 permeable pavement designs, so underdrains should have a minimum 0.5% slope.

Minimum Depth to Water Table. A high groundwater table may cause runoff to pond at the bottom of the permeable pavement system. Therefore, a minimum vertical distance of 2 feet must be provided between the bottom of the permeable pavement installation (i.e., the bottom invert of the reservoir layer) and the seasonal high water table.

Setbacks. Permeable pavement should not be hydraulically connected to structure foundations, in order to avoid harmful seepage. Setbacks to structures and roads vary, based on the scale of the permeable pavement installation (see **Table 7.3** above). At a minimum, small- and large-scale pavement applications should be located a minimum horizontal distance of 100 feet from any water supply well, 50 feet from septic systems, and at least 5 feet down-gradient from dry or wet utility lines. Setbacks can be reduced at the discretion of the local program authority for designs that use underdrains and/or liners.

Informed Owner. The property owner should clearly understand the unique maintenance responsibilities inherent with permeable pavement, particularly for parking lot applications. The owner should be capable of performing routine and long-term actions (e.g., vacuum sweeping) to maintain the pavement's hydrologic functions, and avoid future practices (e.g., winter sanding, seal coating or repaving) that diminish or eliminate them.

High Loading Situations. Permeable pavement is not intended to treat sites with high sediment or trash/debris loads, since such loads will cause the practice to clog and fail.

Groundwater Protection. **Section 10** of this specification presents a list of potential stormwater hotspots that pose a risk of groundwater contamination. Infiltration of runoff from designated hotspots is highly restricted or prohibited.

Limitations. Permeable pavement can be used as an alternative to most types of conventional pavement at residential, commercial and institutional developments, with two exceptions:

- Permeable pavement should not been used for high speed roads, although it has been successfully applied for low speed residential streets, parking lanes and roadway shoulders; and
- Permeable pavement should not be used to treat runoff from stormwater hotspots, as noted above. Refer to Section 10.1 of Stormwater Design Specification No. 8: (Infiltration) for more specific guidance regarding hotspots.

Design Scales. Permeable pavement can be installed at the following three scales:

1. The smallest scale is termed ***Micro-Scale Pavements***, which applies to converting impervious surfaces to permeable ones on small lots and redevelopment projects, where the installations may range from 250 to 1000 square feet in total area. Where redevelopment or

retrofitting of existing impervious areas results in a larger foot-print of permeable pavers (small-scale or large- scale, as described below), the designer should implement the Load Bearing, Observation Well, Underdrain, Soil Test, and Building Setback criteria associated with the applicable scale.

2. ***Small-scale pavement*** applications treat portions of a site between 1000 and 10,000 square feet in area, and include areas that only occasionally receive heavy vehicular traffic.

3. ***Large scale pavement*** applications exceed 10,000 square feet in area and typically are installed within portions of a parking lot.

Table 7.4 outlines the different design requirements for each of the three scales of permeable pavement installation.

Table 7.4. The Three Design Scales for Permeable Pavement

Design Factor	Micro-Scale Pavement	Small-Scale Pavement	Large-Scale Pavement
Impervious Area Treated	250 to 1000 sq. ft.	1000 to 10,000 sq. ft.	More than 10,000 sq. ft.
Typical Applications	Driveways Walkways Court Yards Plazas Individual Sidewalks	Sidewalk Network Fire Lanes Road Shoulders Spill-Over Parking Plazas	Parking Lots with more than 40 spaces Low Speed Residential Streets
Most Suitable Pavement	IP	PA, PC, and IP	PA, PC and IP
Load Bearing Capacity	Foot traffic Light vehicles	Light vehicles	Heavy vehicles (moving & parked)
Reservoir Size	Infiltrate or detain some or all of the Tv	Infiltrate or detain the full Tv and as much of the CPv and design storms as possible	
External Drainage Area?	No	Yes, impervious cover up to twice the permeable pavement area may be accepted as long as sediment source controls and/or pretreatment is used	
Observation Well	No	No	Yes
Underdrain?	Rare	Depends on the soils	Back-up underdrain
Required Soil Tests	One per practice	Two per practice	One per 5000 sq. ft of proposed practice
Building Setbacks	5 feet down-gradient 25 feet up-gradient	10 feet down-gradient 50 feet up-gradient	25 feet down-gradient 100 feet up-gradient

Regardless of the design scale of the permeable pavement installation, the designer should carefully consider the expected traffic load at the proposed site and the consequent structural requirements of the pavement system. Sites with heavy traffic loads will require a thick aggregate base and, in the case of porous asphalt and pervious concrete, may require the addition of an admixture for strength or a specific bedding design. In contrast, most micro-scale applications should have little or no traffic flow to contend with.

SECTION 6: DESIGN CRITERIA

6.1. Sizing of Permeable Pavement

Structural Design. If permeable pavement will be used in a parking lot or other setting that involves vehicles, the pavement surface must be able to support the maximum anticipated traffic load. The structural design process will vary according to the type of pavement selected, and the manufacturer's specific recommendations should be consulted. The thickness of the permeable pavement and reservoir layer must be sized to support structural loads and to temporarily store the design storm volume (e.g., the water quality, channel protection, and/or flood control volumes). On most new development and redevelopment sites, the structural support requirements will dictate the depth of the underlying stone reservoir.

The structural design of permeable pavements involves consideration of four main site elements:

- Total traffic;
- In-situ soil strength;
- Environmental elements; and
- Bedding and Reservoir layer design.

The resulting structural requirements may include, but are not limited to, the thickness of the pavement, filter, and reservoir layer. Designers should note that if the underlying soils have a low California Bearing Ratio (CBR) (less than 4%), they may need to be compacted to at least 95% of the Standard Proctor Density, which generally rules out their use for infiltration.

Designers should determine structural design requirements by consulting transportation design guidance sources, such as the following:

- VDOT Pavement Design Guide for Subdivision and Secondary Roads in Virginia (2000; or latest edition);
- AASHTO Guide for Design of Pavement Structures (1993); and,
- AASHTO Supplement to the Guide for Design of Pavement Structures (1998).

Hydraulic Design. Permeable pavement is typically sized to store the water quality Treatment Volume (T_v) or another design storm volume in the reservoir layer. The infiltration rate typically will be less than the flow rate through the pavement, so that some underground reservoir storage will usually be required. Designers should initially assume that there is no outflow through underdrains, using **Equation 7.1** to determine the depth of the reservoir layer, assuming runoff fully infiltrates into the underlying soil:

Equation 7.1

$$d_p = \frac{\{(d_c \times R) + P - (i/2 \times t_f)\}}{V_r}$$

Where:

d_p = The depth of the reservoir layer (ft.)

d_c = The depth of runoff from the contributing drainage area (not including the permeable paving surface) for the Treatment Volume (Tv/A_c), or other design storm (ft.)

R = A_c/A_p = The ratio of the contributing drainage area (A_c, not including the permeable paving surface) to the permeable pavement surface area (A_p)
[NOTE: With reference to **Table 7.3**, the maximum value for the Level 1 design is R = 2, (the external drainage area A_c is twice that of the permeable pavement area A_p; and for Level 2 design R = 0 (the drainage area is made up solely of permeable pavement A_p]**.**

P = The rainfall depth for the Treatment Volume (Level 1 = 1 inch; Level 2 = 1.1 inch), or other design storm (ft.)

i = The field-verified infiltration rate for native soils (ft./day)

t_f = The time to fill the reservoir layer (day) – typically 2 hours or 0.083 day

V_r = The void ratio for the reservoir layer (0.4)

The maximum allowable depth of the reservoir layer is constrained by the maximum allowable drain time, which is calculated using **Equation 2**.

Equation 7.2

$$d_{p-\max} = \frac{(i/2 \times t_d)}{V_r}$$

Where:

$d_{p\text{-}max}$ = The maximum depth of the reservoir layer (ft.)

i = The field-verified infiltration rate for the native soils (ft./day)

V_r = The void ratio for reservoir layer (0.4 – see assumptions, below)

t_d = The maximum allowable time to drain the reservoir layer, typically 1 to 2 days (days)

The following design assumptions apply to **Equations 7.1 and 7.2**:

- The contributing drainage area (A_c) should not contain pervious areas.
- For design purposes, the native soil infiltration rate (i) should be the field-tested soil infiltration rate divided by a factor of safety of 2. The minimum acceptable native soil infiltration rate is 0.5”/hr.
- The void ratio (V_r) for No. 57 stone = 0.4.
- Max. drain time for the reservoir layer should be not less than 24 nor more than 48 hours.

If the depth of the reservoir layer is too great (i.e. d_p exceeds $d_{p\text{-}max}$), or the verified soil infiltration rate is less than 0.5 inches per hour, then the design method typically changes to account for underdrains. The storage volume in the pavements must account for the underlying infiltration rate and outflow through the underdrain. In this case, the design storm should be routed through the pavement to accurately determine the required reservoir depth. Alternatively, the designer may use **Equations 7.3 through 7.5** to approximate the depth of the reservoir layer for designs using underdrains.

Equation 7.3 can be used to approximate the outflow rate from the underdrain. The hydraulic conductivity, *k*, of gravel media is very high (~17,000 ft./day). However, the permeable pavement reservoir layer will drain increasingly slower as the storage volume decreases (i.e. the hydraulic head decreases). To account for this change, a conservative permeability coefficient of 100 ft./day can be used to approximate the average underdrain outflow rate.

Equation 7.3

$$q_u = k \times m$$

Where:

- q_u = Outflow through the underdrain (per outlet pipe, assumed 6-inch diameter) (ft./day)
- k = Hydraulic conductivity for the reservoir layer (ft./day – assume 100 ft./day)
- m = Underdrain pipe slope (ft./ft.)

Once the outflow rate through the underdrain has been approximated, **Equation 7.4** is used to determine the depth of the reservoir layer needed to store the design storm.

Equation 7.4

$$d_p = \frac{\{(d_c \times R) + P - (i/2 \times t_f) - (q_u \times t_f)\}}{V_r}$$

Where:

- d_p = Depth of the reservoir layer (ft.)
- d_c = Depth of runoff from the contributing drainage area (not including the permeable pavment surface) for the Treatment Volume (Tv/A_c), or other design storm (ft.)
- R = A_c/A_p = The ratio of the contributing drainage area (A_c) (not including the permeable pavment surface) to the permeable pavement surface area (A_p)
- P = The rainfall depth for the Treatment Volume (Level 1 = 1 inch; Level 2 = 1.1 inch), or other design storm (ft.)
- i = The field-verified infiltration rate for the native soils (ft./day)
- t_f = The time to fill the reservoir layer (day) – typically 2 hours or 0.083 day
- V_r = The void ratio for the reservoir layer (0.4)
- q_u = Outflow through Underdrain (ft/day)

The maximum allowable depth of the reservoir layer is constrained by the maximum allowable drain time, which is calculated using **Equation 7.5**.

Equation 7.5

$$d_{p-\max} = \frac{\{(i/2 \times t_d) + (q_u \times t_d)\}}{V_r}$$

Where:

$d_{p\text{-}max}$ = The maximum depth of the reservoir layer (ft.)
i = The field-verified infiltration rate for the native soils (ft./day)
V_r = The void ratio for the reservoir layer (0.4)
t_d = The time to drain the reservoir layer (day – typically 1 to 2 days)
q_u = The outflow through the underdrain (ft./day)

If the depth of the reservoir layer is still too great (i.e. d_p exceeds $d_{p\text{-}max}$), the number of underdrains can be increased, which will increase the underdrain outflow rate.

Permeable pavement can also be designed to address, in whole or in part, the detention storage needed to comply with channel protection and/or flood control requirements. The designer can model various approaches by factoring in storage within the stone aggregate layer, expected infiltration, and any outlet structures used as part of the design. Routing calculations can also be used to provide a more accurate solution of the peak discharge and required storage volume.

Once runoff passes through the surface of the permeable pavement system, designers should calculate outflow pathways to handle subsurface flows. Subsurface flows can be regulated using underdrains, the volume of storage in the reservoir layer, the bed slope of the reservoir layer, and/or a control structure at the outlet.

6.2. Soil Infiltration Rate Testing

To design a permeable pavement system *without* an underdrain, the measured infiltration rate of subsoils must be 0.5 inch per hour or greater. On-site soil infiltration rate testing procedures are outlined in Appendix 8-A of the Infiltration Design Specification (No. 8). A minimum of one test must be taken per 1,000 sq. ft. of planned permeable pavement surface area. In most cases, a single soil test is sufficient for micro-scale and small-scale applications. At least one soil boring must be taken to confirm the underlying soil properties *at the depth where infiltration is designed to occur* (i.e., to ensure that the depth to water table, depth to bedrock, or karst is defined). Soil infiltration testing should be conducted within any confining layers that are found within 4 feet of the bottom of a proposed permeable pavement system.

6.3. Type of Surface Pavement

The type of pavement should be selected based on a review of the factors in **Table 7.2** above, and designed according to the product manufacturer's recommendations.

6.4. Internal Geometry and Drawdowns

- ***Elevated Underdrain.*** To promote greater runoff reduction for permeable pavement located on marginal soils, an elevated underdrain should be installed with a stone jacket that creates a 12 to 18 inch deep storage layer *below* the underdrain invert. The void storage in this layer can help qualify a site to achieve Level 2 design.

- ***Rapid Drawdown.*** When possible, permeable pavement should be designed so that the target runoff reduction volume stays in the reservoir layer for at least 36 hours before being discharged through an underdrain.

- ***Conservative Infiltration Rates.*** Designers should always decrease the measured infiltration rate by a factor of 2 during design, to approximate long term infiltration rates.

6.5. Pretreatment

Pretreatment for most permeable pavement applications is not necessary, since the surface acts as pretreatment to the reservoir layer below. Additional pretreatment may be appropriate if the pavement receives run-on from an adjacent pervious or impervious area. For example, a gravel filter strip can be used to trap coarse sediment particles before they reach the permeable pavement surface, in order to prevent premature clogging.

6.6. Conveyance and Overflow

Permeable pavement designs should include methods to convey larger storms (e.g., 2-yr, 10-yr) to the storm drain system. The following is a list of methods that can be used to accomplish this:

- Place a perforated pipe horizontally near the top of the reservoir layer to pass excess flows after water has filled the base. The placement and/or design should be such that the incoming runoff is not captured (e.g., placing the perforations on the underside only).
- Increase the thickness of the top of the reservoir layer by as much as 6 inches (i.e., create freeboard). The design computations used to size the reservoir layer often assume that no freeboard is present.
- Create underground detention within the reservoir layer of the permeable pavement system. Reservoir storage may be augmented by corrugated metal pipes, plastic or concrete arch structures, etc.
- Route excess flows to another detention or conveyance system that is designed for the management of extreme event flows.
- Set the storm drain inlets flush with the elevation of the permeable pavement surface to effectively convey excess stormwater runoff past the system (typically in remote areas). The design should also make allowances for relief of unacceptable ponding depths during larger rainfall events.

6.7. Reservoir layer

The thickness of the reservoir layer is determined by runoff storage needs, the infiltration rate of in situ soils, structural requirements of the pavement sub-base, depth to water table and bedrock, and frost depth conditions (see **Section 7**). A professional should be consulted regarding the suitability of the soil subgrade.

- The reservoir below the permeable pavement surface should be composed of clean, washed stone aggregate and sized for both the storm event to be treated and the structural requirements of the expected traffic loading.
- The storage layer may consist of clean washed No. 57 stone, although No. 2 stone is preferred because it provides additional storage and structural stability.
- The bottom of the reservoir layer should be completely flat so that runoff will be able to infiltrate evenly through the entire surface.

6.8 Underdrains

The use of underdrains is recommended when there is a reasonable potential for infiltration rates to decrease over time, when underlying soils have an infiltration rate of less than 1/2-inch per hour, or when soils must be compacted to achieve a desired Proctor density. Underdrains can also be used to manage extreme storm events to keep detained stormwater from backing up into the permeable pavement.

- An underdrain(s) should be placed within the reservoir and encased in 8 to 12 inches of clean, washed stone.
- The underdrain outlet can be fitted with a flow-reduction orifice as a means of regulating the stormwater detention time. The minimum diameter of any orifice should be 0.5 inch.
- An underdrain(s) can also be installed and capped at a downstream structure as an option for future use if maintenance observations indicate a reduction in the soil permeability.

6.9. Maintenance Reduction Features

Maintenance is a crucial element to ensure the long-term performance of permeable pavement. The most frequently cited maintenance problem is surface clogging caused by organic matter and sediment, which can be reduced by the following measures:

- ***Periodic Vacuum Sweeping.*** The pavement surface is the first line of defense in trapping and eliminating sediment that may otherwise enter the stone base and soil subgrade. The rate of sediment deposition should be monitored and vacuum sweeping done once or twice a year. This frequency should be adjusted according to the intensity of use and deposition rate on the permeable pavement surface. At least one sweeping pass should occur at the end of winter.

- ***Protecting the Bottom of the Reservoir Layer.*** There are two options to protect the bottom of the reservoir layer from intrusion by underlying soils. The first method involves covering the bottom with nonwoven, polypropylene geotextile that is permeable, although some practitioners recommend avoiding the use of filter fabric since it may become a future plane

of clogging within the system. Permeable filter fabric is still recommended to protect the excavated sides of the reservoir layer, in order to prevent soil piping. The second method is to form a barrier of choker stone and sand. In this case, underlying native soils should be separated from the reservoir base/subgrade layer by a thin 2 to 4 inch layer of clean, washed, choker stone (ASTM D 448 No. 8 stone) covered by a layer of 6 to 8 inches of course sand.

- ***Observation Well.*** An observation well, consisting of a well-anchored, perforated 4 to 6 inch (diameter) PVC pipe that extends vertically to the bottom of the reservoir layer, should be installed at the downstream end of all large-scale permeable pavement systems. The observation well should be fitted with a lockable cap installed flush with the ground surface (or under the pavers) to facilitate periodic inspection and maintenance. The observation well is used to observe the rate of drawdown within the reservoir layer following a storm event.

- ***Overhead Landscaping.*** Most local communities now require from 5% to 10% (or more) of the area of parking lots to be in landscaping. Large-scale permeable pavment applications should be carefully planned to integrate this landscaping in a manner that maximizes runoff treatment and minimizes the risk that sediment, mulch, grass clippings, leaves, nuts, and fruits will inadvertently clog the paving surface.

6.10. Material Specifications

Permeable pavement material specifications vary according to the specific pavement product selected. **Table 7.5** describes general material specifications for the component structures installed beneath the permeable pavement. Note that the size of stone materials used in the reservoir and filter layers may differ depending whether the system is PC, PA or IP (see **Table 7.2** above). A general comparison of different permeable pavements is provided in **Table 7.6** below, but designers should consult manufacturer's technical specifications for specific criteria and guidance.

Table 7.5. Material Specifications for Underneath the Pavement Surface

Material	Specification	Notes
Bedding Layer	PC: None PA: 2 in. depth of No. 8 stone IP: 2 in. depth of No. 8 stone over 3 to 4 inches of No. 57	ASTM D448 size No. 8 stone (e.g. 3/8 to 3/16 inch in size). Should be double-washed and clean and free of all fines.
Reservoir Layer	PC: No. 57 stone PA: No. 2 stone IP: No. 57 stone	ASTM D448 size No. 57 stone (e.g. 1 1/2 to 1/2 inch in size); No. 2 Stone (e.g. 3 inch to 3/4 inch in size). Depth is based on the pavement structural and hydraulic requirements. Should be double-washed and clean and free of all fines.
Underdrain	Use 4 to 6 inch diameter perforated PVC (AASHTO M 252) pipe, with 3/8-inch perforations at 6 inches on center; each underdrain installed at a minimum 0.5% slope located 20 feet or less from the next pipe (or equivalent corrugated HDPE may be used for smaller load-bearing applications). Perforated pipe installed for the full length of the permeable pavement cell, and non-perforated pipe, as needed, is used to connect with the storm drain system. T's and Y's installed as needed, depending on the underdrain configuration. Extend cleanout pipes to the surface with vented caps at the Ts and Ys.	
Filter Layer	The underlying native soils should be separated from the stone reservoir by a thin, 2 to 4 inch layer of choker stone (e.g. No. 8) covered by a 6 to 8 inch layer of coarse sand (e.g. ASTM C 33, 0.02-0.04 inch).	The sand should be placed between the stone reservoir and the choker stone, which should be placed on top of the underlying native soils.
Filter Fabric (optional)	Use a needled, non-woven, polypropylene geotextile with Grab Tensile Strength equal to or greater than 120 lbs (ASTM D4632), with a Mullen Burst Strength equal to or greater than 225 lbs./sq. in. (ASTM D3786), with a Flow Rate greater than 125 gpm/sq. ft. (ASTM D4491), and an Apparent Opening Size (AOS) equivalent to a US # 70 or # 80 sieve (ASTM D4751). The geotextile AOS selection is based on the percent passing the No. 200 sieve in "A" Soil subgrade, using FHWA or AASHTO selection criteria.	
Impermeable Liner	Use a thirty mil (minimum) PVC Geomembrane liner covered by 8 to 12 oz./sq. yd.2 non-woven geotextile. NOTE: THIS IS USED ONLY FOR KARST REGIONS.	
Observation Well	Use a perforated 4 to 6 inch vertical PVC pipe (AASHTO M 252) with a lockable cap, installed flush with the surface.	

Table 7.6. Different Permeable Pavement Specifications

Material	Specification	Notes
Permeable Interlocking Concrete Pavers	Surface open area: 5% to 15%. Thickness: 3.125 inches for vehicles. Compressive strength: 55 Mpa. Open void fill media: aggregate	Must conform to ASTM C936 specifications. Reservoir layer required to support the structural load.
Concrete Grid Pavers	Open void content: 20% to 50%. Thickness: 3.5 inches. Compressive strength: 35 Mpa. Open void fill media: aggregate, topsoil and grass, coarse sand.	Must conform to ASTM C 1319 specifications. Reservoir layer required to support the structural load.
Plastic Reinforced Grid Pavers	Void content: depends on fill material. Compressive strength: varies, depending on fill material. Open void fill media: aggregate, topsoil and grass, coarse sand.	Reservoir layer required to support the structural load.
Pervious Concrete	Void content: 15% to 25 %. Thickness: typically 4 to 8 inches. Compressive strength: 2.8 to 28 Mpa. Open void fill media: None	May not require a reservoir layer to support the structural load, but a layer may be included to increase the storage or infiltration.
Porous Asphalt	Void content: 15% to 20 %. Thickness: typically 3 to 7 in. (depending on traffic load). Open void fill media: None.	Reservoir layer required to support the structural load.

SECTION 7: REGIONAL & SPECIAL CASE DESIGN ADAPTATIONS

The design adaptations described below permit permeable pavement to be used on a wider range of sites. However, it is important not to force this practice onto marginal sites. Other runoff reduction practices are often preferred alternatives for difficult sites.

7.1. Karst Terrain

Karst terrain is found in much of the Ridge and Valley physiographic regions of Virginia. Karst complicates both land development and stormwater design. A detailed geotechnical investigation may be required for any kind of stormwater design in karst terrain (see CSN Technical Bulletin No. 1; and the Virginia SWM Handbook).

- The use of Level 2 (i.e. infiltration) permeable pavement designs at sites with known karst features may cause the formation of sinkholes (especially for large scale pavement applications) and are, therefore, not recommended. Designers should also avoid a Level 2 permeable pavement design if the site is designated as a severe stormwater hotspot, or will discharge to areas known to provide groundwater recharge to an aquifers that is used as a water supply source.
- Micro-scale and small-scale permeable pavement installations are acceptable if they are designed according to the Level 1 criteria (i.e., they possess an impermeable bottom liner and an underdrain).
- The stone used in the reservoir layer should be carbonate in nature to provide extra chemical buffering capacity.

7.2. Coastal Plain

Experience in North Carolina has shown that properly designed and installed permeable pavement systems can work effectively in the demanding conditions of the coastal plain, if the following conditions are met:

- Designers should ensure that the distance from the bottom of the permeable pavement system to the top of the water table is at least 2 feet.
- If an underdrain is used beneath permeable pavement, a minimum 0.5% slope must be maintained to ensure proper drainage.

7.3. Piedmont/Clay Soils

In areas where the underlying soils are not suitable for complete infiltration, permeable pavement systems with underdrains can still function effectively to reduce runoff volume and nutrient loads.

- If the underlying soils have an infiltration rate of less than 0.5 in./hr., an underdrain must be installed to ensure proper drainage from the system.
- Permeable pavement should not be installed over underlying soils with a high shrink/swell potential.

- To promote greater runoff reduction for permeable pavement located on marginal soils, an elevated underdrain configuration may be used (see **Section 8.3**).

7.4. Cold Climate and Winter Performance

In cold climates and winter conditions, freeze-thaw cycles may affect the structural durability of the permeable pavement system. In these situations, the following design adaptations may be helpful:

- To avoid damage caused by freezing, designs should not allow water to pond in or above the permeable pavement. Ensure complete drainage of the permeable pavement system within 24 hours following a rainfall event.
- Extend the filter bed and underdrain pipe below the frost line and/or oversize the underdrain by one pipe size, to reduce the freezing potential.
- Large snow storage piles should be located in adjacent grassy areas so that sediments and pollutants in snowmelt are partially treated before they reach the permeable pavement.
- Sand should never be applied for winter traction over permeable pavement or areas of standard (impervious) pavement that drain toward permeable pavement, since it will quickly clog the system.
- When plowing plastic reinforced grid pavements, snow plow blades should be lifted 1/2 inch to 1 inch above the pavement surface to prevent damage to the paving blocks or turf. Porous asphalt (PA), pervious concrete (PC) and interlocking pavers (IP) can be plowed similar to traditional pavements, using similar equipment and settings.
- Owners should be judicious when using chloride products for deicing over all permeable pavements designed for infiltration, since the salts will most assuredly be transmitted into the groundwater.

SECTION 8: CONSTRUCTION

Experience has shown that proper installation is absolutely critical to the effective operation of a permeable pavement system.

8.1 Necessary Erosion & Sediment Controls

- All permeable pavement areas should be fully protected from sediment intrusion by silt fence or construction fencing, particularly if they are intended to infiltrate runoff.
- Permeable pavement areas should remain outside the limit of disturbance during construction to prevent soil compaction by heavy equipment. Permeable pavement areas should be clearly marked on all construction documents and grading plans. To prevent soil compaction, heavy vehicular and foot traffic should be kept out of permeable pavement areas during and immediately after construction.
- During construction, care should be taken to avoid tracking sediments onto any permeable pavement surface to avoid clogging.
- Any area of the site intended ultimately to be a permeable pavement area should generally not be used as the site of a temporary sediment basin. Where locating a sediment basin on an area intended for permeable pavement is unavoidable, the invert of the sediment basin must

be a minimum of 2 feet above the final design elevation of the bottom of the aggregate reservoir course. All sediment deposits in the excavated area should be carefully removed prior to installing the subbase, base and surface materials.

8.2. Permeable Pavement Construction Sequence

The following is a typical construction sequence to properly install permeable pavement, which may need to be modified to depending on whether Porous Asphalt (PA), Pervious Concrete (PC) or Interlocking Paver (IP) designs are employed.

Step 1. Construction of the permeable pavement shall only begin after the entire contributing drainage area has been stabilized. The proposed site should be checked for existing utilities prior to any excavation. Do not install the system in rain or snow, and do not install frozen bedding materials.

Step 2. As noted above, temporary erosion and sediment (E&S) controls are needed during installation to divert stormwater away from the permeable pavement area until it is completed. Special protection measures such as erosion control fabrics may be needed to protect vulnerable side slopes from erosion during the excavation process. The proposed permeable pavement area must be kept free from sediment during the entire construction process. Construction materials that are contaminated by sediments must be removed and replaced with clean materials.

Step 3. Where possible, excavators or backhoes should work from the sides to excavate the reservoir layer to its appropriate design depth and dimensions. For micro-scale and small-scale pavement applications, excavating equipment should have arms with adequate extension so they do not have to work inside the footprint of the permeable pavement area (to avoid compaction). Contractors can utilize a cell construction approach, whereby the proposed permeable pavement area is split into 500 to 1000 sq. ft. temporary cells with a 10 to 15 foot earth bridge in between, so that cells can be excavated from the side. Excavated material should be placed away from the open excavation so as to not jeopardize the stability of the side walls.

Step 4. The native soils along the bottom and sides of the permeable pavement system should be scarified or tilled to a depth of 3 to 4 inches prior to the placement of the filter layer or filter fabric. In large scale paving applications with weak soils, the soil subgrade may need to be compacted to 95% of the Standard Proctor Density to achieve the desired load-bearing capacity. (NOTE: This effectively eliminates the infiltration function of the installation, and it must be addressed during hydrologic design.)

Step 5. Filter fabric should be installed on the bottom and the sides of the reservoir layer. In some cases, an alternative filter layer, as described in **Section 8.6** may be warranted. Filter fabric strips should overlap down-slope by a minimum of 2 feet, and be secured a minimum of 4 feet beyond the edge of the excavation. Where the filter layer extends beyond the edge of the pavement (to convey runoff to the reservoir layer), install an additional layer of filter fabric 1 foot below the surface to prevent sediments from entering into the reservoir layer. Excess filter fabric should not be trimmed until the site is fully stabilized.

Step 6. Provide a minimum of 2 inches of aggregate above and below the underdrains. The underdrains should slope down towards the outlet at a grade of 0.5% or steeper. The up-gradient end of underdrains in the reservoir layer should be capped. Where an underdrain pipe is connected to a structure, there shall be no perforations within 1 foot of the structure. Ensure that there are no perforations in clean-outs and observation wells within 1 foot of the surface.

Step 7. Moisten and spread 6-inch lifts of the appropriate clean, washed stone aggregate (usually No. 2 or No. 57 stone). Place at least 4 inches of additional aggregate above the underdrain, and then compact it using a vibratory roller in static mode until there is no visible movement of the aggregate. Do not crush the aggregate with the roller.

Step 8. Install the desired depth of the bedding layer, depending on the type of pavement, as follows:

- **Pervious Concrete:** No bedding layer is used.
- **Porous Asphalt:** The bedding layer for porous asphalt pavement consists of 1 to 2 inches of clean, washed ASTM D 448 No.57 stone. The filter course must be leveled and pressed (choked) into the reservoir base with at least four (4) passes of a 10-ton steel drum static roller.
- **Interlocking Pavers:** The bedding layer for open-jointed pavement blocks should consist of 1-1/2 to 2 inches of washed ASTM D 448 No.8 stone. The thickness of the bedding layer is to be based on the block manufacturer's recommendation or that of a qualified professional.

Step 9. Paving materials shall be installed in accordance with manufacturer or industry specifications for the particular type of pavement.

- **Installation of Porous Asphalt.** The following has been excerpted from various documents, most notably Jackson (2007).
  - Install porous asphalt pavement similarly to regular asphalt pavement. The pavement should be laid in a single lift over the filter course. The laying temperature should be between 230°F and 260°F, with a minimum air temperature of 50°F, to ensure that the surface does not stiffen before compaction.
  - Complete compaction of the surface course when the surface is cool enough to resist a 10-ton roller. One or two passes of the roller are required for proper compaction. More rolling could cause a reduction in the porosity of the pavement.
  - The mixing plant must provide certification of the aggregate mix, abrasion loss factor, and asphalt content in the mix. Test the asphalt mix for its resistance to stripping by water using ASTM 1664. If the estimated coating area is not above 95%, additional anti-stripping agents must be added to the mix.
  - Transport the mix to the site in a clean vehicle with smooth dump beds sprayed with a non-petroleum release agent. The mix shall be covered during transportation to control cooling.
  - Test the full permeability of the pavement surface by application of clean water at a rate of at least five gallons per minute over the entire surface. All water must infiltrate directly, without puddle formation or surface runoff.

- Inspect the facility 18 to 30 hours after a significant rainfall (greater than 1/2 inch) or artificial flooding, to determine that the facility is draining properly.

- **Installation of Pervious Concrete.** The basic installation sequence for pervious concrete is outlined by the American Concrete Institute (2008). It is strongly recommended that concrete installers successfully complete a recognized pervious concrete installers training program, such as the Pervious Concrete Contractor Certification Program offered by the NRMCA. The basic installation procedure is as follows:
  - Drive the concrete truck as close to the project site as possible.
  - Water the underlying aggregate (reservoir layer) before the concrete is placed, so that the aggregate does not draw moisture from the freshly laid pervious concrete.
  - After the concrete is placed, approximately 3/8 to 1/2 inch is struck off, using a vibratory screed. This is to allow for compaction of the concrete pavement.
  - Compact the pavement with a steel pipe roller. Care should be taken so that over-compaction does not occur.
  - Cut joints for the concrete to a depth of 1/4 inch.
  - The curing process is very important for pervious concrete. Cover the pavement with plastic sheeting within 20 minutes of the strike-off, and keep it covered for at least seven (7) days. Do not allow traffic on the pavement during this time period.

- **Installation of Interlocking Pavers.** The basic installation process is described in greater detail by Smith (2006).
  - Place edge restraints for open-jointed pavement blocks before the bedding layer and pavement blocks are installed. Permeable interlocking concrete pavement (IP) systems require edge restraints to prevent vehicle loads from moving the paver blocks. Edge restraints may be standard VDOT curbs or gutter pans, or precast or cast-in-place reinforced concrete borders a minimum of 6 inches wide and 18 inches deep, constructed with Class A3 concrete. Edge restraints along the traffic side of a permeable pavement block system are recommended.
  - Place the No. 57 stone in a single lift. Level the filter course and compact it into the reservoir course beneath with at least four (4) passes of a 10-ton steel drum static roller until there is no visible movement. The first two (2) passes are in vibratory mode, with the final two (2) passes in static mode. The filter aggregate should be moist to facilitate movement into the reservoir course.
  - Place and screed the bedding course material (typically No. 8 stone).
  - Fill gaps at the edge of the paved areas with cut pavers or edge units. When cut pavers are needed, cut the pavers with a paver splitter or masonry saw. Cut pavers no smaller than one-third (1/3) of the full unit size.
  - Pavers may be placed by hand or with mechanical installers. Fill the joints and openings with stone. Joint openings must be filled with VDOT No. 8 stone, although VDOT No. 8P or No. 9 stone may be used where needed to fill narrower joints. Remove excess stones from the paver surface.
  - Compact and seat the pavers into the bedding course with a minimum low-amplitude 5,000-lbf, 75- to 95-Hz plate compactor.
  - Do not compact within 6 feet of the unrestrained edges of the pavers.

- The system must be thoroughly swept by a mechanical sweeper or vacuumed immediately after construction to remove any sediment or excess aggregate.
- Inspect the area for settlement. Any blocks that settle must be reset and re-inspected.
- Inspect the facility 18 to 30 hours after a significant rainfall (1/2 inch or greater) or artificial flooding to determine whether the facility is draining properly.

8.3. Construction Inspection

Inspections before, during and after construction are needed to ensure that permeable pavement is built in accordance with these specifications. Use detailed inspection checklists that require sign-offs by qualified individuals at critical stages of construction, to ensure that the contractor's interpretation of the plan is consistent with the designer's intent.

Some common pitfalls can be avoided by careful construction supervision that focuses on the following key aspects of permeable pavement installation:

- Store materials in a protected area to keep them free from mud, dirt, and other foreign materials.
- The contributing drainage area should be stabilized prior to directing water to the permeable pavement area.
- Check the aggregate material to confirm that it is clean and washed, meets specifications and is installed to the correct depth.
- Check elevations (e.g., the invert of the underdrain, inverts for the inflow and outflow points, etc.) and the surface slope.
- Make sure the permeable pavement surface is even, runoff evenly spreads across it, and the storage bed drains within 48 hours.
- Ensure that caps are placed on the upstream (but not the downstream) ends of the underdrains.
- Inspect the pretreatment structures (if applicable) to make sure they are properly installed and working effectively.
- Once the final construction inspection has been completed, log the GPS coordinates for each facility and submit them for entry into the local BMP maintenance tracking database.

It may be advisable to divert the runoff from the first few runoff-producing storms away from larger permeable pavement applications, particularly when up-gradient conventional asphalt areas drain to the permeable pavement. This can help reduce the input of fine particles that are often produced shortly after conventional asphalt is laid down.

SECTION 9: MAINTENANCE

9.1. Maintenance Agreements

Section 4 VAC 50-60-124 of the regulations specifies the circumstances under which a maintenance agreement must be executed between the owner and the local program. This section sets forth inspection requirements, compliance procedures if maintenance is neglected,

notification of the local program upon transfer of ownership, and right-of-entry for local program personnel.

In addition, the maintenance agreements should also note which conventional parking lot maintenance tasks must be *avoided* (e.g., sanding, re-sealing, re-surfacing, power-washing). Signs should be posted on larger parking lots to indicate their stormwater function and special maintenance requirements.

When micro-scale or small-scale permeable pavement are installed on private residential lots, homeowners will need to (1) be educated about their routine maintenance needs, (2) understand the long-term maintenance plan, and (3) be subject to a deed restriction, drainage easement or other mechanism enforceable by the qualifying local program to help ensure that the permeable pavement system is maintained and functioning. The mechanism should, if possible, grant authority for local agencies to access the property for inspection or corrective action.

9.2. Maintenance Tasks

It is difficult to prescribe the specific types or frequency of maintenance tasks that are needed to maintain the hydrologic function of permeable pavement systems over time. Most installations work reasonably well year after year with little or no maintenance, whereas some have problems right from the start.

One preventative maintenance task for large-scale applications involves vacuum sweeping on a frequency consistent with the use and loadings encountered in the parking lot. Many consider an annual, dry-weather sweeping in the spring months to be important. The contract for sweeping should specify that a vacuum sweeper be used that does not use water spray, since spraying may lead to subsurface clogging. Vacuum settings for large-scale interlocking paver applications should be calibrated so they *do not* pick up the stones between pavement blocks.

9.3. Maintenance Inspections

It is highly recommended that a spring maintenance inspection and cleanup be conducted at each permeable pavement site, particularly at large-scale applications.

Maintenance of permeable pavement is driven by annual inspections that evaluate the condition and performance of the practice. The following are suggested annual maintenance inspection points for permeable pavements:

- The drawdown rate should be measured at the observation well for three (3) days following a storm event in excess of 1/2 inch in depth. If standing water is still observed in the well after three days, this is a clear sign that clogging is a problem.
- Inspect the surface of the permeable pavement for evidence of sediment deposition, organic debris, staining or ponding that may indicate surface clogging. If any signs of clogging are noted, schedule a vacuum sweeper (no brooms or water spray) to remove deposited material. Then, test sections by pouring water from a five gallon bucket to ensure they work.

- Inspect the structural integrity of the pavement surface, looking for signs of surface deterioration, such as slumping, cracking, spalling or broken pavers. Replace or repair affected areas, as necessary.
- Check inlets, pretreatment cells and any flow diversion structures for sediment buildup and structural damage. Note if any sediment needs to be removed.
- Inspect the condition of the observation well and make sure it is still capped.
- Generally inspect any contributing drainage area for any controllable sources of sediment or erosion.

An example maintenance inspection checklist for Permeable Pavement can be accessed in Appendix C of Chapter 9 of the *Virginia Stormwater Management Handbook* (2010). Based on inspection results, specific maintenance tasks will be triggered and scheduled to keep the facility in operating condition.

SECTION 10: COMMUNITY & ENVIRONMENTAL CONCERNS

Compliance with the Americans with Disabilities Act (ADA). Porous concrete and porous asphalt are generally considered to be ADA compliant. Most localities also consider interlocking concrete pavers to be complaint, if designers ensure that surface openings between pavers do not exceed 1/2 inch. However, some forms of interlocking pavers may not be suitable for handicapped parking spaces. Interlocking concrete pavers interspersed with other hardscape features (e.g., concrete walkways) *can* be used in creative designs to address ADA issues.

Groundwater Protection. While well-drained soils enhance the ability of permeable pavement to reduce stormwater runoff volumes, they may also increase the risk that stormwater pollutants might migrate into groundwater aquifers. Designers should avoid the use of infiltration-based permeable pavement in areas known to provide groundwater recharge to aquifers used for water supply. In these source water protection areas, designers should include liners and underdrains in large-scale permeable pavement applications (i.e., when the proposed surface area exceeds 10,000 square feet).

Stormwater Hotspots. Designers should also certify that the proposed permeable pavement area will not accept any runoff from a severe stormwater hotspot. Stormwater hotspots are operations or activities that are known to produce higher concentrations of stormwater pollutants and/or have a greater risk of spills, leaks or illicit discharges. Examples include certain industrial activities, gas stations, public works areas, petroleum storage areas (for a complete list of hotspots where infiltration is restricted or prohibited, see Stormwater Design Specification No. 8: Infiltration). For potential hotspots, restricted infiltration means that a minimum of 50% of the total T_v must be treated by a filtering or bioretention practice prior to the permeable pavement system. For known severe hotspots, the risk of groundwater contamination from spills, leaks or discharges is so great that infiltration of stormwater or snowmelt through permeable pavement is *prohibited***.**

Underground Injection Control Permits. The Safe Drinking Water Act regulates the infiltration of stormwater in certain situations pursuant to the Underground Injection Control (UIC) Program, which is administered either by the EPA or a delegated state groundwater protection

agency. In general, the EPA (2008) has determined that permeable pavement installations are not classified as Class V injection wells, since they are always wider than they are deep. There may be an exception in karst terrain if the discharge from permeable pavement is directed to an improved sinkhole, although this would be uncommon. More guidance on stormwater design in karst terrain can be found in CSN Technical Bulletin No. 1 (2008), and Appendix 6-C of Chapter 6 of the Virginia Stormwater Management Handbook (2010).

Cold Climate or Winter Time Operation. Experience has shown that permeable pavement can operate properly in snow and ice conditions, and there is evidence that a permeable surface increases meltwater rates compared to conventional pavement (thereby reducing the need for deicing chemicals). However, in larger parking lot applications certain snow management practices need to be modified to maintain the hydrologic function of the permeable pavement. These include not applying sand for traction and educating snowplow operators to keep blades from damaging the pavement surface. The jointing material for interlocking concrete paver systems (typically No. 8 stone) can be spread over surface ice to increase tire traction.

Air and Runoff Temperature. Permeable pavement appears to have some value in reducing summer runoff temperatures, which can be important in watersheds with sensitive cold-water fish populations. The temperature reduction effect is greatest when runoff is infiltrated into the sub-base, but some cooling may also occur in the reservoir layer, when underdrains are used. ICPI (2008) notes that the use of certain reflective colors for interlocking concrete pavers can also help moderate surface parking lot temperatures.

Vehicle Safety. Permeable pavement is generally considered to be a safer surface than conventional pavement, according to research reported by Smith (2006), Jackson (2007) and ACI (2008). Permeable pavement has less risk of hydroplaning, more rapid ice melt and better traction than conventional pavement.

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Pervious Surfaces

Pervious surfaces can be used for driveways, walkways, and patios and are as functional as traditional materials (asphalt and concrete). Pervious surface options include paver stones, pervious concrete, interlocking grids with gravel or turf, and pervious asphalt.

The benefits of pervious surfaces include:

- An aesthetically pleasing surface that could increase your property value.
- A lifespan equal to or greater than standard asphalt. It may not need to be replaced for 30 years or more (as compared to 20 years for standard asphalt).
- It can be replaced in sections on an as-needed basis, extending the lifespan of the overall surface.
- A reduction in stormwater runoff from your property. This also reduces the amount of sediment and other pollutants that would be washed away with the runoff.
- Groundwater recharge. The slow release of the water allows it to soak into the ground, which supplies water to local streams in between storms.

It is very important to avoid clogging the openings in your pervious surface. These openings allow the water to infiltrate and soak into the ground. Do not use sand or other materials that may clog the openings on the pervious surface and periodically sweep off leaves and other organic debris. Follow any additional manufacturer's recommendations for the type of pervious surface installed.

Learn more about pervious surfaces at:

- www.icpi.org
- www.nrmca.org
- www.invisiblestructures.com/index.html

Arlington's Stormwater Wise Landscapes Program

www.arlingtonva.us/stormwaterwise

Pervious concrete allows water to drain through it (top). Pervious pavers provide an attractive option for parking areas and allow water to infiltrate into the ground.

ARLINGTON VIRGINIA

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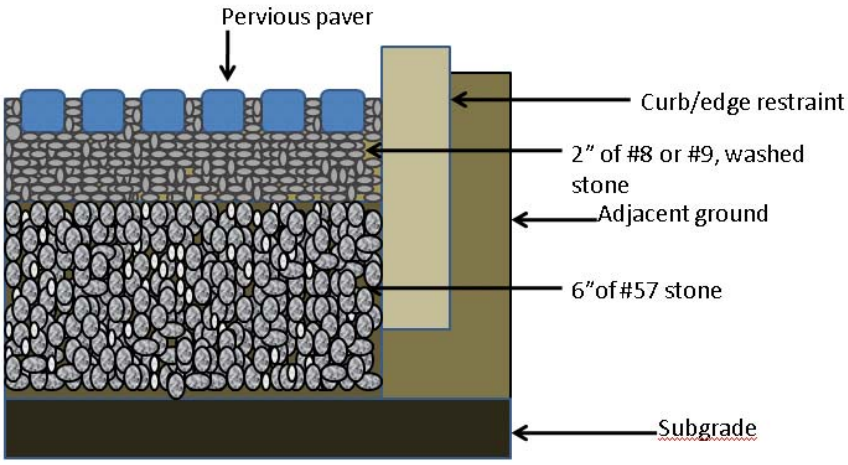
Specifications for a Pervious Paver Driveway

For a pervious driveway to function properly and allow water to soak into the underlying soil, it is very important to use the proper rock in the sub-layers. Use the specifications on this sheet as a guide when working with your contractor. **Prior to beginning construction, provide the StormwaterWise staff with a description of your rock and paver layers.** Note that StormwaterWise will reimburse for the installation of reinforced turf pavers, pervious pavers, and porous concrete.

Interlocking Paver Specifications:

- A curb or edge is needed to ensure that the pavers stay in place. If pavers are adjacent to curbs or foundations, an edge on that side may not be necessary.
- Permeable pavers with washed, #8 stone between the pavers.
- Two inches of #8 stone as a bedding layer.
- Three-four inches of #57 stone as the reservoir layer.
- Sand is not used in any of the layers.

The reservoir layer of a porous concrete driveways should be #57 stone.



Cross section of a typical residential pervious driveway or patio

Rain Barrel

A rain barrel is an above ground storage tank that collects rain water from your gutter's downspout. A rain barrel is a smaller version of a cistern and typically comes in sizes ranging from 30 to 100 gallons. Rain water collected in a rain barrel can be used for many activities including watering plants (gardens, lawn) and washing your car.

The benefits of a rain barrel include:

- Savings on your water bill. Rain barrel water can be used for irrigation instead of drinking water.
- A reduction in stormwater runoff from your property. This also reduces the amount of sediment and other pollutants that would be washed away with the runoff into nearby storm drains and local streams.
- Groundwater recharge. The slow release of the water allows it to soak into the ground, which supplies water to local streams in between storms.

It is best to regularly use the water in your rain barrel to ensure there is capacity to store water from the next rain storm. Locate the rain barrel in a shady or protected location to avoid algae growth in the tank. Darker colored tanks will help prevent algae growth as well. Prior to the first winter freeze, disconnect and drain the rain barrel.

Reduced cost rain barrels are available through the Northern Virginia Rain Barrel Program.

Learn more about the reduced cost program at http://arlingtonenvironment.org/barrel.php

Rain barrels come in a variety of styles and can be customized with artwork. Some barrels include space for plantings.

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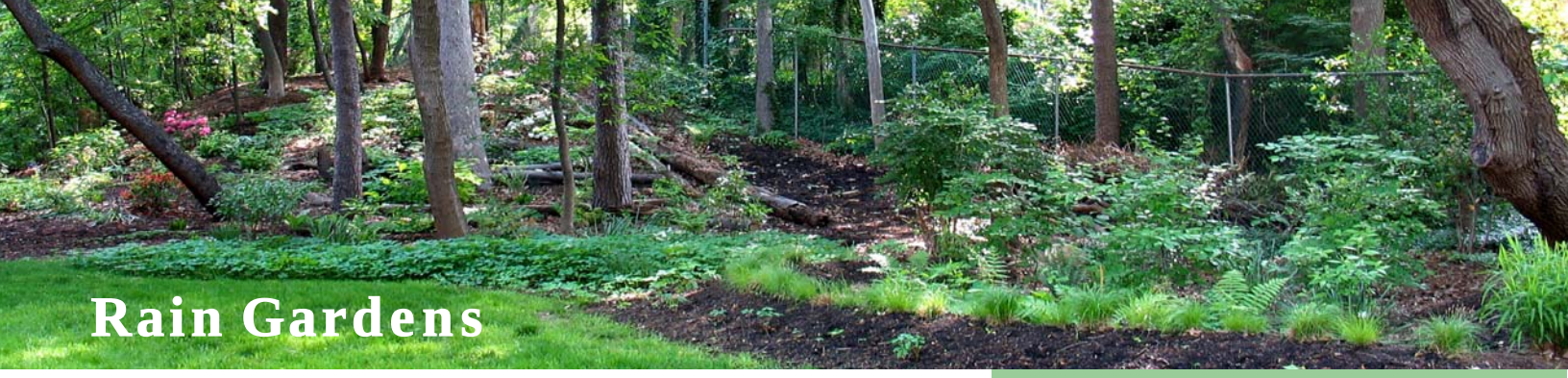
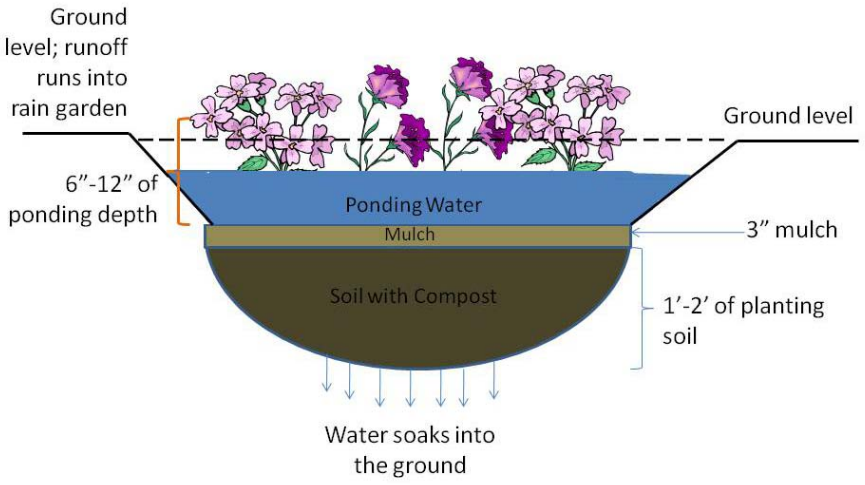


Rain Gardens

Rain gardens are a cost effective option to solve drainage problems and reduce runoff from your yard. Rain gardens allow rain water and snow melt to infiltrate into the ground. The garden's mulch and plants slow down and absorb the runoff flow, and remove pollutants before the water reaches a storm drain. A typical rain garden is designed to collect and filter the first ½ to 1 inch of rain.

The cross section below shows some of the standard measurements for a residential rain garden. The rain garden is made up of sandy soil and mulch, and has a bowl-shape with a ponding area for runoff. Runoff enters from above ground, sometimes through a pipe connected to a downspout. Sometimes a layer of gravel is added below the planting soil to increase the ability of the rain garden to store water.



To install a rain garden:

1. Select the location and size. The size is based on the amount of water that will drain to the garden, and the location should be at least 10 feet from your home's foundation, in an area with good drainage, and not under any trees.
2. Loosen the soil and dig out a low depression at the rain garden location. Some soil may be removed, or existing soil can be amended with leaf mulch. The surface of the rain garden should be slightly lower than the surrounding area, so there is 6-12 inches of ponding depth in the garden.

Rain gardens can treat smaller spaces, like this residential rain garden (top), or large areas like the Fairlington Community Center rain garden (middle). Rain gardens attract wildlife such as the Monarch butterflies pictured (bottom).

Top banner: Rain garden at The Arlington Condominium

3. Test your rain garden by observing it in a rainstorm before planting. Does the water soak into the soil following the storm within 48 hours? If it does, you are ready to plant!
4. Select and plant appropriate native plants for your rain garden.

Rain garden maintenance is similar to that of other gardens. For the first year after the garden is installed, you may need to water the new plants if it doesn't rain for an extended period of time. Once the native plants are established, they should be able to survive dry periods. Adding leaf mulch 1-2 times per year will nourish the plants and minimize the growth of weeds. Rain gardens often thrive without the addition of fertilizers or pesticides because the native plants are well suited for this area. Remove any weeds that do appear in the rain garden by hand pulling.

Learn more about rain gardens at www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf

Arlington's StormwaterWise Landscapes Program
www.arlingtonva.us/stormwaterwise

Wild bergamot attracts butterflies and birds.

Rain gardens are opportunities to add color to your yard throughout the year. Chokeberry (above) and winterberry (below) have bright red berries that add color to your yard in fall and winter and provide food for birds and mammals.

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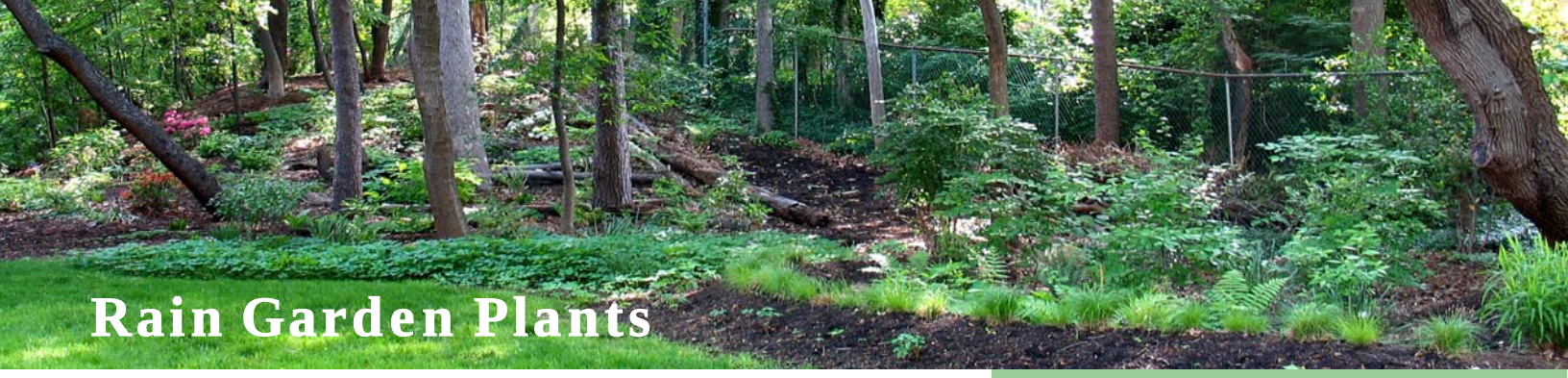

Rain Garden Plants

One of the benefits of a rain garden is that it allows you a lot of flexibility to create a beautiful and wildlife-friendly landscape while also addressing runoff from your property. We strongly encourage the use of native plants in your rain garden. Native plants:

- Are relatively low maintenance.
- Tend to be pest and disease-free relative to conventional landscapes.
- Are adapted to this climate.
- Reduce runoff from your home, which can help alleviate drainage or runoff problems in your yard.
- Attract wildlife such as birds and butterflies.

When purchasing native plants from your nursery, use the botanical name. Carefully research suggested substitutions before making a purchase.

Native trees can be planted at the perimeter of the rain garden. Prior to purchasing and planting new trees, research the tree and learn its ultimate mature size and characteristics.

- Betula nigra—River Birch
- Carpinus carolinia—American Hornbeam
- Magnolia virginiana—Sweetbay Magnolia
- Nyssa sylvatica— Black Gum
- Quercus bicolor—Swamp White Oak
- Acer rubrum—Red Maple
- Amelanchier laevis—Allegheny Serviceberry
- Aesculus pavia—Red Buckeye

Butterflies are attracted to many rain garden plant options.
Pictured: Common buckeye butterfly

Purple coneflower (middle), and wild bergamot (purple flowers), black-eyed susans, and ox-eye sunflowers (bottom).

Native shrubs provide erosion control and absorb a lot of water. Consider the color of the leaves and flowers when making your selection.

- Aronia abutifolia—Red Chokeberry
- Aronia melanocarpa—Black Chokeberry
- Calycanthus floridus—Sweetshrub
- Cornus amomum—Silky Dogwood
- Ilex verticillata—Winterberry
- Itea virginica—Virginia Sweetspire
- Sambucus canadensis—Elderberry
- Vaccinium corymbosum—Highbush Blueberry

Ferns, grasses, and perennials provide seeds and nectar for wildlife throughout the year. They can be planted as borders near the periphery of the garden where there aren't any trees or shrubs.

- Osmunda regalis—Royal Fern
- Osmunda cinnemomea—Cinnamon Fern
- Heliopsis helianthoides—Ox-eye Sunflower
- Eupatorium fistulosum—Joe Pye Weed
- Physostegia virginiana—Obedient Plant
- Rudbeckia hirta—Black-eyed Susan
- Hibiscus moscheutos—Marsh Mallow
- Iris versicolor—Blue Flag
- Monarda fistulosa—Wild Bergamot
- Monarda didyma—Beebalm
- Verbena hastate—Blue Vervain
- Vernonia noveboracensis—Ironweed
- Echinacea purpurea—Purple Coneflower

Learn more about recommended rain garden plants for our region at www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf

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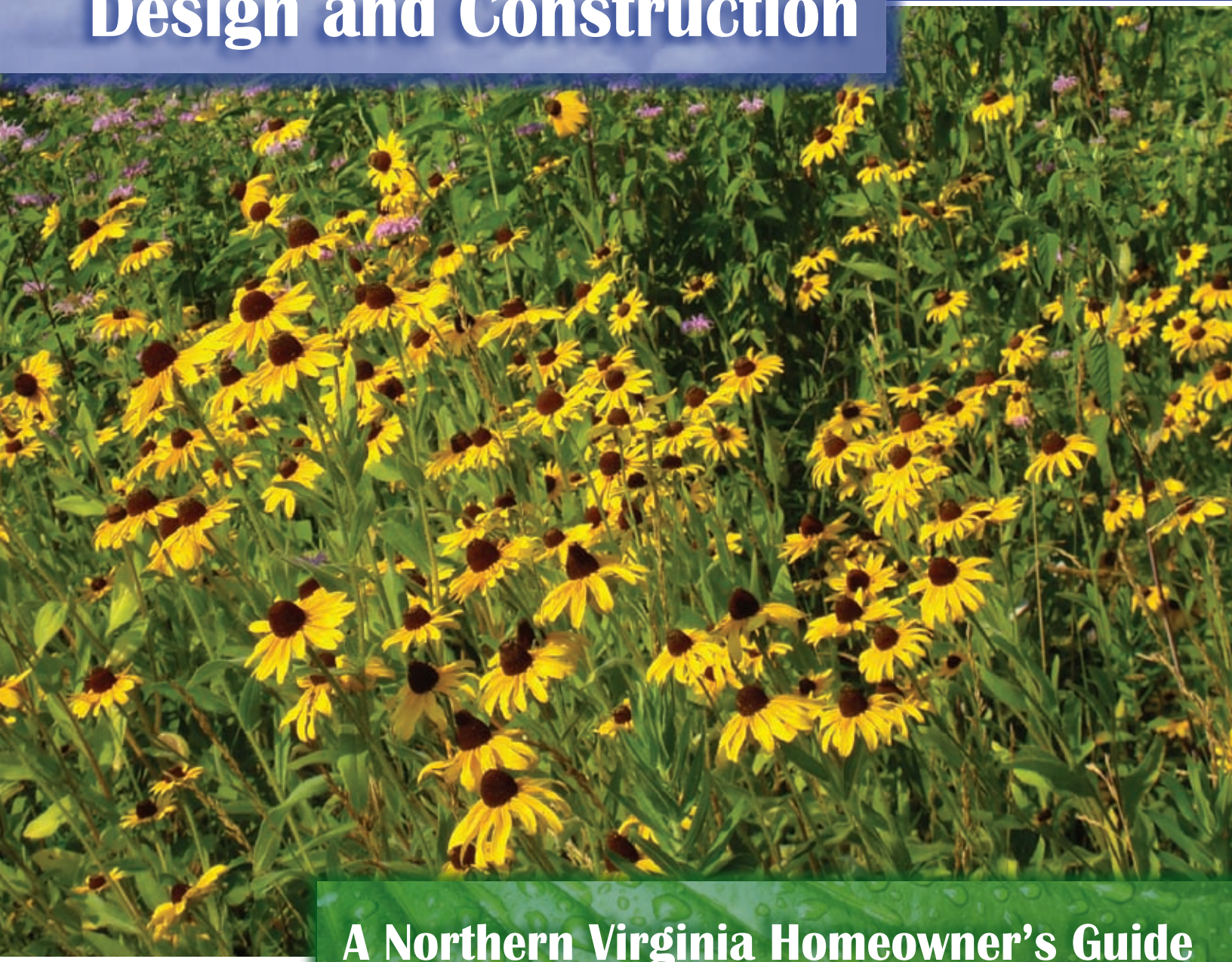
Sensitive Fern. Photo Credit: Robert H. Mohlenbrock. USDA-NRCS PLANTS Database/ USDA SCS. 1991.

Cinnamon Fern. Photo Credit: Robert H. Mohlenbrock. USDA-NRCS PLANTS Database/USDA SCS. 1991.

Obedient Plant. Photo Credit: Jennifer Anderson. USDA-NRCS PLANTS Database.

Rain Garden

Design and Construction



A Northern Virginia Homeowner's Guide

Rain Garden

Design and Construction:

A Northern Virginia Homeowner's Guide

Glossary:

Drain Sleeve - A sleeve of loosely woven, elastic material that fits over a perforated drain pipe and prevents it from clogging
Drip line - The area underneath the entire branch network of a tree which is approximately equal to the critical root zone
Geotextile - A fabric that is stapled or otherwise attached to the ground to prevent the erosion of the underlying soil
Grade - The slope of an object, expressed as vertical rise over horizontal run
Impervious - Unable to let water pass through
Infiltrate - To pass through
Infiltration Rate - The speed by which water can pass through soil, generally measured in inches per hour
Mulch - A covering placed on a ground surface to prevent erosion and weeds and to provide insulation and decomposable organic matter
Pervious - Able to let water pass through
Ponding Depth - The maximum depth of standing water above the soil surface in your rain garden
Porous - Full of pores and easy to infiltrate
Saturation - The point at which soil can hold no more moisture
Soil compaction - The increase in soil density and decrease in soil porosity and infiltration rate that result when weight is applied to the soil surface
Swale - A shallow ditch
Water Table - The zone of soil and rock saturated with ground water

A rain garden adds form and function to an elementary school's landscape.

What is a Rain Garden?

A rain garden is a functional landscaped area constructed to capture and hold stormwater so that it infiltrates into the soil rather than becoming surface runoff. Rain gardens not only beautify an area, they bring larger benefits to the environment, both locally and beyond.

How to Use This Guide

Rain garden style is a matter of individual taste, but rain garden function is the result of careful planning and measurement. The goal of a properly functioning rain garden is to reduce polluted stormwater runoff and recharge the water table. This guide provides technical and practical information to help you set reasonable goals and build the rain garden that functions best at your site. Where technical detail is needed, it is provided, but the final decisions - including appearance, size, and construction techniques - are up to you!

Rain Gardens

Why the Need?

In natural landscapes there's very little stormwater runoff because most rainwater filters down through the soil or evaporates back into the atmosphere. In developed landscapes' compacted soils, impervious surfaces like asphalt and the removal of vegetation result in a huge increase in stormwater runoff. Runoff flows over developed surfaces, enters storm drains and is piped to the nearest stream. The fast-flowing polluted runoff scours away stream banks, widens and deepens the channel, and blankets downstream areas with the dislodged sediment. The deepened stream channel lowers the water table so that nearby vegetation may suffer drought or even death.

Eroded stream banks caused by excess stormwater runoff.

Rain gardens try to re-create the natural water cycle and reduce water quality problems. A rain garden is a shallow, landscaped basin that pools stormwater runoff on its surface allowing it to slowly infiltrate into the soil. Infiltration through the soil removes solid and dissolved pollutants. Some of the filtered stormwater recharges the groundwater while some is held in the pore spaces between the soil particles and rocks. Both groundwater and pore space water are available to plants.

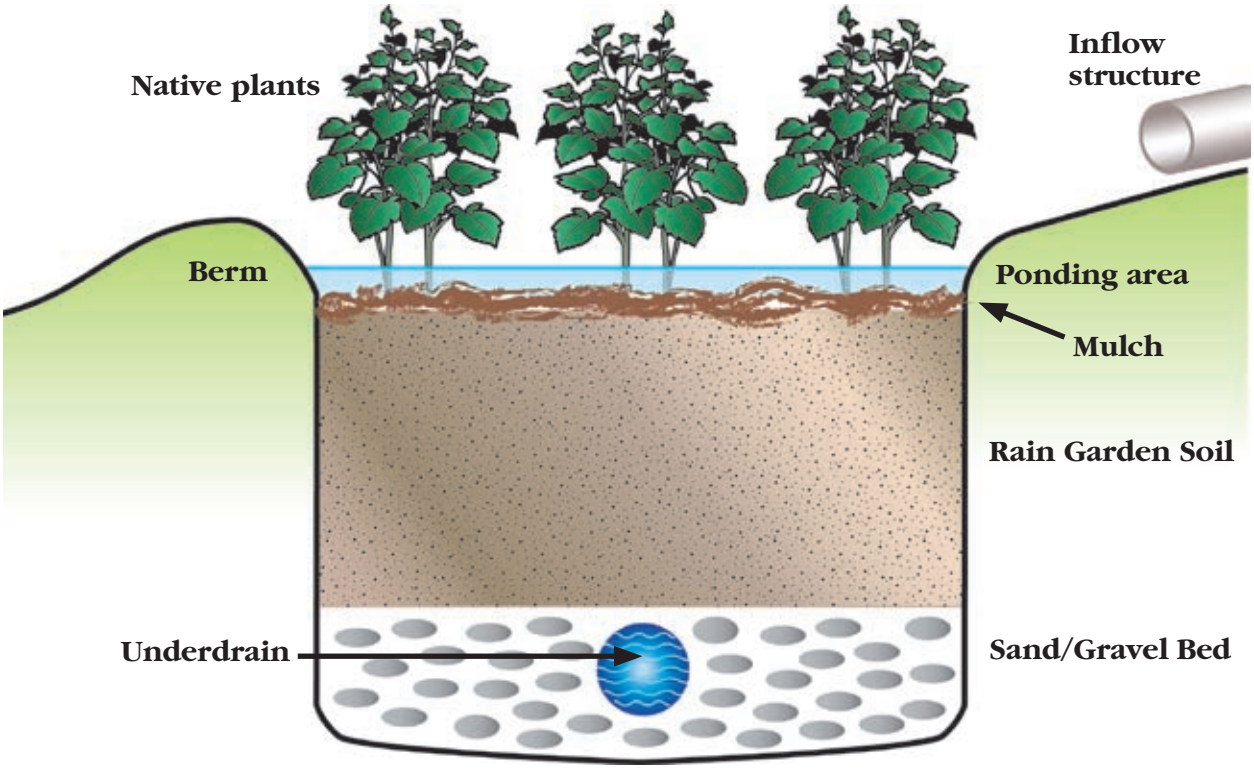
The Structure

A rain garden consists of several standard features.

- The inflow structure directs stormwater to the rain garden. The inflow can be a gutter downspout, a grassed or stone lined swale, or any other mechanism that can direct runoff to the rain garden without causing erosion.
- The ponding area is the basin that allows stormwater to collect on the rain garden's surface. The depth of the ponding area is created by excavating soil from the surface and building up an earthen berm on the downslope edge of the garden.
- A thin layer of mulch lies on the rain garden's surface. Mulch filters out many of the pollutants found in stormwater and physically protects the underlying soil.
- The rain garden is planted with native plants that tolerate periodic inundation. Native plants need less maintenance, take up some of the stormwater and pollutants, are acclimated to local growing conditions, provide habitat and food for native species and improve the aesthetics of the garden.
- The rain garden soil filters the polluted stormwater, stores some in its pores, and lets the rest flow

to the groundwater. Soils with naturally high infiltration rates are desirable as they can filter a large volume of stormwater quickly.

- *Optional:* A gravel bed is useful at the bottom of rain gardens built in soil with slow infiltration. The bed allows for increased storage of stormwater and prevents water logging in the layers above.
- *Optional:* A perforated PVC underdrain is necessary for rain gardens built in soil with slow infiltration. An underdrain pipes excess water out of the rain garden and is the surest way to prevent back up and flooding in the garden.
- The overflow structure allows water to exit the rain garden when the ponding area becomes full. The overflow structure can be a rock-lined notch in the berm, a grass lined swale, or anything that will allow stormwater to leave the ponding area without causing erosion. If the berm is built strongly enough and erosion is not a concern, you can let the ponding water flow over the top of the berm with no further modifications.



Designing Your Own Rain Garden

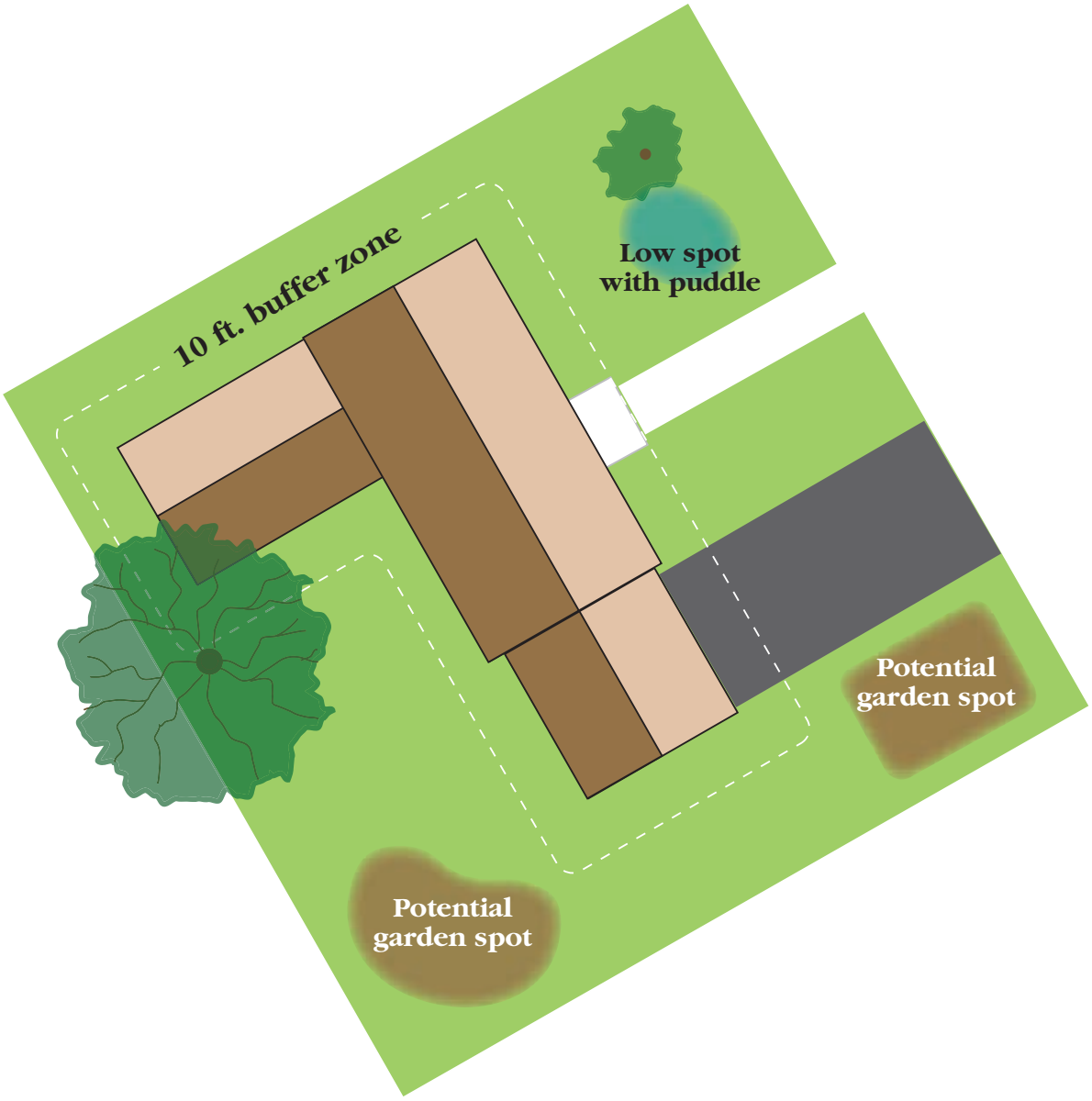
A rain garden is an advanced do-it-yourself project that requires hard labor, but no special skills beyond the guidance and calculations offered in this guide. Landscaping or engineering firms can also do the job for you. If you hire a professional, use this guide to familiarize yourself with the types of decisions that will be made.

Location of Your Rain Garden

When placing a rain garden, some areas should be avoided.

- Rain gardens should be a minimum of 10 feet from structures (yours and your neighbor's) to prevent seepage into the foundations.

- Locate the rain garden outside of a tree's drip line to avoid cutting roots.
- Do not place a rain garden near a septic system.
- Keep the rain garden away from utility lines and any easements. Before you dig, contact Miss Utility at 811 to have utility locations marked. Easement locations are noted on your property plat which is available from the Zoning Permit Review Branch: (703) 222-1082, TTY 711.
- Do not place a rain garden in a spot where water pools after a storm. Puddled water is a sign of slow soil infiltration. Building a rain garden in such soil is difficult. If you wish to eliminate an existing puddle, build a rain garden upslope to intercept the runoff.
- Do not build a rain garden in soil that has a high water table. For a description of the soil in your yard, reference the soil survey (http://www.fairfaxcounty.gov/nvswcd/soilsinfo.htm) or call the Conservation District, 703-324-1460.
- Since a rain garden surface must be flat, the amount of grading required during construction increases with slope. Rain gardens should not be built on land with a slope greater than 15%.

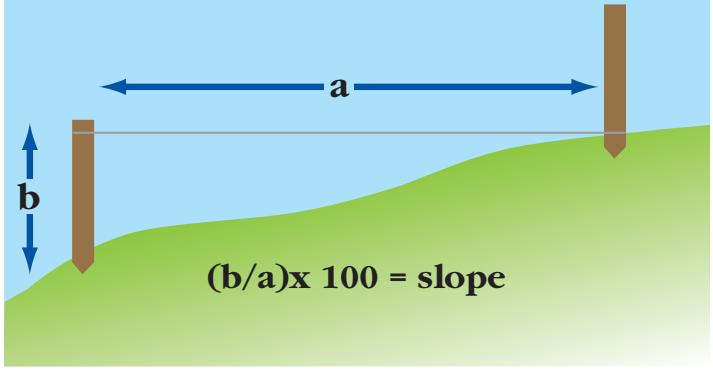


After eliminating the unsuitable spots, note your property's high and low areas and slope. During the next big rain, observe where runoff flows. To narrow down potential locations for your rain garden, consider the following:

- What runoff will you be collecting? For instance, will your rain garden be capturing runoff from the roof, the driveway, the lawn or a combination? The closer you locate the garden to the flow path of the runoff, the easier it will be to direct the runoff into the garden.
- Will any runoff from neighboring properties flow to your rain garden? Careful! Capturing runoff from other properties may greatly increase the volume of stormwater and the size of the rain garden needed to treat it.
- Keep in mind the type of native plants you wish to have in your rain garden and whether or not they are suited for the location you choose. Is there adequate sunlight? If your rain garden will be receiving runoff from surfaces that may be salted during winter weather, will this harm the plants? Will the plants blend in with your existing landscaping? A list of common native rain garden plants can be found in *Appendix B*.

Measuring Slope

- Pound two stakes into the ground; one at the uphill side of your rain garden and one at the downhill side.
- Tie a string to the uphill stake at ground level.
- Tie the other end of the string to the downhill stake, ensuring the string is level.
- Measure the width in inches between the two stakes (a).
- Measure the height in inches from the ground to the string of the downhill stake (b).
- Divide the height (b) by the width (a) and multiply by 100 to calculate the percentage slope of the land.



Testing the Soil

Once you have identified possible locations for your rain garden, test the soil. The success of your rain garden depends heavily on the infiltration rate of the soil. You can determine the rate with a simple procedure.

- Dig a 12-inch deep hole at the proposed site of your rain garden and fill it completely with water.
- Allow the water to sit for at least an hour so that the soil can saturate.
- Refill the hole so it is full.
- From this point on, observe to see if the water drains into the soil.
- If the water drains within 48 hours, the site is suitable for a rain garden, however it is highly recommended that the soil be amended with some compost and sand.
- If the water does not drain in 48 hours, select a different location or amend or replace the soil and install an underdrain. It may be easier to choose another location.
- You may choose to run the infiltration test more than once, in the same hole or in different holes, to ensure an accurate result.

The county soil survey and a soil texture test can be used as supplements to the infiltration test. The sur-

Remember, it is much less complicated to construct a rain garden in soil with a quick infiltration rate. Construction becomes more difficult when the infiltration is slow. Slow infiltration can be caused by high percentages of clay, soil compaction, or both; features which are common in Northern Virginia soils.

vey includes likely infiltration rates for your property, and a texture test measures the soil's percentage of sand silt and clay. Call the Conservation District for help with either resource.

Altering the Soil

Based on the infiltration test results, soils can be altered to make the rain garden more efficient. There are two ways to do this: 1) amend the natural soil with compost or a mixture of compost and sand to make it more porous, or 2) completely excavate and replace the natural soil with an engineered mixture of sand, topsoil and organic matter.

Amending soil is fairly easy with equipment such as a hoe or a rototiller. Removing and replacing soil is expensive and should be used only in the poorest soils.

In soils that pass the 48-hour infiltration test, it is highly recommended, but not required, that you incorporate 6 to 12 inches of compost and sand into the soil during construction. Most of the soil in Northern Virginia has a high clay content, and, over time, may become compacted and less porous due to the weight of the water that is collected in the rain garden. Think of amended soil as an insurance policy for the future performance of your rain garden. An underdrain can be installed at these sites, but it is optional. A gravel bed is not recommended due to the increase in excavation it requires.

In soils that do not pass the 48-hour infiltration test, you can still install a rain garden as long as you increase the infiltration rate of the soil. If you add amendments, incorporate at least 18 inches of compost and sand into the soil. For the poorest soils - those with a very high clay content and/or those that failed to drain the majority of water in 48 hours - removing and replacing the soil may be necessary. To justify the time and expense, it is recommended that you excavate and replace the soil to a depth of at least 24 inches. Be aware that the volume of soil excavated from a medium-sized rain garden is often enough to fill a dump truck. A small piece of construction equipment, such as a mini-excavator, will greatly ease the process. Engineered soil mix is available from landscaping and engineering companies. Contact the Conservation District for help finding a vendor.

A rototiller is used to incorporate compost into the soil of a large rain garden in McLean.

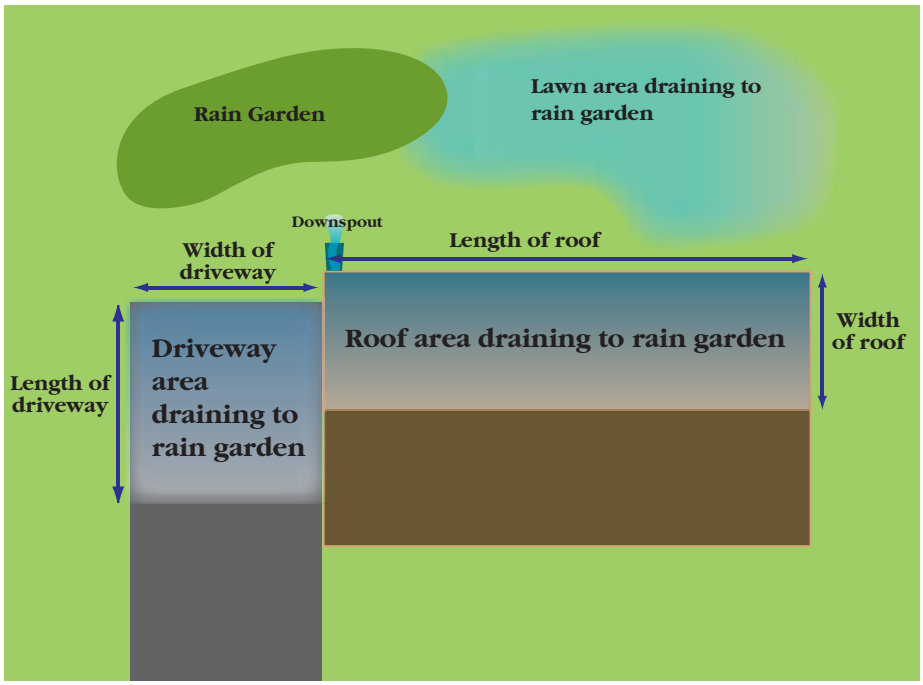
An underdrain is essential in any rain garden installed in soil that does not pass the infiltration test. After the natural soil is amended or excavated, stormwater will infiltrate quickly through the altered soil. However, it will not drain through the natural soil underneath (a process called "perching"). An underdrain removes the perched water and prevents the rain garden from backing up and becoming a soggy mess. A gravel bed below the rain garden can help to increase the

storage capacity. Installing a gravel bed entails excavating, if just temporarily, all of the soil above it. This is time consuming and likely will require construction equipment. If you are planning to excavate and replace the natural soil anyway, then adding a gravel bed requires little extra effort.

Sizing Your Rain Garden

The size of your rain garden depends on the area and type of land that drains to the garden as well as the amount of stormwater that you wish to treat. Ninety percent of storms in Fairfax County produce less than one inch of rainfall; therefore, sizing calculations included in this manual are based on a one-inch storm. During storms that produce more than one inch of rain, your rain garden may overflow. This is normal. Of course, you may choose to make your rain garden any size. A smaller rain garden will capture less stormwater and will overflow more frequently but will still benefit water quality. In general, 100 to 300 square feet is a practical size for homeowner designed rain gardens.

The area that drains to your rain garden is called the drainage area. The type of land surface (pervious, such as lawn, or impervious, such as rooftop or driveway) affects the amount of runoff. More runoff occurs on impervious surfaces than pervious. Generally, the entire drainage area should be one-half acre or less to keep the total runoff volume reasonable. To calculate your rain garden's drainage area, follow these basic steps and record your data on the sizing worksheet in *Appendix A:*



- If you are capturing roof runoff, determine the surface area of the roof that will drain to the rain garden by measuring the length and width of the portion of the roof that drains to the downspout(s) routed to your rain garden. Multiply those numbers and record the result on line 1 of the sizing worksheet.
- If you are capturing runoff from driveways, patios or other impervious surfaces, measure their length and width. Multiply those numbers to get the surface area. Record this result on line 2 of the worksheet.
- To get the total impervious surface area, add lines 1 and 2. Put the sum on line 3 of the worksheet.
- If you are capturing runoff from pervious surfaces such as your lawn, determine the surface area that will drain to the rain garden and record it on line 4 of the worksheet. If you need help determining the parts of your lawn that will drain to the rain garden, observe your property's runoff patterns during a storm. The Conservation District can supply helpful topographic maps.
- Decide on the depth of your ponding area. That depth is the distance from the top of the berm to

the rain garden soil (not the mulch). It is recommended that the depth be between 6 and 12 inches. The ponding area depth determines the rain garden's depth factor, a number which is used in the final sizing equation. Because the amount of stormwater a rain garden can hold is equal to the ponding area depth multiplied by the rain garden's surface area, the deeper the ponding area depth, the smaller the rain garden surface area can be. However, be sure the underlying soil can reliably drain the deeper depth of water in a reasonable period of time. Once you have chosen a ponding area depth, look up the corresponding depth factor in table 1 and record it on line 5 of the sizing worksheet.

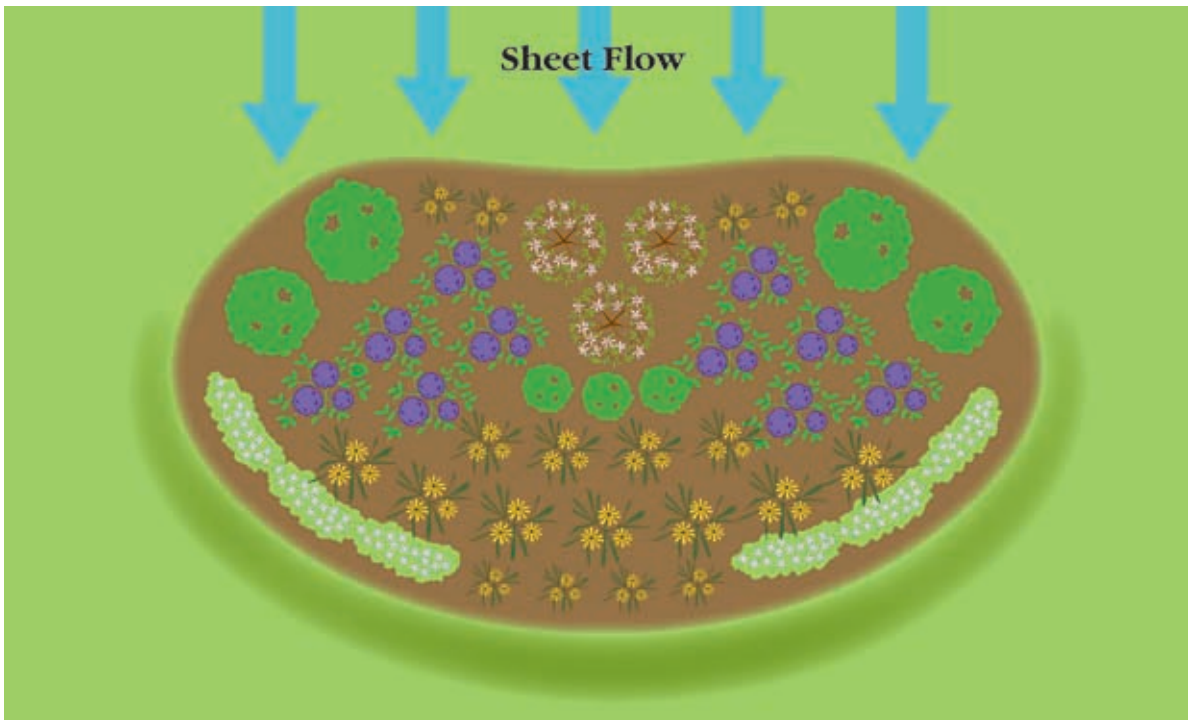
Table 1: Depth

Ponding Depth	6"	9"	12"
Depth Factor	2.0	1.3	1.0

- Next, calculate the size of the rain garden needed to capture and treat the runoff during a one-inch storm. To do this, multiply the impervious (line 3) and pervious (line 4) drainage areas by the depth factor (line 5) and a runoff estimator. The runoff estimator is a number that estimates the proportion of rainfall that is likely to become surface runoff. For impervious surfaces, the estimator is 0.072; for pervious surfaces, 0.028. The results go on lines 6 (impervious surfaces) and line 7 (pervious surfaces).
- If the rain garden will be capturing runoff from both pervious and impervious surfaces, add lines 6 and 7. Put the sum on line 8. That's the total rain garden surface area. If you are only capturing runoff from one type of surface, the relevant surface area calculated in line 6 or 7 represents your total rain garden surface area

Shape

A rain garden can be any shape as long as it successfully captures the runoff and integrates into your current landscaping. The flow pattern of the runoff can determine the most effective design. In general, if you have runoff that flows in a wide swath, a rain garden that is wider than it is long, with the width perpendicular to the flow of the runoff, is best.



Plants

Native plants that are tolerant of wet and dry conditions are best suited for rain gardens. Native plants are adapted to the local environment, do not need extra water or fertilizer once they are established, provide food and habitat for wildlife and are attractive to pollinators. It is not recommended that you plant full size trees in your rain garden. *Appendix B* has a list and description of many native plants suitable for rain gardens. Your local nursery also may provide advice. In addition to the sunlight and salt considerations mentioned earlier, consider these factors when deciding on a plant list:

- Height and width of full grown plants
- Color and type of seeds, berries, flowers or other growth
- Seasonal timing of growth so that color and wildlife food are available year round
- Species of wildlife you wish to attract
- Coordination with existing landscaping.

Clockwise from top left: foxglove, smooth blue aster, partridge pea, swamp milkweed.

Construction of Your Rain Garden

Setting the schedule

Building a rain garden is a big job. Ask family, friends and neighbors to help. Check the weather forecast and be sure that rain isn't predicted during construction. Rain will complicate construction and cause sediment from the site to wash into nearby storm drains and streams. Make sure all material and equipment is onsite and ready to be used when construction starts.

You may hire a landscaping company or contractor to do the construction. Be sure that any professionals you hire are aware of your rain garden's specific design criteria.

Site Preparation

Before construction, contact Miss Utility at 811 to get your utilities marked. You may also want to clear the vegetation off the rain garden surface area and the planned footprints of the berm and any swales or other structures you will dig to create the inflow and overflow.

Mark the borders with stakes, flags or spray paint. The vegetation, especially if it is grass or other ground cover, can be killed by placing plastic, newspaper or any opaque material over it. Killing the vegetation will make excavation significantly easier if you are digging by hand. It also will ensure that the berm is

solidly anchored to the ground surface. Allow at least one week for utility marking and vegetation clearing. Remove any material you used to kill the grass before digging; you don't want to incorporate it into the berm or rain garden.

Choosing Materials

If you need to amend your soil, figure out the type and amount of soil amendments you will use and arrange to pick them up or have them delivered. A mix of half sand, half compost is ideal in most rain gardens. Sand is best at increasing the infiltration rate of soil over the long term, but it is heavy, hard to transport and has no effect on soil fertility. Compost increases infiltration rates less reliably than sand, but it increases soil fertility and is relatively light and easy to transport. If you decide to completely excavate and replace the natural soil, a variety of soil mixes are available, but all will consist of a mixture of sand, topsoil with very little clay and organic compost.

You also will need to obtain mulch. If your design includes an underdrain and a gravel bed, you will need a perforated plastic pipe (either corrugated downspout pipe or PVC) and either pea gravel or V-DOT #57 stone (a specific size of gravel often used in road construction). Underdrains built into the rain garden soil are surrounded by a thin layer of gravel to prevent them from becoming clogged with loose soil particles. If you include an underdrain, you will need stone even if you aren't installing a gravel bed. Larger stone, such as river rock, can be used if you are building a stone-lined inlet or outlet structure or if you are using it as a decorative feature.

Free composted leaf mulch and shredded hardwood mulch are seasonably available from Fairfax County. Composted leaf mulch is an excellent soil amendment and is suitable for the surface mulch layer. Hardwood mulch can be used for the surface mulch layer but may float when the rain garden fills with water. For pickup locations, see www.fairfaxcounty.gov/dpwes/trash/dispmulch.htm. Sand, compost, mulch, perforated pipe, pea gravel, V-DOT #57 stone and river rock can be purchased from hardware stores, gardening and landscaping supply stores or nurseries.

Volume of Materials

Once you have chosen your materials, you will need to know how much to buy. You also may want to know how much natural soil will be excavated from the rain garden, especially if it is to be hauled away. These volumes can be calculated by using this equation:

$$V = SA \times (T/12).$$

V is the total volume of material needed, SA is the surface area of the rain garden in square feet, and T is the thickness of the material in inches.
By now, you know the planned surface area of your rain garden. The thickness (T) of the layers in your rain garden is at your discretion, but there are general guidelines to ensure the garden's proper functioning.

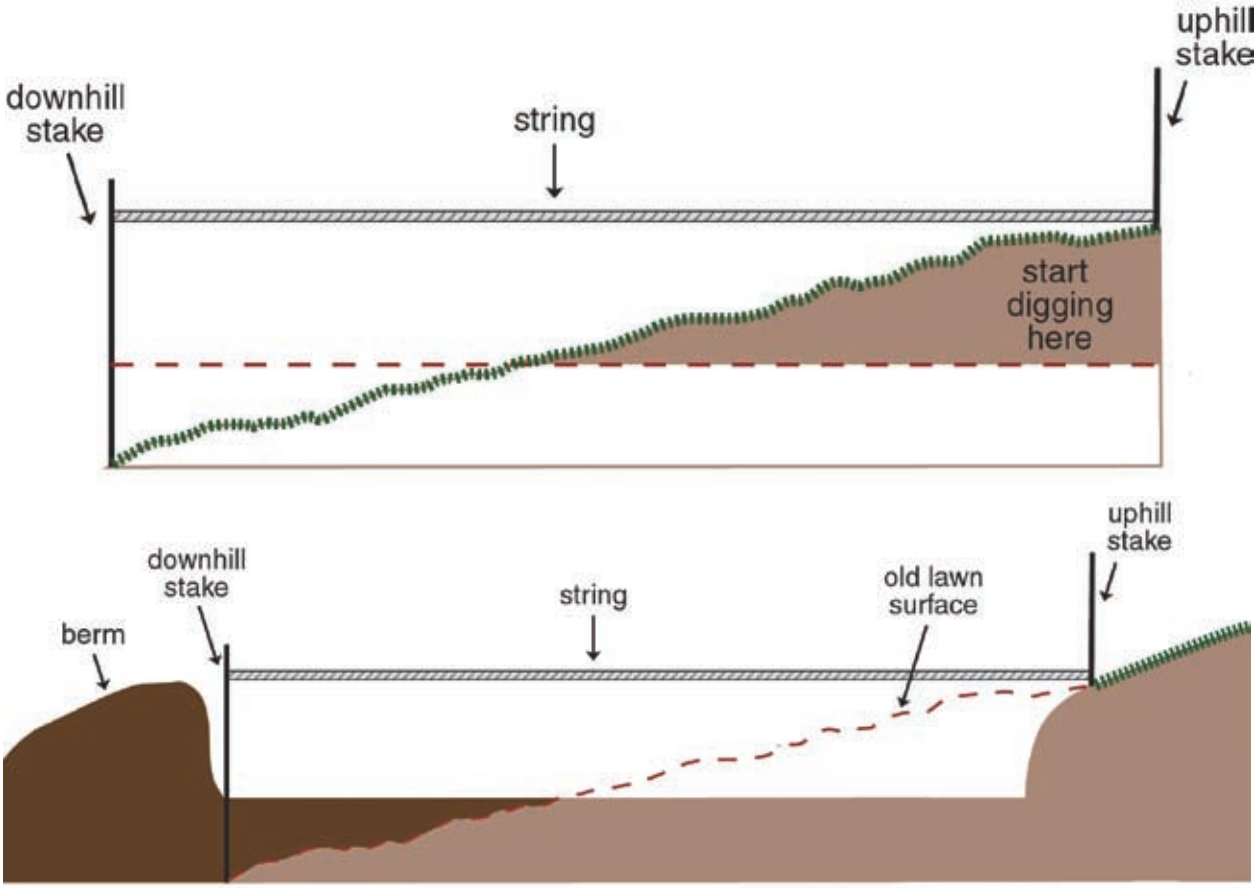
- Mix at least 6 to 12 inches of amendments into the soil for sites that pass the 48-hour infiltration test, and at least 18 inches for sites that do not pass.
- If you excavate and replace the natural soil with engineered soil, remove and replace at least 24 inches to justify the time and expense.
- The mulch layer should be 2 to 3 inches thick.
- The gravel bed, if used, should be at least 6 to 12 inches thick.

- Before mixing in soil amendments, you will have to remove some natural soil to make room for the new material. Compost compacts over time when tilled into soil, but sand does not. No soil needs to be removed to compensate for compost. If adding sand, however, remove soil equal to the amount of sand being added. If the amendments raise the soil up too high and the depth of your ponding area is less than you want, compensate by raising the height of the berm or removing a little soil from the rain garden surface. Alternatively, wait a day or two to see if the amended soil begins to compact and recede. If the ponding area is too deep, add more amendments to the soil or reduce the berm's height.

There is one exception to using the equation. In calculating the volume of soil you will need to excavate for the ponding area, if the land surface at your site is sloped, the equation is not applicable. If the land surface is flat or nearly flat, the equation can be used. Since most, if not all, of the soil removed to create the ponding area will be used to build the berm, this is a minor issue.

Start Digging!

You can now begin to dig out your rain garden! Whether you dig down two or more feet and replace the soil with an engineered soil mix or excavate just a few inches to create the ponding area on top of well-draining natural soil, it is very important that the bottom of the excavation and all layers within the rain garden be as flat as possible. This provides the calculated amount of ponding and minimizes pressure against the berm.



Illustrations courtesy of Univerisity of Wisconsin-Extension and the Wisconsin Department of Natural Resources.

A flat surface can be assured by a simple method similar to the one used earlier to determine slope. Assemble stakes and tie a level string between them just as described in the slope method. This time, use a tape measure or yard stick to measure the distance from the string to the bottom of the excavation. When the desired depth is reached, stop digging. This measurement can be repeated for all areas of the rain garden by keeping the upslope stake in place and moving the downslope stake around the perimeter of the rain garden. The rain garden can then be dug out like slices of a pie.

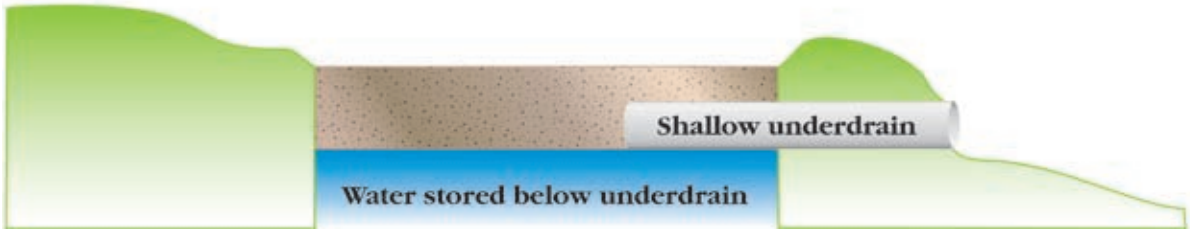
A stone-lined swale serves as the inlet structure for a rain garden in Merrifield.

The point where the string is tied to the downslope stake is equal to the height of the berm at that location. Soil excavated from the rain garden can be used to build the berm. On steeper slopes where more material must be excavated, the extra soil can be used to raise the ground level on the downslope side.

At the same time that you excavate the rain garden, you can dig the inflow and overflow structures. If the rain garden is in the path of stormwater flow, or if you plan to route water to the garden by means of a downspout extension, you may need to dig little, if at all. If you are building rock-lined structures, placing geotextile material under the rocks will prevent stormwater from eroding the underlying soil.

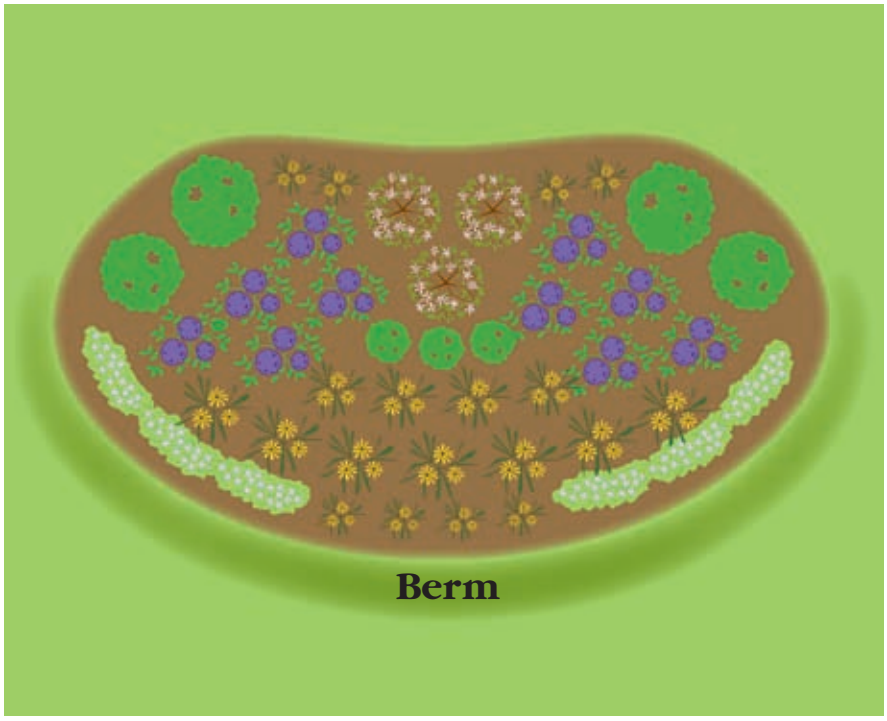
The Underdrain

The underdrain should be placed at least several inches below the surface. The underdrain captures water as it fills the rain garden. Water rising from below enters the underdrain and is piped to an outlet downslope of the rain garden. The underdrain must maintain a small, constant downward grade so that water flows freely out of the rain garden. There is an advantage to placing the underdrain towards the top of the rain garden; the higher the underdrain is placed, the less distance the pipe travels underground before it reaches the surface. An underdrain too near the top of the garden may lead to surface sogginess in and around the garden.



Remember to surround your underdrain on all sides with a thin layer of pea gravel or VDOT #57 stone. This layer will help filter out small particles that may clog the underdrain's perforations. You may further protect the pipe by wrapping it with a drain sleeve or several layers of chicken wire before surrounding it with gravel. Do not wrap the underdrain with geotextile or other tightly woven material. This will cause the pipe to clog.

The Berm



Excess soil from the excavation can be used to construct the berm. The distance from the top of the berm to the rain garden soil (not the mulch) is equal to the ponding area depth. The berm will be tallest along the downslope edge of the rain garden and will gradually taper down to nothing on the upslope edge where storm water enters the rain garden. Remove any vegetation from the ground and roughen the existing soil surface. Build up the berm in layers by placing a few inches of excavated soil on the ground and compacting it firmly with a hand tamper or the back of a shovel. Repeat this process until a gently rounded, solid and aesthetically pleasing berm is formed. To prevent erosion, immediately seed the berm with grass and cover it with an erosion prevention material such as straw or burlap while the grass takes root. You may also choose to cover it with sod. Failure to cover the berm may result in a breach or erosion of the berm into your rain garden and clogging of the rain garden soil! If you do not want grass on the berm, one option is to plant with drought tolerant native plants that prefer well-drained soils.

Native plants are placed in a rain garden in Falls Church.

Planting

Try to avoid stepping in your garden as much as possible. Dig the planting holes shallow and wide, and place the plants in them. Fill the holes gently but firmly, but do not step on them. Water the plants immediately after installation regardless of the soil conditions. Stick identification tags in the soil next to the plants and leave them there until the plants' warranties have expired. Plant shrubs a minimum of three feet apart; perennials and annuals at least one foot apart. Rain gardens do not have to be planted immediately, but if you are delaying your planting, cover the soil with the mulch layer. If you are planting after the mulch has been laid, remove the mulch around the planting hole and plant according to the directions above, then replace the mulch.

For any areas of bare soil adjacent to the rain garden - such as the inflow and overflow - re-vegetate immediately following the same planting procedures used for the berm. This is especially important for areas uphill of the rain garden that can erode into and clog the rain garden's soil.

Straw covers the berm and soil around a recently built rain garden. The white PVC pipes allow for inspection of the underdrain and are not part of most home gardens.

Mulching

Spread mulch on the surface of the rain garden no more than 2 to 3 inches deep. Mulch helps to maintain soil temperature and moisture, control weeds, filter pollutants - especially heavy metals - and protect against erosion and surface crusting. Additionally, as the mulch breaks down, it adds organic matter to the soil. The mulch should be applied in an even layer across the entire surface of the rain garden.

Establishment Phase

Erosion of fine soil particles into your rain garden can lead to clogs, and erosion of the berm or overflow structure can lead to a breach. To avoid this, you may choose to disable your inflow structure to prevent runoff from entering your rain garden until the vegetation, both inside and outside the rain garden, is well established. If you are using a downspout connection, disconnect it from the gutter or reroute it. If you have built a swale, block the front of it with a rock, log or other obstruction. Make sure that the redirected runoff does not cause an erosion problem elsewhere. Your rain garden will sit unused until the plants are established, but this is a small price to pay to ensure the long-term performance of your garden.

Maintenance

The maintenance requirements of your rain garden are similar to those of your regular garden and may even be less because of the native plants.

- **Plants:** Water plants regularly until they are established. Check them regularly for signs of distress and remove dead material after the growing season to add to your compost pile. Weed as necessary.
- **Berm, Inflow, and Overflow Structure:** Periodically check the berm, inflow and overflow for signs of erosion. Tamp more soil into place if you notice rills and gullies formed by erosion, and replant immediately. If the inflow or overflow structure is a stone-lined swale and erosion is occurring, you may want to install geotextile material under the stone.
- **Soil and Ponding Area:** You should not see water in your rain garden 72 hours after a one-inch storm. If water is held for longer than 72-96 hours in the ponding area, the soil pores may be clogged. Check for an accumulation of fine sediment on the mulch surface and remove it. Rough or till the top of the soil as best you can. For rain gardens built without soil amendments, if water still ponds you may have to amend the natural soil with sand and compost. If the rain garden was built with amended soil, use an auger or post hole digger to bore down to the bottom of the rain garden. If you do not have an auger, you can borrow one from the

Conservation District. If the rain garden then begins draining, fill the boring with pure sand. You may want to make more than one sand-filled boring for a large rain garden.

If you have an underdrain, it may become clogged and cause the rain garden to back up. Follow the auger/post hole boring procedures above. If the rain garden drains, a clogged underdrain can be ruled out. If the garden does not drain, dig down to expose a portion of the underdrain. Clear out any obstructions in the exposed perforations and see if the rain garden begins to drain. If it does, repeat the procedure until most or all of the perforations have been cleared.

If none of the above procedures work, you may need to excavate and replace the rain garden soil.

- **Mulch:** Check the mulch for signs of erosion and replace mulch that is washed away. Mulch will naturally decompose, so additions may be needed as frequently as once a year.

A successful rain garden is an attractive addition to the landscape.

Appendix A: Size worksheet

1. Roof surface area (length times width of roof)	_____	Sq. ft.
2. Other impervious surfaces area (length times width of other surfaces)	_____	Sq. ft.
3. Total impervious surface area (line 1 + line 2)	_____	Sq. ft.
4. Pervious surface area	_____	Sq. ft.
5. Depth Factor	_____	
6. **Size of rain garden:** Impervious surfaces (Line 3 x line 5 x .072)	_____	Sq. ft.
7. **Size of rain garden:** Pervious surfaces (Line 4 x line 5 x .028)	_____	Sq. ft.
8. **Size of rain garden:** Impervious plus pervious surfaces (Line 6 + line 7)	_____	Sq. ft.

Appendix B: Native Plants

Common Name	Scientific Name	Preferred Growing Conditions Light	Moisture	Size
Flowering Perennials				
Swamp milkweed	*Asclepias incarnata*	Sun-pt. shade	Moist-Wet	2-4’
Description/Notes: Rose flowers May-June, host for Monarch butterfly, attracts butterflies and beneficial insects.Can tolerate drought. Deer resistant.				
New England Aster	*Symphotrichum novae-angliae*	Sun	Moist	2-4’
Blue to lt. purple flowers Aug.-Oct., host for the Pearl crescent butterfly, attracts butterflies and bees.Tolerates drought and flooding.				
Turtlehead	*Chelone glabra*	Sun-shade	Moist-Wet	3-6’
White flowers Jul-Oct, host for Baltimore checkerspot butterfly, attracts butterflies and hummingbirds. Needs continuously moist or wet soils.				
Blue mistflower	*Conoclinium coelestinum*	Sun-shade	Dry-Wet	1-3’
Violet-purple flowers Jul-Oct, attracts bees and butterflies. Can be aggressive in the garden.				
Joe-Pye weed	*Eupatorium fistulosum*	Sun-pt. shade	Dry-Wet	3-8’
Pink-purple flowers Jul-Oct, attracts butterflies, songbirds and hummingbirds.				
Ox-eye sunflower	*Heliopsis helianthoides*	Sun-pt. shade	Dry-Moist	3-5’
Yellow flowers Jun-Sep, attracts butterflies and hummingbirds.				
Marsh mallow	*Hibiscus moscheutos*	Sun	Moist-Wet	3-5’
White, pink or magenta flowers Jun-Aug, attracts hummingbirds.				
Blue flag	*Iris versicolor*	Sun-pt. shade	Moist-Wet	2-3’
Blue-violet flowers May-Jun, attracts songbirds, waterfowls and mammals. Can flourish in normal garden soils, but also tolerates flooding.				
Blazingstar	*Liatris spicata*	Sun-pt. shade	Dry-Moist	3-4’
Rose-purple flowers Jul-Aug, attracts butterflies, bees and songbirds.				
Cardinal flower	*Lobelia cardinalis*	Sun-shade	Moist-Wet	3-6’
Red flowers Jul-Oct, attracts butterflies, hummingbirds, songbirds, and beneficial insects. Needs continuously moist or wet soils.				
Beardtongue	*Penstemon digitalis*	Sun-pt. shade	Dry-Moist	2-5’
White flowers Jun-Jul, attracts hummingbirds. Tolerates poor drainage/occasionally saturated soils.				
Obedient plant	*Physostegia virginiana*	Sun-shade	Dry-Wet	3-5’
Pink flowers Aug-Nov, attracts butterflies, hummingbirds and beneficial insects. Deer resistant. Can be aggressive in the garden.				
Wild bergamot	*Monarda fistulosa*	Sun-pt. shade	Dry-Moist	2-4’
Pink-purple flowers Jun-Sep, attracts butterflies, songbirds and hummingbirds. Deer resistant.				
Beebalm	*Monarda didyma*	Sun-pt. shade	Moist-Wet	3-4’
Red flowers Jul-Sep, attracts butterflies, hummingbirds and beneficial insects. Deer resistant.				
Black-eyed susan	*Rudbeckia hirta*	Sun-pt. shade	Dry-Moist	1-3’
Yellow flowers with black centers, Jun-Nov, attracts butterflies, songbirds, and beneficial insects. Extremely drought tolerant.				
Rough-stemmed goldenrod	*Solidago rugosa*	Sun-pt. shade	Moist-Wet	3-5’
Yellow flowers Aug-Sept, attracts bees, songbirds and beneficial insects. Tolerates drought. Will spread.				
Blue vervain	*Verbena hastata*	Sun-pt. shade	Moist-Wet	2-5’
Blue to purple flowers Jun-Oct, attracts butterflies and songbirds.				
Ironweed	*Vernonia noveboracensis*	Sun-pt. shade	Moist-Wet	5-8’
Purple flowers Aug-Oct, attracts butterflies.				

Common Name	Scientific Name	Preferred Growing Conditions		Size
		Light	Moisture	
Grasses, Grass-like Plants & Ferns				
Broomsedge	*Andropogon virginicus*	Sun-pt. shade	Dry-Wet	1-3’
Grows in tufts, flowers Aug-Nov, reddish-tan fall color. Host for the Zabulon skipper butterfly. Used by mammals, songbirds and butterflies.				
Sea oats	*Chasmanthium latifolium*	Sun-pt. shade	Dry-Moist	2-4’
Clumping grass, attractive oat-like seedheads, flowers Jul-Sept, tan-gold fall color. Used by mammals, songbirds and butterflies. Deer resistant.				
Soft rush	*Juncus effusus*	Sun-pt. shade	Moist-Wet	1-3’
Grows in clumps, greenish-brown flowers Jun-Sep. Used by songbirds, waterfowl and mammals. Needs continuously moist-wet soils.				
Cinnamon fern	*Osmunda cinnamonea*	Sun-shade	Moist-Wet	3-5’
Reddish-brown fertile fronds Apr-May. Needs continuous moisture in full sun, but can tolerate drought in shade. Used by songbirds and mammals.				
Royal fern	*Osmunda regalis*	Sun-shade	Moist-Wet	2-6’
Reddish-brown fertile fronds Apr-Jun. Delicate lacy foliage. Needs continuous moisture in full sun, but can tolerate drought in shade. Used by mammals.				
Switchgrass	*Panicum virgatum*	Sun-pt. shade	Dry-Wet	3-6’
Clumping grass, flowers Jul-Oct, pale-bright yellow color in fall. Many attractive cultivars available. Host for the Delaware skipper butterfly. Used by mammals, songbirds and butterflies.				
Indian grass	*Sorghastrum nutans*	Sun-pt. shade	Dry-Moist	3-6’
Clumping grass can reach 8’, flowers Aug-Sep, frond-like seed heads, tan-rose fall color. Host for the salt and pepper skipper butterfly. Used by mammals, songbirds and butterflies.				
Shrubs & Trees				
Serviceberry	*Amelanchier canadensis*	Sun-shade	Moist-Wet	15-25’
White flowers Apr-May. Red-purple berries Jun-Jul. Fall color is orange to red. Multi-trunked. Used by songbirds and mammals.				
Red chokeberry	*Aronia arbutifolia*	Sun-pt. shade	Dry-Wet	6-12’
White flowers May-Jul. Red berries Sep-Dec. Fall color is orange to red. Tolerates flooding. Used by songbirds and mammals.				
Black chokeberry	*Aronia melanocarpa*	Sun-pt. shade	Dry-Wet	3-6’
White flowers Apr-May. Black berries Sep-Nov. Fall color is orange to red. Multi-trunked. Used by songbirds and mammals.				
Buttonbush	*Cephalanthus occidentalis*	Sun-shade	Moist-Wet	6-12’
White ball-like flowers Jul-Aug. Interesting green-brown fruits Sep-Jan. Tolerates flooding. Attracts birds, mammals, butterflies and beneficial insects.				
Silky dogwood	*Cornus amomum*	Sun-shade	Moist-Wet	6-12’
White flowers May-Jun. Blue berries Aug. Fall color is orange, red or purple. Maroon twigs. High wildlife value. Used by birds and mammals.				
Winterberry	*Ilex verticillata*	Sun-shade	Moist-Wet	6-12’
White flowers May-Jul. Bright red berries on female plants Aug-Feb. Male plants needed for pollination (5:1 ratio F:M). Tolerates drought. High wildlife value. Used by birds and mammals.				
Virginia sweetspire	*Itea virginica*	Sun-shade	Moist-Wet	4-8’
White flower tassels Jun-Jul. Fall color is red to purple. Tolerates drought and flooding. Attracts birds, mammals and beneficial insects.				
Spicebush	*Lindera benzoin*	Pt. shade-shade	Moist-Wet	6-12’
Yellow flowers Mar-May. Scarlet berries Sep-Oct. Yellow fall color. High wildlife value. Host for Spicebush and Eastern tiger swallowtail butterflies. Attracts butterflies, birds and mammals.				
Ninebark	*Physocarpus opulifolius*	Sun-pt. shade	Dry-Wet	6-12’
White-pink flowers May-Jul. Orange to red capsule-like fruits Jul-Mar. Fall color is yellow to purple. Attractive peeling bark. Attracts birds, mammals and beneficial insects.				
Elderberry	*Sambucus canadensis*	Sun-shade	Dry-Wet	6-12’
Showy white flowers Jun-Jul. Purplish-black berries Aug-Sept. High wildlife value. Used by birds and mammals.				
Highbush blueberry	*Vaccinium corymbosum*	Sun-shade	Dry-Wet	6-12’
White flowers Apr-Jun. Blue-black berries Jul-Aug. Bright yellow to red fall color. High wildlife value. Attracts butterflies, birds and mammals.				
Arrowwood viburnum	*Viburnum dentatum*	Sun-shade	Dry-Wet	6-8’
White flowers May-Jun. Blue-black berries Sept-Nov. Red-purple fall color. Attractive form in winter. High wildlife value. Host plant for the spring azure butterfly. Also used by birds and mammals.				

Rain Garden

Design and Construction

A Northern Virginia Homeowner's Guide

This work supports the Fairfax County Board of Supervisors' 20-year environmental vision.

Special thanks to:

The Northern Virginia Soil and Water Conservation District
12055 Government Center Parkway, Suite 905
Fairfax, VA 22035 • 703-324-1460
conservationdistrict@fairfaxcounty.gov

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To request this information in an alternate format, contact Inclusion and ADA Support at 703-324-8563. TTY 703-803-3354.

APPENDIX E
MAYOR'S PROCLAMATION

PROCLAMATION

WHEREAS, the streams and tributaries that flow both above and below the ground through the City of Falls Church are part of an interconnected watershed system that carries water from our rooftops, yards, streets, and parking lots into the Potomac River and the Chesapeake Bay; and

WHEREAS, the City of Falls Church is committed to improving and protecting these precious waters as habitat for plant and animal life, as a recreational resource, and as drinking water for our citizens, both now and in the future; and

WHEREAS, there are currently 213 commercial and residential properties in the Falls Church City portion of the Tripps Run and Four Mile Run floodplains; and

WHEREAS, the City is participating in the National Flood Insurance Program's Community Rating System, which recognizes and encourages community floodplain management and through which flood insurance rates may be reduced to reflect the reduced flood risk resulting from community activities that meet targeted goals; and

WHEREAS, the City provides opportunities to residents, businesses, schools, churches, and organizations to participate in watershed and floodplain education efforts; and

WHEREAS, many citizens in our community have responded by participating in programs that serve to raise awareness about what individuals can do on their properties, in their homes, and through their transportation choices to improve water quality and minimize their impact on the floodplain; and

WHEREAS, the City has undertaken a city-wide comprehensive effort to examine our watershed and to develop a plan for improving the watershed over the next ten years; and

WHEREAS, the City of Falls Church recognizes the importance of increasing public awareness of watershed and floodplain protection,

NOW, THEREFORE, I, P. DAVID TARTER, Mayor of the City of Falls Church, Virginia, do hereby proclaim May 2014 as

WATERSHED AND FLOODPLAIN AWARENESS MONTH

in the City of Falls Church and urge all citizens to recognize the importance of this observance and to participate in watershed and floodplain protection activities in our community.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Seal of the City of Falls Church, Virginia, to be affixed this 12th day of May, 2014.

P. David Tarter, Mayor

APPENDIX F
GKY OUTREACH PROGRAM STUDY

Public Education Outreach Plan Review and High-Priority Water Quality Issue Selection Matrix

prepared by

GKY & Associates, Inc.
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Chantilly, Virginia 20151

May 27, 2014

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1.0 VPDES PERMIT REQUIREMENTS

The VPDES General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) (General Permit) requires that the City of Falls Church (City) revise its MS4 Public Education Program (Program) to include the following:

- Identify a minimum of three high-priority water quality issues that contribute to the stormwater pollution and provide rationale for their selection.
- Identify target audience(s) that are most likely to have significant impacts for each high-priority water quality issue and estimate each target audience population size.
- Develop relevant message(s) and associated educational and outreach materials for distribution to the selected target audiences.
- Provide for public participation during Program development.
- Once developed, conduct sufficient education and outreach activities to reach an equivalent of 20% of each high-priority issue target audience and provide adjustment to the target audiences and messages in order to address any observed weaknesses or shortcomings.

Additionally, the General Permit Special Conditions for Approved Total Maximum Daily Loads (TMDLs), other than the Chesapeake Bay TMDL, requires the City to enhance its Program to promote methods to eliminate and reduce pollutants identified in TMDL waste loads allocated to the City's MS4. Currently, there are four TMDLs in which the City has been allocated waste loads by the State Water Control Board (SWCB). These TMDLs are:

- Fecal Coliform TMDL (Total Maximum Daily Load) Development for Four Mile Run, Virginia (SWCB Approved June 17, 2004);
- Bacteria TMDLs for the Hunting Creek, Cameron Run, and Holmes Run Watersheds (SWCB Approved August 4, 2011);
- Bacteria TMDL for the Tidal Four Mile Run Watershed (SWCB Approved September 30, 2010); and
- Total Maximum Daily Loads of Polychlorinated Biphenyls (PCBs) for Tidal Portions of the Potomac and Anacostia Rivers in the District of Columbia, Maryland, and Virginia (SWCB Approved April 11, 2008)

The identified pollutants in these TMDLs are bacteria (fecal coliform and e. coli) and Polychlorinated Biphenyls (PCBs). Although Program enhancement to address TMDLs is not required until later in this permit cycle, the City should address it while updating the Program so as to eliminate the City's need to revise the Program again during the permit cycle.

2.0 IDENTIFICATION OF PROPOSED HIGH-PRIORITY WATER QUALITY ISSUES AND THE RATIONALE FOR THEIR SELECTION

Given the City's land use composition and population demographics, it is apparent that the most effective stormwater public education and outreach program should concentrate on increasing awareness of the City's residential population. The impact of increasing citizen awareness will not only result in a potential modification to citizen behavior but will also provide a greater overall public awareness as citizens travel through the City daily. As a result, Table 1 recommends three high-priority water quality issues for the City to consider. Also included is an optional high-priority water quality issue that may be considered either as a substitute for one of the three proposed or as an additional issue that can be included with the three issues.

Table 1: Proposed High-Priority Water Quality Issues

High-Priority Water Quality Issue	Selection Rationale
Bacteria levels in City streams	The City's MS4 discharges stormwater to downstream receiving waters that currently do not meet water quality standards as a result of excessive bacteria levels. The City's MS4 is identified in four local bacteria TMDLs. By concentrating on educating the residential population on reducing bacteria levels, the City will also have met the General Permit TMDL special condition.
Illicit Discharges	The City is an established locality that is best described as a bedroom community with service-based commercial businesses. As such, the opportunity exists for many different types of illicit discharges to exist rather than one specific type. By concentrating on educating the residential population on identifying and reporting illicit discharges, the City not only can eliminate individual illicit discharges that may be the result of the City's citizens but also those illicit discharges that the citizens may observe.
Encouraging Stormwater Retrofit Opportunities	The City is built-out with a significant amount of impervious cover. As a result, local streams are negatively impacted by uncontrolled stormwater runoff by causing erosion of the stream banks. The sediment that is eroded from the stream channels then flows downstream into the Chesapeake Bay. By encouraging retrofit on private properties, the City can ensure that the required BMPs are implemented without needing to acquire land.
OPTIONAL: Landscaping, Erosion Control, and Nutrient Management	Stormwater runoff from the City enters the Chesapeake Bay. The Chesapeake Bay TMDL requires the City to reduce sediment and nutrient discharges to the Bay. By concentrating on educating the residential population on landscaping, erosion control, and nutrient management, the City will also address the Chesapeake Bay TMDL.

3.0 IDENTIFICATION OF TARGET AUDIENCES AND ESTIMATED POPULATIONS

A review of the City's population demographics was conducted in order to identify target audiences for each of the high-priority water quality issues[1]. This review included an evaluation of the demographics to identify minorities, disadvantaged populations, or minors that may be predominate in the City.

The City is a small bedroom community located in the Washington D.C. metropolitan area with an estimated 2012 population of 13,229. The City's population can be characterized as young (median age 39), well-educated (96% high school graduates, 74% hold at least a Bachelor's degree), and professional (52% are employed in a professional, scientific, technical, public administration, finance, or insurance field). The median income of the City's households is estimated to be $117,633 (2011) and less than 3% of the population lives below the federal poverty level. The City has approximately 4,725 housing units, of which 45% are detached single-family residential units. Forty percent of the housing units are rented. The City's racial profile is 74% White, 10% Asian, 9% Hispanic and 5% Black. The vast majority of the City's residents speak English fluently with less than 1% unable to speak English at all. The City has an independent school district that consists of four schools serving approximately 2,400 students.

According to responses by Northern Virginia residents to the Northern Virginia Clean Water Partners 2013 Campaign Summary, 54% prefer to receive information from on-line sources while 19% prefer that they receive their information from newspapers, and another 18% prefer information be received via television.

The City's population is well-educated, professional, and relatively affluent. There does not appear to be significant language, racial, or economic divides that the City needs to specifically address while developing its Program. As such, aside from addressing school-aged children, there does not appear to be a minority or disadvantaged population that cannot be reached utilizing a comprehensive, multi-faceted Program.

Table 2 provides the City proposed target audiences and estimated populations for each of the proposed high-priority water quality issues. Audiences were selected based on those populations must likely to have significant impacts on each high-priority water quality issues. The identified target audiences appear to be consistent with those that the City has previously provided outreach as part of its Program.

[1] City demographics were obtained using the latest available information from City-Data.com.

Table 2: Potential High-Priority Target Audiences

High-Priority Issue	Target Audience(s)	Method for Estimating Target Audience Population	Estimated Target Audience Population	20% of Estimated Population	Comment
Bacteria Levels in City Streams	Dog Owners	Number of Dog Licenses	1,500	300	Per conversation with the City's Treasurer's Office, approximately 450-500 dog licenses are issued annually. Each license is valid for three years.
Illicit Discharges	Head of Households	Number of Housing Units	4,725	945	From City-Data.com
	Elementary School Aged Children	Number of Elementary School Students	457	92	Estimated number from the number of elementary school children at Thomas Jefferson Elementary School at end of school year 2010/2011.
Encouraging Stormwater Retrofit Opportunities	Single Family Residential Property Owners	Number of Single Family Residential Units	2,910	580	From City-Data.com
	Non-Single Family Residential Property Owners	Number Parcels Other Than Non-Single Family Residential	700	140	Estimated using Stormwater Fee Billing Options Assessment dated 12/10/12. 16% of (total utility accounts + 250 not having accounts) rounded up.
OPTIONAL: Landscaping, Erosion Control, and Nutrient Management	Owners of Single Family Detached Properties	Number of Detached Single Family Residences	2,170	a435	From City-Data.com
	Landscape Companies	Number of Landscape Companies Doing Work in the City	90	18	Estimated using search of on-line Superpages, http://www.superpages.com/yellowpages/C-Landscape+Contractors/S-VA/T-Falls+Church/

4.0 RELEVANT MESSAGES AND ASSOCIATED OUTREACH MATERIALS

The City's current Program is comprised of many messages delivered via numerous delivery mechanisms (Appendix 1). Based upon a review of the City's Program, it appears that message delivery options and coordination can be improved in developing a more effective Public Education and Outreach Plan. For example, the Fall/Winter 2012 newsletter, "the Environment," contains an excellent story titled, "How to Keep Falls Church Streams Clean." This story addresses pet wastes, nutrient application and illicit discharges, and provides an excellent opportunity to direct the reader to other sources of information such as the City's web page or the Northern Virginia Clean Water Partner's webpage. However,

the story provides only names and phone numbers to City employees. Additionally, available resources can be better leveraged to improve Program effectiveness.

The City's numerous messages and methods of delivery provide an excellent foundation upon which to build in order to meet the General Permit requirements described above. The City's existing messages should be organized under the high-priority water issues and reformatted to deliver concise, consistent messages. Delivery of the messages should be coordinated and delivered in such a manner as to reinforce each other. Delivery coordination allows for the City to reach its target audience(s) using numerous methods to deliver the same message. A matrix demonstrating the proposed high-priority water quality issues and the potential relationship to the City's existing Program is found in Appendix 2.

5.0 NEXT STEPS

There are several next steps that the City must take. First, the City must identify a method by which the public can participate in development of the Public Education and Outreach Program. This can range from something as simple as allowing the public to comment on the proposed high-priority water quality issues during a City Council meeting to something as sophisticated as utilizing the City's Environmental Services Council as a sounding board during the rebranding of the City's existing Program.

Once the City has decided upon its high-priority water quality issues and determined the level of public participation, the City should develop and implement a Plan of Action, including schedules and deadlines, to re-prioritize the existing Program in such a manner as to annually reach 20% of the identified target populations. Compliance with the General Permit may then be evaluated as proposed in Appendix 2. The end result of the Plan of Action should result in a concise, consistent, coordinated Stormwater Public Education and Outreach Program that can be efficiently implemented as well as provide effective outreach.

Appendix 1: Summary of Current City of Falls Church Public Education and Outreach Program

Delivery Mechanism	Delivery Name	Additional Information	Delivery Schedule	Message(s)	Water Quality Issue	Target Audience(s)
Local Electronic Newsletter	Falls Church Environment	http://www.fallschurchva.gov/content/government/departments/publicworks/solidwaste/theenvironment/spring2014/default.aspx?cnlid=5457	Twice a year	*Watershed News*	Numerous	Households
				Identifying and Disposing of Hazardous Wastes	Illicit Discharge	Households
				Help Keep Falls Church Streams Clean	General Stormwater	Households
Local Newspaper	Falls Church News-Press	http://fcnp.com/; Weekly distribution to 30,500	Three advertisements per year	*A Homeowner's Guide to a Healthy Watershed*	General Stormwater	Households
					Illicit Discharge/ Household Hazardous Waste	Households
				Water Quality Discussion: Resource Protection Areas 101	Riparian Protection	Households
Public Events	Public Utilities Open House	N/A	Once a year	City Stormwater Management	Quantity Control	General population
School Presentations	Enviroscape Watershed Model	N/A	Variable	Water Quality and Stormwater	General Stormwater	Minors
	Operation Earth Watch	N/A	Variable	Water Quality and Stormwater	General Stormwater	Minors
Regional Radio Advertisements	Northern Virginia Clean Water Partners	http://www.onlyrain.org/	Variable	Numerous	Numerous	Households, Pet lovers, General population
					Spanish Language	Spanish speaking residents
Regional TV Advertisements					Numerous	Households, Pet lovers, General population
					Spanish Language	Spanish speaking residents
Regional Web Page			Continuous	*Dog Lovers*	Pet Waste	Dog Owners
				Green Thumbs	Pesticide/ Fertilizers	Households
				Home Maintenance	General Stormwater	General population
Public Access Television	Falls Church Close Circuit TV	http://www.fcctv.net/	Monthly	Monthly Rotation of Films and PowerPoint Presentation Regarding Stormwater	Numerous	General Population
Web Page	City of Falls Church	http://www.fallschurchva.gov/content/government/departments/publicworks/stormwaterfloodplain/default.aspx?cnlid=4144	Continuous	Numerous	Numerous	General Population
Social Media	Facebook	https://www.facebook.com/CityofFallsChurchGov	Variable	Numerous	Numerous	General Population
	Twitter	https://twitter.com/fallschurchinfo	Variable	Numerous	Numerous	General Population
Watershed Awareness Month	Mayoral Proclamation	N/A	Once a year	Numerous	Numerous	General Population
Storm Drain Markers	N/A	N/A	N/A	Numerous	General Stormwater Awareness	General Population

Appendix 2: Proposed Matrix for Falls Church MS4 Public Education and Outreach Program

High-Priority Water Quality Issue	Rationale for Selection as a High-Priority Water Quality Issue	Target Audience(s)	Proposed Methodology for Measuring Population of Target Audience	Estimated Population Size of Target Audience	Proposed Strategy for Reaching 20% of the Target Audience	Potential Message(s)	Method of Delivery	Method of Evaluation	Comments
Bacteria levels in City of Falls Church streams	The Falls Church MS4 discharges stormwater to downstream receiving waters that currently do not meet water quality standards as a result of excessive bacteria levels. The Falls Church MS4 is identified in four local bacteria TMDLs.	Dog Owners	Number of dog licenses	1,500	Develop a mail insert highlighting the message to clean up after your pet. Include a copy of the insert with each letter sent out by the City Treasurer reminding pet owners to purchase their dog licenses. Dog licenses are valid for three years and run concurrent with the rabies vaccine. This delivery mechanism will reach approximately 33% of the licensed dog owners annually.	Clean Up Your Dog's Waste	Regional TV Ad Regional Radio Ad Regional Web Page/Banner Ads City Web Page Mass Mailing Social Media Electronic Newsletter Local Newspaper	Utilize Northern Virginia Clean Water Partners' annual survey highlights as a basis.	Stormwater Utility Fee Credit Manual provides for SWPPP points for installation of pet waste station.
					Re-enforce the message with additional delivery messages such as 'doggie bags' on Social Media.		CCTV		
Illicit Discharges	The City of Falls Church is an established locality that is best described as a bedroom community with service-based commercial businesses. As such, the opportunity exists for many different types of illicit discharges to exist rather than one specific type. By concentrating on educating the residential population on identifying and reporting illicit discharges, the City not only can eliminate individual illicit discharges that may be the result of the City's citizens but also those illicit discharges that the citizens may observe.	Residential Population	Number of Housing Units	4,725	Develop a coordinated effort that directs everyone to an updated City web page regarding illicit discharges. A coordinated outreach effort allows the City to utilize various methods of delivery and combining their reach. Currently, newspaper ads and other information directs everyone to Jason Widstrom. By coordinating the direction to the web page, you can count the number of hits as a mechanism of evaluating the effectiveness of your outreach program. Consider using social media to ask for information regarding identified illicit discharges. Develop an electronic reporting form for submittal on-line.	Identification and Reporting Illicit Discharges	Regional TV Ad Regional Radio Ad Regional Web Page/Banner Ads City Web Page Mass Mailing Social Media Electronic Newsletter Local Newspaper CCTV	Number of suspect discharges reported. Number of hits on revised webpage.	Coordinate with Storm Drain Stenciling Program. Coordinate with Illicit Discharge Reporting Number.
					Develop a coordinated effort to promote and encourage participation in the identification and disposal of household hazardous wastes. Continue utilizing the current methods to reach the City's residents.	Identification and Disposal of Household Hazardous Wastes	Regional TV Ad Regional Radio Ad Regional Web Page/Banner Ads City Web Page Mass Mailing Social Media Electronic Newsletter Local Newspaper CCTV	Develop a goal for percentage of residents to utilize Household Hazardous Waste Collection.	Coordinate with Storm Drain Stenciling Program. Coordinate with Household Hazardous Waste Collection Days.
			Number of Elementary Students	450	Incorporate IDDE Identification into the Operation Earthwatch program. Track the number of elementary-school aged students reached annually.	Identifying Illicit Discharges	Operation EarthWatch	Develop questions regarding illicit discharges to ask during the presentation.	Coordinate with Environmental Services Council.
Encouraging Stormwater Retrofit Opportunities	Falls Church is a built-out City with a significant amount of impervious cover. As a result, local streams are negatively impacted by uncontrolled stormwater runoff by causing erosion of the stream banks. The sediment that is eroded from the stream channels then flows downstream into the Chesapeake Bay. By encouraging retrofit on private properties, Falls Church can ensure that the required BMPs are implemented without needing to acquire land.	Single Family Residential Property Owners	Number of SFR Residential Property Tax Parcels	2,910	Develop a coordinated effort that directs everyone to an updated City web page regarding retrofit possibilities. The web page should be coordinated with existing programs such as the ACE Rain Barrels program and the City's Stormwater Utility Fee Credit program. Consolidate existing web pages into one web page.	ACE Rain Barrels Program	City Web Page Social Media Electronic Newsletter Local Newspaper Presentations	Overall effectiveness of the program can be determined by the cumulative number of rain barrels installed/purchased by Falls Church residents.	Coordinate with Arlingtonians for a Clean Environment
						Green Infrastructure	City Web Page Social Media Electronic Newsletter Local Newspaper Presentations	Overall effectiveness of the program can be determined by 1) the number of residents obtaining information regarding green infrastructure and 2) the number of stormwater utility credit reductions provided as a result of green infrastructure.	
		Non-Single Family Residential Property Owners	Number of Non-SFR Property Tax Parcels	700	Develop a list of non-single family residential property owners. Develop a specific message to deliver to the property owners. Identify opportunities to reach owners such as conducting mass mailing activities, presentations and attaching web links to the utilities bill. The web page should be coordinated with existing programs such as the City's Stormwater Utility Fee Credit program. Consolidate existing web pages into one web page.	Green Infrastructure	City Web Page Local Newspaper Presentations Mass Mailing	Overall effectiveness of the program can be determined by 1) the number of non-SFR property owners obtaining information regarding green infrastructure and 2) the number of stormwater utility credit reductions provided as a result of green infrastructure	Consider post card brochure as a direct mass mailing when appropriate.
OPTIONAL: Landscaping, Erosion Control and Nutrient Management	Stormwater runoff from Falls Church enters the Chesapeake Bay. The Chesapeake Bay TMDL requires the City of Falls Church to reduce sediment and nutrient discharges to the Bay.	Property Owners with Detached SFR	Number of detached SFR Properties	2,170	Develop a coordinated effort that directs everyone to an updated City web page regarding various landscaping issues including pesticides, fertilizer and erosion. Promote signing of No Fertilizer pledges as part of all events. Consider providing limited number of rewards such as 'coupons' to have soils analyzed through the Virginia Cooperative Extension Program. Consolidate a simple message or messages.	"Green Thumbs"	Regional TV Ad Regional Radio Ad Regional Web Page/Banner Ads City Web Page Mass Mailing Social Media Electronic Newsletter Local Newspaper CCTV	Number of No Fertilizer pledges and/or soils tests.	Build on the NVCWC Green Thumbs program. Messages can be developed for when to fertilize and soil testing.
		Landscaping Companies	Number of landscaping companies with business licenses in Falls Church	90	Develop a list of landscaping companies. Conduct mass mailing to all. Update web page to include links, tools and other related items for landscaping companies to use.	Water Quality Information for Landscaping Companies	Mass Mailing City Web Page	General awareness message to the landscaping companies.	Consider post card brochure.

APPENDIX G
CITY COUNCIL MEETINGS

- July 22, 2013 – Stormwater Ordinance
- October 28, 2013 – Stormwater Ordinance
- November 25, 2013 – Stormwater Ordinance
- December 9, 2013 – Stormwater Utility Credit Policy
- February 10, 2014 – Stormwater Ordinance
- February 24, 2014 – Stormwater Ordinance
- March 24, 2014 – Stormwater Ordinance
- April 16, 2014 – Stream Restoration Contract
- May 12, 2014 – Watershed Awareness Month Proclamation

AGENDA FOR THE REGULAR MEETING
OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA
HELD IN COUNCIL CHAMBERS, 300 PARK AVENUE AT 7:30 P.M.,
MONDAY, July 22, 2013
REVISED 07-22-13

1. **CALL TO ORDER**
2. **PLEDGE OF ALLEGIANCE**
3. **ROLL CALL**
4. **VALIDATION OF NOTICE OF SPECIAL MEETING**
5. **ADOPTION OF MEETING AGENDA**
6. **PROCLAMATIONS**

(a) Certificate of Appreciation to Ralph Yatsko for Service on the Environmental Services Council's Climate Change and Energy Efficiency Task Force (Public Utilities Director Brenda Creel)

7. **OATH OF OFFICE TO NEW BOARD AND COMMISSION MEMBERS**
8. **RECEIPT OF PUBLIC COMMENTS, REQUESTS, AND CONSENT ITEM COMMENTS**. [The public may address Council for one 3-minute period. The Mayor may shorten the time allowed each speaker, depending on the length of the agenda and number of speakers. A chair or representative of a board, commission, or committee may make a 5-minute oral summary of the written report.]

(1) Walter Mess Tribute (Roger Neighborgall)

(a) Summary of Written Comments.
(b) Council Requests

9. **REPORT OF CITY MANAGER TO COUNCIL**
10. **BUSINESS ON THE AGENDA**

(a) Second readings of ordinances and other items requiring public hearings

(1) **(TO13-12)** ORDINANCE TO AMEND AND REVISE CHAPTER 15 "FEES," ARTICLE II, "DEPARTMENT OF DEVELOPMENT SERVICES," SECTIONS 15-20, 15-27 AND 15-29; AND ARTICLE III, "DEPARTMENT OF PUBLIC WORKS," SECTION 15-36 "PUBLIC WORKS APPLICATIONS – ENGINEERING," AND SECTION 15-37 "PUBLIC WORKS APPLICATIONS – URBAN FORESTRY," TO INCLUDE UPDATES TO FEES AND LANGUAGE *(Development Services General Manager James Snyder)*

(2) **(TO13-16)** ORDINANCE TO AMEND CHAPTER 48 "ZONING," ARTICLE V "SUPPLEMENTARY REGULATIONS," DIVISION 6 "HEIGHT, LOT AND YARD REGULATIONS," SECTION 1102 TO BRING REDEVELOPMENT OF EXISTING SUBSTANDARD LOTS INTO CLOSER ALIGNMENT WITH THE COMPREHENSIVE PLAN OF THE CITY OF FALLS CHURCH *(Development Services General Manager James Snyder)*

(b) Resolutions and first readings of ordinances

(1) **(TO13-19)** ORDINANCE TO AMEND CHAPTER 30, "PERSONNEL" OF THE CODE OF THE CITY OF FALLS CHURCH TO EXPAND THE DUTIES OF THE CITY'S RETIREMENT BOARD TO INCLUDE INVESTMENT OVERSIGHT OF THE CITY'S OTHER POST-EMPLOYMENT BENEFITS (OPEB) FUNDS *(Human Resources Director Richard Parker)*

(2) (TO13-18) ORDINANCE TO CREATE CHAPTER 35 "STORMWATER," ARTICLE I "STORMWATER MANAGEMENT" OF THE FALLS CHURCH CITY CODE TO CLARIFY AND REORGANIZE EXISTING STORMWATER MANAGEMENT REGULATION; TO ADD NEW LANGUAGE REQUIRED BY THE STATE OF VIRGINIA *(Interim Director of Public Works Cindy Mester)*

(3) **(TR13-21)** RESOLUTION TO APPOINT A TASKFORCE TO WORK WITH STAFF IN DEVELOPING A STORMWATER CREDIT POLICY *(Interim Director of Public Works Cindy Mester)*

(4) **(TR13-23)** RESOLUTION OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA DECLARING ITS INTENTION TO REIMBURSE ITSELF FROM THE PROCEEDS OF ONE OR MORE FINANCINGS FOR CERTAIN CAPITAL PROJECT COSTS *(CFO Richard A. LaCondré)*

(5) **(TR13-22)** RESOLUTION OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH AUTHORIZING THE CONVEYANCE OF 201 W. BROAD STREET *(City Manager Wyatt Shields)*

(6) **(TR13-24)** RESOLUTION SUBMITTING TO THE QUALIFIED VOTERS OF THE CITY A REFERENDUM ON WHETHER THE CITY OF FALLS CHURCH WATER SYSTEM SHOULD BE SOLD TO THE FAIRFAX COUNTY WATER AUTHORITY; SAID REFERENDUM TO BE SET FOR THE GENERAL ELECTION ON NOVEMBER 5, 2013. *(City Attorney John Foster)*

(c) Consent items

(1) AUTHORIZE THE CITY MANAGER TO AWARD CONTRACTS TO ARTHUR CONSTRUCTION COMPANY, INC., FINLEY ASPHALT & SEALING, INC AND VIRGINIA PAVING COMPANY FOR PAVING AND CONCRETE SERVICES IN AMOUNTS UP TO $400,000 ANNUALLY; AND TO RENEW THESE CONTRACTS ANNUALLY FOR FOUR ADDITIONAL ONE-YEAR PERIODS (SUBJECT TO ANNUAL APPROPRIATION OF FUNDS BY CITY COUNCIL) *(Interim Director of Public Works Cindy Mester)*

CONSENT MOTION: MOVE to authorize the City Manager to award contracts to Arthur Construction Company, Inc., Finley Asphalt & Sealing, Inc. and Virginia Paving Company for Paving and Concrete Services in amounts up to $400,000 annually; and to renew these contracts annually for four additional one-year periods (subject to annual appropriation of funds by City Council).

(2) AUTHORIZE THE CITY MANAGER TO AMEND THE NEW CONTRACT WITH ARTHUR CONSTRUCTION COMPANY, INC. TO EXPEND UP TO $1,027,000 FOR THE 2013 SOUTH WEST STREET ROADBED RECONSTRUCTION PROJECT. *(Interim Director of Public Works Cindy Mester)*

CONSENT MOTION: MOVE to authorize the City Manager to amend the new contract with Arthur Construction Company, Inc. to expend up to $1,027,000 for the 2013 South West Street Roadbed Reconstruction Capital Project.

(3) PERMISSION FOR CITY MANAGER TO ACCEPT A PART TIME TEACHING POSITION WITH THE VIRGINIA TECH "CERTIFICATE IN LOCAL GOVERNMENT MANAGEMENT" PROGRAM *(City Manager Wyatt Shields)*

CONSENT MOTION: MOVE to allow the City Manager to accept a part time teaching position with the Virginia Tech "Certificate in Local Government Management" program.

(4) APPOINTMENTS: Reappointment: Leslie A. Rye – Recreation and Parks Advisory Board - 09/01/13 – 08/31/16

CONSENT MOTION: MOVE appointment of the recommended slate of candidates.

(d) Items removed from consent

(e) Other business

11. **BUSINESS NOT ON THE AGENDA**

12. **COUNCIL MEMBER COMMENTS**

13. **APPROVAL OF MINUTES OF PREVIOUS MEETINGS**

(a) 07-08-13 Minutes

14. **ADJOURNMENT**

KATHLEEN CLARKEN BUSCHOW
CITY CLERK

The City of Falls Church is committed to the letter and spirit of the Americans with Disabilities Act. To request a reasonable accommodation for any type of disability call 703 248-5014 (TTY 711). The City of Falls Church is committed to the letter and spirit of the Americans with Disabilities Act. To request a reasonable accommodation for any type of disability call (703) 248-5014, (TTY 711).For information in your language please call 703 248-5014 (TTY 711) to request an interpreter. Để có thông tin bằng ngôn ngữ của quý vị, xin gọi 703-248-5014 để yêu cầu người thông dịch. Para recibir información en su idioma por favor llame al 703 248-5014 (TTY 711) para solicitar un interprete.

AGENDA FOR THE REGULAR MEETING
OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA
HELD IN COUNCIL CHAMBERS, 300 PARK AVENUE AT 7:30 P.M.,
MONDAY, OCTOBER 28, 2013

1. **CALL TO ORDER**
2. **PLEDGE OF ALLEGIANCE**
3. **ROLL CALL**
4. **VALIDATION OF NOTICE OF SPECIAL MEETING**
5. **ADOPTION OF MEETING AGENDA**
6. **PROCLAMATIONS**

7. **OATH OF OFFICE TO NEW BOARD AND COMMISSION MEMBERS**

8. **RECEIPT OF PUBLIC COMMENTS, REQUESTS, AND CONSENT ITEM COMMENTS**. [The public may address Council for one 3-minute period. The Mayor may shorten the time allowed each speaker, depending on the length of the agenda and number of speakers. A chair or representative of a board, commission, or committee may make a 5-minute oral summary of the written report.]

   (1) EPA Green Community Challenge Recognition (Brenda Creel, Director of Public Utilities)

   (a) Summary of Written Comments.
   (b) Council Requests

9. **REPORT OF CITY MANAGER TO COUNCIL**
10. **BUSINESS ON THE AGENDA**

   (a) Second readings of ordinances and other items requiring public hearings

   (1) **(TO13-18)** ORDINANCE TO CREATE CHAPTER 35 "STORMWATER," ARTICLE I "STORMWATER MANAGEMENT" OF THE FALLS CHURCH CITY CODE TO CLARIFY AND REORGANIZE EXISTING STORMWATER MANAGEMENT REGULATION; TO ADD NEW LANGUAGE REQUIRED BY THE STATE OF VIRGINIA (Cindy Mester, Interim Director of Public Works) [to be deferred to 11-12-13]

   (2) **(TO13-21)** ORDINANCE TO AMEND CHAPTER 48 "ZONING" TO REMOVE "ASSISTED LIVING" AS A BY RIGHT USE IN THE B-1, LIMITED BUSINESS ZONING DISTRICT AND REQUIRE A CONDITIONAL USE PERMIT APPROVED BY CITY COUNCIL (James Snyder, Director of Development Services) [referred to Planning Commission and other boards and commissions]

(3) **(TO13-22)** ORDINANCE TO AMEND CHAPTER 48 "ZONING" TO REQUIRE A 20-FOOT FRONT YARD SETBACK FOR COMMERCIAL ZONED PROPERTIES ON BROAD STREET AND WASHINGTON STREET (James Snyder, Director of Development Services) [referred to Planning Commission and other boards and commissions]

(b) Resolutions and first readings of ordinances

(1) **(TO13-27)** ORDINANCE TO AMEND CHAPTER 48, "ZONING," ARTICLE V, "SUPPLEMENTARY REGULATIONS," DIVISION 1, "GENERALLY," TO ADD SECTION 48-869, "MOBILE FOOD SERVICE." (Nancy Vincent, Director of Housing and Human Development)

(2) **(TO13-28)** ORDINANCE TO AMEND CHAPTER 15, "FEES," ARTICLE I, "IN GENERAL," TO ADD SECTION 15-2, "MOBILE FOOD SERVICE FEES." Nancy Vincent, Director of Housing and Human Development)

(3) **(TO13-26)** ORDINANCE TO AMEND CHAPTER 48 "ZONING," SECTION 48-235 "PRINCIPAL USES PERMITTED BY RIGHT,"TO MAINTAIN PRINCIPAL USE STATUS OF WATER UTILITY INFRASTRUCTURE SUBJECT TO SALE (John Foster, City Attorney)

(4) **(TR13-33)** RESOLUTION ADOPTING THE CITY OF FALLS CHURCH BUS STOP MASTER PLAN (James Snyder, Director of Development Services)

(5) **(TR13-29)** RESOLUTION TO ADOPT THE SOUTH WASHINGTON STREET CORRIDOR SMALL AREA PLAN (AREA PLAN NUMBER 2) AS A GUIDING DOCUMENT IN DECISION MAKING FOR PLANNING, ZONING AND DEVELOPMENT REVIEW, CAPITAL IMPROVEMENTS, CITY REGULATIONS AND POLICIES, AND INCLUDED, BY REFERENCE, IN THE CITY'S COMPREHENSIVE PLAN. (James Snyder, Director of Development Services)

(6) **(TO13-29)** ORDINANCE TO ADJUST THE BOUNDARY LINE OF THE CITY OF FALLS CHURCH WITH FAIRFAX COUNTY TO ANNEX AND INCORPORATE THIRTEEN PARCELS AND OTHER LAND INTO THE CITY AND TO ADOPT A VOLUNTARY SETTLEMENT AGREEMENT WITH FAIRFAX COUNTY. (John Foster, City Attorney)

(c) Consent items

(1) AUTHORIZE CITY MANAGER TO AWARD CONTRACT FOR UP TO $450,000 TO FORT MYER CONSTRUCTION CORPORATION FOR BROAD & PENNSYLVANIA INTERSECTION IMPROVEMENTS (CINDY MESTER, INTERIM DIRECTOR OF PUBLIC WORKS)

CONSENT MOTION: MOVE to Authorize the City Manager to award a contract for up to $450,000 to Fort Myer Construction Corporation for Broad & Pennsylvania Intersection Improvements

(2) AUTHORIZE THE CITY MANAGER TO AMEND EACH OF THE CONTRACTS WITH INTEGRITY CONSTRUCTION SERVICES, LLC; COLOSSAL CONTRACTORS, INC.; AND TITO CONTRACTORS, INC. TO EXPEND UP TO $350,000 ANNUALLY FOR FACILITIES MODIFICATIONS (SUBJECT TO ANNUAL APPROPRIATION OF FUNDS BY CITY COUNCIL).

CONSENT MOTION: MOVE to authorize the City Manager to amend each of the contracts with Integrity Construction Services, LLC; Colossal Contractors, Inc., and Tito Contractors, Inc. to expend up to $350,000 annually each for facilities modifications (subject to annual appropriation of funds by City Council).

(3) AUTHORIZE CITY MANAGER TO AMEND THE CONTRACT WITH ALS OF NORTH CAROLINA FOR THE CLOSED LOOP TRAFFIC SIGNAL MANAGEMENT SYSTEM IN AN AMOUNT UP TO $575,000

CONSENT MOTION: MOVE to Authorize the City Manager to Amend the Contract with ALS of North Carolina for the Closed Loop Traffic Signal Management System in an amount up to $575,000

(4) Appointments: Term Correction: Linda Neighborgall – Girls' Home Advisory Board - 10/01/13 – 09/30/17

(d) Items removed from consent
(e) Other business

11. **BUSINESS NOT ON THE AGENDA**
12. **COUNCIL MEMBER COMMENTS**
13. **APPROVAL OF MINUTES OF PREVIOUS MEETINGS**
14. **ADJOURNMENT**

KATHLEEN CLARKEN BUSCHOW
CITY CLERK

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AGENDA FOR THE REGULAR MEETING
OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA
HELD IN COUNCIL CHAMBERS, 300 PARK AVENUE AT 7:30 P.M.,
MONDAY, NOVEMBER 25, 2013

1. **CALL TO ORDER**

2. **PLEDGE OF ALLEGIANCE**

3. **ROLL CALL**

4. **VALIDATION OF NOTICE OF SPECIAL MEETING**

5. **ADOPTION OF MEETING AGENDA**

6. **PROCLAMATIONS**

   (a) Proclamation Declaring November 27, 2013 as Volunteer Appreciation Day *(Deputy City Clerk Veronica Prince)*

7. **OATH OF OFFICE TO NEW BOARD AND COMMISSION MEMBERS**

8. **RECEIPT OF PUBLIC COMMENTS, REQUESTS, AND CONSENT ITEM COMMENTS**. [The public may address Council for one 3-minute period. The Mayor may shorten the time allowed each speaker, depending on the length of the agenda and number of speakers. A chair or representative of a board, commission, or committee may make a 5-minute oral summary of the written report.]

   (a) Summary of Written Comments.
   (b) Council Requests

9. **REPORT OF CITY MANAGER TO COUNCIL**

10. **BUSINESS ON THE AGENDA**

    (a) Second readings of ordinances and other items requiring public hearings

    (1) **For Public Hearing Only: (TO13-18)** ORDINANCE TO CREATE CHAPTER 35 "STORMWATER," ARTICLE I "STORMWATER MANAGEMENT" OF THE FALLS CHURCH CITY CODE TO CLARIFY AND REORGANIZE EXISTING STORMWATER MANAGEMENT REGULATION; TO ADD NEW LANGUAGE REQUIRED BY THE STATE OF VIRGINIA *(Assistant City Manager Cindy Mester)* **Council action to be deferred to a later date.**

(2) **(TO13-26)** ORDINANCE TO AMEND CHAPTER 48 "ZONING," SECTION 48-235 "PRINCIPAL USES PERMITTED BY RIGHT,"TO MAINTAIN PRINCIPAL USE STATUS OF WATER UTILITY INFRASTRUCTURE SUBJECT TO SALE *(City Attorney John Foster)*

(b) Resolutions and first readings of ordinances

(1) **(TR13-36)** RESOLUTION TO ADOPT FY2015 FUNDING RECOMMENDATIONS FOR COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG) AND HOME INVESTMENT PARTNERSHIPS PROGRAM (HOME) FUNDS *(Human Services Director Nancy Vincent)*

(2) **(TR13-37)** RESOLUTION ADOPTING THE CITY OF FALLS CHURCH 2014 LEGISLATIVE PROGRAM (Assistant City Manager Cindy Mester)

(3) **(TR13-38)** RESOLUTION REQUESTING THE GENERAL ASSEMBLY TO AMEND SECTIONS OF THE CITY CHARTER TO CONFORM WITH CITY CHARTER SECTION 3.01 SETTING NOVEMBER ELECTION DATE FOR CITY COUNCIL AND THE SCHOOL BOARD *(City Attorney John Foster)*

(4) **(TR13-39)** RESOLUTION DECLARING THE POSITION OF THE FALLS CHURCH CITY COUNCIL THAT CORPORATIONS SHOULD NOT RECEIVE THE SAME LEGAL RIGHTS AS NATURAL PERSONS, THAT MONEY IS NOT SPEECH, AND THAT POLITICAL EXPENDITURES CAN BE REGULATED *(City Clerk Kathleen Buschow)*

(5) **(TO13-30)** ORDINANCE TO ALIGN THE REAL ESTATE TAX YEAR WITH THE FISCAL YEAR *(City Manager Wyatt Shields)*

(6) **(TR13-40)** RESOLUTION FOR IRREVOCABLE ELECTION NOT TO PARTICIPATE IN VIRGINIA LOCAL DISABILITY PROGRAM *(Human Resources Director Richard Parker)*

(c) Consent items

(1) Appointments

(a) New Appointment: Charles Anderson: Architectural Advisory Board – (6/1/12) – 5/31/15 (Unexpired Term)
(b) Reappointment: Barry Buschow: Economic Development Authority - 12/1/13 – 11/30/17
(c) Reappointment: Lindy Hockenberry: Planning Commission – 1/1/14 – 12/31/14

(d) Items removed from consent

(e) Other business

11. **BUSINESS NOT ON THE AGENDA**

12. **COUNCIL MEMBER COMMENTS**

13. **APPROVAL OF MINUTES OF PREVIOUS MEETINGS**

14. **ADJOURNMENT**

KATHLEEN CLARKEN BUSCHOW
CITY CLERK

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AGENDA FOR THE REGULAR MEETING
OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA
HELD IN COUNCIL CHAMBERS, 300 PARK AVENUE AT 7:30 P.M.,
MONDAY, DECEMBER 9, 2013
Revised: 12-06-13

1. **CALL TO ORDER**

2. **PLEDGE OF ALLEGIANCE**

3. **ROLL CALL**

4. **VALIDATION OF NOTICE OF SPECIAL MEETING**

5. **ADOPTION OF MEETING AGENDA**

6. **PROCLAMATIONS**

(1) Presentation to Hon. Mary Margaret Whipple (Mayor)
(2) Presentation to Hon. James Scott (Mayor)
(3) Oath of Office to Newly Elected City Council Members (City Clerk)

- Marybeth Connelly
- Karen Oliver
- David Snyder
- Daniel Sze

(4) Presentations to Outgoing City Council Members (Mayor)

- Johannah Barry
- Ira Kaylin
- Ron Peppe

7. **OATH OF OFFICE TO NEW BOARD AND COMMISSION MEMBERS**

8. **RECEIPT OF PUBLIC COMMENTS, REQUESTS, AND CONSENT ITEM COMMENTS**. [The public may address Council for one 3-minute period. The Mayor may shorten the time allowed each speaker, depending on the length of the agenda and number of speakers. A chair or representative of a board, commission, or committee may make a 5-minute oral summary of the written report.]

(a) Summary of Written Comments.
(b) Council Requests

9. **REPORT OF CITY MANAGER TO COUNCIL**

10. **BUSINESS ON THE AGENDA**

(a) Second readings of ordinances and other items requiring public hearings

(1) **(TO13-27)** ORDINANCE TO AMEND CHAPTER 48, "ZONING,"

ARTICLE V, "SUPPLEMENTARY REGULATIONS," DIVISION 1, "GENERALLY," TO ADD SECTION 48-869, "MOBILE FOOD SERVICE." (Nancy Vincent, Director of Housing and Human Development)

(2) **(TO13-28)** ORDINANCE TO AMEND CHAPTER 15, "FEES," ARTICLE I, "IN GENERAL," TO ADD SECTION 15-2, "MOBILE FOOD SERVICE FEES." (Nancy Vincent, Director of Housing and Human Development)

(3) **(TO13-30)** ORDINANCE TO ALIGN THE REAL ESTATE TAX YEAR WITH THE FISCAL YEAR (City Manager Wyatt Shields) [defer to January 13, 2014 for second reading to allow for proper advertising]

(b) Resolutions and first readings of ordinances

(1) **(TR13-41)** RESOLUTION PROVIDING GUIDANCE TO THE CITY MANAGER ON THE DEVELOPMENT OF THE FY2015 CITY BUDGET (Mayor Baroukh)

(2) **(TR13-44)** RESOLUTION AUTHORIZING THE DEFEASANCE AND REDEMPTION OF ALL OR A PORTION OF CERTAIN OUTSTANDING GENERAL OBLIGATION BONDS OF THE CITY OF FALLS CHURCH, VIRGINIA AND SETTING FORTH THE DETAILS THEREOF AND THE PROVISIONS THEREFOR (Richard LaCondré, CFO and Director of Finance)

(3) **(TR13-42)** RESOLUTION EXPRESSING THE GOALS OF THE CITY COUNCIL FOR THE USE OF WATER SALE PROCEEDS (Wyatt Shields, City Manager; Richard LaCondré, CFO and Director of Finance)

(4) **(TR13-43)** RESOLUTION TO ADOPT CITY OF FALLS CHURCH STORMWATER UTILITY FEE CREDIT POLICY (Cindy Mester, Acting Director of Public Works; Jason Widstrom, Engineer)

(5) **(TR13-45)** RESOLUTION TO AUTHORIZE THE CITY MANANGER TO EXECUTE A LEASE WITH THE NORTHERN VIRGINIA REGIONAL PARK AUTHORITY FOR THE TINNER HILL HISTORIC SITE (Cindy Mester, Assistant City Manager)

(6) **(TR13-46)** RESOLUTION TO AUTHORIZE THE CITY MANANGER TO EXECUTE TWO CONSERVATION EASEMENTS ON THE TINNER HILL HISTORIC SITE (Cindy Mester, Assistant City Manager)

(7) **(TR13-47)** RESOLUTION TO AUTHORIZE THE CITY MANANGER TO EXECUTE THE MEMORANDUM OF UNDERSTANDING BETWEEN THE CITY OF FALLS CHURCH, FAIRFAX COUNTY, THE NORTHERN

VIRGINIA REGIONAL PARK AUTHORITY, AND THE TINNER HILL HERITAGE FOUNDATION (Cindy Mester, Assistant City Manager)

(8) **(TR13-39)** RESOLUTION DECLARING THE POSITION OF THE FALLS CHURCH CITY COUNCIL THAT CORPORATIONS SHOULD NOT RECEIVE THE SAME LEGAL RIGHTS AS NATURAL PERSONS, THAT MONEY IS NOT SPEECH, AND THAT POLITICAL EXPENDITURES CAN BE REGULATED (Cindy Mester, Assistant City Manager)

(9) (TR13-48) RESOLUTION REQUESTING THE ENVIRONMENTAL PROTECTION AGENCY (EPA) TO ACT TO REDUCE CARBON POLLUTION WHILE BUILDING RESILIENT COMMUNITIES **(TR13-48)** (Council Member Barry)

(c) Consent items

(d) Items removed from consent

(e) Other business

11. **BUSINESS NOT ON THE AGENDA**

12. **COUNCIL MEMBER COMMENTS**

13. **APPROVAL OF MINUTES OF PREVIOUS MEETINGS**

14. **ADJOURNMENT**

KATHLEEN CLARKEN BUSCHOW
CITY CLERK

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AGENDA FOR THE REGULAR MEETING
OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA
HELD IN COUNCIL CHAMBERS, 300 PARK AVENUE AT 7:30 P.M.,
MONDAY, FEBRUARY 10, 2014
Revised 02-10-14

1. **CALL TO ORDER**

2. **PLEDGE OF ALLEGIANCE**

3. **ROLL CALL**

4. **VALIDATION OF NOTICE OF SPECIAL MEETING**

5. **ADOPTION OF MEETING AGENDA**

6. **PROCLAMATIONS**

7. **OATH OF OFFICE TO NEW BOARD AND COMMISSION MEMBERS**

8. **RECEIPT OF PUBLIC COMMENTS, REQUESTS, AND CONSENT ITEM COMMENTS**. [The public may address Council for one 3-minute period. The Mayor may shorten the time allowed each speaker, depending on the length of the agenda and number of speakers. A chair or representative of a board, commission, or committee may make a 5-minute oral summary of the written report.]

   (1) Environmental Services Council 2013 Annual Report (Tim Stevens, ESC Chair)

   (a) Summary of Written Comments.
   (b) Council Requests

9. **REPORT OF CITY MANAGER TO COUNCIL**

   (1) Briefing on the status of Conceptual Planning for City Hall Public Safety Improvements

10. **BUSINESS ON THE AGENDA**

   (a) Second readings of ordinances and other items requiring public hearings

   (1) **(TO13-18)** ORDINANCE TO CREATE CHAPTER 35 "STORMWATER," ARTICLE I "STORMWATER MANAGEMENT" OF THE FALLS CHURCH CITY CODE TO CLARIFY AND REORGANIZE EXISTING STORMWATER MANAGEMENT REGULATION; TO ADD NEW LANGUAGE REQUIRED BY THE STATE OF VIRGINIA (1st reading 7-22-13; deferred from 11.25.13) [No

Council Action] (Public Works Director Mike Collins, Civil Engineer, Jason Widstrom)

(b) Resolutions and first readings of ordinances

(1) **(TR14-08)** RESOLUTION AUTHORIZING THE CITY MANAGER TO EXECUTE ON THE CITY'S BEHALF A MEMORANDUM OF AGREEMENT BETWEEN THE CITY OF FALLS CHURCH AND THE NORTHERN VIRGINIA TRANSPORTATION AUTHORITY (James Snyder, Director of Development Services; Paul Stoddard, Senior Planner)

(c) Consent items

(1) APPOINTMENTS

(a) New Appointment: Richard Rankin – Falls Church Cable Access Corporation Advisory Board - (11/01/13) – 10/31/16 (Unexpired Term)

(d) Items removed from consent

(e) Other business

11. **BUSINESS NOT ON THE AGENDA**

12. **COUNCIL MEMBER COMMENTS**

13. **APPROVAL OF MINUTES OF PREVIOUS MEETINGS**

(1) Minutes of November 25, 2013

14. **ADJOURNMENT**

KATHLEEN CLARKEN BUSCHOW
CITY CLERK

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AGENDA FOR THE REGULAR MEETING
OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA
HELD IN COUNCIL CHAMBERS, 300 PARK AVENUE AT 7:30 P.M.,
MONDAY, FEBRUARY 24, 2014
REVISED: 2-24-14

1. **CALL TO ORDER**
2. **PLEDGE OF ALLEGIANCE**
3. **ROLL CALL**
4. **VALIDATION OF NOTICE OF SPECIAL MEETING**
5. **ADOPTION OF MEETING AGENDA**
6. **PROCLAMATIONS**
7. **OATH OF OFFICE TO NEW BOARD AND COMMISSION MEMBERS**
8. **RECEIPT OF PUBLIC COMMENTS, REQUESTS, AND CONSENT ITEM COMMENTS**. [The public may address Council for one 3-minute period. The Mayor may shorten the time allowed each speaker, depending on the length of the agenda and number of speakers. A chair or representative of a board, commission, or committee may make a 5-minute oral summary of the written report.]

   (a) Summary of Written Comments.
   (b) Council Requests

9. **REPORT OF CITY MANAGER TO COUNCIL**
10. **BUSINESS ON THE AGENDA**

   (a) Second readings of ordinances and other items requiring public hearings

   (b) Resolutions and first readings of ordinances

   (1) **(TO14-04)** ORDINANCE TO CREATE CHAPTER 35 "STORMWATER," ARTICLE I "STORMWATER MANAGEMENT" OF THE FALLS CHURCH CITY CODE AND TO MODIFY CHAPTER 48 "ZONING," TO REMOVE STORMWATER DEVELOPMENT CRITERIA AND CREATE A CAP ON IMPERVIOUS COVERAGE (Mike Collins, Director of Public Works; Jason Widstrom, Engineer)

   (2) **(TR14-10)** RESOLUTION TO GRANT A CONDITIONAL USE PERMIT FOR ASSISTED LIVING AND A SPECIAL EXCEPTION TO INCREASE THE BUILDING HEIGHT BONUS BY 18 FEET AND FROM FOUR TO FIVE STORIES WITH A MAXIMUM HEIGHT OF 73 FEET FOR DEVELOPMENT ON APPROXIMATELY 0.77 ACRES OF LAND LOCATED AT 700 WEST BROAD STREET (REAL PROPERTY CODE NUMBERS ARE 51-131- REAL PROPERTY CODE NUMBERS 51-131-003 AND 51-131-005) KNOWN AS "THE KENSINGTON AT FALLS CHURCH" BY NOVA HABITAT, INC**.**

   (3) REFERRAL OF THE DRAFT DOWNTOWN FALLS CHURCH POA SMALL AREA PLAN TO BOARDS AND COMMISSIONS FOR REVIEW AND COMMENT. (James Snyder, Director of Planning and Development)

(4) **(TR14-09)** RESOLUTION TO APPROVE THE CONSOLIDATED PLAN ACTION PLAN FOR FISCAL YEAR 2014

(5) **(TO14-01)** ORDINANCE TO AMEND THE BUDGET OF EXPENDITURES AND REVENUES, APPROPRIATING FUNDS FOR THE FISCAL YEAR 2014: GENERAL FUND, WATER REVENUE FUND, STORMWATER FUND, CAPITAL IMPROVEMENT PROJECT FUND AND SPECIAL TRANSPORTATION CAPITAL IMPROVEMENT PROJECT FUND (Richard LaCondre, CFO and Director of Finance)

(c) Consent items

(1) AUTHORIZE THE CITY MANAGER TO AMEND AND AWARD THE CONTRACT WITH MID-ATLANTIC TENNIS COURTS TO EXPEND UP TO $150,000 FOR BASKETBALL AND TENNIS COURT RE PLACEMENTS AND REPAIRS (Daniel Schlitt, Director of Recreation and Parks)

(d) Items removed from consent

(e) Other business

11. **BUSINESS NOT ON THE AGENDA**

12. **COUNCIL MEMBER COMMENTS**

13. **APPROVAL OF MINUTES OF PREVIOUS MEETINGS**

~~(1) December 9, 2013~~
(2) January 6, 2014
(3) November 25, 2013

14. **CLOSED SESSION**
Pursuant to Virginia Code §**2.2-3711. (A)** 7. Consultation with legal counsel employed or retained by the City regarding specific legal matters requiring the provision of legal advice by such counsel. [Voluntary Concessions for Special Exception for The Kensington at Falls Church]

15. **ADJOURNMENT**

KATHLEEN CLARKEN BUSCHOW, CITY CLERK

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AGENDA FOR THE REGULAR MEETING
OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA
HELD IN COUNCIL CHAMBERS, 300 PARK AVENUE AT 7:30 P.M.,
MONDAY, MARCH 24, 2014

1. **CALL TO ORDER**

2. **PLEDGE OF ALLEGIANCE**

3. **ROLL CALL**

4. **VALIDATION OF NOTICE OF SPECIAL MEETING**

5. **ADOPTION OF MEETING AGENDA**

6. **PROCLAMATIONS**

   (a) Proclamation Declaring April 1-7, 2014 as Local Government Education Week *(Assistant City Manager Cindy Mester)*

7. **OATH OF OFFICE TO NEW BOARD AND COMMISSION MEMBERS**

8. **RECEIPT OF PUBLIC COMMENTS, REQUESTS, AND CONSENT ITEM COMMENTS**. [The public may address Council for one 3-minute period. The Mayor may shorten the time allowed each speaker, depending on the length of the agenda and number of speakers. A chair or representative of a board, commission, or committee may make a 5-minute oral summary of the written report.]

   (1) CACT Annual Report Presentation to Council *(CACT Vice Chair Hal Morgan)*

   (a) Summary of Written Comments
   (b) Council Requests

9. **REPORT OF CITY MANAGER TO COUNCIL**

10. **BUSINESS ON THE AGENDA**

    (a) Second readings of ordinances and other items requiring public hearings

    (1) **(TO14-04)** ORDINANCE TO CREATE CHAPTER 35 "STORMWATER," ARTICLE I "STORMWATER MANAGEMENT" OF THE FALLS CHURCH CITY CODE AND TO MODIFY CHAPTER 48 "ZONING," TO REMOVE STORMWATER DEVELOPMENT CRITERIA AND CREATE A CAP ON IMPERVIOUS COVERAGE *(Public Works Director Mike Collins)*

    (2) **(TO14-01)** ORDINANCE TO AMEND THE BUDGET OF EXPENDITURES AND REVENUES, APPROPRIATING FUNDS FOR THE FISCAL YEAR 2014:

GENERAL FUND, WATER REVENUE FUND, STORMWATER FUND, CAPITAL IMPROVEMENT PROJECT FUND AND SPECIAL TRANSPORTATION CAPITAL IMPROVEMENT PROJECT FUND *(CFO and Director of Finance Richard LaCondre)*

(3) **(TO14-03)** ORDINANCE TO APPROVE A TEN-MONTH EXTENSION OF THE CABLE TELEVISION FRANCHISE HELD BY COXCOM, LLC, UNTIL JANUARY 31, 2015, TO ALLOW THE CITY AND THE FRANCHISEE TO COMPLETE RENEWAL DISCUSSIONS *(Assistant City Manager Cindy Mester)*

(b) Resolutions and first readings of ordinances

(1) **(TO14-19)** ORDINANCE FIXING AND DETERMINING THE BUDGET OF EXPENDITURES AND REVENUES, APPROPRIATING FUNDS FOR THE FISCAL YEAR 2015: GENERAL FUND; SCHOOL OPERATING FUND; SCHOOL COMMUNITY SERVICE FUND; AND SCHOOL FOOD SERVICE FUND; SEWER FUND, STORMWATER FUND; AND AFFORDABLE HOUSING FUND *(City Manager Wyatt Shields)*

(2) **(TO14-20)** ORDINANCE FIXING AND DETERMINING THE FY2015-FY2019 CAPITAL IMPROVEMENTS PROGRAM AND APPROPRIATING EXPENDITURE AND REVENUE FUNDS FOR THE FISCAL YEAR 2015 *(City Manager Wyatt Shields)*

(3) **(TO14-05)** ORDINANCE TO AMEND CHAPTER 40, "TAXATION," ARTICLE VII, "TAX RELIEF FOR LOW INCOME ELDERLY OR PERMANENTLY AND TOTALLY DISABLED," SECTIONS 40-133 THROUGH 40-137 *(Chief Deputy Treasurer Jody Acosta)*

(4) **(TO14-17)** ORDINANCE SETTING THE RATE OF TAX LEVY ON REAL ESTATE, PERSONAL PROPERTY, MACHINERY AND TOOLS AND ALL OTHER PROPERTY SEGREGATED BY LAW FOR LOCAL TAXATION IN THE CITY OF FALLS CHURCH VIRGINIA FOR TAX YEAR 2014 AND SHORT TAX YEAR 2015 *(City Manager Wyatt Shields)*

(5) **(TO14-21)** ORDINANCE TO AMEND AND REVISE CHAPTER 15 "FEES," ARTICLE II, "DEPARTMENT OF DEVELOPMENT SERVICES," TO INCLUDE UPDATES TO FEES AND LANGUAGE *(Development Services Director Jim Snyder)*

(6) **(TO14-22)** ORDINANCE TO AMEND CHAPTER 42, "UTILITIES," TO REVISE SEWER RATES AND FEES AS OF JULY 1, 2014 *(Public Works Director Mike Collins)*

(7) **(TR14-12)** RESOLUTION TO AMEND THE AGREEMENT FOR THE SALE OF THE POST OFFICE LOT *(City Manager Wyatt Shields)*

(c) Consent items

(1) Reappointment: Peter Adriance – Environmental Services Council – 03/01/14 – 02/28/17

(d) Items removed from consent

(e) Other business

11. **BUSINESS NOT ON THE AGENDA**

12. **COUNCIL MEMBER COMMENTS**

13. **APPROVAL OF MINUTES OF PREVIOUS MEETINGS**

14. **ADJOURNMENT**

KATHLEEN CLARKEN BUSCHOW
CITY CLERK

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AGENDA FOR THE REGULAR MEETING
OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA
HELD IN COUNCIL CHAMBERS, 300 PARK AVENUE AT 7:30 P.M.,
WEDNESDAY, APRIL 16, 2014

[The City Council Meeting was rescheduled in observance of Passover on Monday and Tuesday]

1. **CALL TO ORDER**

2. **PLEDGE OF ALLEGIANCE**

3. **ROLL CALL**

4. **VALIDATION OF NOTICE OF SPECIAL MEETING**

5. **ADOPTION OF MEETING AGENDA**

6. **PROCLAMATIONS**

   (1) Proclamation Declaring April 2014, Fair Housing Month

7. **OATH OF OFFICE TO NEW BOARD AND COMMISSION MEMBERS**

8. **RECEIPT OF PUBLIC COMMENTS, REQUESTS, AND CONSENT ITEM COMMENTS**. [The public may address Council for one 3-minute period. The Mayor may shorten the time allowed each speaker, depending on the length of the agenda and number of speakers. A chair or representative of a board, commission, or committee may make a 5-minute oral summary of the written report.]

   (1) Employee of the Year

   (a) Summary of Written Comments.
   (b) Council Requests

9. **REPORT OF CITY MANAGER TO COUNCIL**

10. **BUSINESS ON THE AGENDA**

    (a) Second readings of ordinances and other items requiring public hearings

    PUBLIC HEARING ON THE FOLLOWING – No Council Action:

    - **The next Public Hearing and Second Reading/Council Action is scheduled for Monday, April 28, 2014**

    (1) **(TO14-19)** ORDINANCE FIXING AND DETERMINING THE BUDGET OF EXPENDITURES AND REVENUES, APPROPRIATING FUNDS FOR THE

FISCAL YEAR 2015: GENERAL FUND; SCHOOL OPERATING FUND; SCHOOL COMMUNITY SERVICE FUND; AND SCHOOL FOOD SERVICE FUND; SEWER FUND, STORMWATER FUND; AND AFFORDABLE HOUSING FUND *(City Manager Wyatt Shields)*

(2) **(TO14-20)** ORDINANCE FIXING AND DETERMINING THE FY2015-FY2019 CAPITAL IMPROVEMENTS PROGRAM AND APPROPRIATING EXPENDITURE AND REVENUE FUNDS FOR THE FISCAL YEAR 2015 *(City Manager Wyatt Shields)*

(3) **(TO14-05)** ORDINANCE TO AMEND CHAPTER 40, "TAXATION," ARTICLE VII, "TAX RELIEF FOR LOW INCOME ELDERLY OR PERMANENTLY AND TOTALLY DISABLED," SECTIONS 40-133 THROUGH 40-137 *(Chief Deputy Treasurer Jody Acosta)*

(4) **(TO14-17)** ORDINANCE SETTING THE RATE OF TAX LEVY ON REAL ESTATE, PERSONAL PROPERTY, MACHINERY AND TOOLS AND ALL OTHER PROPERTY SEGREGATED BY LAW FOR LOCAL TAXATION IN THE CITY OF FALLS CHURCH VIRGINIA FOR TAX YEAR 2014 AND SHORT TAX YEAR 2015 *(City Manager Wyatt Shields)*

(5) **(TO14-21)** ORDINANCE TO AMEND AND REVISE CHAPTER 15 "FEES," ARTICLE II, "DEPARTMENT OF DEVELOPMENT SERVICES," TO INCLUDE UPDATES TO FEES AND LANGUAGE *(Development Services Director Jim Snyder)*

(6) **(TO14-22)** ORDINANCE TO AMEND CHAPTER 42, "UTILITIES," TO REVISE SEWER RATES AND FEES AS OF JULY 1, 2014 *(Public Works Director Mike Collins)*

(b) <u>Resolutions and first readings of ordinances</u>

(1) REFERRAL OF THE DRAFT DOWNTOWN FALLS CHURCH POA SMALL AREA PLAN TO BOARDS AND COMMISSIONS FOR REVIEW AND COMMENT. (James Snyder, Director of Development Services)

(c) <u>Consent items</u>

(1) AUTHORIZE THE CITY MANAGER TO AWARD A CONTRACT TO AVON CORPORATION IN AN AMOUNT UP TO $1,638,620 FOR THE PEARSON BRANCH AND COE BRANCH STREAM RESTORATION PROJECTS. (Mike Collins, Director of Public Works)

CONSENT MOTION: MOVE to authorize the City Manager to award a Contract to Avon Corporation in an amount up to $1,638,620 for the Pearson Branch and Coe Branch Stream Restoration Projects.

(2) *Appointments*

a) New Appointment: Doug Devereaux – Citizens' Advisory Committee on Transportation – (02/01/14) – 01/31/17 (Unexpired term)
b) Reappointment: Laurence J. Dorr – Tree Commission – 04/01/14 – 03/31/17
d) Reappointment: Kathleen Philpott Costa – Tree Commission - 04/01/14 – 03/31/17
e) Reappointment: Glenn Stephens – City Employee Review Board – 11/01/13 – 10/31/16
f) Appointment of Leah Porzel as Member Emeritus of the Girls' Home Advisory Board

(d) Items removed from consent

(e) Other business

11. **BUSINESS NOT ON THE AGENDA**

12. **COUNCIL MEMBER COMMENTS**

13. **APPROVAL OF MINUTES OF PREVIOUS MEETINGS**

(1) January 13, 2014
(2) January 27, 2014
(3) March 10, 2014

14. **ADJOURNMENT**

KATHLEEN CLARKEN BUSCHOW
CITY CLERK

Council Work Session to Follow

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AGENDA FOR THE REGULAR MEETING
OF THE CITY COUNCIL OF THE CITY OF FALLS CHURCH, VIRGINIA
HELD IN COUNCIL CHAMBERS, 300 PARK AVENUE AT 7:30 P.M.,
MONDAY, May 12, 2014

[Note: The following two items are not on the agenda and will not be heard this evening. Council will hold public hearings and take action on these matters on May 27, 2014.
(1)**(TR14-10)** Resolution To Grant A Special Use Permit For Assisted Living And A Special Exception To Increase The Building Height Bonus By Eighteen (18) Feet And From Four To Five (4-5) Stories With A Maximum Height Of Seventy-Three (73) Feet For Development On Approximately 0.77 Acres Of Land Located At 700 West Broad Street (Real Property Code Numbers 51-131-003 And 51-131-005) Known As "The Kensington At Falls Church" By Nova Habitat, Inc.; and
(2) **(TO14-16)** Ordinance To Amend The Official Zoning Map Of The City Of Falls Church To Remove Mixed-Use Redevelopment (MUR-1) From 700 West Broad Street (Real Property Code Numbers 51-131-003 and 51-131-005)]

AGENDA

1. **CALL TO ORDER**

2. **PLEDGE OF ALLEGIANCE**

3. **ROLL CALL**

4. **VALIDATION OF NOTICE OF SPECIAL MEETING**

5. **ADOPTION OF MEETING AGENDA**

6. **PROCLAMATIONS**

   (1) Presentation of Virginia General Assembly House Joint Resolution No. 350 Commending Henderson House *(Virginia General Assembly Delegate Marcus Simon and Assistant City Manager Cindy Mester)*

   (2) Proclamation Declaring May as Watershed and Floodplain Awareness Month *(Director of Public Work Mike Collins)*

   (3) Proclamation Declaring May 11-17, 2014 as Police Week *(Police Chief Mary Gavin)*

7. **OATH OF OFFICE TO NEW BOARD AND COMMISSION MEMBERS**

8. **RECEIPT OF PUBLIC COMMENTS, REQUESTS, AND CONSENT ITEM COMMENTS**. [The public may address Council for one 3-minute period. The Mayor may shorten the time allowed each speaker, depending on the length of the agenda and number of

speakers. A chair or representative of a board, commission, or committee may make a 5-minute oral summary of the written report.]

(1) Presentation on Citizens for a Better City (CBC) proposal to add youth members to boards and commissions (CBC Vice President Carol Loftur-Thun)

(a) Summary of Written Comments.
(b) Council Requests

9. **REPORT OF CITY MANAGER TO COUNCIL**

(1) Presentation on the City's New Website (Director of Communications Susan Finarelli)

10. **BUSINESS ON THE AGENDA**

(a) Second readings of ordinances and other items requiring public hearings

(b) Resolutions and first readings of ordinances

(1) **(TO14-23)** ORDINANCE TO AMEND ORDINANCE 1916, REGARDING THE FY2014-FY2018 CAPITAL IMPROVEMENT PROGRAM BUDGET, AND TO APPROPRIATE EXPENDITURE AND REVENUE FUNDS FOR FISCAL YEAR 2014 (CFO Richard LaCondre´)

(c) Consent items

(1) APPOINTMENTS

(a) New Appointment: Kimball Winn – Historic Architectural Review Board – (02/01/13) – 01/31/17 (Unexpired Term)
(b) Reappointment: Linda Valentino – Historic Architectural Review Board - 02/01/14 – 01/31/18
(c) Reappointment: Sharon Friedlander – Architectural Advisory Board - 06/01/14 – 05/31/17

(2) AUTHORIZE THE CITY MANAGER TO AWARD A SOLE SOURCE CONTRACT TO HESS CONSTRUCTION IN AN AMOUNT UP TO $510,114 FOR STORMWATER IMPROVEMENTS AT THE CHILDHOOD DEVELOPMENT CENTER *(Director of Public Work Mike Collins)*

CONSENT MOTION: MOVE to authorize the City Manager to award a sole source contract to Hess Construction in an amount up to $510,114 for stormwater improvements at the Childhood Development Center.

(3) AUTHORIZE THE CITY MANAGER TO SIGN AN AGREEMENT WITH LV COMM-SEC, INC. IN AN AMOUNT UP TO $150,000 FOR FIRST YEAR FOR ELECTRONIC CARD ACCESS AND SECURITY SYSTEM SERVICES AND TO RENEW THIS CONTRACT FOR FOUR ADDITIONAL ONE-YEAR

MAINTENANCE PERIODS (SUBJECT TO ANNUAL APPROPRIATION OF FUNDS BY CITY COUNCIL) *(Assistant City Manager Cindy Mester & Director of Public Work Mike Collins)*

CONSENT MOTION: MOVE to authorize the City Manager to sign an agreement with LV Comm-Sec, Inc. in an amount up to $150,000 for first year for electronic card access and security system services; and to renew this contract for four additional one-year periods (subject to annual appropriation of funds by City Council).

(d) Items removed from consent

(e) Other business

11. **BUSINESS NOT ON THE AGENDA**

12. **COUNCIL MEMBER COMMENTS**

13. **APPROVAL OF MINUTES OF PREVIOUS MEETINGS**

14. **CLOSED SESSION:** Closed session pursuant VA Code Section **2.2-3711 (A)1.** Discussion …. of prospective candidates for employment;…. of specific public officers, appointees, or employees of any public body;…. [City Attorney Recruitment]

15. **ADJOURNMENT**

KATHLEEN CLARKEN BUSCHOW
CITY CLERK

The City of Falls Church is committed to the letter and spirit of the Americans with Disabilities Act. To request a reasonable accommodation for any type of disability call 703 248-5014 (TTY 711). The City of Falls Church is committed to the letter and spirit of the Americans with Disabilities Act. To request a reasonable accommodation for any type of disability call (703) 248-5014, (TTY 711).For information in your language please call 703 248-5014 (TTY 711) to request an interpreter. Để có thông tin bằng ngôn ngữ của quý vị, xin gọi 703-248-5014 để yêu cầu người thông dịch. Para recibir información en su idioma por favor llame al 703 248-5014 (TTY 711) para solicitar un interprete.

APPENDIX H
ESC MEETING MINUTES

- July 2013 – Stormwater Ordinance
- October 2013 – Stormwater Ordinance, Stormwater Utility Fund Credit Program
- November 2013 – Stormwater Ordinance, Stormwater Utility Fund Credit Program, Stream Restoration Projects

Environmental Services Council Agenda

Thursday, July 18, 2013 7:30 - 9:30 pm Dogwood Room, G Corridor

1. **Call to Order**
2. **Public Comments**
3. **Approval of Minutes (June 2013)**
4. **New Business (Presentations)**
    - David Smith- Technical Director
        - Interlocking Concrete Pavement Institute
    - Paul Stoddard- Planner
        - Transportation policy update
5. **Old Business**
6. **Discussion items**
    - Draft descriptions for legislative letter
7. **Informational Items**
    - Misc.
8. **Other Business**
9. **Set Next Meeting**
    - **September 19, 2013**
10. **Adjournment**

The City of Falls Church is committed to the letter and spirit of the Americans with Disabilities Act.

To request a reasonable accommodation for any type of disability call (703) 248-5456, (TTY 711).

Falls Church Environmental Services Council
Thursday July 18, 2013 - 7:30 - 9:30 pm
Dogwood Room, G Corridor

DRAFT
Minutes - Prepared by Suzanne Updike

1. Call to Order

Members present: Suzanne Updike, Sarah Bayldon, Peter Oppenheimer, Bill Schellstede and Tim Stevens (Chair)

City Staff present: Allison Lohrenz, Jason Widstrom, Paul Stoddard

2. Public Comments - none

3. New Business –Two presentations

- David Smith, Technical Director of the Interlocking Concrete Pavement Institute presented information on the increasing use of pervious pavers for storm water management. Pavers are suitable for locations with local traffic volume. Pavers rest on three layers of bedding rock, with or without an impervious liner and underdrain. Locations with favorable conditions (e.g., pervious soil) can sometimes avoid separate SW pipes. In other cases, the paving system only detains a portion of the runoff. He said bedding layer has a 35-40% storage capacity. He cited a range of percentages for possible reductions of runoff volume (25-99%) TN (30-60%), TP (23-50%), TSS (60-80%), and metals (12-70%). He expressed support for city to provide maximum credit possible in storm water utility fee program to promote the use of pervious pavers.

  Brief ESC discussion with city engineer, Jason Widstrom following presentation included issues related to the size and application of potential utility fee credits, limitation to use of wider use pervious pavers in FC including cost, slope, underlying soil, maintenance.

- Peter Stoddard, City Transportation Planner, provided an update on planning efforts related to walking, biking and transit.

  Walking – The common distance sited for the average walking commute is under half a mile. Mentioned “walk appeal” – people will walk longer distances when surrounding areas are pleasant. http://www.originalgreen.org/blog/walk-appeal.html

  Discussed shared parking issue. Last study was done in late 90’s. Need funding/manpower to update parking numbers. No formal agreements exist between commercial properties to share parking at this time.

Biking – He presented ideas for improving specific locations on the W&OD trail, including trail entrances to FCC. City is developing plans to improve the western entrance first (site of existing storage shed). He is seeking funding from EDA to fund wayfinding signs to direct cyclists to various city locations. Would like sherrow markings on streets to alert drivers to share road, no funding exists for this right now. Discussion of possible ways to allow public to request bike racks. Discussion WABA's work supporting the DC bike rack program, Capital Bike Share.

Transit – 1,400 trips start in FCC daily. There are 40 stops, only five with shelters. Looking at possibly consolidating bus stops, possible new/shifted shelter locations.

4. Old business

- ESC has a chance to comment on the South Washington Street small area plan. We will discuss at September meeting, as comments are due the end of September.

- Storm water. Jason Widstorm, City Engineer, discussed progress of the City's draft storm water ordinance. It contains new language and incorporates existing code language -- both Chesapeake Bay regulations (pulled from Zoning) and erosion and sediment control. The city council's second reading of the new ordinance should happen in October.

- Jason is seeking a member of the ESC to serve on a citizen panel as the City develops its policy regarding BMP credits as part of the planned storm water utility.

6. Discussion Items

- Annual letter to City Council recommending legislation for the 2014 State General Assembly. ESC members expressed support for the draft letter.

- Approval of Minutes (May 2013) -- approved.

7. Next meeting: September (Minutes: Adriance)

8. Adjournment - at 9:00

Environmental Services Council Agenda

Thursday, October 17, 2013 7:30 - 9:30 pm Dogwood Room, G Corridor

1. **Call to Order**
2. **Public Comments**
3. **Approval of Minutes (Sept 2013)**
4. **New Business**
    - Discuss inviting newly elected Councilmembers to future ESC meeting
5. **Old Business**
    - Stormwater Credit System Update & Discussion of new timeline
6. **Discussion items**
    - WABA Spokesperson
    - Proceeds from potential sale of Water Utility
7. **Informational Items**
    - EPA Green Power Community Challenge Celebration Date
    - ESC state legislation program update
    - Bike rack at Burke & Herbert Bank
8. **Set Next Meeting**
    - **Magnolia Room, 7:30 p.m. November 21, 2013**
9. **Adjournment**

The City of Falls Church is committed to the letter and spirit of the Americans with Disabilities Act.

To request a reasonable accommodation for any type of disability call (703) 248-5456, (TTY 711).

Environmental Services Council – Draft Minutes

Thursday, October 17, 2013 7:30 - 9:30 pm

Dogwood Room, G Corridor

Minutes by Peter Adriance

1. Call to Order

Present: Peter Oppenheimer, Peter Adriance, Ray Arnaudo, Tim Stevens, Sarah Bayldon

City Staff: Allison Lohrenz

Absent: Bill Schellstede, Suzanne Updike

Guest: Katie Mandes (Center for Climate and Energy Solutions, PEW, in charge of community engagement) She is potentially interested in involvement with the ESC.

2. Public Comments - none

3. Approval of Minutes (Sept 2013) – approved with corrections

4. New Business

• **Discuss inviting newly elected Councilmembers to future ESC meeting** – elections will occur November 5; new council convenes first of year and makes assignments to the committees. Johanna Barry is not running for re-election, so we will have a new council liaison.

DECISION: after election, Tim will send an invitation to those who are new to the Council to attend our November or December meeting.

5. Old Business

• **Stormwater Credit System Update & Discussion of new timeline** – There is a lot of confusion on this issue. Tim reviewed how this has evolved. The council has created a storm water utility with a fee that is tax deductible and includes non-profits. The task force is charged with recommending the fee structure. A lot still needs to be worked out. In December, the City will send around the GIS info on impervious surfaces. Bills will appear in June. Avg. homeowner will be billed $200-300/yr. Not many are aware of the specifics. This may be one of the first things on the new Council's agenda. Churches with big lots will be charged about $5-6,000. The system needs to be fair to float with residents. Good communication is essential. Arlington hired a firm to work on communications for their plan. A new customer service representative has been hired for stormwater.

DECISION: The ESC recommends that communications on this project should be a top priority. We will invite the new customer service representative to our next meeting and exchange thoughts on a good outreach strategy.

• **Stormwater ordinance** – Tim distributed our draft comments from the last meeting. The ordinance codifies stormwater provisions. As technology has developed, the limits on impervious coverage have become somewhat obsolete. ESC urges the Council not to remove the language from City code.

6. Discussion items

• **WABA Spokesperson** – Peter O. has done outreach to a representative of WABA to see if he could share with us area experience on practices encouraging biking. The city will revisit the bike/ped plan in about a month. (They want to take out recommendations on sidewalk installations that would eliminate street parking and substantial landscaping.)

DECISION: We will hold off for now on inviting the WABA spokesperson pending developments on the bike/ped plan.

- **Proceeds from potential sale of Water Utility –** Public information sessions have been interesting, but there has not been a lot of attendance. The sale will likely pass. The city will receive about $10mm net profit from it. 30% of the land acquired can be used for commercial development. We should be aware of this for future agendas.

7. Informational Items

- **EPA Green Power Community Challenge Celebration Date –** Several businesses pitched in, following appeals from citizens to help push this to the top. The new celebration date is Monday Oct. 28, 7:30PM. Tim will speak briefly. Attendance is encouraged to show support for green energy in the city.

- **ESC state legislation program update –** Tim has spoken with Dave Snyder and Phil Duncan. Nothing new to report. Adjacent communities are interested in collaborating with Falls Church on legislative recommendations.

- **Bike rack at Burke & Herbert Bank –** Dan Sze sent a note directly to a manager he knows. They agreed to install a bike rack, which is on order. The City should generate publicity with this and encourage its spread.

- **Other –**

- **ESC filed comments on the S. Washington small area plan**.

- **Speaker opportunities**:

- Northern VA Conservation Trust – still waiting to hear

- LEAP – an umbrella group dealing with energy efficiency, energy audits, etc. is working with Arlington. They act like a neutral third party, recommending contractors, etc. Peter O. invited them to speak with us, sometime after the new Council is elected.

- Dominion has an environmental report; we could have someone speak to us about their practices and how smart meters might be used most effectively. DECISION: We will invite them to speak with us early next year.

New Director of Public Works: Michael Collins has been hired to start Dec. 9 as Director of Public Works (Bill Hicks' replacement). He managed Arlington County road maintenance and fleet, plus their design dept.

8. Set Next Meeting

- Magnolia Room, 7:30 p.m. November 21, 2013

9. Adjournment

Agenda
Environmental Services Council
Thursday November 21, 2013 7:30 pm Magnolia Room, G Corridor

1 . Call to Order

2. Public Comments

3. Approval of Minutes (Oct 2013)

4. New Business
- Andrea Reese, Land Conservation Specialist
- 2013 Accomplishments

5. Old Business
- Stormwater credit system update
- Consumer disposable bag legislation

6. Discussion items
- Budget process and discussion

7. Informational Items

8. Set Next Meeting

9. Adjournment

APPROVED Minutes

Falls Church Environmental Services Council

Thursday, November 21, 2013 7:30 - 9:30 pm

Magnolia Room

ESC Council members: Peter Adriance, Raymond Arnaudo, Sarah Bayldon, Peter Oppenheimer, Tim Stevens, Suzanne Updike, Bill Schellstede

Present: Tim Stevens (Chairman), Peter Adriance, Sarah Bayldon, Peter Oppenheimer, Suzanne Updike, Bill Schellstede, Ray Arnaudo, Allison Lohrenz – City Staff Liaison

Visitors: Karen Oliver, City Council Member Elect, Andreas Reese, Land Conservation Specialist, Northern Virginia Conservation Trust; Jason Widstrom - City Staff

Tim Stevens and the ECS members welcomed Ms Oliver to the meeting and thanked her for expressing interest in the work that we do. We expressed our hope that we could be useful to her and her colleagues in the coming year.

Technical Briefing: Conservation Easements and NVCT

Ms Reese provided interesting background and technical details with regard to placing land into conservation trusts to protect that land from development. Such codicils to property deeds prevent subsequent owners from making changes to the land that would threaten its ecological properties; NVCT enforces such provisions. NVCT manages conservations trusts throughout Northern Virginia, including property in Falls Church, for example, the Boy Scout lodge. Ms. Reese stated that she would continue to reach out in the Falls Church community to build partnerships and help look for conservation opportunities in our area. Additional, Ms. Reese is willing to set up a viewing of "Green Fire" if there is interest.

Old Business

Stormwater Credit Task Force - Tim Stevens updated the ESC on progress in implementing the Stormwater Credit System. The committee charged with defining the incentive scheme for encouraging the adoption of BMPs has completed its work. Credit on the stormwater fee will be granted on the placement of certified BMPs at a rate of 30% for reduction in the quantity of runoff from a lot, 30% for improvement in the quality of that runoff, and 10% for SWIPs (Storm water implementation plans), aimed mostly for residential lots.

Stormwater Ordinance- Jason Widstrom briefed the ESC on the progress to date and plans for the near future in the adoption and implementation of the Storm Water Management Plan. Jason informed us that the Council is unlikely to vote on the Stormwater Ordinance until early next year; there is still discussion about removing the 35% limitation on impermeable surface and replacing it solely with the 0.41 lb./acre/year limit on phosphorus pollution. There was some opinion in the ESC that the simple statement of a 35% limitation was easier for all to understand and was therefore desirable, especially before the restatement of that limit in zoning language has not yet be accomplished. At the same time, the strictly environmental implications in the argument remain are not at all clear. In order to apply the more stringent requirements of the Plan on the several large developments slated to begin in the near future, Bill Schellstede moved that the Chair be authorized to communicate to the City Council that the ESC strongly recommends that the date for the inception of the requirements be advanced to January 1, 2014; a majority of the ESC approved the motion.

Streambed restoration- Jason also briefed the ESC on progress toward two projects for natural streambed restoration, one on Coe Branch, the other on Pearson Branch, both small tributaries to Tripps Run. The improvements will stabilize the channels and mimic natural streams. The $1.8 million cost includes matching funds from the City's new stormwater

fees; the matching funds from a federal grant must be expended by end April, and thus construction must be completed in 90 days. Design of the projects included participation of area residents. The Coe Branch project includes daylighting some of the stream. Some 400 trees will be removed to make way for the construction; replacements will include hundreds of trees and other plantings.

Several members expressed support for the goals of the projects.

Legislative Recommendations Tim Stevens reported that both the recommendations the ESC made to the City Council - recommending the approval of community net metering and permitting local jurisdictions to regulate the use of plastic bags - were forwarded to Richmond by the City and will be submitted to the legislature.

Budget – Allison explained the budget process. The initial budget discussions begin in November, ends for staff in January and after multiple discussion between the City Council and School Board, is adopted in April. It was then realized the overall goal of the budget discussion was when is the appropriate time to ask the City Council for more staff or staff resources. It was decided that the earlier the better, summer would be the ideal time with multiple letters ending in December.

Adjournment – 9:15 p.m. Next meeting is Thursday, December 19, 2013.

APPENDIX I
GKY IDDE EXPANDED SCOPE OF WORK AND SOP

June 4, 2014

Mr. Jason Widstrom, P.E.
Deputy Director
Engineering and Construction Division
Department of Environmental Services
City of Falls Church
300 Park Avenue
Suite 100W
Falls Church, VA 22046

RE: Contract #0309-11-SGES-GKY, Year Three
Task Order #11 – Scope of Work Revision for MS4 Permit Stormwater Services and City Yard Conceptual Plan

Dear Mr. Widstrom:

GKY received authorization to proceed on Task Order #11 on March 26, 2014 and has made significant progress towards the completion of many of the tasks specified in the Task Order. However, based upon the City's request to address issues identified on the findings of the work to date, GKY proposes several revisions to the Scope of Work. Specifically, proposed revisions should be made to the Scope of Work for Tasks 2 and 3 of the existing task order to broaden the scope to assist the City in complying with the requirements of the City's Phase II Municipal Separate Storm Sewer System (MS4) Permit for small municipalities (General Permit). In addition, based upon the broadened scope, the fees associated with this proposed expansion would increase the initial cost by $12,555.40. GKY proposes to extend the period of performance for the task order as outlined below in order to accommodate the City's request.

Task 2—Review and Comment on the City's Illicit Discharge Detection and Elimination (IDDE) Manual and Procedures

As specified in the original Scope of Work, GKY conducted an initial review of the City's IDDE manual to identify discrepancies with the requirements included in the General Permit and to investigate the City's ability to respond to illicit discharges and provide recommendations for improving response capabilities.

Based upon the findings of the IDDE manual review, GKY identified that the City's existing IDDE manual is in need of more than minor revisions to bring the manual into compliance with the General Permit and recommends that the City abandon the existing manual in favor of a more streamlined approach with pertinent information regarding the City's current IDDE program. The outline of the proposed manual is attached.

The original Task 2 Scope of Work contained a total of 56 hours for the review of the existing manual, updating of the IDDE manual to include specific language to address any discrepancies with the requirements in the General Permit, and the development a brief (no more than 2 to 3 pages) IDDE response protocol. GKY estimates that an additional 32 hours will be needed to develop the new manual in the proposed format.

(P)703.642.5080 (F)703.642.5367 WWW.GKY.COM
4229 LAFAYETTE CENTER DRIVE : SUITE 1850 : CHANTILLY, VA 20151
WATER RESOURCES & ENVIRONMENTAL SOLUTIONS

Task 3—Review and Comment on the City's Operator-Owned (City) Post-Construction Stormwater Management Inspection Policy and Procedures

As specified in the original Scope of Work, GKY conducted a review of the City's current Post-Construction Stormwater Management Inspection Procedures for City-owned stormwater management facilities that were developed by GKY in 2010. GKY reviewed these procedures and identified that the document contains numerous recommendations and considerations, but is not necessarily a "written policy and procedure" meeting the requirements of the General Permit.

As outlined in GKY's deliverable for Task 3 (under the original Scope of Work), GKY recommends a significant document revision to remove items that are not part of the City's policies and procedures, and identify and clearly label guidance.

The proposed efforts under this Scope of Work revision include:

1) Restructure the document to remove recommendations;
2) Incorporate requirements for public BMP inspections;
3) Update existing tables, references and inclusions;
4) Incorporate new legal authorities;
5) Include a description of City's existing tracking system of public and private facilities;
6) Develop written inspection policies and procedures utilized in conducting inspections;
7) Develop written procedures for inspection and maintenance of operator-owned stormwater management facilities; and
8) Develop a progressive compliance and enforcement strategy.

The Task 3 Scope of Work originally contained a total of 18 hours for the review of the existing document and the development of an itemized list of required modifications to the current inspection program and the BMP inspection policy necessary to comply with the General Permit. GKY estimates that an additional 68 hours will be needed to develop the new manual in the proposed format.

This revised Scope of Work does not include the update, modification or implementation of the City's MS4 Program nor does it include the implementation or development of any recommendations or proposals identified as a result of completion of this scope.

Deliverables and Proposed Schedule:

Task 2:

1. A draft IDDE manual in the format proposed to the City. The draft IDDE manual shall be provided to the City for review within 45 business days from notice to proceed with a final version of the document provided to the City within 15 days of receipt of comments.

Task 3:

1. A revised BMP Inspection Policy for operator (City) owned facilities. The policy manual shall be provided to the City for review within 45 business days from notice to proceed with a final version of the document provided to the City within 15 days of the receipt of comments.

Proposed Task Order Schedule

GKY is prepared to proceed with the revised Scope of Work as described above upon notice to proceed from the City. GKY originally anticipated that all tasks would be completed by June 30, 2014; however, with the broadened scope, additional time will be needed.

Budget

GKY's original Scope of Work proposed a fixed fee of $60,031.85. With the broadened Scope of Work, GKY proposes an increase of $12,555.40 for a total fixed fee of $72,587.25.

We are confident that this revised Scope of Work provides an excellent solution to some of the City's challenges and will enhance the City's level of service to its citizens. Please feel free to contact me with any questions or comments. We look forward to being of service.

Sincerely,
GKY & Associates, Inc.

Stuart M. Stein, P.E. D.WRE
President

Accepted by City of Falls Church

Date

Enclosure: Proposed IDDE Manual Outline
Revision Price Summary

GKY IDDE Manual Proposed Format

1 Introduction

- 1.1 Overview
- 1.2 Authority
- 1.3 Chapter Overview
- 1.4 Roles and Responsibilities

2 Outfall Prioritization

- 2.1 Introduction
- 2.2 Prioritization Criteria
- 2.3 Desktop Analysis
- 2.4 Results

3 Dry Weather Field Screening

- 3.1 Introduction
- 3.2 Preparation for Field Screening
- 3.3 Procedures For Selecting Appropriate Field Screening Days
- 3.4 Field Screening Preparation
- 3.5 Conducting Field Screening
- 3.6 Field Screening Follow-Up

4 Addressing Complaints

- 4.1 Introduction
- 4.2 Complaint Investigation
- 4.3 Follow-Up and Reporting

5 Determining the Source of Suspect Discharges

- 5.1 Introduction
- 5.2 Preparing to Investigate Suspect Discharges
- 5.3 Investigating Suspect Discharges
- 5.4 Documentation and Recordkeeping
- 5.5 Follow-Up and Next Steps

6 Elimination of Illicit Discharges

- 6.1 Introduction
- 6.2 Authorized Discharges
- 6.3 Education and Outreach
- 6.4 Written Notice
- 6.5 Citation to Court or Other
- 6.6 Confirmation of Elimination
- 6.7 Documentation

7 Contacting Other Agencies

- 7.1 Introduction
- 7.2 Other Regulatory Agencies
- 7.3 Reporting Illicit Discharges Not Entering the City Stormwater System
- 7.4 Reporting Discharges to Receiving Waters from City Outfalls

8 Safety

8.1 Introduction
8.2 General Safety
8.3 Hazardous Materials
8.4 Physical Hazards
8.5 If an Emergency Occurs

9 Appendices

CITY OF FALLS CHURCH
DEPARTMENT OF PUBLIC WORKS
OPERATIONS DIVISION

STANDARD OPERATING PROCEDURE

SPILL AND ILLICIT DISCHARGE RESPONSE AND REPORTING

OBJECTIVE

The purpose of this procedure is to ensure that all spills and illicit discharges are handled in a safe and appropriate manner and are properly reported. This procedure covers proper response, cleanup, and reporting methods for all types of spills and illicit discharges. It applies to all Department of Public Works (DPW) employees discovering and/or responding to spills and illicit discharges and their supervisors.

Potential spills and illicit discharges may include, but are not limited to, the following:

- Sanitary Sewer Overflows (SSOs);
- Illegal Sanitary Connections, Spills, or Dumping;
- Illegal Dumping of Solid or Liquid Hazardous Materials;
- Illegal Discharges of Cleaning Products and Solvents;
- Spills of Oil and Petroleum Products;
- Spills of Fuel; and
- Spills of Hazardous Materials.

RESPONSIBILITY

DPW is responsible for coordinating and executing the activities outlined in this standard operating procedure.

BACKGROUND

Emergency Spills and Illicit Discharges

A spill or illicit discharge is considered an emergency when it poses a serious threat to human health or the environment. Emergency spills must be handled by external or internal emergency hazardous materials responders.

Non-Emergency Spills and Illicit Discharges

A spill or illicit discharge is considered a non-emergency when it is not life threatening and will not result in serious environmental damage.

PROCEDURES

Initial Notification and Response

All spills and illicit discharges, regardless of size, must be contained and cleaned up in a safe and effective manner. Spills and illicit discharges that affect or threaten public health, welfare, or the environment will be attended to immediately by protecting human safety, and containing and cleaning up the substance.

In the event that you discover or are alerted to a spill or illicit discharge, the following actions must be immediately taken:

1) Secure the site, taking priority to protect the health and safety of personnel responding to the spill or illicit discharge, bystanders, and the community.
2) Attempt to determine if the spill or illicit discharge should be considered an Emergency or Non-Emergency. If you are not able to make this determination, immediately contact your supervisor and/or the DPW Superintendent for assistance in making the determination. If the DPW Superintendent or a supervisor is not immediately available, call the City's Engineering and Construction Division – Stormwater (703-248-5350, ext. 2 (TTY 711)).

If an issue is noted in a waterway that is investigated and determined to originate in another jurisdiction, contact the jurisdiction in which the source was determined to originate. If a source was not able to be identified follow the reporting process explained below.

Emergency Spills and Illicit Discharges

1) Call 911 from a safe location and provide the following information:
    a. Name;
    b. Telephone Number;
    c. Location;
    d. Possible injuries;
    e. Type and estimated quantity of spilled material; and
    f. If there is immediate hazard to life or property.
2) Notify your supervisor and/or the DPW Superintendent and provide the same information as outlined under Item 1.
3) If deemed safe, control and contain the material using absorbent booms, socks, and/or soil until the fire department arrives. Focus control measures at location(s) of storm sewers and/or nearby waterways. Use personal protective equipment (PPE) to minimize the responder's exposure to hazardous substances.
4) If not deemed safe, stay in a safe area and allow only trained responders in the spill area.
5) Document as many details of the spill or illicit discharge and the subsequent response as possible, including if/how much of the material entered the storm drain and if the material was released to nearby waterways.

6) If the material entered the storm drain and/or was released to a nearby waterway, complete the Spill and Illicit Discharge Incident Report Form (Attachment 1) and submit the form to your supervisor and/or the Public Works Superintendent.

Non-Emergency Spills and Illicit Discharges

1) Notify your supervisor and/or the DPW Superintendent.
2) Control and contain the spill or illicit discharge using absorbent booms, socks, and/or soil (if necessary). Focus control measures at location(s) of storm sewers and/or nearby waterways.
3) If deemed safe, attempt to stop the spill or illicit discharge if it has not already been done. Use PPE to minimize the responder's exposure to hazardous substances.
4) Apply absorbent pads/material to clean up the material. If assistance is required for the cleanup of larger events, contact an outside contractor (listed in Table 1 below). **Do not hose down spills – use "dry" cleanup methods.**
5) Dispose of the collected waste in the hazardous waste shed located at the City of Falls Church Property Yard or other location approved by the DPW Superintendent.
6) Document as many details of the spill or illicit discharge and the subsequent response as possible, including if/how much of the material entered the storm drain and was released to nearby waterways.
7) If material entered the storm drain and/or was released to a nearby waterway, complete the Spill and Illicit Discharge Incident Report Form (Attachment 1) and submit the form to your supervisor and/or the DPW Superintendent.

All spills and illicit discharges, regardless of size or material, should be reported as soon as possible to the DPW Superintendent or their designee. In the event that a spill or illicit discharge is discharging to, or has the potential to reasonably discharge to, a storm drain or waterway and the DPW Superintendent or a supervisor is not immediately available, call the City's Engineering and Construction Division – Stormwater (703-248-5350, ext. 2 (TTY 711)).

The DPW Superintendent will determine the appropriate reporting protocol. The DPW Superintendent will coordinate with the City's Engineering and Construction Division to ensure that the required documentation is completed and proper reporting protocols are followed.

<u>State, Federal, and Local Reporting</u>

All spills and illicit discharges that reach a storm drain and/or a waterway must be reported to the appropriate agencies within the specified timelines as outlined in Table 1. The nature and quantity of the spill or illicit discharge will dictate which Federal, State, and Local agencies that must be contacted to report the incident immediately or within 24 hours of being notified of the event.

In addition, the DPW Superintendent must follow-up the initial verbal notification within five (5) days of the event with a written report to VADEQ Northern Regional Office containing the following information for each spill or illicit discharge that reach storm drains or receiving waters:

- A description of the nature and location of the discharge;
- The cause of the discharge;
- The date on which the discharge occurred;
- The length of time over which the discharge continued;
- The volume of the discharge;
- If the discharge is continuing, how long it is expected to continue;
- If the discharge is continuing, what the expected total volume of the discharge will be; and,
- Any steps that the City has planned or taken to reduce, eliminate, and prevent reoccurrence of the present discharge or any future discharges.

RECORDKEEPING

For **ALL** spills and illicit discharges, the DPW employees must ensure that a Spill and Illicit Discharge Report Form (Attachment 1) is completed for each incident. In addition, the DPW Superintendent must maintain documentation of the time and date that applicable State, Federal, and Local agency(s) were notified of each spill and illicit discharge.

Table 1. Notification Procedures and Contacts

Depending on the nature and quantity of the spill or illicit discharge, the following individuals and organizations must be contacted by the DPW Superintendent, or their designee.

Agency/Organization	Contact Information	Circumstances	When to Notify
Local Agencies			
DPW Superintendent	Office – 703-248-5013 Cell – 571-238-5127	All spills and illicit discharges, regardless of size or material.	Immediately (verbal)
DPW Engineering and Construction – Stormwater	703-248-5350, ext. 2 (TTY 711)	Any discharge into the storm sewer, regardless of size or material and oil that reaches receiving waters.	Immediately (verbal)
Fire Department	911	All spills and illicit discharges that pose emergency conditions, regardless of the size or material. **AND** Discharges of oil that reach storm drains or receiving waters.	Immediately (verbal)
State Agencies			
VADEQ Pollution Response and Preparedness (PREP)	DEQ Northern Regional Office Coordinator 703-583-3864 (8:30 AM to 4:30 PM) Alternative website reporting at: http://www.deq.virginia.gov/Programs/PollutionResponsePreparedness/PollutionReportingForm.aspx	All spills and illicit discharges that discharge, or have the potential to reasonably discharge, to receiving waters regardless of size or material. **OR** All spills and illicit discharges causing a film or sheen on a waterway's surface, or leaves sludge or emulsion beneath the surface.	Immediately or within 24 hours (verbal or internet report) **AND** Within 5 calendar days (written)
Virginia Department of Emergency Management (VADEM)	1-800-468-8892 (nights, holidays, and weekends)	Non-business hour emergency spills and illicit discharges that reach storm drains or receiving waters, regardless of size or material. **OR** Non-business hour emergency spills and illicit discharges causing a film or sheen on the receiving water's surface, or leaves sludge or emulsion beneath the surface.	Immediately during non-business hours.
Federal Agencies			
National Response Center (NRC)	1-800-424-8802	Spills and illicit discharges reaching waterways or causing a film or sheen on the water's surface, or leaves sludge or emulsion beneath the surface.	Immediately upon gaining control of spill or illicit discharge (verbal)
Others			
Response and Cleanup Contractors	TBD	Spills and illicit discharges that exceeds the capacity of local agency capabilities for response and cleanup.	As needed
Arlington County	TBD	Spills and illicit discharges originating outside of City's Jurisdiction	As needed
Fairfax County	TBD	Spills and illicit discharges originating outside of City's Jurisdiction	As needed

Attachment 1

Spill and Illicit Discharge Report Form

Spill and Illicit Discharge Report Form

Instructions: This form is to be completed by DPW field personnel and maintained by the DPW Superintendent following the Spill/Illicit Discharge Response and Reporting SOP.

Initial Spill/Illicit Discharge Identification

Name and Address of Person Making Report	Contact Information Phone: Email:	
Date	Time of Identification ☐ AM ☐ PM	Time of Report to City ☐ AM ☐ PM
Description of event (material, source of discharge, etc.)		

Spill/Illicit Discharge Description

Location (address (preferred), cross streets, boating instructions, and/or gps coordinates)		Responsible Party (name and address)	
Date	Event Start Time ☐ AM ☐ PM	Event End Time ☐ AM ☐ PM	Occurring at time of Discovery? ☐ Yes ☐ No
Material (sewage, oil, chemicals, etc.)	☐ Continuous flow ☐ Intermittent flow ☐ Discrete release (spill or dumping)		Estimated volume of the discharge in gallons
Cause of the discharge (SSO from manhole, sewage pumping from bus, oil spill, etc.)			
If the discharge is continuing, how long it is expected to continue and what will the expected total volume of the discharge be?			
Surface contacted *(check all that apply and describe)* ☐ Asphalt ☐ Concrete ☐ Soil ☐ To atmosphere		Resources entered *(check all that apply and describe)* ☐ Sewer, manhole number ☐ Storm drain, catch basin number ☐ Waterway ☐ Atmosphere	
Description of the nature and location of the discharge			
List immediate actions taken to stop / control / contain the spill and describe the results *(calls made, equipment used)*			

Spill area diagram: Include scale, north arrow, and nearby buildings for reference. Indicate the closest down-gradient catch basin and its distance from spill.

Internal Notification and Reporting		
City Contact	**Name**	**Phone Number(s)**
Person(s) Responding to Spill		
Supervisor		
Superintendent		

Reportable Quantity

Substance	Reportable Quantity	Fire Department	VADEQ PREP	VADEM	City E&C - Stormwater	NRC
Any Emergency Spill	Any	Yes	Yes	Off Business Hours	---	Yes
Oil (in or on waterways)	Any	Yes	Yes	Off Business Hours	Yes	Yes
Sewage (into storm drains and/or in waterways)	Any	---	Yes	---	Yes	---
Hazardous Chemicals	See 40 CFR 302	Yes	Yes	Off Business Hours	---	---

Immediate External Agency Contact Log (to be completed by the Superintendent or their designee)

Agency	Contact	Contact Person	Time	Date
City of Falls Church Fire Department	Emergency Events 911	Tom Polera / Dispatcher		
VADEQ Pollution Response and Preparedness (PREP)	Business Hours Emergency/Non-Emergency Reaching Waterways or Causing a Film or Sheen on Water's Surface 703-583-3864 (alternatively via web address in SOP)	Mark Miller		
Virginia Department of Emergency Management (VADEM)	Emergency Non-Business Hours 1-800-468-8892	N/A		
City of Falls Church DPW Engineering and Construction – Stormwater	Events reaching storm drain system (703-248-5350, ext. 2 (TTY 711))	Jason Widstrom		
National Response Center (NRC)	Events Reaching Waterways or Causing a Film or Sheen on Water's Surface reaching 1-800-424-8802	N/A		

Follow-Up External Agency Contact Log (to be completed by the Superintendent or their designee)

VADEQ Pollution Response and Preparedness (PREP)	Written Report of All Events Reaching Waterways or Causing a Film or Sheen on Water's Surface	Mark Miller		

Describe the steps the City has planned or taken to reduce, eliminate and prevent reoccurrence of the present discharge or any future discharges (alternative: attach written report submitted to PREP):

APPENDIX J
HAZARDOUS WASTE

- Household Hazardous Waste Flyer
- Automotive Outreach Letter
- Automotive Shop Stormwater Pollution Prevention (English and Spanish)

Household Hazardous Waste Collection Event

Hours of Operation
Saturday, August 23, 2014: 9 A.M—1 P.M

Location
Falls Church Recycling Center and Property Yard
217 Gordon Rd

Free event for City of Falls Church residents only! Proof of residency is required. (utility bill, driver's license, vehicle decal)

For more information or questions regarding disposal

- Visit www.fallschurchva.gov
- Or call 703-248-5456 (TTY 711).

LEAVE ITEMS IN ORIGINAL, LEAK-PROOF CONTAINERS

CleanHarbors ENVIRONMENTAL SERVICES®

Sponsored by the City of Falls Church Department of Public Works. Hosted by our licensed contractor CleanHarbors

Acceptable Materials for HHW Disposal

- Insecticides
- Acids
- Antifreeze
- Button batteries
- Rechargeable batteries
- Gasoline and motor oil
- Compact or fluorescent bulbs
- Floor care products
- Fungicides
- Furniture polish
- Furniture strippers
- Herbicides
- Mercury products
- Poisons
- Pool chemicals
- Rug cleaners
- Solvent-based glue
- Oil-based paint
- Oil-based stain
- Paint thinner
- Oven cleaner

Drive Through Event! Please stay in your vehicles.

Latex paint is not a household hazardous waste. You may bring it, or dry it up at home using kitty litter. Once fully dry, place the cans out, removing lids for collection in your regular household trash.

Unacceptable Materials for HHW Disposal

- Explosives
- Commercial, industrial or medical waste
- Radioactive materials
- Asbestos
- Dioxins
- Kepones
- Pharmaceutical waste

The City of Falls Church is committed to the letter and spirit of the Americans with Disabilities Act. This document will be made available in alternate format upon request. Call 703-248-5350, (TTY 711).

City of Falls Church

June 25, 2014

Subject: Automotive Industry Outreach Material

Dear Automotive Industry Facility Manager:

The City of Falls Church Department of Public Works is providing the following informational materials to establishments that are engaged in the automotive industry. This mailing is a small part of the City's effort to educate public and private businesses about the common types of illicit discharges that plague our environment. More specifically, the following materials cover general good housekeeping practices for automotive businesses and address items such are hazardous waste disposal, leaks and spills, material storage, dumpster management, and vehicle maintenance.

Please take a moment to read and share the provided information with your staff. If you have any questions about the City's stormwater program or require technical assistance on how you can improve your workplace to prevent illicit discharges please contact the City's Civil Engineer, Jason Widstrom, at 703-248-5026 or via email at jwidstrom@fallschurchva.gov.

Sincerely,

Jason Widstrom, P.E.
Civil Engineer

Enc.

Automotive Shop
Stormwater Pollution Prevention

Practice Good Shop Keeping

- Designate an area away from storm or sanitary sewer drains to change automotive fluids
- Use drip pans to capture leaks when pouring and draining fluids. Never allow pan to fill more than half full
- Post signs to prevent disposal of liquid wastes into sanitary drains
- Routinely sweep fuel dispensing areas for removal of litter and debris
- Inspect and clean facility stormdrain inlets and catch basins before the first rainfall event of the year
- Post signs at fuel dispensers warning against topping off vehicle fuel tanks
- Prohibit washing down the fueling pad off-site or to a stormdrain. Collect runoff water for proper disposal
- Do not hose down outside area, sweep or us a mop and bucket. Do not discharge mop water into the parking lot, street, gutter, or stormdrain.

Manage Spills

- Immediately clean up small spills using shop rags
- Utilize dry methods, including sweeping and absorbing cleaning agents, to clean work areas instead of hosing them down
- Prepare and use spill containment clean-up kits
- Follow your hazardous materials response plan in the event of a hazardous spill
- Train employees to be knowledgeable with hazardous spill response plans and emergency procedures

Properly Dispose of Waste

- Cover outdoor storage areas to prevent contaminated stormwater runoff
- Recycle motor oil, oil filters, antifreeze, batteries, solvents and tires
- Contact a state licensed waste hauler for proper disposal of hazardous wastes

For more information call:
City of Falls Church Department of Public Works, 703-248-5350 (TTY711)

The City of Falls Church is committed to the letter and spirit of the Americans with Disabilities Act. To request reasonable accommodation for any type of disability, call (703) 248-5350 (TTY 711).

Talleres automotores
Evite la contaminación del agua de lluvia

Implemente buenas prácticas de mantenimiento en el taller

- Para el cambio de fluidos automotores designe un área alejada de alcantarillas y drenajes pluviales (drenajes por los que se elimina el agua de lluvia).
- Al drenar y verter fluidos utilice bandejas recolectoras para recoger escurrimientos o derrames. Nunca permita que la bandeja se llene a más de la mitad de su capacidad.
- Coloque avisos para evitar la eliminación de desechos líquidos en alcantarillas/drenajes.
- Barra frecuentemente las áreas de abastecimiento de combustible para eliminar basura y residuos.
- Antes de las primeras lluvias de cada año, inspeccione y limpie las entradas/rejillas del drenaje pluvial y colector de lodo/fango del taller.
- Coloque avisos en las bombas abastecedoras de combustible desaconsejando llenar al tope el tanque de combustible de los vehículos.
- Prohíba el lavado del tapete de abastecimiento de combustible en otro lugar o en el drenaje pluvial. Recolecte el agua de escurrimientos para su eliminación adecuada.
- No limpie con manguera el área externa; barra o use cubeta y trapeador /mapo. No arroje el agua con la que limpió al estacionamiento, la calle, la alcantarilla o el drenaje pluvial.

Controle derrames

- Limpie inmediatamente cualquier derrame pequeño usando trapos o paños del taller.
- Para limpiar áreas de trabajo utilice métodos secos, como barrido y agentes de limpieza absorbentes, en lugar de limpiarlas con la manguera.
- Prepare y utilice kits de limpieza para contención de derrames.
- En caso de derrame de sustancias peligrosas, siga su plan de respuesta para este tipo de accidentes.
- Capacite a los empleados para que conozcan los procedimientos de emergencia y los planes de respuesta en caso de derrames de sustancias peligrosas.

Elimine desechos adecuadamente

- Cubra las áreas de almacenamiento externas para evitar el escurrimiento de aguas pluviales contaminadas.
- Recicle aceite de motor, filtros de aceite, anticongelante, baterías, solventes y llantas.
- Para eliminar desechos peligrosos adecuadamente comuníquese con un recolector de desechos con licencia estatal.

Para obtener más información llame al:
Departamento de Obras Públicas de la Ciudad de Falls Church, 703-248-5350 (TTY711)

La Ciudad de Falls Church está comprometida con la letra y el espíritu de la Ley sobre estadounidenses con discapacidades. Este documento puede proporcionarse en otro formato, previa solicitud, llamar al (703) 248-5350 (TTY 711).

APPENDIX K
OUTFALL CHARACTERIZATIONS

SUMMARY OF REGULATED OUTFALL CHARACTERIZATION					
Outfall	**Watershed**	**Sub-Watershed**	**Land Use**	**2013 Characterization**	**2014 Characterization**
A1-2.1	Four Mile Run	Trammel Branch	Suburban Residential	Unlikely	Unlikely
A51.1	Four Mile Run	N/A	Commercial	Unlikely	Unlikely
B81.1	Four Mile Run	Osborne Branch	Commercial/Industrial	Potential	Unlikely
C4	Four Mile Run	N/A	Suburban Residential	Unlikely	Potential
CC24B-1	Tripps Run	N/A	Commercial/Industrial	Unlikely	Unlikely
E8.1A	Four Mile Run	N/A	Commercial	Unlikely	Unlikely
E8C-A	Four Mile Run	N/A	Commercial	Unlikely	Unlikely
E8E	Four Mile Run	N/A	Commercial	Unlikely	Unlikely
E19.1A	Four Mile Run	N/A	Commercial	Unlikely	Potential
EE73	Tripps Run	Church Branch	Industrial	Unlikely	Potential
EF4	Four Mile Run	N/A	Commercial	Unlikely	Unlikely
F33.1	Four Mile Run	Crossman Branch	Suburban Residential	Potential	Potential
F36F	Four Mile Run	Crossman Branch	Suburban Residential	Unlikely	Unlikely
G54.1	Four Mile Run	Harrison Branch	Suburban Residential	Unlikely	Suspect
H44	Four Mile Run	Wrens Branch	Suburban Residential	Unlikely	Potential
HH3A	Tripps Run	Robertson Branch	Suburban Residential	Unlikely	Unlikely
IX1	Four Mile Run	N/A	Suburban Residential	Unlikely	Unlikely
IX2	Four Mile Run	N/A	Suburban Residential	Unlikely	Unlikely
J53A	Tripps Run	Pearson Branch	Commercial	Potential	Potential
JX20	Tripps Run	Pearson Branch	Industrial	Unlikely	Suspect
JX27	Tripps Run	Pearson Branch	Industrial	Unlikely	Potential
K28B1	Tripps Run	Pearson Branch	Suburban Residential	Unlikely	Unlikely
O17	Tripps Run	N/A	Suburban Residential	Unlikely	Unlikely
Q3.1	Tripps Run	N/A	Suburban Residential	Unlikely	Unlikely
R51.1	Tripps Run	Reagan Branch	Suburban Residential	Unlikely	Unlikely
S71.1	Tripps Run	Coe Branch	Suburban Residential/Commercial	Unlikely	Unlikely
T7A	Tripps Run	Coe Branch	Suburban Residential	Unlikely	Unlikely
U3.1A	Tripps Run	Coe Branch	Suburban Residential	Unlikely	Unlikely
U7A	Tripps Run	Coe Branch	Suburban Residential/Commercial	Unlikely	Unlikely
X13.1	Tripps Run	N/A	Suburban Residential	Potential	Unlikely
Y27.1	Tripps Run	Gundry Branch	Suburban Residential	Unlikely	Unlikely
Z5	Tripps Run	N/A	Suburban Residential	Unlikely	Potential

APPENDIX L
LAND DISTURBANCE REPORT

CITY OF FALLS CHURCH - LAND DISTURBING ACTIVITIES

PERMITTED PLANS - July 1, 2013 - June 30, 2014						
PLAN NO.	**LOCATION**	**OWNER / APPLICANT NAME**	**OWNER / APPLICANT ADDRESS**	**LOT AREA (SF)**	**DISTURBED AREA (SF)**	**ACRES**
20120874	700 Highland	Venkat Ramaswamy	700 Highland Ave, Falls Church, VA 22046	12000	8740	0.20
20121040	301 W. Broad Street	Dan Garripoli - 703-929-7317	Hitt Contractors, 2990 Fairview Park Dr, Falls Church	111078	108028	2.48
20130205	935 W. Broad Street	McMillen & Associates - 317-596-3260	8440 Allison Pointe Blvd, Indianapolis, IN 46250	39954	5563	0.13
20130338	1218 Ellison Street	Steve Smith - 202-438-0460	PO Box 100775 Arlington, VA 22210	17399	13504	0.31
20130395	1112 Tuckahoe Street	Brian - 703-964-5000	11111 Sunset Hills Rd, Suite 200, Reston, VA 20190	7822	7631	0.18
20130452	801 Parker Street	Paul - 571-229-2458	Reel Homes, 10625 Jones St, Fairfax, VA 22030	11164	9115	0.21
20130464	311 Walnut Street	Serhan Kokuuslu - 703-509-1297	209 W Greenway Blvd, Falls Church, VA 22046	5980	5000	0.11
20130621	1300 Seaton Lane	Tim Kuhn - 571-436-0481	10687 Gaskins Way, St 201, Manassas, VA 20109	10735	8577	0.20
20130653	122 W. Greenway Boulevard	Patrick Ohlhorst 703-853-9300	2710 Hunter Mill Rd, Oakton, VA 22124	7250	7525	0.17
20130656	306 Riley Street	Kevin Burke - 540-379-5362	International Parkway Suite # 149, Fredericksburg, VA 22406	10001	9400	0.22
20130819	608 Timber Lane	Eric Williams - 703-798-3098	217 Forest Dr, Falls Church, VA 22046	15246	13939	0.32
20130867	302 Grove Ave	Tim Kuhn - 571-436-0481	10687 Gaskins Way, St 201, Manassas, VA 20109	8427	6763	0.16
20130878	103 & 105 W. Marshall	Serhan Kokuuslu - 703-509-1297	209 W Greenway Blvd, Falls Church, VA 22046	16305	16117	0.37
20130882	1003 A Lincoln Ave	Joey Randhawa 703-819-1246	6712 Whittier Ave, Mclean, VA 22101	6981	5115	0.12
20130884	1003 B Lincoln Ave	Joey Randhawa 703-819-1246	6712 Whittier Ave, Mclean, VA 22101	6594	5422	0.12
20130907	311 Grove Ave	Eric Williams - 703-798-3098	217 Forest Dr, Falls Church, VA 22046	12000	7783	0.18
20130925	305 N Virginia	John Grimm - 703-398-5756	1225 Providence Terrace, Mclean, VA 22101	11250	7841	0.18
20130964	902 Madison Ln	Rob Zimmerman - 203-313-9697	419 Rollins St, Falls Church, VA 22046	11256	7919	0.18
20130979	208 S Lee	Scott Shreffler 703-786-5192	510 Anne St, Falls Church, VA 22046	8507	7528	0.17
20131114	207 Jackson	Craig - 571-221-8813	11111 Sunset Hills Rd, Suite 200, Reston, VA 20190	9449	6957	0.16
20131117	527 Poplar	Matt Mamajek - 703 217 9195	44031 Pipeline Plaza, Suite 210, Ashburn, VA 20147	12046	11000	0.25
20131126	201 N. Cherry	Mike Neuvel - 301-370-2486	6802 Paragon Place, St 410, Richmond, VA 23230	62690	39150	0.90
20131181	109 W Greenway	Evan 540-389-1121	5417A Backlick Rd, Springfield, VA 22151	12500	10994	0.25
20131199	522 Great Falls	Steve Veroneau - 703-244-5264	3421 Fiddlers Green, Falls Church, VA 22044	8097	6490	0.15
20131244	502 Timber Lane	Scott Shreffler 703-786-5192	510 Anne St, Falls Church, VA 22046	10900	7069	0.16
20131267	1009 Lincoln	Ed Seroskie 703-965-1175	1069 W Broad St, Suite 250, Falls Church, VA 22046	12000	11826	0.27
20140100	510 Anne St	Scott Shreffler 703-786-5192	510 Anne St, Falls Church, VA 22046	9165	8522	0.20
20140103	518 S Spring St	Scott Shreffler 703-786-5192	510 Anne St, Falls Church, VA 22046	11250	8656	0.20
20140182	523 Great Falls St	Adam Cook 703-926-2887	10687 Gaskins Way, St 201, Manassas, VA 20109	8975	8029	0.18
20140212	1011 Lincoln Ave	Dylan Bateman 703-932-3531	1011 Lincoln Ave, Falls Church, VA 22046	12000	9934	0.23
20140232	311A Grove Ave	Eric Williams - 703-798-3098	217 Forest Dr, Falls Church, VA 22046	10186	9148	0.21
20140272	300 N Cherry	Russ Whitworth - 202-431-2864	PO Box 462 Falls Church, VA 22046	13412	5663	0.13
						9.30

APPENDIX M
BMP DATABASE
BMP INSPECTION MEMORANDUM

City of Falls Church - Private Stormwater Management BMP Inventory as of 6/31/2014

Address	RPC	SWM Facility Type	Acres Treated	HUC
100 W GREENWAY BLVD	52402011	Infiltration	0.02	PL-26
1000 E BROAD ST	53216003	Manufactured BMP	0.63	PL-26
1003 ELLISON ST	52113012	Infiltration	0.06	PL-26
1003 W BROAD ST	52102065	Detention Pond	1.76	PL-26
1004 N ROOSEVELT ST	53212011	Infiltration	0.01	PL-25
1005 A LINCOLN AVE	51215087	Porous Pavers	0.02	PL-26
1005 B LINCOLN AVE	51215088	Porous Pavers	0.03	PL-26
1007 A LINCOLN AVE	51215089	Detention	0.05	PL-26
1007 B LINCOLN AVE	51215090	Detention	0.05	PL-26
1009 MADISON LANE	52110014	Infiltration	0.05	PL-26
1010 MADISON LANE	52111006	Infiltration	0.09	PL-26
1011 KENNEDY ST	52106008	Bioretention	0.01	PL-26
1011 N TUCKAHOE ST	53213008	Infiltration	0.02	PL-25
1019 PARKER ST	52111011	Manufactured BMP	0.03	PL-26
1019 SPRUCE ST	51216086	Infiltration	0.05	PL-26
102 DULANY PL	52405091	Infiltration	0.08	PL-26
103 S CHERRY ST	53120022	Manufactured BMP	0.05	PL-26
105 S CHERRY ST	53120021	Manufactured BMP	0.06	PL-26
107 S CHERRY ST	53120020	Manufactured BMP	0.02	PL-26
108 CHURCH PL	53210009	Infiltration	0.02	PL-25
110 GREAT FALLS ST	51103004	Infiltration	0.15	PL-25
1109 LINCOLN AVE	51215081	Manufactured BMP	0.03	PL-26
1109 N TUCKAHOE ST	53211005	Pavers	0.01	PL-25
111 S LEE ST	52302244	Manufactured BMP	0.01	PL-26
1111 LINCOLN AVE	51215082	Manufactured BMP	0.03	PL-26
1113 LINCOLN AVE	51215083	Manufactured BMP	0.03	PL-26
1115 LINCOLN AVE	51215084	Manufactured BMP	0.03	PL-26
114 W GEORGE MASON RD	52403009	Infiltration	0.02	PL-26
116 W GEORGE MASON RD	52403010	Infiltration	0.14	PL-26
117 E COLUMBIA ST	53102005	Infiltration	0.06	PL-25
117 W GEORGE MASON RD	52404040	Infiltration	0.02	PL-26
118 W CAMERON RD	52401018	Infiltration	0.01	PL-26
119 N VIRGINIA AVE	51114034	Infiltration	0.04	PL-26
1205 A LINCOLN AVE	51215092	Manufactured BMP	0.02	PL-26
1205 B LINCOLN AVE	51215091	Manufactured BMP	0.02	PL-26
1207 ELLISON ST	52112009	Infiltration	0.05	PL-26

Address	RPC	SWM Facility Type	Acres Treated	HUC
1218 ELLISON ST	52102014	Infiltration	0.04	PL-26
1230 W BROAD ST	51219011	Manufactured BMP	0.18	PL-26
1300 N TUCKAHOE ST	53210069	Infiltration	0.01	PL-25
1311 SEATON CIR	52505013	Manufactured BMP	0.02	PL-26
200 W CAMERON RD	52401063	Vegetated filter strip	0.02	PL-26
201 JACKSON ST	52501039	Detention	0.03	PL-26
202 W CAMERON RD	52401064	Vegetated filter strip	0.03	PL-26
206 FOREST DR	53207007	Manufactured BMP	0.01	PL-25
209 N LEE ST	51128030	Manufactured BMP	0.02	PL-26
209 POPLAR DR	52502052	Detention	0.18	PL-26
211 E COLUMBIA ST	53102002	Infiltration	0.05	PL-25
212 PATTERSON ST	52112017	Bioretention	0.20	PL-26
215 FOREST DR	53206044	Infiltration	0.00	PL-25
215 VAN BUREN ST	53207042	Infiltration	0.04	PL-25
229 MIDVALE ST	53118053	Infiltration	0.07	PL-25
300 HUNTON AVE	53114037	Infiltration	0.40	PL-26
300 N VIRGINIA AVE	51112007	Infiltration	0.01	PL-26
304 A PINE ST	51212025	Infiltration	0.05	PL-26
304 B PINE ST	51212026	Infiltration	0.05	PL-26
304 KENT ST	52608024	Infiltration	0.03	PL-26
306 A PINE ST	51212027	Infiltration	0.05	PL-26
306 B GROVE AVE	51215086	Manufactured BMP	0.05	PL-26
306 B PINE ST	51212028	Infiltration	0.05	PL-26
308 GROVE AVE	51215085	Porous Pavers	0.01	PL-26
310 GROVE AVE	51215018	Porous Pavers	0.02	PL-26
310 SYCAMORE ST	51214031	Infiltration	0.03	PL-26
311 N VIRGINIA AVE	51111015	Manufactured BMP	0.05	PL-25
312 SYCAMORE ST	51214030	Infiltration	0.02	PL-26
314 GROVE AVE	51215020	Manufactured BMP	0.04	PL-26
314 SYCAMORE ST	51214029	Infiltration	0.04	PL-26
335 RILEY ST	51115019	Manufactured BMP	0.05	PL-25
402 W BROAD ST	51114100	Bioretention	0.50	PL-26
404 GREAT FALLS ST	51110003	Infiltration	0.02	PL_25
404 VAN BUREN ST	53208004	Infiltration	0.04	PL-25
405 PARK AVE	51114035	Infiltration	0.04	PL-26
407 A LINCOLN AVE	51116039	Infiltration	0.09	PL-25

Address	RPC	SWM Facility Type	Acres Treated	HUC
407 B LINCOLN AVE	51116038	Infiltration	0.13	PL-25
410 S MAPLE AVE	52312100	Manufactured BMP	2.43	PL-25
416 E COLUMBIA ST	53118022	Infiltration	0.12	PL-25
416 POPLAR DR	52505010	Infiltration	0.04	PL-26
417 LINCOLN AVE	51116035	Porous Pavers	0.04	PL-25
419 LINCOLN AVE	51116036	Porous Pavers	0.02	PL-25
434 E COLUMBIA ST	53118047	Infiltration	0.03	PL-25
444 W Broad	51133100	Manufactured BMP	2.27	PL-26
500 W BROAD ST	51130003	Detention	0.17	PL-26
502 -A WALDEN CT	51119026	Bioretention	0.21	PL-25
503 S SPRING ST	52602028	Manufactured BMP	0.03	PL-26
504 MERIDIAN ST	51119012	Infiltration	0.04	PL-25
505 S SPRING ST	52602027	Infiltration	0.03	PL-26
513 GREENWICH ST	51123024	Manufactured BMP	0.03	PL-26
513 W Broad	52302052	Manufactured BMP	1.14	PL-26
517 N OAK ST	51208023	Infiltration	0.05	PL-26
523 S SPRING ST	52602018	Infiltration	0.03	PL-26
602 LAURA DR	52605002	Infiltration	0.05	PL-26
608 FULTON AVE	51125089	Porous Pavers	0.02	PL-26
609 POPLAR DR	52605027	Infiltration	0.02	PL-26
613 JACKSON ST	52602029	Infiltration	0.01	PL-26
6607 WILSON BLVD	53218002	Manufactured BMP	1.92	PL-26
6795 WILSON BLVD	53218006	Manufactured BMP	1.30	PL-25
700 E BROAD ST	53203024	Manufactured BMP	0.01	PL-26
702 E BROAD ST	53203025	Manufactured BMP	0.04	PL-26
702 PARK AVE	51128002	Manufactured BMP	0.00	PL-26
706 W BROAD ST	51131030	Manufactured BMP	0.89	PL-26
710 N WEST ST	51121013	Manufactured BMP	0.04	PL-26
710 TIMBER LN	52605034	Porous Pavers	0.01	PL-26
800 W BROAD ST	51220001	Manufactured BMP	0.97	PL-26
807 RIDGE PL	53210095	Infiltration	0.04	PL-26
822 VILLA RIDGE RD	53210035	Infiltration	0.03	PL-25
935 W BROAD ST	52203011	Manufactured BMP	0.30	PL-26
HILLWOOD AVE	53115085	Detention	8.26	PL-26

SWM Facility Type (CBPO Release BMPs)	Public Agency	Address	HUC	Acres Treated	PLAN
Water Quality Inlet	City	217 GORDON RD	02070010PL26	0.32	Recycling Center Filterra
Bioretention, no underdrain, A/B soils	City	407 Lincoln Ave	02070010PL25	1.44	407 Lincoln Ave ROW Rain Garden
Bioretention, underdrain, C/D soils	City	211 Buxton Rd	02070010PL25	1.96	Buxton & Tyson Drive Raingarden
Dry Detention Ponds	City	217 GORDON RD	02070010PL25	0.18	Property Yard Cisterns
Reduction of Impervious Surface	City	555 N Washington St	02070010PL25	0.069	Fire Station Trail
Bioretention, underdrain, C/D soils	FCCPS	601 S OAK ST	02070010PL26	0.05	TJ Elementary Raingarden #2
Bioretention, underdrain, C/D soils	FCCPS	601 S OAK ST	02070010PL26	0.31	TJ Elementary Raingarden #1
Dry Detention Ponds	FCCPS	601 S OAK ST	02070010PL26	0.23	TJ Elementary Cisterns
Bioretention, underdrain, C/D soils	City	KENT ST	02070010PL26	1.2	Berman Park Rain Garden
Bioretention, soils unknown	City	LINCOLN AVE	02070010PL25	0.8	Lincoln Park Rain Garden
Bioretention, underdrain, C/D soils	City	VAN BUREN ST	02070010PL25	0.52	Crossman Park Rain Garden

CITY OF FALLS CHURCH

Memo

To: Jason Widstrom, P.E., MS4 Program Manager

From: Matthew Hansen, E.I.T., BMP Program Manager

Date: September 30, 2013

Subject: 2014 BMP Program Update

I have reviewed the results of our Best Management Practices (BMPs) Assessment Program since our 2013 MS4 update and prepared summary information. This document briefly presents the findings of our ongoing BMP assessments.

Summary of Inspection Results

Inspection for this cycle included both new installations and existing BMPs

- 14 facility inspections were conducted.
- 10 new BMP installations were accepted as properly constructed
- 3 inspections of the same facility resulted in eventual compliance with proper maintenance practices.

Maintenance Needed

BMP enforcement efforts in this term focused on a large filtering system for which cartridge replacement was overdue and needed. The cartridges were replaced following repeated City requests of the developer and owning homeowners association. For the new BMPs constructed City inspectors ensured proper materials were used in all infiltration systems before approving those new installations.

Enforcement and Next Steps

One residential site is missing treatment entirely while another has an infiltration trench that is likely plugged with sediment. Other locations continue to have minor maintenance issues. These owners have received inspection reports and it is now necessary to escalate our enforcement procedures.

2 porous pavement installations are plugged in the City and several more will need cleaning in the next few years. I am told by homeowners that they do not know where to get this service. The City would benefit from researching cleaning services for our own porous pavement and sharing what we learn with homeowners.

We must formalize our process and decide on how maintenance agreements will be enforced before proceeding. The cases where maintenance has been neglected despite City inspection reports require us to plan and implement a stronger enforcement procedure in the upcoming project year.

In the next permit year we will inspect all BMPs that were not inspected in the past year and those that were found to be non-compliant this year. That will require around 75 inspections during the next permit year. This is to include the annual inspection of City-owned facilities.

New BMPs in PY-1

12 new BMPs came online during Permit Year 1. 4 new BMPs treating 3.19 acres discharge to the Four Mile Run (PL-25) watershed. 10 new BMPs treating 0.67 acres discharge into the Tripp's Run (PL-26) watershed. 4 BMPs were removed from our tracking system as the developments never occurred. There are now 111 BMPs tracked and inspected by the City.

Conclusion

Our top priority for the BMP program should be establishing and committing to an enforcement procedure for non-compliance with agreements. Working on this in the coming year will enable more robust enforcement to improve compliance rates.

APPENDIX N
GKY BMP STUDY
GKY CREDIT MANUAL STUDY

April 24, 2014

Mr. Jason Widstrom, P.E.
300 Park Avenue, Suite 100W
Falls Church, VA 22046

Re: Task Order #11, Task 4: City of Falls Church Single Family Residential (SFR) Credit Policy – Alternative Inspection Policy Review

Dear Jason:

Under TO #11, Task 4, GKY reviewed the City's Stormwater Fees Credit Manual, Version 1.1, and (Credit Manual) in order to assess the Credit Manual's potential applicability as an optional strategy to ensure the long-term maintenance of single family residential (SFR) stormwater management facilities under the Virginia Stormwater Management Program (VSMP). As a VSMP authority, the City of Falls Church is required to ensure that stormwater management facilities installed under the VSMP program are adequately maintained and functioning properly. For most stormwater management facilities, the VSMP regulations (9VAC25-870-112) require maintenance agreements and routine City inspections as the method to ensure these requirements. However, the VSMP regulations provide the City the flexibility in addressing facilities that are designed to treat stormwater runoff from only the SFR lot upon which they are located.

Based on GKY's review of the Credit Manual, the City has not opted to implement an alternative strategy in order to address long-term maintenance on stormwater management facilities placed on SFRs. The Credit Manual requires that "*Facilities installed as a condition of development must have a signed Maintenance Agreement recorded in the land records.*" This requirement is universally applicable to VSMP-required stormwater management facilities in the City of Falls Church. In addition, in order to qualify for stormwater credit reductions, the applicant must agree *"to the statements on the Credit Application Form regarding maintenance responsibility and agree to maintain the facility per City and manufacturer guidance."* The Credit Manual appears to give the City additional leverage to ensure the long-term maintenance and upkeep of all VSMP-required stormwater management facilities.

The VSMP regulations (9VAC25-870-114 C.) do allow the City to accept inspections conducted by the owner, in lieu of City inspections, provided certain criteria are met regarding who conducts the inspections. The City's Credit Manual includes a City of Falls Church Facility Inspection Form (Form SW4), which requires that a "*licensed professional engineer, landscape architect, or other professional accepted by the City*" certify that the facility is functioning as designed. However, neither the Credit Manual nor the draft Maintenance Agreement appear to make reference as to when the Facility Inspection Form is to be used or submitted to the City. GKY recommends that if the City chooses to utilize owner inspections in lieu of City inspections in order to meet VSMP inspection requirements, the Credit Manual or the Maintenance Agreement (or both) be revised to include an inspection schedule and form submittal requirements. In addition, GKY recommends that the City review and, if necessary, refine its requirements for professional certification

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included on the Facility Inspection Form in order to ensure consistency with 9VAC25-870-114 C.

If you have any questions or need any additional information, you may contact us at (703) 870-7000 or by email at sstein@gky.com or dfritz@gky.com.

We greatly appreciate the opportunity to work with you and the City.

Sincerely,

Stuart Stein, P.E. D.WRE
President

J. Douglas Fritz
Senior Technical Advisor

CC: Max Kuker – GKY

April 21, 2014

Mr. Jason Widstrom, P.E.
300 Park Avenue, Suite 100W
Falls Church, VA 22046

Re: TO#11, Task 3: Post-Construction Stormwater Management (SWM) Inspection Policy Review

Dear Jason:

As outlined in TO#11, Task 3, GKY reviewed the City's "Stormwater BMP/Facility Assessment Program Policy Considerations" document, dated August 5, 2011. GKY compared the document to the requirements of the City's 2013 Phase II Municipal Separate Storm Sewer (MS4) General Permit and the requirements of the Virginia Stormwater Management Program (VSMP) in order to determine what updates are necessary to ensure the assessment program document is compliant. A narrative summary is provided below and an itemized list of the results is enclosed with this letter.

The General Permit requires the City to have written policy and procedures regarding BMP inspection and maintenance by June 30, 2014. The City's document, as currently written, provides the City considerations for its Stormwater / BMP Inspection Program. The document contains numerous recommendations and considerations, but is not necessarily a "written policy and procedure." GKY recommends a document revision to remove items that are not part of the City's policies and procedures, and identify and clearly label guidance.

In addition, the current document primarily addresses privately owned SWM facility maintenance. GKY recommends that either a separate guidance document should be created for publicly owned SWM facility inspection and maintenance, or that the document be revised to produce a more comprehensive version that addresses both public and private facilities.

GKY would be happy to provide the City with a proposal to implement the recommendations provided above and in the enclosed document.

If you have any questions or need any additional information, you may contact us at (703) 870-7000 or by email at sstein@gky.com or bkutch@gky.com.

We greatly appreciate the opportunity to work with you and the City.

Sincerely,

Stuart Stein, P.E. D.WRE
President

Brice R. Kutch, P.E., LEED BD+C
Senior Design Engineer

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CC: Matt Hansen – City of Falls Church
Max Kuker – GKY
Doug Fritz – GKY

Enclosure: Summary Table

Required Updates to the City's "Stormwater BMP Facility Assessment Program Policy Considerations" Document				
#	Section	Required Update / Edit	Reference	Language
1	General	The current "Stormwater BMP/Facility Assessment Program Policy Considerations" document primarily addresses privately owned SWM facility maintenance. Either a separate guidance document should be created for publicly owned SWM facility maintenance, or a comprehensive document should be developed addressing both public and private facilities.	N/A	N/A
2	General	The General Permit requirement is for the City to have written policy and procedures regarding inspection and maintenance. This document, as written, provided the City considerations for its Stormwater / BMP Inspection Program. The document contains numerous recommendations and considerations and is not necessarily a "written policy and procedure". The document should be revised to remove those items that are not part of policy and procedure. Items included in the document as guidance should be clearly identified as guidance.	9VAC25-890-40 Section II, B, 5, d, (3-5)	The operator's MS4 Program Plan shall be updated in accordance with Table 1 to include: (3) Written inspection policies and procedures utilized in conducting inspections; (4) Written procedures for inspection, compliance and enforcement to ensure maintenance is conducted on private stormwater facilities to ensure long-term operation in accordance with approved design; (5) Written procedures for inspection and maintenance of operator-owned stormwater management facilities.
3	1 (Introduction)	References to Virginia Department of Conservation and Recreation (DCR) should be changed to Virginia Department of Environmental Quality (DEQ).	N/A	N/A
4	1 (Introduction)	The City of Falls Church Stormwater BMP / Facility Inventory Table should be updated to reflect the 2014 Privately and Publicly Owned SWM Facility inventory.	N/A	N/A
5	1 (Introduction)	Under "Topic areas covered include", bullets should be added for (1) development of a recorded inspection schedule, and (2) recordation of a maintenance agreement.	9VAC25-890-40, Section II, B, 5, c, (1), a	The operator shall require adequate long-term operation and maintenance by the owner of the stormwater management facility by requiring the owner to develop a recorded inspection schedule and maintenance agreement to the extent allowable under state or local law or other legal mechanism.
6	3 (Pre-Assessment Facility Research)	Although this Section (Pre-Assessment Facility Research) is not required by the State General Permit, incorporating and developing the minimum Stormwater Management facility tracking and reporting requirements during Pre-Assessment Research tasks, as required by Section 9VAC25-890-40 Section II, B, 5 (2) e (1-9), would help create the database mentioned in Section 6 of the document, as well as meet the General Permit provisions for facility tracking and reporting.	9VAC25-890-40 Section II, B, 5, c, (2), e, (1-9)	Stormwater management facility tracking and reporting requirements. The operator 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 the following: (1) SWM facility type; (2) Facility Location; (3) Acres treated by facility; (4) Date facility was brought online; (5) HUC Code; (6) Discharge to impaired waters and name of such waters; (7) Private/Public owned; (8) If a maintenance agreement exists; (9) Date of most recent inspection.
7	3 (Pre-Assessment Facility Research)	Regarding the City of Falls Church's Stormwater Detention and BMP Maintenance Agreement: Has this document been changed and updated to reflect the new regulatory changes, as well as any updates to VA and/or local code references? If so, have those changes been reviewed by the City Attorney?	N/A	A Sample Maintenance Agreement for a Stormwater Management System can be found in Chapter 9, Appendix 9B of the Virginia Stormwater Management Handbook.
8	4 (Assessment Procedures and Practices)	The proper implementation of an inspection schedule should be addressed in this section. Publicly owned facilities must be inspected anually; privately owned facilities must be inspected every five years.	9VAC25-890-40, Section II, B, 5, c, (1), a	The operator shall require adequate long-term operation and maintenance by the owner of the stormwater management facility by requiring the owner to develop a recorded inspection schedule and maintenance agreement to the extent allowable under state or local law or other legal mechanism.
9	4 (Assessment Procedures and Practices)	Clarify which personnel are eligible to perform the BMP facility assessments.	9VAC25-870-114.C	The BMP facility inspeciton must be conducted by 1) a professional engineer, architect, landscape architect, or land surveyor; or 2) a person who works under the direct supervision and oversight of the licensed professional engineer, architect, landscape architect, or land surveyor; or 3) a person who holds an appropriate certificate of competence from the board (certified stormwater inspector).

Required Updates to the City's "Stormwater BMP Facility Assessment Program Policy Considerations" Document				
#	Section	Required Update / Edit	Reference	Language
10	4 (Assessment Procedures and Practices)	The bulleted item regarding capturing facility conditions using the inspection form(s) attached in the Appendix should be updated. For new construction, different maintenance requirements are needed based on the new State regulations. The current forms in the Appendix either need to be updated to encompass additional maintenance requirements, or the BMP O&M Checklists available in Chapter 9, Appendix 9-C of the Virginia Stormwater Management Handbook could be used.	N/A	Sample O&M Checklists for all of the currently approved Stormwater Management Facilities referenced at the BMP Clearinghouse can be found in Chapter 9, Appendix 9B of the Virginia Stormwater Management Handbook.
11	4 (Assessment Procedures and Practices)	The new VSMP regulations allow for the City to accept the BMP owner's inspection if completed in accordance with 9VAC25-870-114.C. In addition, the City recently published a Stormwater Utility Fee Credit Manual that also requires owner inspections be conducted and submitted when and if stormwater utility fee credits are to be renewed. If the City is considering utilizing BMP inspections by the owner or the owner's representative, this section should be updated to include the City's expectations and requirements and should also be coordinated with the Stormwater Utility Fee Credit Manual.	9VAC25-870-114.C	The VSMP authority may utilize the inspection reports of the owner of a stormwater management facility as part of an inspection program established in subsection B of this section if the inspection is conducted by a person who is licensed as a professional engineer, architect, landscape architect, or land surveyor pursuant to Article 1 (§ 54.1-400 et seq.) of Chapter 4 of Title 54.1; a person who works under the direction and oversight of the licensed professional engineer, architect, landscape architect, or land surveyor; or a person who holds an appropriate certificate of competence from the board.
12	6 (Data Management and Reporting Issues)	The City is required to create a Stormwater management facility tracking database. The operator shall maintain an electronic database of all known public and private SWM facilities. This requirement should be included in this Section.	9VAC25-890-40 Section II, B, 5, c, (2), e, (1-9)	Stormwater management facility tracking and reporting requirements. The operator 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 the following: (1) SWM facility type; (2) Facility Location; (3) Acres treated by facility; (4) Date facility was brought online; (5) HUC Code; (6) Discharge to impaired waters and name of such waters; (7) Private/Public owned; (8) If a maintenance agreement exists; (9) Date of most recent inspection.
13	7 (Facility Assessment Liability Issues)	All references to the City of Falls Church's Stormwater Detention and BMP Maintenance Agreement should be exact and up to date. Furthermore, if any changes have been made, the City Attorney should review the Maintenance Agreement.	N/A	N/A
14	8 (Enforcing Maintenance Agreements)	All references to the City of Falls Church's Stormwater Detention and BMP Maintenance Agreement should be exact and up to date. Furthermore, if any changes have been made, a City Attorney should review the Maintenance Agreement.	N/A	N/A
15	8 (Enforcing Maintenance Agreements)	Include the operator's legal authority for enforcement, and provide a detailed enforcement plan.	9VAC25-890-40, Section II, B, 5, c, (1), c	The operator shall utilize its legal authority for enforcement of maintenance responsibilities if maintenance is neglected by the owner. The operator may develop and implement a progressive compliance and enforcement strategy provided that the strategy is included in the MS4 Program Plan.

APPENDIX O
STREET SWEEPING

2014 FALLS CHURCH SWEEPING LOG

3/24/2014 AREA SWEPT QUADRANT SWEPT FROM SOUTH GORDONS TO TIMBER LANE

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARD	TONS
SUNNY	101	22800	21640	4.5	KEVIN	8	24	13.6
	14	11100	11080	4	ZACH	5	15	8.5

3/25/2014 AREA SWEPT QUADRANT SWEPT FROM TIMBER LANE TO HAMPTON RD

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARD	TONS
LIGHT SNOW	101	22800	21640	4.5	KEVIN	9	27	15.3

3/26/2014 AREA SWEPT QUADRANT SWEPT FROM HAMPTON RD TO BERRY STREET

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARD	TONS
SUNNY	101	22800	21640	4.5	KEVIN	7	21	11.9
	14	11100	11080	4	ZACH	2	6	3.4

3/26/2014 AREA SWEPT ARTERIALS AND PARKING LOTS

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARD	TONS
CLEAR/COLD	105	22800	21640	4.5	DEREK	8	24	13.6

3/272014 AREA SWEPT QUADRANT SWEPT FROM BERRY STREET to WASHINGTON ST.

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARD	TONS
SUNNY	101	22800	21640	4.5	KEVIN	8	24	13.6
	14	11100	11080	4	ZACH	3	9	5.1

3/28/2013 AREA SWEPT QUADRANT SWEPT FROM WASHINGTON ST TO BIRCH STREET

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARD	TONS
LIGHT RAIN	101	22800	21640	4.5	KEVIN	8	24	13.6
	102	22800	21640	4.5	RAY	8	24	13.6

TOTALS	**66**	**198**	**112.2**

2014 FALLS CHURCH SWEEPING LOG

4/14/2014 — AREA SWEPT: QUADRANT SWEPT FROM RAILROAD AVE TO POPLAR DR

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARDS	TONS
SUNNY/WINDY	101	24950	21830	4.5	KEVIN	3	9	5.1
	14	11300	10340	4	ZACH	2	6	1.2

4/16/2014 — AREA SWEPT: ARTERIALS AND PARKING LOTS

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARDS	TONS
CLEAR	106	24950	21830	4.5	LESTER	5	15	8.5

4/17/2014 — AREA SWEPT: QUADRANT SWEPT FROM POPLAR DR TO HILLWOOD ROAD

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARDS	TONS
SUNNY	101	24950	21830	4.5	KEVIN	4	12	6.8
	14	11300	10340	4	JOHN	3	9	5.1

4/18/2014 — AREA SWEPT: QUADRANT SWEPT FROM HILLWOOD ROAD TO GREAT FALLS ROAD

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARDS	TONS
SUNNY	101	24950	21830	4.5	KEVIN	4	12	6.8
	16	11300	10340	4	JOHN	2	6	3.4

4/21/2014 — AREA SWEPT: QUADRANT SWEPT FROM GREAT FALLS TO GORDON ROAD

WEATHER	TRUCK #	GROSS WEIGHT	TARE WEIGHT	CUBIC YARD CAPACITY	OPERATOR	LOADS	CUBIC YARDS	TONS
SUNNY	101	24950	21830	4.5	KEVIN	4	12	6.8
	14	11300	10340	4	JOHN	3	9	1.8

TOTALS	**30**	**90**	**45.5**

APPENDIX P
DRAFT TRAINING SCHEDULE
TRAINING LOG AND MATERIALS

Employee Training Schedule and Program (DRAFT September 2014)

Frequency	Date	Training	Internal Trainer	External Trainer	Staff
Year 1	Jan / Feb	Land Disturbance	X		Public Works
	April / May	Illicit Discharge Recognition and Reporting	X		Public Works, Development Services
	September / October	Parks and Grounds Operations and Maintenance	X		Public Works, Recreation and Parks
Year 2	Jan / Feb	Spill Response Procedures	X		Public Works, Public Safety
	April / May	Street, Parking and Drainage Operations and Maintenance	X		Public Works
	September / October	Fleet and Facility Operations	X		Public Works
As required for certification	When available	Stormwater Management		X	Engineers / Inspectors
As required for certification	When available	Erosion and Sediment Control		X	Engineers / Inspectors / Superintendent

21

Stormwater Pollution Prevention Training

Wednesday, June 25, 2014

Name	Signature
Gregory Grayson	Greg Grayson
MARK KOORNOR	
Jonathan Bell	
Rick Hodge	
Edwin Sanjines	
Jonathan Brown	Jonathan Brown
Joe Dowling	Joe Dowling
Clifton Rector	Clifton Rector
José Lucilo Arguata	
Walter Guando	
LeRoy Holland	
Marcelo E Osorio	
Jonathan Horneman	
Brian Benson	Brian Benson
Sam Stribling	
Darnell Pendleton	Darnell
Wendell Goins	Wendell Goins

Stormwater Pollution Prevention Training

Wednesday, June 25, 2014

Name	Signature
Eric Lauer	Eric Lauer
Robert Goff	Robert Goff
Charles Prince	[illegible]
Kathy Allen	[illegible]

Storm Water Pollution Prevention Training

Why is this a stormwater problem?

What is Stormwater?

- Stormwater is water flowing over the land during and immediately after a rain storm.

- Stormwater does not flow into a wastewater treatment system, it flows into our surface waters

  In Falls Church our stormwater system consists of our gutters, storm drains, underground pipes, open channels, culverts, and streams. Our stormwater system discharges into Four Mile Run and Tripp's Run, which are part of the Chesapeake Bay Watershed.

- What we do on the land affects the water quality and the habitat of our water bodies. It also affects our quality of life, our wildlife, and our recreation.

Why do we have to do something to improve our stormwater discharges?

- In 1972, Congress passed the Clean Water Act and focused on point source pollution discharges to surface waters. Most point sources have been eliminated, others are permitted.

- In 1990, the EPA began the National Pollutant Discharge Elimination System (NPDES) Permitting process to address non-point sources of pollution.

- Localities must have a NPDES Permit for their stormwater discharges. The permit requires that facilities, like the Property Yard, have a Stormwater Pollution Prevention Plan (SWPPP), observe their discharges, and work to implement Best Management Practices (BMPs) to minimize pollutants from leaving their facility.

How do you achieve compliance with the NPDES permit?

- The City has a SWPPP for the Property Yard that addresses all potential pollutant sources and measures and controls needed to prevent pollution.
- For our facility we must inspect for signs of pollution.
- BMPs must be implemented and, sometimes, engineering controls must be installed in order to prevent pollution from your facility.
- Employees must be trained (activities like today)

What is the goal of training employees about stormwater?

To stress the importance of being AWARE of and ALERT to conditions that could result in the discharge of pollutants to storm water!

To improve communication employees and supervisors.

TRAINING TOPICS

- Vehicle Washing and Fueling
- Fuel and Chemical Storage Activities
- Sand/Soil Piles
- Indoor Housekeeping
- Outdoor Storage
- Vehicle Parking Lots
- Preventive Maintenance
- Spill Prevention and Response

Vehicle Washing

Non-stormwater discharges must go to sanitary sewer

Vehicles that fit in the garage must be washed in the garage.

Fuel and Chemical Storage Activities

Fuel and Chemical Transfer Activities

- Consider how fuels and chemicals are transferred day to day
- Report spills to your supervisor
- Clean up spills immediately

OIL-DRI
Premium
Absorbent
DIRECTIONS
WARNING
INDUSTRIAL USES
HOME USES
OIL-DRI

Absorbent material placed on a spill…

Good Housekeeping Prevents Pollution

Minimize exposure, inspect and report, cleanup spills and leaks promptly

INGERSOLL-RAND
CITY OF FALLS CHURCH
INCORPORATED
1875
1948
VIRGINIA

What would have helped prevent the pollution leaving this site?

How about this site?

Material Storage

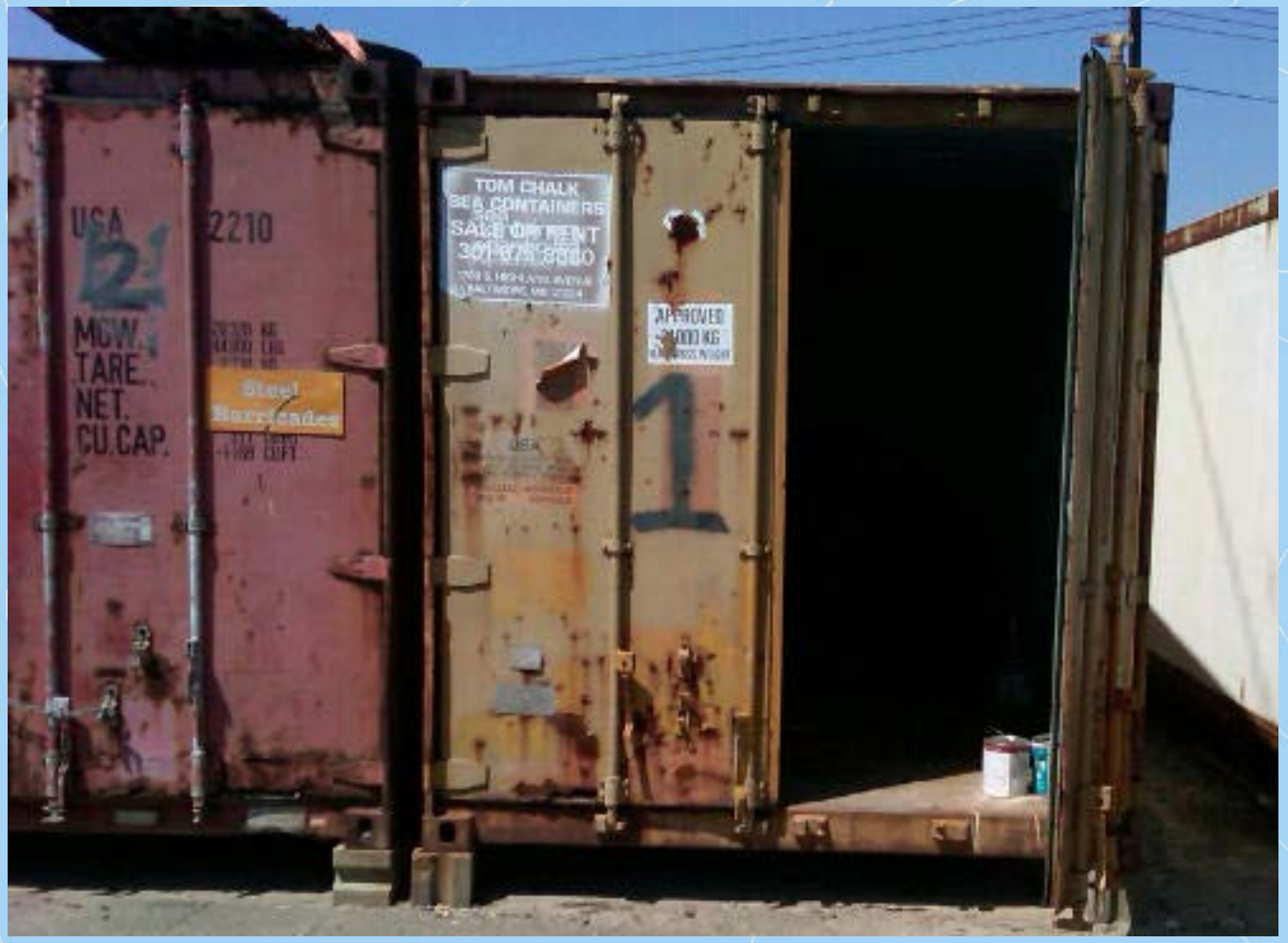
Material Storage Continued

Questions? ASK!

Left: Solvents & Oil Based Paint

Right: Light bulbs & Batteries

Latex Paint



Cover salt, sand, and soil piles to prevent pollution!!

Our stream - Four Mile Run

Good Housekeeping Inside Buildings to Prevent Pollution

- Make sure that there are no discharges from the building to stormwater inlet through doorways or other pathways
- Make sure that spill response equipment is readily available throughout building to contain leaks and spills
- Clean the floors and do not allow the wash water to discharge outside
- Have a comprehensive chemical storage and management plan, specify co-located areas and accumulation amounts for vendor pick-ups

General Storage Areas

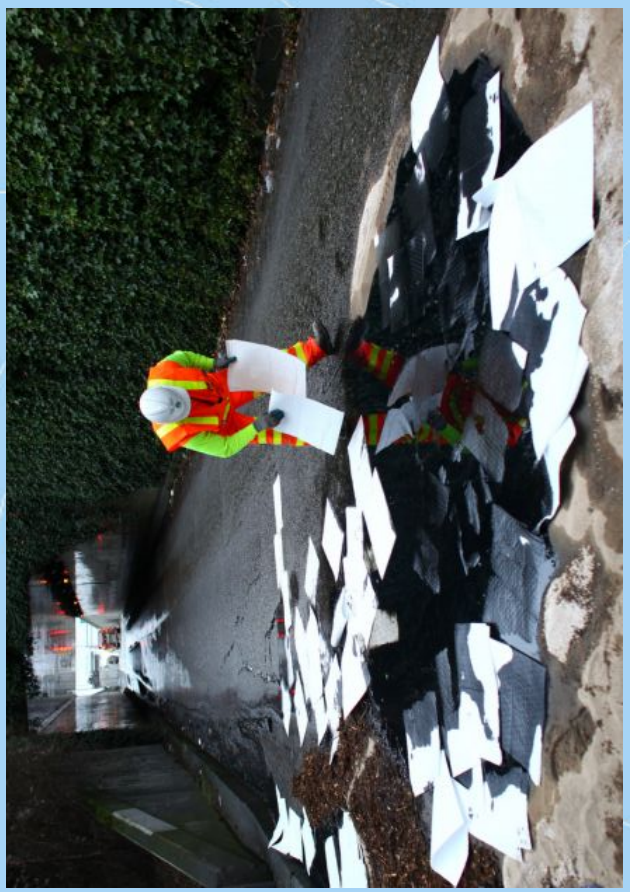
Putting debris where it belongs

Keeping lids closed is important

Vehicle storage areas must remain clean and orderly to prevent pollution

Preventative Maintenance

- Daily inspections of equipment and storage
- Regular maintenance of equipment
- Routine sediment/debris removal and surface cleaning of stormwater management devices



1203
176
TSI
(866) 720-4999
TSI
(866) 720-4999

Spill Response

- 1. Contain
- 2. Locate and stop the source
- 3. Clean up
- 4. Dispose of properly
- 5. Notify supervisor
- 6. Document
- 7. Follow up:
  - Evaluate changes needed and modify SWPPP
  - Implement changes
  - Replace spill response equipment used

APPENDIX Q
PROPERTY YARD

- GKY STUDY
- GKY DRAFT SWPPP
- FUEL CANOPY PHOTO

Stormwater Pollution Prevention Plan Site Visit Report for the Property Yard and George Mason High School

April 23, 2014

Prepared for:

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1.0 Introduction

On Wednesday April 9, 2014 GKY staff conducted a site assessment of City of Falls Church facilities (the City's Property Yard and George Mason High School) that the City expected would meet the requirements of a "High Priority Municipal Facility with a high potential for pollutant discharge." Based on the information provided by the City and GKY's site assessment, GKY concurs with the City's assessment that the facilities should be considered high priority municipal facilities with a high potential to discharge pollutants. This document is intended to provide the City with site visit findings and to provide recommendations to the City for improvements to pollution prevention efforts.

2.0 General Observations and Recommendations

1) The City's 2013 Phase II MS4 General Permit requires that a Stormwater Pollution Prevention Plan (SWPPP) be developed and implemented for "High Priority Municipal Facilities" that have a "high potential of discharging pollutants." A SWPPP has been prepared for the Property Yard; however, the SWPPP is outdated and needs to be updated to be compliant with the recently issued permit. A SWPPP has not been prepared for the George Mason High School stockpile storage area and school bus parking area. A SWPPP should be prepared and implemented for the stockpile storage area and bus parking area.
2) It is recommended that the City regulate the area leased by Fairfax Water through contractual lease requirements and its existing legal authority, and not through the development of SWPPP requirements.
3) 40 CFR Part 112 requires that facilities that store over 1,320 gallons of petroleum in above ground storage tanks (ASTs) develop and maintain a Spill Pollution Control and Countermeasure (SPCC) Plan. A SPCC plan has not been prepared for the facility. It is recommended that a SPCC Plan be developed for the facility. Note that a Commonwealth of Virginia Oil Discharge Contingency Plan (ODCP) is not required to be developed and maintained as the facility does not store greater than or equal to the 25,000 gallon threshold.
4) Good housekeeping at the Property Yard and George Mason High need to be improved and pollution prevention BMPs need to be in place at all times and maintained as needed. For example, the Superintendent of Public Works (Superintendent) indicated that a filter sock was to be in place at several storm drain inlets throughout the Property Yard Complex that were not in place during the site visit. In addition, silt fence controlling runoff from salt and mulch stockpiles at the George Mason High School stockpile storage area and school bus parking area had deteriorated and was no longer in effective in controlling runoff of pollutants from the stockpiles.

5) Water spigots were noted in several areas throughout the Property Yard Complex. Signage should be provided at each spigot indicating prohibited activities in order to prevent illicit discharges.

3.0 Facility Specific Observations and Recommendations

3.1 Property Yard Complex

Shop Yard (7111 Gordon Road)

1) Sediment, debris and a vehicle battery in a container filled with fluid were observed (Appendix A, Photographs 1 and 2). The Superintendent of Public Works indicated that the lot was regularly swept with a Bobcat broom. The City should consider a more formal sweeping schedule to prevent the build-up of sediment and debris, and implementing oil and sediment catch basin inserts at the storm drains collecting stormwater runoff from the parcel.
2) It is recommended, if it has not already been done, that the City investigate the oil/water separator located behind the Police Department shed that was supposedly abandoned to ensure that no environmental risk or liability exists (Appendix A, Photograph 3).
3) A water spigot with a hose attached was noted near the entrance of the Shop Yard adjacent to the Police Department shed (Appendix A, Photograph 4). No signage was noted indicating prohibited activities. The City should consider providing signage near the water spigot.
4) Staining was observed under the salt and sand spreader storage area and adjacent to a storm drain inlet (Appendix A, Photographs 5 and 6). The City should consider providing a cover for the salt and sand spreader storage area to minimize exposure of salt and sand from the sanders and leaking hydraulic fluids.
5) Washing of the salt and sand spreaders was occurring on impervious surface near storm drain inlets resulting in the discharge of pollutants. The City should conduct all equipment washing in the wash bay at the main facility to prevent the discharge of salt, sand, petroleum, hydraulic fluids, and cleaning chemicals to the storm drain system (Appendix A, Photographs 7 and 8).
6) A spill kit was not observed in this area. A spill kit should be provided to ensure that spills area able to be contained immediately.

Main Complex (7100 Gordon Road)

1) Staining was noted in the plow storage area located west of the fueling area, and in the employee parking area (Appendix A, Photograph 9). The City should consider providing raised storage with cover for plow equipment to minimize exposure of leaking hydraulic fluids to stormwater runoff.

2) Several spills were noted throughout the facility that had been covered with absorbent (Appendix A, Photographs 10 and 11). Although the absorbent did not appear to have been left on the spills for an extended period of time, it should be emphasized that absorbent applied to spills should be cleaned up on a daily basis or, at a minimum, prior to any potential rain events.
3) The hazardous materials/waste storage building (Appendix A, Photographs 12 through 16) did not have proper secondary containment, ventilation, or a sprinkler system. The City should consider replacing the shed with a containment area with the required features, similar to the small hazardous materials storage building near the recycling center.
4) An underground storage tank containing used oil was located to the north of the main building outside of a maintenance bay (Appendix A, Photograph 16). Facility staff manually transports drip pans and other containers of used oil from maintenance activities to the fill port located in the asphalt travel way outside the building to transfer used oil to the tank. This procedure increases the risk of spills on areas exposed to stormwater. The City should investigate alternatives to this practice. Specifically, the City should consider replacing the underground tank with an above ground tank located inside the maintenance area, or closer to the garage entrance with cover to prevent contact with rain.
5) Approximately eight 5-gallon containers of latex paint were stored outside and exposed to stormwater on a wooden pallet. The City should consider providing a designated location that is not exposed to stormwater (i.e., covered area or indoors) (Appendix A, Photograph 17).
6) Pressure washer maintenance was observed occurring outside of a maintenance bay, exposing potential pollutants to stormwater (Appendix A, Photograph 18). When at all possible, maintenance activities should be conducted inside the maintenance bays or in areas that are not exposed to stormwater.
7) A container storing used oil from an oil filter crusher located in the maintenance area was not labeled as required (Appendix A, Photograph 19). This container should be labeled "Used Oil."

Utilities Maintenance Area (217 Gordon Road)

1) Street sweeping debris, and tailings and material collected during storm drain cleaning are deposited in the northeast corner of the Utilities Maintenance area without any prior dewatering practices, allowing fluids from the materials to runoff into the nearby storm drain and creating an illicit discharge (Appendix A, Photos 20 through 24). The City should discontinue depositing the materials in this location or provide best management practices to capture the fluids.
2) Two water spigots with hoses attached were noted near in the area (Appendix A, Photographs 25 and 26). No signage was posted indicating prohibited activities. The City should consider providing signage near the water spigot.

3) Paint waste reportedly dropped off at the Recycling Center was stored outside and exposed to stormwater on a wooden pallet. The City should consider providing a designated location that is not exposed to stormwater (i.e., covered area or indoors) (Appendix A, Photograph 27).
4) Sediment tracking was noted on the paved area near the entrance to the property leased to Fairfax Water (Appendix A, Photograph 28). The Superintendent of Public Works indicated that the lot was regularly swept with a Bobcat broom. The City should consider a more formal sweeping schedule to prevent the build-up of sediment and debris in the area.
5) A spill kit was not observed in this area. A spill kit should be provided to ensure that spills area able to be contained immediately.

Recycling Center (217 Gordon Road)

1) The City should consider restricting access to the recycling area during non-business hours to prevent the drop off of unauthorized materials, and to ensure that any spills are able to be contained and cleaned up immediately.
2) A spill kit was not observed in this area. A spill kit should be provided to ensure that spills area able to be contained immediately.

3.2 George Mason High School

Stockpile Storage Area

1) The City should implement a routine inspection and maintenance program. This program will be addressed in the SWPPP developed for the facility.
2) It appeared that an underground stormwater management facility was located near the northwest corner of the tennis courts (Appendix B, Photographs 1 and 2). It is recommended that the City investigate the design and maintenance requirements of the facility to ensure proper operation and maintenance. In addition, the City should add the facility to the City's inventory of post-construction BMPs.
3) Silt fence was observed surrounding the stockpile storage area to control runoff from salt and mulch piles; however, the silt fence had not been maintained and a clear runoff path that contained evidence of salt and sediment was observed from the stockpiles to the storm drain located near the northeast corner of the tennis courts (Appendix B, Photograph 3). The silt fence should be repaired and a regular inspection/maintenance schedule should be implemented.
4) A trash and debris pile was noted along the entrance ramp to I-66 (Appendix B, Photograph 4). According to Mr. Widstrom, the pile appeared to be the result of public dumping. The pile should be removed and the area should be secured using fencing to limit public access to the area and prevent future dumping.

5) Sediment tracking was noted on the paved area from the stockpile area to the bus parking area (Appendix B, Photographs 5 and 6). A gravel entrance or other tracking prevention device should be provided to prevent the tracking of sediment from the area.
6) Trash and debris were noted along the fence line between school bus parking area and entrance ramp to I-66 (Appendix B, Photograph 7). Trash receptacles should be provided for the removal of trash from school buses.

School Bus Parking Area

1) Small amounts of salt were stored in the bus parking area in plastic totes (Appendix B, Photographs 8 and 9). A shed or other form of cover should be provided to store salt.
2) An aging front loader was noted in the bus parking area (Appendix B, Photograph 9). A regular inspection/maintenance program should be implemented to prevent spills and leaks from the engine and hydraulic lines.
3) A Port-o-John located in the bus parking area and adjacent to the baseball field was not secured to prevent tipping during high winds (Photograph 10). The City should consider securing the port-o-john to prevent tipping.

Appendix A – Property Yard Photograph Log

Shop Yard (7111 Gordon Road)

Photograph 1. View of Yard with sediment and debris noted throughout the area.

Photograph 2. View of battery stored in a container full of suspected storm water.

Photograph 3. Abandoned oil/water separator behind Police Department shed.

Photograph 4. Water spigot with hose near entrance to Yard.

Photograph 5. Example of oil staining adjacent to storm drain inlet.

Photograph 6. Close-up view of staining identified in previous photograph.

Photograph 7. View of salt and sand spreader washing adjacent to storm drain inlet.

Photograph 8. Another view of salt and sand spreader washing adjacent to storm drain inlet.

Main Complex (7100 Gordon Road)

Photograph 9. View of plow storage with staining in area.

Photograph 10. Oily release from backup generator engine compartment covered with absorbent.

Photograph 11. Diesel fuel on pavement from repairs to the diesel fuel pump line covered with absorbent.

Photograph 12. Hazardous materials/waste storage building.

Photograph 13. Another view of the hazardous materials/waste storage building with staining evident along the base of the building and on the adjacent pavement. Note that the Superintendent stated that the building is inundated with runoff from the upgradient area during large storm events.

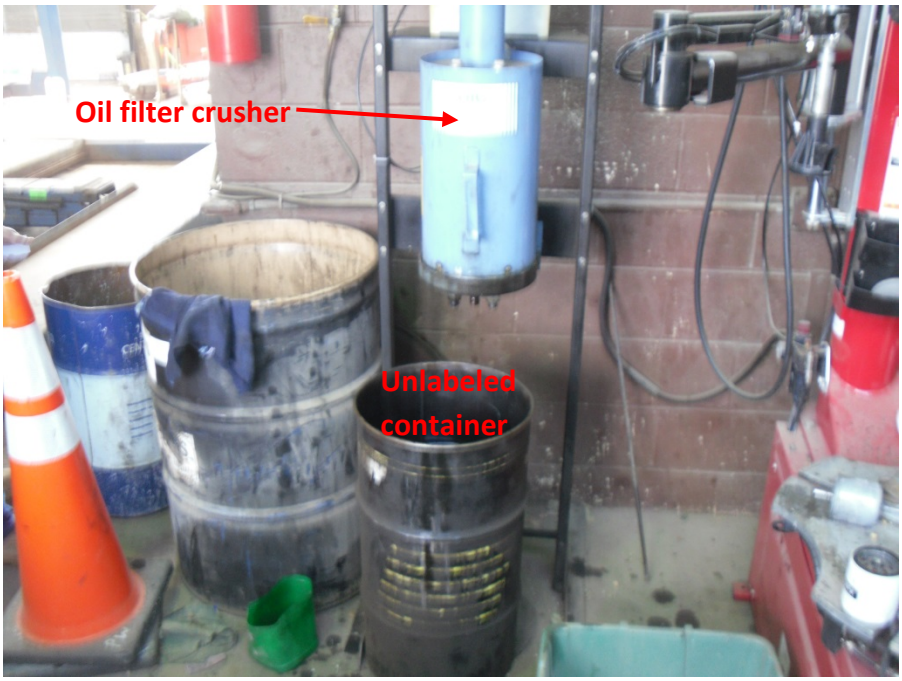
Photograph 14. View of disorganized hazardous materials/waste storage and staining inside building identified in the previous two photographs.

Photograph 15. View of the inside of the hazardous materials/waste storage building with staining evident on the floor of the building near the entrance and no secondary containment.

Photograph 16. Used oil underground storage tank.

Photograph 17. Approximately eight 5-gallon containers of latex paint awaiting disposal.

Photograph 18. Pressure washer maintenance occurring outside of a maintenance bay.

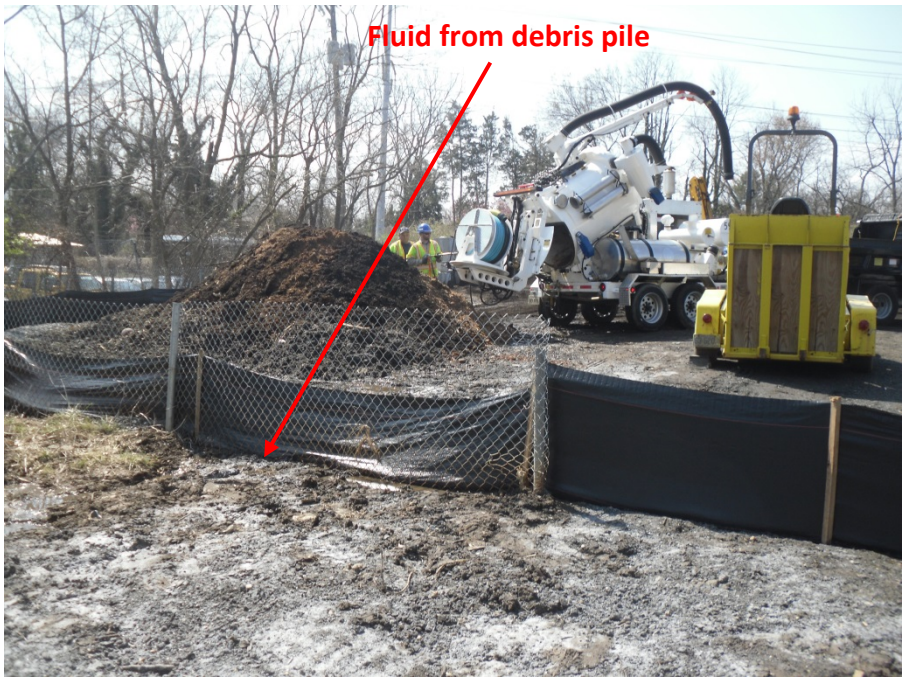


Photograph 19. Unlabeled container storing used oil from oil filter crusher in the maintenance area.

Utilities Maintenance Yard

Photograph 20. Vac truck unloading debris collected from storm drain cleaning activities. Note fluid draining from materials.

Photograph 21. Fluid from debris pile flowing toward storm drain inlet.



Photograph 22. Fluid from debris pile flowing toward storm drain inlet.

Photograph 23. View of fluid from stockpiles flowing toward the storm drain in the northeast corner of the Utilities Maintenance Yard. White residue evident on the soil in the foreground of the photograph appeared to be the result of runoff from salt storage activities.

Photograph 24. View of the storm drain noted in the two previous photographs in the northeast corner of the Utilities Maintenance Yard. Note salt migration between silt fence and rip rap drainage channel leading to storm drain inlet.

Photograph 25. Water spigot with hose in vehicle/equipment parking area just inside the gate of the area leased by Fairfax Water.

Photograph 26. Water spigot with hose in vehicle/equipment parking area just outside of recycling center.

Photograph 27. Paint waste dropped off at the Recycling Center.

Photograph 28. Sediment tracking onto the facility from property leased to Fairfax Water.

Appendix B – George Mason High School Photograph Log

Photograph 1. Access point to stormwater BMP.

Photograph 2. View inside possible stormwater BMP.

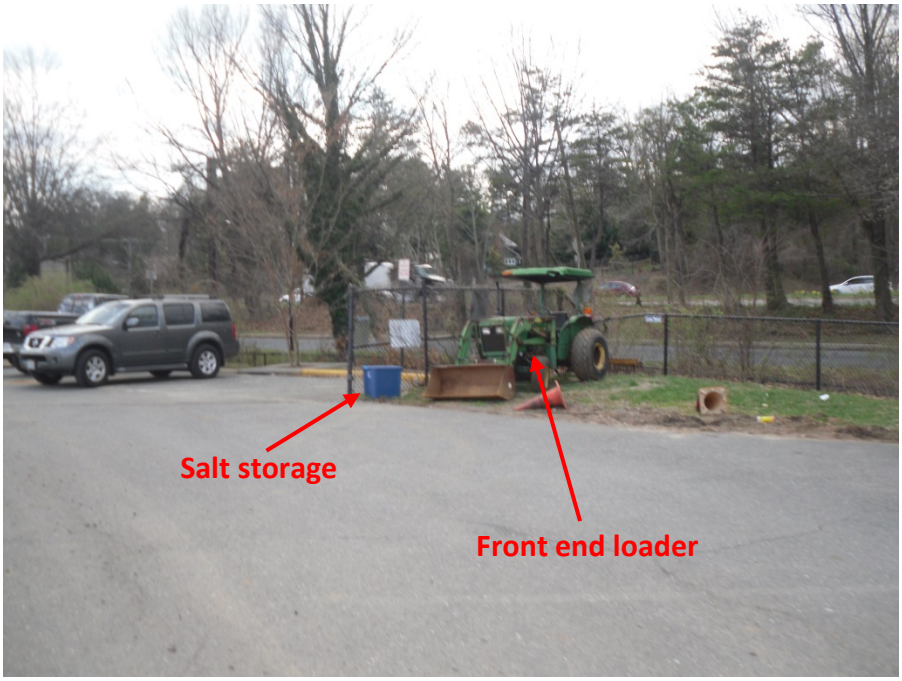
Photograph 3. Drainage way from material storage area to storm drain located at northeast corner of tennis courts. Note deteriorated silt fence and evidence of sediment and salt/sand migration from stock pile to storm drain.

Photograph 4. Trash dumped along I-66 entrance ramp.

Photograph 5. Sediment tracking on roadway from material storage area toward bus parking area.

Photograph 6. Another view of sediment tracking on roadway from material storage area toward bus parking area.

Photograph 7. Trash and debris along the fence line between school bus parking area and entrance ramp to I-66.



Photograph 8. Front end loader and salt storage.

Photograph 9. Salt storage in plastic tote.

Photograph 10. Unsecured port-o-john.

PROPERTY YARD COMPLEX AND REMOTE STORAGE AREA STORMWATER POLLUTION PREVENTION PLAN (SWPPP)
7100 Gordon Road
Falls Church, Virginia 22046

Prepared For:

City of Falls Church
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Falls Church, Virginia 22046

Prepared By:

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Chantilly, Virginia 20151

June 30, 2014

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Figure 3 Remote Storage Area Site Diagram

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Appendix A Municipal Separate Storm Sewer (MS4) General Permit
Appendix B Spill and Illicit Discharge SOP
Appendix C Annual Comprehensive Site Compliance Evaluation Report
Appendix D Quarterly Facility Inspection Report
Appendix E Employee Training Sheet
Appendix F SWPPP Amendment Log

1.0 PURPOSE OF STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

This SWPPP is intended to document the selection, design, and installation of control measures, including best management practices (BMPs), to eliminate or reduce the pollutants in stormwater discharges from the City's Property Yard Complex and Remote Storage Yard at George Mason High School (hereafter, collectively, facility), and to meet applicable water quality standards. The content of this SWPPP is geared toward compliance with the requirements of the City's MS4 General Permit (9VAC25-890-40 et seq).

The goal of the SWPPP is to improve water quality by reducing the pollutants contained in stormwater discharges. The SWPPP was prepared in accordance with the requirements of the City's MS4 General Permit and good engineering practices. The SWPPP identifies the sources of pollution at the Property Yard Complex and Remote Storage Area and the measures that will be implemented to prevent or control the discharge of those pollutants in stormwater runoff.

The SWPPP (1) identifies potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the facility; (2) describes and ensures implementation of the practices and features used to eliminate or reduce pollutants in stormwater discharges from the facility; and (3) ensures compliance with the terms and conditions of the General MS4 Permit.

The SWPPP outlines site specific control measures (e.g., BMPs) that are economically reasonable and appropriate. The control measures were selected and designed in accordance with good engineering practices to eliminate or reduce pollutants in the stormwater discharge to meet water quality standards.

The SWPPP will be retained on-site at the facility and will be available upon request. The SWPPP will be updated and utilized as part of staff training required by the General MS4 Permit.

2.0 POLLUTION PREVENTION TEAM

The Pollution Prevention Team is responsible for implementing the SWPPP including the administrative requirements associated with the SWPPP. All other facility personnel also have implementation responsibilities for the SWPPP.

The Pollution Prevention Team members were selected as key individuals who are responsible for, and are most familiar with the operation of the facility. The purpose of designating specific team members makes it clear that it is part of these individuals' responsibilities to prevent stormwater pollution. It also provides a point of contact to other facility personnel and regulatory officials to discuss specific aspects of the plan. The team is made up of key on-site personnel who are familiar with the facility and its operations and representatives from all phases of the facility's operations.

The team is responsible for the following:

- Implementing all pollution prevention plan requirements.
- Being aware of changes that are made in facility operations and determining whether any changes must be made to the stormwater pollution prevention plan.
- Maintaining a clear line of communication with facility personnel and City management to ensure a cooperative partnership.
- Overseeing routine materials inventory and recommending ways to reduce or eliminate hazardous materials.
- Implementing and overseeing employee training and the inspection program.
- Identifying potential pollutant sources and recommending ways to alleviate problem areas through changes in operations, equipment, layout, and materials.
- Coordinating the implementation of BMPs, reviewing the effectiveness of the program, and updating the program as needed.
- Reporting the results and advising facility management of problems encountered.

Table 1 shows the personnel who have been assigned to the team, along with their phone numbers, and responsibilities. A copy of this roster will be posted at the Property Yard Complex so that City employees are aware of who is responsible for stormwater management. If the facility's personnel notice potential sources of pollutants or have ideas to help reduce stormwater pollution, they should discuss them with the appropriate team member. The active participation of all facility personnel in helping to identify and eliminate potential stormwater pollution sources is vital to the success of this SWPPP. The Pollution Prevention Team will gather at regularly scheduled meetings held annually. During these meetings, the team will discuss the goals of the SWPPP, review BMP's progress, address comments and suggestions received from others, and determine if changes need to be made to the plan to meet its objectives. The team will revise the SWPPP, including the BMP implementation schedule, as necessary.

Table 1
Pollution Prevention Team

Role	Title	Telephone (Office/Mobile)	Responsibilities
Pollution Prevention Team Leader	Superintendent of Public Works	(703) 248-5013 (571) 238-5127	Define goals for facility and update SWPPP as needed, review effectiveness of the program, and report results and advice the City's Environmental Staff of problems encountered. Signatory Authority.
Pollution Prevention Team Member 1	Stormwater Crew Chief	(703) XXX-XXXX (571) XXX-XXXX	Oversee implementation of SWPPP, training program and inspections. Signatory Authority.
Pollution Prevention Team Member 2	Urban Forestry Crew Chief	(703) XXX-XXXX (571) XXX-XXXX	Implement the SWPPP requirements and BMP's, identify potential pollutant sources and solutions to alleviate problem areas, and implement employee training program and inspections.
Pollution Prevention Team Member 3	General Services Crew Chief	(703) XXX-XXXX (571) XXX-XXXX	
Pollution Prevention Team Member 4	Sanitary Sewer Crew Chief	703) XXX-XXXX (571) XXX-XXXX	

3.0 SWPPP CERTIFICATION

The Superintendent of Public Works (Superintendent) will sign the SWPPP. All required reports will be signed by the Superintendent or a "Duly Authorized Representative"[1] of that person.

Facility Manager

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.

Name: _____ Title: _____

Signature: _____ Date: _____

Duly Authorized Representative

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.

Name: _____ Title: _____

Signature: _____ Date: _____

[1] A "Duly Authorized Representative" which is defined by the State Industrial General Permit as an appointee that acts as the owner/site operator's representative on-site. A Duly Authorized Representative is authorized to make changes and modifications to the SWPPP and sign required reports. To be considered a Duly Authorized Representative, written authorization must be given to the person(s) or the person(s) position and must be included in the SWPPP.

4.0 SITE DESCRIPTION

4.1 Facility Description and Activities

This SWPPP covers the Department of Public Work's (DPW's) activities conducted at the areas collectively referred to as the Property Yard Complex and the Remote Storage Area located at George Mason High School (Remote Storage Area).

The Property Yard Complex is comprised of four separate areas totaling 5.66 acres. The areas consist of the Main Complex, the Shop Yard, the Recycling Area, and the Utilities Maintenance Area. These areas are located on both sides of Gordon Road between West Broad Street (Route 7) and Shreve Road (Route 703) within the City of Falls Church limits.

As of 2014, the City only actively uses 4.36 acres of the Property Yard Complex. The remaining area, roughly 1.30 acres, is leased to Fairfax Water. This area contains a roughly 19,000 square foot warehouse and is primarily used by Fairfax Water for vehicle, equipment and materials storage. The Fairfax Water facility is located on the south side of Gordon road, directly across from the City's DPW Operations Division building, and is bounded by the City's primary solid waste and materials storage area to the east and a concrete production facility to the west. A chain link fence separates the Fairfax Water lease from the City's solid waste and materials storage area. Stormwater runoff from a portion of the parcel drains to the City's site; however, the activities and operations of Fairfax Water are not covered under this SWPPP.

Figure 1 shows the location and general vicinity of the Property Yard Complex and Remote Storage Yard. **Figure 2** is a site diagram of the Property Yard Complex which serves as the primary facility for all of the City's DPW activities and operations. **Figure 3** is a site diagram of the Remote Storage Area. The Remote Storage Area serves as auxiliary storage for materials, typically consisting of mulch only.

The Property Yard Complex consists of the following:

- An employee parking area;
- A vehicle and equipment storage and maintenance area;
- A fueling station;
- A 'self-serve' recycling center for City residents;
- Solid waste storage (e.g., dumpsters);
- Materials storage area (e.g., stockpile area);
- Salt and sand storage area;
- Vehicle wash rack; and
- Vehicle and equipment storage for other City Departments (i.e. Police, Fire, and Parks and Recreation).

Property Yard Complex

Main Yard

The Main Yard is located at 7100 Gordon Road. The property is bounded by a car dealership to the north, by Gordon Road to the south and east, and by Shreve Road to the west. The DPW's Operations building is located on the property and contains offices for DPW employees, three (3) vehicle maintenance bays, and one (1) bay that serves as the City's main vehicle/equipment wash area. The building has a footprint of approximately 7,300 square feet. Runoff from the roof of the building drains to a large cistern located at the northeast corner of the building, near the entrance to the property. The stormwater collected in this cistern is reused onsite and

throughout the City for routine activities. The property also contains an approximately 2,500 square foot one-story building located along the northern boundary of the property that serves as storage for maintenance equipment and materials. Runoff from the roof of this building drains to the asphalt travel way and flows to the curb inlet at the southeast corner of the property. The Main Yard is also used for vehicle and equipment storage, and contains a fueling station for City vehicles comprised of two (2) 6,000 gallon above-ground storage tanks (ASTs) containing unleaded gasoline and diesel. The two (2) ASTs are triple-walled and have an internal leak detection system, as well as an emergency shutoff switch. The fueling station is covered by a metal roof canopy, and situated on an elevated concrete pad that is designed to route the flow of stormwater runoff around the fueling area. Areas of the property are also used for equipment and materials storage by other City Departments, such as the Police Department and the Department of Parks and Recreation. Storage trailers and containers utilized by these departments are located on the paved area near the southwest corner of the property. The paved area toward the northwest corner of the property serves as the primary employee parking area. The parcel at 7100 Gordon Road is roughly 2.50 acres in size and contains approximately 0.50 acres of undeveloped land bordering Shreve Road. This pervious areas drains to the east, toward the paved portion of the property, and is separated from the rest of the site by a chain link fence. Stormwater runoff from the Main Yard drains to the east, toward an inlet located along the eastern portion of the yard before it is conveyed to the Utilities Maintenance Area property before it is conveyed offsite.

Shop Yard

The shop yard is a small lot located at 7111 Gordon Road, south of the Main Yard and immediately west of the concrete production facility. The property is primarily used by the City for equipment and materials storage, and contains an approximately 4,000 square foot one-story storage building. Two (2) small storage sheds and a storage container located at the front of the property, near Gordon Road, house City Police Department motorcycles and equipment. Salt and sand spreaders are stored on wood racks along the west edge of the property. The shop yard is roughly 0.3 acres in size and is separated from adjacent properties by a chain link fence. Runoff from the roof of the building and asphalt travel way flow to one (1) of three (3) grate inlets located on the property before it is conveyed offsite.

Recycling Center

Part of the City's Property Yard includes a 'self-serve' Recycling Center, where citizens can recycle scrap metal, glass, plastic, mixed paper, cardboard, and electronics 24 hours per day. Recyclable materials collected here are stored in covered dumpsters at this location, and several metal shipping containers located on the adjacent Property Yards' Utilities Maintenance Area (described below). The City also holds annual hazardous waste collection events at this location, and offers recycled leaf mulch to residents in the spring. The Recycling Center is located at 217 Gordon Road and is bounded by Gordon Road to the west, the Utilities Maintenance Area to the south and east, and a sheet metal fabrication and welding shop to the north. The area is separated from adjacent properties by a chain link fence. The Recycling Center is approximately 0.20 acres in size and is entirely impervious. Stormwater runoff drains to the east, toward yard inlets located on the Utilities Maintenance Area property before it is conveyed offsite.

Utilities Maintenance Area

The Utilities Maintenance Area is an area approximately 1.30 acres in size and is located directly east of the Main Complex at 7100 Gordon Road. The property is bounded by the Recycling Center to the north, the Washington and Old Dominion (W & OD) Trail to the south, an automotive repair shop to the west, and Gordon Road and the Fairfax Water facility to the west. The area is separated from adjacent properties by a chain link fence. The Utilities

Maintenance Area is primarily used by the City as storage for additional vehicles and equipment, as well as materials and solid waste. Four (4) concrete bays containing mulch, salt, sand and gravel are located near the southwest corner of the property. Large aggregate, soil generated from construction excavation, and other construction materials are also stored at this location. Stockpiling operations vary depending on seasonal operations and activities. Materials collected at the Recycling Center are stored in metal shipping containers (i.e., white goods, electronics, and other materials) located in this area until they can be removed for permanent offsite disposal. A small hazardous materials storage unit is located on the parcel to house hazardous materials disposed of by City residents at the annual event. The City of Falls Church Urban Forestry Department also uses a small portion of the parcel for equipment and materials storage. Stormwater drains to the north and east where it flows to one (1) of three (3) yard inlets located on the property before being conveyed offsite. All three (3) inlets are protected from silt and sediment generated during stockpiling operations.

Remote Storage Area

The City of Falls Church Public Works utilizes a Remote Storage Area on the George Mason High School property where stockpiling operations take place (e.g., mulch). This area is located northwest of the high school, between the baseball and softball fields and the Washington Metropolitan Area Transit Authority (WMATA) access exit ramp. Recycled leaf mulch is stored in the mulching area in the spring and early summer. Stockpiling operations are surrounded by silt fence to prevent runoff to the storm sewer system. Stormwater drains to the south and east and flows to a yard inlet and to a parcel owned by WMATA as shown in **Figure 3**. An underground stormwater management facility is located between the storage area and the adjacent tennis courts, and treats drainage from the nearby athletic fields and is maintained by the City of Falls Church Public Schools. City of Falls Church activities and operations at this location are covered under this SWPPP.

4.2 Discharge Points and Receiving Waters

Stormwater runoff from the Property Yard Complex is conveyed and discharged offsite at three (3) locations. The discharge locations are outlined in **Table 2** below, and are also identified on the Site Drainage Map included in **Figure 2**. Runoff from the Main Yard, the Recycling Center, the Utilities Maintenance Area, and a portion of Gordon Road drains to onsite stormwater structures that convey flow offsite via Outfall 001 to the City's MS4 and ultimately to the Pearson Branch of Tripps Run. Runoff from the Shop Yard drains to onsite stormwater structures that convey flow offsite via Outfall 002 to the City's MS4 and ultimately to Tripps Run. Tripps Run is listed as an impaired waterbody by the EPA based on water quality standards for aquatic life and the poor health of benthic macroinvertebrates present in the stream. Currently, development of a Total Maximum Daily Load (TMDL) for Tripps Run is underway, and is expected to be established by 2016.

Stormwater runoff from the Remote Storage Area is conveyed and discharged offsite at two (2) locations. The discharge locations are outlined in **Table 2** below, and are also identified on the Site Drainage Map included in **Figure 3**. Runoff from a portion of the Remote Storage Area drains to onsite stormwater structures that convey flow offsite via Outfall 003 to Fairfax County's MS4 and ultimately to Pimmit Run. Runoff from the remaining portion of the Remote Storage Area drains to an onsite stormwater structure that conveys flow offsite via Outfall 004 to a drainage swale located on a parcel of land owned by WMATA to Fairfax County's MS4 and ultimately to Pimmit Run. Pimmit Run is an impaired waterbody with TMDLs in development for benthic macroinvertebrates, *E.coli*, Chlordane and Heptachlor epoxide.

Table 2
Discharge Locations

MS4 Operator/ Discharge ID	Common Description	Discharge Location	Discharge Coordinates
001	24” Corrugated Metal Pipe (CMP) outlet located in the Utilities Maintenance Area	City of Falls Church MS4 to Pearson Branch of Tripps Run	38°53’30.7” -77°11’21.2”
002	Grated inlet located in the Shop Yard	City of Falls Church MS4 to Tripps Run	38°53’31.1” -77°11’31.0”
003	Grated inlet located in the Remote Storage Area	Fairfax County MS4 to Pimmit Run	38°53’55.8” -77°11’40.7”
004	Drainage Swale located on WMATA Parcel adjacent to the Remote Storage Area	WMATA Parcel to Fairfax County MS4 to Pimmit Run	38°57’57.3” -77°11’38.8”

5.0 SUMMARY OF POTENTIAL POLLUTANT SOURCES

5.1 Potential Areas for Stormwater Contamination

This section identifies specific areas at the Property Yard Complex and Remote Storage Area where certain activities and/or materials are exposed to stormwater, or have the potential for contact with stormwater.

Activities with a potential for contributing to stormwater pollution onsite include, but are not limited to:

- Vehicle / Equipment Fueling;
- Vehicle / Equipment Maintenance and Washing;
- Vehicle / Equipment Storage;
- Solid Waste Disposal and Recycling; and
- Material Handling and Stockpiling.

These activities can introduce pollutants into the stormwater system, which can be harmful to the environment. Fuel, oil, solvents, metal shavings, lubricants, paint, sediment, pesticides, trash, and other materials can negatively impact water quality, if they are allowed to enter the storm sewer. Transport and bulk storage of materials such as hazardous wastes, chemicals, fuels, oil, asphalt, concrete, sand, salt, and yard waste can also contribute to water pollution if the materials are not properly managed and stored.

5.2 Activities and Associated Pollutants Exposed to Stormwater

Table 3 summarizes activities at the Property Yard Complex and Remote Storage Area that may potentially expose pollutants to stormwater (e.g., material storage, equipment fueling and cleaning, etc.). The table is subdivided into the five (5) main areas covered by this SWPPP and includes the general location of each activity, as well as the pollutants associated with the activity and the BMP(s) implemented for protecting stormwater quality.

Table 3
Activities and Associated Pollutants Exposed to Stormwater

Area	Pollutant Source	Location	Associated Pollutants	Source Control BMP
Main Yard (7100 Gordon Road)	Vehicle / Equipment Fueling	Fueling Station	Petroleum products	Inlet protection, covered and graded to divert stormwater from fueling area, fueling standard operating procedure
	Vehicle / Equipment Washing	Wash Bay	Oil and grease, grit or solids particulates, metals, deicer products, other automotive fluids, soaps and detergents	Dedicated wash bay with containment for washwater

Area	Pollutant Source	Location	Associated Pollutants	Source Control BMP
	Vehicle / Equipment Maintenance	Vehicle Maintenance Bays (3)	Automotive and equipment fluids (i.e., brake fluid, hydraulic fluid, antifreeze, and oil), part cleaning solvents, sediment, and metals	Dedicated vehicle maintenance bays, approved containers for used automotive and equipment fluids, dry cleaning methods, and spill kits
	Vehicle / Equipment Parking	Vehicle / Equipment Parking Area	Automotive and equipment fluids (i.e., brake fluid, hydraulic fluid, antifreeze, and oil) and deicer products	Spill kits, inlet protection, and routine sweeping (mechanical sweeper)
	Vehicle / Equipment Fluids Storage (i.e., oils, lubricants, etc.)	Hazardous Materials Storage Shed north of DPW Operations Building	Automotive and equipment fluids (i.e., brake fluid, hydraulic fluid, antifreeze, and oil)	Containment system, spill kits, inlet protection
Shop Yard (7111 Gordon Road)	Vehicle / Equipment Parking	Vehicle / Equipment Parking	Automotive and equipment fluids (i.e., brake fluid, hydraulic fluid, antifreeze, and oil) and deicer products	Spill kits, inlet protection, and routine sweeping (mechanical sweeper
	Plow Storage, Salt/Sand Spreader Storage, other equipment containing hydraulic or mechanical fluids	Storage Rack	Hydraulic fluid	Best practices for proper equipment storage, spill kits, inlet protection, and routine sweeping (mechanical sweeper
Utilities Maintenance Area (217 Gordon Road)	Vehicle / Equipment Parking	Vehicle / Equipment Parking	Automotive and equipment fluids (i.e., brake fluid, hydraulic fluid, antifreeze, and oil) and deicer products	Spill kits, inlet protection, and routine sweeping (mechanical sweeper
	Stockpiled Materials (Milling / Paving / Sand, etc.)	Stockpile Bays	Solid particulates	Best practices for stockpiling operations and equipment washing, silt fence, inlet protection

Area	Pollutant Source	Location	Associated Pollutants	Source Control BMP
	Solid Deicing Storage	Stockpile Bays	Sodium chloride and sand	Best practices for stockpiling operations and equipment washing, silt fence, inlet protection
	Exposed Soils	Stockpile Bays	Sediment	Best practices for stockpiling operations and equipment washing, silt fence, inlet protection
	Paints and Solvents	Hazardous Materials Storage Building for Recycling Activities	Paints and solvents	Hazardous material storage shed provides primary and secondary containment
Recycling Center (217 Gordon Road)	Temporary Storage of Collected Materials (i.e., Recyclables)	'Self-serve' Recycling Area	Sediment, grit, trash and debris, oil and grease	Routine sweeping (mechanical sweeper) and tree filter
	Landscaping and Gardening Materials	'Self-serve' Recycling Area	Solid particulates	Tree filter
	Stockpiled Materials (mulch)	'Self-serve' Recycling Area	Solid particulates	Best practices for stockpiling operations and equipment washing, silt fence, inlet protection, and tree filter
Remote Storage Area (George Mason High School)	Vehicle / Equipment Parking	Stockpile Area	Automotive and equipment fluids (i.e., brake fluid, hydraulic fluid, antifreeze, and oil) and sediment	Spill kit, inlet protection, and underground stormwater management facility
	Stockpiled Materials (mulch, topsoil)	Stockpile Area	Solid particulates	Best practices for stockpiling operations, silt fence, inlet protection, and underground stormwater management facility

6.0 NON-STORMWATER DISCHARGES

A non-stormwater discharge is any discharge or flow to a stormwater drainage system that is not composed entirely of stormwater runoff. The MS4 General Permit prohibits the discharge of non-stormwater, including those from public agency activities, into their respective MS4s and to the Waters of the United States unless the discharge is authorized by a respective MS4 Permit or regulated under a separate NPDES permit.

Non-stormwater discharges to the stormwater sewer or surface waters that are not covered under the City's MS4 permit that occur at the facilities should be reported and documented in accordance with the City's Spill and Illicit Discharge SOP (**Appendix B**).

All discharge locations from the facilities will be inspected during Annual Comprehensive Site Compliance Evaluations. Dry weather non-stormwater discharges identified should be investigated to determine the source of the discharge. Findings will be documented in the Annual Comprehensive Site Compliance Evaluation Reports (**Appendix C**) and kept on file with this SWPPP.

The facility operations conducted at the Property Yard Complex and Remote Storage Yard do not discharge any non-stormwater discharges. Any non-stormwater discharges observed at the Property Yard Complex and Remote Storage Area in the future will be investigated immediately by the Superintendent or their designee and corrected.

6.1 Authorized Non-Stormwater Discharges

Certain types of non-stormwater discharges are authorized unless they are identified as a significant source of pollutants.

The following "non-stormwater" discharges are authorized:

- Discharges from firefighting activities;
- Fire hydrant flushings;
- Potable water, including water line flushings;
- Uncontaminated condensate from air conditioners, coolers, and other compressors and from the outside storage of refrigerated gases or liquids;
- Irrigation drainage;
- Landscape watering provided all pesticides, herbicides, and fertilizer have been applied in accordance with the approved labeling;
- Pavement wash waters where no detergents are used and no spills or leaks of toxic or hazardous materials have occurred (unless all spilled material has been removed);
- Routine external building washdown that does not use detergents;
- Uncontaminated ground water or spring water; and
- Foundation or footing drains where flows are not contaminated with process materials.

6.2 Prohibited Non-Stormwater Discharges

Discharges from certain pollutant generating activities are prohibited from entry into the storm drainage system. The discharge of substances other than stormwater, with the exception of the discharges provided above, or those discharges covered under a VPDES permit, are prohibited.

The following non-stormwater discharges are prohibited:

- Wash water from vehicle and equipment operation and maintenance;

- Yard waste and grass clippings;
- Wash water from the clean-up of concrete equipment and mixers;
- Wash water from the clean-up of stucco, paint, form release oils, curing compounds, and other materials;
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
- Sanitary wastewater and sewage;
- Yard waste and grass clippings;
- Decant fluid from contents of storm drain cleaning and street sweeping tailings;
- Soaps or solvents used in vehicle and equipment washing; and
- Hazardous materials and wastes.

7.0 STORMWATER CONTROLS

The plan identifies stormwater control measures recommended to eliminate or reduce stormwater pollution specific to the activities and materials outlined in Section 4.0 of this SWPPP. These stormwater controls include, but are not limited to, implementing good housekeeping practices (best practices) for activities identified to have a high potential for illicit discharge, implementing inlet BMPs (i.e., filter rolls, catch-basin inserts, etc.) at storm drains across the site, and addressing proper equipment and material storage. These control measures are outlined in more detail in the following sections.

Control measures will be implemented to address potential pollutant sources and to prevent stormwater pollution and illicit discharges from the facility. This section of the SWPPP describes the type, location and implementation of control measures for each area where potential pollutant sources may be exposed to stormwater.

7.1 Structural Control Measures

Structural control measures are engineered controls that are put in place at the facility that are intended to manage stormwater runoff and/or mitigate the effects of stormwater runoff.

There are several structural control measures that have been implemented at the Property Yard Complex and Remote Storage Area to reduce potential stormwater contamination. The structural control measures include:

- All equipment servicing and motor repair activities occur within the designated shop areas within the structure;
- All waste fluids and petroleum products are stored within the hazardous materials storage shed and vehicle maintenance bays, and out of the weather;
- Spill pallets are utilized for the storage of drums containing used oil filters and used oil absorbent material where possible;
- The parts washer is a closed loop recycled solvent washer, only generating residual oil;
- Oil absorbent drain inserts and booms are utilized at applicable storm drain inlets;
- New and used vehicle and equipment parts are stored in designated areas that are not exposed to stormwater;
- A tree filter is installed to treat runoff; and
- Silt fence is installed in several locations to reduce the discharge of sediment.

The following structural control measures will be implemented at specific locations throughout the Property Yard Complex and Remote Storage Area where appropriate to prevent and control pollutants in stormwater discharges from the facility.

7.1.1 Dumpster and Trash Receptacle Lids/Plugs

All dumpsters and trash receptacles utilized at the Property Yard Complex and Remote Storage Area will have lids that cover the entire dumpster and will also have plugs to prevent leakage from the dumpster to the stormwater system.

7.1.2 Silt Fence

Silt fence is utilized at the Property Yard Complex and Remote Storage Area to control sediment from the stockpiling of materials. Silt fence will be properly installed and maintained at all times.

7.1.3 Equipment Servicing and Motor Repair Activities

All vehicle and equipment servicing and motor repair activities occur within the three vehicle maintenance bays. The vehicle maintenance bays are located inside the garage at the Main Yard and are not exposed to the weather. The vehicle maintenance bay area utilizes numerous chemical and petroleum products as part of its daily activities. Used oil generated within the vehicle maintenance bay is collected within each bay and transferred to the used oil aboveground storage tank (AST) located within the shop building to await disposal. In addition, several 55-gallon containers of new motor oil were observed within the vehicle maintenance bay area. The vehicle maintenance bays are not equipped with floor drains and all floor cleaning is conducted using dry methods. The vehicle maintenance bay area provides adequate protection from precipitation events, and stormwater does not come into contact with any of the materials stored within the shop.

7.1.4 Hazardous Materials Storage Sheds

All generated chemical and petroleum waste fluids are temporarily stored in the vehicle maintenance bays or nearby hazardous materials storage shed located within the Main Yard. A double-walled 500-gallon used oil AST is located within the vehicle maintenance bay area. Additionally, 55-gallons drums are stored in the hazardous materials storage shed for the temporary storage of additional waste product fluids. The waste product fluids generated at the facility are stored within the petroleum storage room for no more than 90 days as required by the EPA regulations. The double walled 500-gallon AST and hazardous materials storage shed provide adequate protection from precipitation events and stormwater does not come into contact with the AST or drums.

7.1.5 Parts Washer

A closed loop parts washer is utilized in the maintenance shop at the Main Yard. The parts washer recycles 100 percent of the cleaning solvents. During parts washing activities, dirty solvent is heated under vacuum to the vapor point. The solvent is vaporized and any oily residue is separated from the solvent for removal. The solvent vapors are then cooled back to a liquid state in a condenser and 100 percent of the solvent is returned to the reservoir and is available for continued use. The use of this type of parts washer is eco-friendly and no hazardous waste materials are generated or will need to be disposed of as a hazardous waste. Any oily residue that is recovered during this process is disposed of as used oil. The parts washer is stored and maintained within the vehicle maintenance bay and is not in contact with any precipitation or weather.

7.1.6 Oil Absorbent Booms

Oil absorbent booms and socks are installed at the curbside inlet located in the eastern portion of the Main Complex along Gordon Road. The boom is maintained at the inlet to skim and remove floating petroleum from the stormwater entering into the drainage network. The boom is inspected monthly or as needed if they become soiled with petroleum. Soiled booms are stored in 55-gallon sealed containers until they can be properly disposed of offsite.

7.1.7 Oil Absorbent Drain Inserts

Oil absorbent drain inserts are installed at each of the three (3) rectangular storm drain inlets in the Shop Yard. The drain inserts are maintained at each of the three inlets to remove floating petroleum from stormwater entering into the drainage network. The drain inserts are inspected monthly or as needed if they become soiled with petroleum. Soiled drain inserts are stored in 55-gallon sealed containers until they can be properly disposed of offsite.

7.1.8 Metal Shipping Storage Containers

A number of storage containers (e.g., metal shipping containers or sea crates) are utilized for the dry storage of materials received at the Recycling Center (i.e., white goods, paints, etc.), as well as Parks and Recreation, Police Department and Fire Department equipment. The containers are water tight and provide ample protection of the materials received at the Recycling Center and for storage of equipment from the elements.

7.1.9 Tree Filter

A tree filter is installed downgradient of the Recycling Area. The tree filter is maintained to remove bacteria, metals, nutrients and sediment. The tree filter is inspected monthly to ensure proper operation and maintenance.

7.2 Non-Structural Controls

Non-structural controls are a combination of design and planning techniques that preserve natural systems and hydrologic functions. Non-structural controls encourage the treatment, infiltration, evaporation, and transpiration of precipitation close to where it falls, while helping to maintain a more natural and functional landscape.

The following types of non-structural BMPs will be implemented at the facility in an effort to prevent and minimize pollutants where stormwater is conveyed offsite:

7.2.1 Good Housekeeping

Good housekeeping practices include activities that are intended to maintain a clean site and keep equipment in good working order to prevent stormwater pollution. Daily cleanup and inspections are the most effective means of achieving good housekeeping. Generally, good housekeeping is comprised of day-to-day activities that do not require a large expenditure of time or expense, and should be implemented on an ongoing basis. An inspection and maintenance schedule for these areas is contained in Section 8 of this document.

Good housekeeping practices consist of:

- Tools and materials should be returned to designated storage areas after use;
- Waste materials should be collected and properly disposed after the completion of each job, shift, or day, as appropriate;
- Indoor work areas should be neat, uncluttered, and well-ventilated to discourage outdoor work and to allow leaks and spills to be quickly detected and controlled;
- Outdoor work areas should be swept regularly (not hosed) and kept clean;
- Occasionally outdoor work areas may need cleaning beyond sweeping. In such cases, all wash water should be contained, collected, and properly disposed; and
- Outdoor waste or trash receptacles should be covered and emptied regularly, and the adjacent areas inspected for misplaced or wind-blown litter.

7.2.2 Eliminating and Minimizing Exposure

To the extent practicable, all activities are conducted inside, or protected by a storm-resistant covering to prevent exposure to rain, snow, snowmelt, and runoff. As previously mentioned, routine engine maintenance is performed inside of the vehicle maintenance bay area in the Main Yard. All of the bulk maintenance material containers (tanks and drums) are located within the vehicle maintenance bay or hazardous materials storage shed located at the Main Yard. The only materials at the Property Yard Complex and Remote Storage Area that are typically

stored outside are vehicles and equipment and bulk material storage (e.g., mulch, aggregate, etc.).

7.2.3 Preventive Maintenance

Preventive maintenance involves the regular inspection, testing, maintenance and repairing of all equipment and systems to avoid situations that could result in leaks, spills and other releases of pollutants in stormwater discharge from the facility. This program is in addition to the specific maintenance of control measures. These inspections will help prevent conditions that could cause breakdowns or failures resulting in discharges of pollutants.

To reduce the likelihood of breakdown or failure, major equipment will be maintained under a preventive maintenance schedule for inspection, repair, and replacement of fluids (e.g., hydraulic, lubricating, cooling), greases, seals, hoses, filters, pressure gauges, piping, etc. Paved areas and surrounding landscaping will not be allowed to degrade to the point where surfaces erode and may contribute pollutants to runoff. Leaky roofs, broken doors, cracked pavement and berms, and any other enclosure or structural defects that may impact the quality of stormwater runoff will be promptly repaired. Structural BMPs and storm drains within facility boundaries will also be inspected and maintained regularly.

7.2.4 Spill Prevention and Response Procedures

Spills and leaks are some of the most significant sources of stormwater pollution, and are, in most cases, avoidable. A spill can be a one-time event, a continuous leak, or a reoccurring leak. All spills must be prevented. Leaks and spills of potential pollutants (both solid and liquid) on any exposed surfaces will be promptly contained and cleaned up to prevent contact with stormwater runoff. Spill cleanup kits are available at locations where spills are possible. Site drainage maps for the Property Yard Complex and the Remote Storage Area are included in **Figures 2 and 3** and identify spill kit locations.

Spill prevention, control, and cleanup applies to all materials and wastes—not only hazardous substances. The toxic water quality effects from spills of hazardous substances (e.g., acids, oils, greases, fuels, solvents, pesticides) are commonly understood. However, non-hazardous materials—for example, sand, litter, corn oil, sweeteners, soaps, and milk, among others—can also greatly impact water quality.

Prevention

In order to reduce the potential for spills, the following practices will be implemented:

- Berms and containment features will be placed around structures or areas where fluids are stored, so releases can be prevented, easily detected, and controlled;
- All containers that contain potential pollutants will be clearly labeled;
- Liquid materials will be stored and transported in appropriate containers with tight fitting lids;
- Drip pans will be placed underneath all containers, fittings, valves, and other areas where materials are likely to spill or leak;
- Tarpaulins, ground cloths, or drip pans will be placed in areas where materials are mixed, carried, and applied to capture any spilled materials;
- Employees will be regularly trained on the safe techniques for handling materials used onsite, and encouraged to check for leaks and spills;
- Employees will be regularly trained on the proper use of spill response equipment and supplies; and

- Spill cleanup kits will be stored near areas with a high potential for spills, so that they are easily accessible in the event of a spill. The contents of the spill kit have been selected based on the types and quantities of materials stored or used at the facility. Spill kit contents are routinely inventoried and replaced as materials are used.

Materials handling and storage BMPs are implemented at the facility related to controlling the potential for leaks and spills of materials used and stored at a facility. Spills and leaks of materials can accumulate in soils or on surfaces and be carried away in stormwater runoff or authorized non-stormwater discharges. Examples of appropriate materials handling and storage BMPs are:

Materials Use

- Only obtain the amount of materials needed to finish a particular job;
- Limit waste generation by keeping good records and reviewing activities;
- Recycle materials whenever possible;
- Read and follow manufacturer directions for use of materials; and
- Review the associated Material Safety Data Sheet (MSDS).

Materials Storage

- Store materials indoors, or in a covered area where exposure to stormwater is minimized;
- Store lead-acid batteries indoors and within secondary containment;
- Use hazardous materials storage lockers with spill containment, or flammable materials lockers when appropriate;
- Locate storage areas away from vehicle and equipment paths to reduce the potential for accident-related leaks or spills;
- Do not store drums or other containers close to storm drain inlets;
- Provide informational signing, labels, restricted access, locks, inventory control, overhead coverage, and secondary containment for all hazardous material storage areas or container units;
- The contents of all storage containers (hazardous and non-hazardous) should be properly labeled; and
- Conduct regular inspections for leaks and spills.

The storage of daily use chemicals such as engine degreasers, solvents, petroleum lubricants, penetrating oils, petroleum motor oils, coolants, specialty motor fluids, etc., will be maintained indoors within the vehicle maintenance bay as feasible.

Table 4 shows the areas where potential spills or leaks could occur, and the direction of flow for an uncontained spill.

Table 4
Areas of Site Where Potential Spills/Leaks Could Occur

Area	Type of Failure (Discharge Scenario)	Potential Discharge Volume (Gallons)	Direction of Flow for Uncontained Spill	Secondary Containment Method and Capacity
AST #1	Loading (used oil disposal), leak or spill	500	Inside Vehicle maintenance Bay	Double Wall Steel Tank
UST #1[1]	Loading (used oil disposal)	Unknown	South / southeast towards Catch Basin #1 and #2	Double Wall Steel Tank
Hazardous Materials Storage Shed	Loading (used fluids), leak or spill	Approx. 300	Southeast	Secondary Containment in Shed

[1] UST #1 is scheduled to be removed from service in late 2014.

Response and Contacts

In response to a potential release, employees are trained to handle minor releases. Spills are to be reported immediately to the Superintendent or their designee in accordance with the City's SOP for Spills and Illicit Discharges in **Appendix B**. The Superintendent or their designee will then contact the appropriate local, state and federal agencies. Those agencies include:

- Local Emergency Responder (911);
- VADEQ Northern Regional Office (703-583-3864);
- Virginia Department of Emergency Management (VADEM) (1-800-468-8892); and
- National Response Center (NRC) (1-800-424-8802).

For more detailed instructions on proper procedures for spill response and cleanup, refer to the SOP for Spills and Illicit Discharges in **Appendix B**.

Spills will be documented in the Significant Spill Report form contained in **Appendix B**. All reasonable abatement measures are to be taken immediately with subsequent evaluation and implementation of long term solutions to assure that the release of product does not occur again. This plan should be updated as soon as possible after the Superintendent or their designee receives knowledge of the release.

Spill Response Kits

Each spill kit should be labeled with the words "SPILL KIT" and the necessary emergency telephone number(s) of persons to be contacted in case of a spill or leak that is beyond the training and equipment available on or near each spill kit:

Superintendent Phone Number: **703-238-5127**

DEQ Regional Office Phone Number: **703-583-3864**

Stencil the following warning on each spill kit:

"WARNING: NEVER HOSE DOWN A SPILL!

CLEAN IT UP PROMPTLY AND DISPOSE OF THE WASTE PROPERLY."

Spill Cleanup

Any spills or leaks that occur at the Property Yard Complex and Remote Storage Yard will be cleaned up promptly, especially when they occur outdoors in areas exposed to precipitation. The spills will be cleaned up with appropriate materials that will be collected for proper disposal. Spill kits are located at multiple points throughout the facility as indicated in **Figures 2 and 3**. Petroleum absorbent booms/socks or drain inlet inserts will be maintained at each storm drain inlets.

Spill response supplies are maintained in areas of clear sight and in locations that employees can easily access. The spill response supplies are clearly labeled. The spill kits consist of granular absorbents, spill pads, and booms. Petroleum impacted materials that are generated at the facility will be properly containerized and properly disposed of promptly.

7.2.5 Salt Storage Piles or Piles Containing Salt

Storage piles of salt or piles containing salt used for deicing or other commercial or industrial purposes will be enclosed or covered to prevent exposure to precipitation. Structural and non-structural BMPs will be implemented to prevent contact with stormwater including, but not limited to; good housekeeping practices, diversions, silt fence, inlet controls, and containment controls to minimize exposure resulting from adding to or removing materials from the pile.

A combination of any or all of the above methods may be used. In no case will salt contaminated stormwater be allowed to discharge directly to the storm sewer system or to surface waters.

7.2.6 Employee Training

Bi-annual employee awareness training will be conducted on the handling and management practices of petroleum and chemical products and materials at the facility for the protection of stormwater. Employee training is further discussed in Section 10.0 of this SWPPP.

7.2.7 Sediment and Erosion Control

The paved and unpaved areas of the facility appear to be in good condition and do not appear likely to produce eroded sediments that may pollute stormwater. However, should erosion affect on-site stormwater management systems, remedial action should be taken to mitigate the erosion. This could involve planting new grass, or patching or repaving deteriorated paved surfaces. If construction activity occurs on site, sediment and erosion control must be implemented and monitored. Construction activities will be conducted to minimize the amount of site disturbance, and minimize and control erosion and sedimentation through the use of mulch and silt fencing.

7.2.8 Management of Runoff

Runoff at the Property Yard Complex is managed using a number of different stormwater management techniques. Roof drainage is directed to cisterns where possible, water from the Recycling Center drains to a tree filter, and water from the Utility Maintenance Area flows through a rip rap conveyance. The site is graded such that drainage from the building perimeters and downspouts is directed away from the buildings to the on-site municipal stormwater sewer system. Stormwater from the parking areas and outside storage areas is also collected by the municipal stormwater sewer system.

Runoff at the Remote Storage Area is managed through a vegetated swale and an underground Stormwater Management Facility.

7.2.9 Dust Suppression and Vehicle Tracking

Stormwater collected on-site may be used for the purposes of dust suppression. Potable water, well water, and uncontaminated reuse water may also be used for this purpose. There will be no direct discharge to surface waters from dust suppression activities or as a result of spraying stockpiles.

Since a majority of the facility is paved, the generation of dust and vehicle tracking off-site is minimal. However, in order to minimize dust generation and off-site tracking of raw, final, or waste materials, good housekeeping practices such as maintaining work areas clean from debris and periodical sweeping on open space areas will be implemented.

7.2.10 Landscape Maintenance

Application of any landscape maintenance chemicals should be done in accordance with the chemical's manufacture's labels. For herbicide / pesticide applications, spot treatments should be conducted rather than broadcast spraying. Applications should not be conducted when heavy rain is in the immediate forecast. Pesticide applications should only be conducted when wind speeds are low (less than 5 mph) to prevent drift. Fertilizers should be worked into the soil rather than dumped or broadcasted onto the surface. Equipment should be calibrated to avoid excessive applications. If fertilizer is spilled on paved areas, it should be swept up and properly disposed of offsite.

7.2.11 Waste Disposal

All wastes generated at this facility that are not recyclable for on-site use will be properly disposed of via outside contractors according to appropriate current state and federal regulations in a timely manner. All used oil, transmission fluid, and other suitable vehicle fluids are batched together and disposed of as used oil. The parts cleaner solvent is recycled to the maximum extent practical. This fluid is not to be disposed of with the used oil as it will render the used oil a hazardous waste. The used antifreeze will be stored separately from the used oil and will be shipped via the vendor for recycling. All waste fluids will be stored within appropriate storage containers within the hazardous waste storage shed pending disposal and out of the weather. Used oil filters will be stored in the used oil filter container or designated drums in the hazardous waste storage shed. Used tires and batteries will be routinely disposed of by the appropriate vendors. Spent metal parts should not be permitted to accumulate more than a 30 day supply and should be recycled promptly. Unnecessary storage of empty drums and/or containers on the exterior will be eliminated as much as possible.

Any drums or empty chemical containers that are found around the facility perimeter will be gathered and moved to the appropriate staging location at the facility. Empty chemical containers that are accepted by the municipal landfill will be properly disposed of within the dumpster. If the dumpster contains a weather lid, the lid should be maintained in the closed position at all times to prevent leaching of residual chemicals during precipitation events.

7.2.12 Safe Fueling Practices

Safe fueling practices will be observed to prevent unnecessary spills during the fueling of equipment and vehicles at the Main Yard from the dispensers. Before fuel is dispensed, the level of fuel in each vehicle should be checked to ensure that fuel is needed and to provide an estimate on the volume needed. Smoking or other sources of ignition are prohibited from fueling areas. Any spills will be cleaned up immediately and reported. Once fueling is complete, the nozzle is to be placed back on the dispenser and the fuel cap securely placed back on the equipment fill tank. During the fueling operations of equipment, any operator that observes leaking hoses, couplers, or damaged nozzles at the dispensers should report this immediately for review. A spill kit is located adjacent to the fueling area.

8.0 ROUTINE FACILITY INSPECTIONS

At the end of each daily shift, the shift supervisor is responsible for the proper disposal and management of any petroleum or chemical waste materials generated during his or her shift at the facility. This includes the proper transfer of used oil from the vehicle maintenance bay mobile containers into the used oil AST located in the petroleum storage room. In addition, the shift supervisor is responsible to ensure that all employees properly dispose of any soiled shop rags, used antifreeze, or other vehicle fluids that are generated during their shift. Daily cleanup of minor petroleum spills via the placement of oil absorbent materials and the proper containerization of such generated materials will also be performed. All in-use shop chemicals should be secured at the end of each business shift prior to departing for the day. Municipal wastes will not be permitted to exceed normal weekly loads. All municipal wastes, including empty chemical storage containers that are accepted by the municipal landfill, will be promptly disposed of from the facility by the municipal waste vendor.

The Superintendent or their designee will perform a quarterly routine facility inspection of all control measure areas of concern at the facility noted in **Appendix D**. These areas include routine inspections of all storm drain inlets, absorbent boom conditions, drain inserts, tree filter, parking lot inspections for evidence of large petroleum surface stains, petroleum storage room, inspections of vehicles and equipment for leaks, inspections of the petroleum storage tank areas, fuel dispenser area, vehicle refueling areas, metal shipping container areas, the stormwater retention pond, and areas around the municipal waste containers. This inspection will be performed at a minimum quarterly, unless a particular area is brought to the attention of the Superintendent or their designee, in which case the inspection of the Property Yard Complex or Remote Storage Yard will be initiated upon report. Any deficiencies observed in the implementation of the plan must be corrected as soon as practicable, but no later than 14 days after the inspection. The results of the inspections will be documented in **Appendix D** of this plan along with any corrective action that has taken place due to a deficiency.

9.0 MAINTENANCE

All control measures identified in this SWPPP will be maintained in effective operating condition and will be observed at least annually during active operation (i.e., during a stormwater runoff event) to ensure that they are functioning correctly.

Table 5 shows the equipment/areas that will be included in the maintenance program.

Equipment	Tasks	Frequency
Vehicle and equipment parking areas	1) Inspect cleanliness of area. 2) Inspect vehicles and equipment for drips and leaks.	Daily
Vehicle and equipment maintenance area	1) Inspect cleanliness of area. 2) Check spill kit contents. 3) Make sure equipment is in good working condition.	Daily
Recycling Center trash receptacles	1) Inspect cleanliness of area. 2) Check spill kit contents. 3) Make sure equipment is in good working condition.	Daily
Solid waste receptacle areas	1) Inspect cleanliness of area. 2) Make sure drain plug is in place and lid is closed.	Daily
Fueling area including pumps	1) Inspect cleanliness of area. 2) Check spill kit contents. 3) Make sure equipment is in good working condition.	Weekly
Metal storage container areas	1) Inspect cleanliness of areas.	Weekly
Hazmat storage sheds	1) Inspect cleanliness of area. 2) Check spill kit contents. 3) Make sure equipment is in good working condition.	Weekly
Curb inlet booms/socks	1) Make sure that an absorbent boom is in place and is free of petroleum staining.	Monthly
Drain inlet inserts	1) Make sure that an insert is in place and is functioning properly.	Monthly
Silt fence	1) Make sure silt fence is properly installed and maintained.	Monthly
Bulk material stockpile areas	1) Inspect cleanliness of area. 2) Check spill kit contents. 3) Make sure equipment is in good working condition.	Monthly
Tree Filter	1) Inspect health of tree. 2) Check for excessive sediment build up.	Monthly

10.0 EMPLOYEE TRAINING

The training covers the components and goals of the SWPPP, and includes such topics as good housekeeping, inspections, spill prevention and response, material management practices, control measure operation and maintenance, etc. This training typically occurs on a bi-annual basis (every two years).

The training program will consist of both formal and informal training. Training tools that are included in the facility's training program are described in **Table 6**:

Table 6
Employee Training Topics

Training Topics	Brief Description of Training Program/Materials	Schedule for Training	Attendees
Illicit Discharge Recognition and Reporting	General awareness regarding illicit discharges, their impacts to water quality, and the City's responsibility under MS4 permitting and employee recognition and reporting.	Bi-Annual	All Employees
Fleet and Facility Maintenance	General awareness regarding fleet and facility operations good housekeeping, stormwater pollution practices and requirements of the SWPPP.	Bi-Annual	All Employees
Street, Parking and Drainage Operations and Maintenance	Good housekeeping and pollution prevention awareness regarding operation and maintenance of the City's transportation-related infrastructure.	Bi-Annual	All Employees
Land Disturbance	General good housekeeping and pollution prevention awareness for activities involving land disturbance.	Bi-Annual	All Employees
Spill Prevention and Response	Contingency plan and emergency procedures	Bi-Annual	All Employees

Additional training tools may include:

- Employee handbooks and standard operating procedures;
- Slide presentations;
- Drills;
- Routine employee meetings; and
- Bulletin boards.

Training attendance sheets and any other training documentation is provided in **Appendix E**; including the name of instructor, date, time and location of training, topics covered, and attending participants.

The training records are maintained in **Appendix E** with this SWPPP for a period of no less than five years.

11.0 ANNUAL COMPREHENSIVE SITE COMPLIANCE EVALUATION

A Comprehensive Site Compliance Evaluation must be conducted at least once each calendar year. The evaluations will be done by qualified personnel who possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at the facility, and who can also evaluate the effectiveness of control measures. The personnel conducting the evaluations may be either facility employees or outside personnel hired by the facility; however, the evaluators will be accompanied by employees who are familiar with the facility operations and the goals and requirements of the SWPPP. In addition, Pollution Prevention Team Members must participate or review the findings of the evaluation.

11.1 Scope of the Compliance Evaluation

The compliance evaluation consists of a review of the accuracy and effectiveness of the SWPPP and a review of the associated required documentation. In addition, the evaluations will include a review of all areas where industrial materials or activities are exposed to stormwater.

The compliance evaluation requires that personnel will physically evaluate:

- Industrial materials, residue or trash that may have or could come into contact with stormwater;
- Leaks or spills from industrial equipment, drums, barrels, tanks or other containers that have occurred within the past three years;
- Off-site tracking of industrial or waste materials or sediment where vehicles enter or exit the site;
- Tracking or blowing of raw, final, or waste materials from areas of no exposure to exposed areas;
- Evidence of, or the potential for, pollutants entering the drainage system;
- Evidence of pollutants discharging to surface waters at all facility outfalls, and the condition of and around the outfall, including flow dissipation measures to prevent scouring; and
- Review of stormwater related training performed, inspections completed, maintenance performed, quarterly visual examinations, and effective operation of control measures, including BMPs.

11.2 Corrective Actions

Based on the results of the evaluation, corrective actions will be taken when the following are identified:

- An unauthorized release or discharge (e.g., spill, leak, or discharge of non-stormwater not authorized by this or another NPDES permit) occurs;
- An inspection or evaluation of the facility by an EPA official determines that modifications to the control measures are necessary;
- A routine facility inspection or comprehensive site inspection find that the control measures are not being properly operated and maintained; and
- Construction or a change in design, operation, or maintenance at the facility significantly changes the nature of pollutants discharged in stormwater from the facility, or significantly increases the quantity of pollutants discharged.

All operational changes and new control measures will be recorded in this SWPPP in **Appendix F**. Additionally, the inspection date, the inspection personnel, the scope of the inspection, major observations, and any needed revisions will be recorded. Revisions to this plan will occur within 30 days after the annual inspection. If existing control measures need to be modified or if additional control measures are necessary, implementation will be completed before the next anticipated storm event, if practicable, but not more than 60 days after completion of the comprehensive site evaluation

12.0 MAINTAINING AN UPDATED SWPPP

The Pollution Prevention Team will review and amend the SWPPP as appropriate whenever:

- There is construction or a change in design, operation, or maintenance at the facility that has a significant effect on the discharge, or the potential for the discharge, of pollutants from the facility;
- Routine inspections or compliance evaluations determine that there are deficiencies in the control measures, including BMPs;
- Inspections by local, state, or federal officials determine that modifications to the SWPPP are necessary;
- There is a spill, leak or other release at the facility; or
- There is an unauthorized discharge from the facility.

SWPPP modifications should be made within 30 calendar days after the discovery, observation or event requiring a SWPPP modification. Implementation of new or modified BMPs distinct from regular preventive maintenance of existing BMPs will be initiated before the next storm event if possible, but no later than 60 days after discovery, or as otherwise provided or approved by the director. The amount of time taken to modify a BMP or implement additional BMPs will be documented in the SWPPP. Modifications made to the SWPPP are to be noted in the SWPPP Amendment Log (**Appendix F**).

If the SWPPP modification is based on a release or unauthorized discharge, a description and date of the release, the circumstances leading to the release, actions taken in response to the release, and measures to prevent the recurrence of such releases must be documented in the SWPPP Amendment Log **(Appendix F)**.

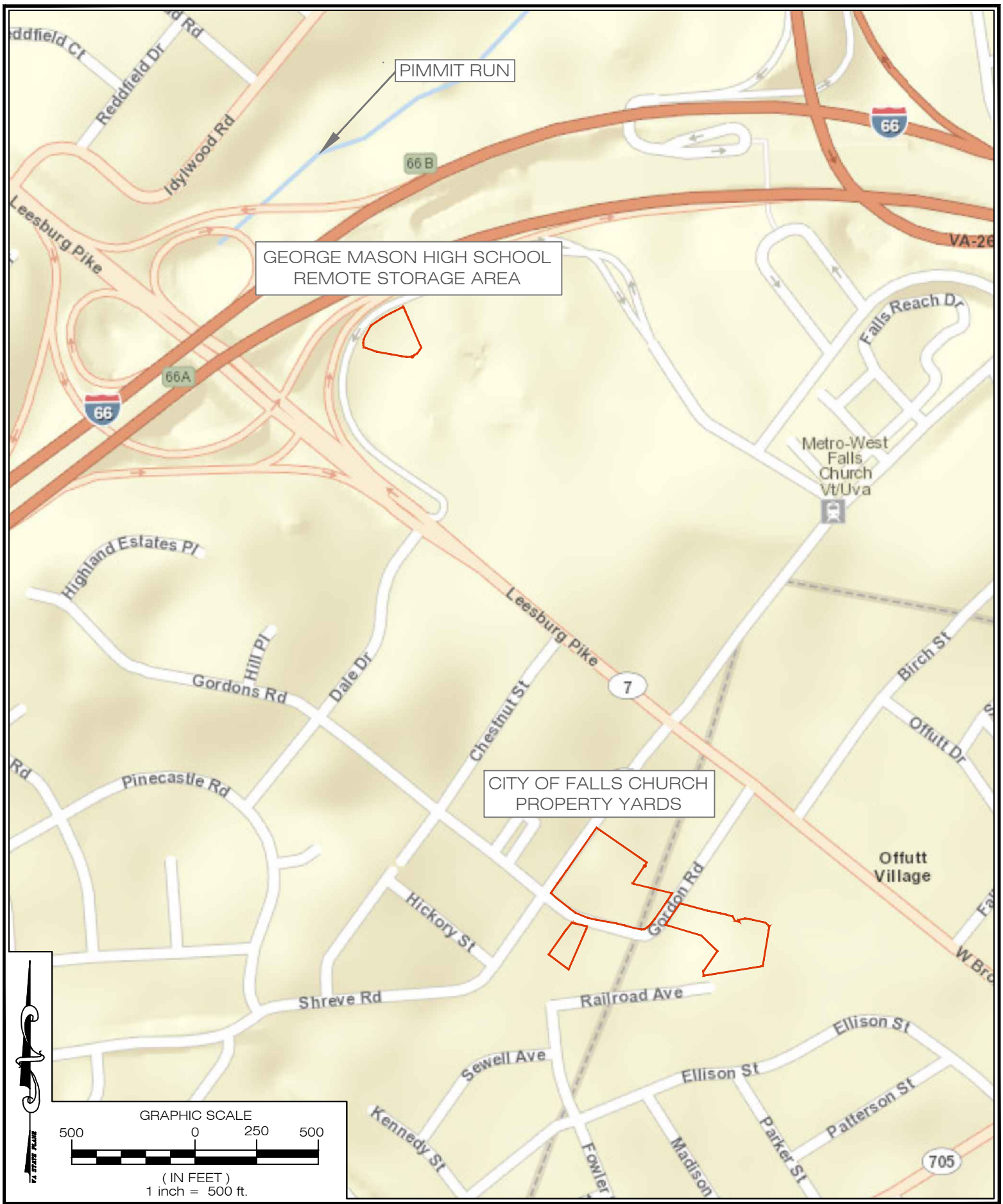
13.0 SIGNATURE AND PLAN REVIEW

A copy of the SWPPP, including revisions to document any corrective actions taken, will be signed, dated, and retained on-site at the Property Yard Complex. All other changes to the SWPPP, and other permit compliance documentation, will be signed and dated by the person preparing the change or documentation. The plan will be kept current by the following recordkeeping practices:

- Site plans in the figures section of this plan will be updated whenever any physical changes occur at the facility (**Figures 2 and 3**);
- MSDSs for products stored and/or used at the facility will be kept current;
- All waste product disposal records and manifest will be maintained for a minimum period of three years;
- Spill and leak response abatement activities will be documented and maintained in Significant Spill Report contained in **Appendix B** of this plan;
- A copy of each year's Annual Comprehensive Site Compliance Evaluation will be included in **Appendix C**;
- Completed Quarterly Facility Inspection Reports will be maintained in **Appendix D** of this plan;
- Documentation of employee training will be maintained in **Appendix E** of this plan;
- Documentation regarding SWPPP amendments will be maintained in **Appendix F** of this plan; and
- A copy of the current SWPPP and associated documentation will be retained at the Property Yard Complex, and it will be immediately available to the department or EPA at the time of an on-site inspection or upon request.

Figures

Figure 1 – Site Vicinity Map
Figure 2 – Property Yard Complex Site Diagram
Figure 3 – Remote Storage Yard Site Diagram



DATE	DESCRIPTION
06/13/2014	SWPPP SUBMITTAL

FIGURE 1
GENERAL VICINITY MAP
CITY PROPERTY YARDS CITY
OF FALLS CHURCH, VIRGINIA

GKY & ASSOCIATES, INC.
4229 LAFAYETTE CENTER DRIVE
SUITE 1850
CHANTILLY, VIRGINIA 20151

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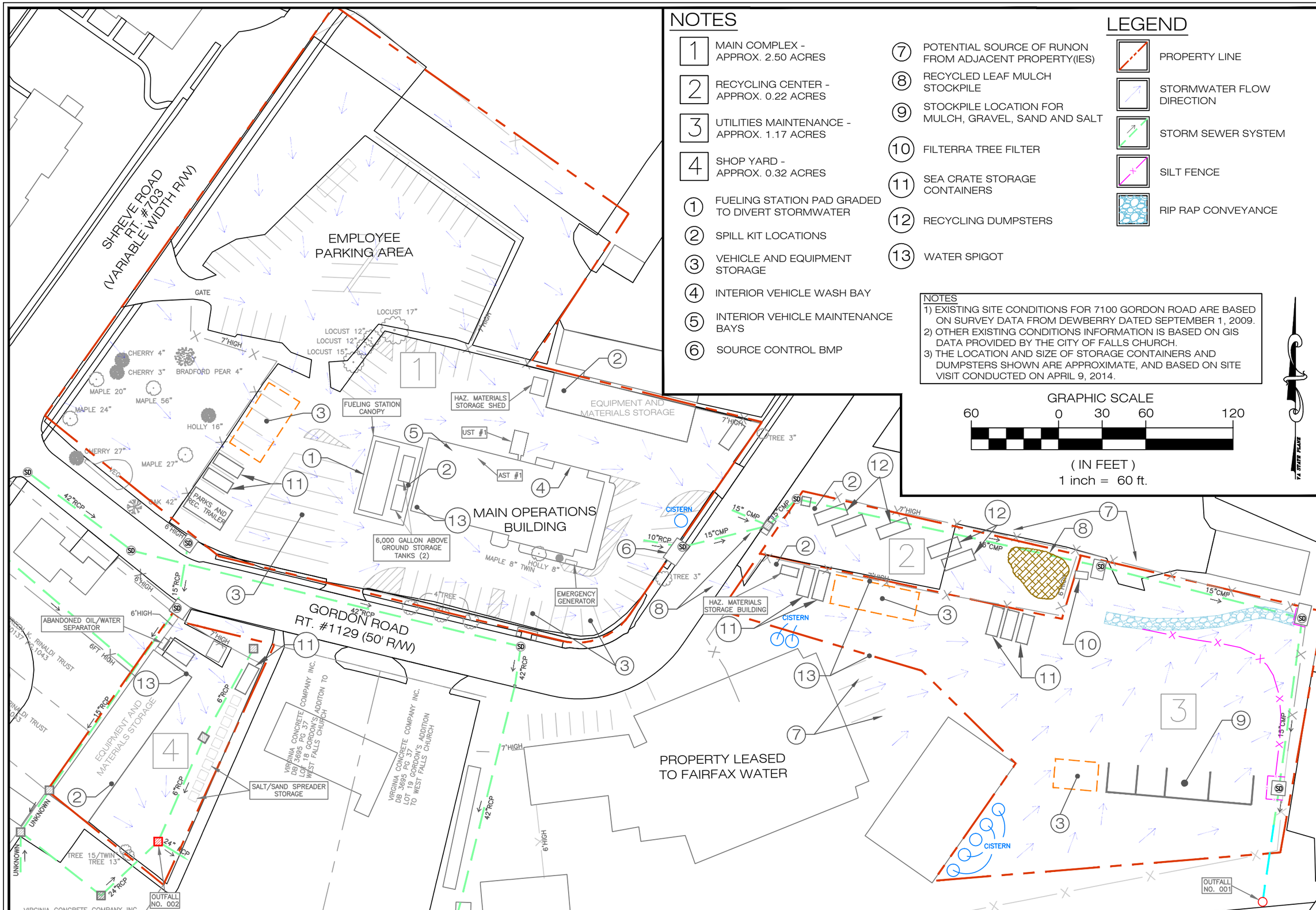

NOTES

1. MAIN COMPLEX - APPROX. 2.50 ACRES
2. RECYCLING CENTER - APPROX. 0.22 ACRES
3. UTILITIES MAINTENANCE - APPROX. 1.17 ACRES
4. SHOP YARD - APPROX. 0.32 ACRES

1. FUELING STATION PAD GRADED TO DIVERT STORMWATER
2. SPILL KIT LOCATIONS
3. VEHICLE AND EQUIPMENT STORAGE
4. INTERIOR VEHICLE WASH BAY
5. INTERIOR VEHICLE MAINTENANCE BAYS
6. SOURCE CONTROL BMP
7. POTENTIAL SOURCE OF RUNON FROM ADJACENT PROPERTY(IES)
8. RECYCLED LEAF MULCH STOCKPILE
9. STOCKPILE LOCATION FOR MULCH, GRAVEL, SAND AND SALT
10. FILTERRA TREE FILTER
11. SEA CRATE STORAGE CONTAINERS
12. RECYCLING DUMPSTERS
13. WATER SPIGOT

LEGEND

- PROPERTY LINE
- STORMWATER FLOW DIRECTION
- STORM SEWER SYSTEM
- SILT FENCE
- RIP RAP CONVEYANCE

NOTES
1) EXISTING SITE CONDITIONS FOR 7100 GORDON ROAD ARE BASED ON SURVEY DATA FROM DEWBERRY DATED SEPTEMBER 1, 2009.
2) OTHER EXISTING CONDITIONS INFORMATION IS BASED ON GIS DATA PROVIDED BY THE CITY OF FALLS CHURCH.
3) THE LOCATION AND SIZE OF STORAGE CONTAINERS AND DUMPSTERS SHOWN ARE APPROXIMATE, AND BASED ON SITE VISIT CONDUCTED ON APRIL 9, 2014.

GRAPHIC SCALE
60 0 30 60 120
(IN FEET)
1 inch = 60 ft.

VA STATE PLANE

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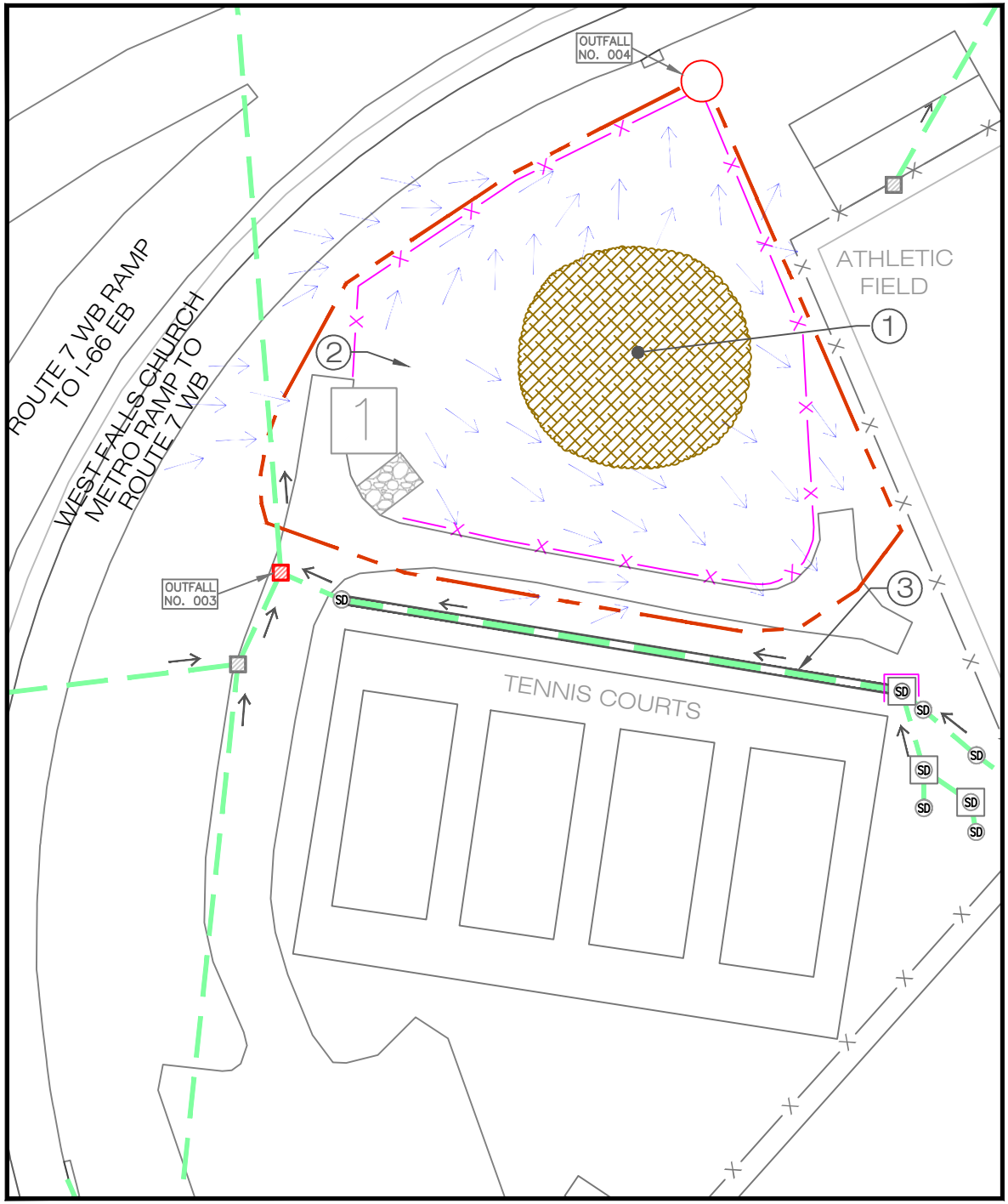
FALLS CHURCH PROPERTY YARD
SWPPP DEVELOPMENT
CITY OF FALLS CHURCH
FALLS CHURCH, VIRGINIA

FIGURE 2
CITY OF FALLS CHURCH
PROPERTY YARD SWPPP
SITE MAP

DATE	DESCRIPTION
06/13/14	1ST SUB.

H SCALE:	1" = 60'
H DATUM:	NAD83
V SCALE:	N/A
V DATUM:	NAVD88
DESIGNED:	DAB
DRAFTED:	DAB
CHECKED:	MK
PROJECT#:	2011-10
CONTRACT#:	TO#3
SHEET:	1 OF 2



NOTES

1 REMOTE STORAGE AREA - APPROX. 0.70 ACRES

1 RECYCLED LEAF MULCH STOCKPILE

2 LOADING/UNLOADING AREA

3 UNDERGROUND STORMWATER MANAGEMENT FACILITY

LEGEND

PROPERTY LINE

STORMWATER FLOW DIRECTION

STORM SEWER SYSTEM

SILT FENCE

RIP RAP ENTRANCE

NOTES

1) EXISTING SITE CONDITIONS FOR THE REMOTE STORAGE AREA AT GEORGE MASON HIGH SCHOOL ARE BASED ON GIS DATA FROM THE CITY OF FALLS CHURCH AND FAIRFAX COUNTY, AND OBSERVATIONS MADE DURING SITE VISIT CONDUCTED ON APRIL 9, 2014.

GRAPHIC SCALE

0 30 60 60

(IN FEET)
1 INCH = 60 FT.

VA STATE PLANE

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FIGURE 3
ALLS CHURCH PROPERTY YARD
GEORGE MASON HIGH SCHOOL
REMOTE STORAGE AREA
CITY OF FALLS CHURCH
FALLS CHURCH, VIRGINIA

DATE	DESCRIPTION
06/13/14	1ST SUB.

H SCALE:	1"=60'
H DATUM:	NAD83
V SCALE:	N/A
V DATUM:	NAVD88
DESIGNED:	DAB
DRAFTED:	DAB
CHECKED:	MK
PROJECT#:	2011-10
CONTRACT#:	TO#03
SHEET:	2 OF 2

APPENDIX A

CURRENT VIRGINIA MS4 PERMIT

prev | next

9VAC25-890-40. General permit.

Any operator whose registration statement is accepted by the department will receive coverage under the following state permit and shall comply with the requirements therein and be subject to all applicable requirements of the Virginia Stormwater Management Act (Article 2.3 (§ 62.1-44.15:24 et seq.) of Chapter 3.1 of Title 62.1 of the Code of Virginia) and the Virginia Stormwater Management Program (VSMP) Regulations (9VAC25-870).

General Permit No.: VAR04

Effective Date: July 1, 2013

Expiration Date: June 30, 2018

GENERAL VPDES PERMIT FOR DISCHARGES OF STORMWATER FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS

AUTHORIZATION TO DISCHARGE UNDER THE VIRGINIA STORMWATER MANAGEMENT PROGRAM AND THE VIRGINIA STORMWATER MANAGEMENT ACT

In compliance with the provisions of the Clean Water Act, as amended and pursuant to the Virginia Stormwater Management Act and regulations adopted pursuant thereto, this state permit authorizes operators of small municipal separate storm sewer systems to discharge to surface waters within the boundaries of the Commonwealth of Virginia, except those waters specifically named in State Water Control Board regulations which prohibit such discharges.

The authorized discharge shall be in accordance with this cover page, Section I—Discharge Authorization and Special Conditions, Section II—MS4 Program and Section III—Conditions Applicable To All State Permits, as set forth herein. The operator shall utilize all legal authority provided by the laws and regulations of the Commonwealth of Virginia to control discharges to and from the MS4. This legal authority may be a combination of statute, ordinance, permit, specific contract language, order or interjurisdictional agreements.

For operators of small MS4s that are applying for initial coverage under this general permit, the schedule to develop and implement the MS4 Program Plan shall be submitted with the completed registration statement.

For operators that have previously held MS4 state permit coverage, the operator shall update the MS4 Program Plan in accordance with the following schedule. Until such time as the required updates are completed and implemented, the operator shall continue to implement the MS4 Program consistent with the MS4 Program Plan submitted with the registration statement.

Table 1: Schedule of MS4 Program Plan Updates Required in this Permit		
Program Update Requirement	Permit Reference	Update Completed By
Public Education Outreach Plan (Minimum Control Measure 1 – Public Education and Outreach on Stormwater Impacts)	Section II B 1	

Illicit Discharge Procedures - (Minimum Control Measure 3 – Illicit Discharge Detection and Elimination)	Section II B 3	12 months after permit coverage
Individual Residential Lot Special Criteria (Minimum Control Measure 5 – Post-Construction Stormwater Management in New Development and Development on Prior Developed Lands)	Section II B 5 c (1) (d)	
Operator-Owned Stormwater Management Inspection Procedures (Minimum Control Measure 5 – Post-Construction Stormwater Management in New Development and Development on Prior Developed Lands)	Section II B 5	
Identification of Locations Requiring SWPPPs (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 b	
Nutrient Management Plan (NMP) Locations - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 c (1) (a)	
Training Schedule and Program - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6	
Updated TMDL Action Plans (TMDLs approved before July of 2008) – (Special Conditions for Approved Total Maximum Daily Loads (TMDL) Other Than Chesapeake Bay)	Section I B	24 months after permit coverage
Chesapeake Bay TMDL Action Plan – (Special Condition for Chesapeake Bay TMDL)	Section I C	
Stormwater Management Progressive Compliance and Enforcement – (Minimum Control Measure 4 - Construction Site Stormwater Runoff Control)	Section II B 5	
Daily Good Housekeeping Procedures (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 a	
Other TMDL Action Plans for applicable TMDLs approved between July 2008 and June 2013 - (Special Conditions for Approved Total Maximum Daily Loads (TMDL) Other Than Chesapeake Bay)	Section I B	36 months after permit coverage
Outfall Map Completed - (Minimum Control Measure 3 – Illicit Discharge Detection and Elimination) – Applicable to new boundaries identified as "urbanized" areas in the 2010 Decennial Census	Section II B 3 a (3)	48 months after permit coverage
SWPPP Implementation - (Minimum Control Measure 6 –		

Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 b (3)	
NMP Implementation - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 c (1) (b)	60 months after permit coverage
*Updates should be submitted with the appropriate annual report.		

SECTION I

DISCHARGE AUTHORIZATION AND SPECIAL CONDITIONS

A. Coverage under this state permit. During the period beginning with the date of coverage under this general permit and lasting until the expiration and reissuance of this state permit, the operator is authorized to discharge in accordance with this state permit from the small municipal separate storm sewer system identified in the registration statement into surface waters within the boundaries of the Commonwealth of Virginia and consistent with 9VAC25-890-30.

B. Special conditions for approved total maximum daily loads (TMDL) other than the Chesapeake Bay TMDL. An approved TMDL may allocate an applicable wasteload to a small MS4 that identifies a pollutant or pollutants for which additional stormwater controls are necessary for the surface waters to meet water quality standards. The MS4 operator shall address the pollutants in accordance with this special condition where the MS4 has been allocated a wasteload in an approved TMDL.

1. The operator shall maintain an updated MS4 Program Plan that includes a specific TMDL Action Plan for pollutants allocated to the MS4 in approved TMDLs. TMDL Action Plans may be implemented in multiple phases over more than one state permit cycle using the adaptive iterative approach provided adequate progress to reduce the pollutant discharge in a manner consistent with the assumptions and requirements of the specific TMDL wasteload is demonstrated in accordance with subdivision 2 e of this subsection. These TMDL Actions Plans shall identify the best management practices and other interim milestone activities to be implemented during the remaining terms of this state permit.

a. In accordance with Table 1, the operator shall update the MS4 Program Plans to address any new or modified requirements established under this special condition for pollutants identified in TMDL wasteload allocations approved prior to July 9, 2008.

b. In accordance with Table 1, the operator shall update the MS4 Program Plan to incorporate approvable TMDL Action Plans that identify the best management practices and other interim milestone activities that will be implemented during the remaining term of this permit for pollutants identified in TMDL wasteload allocations approved either on or after July 9, 2008, and prior to issuance of this permit.

c. Unless specifically denied in writing by the department, TMDL Action Plans and updates developed in accordance with this section become effective and enforceable 90 days after the date received by the department.

2. The operator shall:

a. Develop and maintain a list of its legal authorities such as ordinances, state and other permits, orders, specific contract language, and interjurisdictional agreements applicable to reducing the pollutant identified in each applicable WLA;

b. Identify and maintain an updated list of all additional management practices, control techniques and system design and engineering methods, beyond those identified in Section II B, that have been implemented as part of the MS4 Program Plan that are applicable to reducing the pollutant identified in the WLA;

c. Enhance its public education and outreach and employee training programs to also promote methods to eliminate and reduce discharges of the pollutants identified in the WLA;

d. Assess all significant sources of pollutant(s) from facilities of concern owned or operated by the MS4 operator that are not covered under a separate VPDES permit and identify all municipal facilities that may be a significant source of the identified pollutant. For the purposes of this assessment, 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. (For example, a significant source of pollutant from a facility of concern for a bacteria TMDL would be expected to be greater at a dog park than at other recreational facilities where dogs are prohibited);

e. Develop and implement a method to assess TMDL Action Plans for their effectiveness in reducing the pollutants identified in the WLAs. The evaluation shall use any newly available information, representative and adequate water quality monitoring results, or modeling tools to estimate pollutant reductions for the pollutant or pollutants of concern from implementation of the MS4 Program Plan. Monitoring may include BMP, outfall, or in-stream monitoring, as appropriate, to estimate pollutant reductions. The operator may conduct monitoring, utilize existing data, establish partnerships, or collaborate with other MS4 operators or other third parties, as appropriate. This evaluation shall include assessment of the facilities identified in subdivision 2 d of this subsection. The methodology used for assessment shall be described in the TMDL Action Plan.

3. Analytical methods for any monitoring shall be conducted according to procedures approved under 40 CFR Part 136 or alternative methods approved by the Environmental Protection Agency (EPA). Where an approved method does not exist, the operator must use a method consistent with the TMDL.

4. The operator is encouraged to participate as a stakeholder in the development of any TMDL implementation plans applicable to their discharge. The operator may incorporate applicable best management practices identified in the TMDL implementation plan in the MS4 Program Plan or may choose to implement BMPs of equivalent design and efficiency provided that the rationale for any substituted BMP is provided and the substituted BMP is consistent with the assumptions and requirements of the TMDL WLA.

5. Annual reporting requirements.

a. The operator shall submit the required TMDL Action Plans with the appropriate annual report and in accordance with the associated schedule identified in this state permit.

b. On an annual basis, the operator shall report on the implementation of the TMDL Action Plans and associated evaluation including the results of any monitoring conducted as part of the evaluation.

6. The operator shall identify the best management practices and other steps that will be implemented during the next state permit term as part of the operator's reapplication for coverage as required under Section III M.

7. For planning purposes, the operator shall include an estimated end date for achieving the applicable wasteload allocations as part of its reapplication package due in accordance with Section III M.

C. Special condition for the Chesapeake Bay TMDL. The Commonwealth in its Phase I and Phase II Chesapeake Bay TMDL Watershed Implementation Plans (WIP) committed to a phased approach for MS4s, affording MS4 operators up to three full five-year permit cycles to implement necessary reductions. This permit is consistent with the Chesapeake Bay TMDL and the Virginia Phase I and II WIPs to meet the Level 2 (L2) scoping run for existing developed lands as it represents an implementation of 5.0% of L2 as specified in the 2010 Phase I WIP. Conditions of future permits will be consistent with the TMDL or WIP conditions in place at the time of permit issuance.

1. Definitions. The following definitions apply to this state permit for the purpose of the special condition for discharges in the Chesapeake Bay Watershed:

"Existing sources" means pervious and impervious urban land uses served by the MS4 as of June 30, 2009.

"New sources" means pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009.

"Pollutants of concern" or "POC" means total nitrogen, total phosphorus, and total suspended solids.

"Transitional sources" means regulated land disturbing activities that are temporary in nature and discharge through the MS4.

2. Chesapeake Bay TMDL planning.

a. In accordance with Table 1, the operator shall develop and submit to the department for its review and acceptance an approvable Chesapeake Bay TMDL Action Plan. Unless specifically denied in writing by the department, this plan becomes effective and enforceable 90 days after the date received by the department. The plan shall include:

(1) A review of the current MS4 program implemented as a requirement of this state permit including a review of the existing legal authorities and the operator's ability to ensure compliance with this special condition;

(2) The identification of any new or modified legal authorities such as ordinances, state and other permits, orders, specific contract language, and interjurisdictional agreements implemented or needing to be implemented to meet the requirements of this special condition;

(3) The means and methods that will be utilized to address discharges into the MS4 from new sources;

(4) An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009, based on the 2009 progress run. The operator shall utilize the applicable versions of Tables 2 a-d in this section based on the river basin to which the MS4 discharges by multiplying the total existing acres served by the MS4 on June 30, 2009, and the 2009 Edge of Stream (EOS) loading rate:

Table 2 a: Calculation Sheet for Estimating Existing Source Loads for the James River Basin
***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen		9.39	
Regulated Urban Pervious			6.99	
Regulated Urban Impervious	Phosphorus		1.76	
Regulated Urban Pervious			0.5	
Regulated Urban Impervious	Total Suspended Solids		676.94	
Regulated Urban Pervious			101.08	

Table 2 b: Calculation Sheet for Estimating Existing Source Loads for the Potomac River Basin
***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen		16.86	
Regulated Urban Pervious			10.07	

Regulated Urban Impervious	Phosphorus		1.62	
Regulated Urban Pervious			0.41	
Regulated Urban Impervious	Total Suspended Solids		1,171.32	
Regulated Urban Pervious			175.8	

Table 2 c: Calculation Sheet for Estimating Existing Source Loads for the Rappahannock River Basin

***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen		9.38	
Regulated Urban Pervious			5.34	
Regulated Urban Impervious	Phosphorus		1.41	
Regulated Urban Pervious			0.38	
Regulated Urban Impervious	Total Suspended Solids		423.97	
Regulated Urban Pervious			56.01	

Table 2 d: Calculation Sheet for Estimating Existing Source Loads for the York River Basin

***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run

Regulated Urban Impervious	Nitrogen		7.31	
Regulated Urban Pervious			7.65	
Regulated Urban Impervious	Phosphorus		1.51	
Regulated Urban Pervious			0.51	
Regulated Urban Impervious	Total Suspended Solids		456.68	
Regulated Urban Pervious			72.78	

(5) A determination of the total pollutant load reductions necessary to reduce the annual POC loads from existing sources utilizing the applicable versions of Tables 3 a-d in this section based on the river basin to which the MS4 discharges. This shall be calculated by multiplying the total existing acres served by the MS4 by the first permit cycle required reduction in loading rate. For the purposes of this determination, the operator shall utilize those existing acres identified by the 2000 U.S. Census Bureau urbanized area and served by the MS4.

Table 3 a: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the James River Basin
***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre)	Total Reduction Required First Permit Cycle (lbs)
Regulated Urban Impervious	Nitrogen		0.04	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		6.67	
Regulated Urban Pervious			0.44	

Table 3 b: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the Potomac River Basin *Based on Chesapeake Bay Program Watershed Model Phase 5.3.2				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (6/30/09)**	**First Permit Cycle Required Reduction in Loading Rate (lbs/acre)**	**Total Reduction Required First Permit Cycle (lbs)**
Regulated Urban Impervious	Nitrogen		0.08	
Regulated Urban Pervious			0.03	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.001	
Regulated Urban Impervious	Total Suspended Solids		11.71	
Regulated Urban Pervious			0.77	

Table 3 c: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the Rappahannock River Basin *Based on Chesapeake Bay Program Watershed Model Phase 5.3.2				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (6/30/09)**	**First Permit Cycle Required Reduction in Loading Rate (lbs/acre)**	**Total Reduction Required First Permit Cycle (lbs)**
Regulated Urban Impervious	Nitrogen		0.04	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total		4.24	

Regulated Urban Pervious	Suspended Solids		0.25	

Table 3 d: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the York River Basin *Based on Chesapeake Bay Program Watershed Model Phase 5.3.2				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (6/30/09)**	**First Permit Cycle Required Reduction in Loading Rate (lbs/acre)**	**Total Reduction Required First Permit Cycle (lbs)**
Regulated Urban Impervious	Nitrogen		0.03	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		4.60	
Regulated Urban Pervious			0.32	

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

(7) The means and methods to offset the increased loads from new sources initiating construction between July 1, 2009, and June 30, 2014, that disturb one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. The operator shall utilize Table 4 to develop the equivalent pollutant load for nitrogen and total suspended solids. The operator shall offset 5.0% of the calculated increased load from these new sources during the permit cycle.

(8) The means and methods to offset the increased loads from projects as grandfathered in accordance with 9VAC25-870-48, that disturb one acre or greater that begin construction after July 1, 2014, where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development

stormwater management facilities. The operator shall utilize Table 4 to develop the equivalent pollutant load for nitrogen and total suspended solids.

(9) The operator shall address any modification to the TMDL or watershed implementation plan that occurs during the term of this state permit as part of its permit reapplication and not during the term of this state permit.

Table 4: Ratio of Phosphorus Loading Rate to Nitrogen and Total Suspended Solids Loading Rates for Chesapeake Bay Basins			
Ratio of Phosphorus to Other POCs (Based on All Land Uses 2009 Progress Run)	**Phosphorus Loading Rate (lbs/acre)**	**Nitrogen Loading Rate (lbs/acre)**	**Total Suspended Solids Loading Rate (lbs/acre)**
James River Basin	1.0	5.2	420.9
Potomac River Basin	1.0	6.9	469.2
Rappahannock River Basin	1.0	6.7	320.9
York River Basin	1.0	9.5	531.6

(10) A list of future projects and associated acreage that qualify as grandfathered in accordance with 9VAC25-870-48;

(11) An estimate of the expected costs to implement the requirements of this special condition during the state permit cycle; and

(12) An opportunity for receipt and consideration of public comment regarding the draft Chesapeake Bay TMDL Action Plan.

b. As part of development of the Chesapeake Bay TMDL Action Plan, the operator may consider:

(1) Implementation of BMPs on unregulated lands provided any necessary baseline reduction is not included toward meeting the required reduction in this permit;

(2) Utilization of stream restoration projects, provided that the credit applied to the required POC load reduction is prorated based on the ratio of regulated urban acres to total drainage acres upstream of the restored area;

(3) Establishment of a memorandum of understanding (MOU) with other MS4 operators that discharge to the same or adjacent eight digit hydrologic unit within the same basin to implement BMPs collectively. The MOU shall include a mechanism for dividing the POC reductions created by BMP implementation between the cooperative MS4s;

(4) Utilization of any pollutant trading or offset program in accordance with §§ 62.1-44.19:20 through 62.1-44.19:23 of the Code of Virginia, governing trading and offsetting;

(5) A more stringent average land cover condition based on less than 16% impervious cover for new sources

initiating construction between July 1, 2009, and June 30, 2014, and all grandfathered projects where allowed by law; and

(6) Any BMPs installed after June 30, 2009, as part of a retrofit program may be applied towards meeting the required load reductions provided any necessary baseline reductions are not included.

3. Chesapeake Bay TMDL Action Plan implementation. The operator shall implement the TMDL Action Plan according to the schedule therein. Compliance with this requirement represents adequate progress for this state permit term towards achieving TMDL wasteload allocations consistent with the assumptions and requirements of the TMDL. For the purposes of this permit, the implementation of the following represents implementation to the maximum extent practicable and demonstrates adequate progress:

a. Implementation of nutrient management plans in accordance with the schedule identified in the minimum control measure in Section II related to pollution prevention/good housekeeping for municipal operations;

b. Implementation of the minimum control measure in Section II related to construction site stormwater runoff control in accordance with this state permit shall address discharges from transitional sources;

c. Implementation of the means and methods to address discharges from new sources in accordance with the minimum control measure in Section II related to post-construction stormwater management in new development and development of prior developed lands and in order to offset 5.0% of the total increase in POC loads between July 1, 2009, and June 30, 2014. Increases in the POC load from grandfathered projects initiating construction after July 1, 2014, must be offset prior to completion of the project; and

d. Implementation of means and methods sufficient to meet the required reductions of POC loads from existing sources in accordance with the Chesapeake Bay TMDL Action Plan.

4. Annual reporting requirements.

a. In accordance with Table 1, the operator shall submit the Chesapeake Bay Action Plan with the appropriate annual report.

b. Each subsequent annual report shall include a list of control measures implemented during the reporting period and the cumulative progress toward meeting the compliance targets for nitrogen, phosphorus, and total suspended solids.

c. Each subsequent annual report shall include a list of control measures, in an electronic format provided by the department, that were implemented during the reporting cycle and the estimated reduction achieved by the control. For stormwater management controls, the report shall include the information required in Section II B 5 e and shall include whether an existing stormwater management control was retrofitted, and if so, the existing stormwater management control type retrofit used.

d. Each annual report shall include a list of control measures that are expected to be implemented during the next reporting period and the expected progress toward meeting the compliance targets for nitrogen, phosphorus, and

total suspended solids.

5. The operator shall include the following as part of its reapplication package due in accordance with Section III M:

a. Documentation that sufficient control measures have been implemented to meet the compliance target identified in this special condition. If temporary credits or offsets have been purchased in order to meet the compliance target, the list of temporary reductions utilized to meet the required reduction in this state permit and a schedule of implementation to ensure the permanent reduction must be provided; and

b. A draft second phase Chesapeake Bay TMDL Action Plan designed to reduce the existing pollutant load as follows:

(1) The existing pollutant of concern loads by an additional seven times the required reductions in loading rates using the applicable Table 3 for sources included in the 2000 U.S. Census Bureau urbanized areas;

(2) The existing pollutant of concerns loads by an additional eight times the required reductions in loading rates using the applicable Table 3 for expanded sources identified in the U.S. Census Bureau 2010 urbanized areas;

(3) An additional 35% reduction in new sources developed between 2009 and 2014 and for which the land use cover condition was greater than 16%; and

(4) Accounts for any modifications to the applicable loading rate provided to the operator as a result of TMDL modification.

SECTION II

MUNICIPAL SEPARATE STORM SEWER SYSTEM MANAGEMENT PROGRAM

A. The operator of a small MS4 must develop, implement, and enforce a MS4 Program designed to reduce the discharge of pollutants from the small MS4 to the maximum extent practicable (MEP), to protect water quality, to ensure compliance by the operator with water quality standards, and to satisfy the appropriate water quality requirements of the Clean Water Act and its attendant regulations. The MS4 Program must include the minimum control measures described in paragraph B of this section. Implementation of best management practices consistent with the provisions of an iterative MS4 Program required pursuant to this section constitutes compliance with the standard of reducing pollutants to the "maximum extent practicable," protects water quality in the absence of a TMDL wasteload allocation, ensures compliance by the operator with water quality standards, and satisfies the appropriate water quality requirements of the Clean Water Act and regulations in the absence of a TMDL WLA. The requirements of this section and those special conditions set out in Section I B also apply where a WLA is applicable.

B. Minimum control measures.

NOTE regarding minimum control measures for public education and outreach on stormwater impacts and public involvement/participation: "Public" is not defined in this permit. However, the department concurs with the following EPA statement, which was published in the Federal Register, Volume 64, No. 235, page 68,750 on December 8, 1999, regarding "public" and its applicability to MS4 programs: "EPA acknowledges that federal and state facilities are different from

municipalities. EPA believes, however, that the minimum measures are flexible enough that they can be implemented by these facilities. As an example, DOD commentators asked about how to interpret the term "public" for military installations when implementing the public education measure. EPA agrees with the suggested interpretation of "public" for DOD facilities as "the resident and employee population within the fence line of the facility." The department recommends that nontraditional MS4 operators, such as state and federal entities and local school districts, utilize this statement as guidance when determining their applicable "public" for compliance with this permit.

1. Public education and outreach on stormwater impacts.

a. The operator shall continue to implement the public education and outreach program as included in the registration statement until the program is updated to meet the conditions of this state permit. Operators who have not previously held MS4 permit coverage shall implement this program in accordance with the schedule provided with the completed registration statement.

b. The public education and outreach program should be designed with consideration of the following goals:

(1) 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;

(2) Increasing target audience knowledge of hazards associated with illegal discharges and improper disposal of waste, including pertinent legal implications; and

(3) Implementing a diverse program with strategies that are targeted towards audiences most likely to have significant stormwater impacts.

c. The updated program shall be designed to:

(1) Identify, at a minimum, three high-priority water quality issues, that contribute to the discharge of stormwater (e.g., Chesapeake Bay nutrients, pet wastes and local bacteria TMDLs, high-quality receiving waters, and illicit discharges from commercial sites) and a rationale for the selection of the three high-priority water quality issues;

(2) Identify and estimate the population size of the target audience or audiences who is most likely to have significant impacts for each high-priority water quality issue;

(3) Develop relevant message or messages and associated educational and outreach materials (e.g., various media such as printed materials, billboard and mass transit advertisements, signage at select locations, radio advertisements, television advertisements, websites, and social media) for message distribution to the selected target audiences while considering the viewpoints and concerns of the target audiences including minorities, disadvantaged audiences, and minors;

(4) Provide for public participation during public education and outreach program development;

(5) Annually conduct sufficient education and outreach activities designed to reach an equivalent 20% of each high-priority issue target audience. It shall not be considered noncompliance for failure to reach 20% of the target audience. However, it shall be a compliance issue if insufficient effort is made to annually reach a minimum of

20% of the target audience; and

(6) 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.

d. The operator may coordinate their public education and outreach efforts with other MS4 operators; however, each operator shall be individually responsible for meeting all of its state permit requirements.

e. Prior to application for continued state permit coverage required in Section III M, the operator shall evaluate the education and outreach program for:

(1) Appropriateness of the high-priority stormwater issues;

(2) Appropriateness of the selected target audiences for each high-priority stormwater issue;

(3) Effectiveness of the message or messages being delivered; and

(4) Effectiveness of the mechanism or mechanisms of delivery employed in reaching the target audiences.

f. The MS4 Program Plan shall describe how the conditions of this permit shall be updated in accordance with Table 1.

g. The operator shall include the following information in each annual report submitted to the department during this permit term:

(1) A list of the education and outreach activities conducted during the reporting period for each high-priority water quality issue, the estimated number of people reached, and an estimated percentage of the target audience or audiences that will be reached; and

(2) A list of the education and outreach activities that will be conducted during the next reporting period for each high-priority water quality issue, the estimated number of people that will be reached, and an estimated percentage of the target audience or audiences that will be reached.

2. Public involvement/participation.

a. Public involvement.

(1) The operator shall comply with any applicable federal, state, and local public notice requirements.

(2) The operator shall:

(a) Maintain an updated MS4 Program Plan. Any required updates to the MS4 Program Plan shall be completed at a minimum of once a year and shall be updated in conjunction with the annual report. The operator shall post copies of each MS4 program plan on its webpage at a minimum of once a year and within 30 days of submittal of the annual report to the department.

(b) Post copies of each annual report on the operator's web page within 30 days of submittal to the department and retain copies of annual reports online for the duration of this state permit; and

(c) Prior to applying for coverage as required by Section III M, notify the public and provide for receipt of comment

of the proposed MS4 Program Plan that will be submitted with the registration statement. As part of the reapplication, the operator shall address how it considered the comments received in the development of its MS4 Program Plan. The operator shall give public notice by a method reasonably calculated to give actual notice of the action in question to the persons potentially affected by it, including press releases or any other forum or medium to solicit public participation.

b. Public participation. The operator shall participate, through promotion, sponsorship, or other involvement, in a minimum of four local activities annually (e.g., stream cleanups; hazardous waste cleanup days; and meetings with watershed associations, environmental advisory committees, and other environmental organizations that operate within proximity to the operator's small MS4). The activities shall be aimed at increasing public participation to reduce stormwater pollutant loads; improve water quality; and support local restoration and clean-up projects, programs, groups, meetings, or other opportunities for public involvement.

c. The MS4 Program Plan shall include written procedures for implementing this program.

d. Each annual report shall include:

(1) A web link to the MS4 Program Plan and annual report; and

(2) Documentation of compliance with the public participation requirements of this section.

3. Illicit discharge detection and elimination.

a. The operator shall maintain an accurate storm sewer system map and information table and shall update it in accordance with the schedule set out in Table 1.

(1) The storm sewer system map must show the following, at a minimum:

(a) The location of all MS4 outfalls. In cases where the outfall is located outside of the MS4 operator's legal responsibility, the operator may elect to map the known point of discharge location closest to the actual outfall. Each mapped outfall must be given a unique identifier, which must be noted on the map; and

(b) The name and location of all waters receiving discharges from the MS4 outfalls and the associated HUC.

(2) The associated information table shall include for each outfall the following:

(a) The unique identifier;

(b) The estimated MS4 acreage served;

(c) The name of the receiving surface water and indication as to whether the receiving water is listed as impaired in the Virginia 2010 303(d)/305(b) Water Quality Assessment Integrated Report; and

(d) The name of any applicable TMDL or TMDLs.

(3) Within 48 months of coverage under this state permit, the operator shall have a complete and updated storm sewer system map and information table that includes all MS4 outfalls located within the boundaries identified as "urbanized" areas in the 2010 Decennial Census and shall submit the updated information table as an appendix

to the annual report.

(4) The operator shall maintain a copy of the current storm sewer system map and outfall information table for review upon request by the public or by the department.

(5) The operator shall continue to identify other points of discharge. The operator shall notify in writing the downstream MS4 of any known physical interconnection.

b. The operator shall effectively prohibit, through ordinance or other legal mechanism, nonstormwater discharges into the storm sewer system to the extent allowable under federal, state, or local law, regulation, or ordinance. Categories of nonstormwater discharges or flows (i.e., illicit discharges) identified in 9VAC25-870-400 D 2 c (3) must be addressed only if they are identified by the operator as significant contributors of pollutants to the small MS4. Flows that have been identified in writing by the department as de minimis discharges are not significant sources of pollutants to surface water and do not require a VPDES permit.

c. The operator shall develop, implement, and update, when appropriate, written procedures to detect, identify, and address unauthorized nonstormwater discharges, including illegal dumping, to the small MS4. These procedures shall include:

(1) Written dry weather field screening methodologies to detect and eliminate illicit discharges to the MS4 that include field observations and field screening monitoring and that provide:

(a) A prioritized schedule of field screening activities determined by the operator based on such criteria as age of the infrastructure, land use, historical illegal discharges, dumping or cross connections.

(b) The minimum number of field screening activities the operator shall complete annually to be determined as follows: (i) if the total number of outfalls in the small MS4 is less than 50, all outfalls shall be screened annually or (ii) if the small MS4 has 50 or more total outfalls, a minimum of 50 outfalls shall be screened annually.

(c) Methodologies to collect the general information such as time since the last rain, the quantity of the last rain, site descriptions (e.g., conveyance type and dominant watershed land uses), estimated discharge rate (e.g., width of water surface, approximate depth of water, approximate flow velocity, and flow rate), and visual observations (e.g., order, color, clarity, floatables, deposits or stains, vegetation condition, structural condition, and biology).

(d) A time frame upon which to conduct an investigation or investigations to identify and locate the source of any observed continuous or intermittent nonstormwater discharge prioritized as follows: (i) illicit discharges suspected of being sanitary sewage or significantly contaminated must be investigated first and (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 sewage 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.

(e) Methodologies to determine the source of all illicit discharges shall be conducted. If an illicit discharge is

found, but within six months of the beginning of the investigation neither the source nor the same nonstormwater discharge has been identified, then the operator shall document such in accordance with Section II B 3 f. If the observed discharge is intermittent, the operator must document that a minimum of three separate investigations were made in an attempt to observe the discharge when it was flowing. If these attempts are unsuccessful, the operator shall document such in accordance with Section II B 3 f.

(f) Mechanisms to eliminate identified sources of illicit discharges including a description of the policies and procedures for when and how to use legal authorities.

(g) Methods for conducting a follow-up investigation in order to verify that the discharge has been eliminated.

(h) A mechanism to track all investigations to document: (i) the date or dates that the illicit discharge was observed and reported; (ii) the results of the investigation; (iii) any follow-up to the investigation; (iv) resolution of the investigation; and (v) the date that the investigation was closed.

d. The operator shall promote, publicize, and facilitate public reporting of illicit discharges into or from MS4s. The operator shall conduct inspections in response to complaints and follow-up inspections as needed to ensure that corrective measures have been implemented by the responsible party.

e. The MS4 Program Plan shall include all procedures developed by the operator to detect, identify, and address nonstormwater discharges to the MS4 in accordance with the schedule in Table 1. In the interim, the operator shall continue to implement the program as included as part of the registration statement until the program is updated to meet the conditions of this permit. Operators, who have not previously held MS4 permit coverage, shall implement this program in accordance with the schedule provided with the completed registration statement.

f. Annual reporting requirements. Each annual report shall include:

(1) A list of any written notifications of physical interconnection given by the operator to other MS4s;

(2) The total number of outfalls screened during the reporting period, the screening results, and detail of any follow-up actions necessitated by the screening results; and

(3) A summary of each investigation conducted by the operator of any suspected illicit discharge. The summary must include: (i) the date that the 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.

4. Construction site stormwater runoff control.

a. Applicable oversight requirements. The operator shall utilize its legal authority, such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements, to address discharges entering the MS4 from the following land-disturbing activities:

(1) Land-disturbing activities as defined in § 62.1-44.15:51 of the Code of Virginia that result in the disturbance of 10,000 square feet or greater;

(2) 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 Acres (IDA), pursuant to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act;

(3) Land-disturbing activities disturbing less than the minimum land disturbance identified in subdivision (1) or (2) above for which a local ordinance requires that an erosion and sediment control plan be developed; and

(4) Land-disturbing activities on individual residential lots or sections of residential developments being developed by different property owners and where the total land disturbance of the residential development is 10,000 square feet or greater. The operator may utilize an agreement in lieu of a plan as provided in § 62.1-44.15:55 of the Code of Virginia for this category of land disturbances.

b. Required plan approval prior to commencement of the land disturbing activity. The operator shall require that land disturbance not begin until an erosion and sediment control plan or an agreement in lieu of a plan as provided in § 62.1-44.15:55 is approved by a VESCP authority in accordance with the Erosion and Sediment Control Law (§ 62.1-44.15:51 et seq. of the Code of Virginia). The plan shall be:

(1) Compliant with the minimum standards identified in 9VAC25-840-40 of the Erosion and Sediment Control Regulations; or

(2) Compliant with department-approved annual standards and specifications. Where applicable, the plan shall be consistent with any additional or more stringent, or both, erosion and sediment control requirements established by state regulation or local ordinance.

c. Compliance and enforcement.

(1) The operator shall inspect land-disturbing activities for compliance with an approved erosion and sediment control plan or agreement in lieu of a plan in accordance with the minimum standards identified in 9VAC25-840-40 or with department-approved annual standards and specifications.

(2) The operator shall implement an inspection schedule for land-disturbing activities identified in Section II B 4 a as follows:

(a) Upon initial 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 performance bonds.

Where an operator establishes an alternative inspection program as provided for in 9VAC25-840-60 B 2, the written schedule shall be implemented in lieu of Section II B 4 c (2) and the written plan shall be included in the MS4

Program Plan.

(3) Operator inspections shall be conducted by personnel who hold a certificate of competence in accordance with 9VAC25-850-40. Documentation of certification shall be made available upon request by the VESCP authority or other regulatory agency.

(4) The operator shall promote to the public a mechanism for receipt of complaints regarding regulated land-disturbing activities and shall follow up on any complaints regarding potential water quality and compliance issues.

(5) The operator shall utilize its legal authority to require compliance with the approved plan where an inspection finds that the approved plan is not being properly implemented.

(6) The operator shall utilize, as appropriate, its 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.

(7) The operator shall require implementation of appropriate controls to prevent nonstormwater discharges to the MS4, such as wastewater, concrete washout, fuels and oils, and other illicit discharges identified during land-disturbing activity inspections of the MS4. The discharge of nonstormwater discharges other than those identified in 9VAC25-890-20 through the MS4 is not authorized by this state permit.

(8) The operator may develop and implement a progressive compliance and enforcement strategy provided that such strategy is included in the MS4 Program Plan and is consistent with 9VAC25-840.

d. Regulatory coordination. The operator shall implement enforceable procedures to require that large construction activities as defined in 9VAC25-870-10 and small construction activities as defined in 9VAC25-870-10, including municipal construction activities, secure necessary state permit authorizations from the department to discharge stormwater.

e. MS4 Program requirements. The operator's MS4 Program Plan shall include:

(1) A description of the legal authorities utilized to ensure compliance with the minimum control measure in Section II related to construction site stormwater runoff control such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements;

(2) Written plan review procedures and all associated documents utilized in plan review;

(3) For the MS4 operators who obtain department-approved standards and specifications, a copy of the current standards and specifications;

(4) Written inspection procedures and all associated documents utilized during inspection including the inspection schedule;

(5) Written procedures for compliance and enforcement, including a progressive compliance and enforcement strategy, where appropriate; and

(6) The roles and responsibilities of each of the operator's departments, divisions, or subdivisions in implementing the minimum control measure in Section II related to construction site stormwater runoff control. If the operator utilizes another entity to implement portions of the MS4 Program Plan, a copy of the written agreement must be retained in the MS4 Program Plan. The description of each party's roles and responsibilities, including any written agreements with third parties, shall be updated as necessary.

Reference may be made to any listed requirements in this subdivision provided the location of where the reference material can be found is included and the reference material is made available to the public upon request.

f. Reporting requirements. The operator shall track regulated land-disturbing activities and submit the following information in all annual reports:

(1) Total number of regulated land-disturbing activities;

(2) Total number of acres disturbed;

(3) Total number of inspections conducted; and

(4) A summary of the enforcement actions taken, including the total number and type of enforcement actions taken during the reporting period.

5. Post-construction stormwater management in new development and development on prior developed lands.

a. Applicable oversight requirements. The operator shall address post-construction stormwater runoff that enters the MS4 from the following land-disturbing activities:

(1) New development and development on prior developed lands that are defined as large construction activities or small construction activities in 9VAC25-870-10;

(2) New development and development on prior developed lands that disturb greater than or equal to 2,500 square feet, but less than one acre, located in a Chesapeake Bay Preservation Area designated by a local government located in Tidewater, Virginia, as defined in § 62.1-44.15:68 of the Code of Virginia; and

(3) New development and development on prior developed lands where an applicable state regulation or local ordinance has designated a more stringent regulatory size threshold than that identified in subdivision (1) or (2) above.

b. Required design criteria for stormwater runoff controls. The operator shall utilize legal authority, such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements, to require that activities identified in Section II B 5 a address stormwater runoff in such a manner that stormwater runoff controls are designed and installed:

(1) In accordance with the appropriate water quality and water quantity design criteria as required in Part II (9VAC25-870-40 et seq.) of 9VAC25-870;

(2) In accordance with any additional applicable state or local design criteria required at project initiation; and

(3) Where applicable, in accordance with any department-approved annual standards and specifications.

Upon board approval of a Virginia Stormwater Management Program authority (VSMP Authority) as defined in § 62.1-44.15:24 of the Code of Virginia and reissuance of the Virginia Stormwater Management Program (VSMP) General Permit for Discharges of Stormwater from Construction Activities, the operator shall require that stormwater management plans are approved by the appropriate VSMP Authority prior to land disturbance. In accordance with § 62.1-44.15:27 M of the Code of Virginia, VSMPs shall become effective July 1, 2014, unless otherwise specified by state law or by the board.

c. Inspection, operation, and maintenance verification of stormwater management facilities.

(1) For stormwater management facilities not owned by the MS4 operator, the following conditions apply:

(a) The operator shall require adequate long-term operation and maintenance by the owner of the stormwater management facility by requiring the owner to develop a recorded inspection schedule and maintenance agreement to the extent allowable under state or local law or other legal mechanism;

(b) The operator or his designee shall implement a schedule designed to inspect all privately owned stormwater management facilities that discharge into the MS4 at least once every five years to document that maintenance is being conducted in such a manner to ensure long-term operation in accordance with the approved designs.

(c) The operator shall utilize its legal authority for enforcement of maintenance responsibilities if maintenance is neglected by the owner. The operator may develop and implement a progressive compliance and enforcement strategy provided that the strategy is included in the MS4 Program Plan.

(d) Beginning with the issuance of this state permit, the operator may utilize strategies other than maintenance agreements such as periodic inspections, homeowner outreach and education, and other methods targeted at promoting the long-term maintenance of stormwater control measures that are designed to treat stormwater runoff solely from the individual residential lot. Within 12 months of coverage under this permit, the operator shall develop and implement these alternative strategies and include them in the MS4 Program Plan.

(2) For stormwater management facilities owned by the MS4 operator, the following conditions apply:

(a) The operator shall provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan.

(b) The operator shall inspect these stormwater management facilities annually. The operator may choose to implement an alternative schedule to inspect these stormwater management facilities based on facility type and expected maintenance needs provided that the alternative schedule is included in the MS4 Program Plan.

(c) The operator shall conduct maintenance on its stormwater management facilities as necessary.

d. MS4 Program Plan requirements. The operator's MS4 Program Plan shall be updated in accordance with Table 1 to include:

(1) A list of the applicable legal authorities such as ordinance, state and other permits, orders, specific contract language, and interjurisdictional agreements to ensure compliance with the minimum control measure in Section II related to post-construction stormwater management in new development and development on prior developed lands;

(2) Written policies and procedures utilized to ensure that stormwater management facilities are designed and installed in accordance with Section II B 5 b;

(3) Written inspection policies and procedures utilized in conducting inspections;

(4) Written procedures for inspection, compliance and enforcement to ensure maintenance is conducted on private stormwater facilities to ensure long-term operation in accordance with approved design;

(5) Written procedures for inspection and maintenance of operator-owned stormwater management facilities;

(6) The roles and responsibilities of each of the operator's departments, divisions, or subdivisions in implementing the minimum control measure in Section II related to post-construction stormwater management in new development and development on prior developed lands. If the operator utilizes another entity to implement portions of the MS4 Program Plan, a copy of the written agreement must be retained in the MS4 Program Plan. Roles and responsibilities shall be updated as necessary.

e. Stormwater management facility tracking and reporting requirements. The operator 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 the following:

(1) The stormwater management facility type;

(2) A general description of the facility's location, including the address or latitude and longitude;

(3) The acres treated by the facility, including total acres, as well as the breakdown of pervious and impervious acres;

(4) The date the facility was brought online (MM/YYYY). If the date is not known, the operator shall use June 30, 2005, as the date brought online for all previously existing stormwater management facilities;

(5) The sixth order hydrologic unit code (HUC) in which the stormwater management facility is located;

(6) 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;

(7) Whether the stormwater management facility is operator-owned or privately-owned;

(8) Whether a maintenance agreement exists if the stormwater management facility is privately owned; and

(9) The date of the operator's most recent inspection of the stormwater management facility.

In addition, the operator shall annually track and report the total number of inspections completed and, when applicable, the number of enforcement actions taken to ensure long-term maintenance.

The operator shall submit an electronic database or spreadsheet of all stormwater management facilities brought online during each reporting year with the appropriate annual report. Upon such time as the department provides the operators access to a statewide web-based reporting electronic database or spreadsheet, the operator shall utilize such database to complete the pertinent reporting requirements of this state permit.

6. Pollution prevention/good housekeeping for municipal operations.

a. Operations and maintenance activities. The MS4 Program Plan submitted with the registration statement shall be implemented by the operator until updated in accordance with this state permit. In accordance with Table 1, the operator shall develop and implement written procedures designed to minimize or prevent pollutant discharge from: (i) daily operations such as road, street, and parking lot maintenance; (ii) equipment maintenance; and (iii) the application, storage, transport, and disposal of pesticides, herbicides, and fertilizers. The written procedures shall be utilized as part of the employee training. At a minimum, the written procedures shall be designed to:

(1) Prevent illicit discharges;

(2) Ensure the proper disposal of waste materials, including landscape wastes;

(3) Prevent the discharge of municipal vehicle wash water into the MS4 without authorization under a separate VPDES permit;

(4) Prevent the discharge of wastewater into the MS4 without authorization under a separate VPDES permit;

(5) Require implementation of best management practices when discharging water pumped from utility construction and maintenance activities;

(6) Minimize the pollutants in stormwater runoff from bulk storage areas (e.g., salt storage, topsoil stockpiles) through the use of best management practices;

(7) Prevent pollutant discharge into the MS4 from leaking municipal automobiles and equipment; and

(8) Ensure that the application of materials, including fertilizers and pesticides, is conducted in accordance with the manufacturer's recommendations.

b. Municipal facility pollution prevention and good housekeeping.

(1) Within 12 months of state permit coverage, the operator shall identify all municipal high-priority facilities. These high-priority facilities shall include: (i) composting facilities, (ii) equipment storage and maintenance facilities, (iii) materials storage yards, (iv) pesticide storage facilities, (v) public works yards, (vi) recycling facilities, (vii) salt storage facilities, (viii) solid waste handling and transfer facilities, and (ix) vehicle storage and maintenance yards.

(2) Within 12 months of state permit coverage, the operator shall identify which of the municipal high-priority facilities have a high potential of discharging pollutants. Municipal high-priority facilities that have a high potential for discharging pollutants are those facilities identified in subsection (1) above that are not covered under a separate VPDES permit and which any of the following materials or activities occur and are expected to have

exposure to stormwater resulting from rain, snow, snowmelt or runoff:

(a) Areas where residuals from using, storing or cleaning machinery or equipment remain and are exposed to stormwater;

(b) Materials or residuals on the ground or in stormwater inlets from spills or leaks;

(c) Material handling equipment (except adequately maintained vehicles);

(d) Materials or products that would be expected to be mobilized in stormwater runoff during loading/unloading or transporting activities (e.g., rock, salt, fill dirt);

(e) Materials or products stored outdoors (except final products intended for outside use where exposure to stormwater does not result in the discharge of pollutants);

(f) Materials or products that would be expected to be mobilized in stormwater runoff contained in open, deteriorated or leaking storage drums, barrels, tanks, and similar containers;

(g) Waste material except waste in covered, non-leaking containers (e.g., dumpsters);

(h) Application or disposal of process wastewater (unless otherwise permitted); or

(i) Particulate matter or visible deposits of residuals from roof stacks, vents or both not otherwise regulated (i.e., under an air quality control permit) and evident in the stormwater runoff.

(3) The operator shall develop and implement specific stormwater pollution prevention plans for all high-priority facilities identified in subdivision 2 of this subsection. The operator shall complete SWPPP development and implementation shall be completed within 48 months of coverage under this state permit. Facilities covered under a separate VPDES permit shall adhere to the conditions established in that permit and are excluded from this requirement.

(4) Each SWPPP shall include:

(a) A site description that includes a site map identifying all outfalls, direction of flows, existing source controls, and receiving water bodies;

(b) A discussion and checklist of potential pollutants and pollutant sources;

(c) A discussion of all potential nonstormwater discharges;

(d) Written procedures designed to reduce and prevent pollutant discharge;

(e) A description of the applicable training as required in Section II B 6 d;

(f) Procedures to conduct an annual comprehensive site compliance evaluation;

(g) An inspection and maintenance schedule for site specific source controls. The date of each inspection and associated findings and follow-up shall be logged in each SWPPP;

(h) The contents of each SWPPP shall be evaluated and modified as necessary to accurately reflect any discharge, release, or spill from the high priority facility reported in accordance with Section III G. For each such

discharge, release, or spill, the SWPPP must include the following information: date of incident; material discharged, released, or spilled; and quantity discharged, released or spilled; and

(i) A copy of each SWPPP shall be kept at each facility and shall be kept updated and utilized as part of staff training required in Section II B 6 d.

c. Turf and landscape management.

(1) The operator shall implement turf and landscape nutrient management plans that have been developed by a certified turf and landscape nutrient management planner in accordance with § 10.1-104.2 of the Code of Virginia on all lands owned or operated by the MS4 operator where nutrients are applied to a contiguous area greater than one acre. Implementation shall be in accordance with the following schedule:

(a) Within 12 months of state permit coverage, the operator shall identify all applicable lands where nutrients are applied to a contiguous area of more than one acre. A latitude and longitude shall be provided for each such piece of land and reported in the annual report.

(b) Within 60 months of state permit coverage, the operator shall implement turf and landscape nutrient management plans on all lands where nutrients are applied to a contiguous area of more than one acre. The following measurable outcomes are established for the implementation of turf and landscape nutrient management plans: (i) within 24 months of permit coverage, not less than 15% of all identified acres will be covered by turf and landscape nutrient management plans; (ii) within 36 months of permit coverage, not less than 40% of all identified acres will be covered by turf and landscape nutrient management plans; and (iii) within 48 months of permit coverage, not less than 75% of all identified acres will be covered by turf and landscape nutrient management plans. The operator shall not fail to meet the measurable goals for two consecutive years.

(c) MS4 operators with lands regulated under § 10.1-104.4 of the Code of Virginia shall continue to implement turf and landscape nutrient management plans in accordance with this statutory requirement.

(2) Operators shall annually track the following:

(a) The total acreage of lands where turf and landscape nutrient management plans are required; and

(b) The acreage of lands upon which turf and landscape nutrient management plans have been implemented.

(3) The operator shall not apply any deicing agent containing urea or other forms of nitrogen or phosphorus to parking lots, roadways, and sidewalks, or other paved surfaces.

d. Training. The operator shall conduct training for employees. The training requirements may be fulfilled, in total or in part, through regional training programs involving two or more MS4 localities provided; however, that each operator shall remain individually liable for its failure to comply with the training requirements in this permit. Training is not required if the topic is not applicable to the operator's operations and therefore does not have applicable personnel provided the lack of applicability is documented in the MS4 Program Plan. The operator

shall determine and document the applicable employees or positions to receive each type of training. The operator shall develop an annual written training plan including a schedule of training events that ensures implementation of the training requirements as follows:

(1) The operator shall provide biennial training to applicable field personnel in the recognition and reporting of illicit discharges.

(2) The operator shall provide biennial training to applicable employees in good housekeeping and pollution prevention practices that are to be employed during road, street, and parking lot maintenance.

(3) The operator shall provide biennial training to applicable employees in good housekeeping and pollution prevention practices that are to be employed in and around maintenance and public works facilities.

(4) The operator shall 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).

(5) The operator shall ensure 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.

(6) The operator shall ensure that applicable employees obtain the appropriate certifications as required under the Virginia Erosion and Sediment Control Law and its attendant regulations.

(7) The operators shall provide biennial training to applicable employees in good housekeeping and pollution prevention practices that are to be employed in and around recreational facilities.

(8) The appropriate emergency response employees shall have training in spill responses. A summary of the training or certification program provided to emergency response employees shall be included in the first annual report.

(9) The operator shall keep documentation on each training event including the training date, the number of employees attending the training, and the objective of the training event for a period of three years after each training event.

e. The operator shall require that municipal contractors use appropriate control measures and procedures for stormwater discharges to the MS4 system. Oversight procedures shall be described in the MS4 Program Plan.

f. At a minimum, the MS4 Program Plan shall contain:

(1) The written protocols being used to satisfy the daily operations and maintenance requirements;

(2) A list of all municipal high-priority facilities that identifies those facilities that have a high potential for chemicals or other materials to be discharged in stormwater and a schedule that identifies the year in which an individual SWPPP will be developed for those facilities required to have a SWPPP. Upon completion of a SWPPP, the SWPPP shall be part of the MS4 Program Plan. The MS4 Program Plan shall include the location in

which the individual SWPPP is located;

(3) A list of lands where nutrients are applied to a contiguous area of more than one acre. Upon completion of a turf and landscape nutrient management plan, the turf and landscape nutrient management plan shall be part of the MS4 Program Plan. The MS4 Program Plan shall include the location in which the individual turf and landscape nutrient management plan is located; and

(4) The annual written training plan for the next reporting cycle.

g. Annual reporting requirements.

(1) A summary report on the development and implementation of the daily operational procedures;

(2) A summary report on the development and implementation of the required SWPPPs;

(3) A summary report on the development and implementation of the turf and landscape nutrient management plans that includes:

(a) The total acreage of lands where turf and landscape nutrient management plans are required; and

(b) The acreage of lands upon which turf and landscape nutrient management plans have been implemented; and

(4) A summary report on the required training, including a list of training events, the training date, the number of employees attending training and the objective of the training.

C. If an existing program requires the implementation of one or more of the minimum control measures of Section II B, the operator, with the approval of the board, may follow that program's requirements rather than the requirements of Section II B. A program that may be considered includes, but is not limited to, a local, state or tribal program that imposes, at a minimum, the relevant requirements of Section II B.

The operator's MS4 Program Plan shall identify and fully describe any program that will be used to satisfy one or more of the minimum control measures of Section II B.

If the program the operator is using requires the approval of a third party, the program must be fully approved by the third party, or the operator must be working towards getting full approval. Documentation of the program's approval status, or the progress towards achieving full approval, must be included in the annual report required by Section II E 3. The operator remains responsible for compliance with the permit requirements if the other entity fails to implement the control measures (or component thereof).

D. The operator may rely on another entity to satisfy the state permit requirements to implement a minimum control measure if: (i) the other entity, in fact, implements the control measure; (ii) the particular control measure, or component thereof, is at least as stringent as the corresponding state permit requirement; and (iii) the other entity agrees to implement the control measure on behalf of the operator. The agreement between the parties must be documented in writing and retained by the operator with the MS4 Program Plan for the duration of this state permit.

In the annual reports that must be submitted under Section II E 3, the operator must specify that another entity is being

relied on to satisfy some of the state permit requirements.

If the operator is relying on another governmental entity regulated under 9VAC25-870-380 to satisfy all of the state permit obligations, including the obligation to file periodic reports required by Section II E 3, the operator must note that fact in the registration statement, but is not required to file the periodic reports.

The operator remains responsible for compliance with the state permit requirements if the other entity fails to implement the control measure (or component thereof).

E. Evaluation and assessment.

1. MS4 Program Evaluation. The operator must annually evaluate:

a. Program compliance;

b. The appropriateness of the identified BMPs (as part of this evaluation, the operator shall evaluate the effectiveness of BMPs in addressing discharges into waters that are identified as impaired in the 2010 § 305(b)/303(d) Water Quality Assessment Integrated Report); and

c. Progress towards achieving the identified measurable goals.

2. Recordkeeping. The operator must keep records required by the state permit for at least three years. These records must be submitted to the department only upon specific request. The operator must make the records, including a description of the stormwater management program, available to the public at reasonable times during regular business hours.

3. Annual reports. The operator must submit an annual report for the reporting period of July 1 through June 30 to the department by the following October 1 of that year. The reports shall include:

a. Background Information.

(1) The name and state permit number of the program submitting the annual report;

(2) The annual report permit year;

(3) Modifications to any operator's department's roles and responsibilities;

(4) Number of new MS4 outfalls and associated acreage by HUC added during the permit year; and

(5) Signed certification;

b. The status of compliance with state permit conditions, an assessment of the appropriateness of the identified best management practices and progress towards achieving the identified measurable goals for each of the minimum control measures;

c. Results of information collected and analyzed, including monitoring data, if any, during the reporting period;

d. A summary of the stormwater activities the operator plans to undertake during the next reporting cycle;

e. A change in any identified best management practices or measurable goals for any of the minimum control measures including steps to be taken to address any deficiencies;

f. Notice that the operator is relying on another government entity to satisfy some of the state permit obligations (if applicable);

g. The approval status of any programs pursuant to Section II C (if appropriate), or the progress towards achieving full approval of these programs; and

h. Information required for any applicable TMDL special condition contained in Section I.

F. Program Plan modifications.

1. Program modifications requested by the operator. Modifications to the MS4 Program are expected throughout the life of this state permit as part of the iterative process to reduce the pollutant loadings and to protect water quality. As such, modifications made in accordance with this state permit as a result of the iterative process do not require modification of this permit unless the department determines that the changes meet the criteria referenced in 9VAC25-870-630 or 9VAC25-870-650. Updates and modifications to the MS4 Program may be made during the life of this state permit in accordance with the following procedures:

a. Adding (but not eliminating or replacing) components, controls, or requirements to the MS4 Program may be made by the operator at any time. Additions shall be reported as part of the annual report.

b. Updates and modifications to specific standards and specifications, schedules, operating procedures, ordinances, manuals, checklists, and other documents routinely evaluated and modified are permitted under this state permit provided that the updates and modifications are done in a manner that (i) is consistent with the conditions of this state permit, (ii) follow any public notice and participation requirements established in this state permit, and (iii) are documented in the annual report.

c. Replacing, or eliminating without replacement, any ineffective or infeasible strategies, policies, and BMPs specifically identified in this permit with alternate strategies, policies, and BMPs may be requested at any time. Such requests must be made in writing to the department and signed in accordance with 9VAC25-870-370, and include the following:

(1) An analysis of how or why the BMPs, strategies, or policies are ineffective or infeasible, including information on whether the BMPs, strategies, or policies are cost prohibitive;

(2) Expectations regarding the effectiveness of the replacement BMPs, strategies, or policies;

(3) An analysis of how the replacement BMPs are expected to achieve the goals of the BMPs to be replaced;

(4) A schedule for implementing the replacement BMPs, strategies, and policies; and

(5) An analysis of how the replacement strategies and policies are expected to improve the operator's ability to meet the goals of the strategies and policies being replaced.

d. The operator follows the public involvement requirements identified in Section II B 2 (a).

2. MS4 Program updates requested by the department. In a manner and following procedures in accordance with the

Virginia Administrative Process Act, the Virginia Stormwater Management regulations, and other applicable state law and regulations, the department may request changes to the MS4 Program to assure compliance with the statutory requirements of the Virginia Stormwater Management Act and its attendant regulations to:

a. Address impacts on receiving water quality caused by discharges from the MS4;

b. Include more stringent requirements necessary to comply with new state or federal laws or regulations; or

c. Include such other conditions necessary to comply with state or federal law or regulation.

Proposed changes requested by the department shall be made in writing and set forth the basis for and objective of the modification as well as the proposed time schedule for the operator to develop and implement the modification. The operator may propose alternative program modifications or time schedules to meet the objective of the requested modification, but any such modifications are at the discretion of the department.

SECTION III

CONDITIONS APPLICABLE TO ALL STATE PERMITS

A. Monitoring.

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

2. Monitoring shall be conducted according to procedures approved under 40 CFR Part 136 or alternative methods approved by the U.S. Environmental Protection Agency, unless other procedures have been specified in this state permit.

3. The operator shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals that will insure accuracy of measurements.

B. Records.

1. Monitoring records/reports shall include:

a. The date, exact place, and time of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) and time(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

2. The operator shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this state permit, and records of all data used to complete the registration statement for this state permit, for a period of at least three years from the date of the sample, measurement, report or request for coverage. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or

regarding control standards applicable to the operator, or as requested by the board.

C. Reporting monitoring results.

1. The operator shall submit the results of the monitoring required by this state permit with the annual report unless another reporting schedule is specified elsewhere in this state permit.

2. Monitoring results shall be reported on a Discharge Monitoring Report (DMR); on forms provided, approved or specified by the department; or in any format provided the date, location, parameter, method, and result of the monitoring activity are included.

3. If the operator monitors any pollutant specifically addressed by this state permit more frequently than required by this state permit using test procedures approved under 40 CFR Part 136 or using other test procedures approved by the U.S. Environmental Protection Agency or using procedures specified in this state permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or reporting form specified by the department.

4. Calculations for all limitations that require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this state permit.

D. Duty to provide information. The operator shall furnish to the department, within a reasonable time, any information that the board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this state permit or to determine compliance with this state permit. The board may require the operator to furnish, upon request, such plans, specifications, and other pertinent information as may be necessary to determine the effect of the wastes from his discharge on the quality of surface waters, or such other information as may be necessary to accomplish the purposes of the CWA and Virginia Stormwater Management Act. The operator shall also furnish to the department upon request, copies of records required to be kept by this permit.

E. Compliance schedule reports. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this state permit shall be submitted no later than 14 days following each schedule date.

F. Unauthorized stormwater discharges. Pursuant to § 62.1-44.15:26 of the Code of Virginia, except in compliance with a state permit issued by the board, it shall be unlawful to cause a stormwater discharge from a MS4.

G. Reports of unauthorized discharges. Any operator of a small MS4 who discharges or causes or allows a discharge of sewage, industrial waste, other wastes or any noxious or deleterious substance or a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302 that occurs during a 24-hour period into or upon surface waters; or who discharges or causes or allows a discharge that may reasonably be expected to enter surface waters, shall notify the department of the discharge immediately upon discovery of the discharge, but in no case later than within 24 hours after said discovery. A written report of the unauthorized discharge shall be submitted to the department within five days of discovery of the discharge. The

written report shall contain:

1. A description of the nature and location of the discharge;

2. The cause of the discharge;

3. The date on which the discharge occurred;

4. The length of time that the discharge continued;

5. The volume of the discharge;

6. If the discharge is continuing, how long it is expected to continue;

7. If the discharge is continuing, what the expected total volume of the discharge will be; and

8. Any steps planned or taken to reduce, eliminate and prevent a recurrence of the present discharge or any future discharges not authorized by this state permit.

Discharges reportable to the department under the immediate reporting requirements of other regulations are exempted from this requirement.

H. Reports of unusual or extraordinary discharges. If any unusual or extraordinary discharge including a "bypass" or "upset," as defined herein, should occur from a facility and the discharge enters or could be expected to enter surface waters, the operator shall promptly notify, in no case later than within 24 hours, the department by telephone after the discovery of the discharge. This notification shall provide all available details of the incident, including any adverse effects on aquatic life and the known number of fish killed. The operator shall reduce the report to writing and shall submit it to the department within five days of discovery of the discharge in accordance with Section III I 2. Unusual and extraordinary discharges include but are not limited to any discharge resulting from:

1. Unusual spillage of materials resulting directly or indirectly from processing operations;

2. Breakdown of processing or accessory equipment;

3. Failure or taking out of service some or all of the facilities; and

4. Flooding or other acts of nature.

I. Reports of noncompliance. The operator shall report any noncompliance which may adversely affect surface waters or may endanger public health.

1. An oral report shall be provided within 24 hours to the department from the time the operator becomes aware of the circumstances. The following shall be included as information which shall be reported within 24 hours under this paragraph:

a. Any unanticipated bypass; and

b. Any upset which causes a discharge to surface waters.

2. A written report shall be submitted within five days and shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and

c. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

The board or its designee may waive the written report on a case-by-case basis for reports of noncompliance under Section III I if the oral report has been received within 24 hours and no adverse impact on surface waters has been reported.

3. The operator shall report all instances of noncompliance not reported under Sections III I 1 or 2, in writing, at the time the next monitoring reports are submitted. The reports shall contain the information listed in Section III I 2.

NOTE: The immediate (within 24 hours) reports required to be provided to the department in Sections III G, H and I may be made to the appropriate Regional Office Pollution Response Program as found at http://deq.virginia.gov/Programs/PollutionResponsePreparedness.aspx. Reports may be made by telephone or by fax. For reports outside normal working hours, leave a message and this shall fulfill the immediate reporting requirement. For emergencies, the Virginia Department of Emergency Services maintains a 24-hour telephone service at 1-800-468-8892.

4. Where the operator becomes aware of a failure to submit any relevant facts, or submittal of incorrect information in any report to the department, it shall promptly submit such facts or correct information.

J. Notice of planned changes.

1. The operator shall give notice to the department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The operator plans an alteration or addition to any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced:

(1) After promulgation of standards of performance under § 306 of the Clean Water Act that are applicable to such source; or

(2) After proposal of standards of performance in accordance with § 306 of the Clean Water Act that are applicable to such source, but only if the standards are promulgated in accordance with § 306 within 120 days of their proposal;

b. The operator plans alteration or addition that would significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this state permit; or

2. The operator shall give advance notice to the department of any planned changes in the permitted facility or activity; which may result in noncompliance with state permit requirements.

K. Signatory requirements.

1. Registration statement. All registration statements shall be signed as follows:

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

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

c. For a municipality, state, federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a public agency includes:

(1) The chief executive officer of the agency, or

(2) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

2. Reports, etc. All reports required by state permits, and other information requested by the board shall be signed by a person described in Section III K 1, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Section III K 1;

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

c. The written authorization is submitted to the department.

3. Changes to authorization. If an authorization under Section III K 2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Section III K 2 shall be submitted to the department prior to or together with any reports, or information to be signed by an authorized representative.

4. Certification. Any person signing a document under Sections III K 1 or 2 shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or

supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

L. Duty to comply. The operator shall comply with all conditions of this state permit. Any state permit noncompliance constitutes a violation of the Virginia Stormwater Management Act and the Clean Water Act, except that noncompliance with certain provisions of this state permit may constitute a violation of the Virginia Stormwater Management Act but not the Clean Water Act. State permit noncompliance is grounds for enforcement action; for state permit termination, revocation and reissuance, or modification; or denial of a state permit renewal application.

The operator shall comply with effluent standards or prohibitions established under § 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if this state permit has not yet been modified to incorporate the requirement.

M. Duty to reapply. If the operator wishes to continue an activity regulated by this state permit after the expiration date of this state permit, the operator shall submit a new registration statement at least 90 days before the expiration date of the existing state permit, unless permission for a later date has been granted by the board. The board shall not grant permission for registration statements to be submitted later than the expiration date of the existing state permit.

N. Effect of a state permit. This state permit does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any injury to private property or invasion of personal rights, or any infringement of federal, state or local law or regulations.

O. State law. Nothing in this state permit shall be construed to preclude the institution of any legal action under, or relieve the operator from any responsibilities, liabilities, or penalties established pursuant to any other state law or regulation or under authority preserved by § 510 of the Clean Water Act. Except as provided in state permit conditions on "bypassing" (Section III U), and "upset" (Section III V) nothing in this state permit shall be construed to relieve the operator from civil and criminal penalties for noncompliance.

P. Oil and hazardous substance liability. Nothing in this state permit shall be construed to preclude the institution of any legal action or relieve the operator from any responsibilities, liabilities, or penalties to which the operator is or may be subject under §§ 62.1-44.34:14 through 62.1-44.34:23 of the State Water Control Law or § 311 of the Clean Water Act.

Q. Proper operation and maintenance. The operator shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed or used by the operator to achieve compliance with the conditions of this state permit. Proper operation and maintenance also includes effective plant performance, adequate funding, adequate staffing, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems,

which are installed by the operator only when the operation is necessary to achieve compliance with the conditions of this state permit.

R. Disposal of solids or sludges. Solids, sludges or other pollutants removed in the course of treatment or management of pollutants shall be disposed of in a manner so as to prevent any pollutant from such materials from entering surface waters.

S. Duty to mitigate. The operator shall take all reasonable steps to minimize or prevent any discharge in violation of this state permit that has a reasonable likelihood of adversely affecting human health or the environment.

T. Need to halt or reduce activity not a defense. It shall not be a defense for an operator in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this state permit.

U. Bypass.

1. "Bypass," as defined in 9VAC25-870-10, means the intentional diversion of waste streams from any portion of a treatment facility. The operator may allow any bypass to occur that does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Sections III U 2 and U 3.

2. Notice.

a. Anticipated bypass. If the operator knows in advance of the need for a bypass, prior notice shall be submitted, if possible at least 10 days before the date of the bypass.

b. Unanticipated bypass. The operator shall submit notice of an unanticipated bypass as required in Section III I.

3. Prohibition of bypass.

a. Bypass is prohibited, and the board or its designee may take enforcement action against an operator for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The operator submitted notices as required under Section III U 2.

b. The board or its designee may approve an anticipated bypass, after considering its adverse effects, if the board or its designee determines that it will meet the three conditions listed above in Section III U 3 a.

V. Upset.

1. An "upset", as defined in 9VAC25-870-10, constitutes an affirmative defense to an action brought for noncompliance

with technology based state permit effluent limitations if the requirements of Section III V 2 are met. A determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is not a final administrative action subject to judicial review.

2. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

3. An operator who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An upset occurred and that the operator can identify the cause(s) of the upset;

b. The permitted facility was at the time being properly operated;

c. The operator submitted notice of the upset as required in Section III I; and

d. The operator complied with any remedial measures required under Section III S.

4. In any enforcement proceeding the operator seeking to establish the occurrence of an upset has the burden of proof.

W. Inspection and entry. The operator shall allow the department as the board's designee, or an authorized representative (including an authorized contractor acting as a representative of the administrator), upon presentation of credentials and other documents as may be required by law, to:

1. Enter upon the operator's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this state permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this state permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this state permit; and

4. Sample or monitor at reasonable times, for the purposes of assuring state permit compliance or as otherwise authorized by the Clean Water Act and the Virginia Stormwater Management Act, any substances or parameters at any location.

For purposes of this subsection, the time for inspection shall be deemed reasonable during regular business hours, and whenever the facility is discharging. Nothing contained herein shall make an inspection unreasonable during an emergency.

X. State permit actions. State permits may be modified, revoked and reissued, or terminated for cause. The filing of a request by the operator for a state permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any state permit condition.

Y. Transfer of state permits.

1. State permits are not transferable to any person except after notice to the department. Except as provided in Section III Y 2, a state permit may be transferred by the operator to a new operator only if the state permit has been modified or revoked and reissued, or a minor modification made, to identify the new operator and incorporate such other requirements as may be necessary under the Virginia Stormwater Management Act and the Clean Water Act.

2. As an alternative to transfers under Section III Y 1, this state permit may be automatically transferred to a new operator if:

a. The current operator notifies the department at least two days in advance of the proposed transfer of the title to the facility or property;

b. The notice includes a written agreement between the existing and new operators containing a specific date for transfer of state permit responsibility, coverage, and liability between them; and

c. The board does not notify the existing operator and the proposed new operator of its intent to modify or revoke and reissue the state permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Section III Y 2 b.

Z. Severability. The provisions of this state permit are severable, and if any provision of this state permit or the application of any provision of this state permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this state permit, shall not be affected thereby.

Statutory Authority

§ 62.1-44.15:28 of the Code of Virginia.

Historical Notes

Former 4VAC50-60-1240, derived from Virginia Register Volume 21, Issue 3, eff. January 29, 2005; amended, Virginia Register Volume 24, Issue 20, eff. July 9, 2008; Volume 29, Issue 4, eff. November 21, 2012; Volume 29, Issue 17, eff. July 1, 2013; amended and renumbered, Virginia Register Volume 30, Issue 2, eff. October 23, 2013.

Appendix B

SPILL AND ILLICIT DISCHARGE SOP

Prepared Date: 5/27/2014

CITY OF FALLS CHURCH
DEPARTMENT OF PUBLIC WORKS
OPERATIONS DIVISION

STANDARD OPERATING PROCEDURE

SPILL AND ILLICIT DISCHARGE RESPONSE AND REPORTING

OBJECTIVE

The purpose of this procedure is to ensure that all spills and illicit discharges are handled in a safe and appropriate manner and are properly reported. This procedure covers proper response, cleanup, and reporting methods for all types of spills and illicit discharges. It applies to all Department of Public Works (DPW) employees discovering and/or responding to spills and illicit discharges and their supervisors.

Potential spills and illicit discharges may include, but are not limited to, the following:

- Sanitary Sewer Overflows (SSOs);
- Illegal Sanitary Connections, Spills, or Dumping;
- Illegal Dumping of Solid or Liquid Hazardous Materials;
- Illegal Discharges of Cleaning Products and Solvents;
- Spills of Oil and Petroleum Products;
- Spills of Fuel; and
- Spills of Hazardous Materials.

RESPONSIBILITY

DPW is responsible for coordinating and executing the activities outlined in this standard operating procedure.

BACKGROUND

Emergency Spills and Illicit Discharges

A spill or illicit discharge is considered an emergency when it poses a serious threat to human health or the environment. Emergency spills must be handled by external or internal emergency hazardous materials responders.

Non-Emergency Spills and Illicit Discharges

A spill or illicit discharge is considered a non-emergency when it is not life threatening and will not result in serious environmental damage.

PROCEDURES

Initial Notification and Response

All spills and illicit discharges, regardless of size, must be contained and cleaned up in a safe and effective manner. Spills and illicit discharges that affect or threaten public health, welfare, or the environment will be attended to immediately by protecting human safety, and containing and cleaning up the substance.

In the event that you discover or are alerted to a spill or illicit discharge, the following actions must be immediately taken:

1) Secure the site, taking priority to protect the health and safety of personnel responding to the spill or illicit discharge, bystanders, and the community.
2) Attempt to determine if the spill or illicit discharge should be considered an Emergency or Non-Emergency. If you are not able to make this determination, immediately contact your supervisor and/or the DPW Superintendent for assistance in making the determination. If the DPW Superintendent or a supervisor is not immediately available, call the City's Engineering and Construction Division – Stormwater (703-248-5350, ext. 2 (TTY 711)).

If an issue is noted in a waterway that is investigated and determined to originate in another jurisdiction, contact the jurisdiction in which the source was determined to originate. If a source was not able to be identified follow the reporting process explained below.

Emergency Spills and Illicit Discharges

1) Call 911 from a safe location and provide the following information:
    a. Name;
    b. Telephone Number;
    c. Location;
    d. Possible injuries;
    e. Type and estimated quantity of spilled material; and
    f. If there is immediate hazard to life or property.
2) Notify your supervisor and/or the DPW Superintendent and provide the same information as outlined under Item 1.
3) If deemed safe, control and contain the material using absorbent booms, socks, and/or soil until the fire department arrives. Focus control measures at location(s) of storm sewers and/or nearby waterways. Use personal protective equipment (PPE) to minimize the responder's exposure to hazardous substances.
4) If not deemed safe, stay in a safe area and allow only trained responders in the spill area.
5) Document as many details of the spill or illicit discharge and the subsequent response as possible, including if/how much of the material entered the storm drain and if the material was released to nearby waterways.

6) If the material entered the storm drain and/or was released to a nearby waterway, complete the Spill and Illicit Discharge Incident Report Form (Attachment 1) and submit the form to your supervisor and/or the Public Works Superintendent.

Non-Emergency Spills and Illicit Discharges

1) Notify your supervisor and/or the DPW Superintendent.
2) Control and contain the spill or illicit discharge using absorbent booms, socks, and/or soil (if necessary). Focus control measures at location(s) of storm sewers and/or nearby waterways.
3) If deemed safe, attempt to stop the spill or illicit discharge if it has not already been done. Use PPE to minimize the responder's exposure to hazardous substances.
4) Apply absorbent pads/material to clean up the material. If assistance is required for the cleanup of larger events, contact an outside contractor (listed in Table 1 below). **Do not hose down spills – use "dry" cleanup methods.**
5) Dispose of the collected waste in the hazardous waste shed located at the City of Falls Church Property Yard or other location approved by the DPW Superintendent.
6) Document as many details of the spill or illicit discharge and the subsequent response as possible, including if/how much of the material entered the storm drain and was released to nearby waterways.
7) If material entered the storm drain and/or was released to a nearby waterway, complete the Spill and Illicit Discharge Incident Report Form (Attachment 1) and submit the form to your supervisor and/or the DPW Superintendent.

All spills and illicit discharges, regardless of size or material, should be reported as soon as possible to the DPW Superintendent or their designee. In the event that a spill or illicit discharge is discharging to, or has the potential to reasonably discharge to, a storm drain or waterway and the DPW Superintendent or a supervisor is not immediately available, call the City's Engineering and Construction Division – Stormwater (703-248-5350, ext. 2 (TTY 711)).

The DPW Superintendent will determine the appropriate reporting protocol. The DPW Superintendent will coordinate with the City's Engineering and Construction Division to ensure that the required documentation is completed and proper reporting protocols are followed.

<u>State, Federal, and Local Reporting</u>

All spills and illicit discharges that reach a storm drain and/or a waterway must be reported to the appropriate agencies within the specified timelines as outlined in Table 1. The nature and quantity of the spill or illicit discharge will dictate which Federal, State, and Local agencies that must be contacted to report the incident immediately or within 24 hours of being notified of the event.

In addition, the DPW Superintendent must follow-up the initial verbal notification within five (5) days of the event with a written report to VADEQ Northern Regional Office containing the following information for each spill or illicit discharge that reach storm drains or receiving waters:

- A description of the nature and location of the discharge;
- The cause of the discharge;
- The date on which the discharge occurred;
- The length of time over which the discharge continued;
- The volume of the discharge;
- If the discharge is continuing, how long it is expected to continue;
- If the discharge is continuing, what the expected total volume of the discharge will be; and,
- Any steps that the City has planned or taken to reduce, eliminate, and prevent reoccurrence of the present discharge or any future discharges.

RECORDKEEPING

For **ALL** spills and illicit discharges, the DPW employees must ensure that a Spill and Illicit Discharge Report Form (Attachment 1) is completed for each incident. In addition, the DPW Superintendent must maintain documentation of the time and date that applicable State, Federal, and Local agency(s) were notified of each spill and illicit discharge.

Table 1. Notification Procedures and Contacts

Depending on the nature and quantity of the spill or illicit discharge, the following individuals and organizations must be contacted by the DPW Superintendent, or their designee.

Agency/Organization	Contact Information	Circumstances	When to Notify
Local Agencies			
DPW Superintendent	Office – 703-248-5013 Cell – 571-238-5127	All spills and illicit discharges, regardless of size or material.	Immediately (verbal)
DPW Engineering and Construction – Stormwater	703-248-5350, ext. 2 (TTY 711)	Any discharge into the storm sewer, regardless of size or material and oil that reaches receiving waters.	Immediately (verbal)
Fire Department	911	All spills and illicit discharges that pose emergency conditions, regardless of the size or material. **AND** Discharges of oil that reach storm drains or receiving waters.	Immediately (verbal)
State Agencies			
VADEQ Pollution Response and Preparedness (PREP)	DEQ Northern Regional Office Coordinator 703-583-3864 (8:30 AM to 4:30 PM) Alternative website reporting at: http://www.deq.virginia.gov/Programs/PollutionResponsePreparedness/PollutionReportingForm.aspx	All spills and illicit discharges that discharge, or have the potential to reasonably discharge, to receiving waters regardless of size or material. **OR** All spills and illicit discharges causing a film or sheen on a waterway's surface, or leaves sludge or emulsion beneath the surface.	Immediately or within 24 hours (verbal or internet report) **AND** Within 5 calendar days (written)
Virginia Department of Emergency Management (VADEM)	1-800-468-8892 (nights, holidays, and weekends)	Non-business hour emergency spills and illicit discharges that reach storm drains or receiving waters, regardless of size or material. **OR** Non-business hour emergency spills and illicit discharges causing a film or sheen on the receiving water's surface, or leaves sludge or emulsion beneath the surface.	Immediately during non-business hours.
Federal Agencies			
National Response Center (NRC)	1-800-424-8802	Spills and illicit discharges reaching waterways or causing a film or sheen on the water's surface, or leaves sludge or emulsion beneath the surface.	Immediately upon gaining control of spill or illicit discharge (verbal)
Others			
Response and Cleanup Contractors	TBD	Spills and illicit discharges that exceeds the capacity of local agency capabilities for response and cleanup.	As needed
Arlington County	TBD	Spills and illicit discharges originating outside of City's Jurisdiction	As needed
Fairfax County	TBD	Spills and illicit discharges originating outside of City's Jurisdiction	As needed

Attachment 1

Spill and Illicit Discharge Report Form

Spill and Illicit Discharge Report Form

Instructions: This form is to be completed by DPW field personnel and maintained by the DPW Superintendent following the Spill/Illicit Discharge Response and Reporting SOP.

Initial Spill/Illicit Discharge Identification

Name and Address of Person Making Report	Contact Information Phone: Email:	
Date	Time of Identification ☐ AM ☐ PM	Time of Report to City ☐ AM ☐ PM
Description of event (material, source of discharge, etc.)		

Spill/Illicit Discharge Description

Location (address (preferred), cross streets, boating instructions, and/or gps coordinates)		Responsible Party (name and address)	
Date	Event Start Time ☐ AM ☐ PM	Event End Time ☐ AM ☐ PM	Occurring at time of Discovery? ☐ Yes ☐ No
Material (sewage, oil, chemicals, etc.)	☐ Continuous flow ☐ Intermittent flow ☐ Discrete release (spill or dumping)		Estimated volume of the discharge in gallons
Cause of the discharge (SSO from manhole, sewage pumping from bus, oil spill, etc.)			
If the discharge is continuing, how long it is expected to continue and what will the expected total volume of the discharge be?			
Surface contacted *(check all that apply and describe)* ☐ Asphalt ☐ Concrete ☐ Soil ☐ To atmosphere		Resources entered *(check all that apply and describe)* ☐ Sewer, manhole number ☐ Storm drain, catch basin number ☐ Waterway ☐ Atmosphere	
Description of the nature and location of the discharge			
List immediate actions taken to stop / control / contain the spill and describe the results *(calls made, equipment used)*			

Spill area diagram: Include scale, north arrow, and nearby buildings for reference. Indicate the closest down-gradient catch basin and its distance from spill.

Internal Notification and Reporting		
City Contact	**Name**	**Phone Number(s)**
Person(s) Responding to Spill		
Supervisor		
Superintendent		

Reportable Quantity

Substance	Reportable Quantity	Fire Department	VADEQ PREP	VADEM	City E&C - Stormwater	NRC
Any Emergency Spill	Any	Yes	Yes	Off Business Hours	---	Yes
Oil (in or on waterways)	Any	Yes	Yes	Off Business Hours	Yes	Yes
Sewage (into storm drains and/or in waterways)	Any	---	Yes	---	Yes	---
Hazardous Chemicals	See 40 CFR 302	Yes	Yes	Off Business Hours	---	---

Immediate External Agency Contact Log (to be completed by the Superintendent or their designee)

Agency	Contact	Contact Person	Time	Date
City of Falls Church Fire Department	Emergency Events 911	Tom Polera / Dispatcher		
VADEQ Pollution Response and Preparedness (PREP)	Business Hours Emergency/Non-Emergency Reaching Waterways or Causing a Film or Sheen on Water's Surface 703-583-3864 (alternatively via web address in SOP)	Mark Miller		
Virginia Department of Emergency Management (VADEM)	Emergency Non-Business Hours 1-800-468-8892	N/A		
City of Falls Church DPW Engineering and Construction – Stormwater	Events reaching storm drain system (703-248-5350, ext. 2 (TTY 711))	Jason Widstrom		
National Response Center (NRC)	Events Reaching Waterways or Causing a Film or Sheen on Water's Surface reaching 1-800-424-8802	N/A		

Follow-Up External Agency Contact Log (to be completed by the Superintendent or their designee)

VADEQ Pollution Response and Preparedness (PREP)	Written Report of All Events Reaching Waterways or Causing a Film or Sheen on Water's Surface	Mark Miller		

Describe the steps the City has planned or taken to reduce, eliminate and prevent reoccurrence of the present discharge or any future discharges (alternative: attach written report submitted to PREP):

APPENDIX C

ANNUAL COMPREHENSIVE SITE COMPLIANCE EVALUATION REPORT

ANNUAL COMPREHENSIVE SITE COMPLIANCE EVALUATION REPORT (Page 1 of 3)
Property Yard Complex and Remote Storage Yard

Date: _____

Inspector's Name: _____

Weather Conditions: _____

Are there any Discharges Occurring: _____

Any new operations at the facility since last annual inspection? (Y/N): _____

If Yes Explain: _____

_____

_____

Any new potential pollutants source at the facility? (Y/N): _____

If Yes Explain: _____

_____

_____

Any changes in drainage area? (Y/N): _____

If Yes Explain: _____

_____

_____

Any areas of fresh petroleum or chemical stains at facility? (Y/N): _____

If Yes Explain: _____

_____

_____

Are the ASTs in good working condition? (Y/N): _____

If No Explain: _____

_____

_____

ANNUAL COMPREHENSIVE SITE COMPLIANCE EVALUATION REPORT (Page 2 of 3)
Property Yard Complex and Remote Storage Yard

Are the current waste material handling and management procedures adequate for the protection of stormwater at the facility? (Y/N): _____

If No Explain: _____

_____

_____

Are the storm drains at the facility free of debris? (Y/N): _____

If No Explain: _____

_____

_____

Are the storm drains at the facility free of petroleum or chemical stains? (Y/N): _____

If No Explain: _____

_____

_____

Are the petroleum absorbent booms and drain inserts installed at the storm drains functioning properly as indented? (Y/N): _____

If No Explain: _____

_____

_____

Are there adequate spill response materials present at the facility? (Y/N): _____

If No Explain: _____

_____

_____

Has stormwater related training been conducted as per the SWPPP and General Permit? (Y/N): ___
_____

If No Explain: _____

_____

_____

ANNUAL COMPREHENSIVE SITE COMPLIANCE EVALUATION REPORT (Page 3 of 3)
Property Yard Complex and Remote Storage Yard

Is silt fence installed and maintained in the appropriate areas (i.e., Utilities Maintenance Area and Remote Storage Yard) as required? (Y/N):_____

If No Explain: _____

_____

_____

Have stormwater related inspections (i.e., routine inspections, quarterly inspections, etc.) been completed as required? (Y/N):_____

If No Explain: _____

_____

_____

Has stormwater related maintenance been completed as required? (Y/N):_____

If No Explain: _____

_____

_____

Has the SWPPP been modified to address any deficiencies noted? (Y/N):_____

If No Explain: _____

_____

_____

If no incidents of non-compliance were identified, do you certify that the facility is in compliance with the SWPPP and General Permit? (Y/N):_____

If No Explain: _____

_____

_____

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 gathered 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.

_____	_____
(Name)	**(Title)**
_____	_____
(Signature)	**(Date)**

APPENDIX D

QUARTERLY FACILITY INSPECTION REPORT

QUARTERLY FACILITY INSPECTION REPORT (Page 1 of 4)

Property Yard Complex and Remote Storage Yard

The following locations shall be inspected quarterly at a minimum unless an area is brought to the attention of employees or management.

Date: _____

Inspector's Name: _____

Weather Conditions: _____

Are there any Discharges Occurring: _____

*The Facility Coordinator shall visit and inspect each of the listed areas for potential issues. Any area with a **No** observed condition will be addressed as of its cause and the date corrected. Deficiencies are to be corrected within **14** days of inspection.*

Observed Conditions

Areas Inspected	**Operating Effectively?**	**If No, In Need of Maintenance, Repair, or Replacement?**	**Corrective Action Needed and Notes**
Storm Drain Inlets:			
Each storm drain is free of any debris that would reduce the overall effectiveness of the drain.	Yes/No	Maintenance Repair Replacement	
Inlet Protection Condition:			
Each curbside storm drain has an absorbent boom in place and is free of petroleum staining and sediment.	Yes/No	Maintenance Repair Replacement	
Each grate inlet insert is in place and free of petroleum staining and sediment	Yes/No	Maintenance Repair Replacement	
Hazardous Materials Storage			
The hazardous materials storage shed floor is free of fresh petroleum staining, which may indicate a spill or leak.	Yes/No	Maintenance Repair Replacement	
Petroleum wastes stored in the hazardous materials storage shed are properly labeled and containerized.	Yes/No	Maintenance Repair Replacement	
The used oil AST is in good working order.	Yes/No	Maintenance Repair Replacement	
The used oil AST's interstitial space is free of oil.	Yes/No	Maintenance Repair Replacement	
Spill kits are in place and contain appropriate supplies in good condition.	Yes/No	Maintenance Repair Replacement	

QUARTERLY FACILITY INSPECTION REPORT (Page 2 of 4)
Property Yard Complex and Remote Storage Yard

Areas Inspected	**Operating Effectively?**	**If No, In Need of Maintenance, Repair, or Replacement?**	**Corrective Action Needed and Notes**
Petroleum Storage Tank Areas:			
The diesel fuel AST area is free of new or excessive petroleum staining.	Yes/No	Maintenance Repair Replacement	
Spill kits are in place and contain appropriate supplies in good condition.	Yes/No	Maintenance Repair Replacement	
Fuel Dispenser Area:			
Fuel dispenser area is free of recent spills and leaks.	Yes/No	Maintenance Repair Replacement	
Fuel dispensers are in good working order.	Yes/No	Maintenance Repair Replacement	
Dispenser hoses, fittings, and filters are free of cracks, leaks, seeps, or spills.	Yes/No	Maintenance Repair Replacement	
Parking Lot Inspection:			
The parking lots are free of fresh excessive petroleum staining.	Yes/No	Maintenance Repair Replacement	
Metal Shipping Container Areas:			
The metal shipping container areas are free of petroleum, chemical, or excessive metal staining.	Yes/No	Maintenance Repair Replacement	
The metal shipping containers are properly located.	Yes/No	Maintenance Repair Replacement	
Tree Filter:			
Tree filter is clear of leaves and debris and is free draining.	Yes/No	Maintenance Repair Replacement	
Tree filter is clear of significant sediment and is free draining.	Yes/No	Maintenance Repair Replacement	
Tree filter is in good conditions and does not show signs of distress.	Yes/No	Maintenance Repair Replacement	
Silt Fence:			
Silt fence has been properly installed and maintained (i.e., trenched, no significant sediment buildup, etc.).	Yes/No	Maintenance Repair Replacement	

QUARTERLY FACILITY INSPECTION REPORT (Page 3 of 4)

Property Yard Complex and Remote Storage Yard

Areas Inspected	**Operating Effectively?**	**If No, In Need of Maintenance, Repair, or Replacement?**	**Corrective Action Needed and Notes**
Stockpiled Material Storage:			
Materials are stored in accordance with best stockpiling practices.	Yes/No	Maintenance Repair Replacement	
Municipal Waste Storage Area:			
The municipal waste storage area is free of petroleum or chemical staining.	Yes/No	Maintenance Repair Replacement	
Solid waste containers are properly located and free of petroleum products.	Yes/No	Maintenance Repair Replacement	
Employee Training:			
Any required employee training has been conducted during the quarter.	Yes/No/NA	N/A	

Comments: _____

APPENDIX E

EMPLOYEE TRAINING SHEET

Falls Church Employee Stormwater Training Module 1

Illicit Discharge Recognition and Reporting

Training Objective: Learn the procedures to prevent, detect, and eliminate illicit connections and discharges to minimize stormwater pollution.

Training Date:_____ Total Number of Employees Attending:_____

Name	Department	Job Title

Name	Department	Job Title

Falls Church Employee Stormwater Training Module 2

Minimizing Stormwater Pollution from Fleet and Facility Operations

Training Objective: Increase employee awareness on how to reduce stormwater pollution from daily fleet and facility operations.

Training Date:_____ Total Number of Employees Attending:_____

Name	Department	Job Title

Name	Department	Job Title

Falls Church Employee Stormwater Training Module 3

Minimizing Stormwater Pollution from Street, Parking and Drainage Operations and Maintenance

Training Objective: Understand how to prevent stormwater pollution during the City's street, parking, and drainage operations by following all SOPs and good housekeeping practices.

Training Date:_____ Total Number of Employees Attending:_____

Name	Department	Job Title

Name	Department	Job Title

Falls Church Employee Stormwater Training Module 4

Minimizing Stormwater Pollution from Parks and Ground Operation and Maintenance

Training Objective: Increase employee awareness on how to minimize stormwater pollution from parks and ground operation and maintenance.

Training Date:_____ Total Number of Employees Attending:_____

Name	Department	Job Title

Name	Department	Job Title

Falls Church Employee Stormwater Training Module 5

Minimizing Stormwater Pollution from Land Disturbance Activities

Training Objective: Increase employee awareness on how to reduce stormwater pollution from land disturbing activities.

Training Date:_____ Total Number of Employees Attending:_____

Name	Department	Job Title

Name	Department	Job Title

Falls Church Employee Stormwater Training Module 6

Spill Response Procedures

Training Objective: Learn how to respond and report all spills and illicit discharges in a safe and appropriate manner.

Training Date:_____ Total Number of Employees Attending:_____

Name	Department	Job Title

Name	Department	Job Title

APPENDIX F

SWPPP AMENDMENT LOG

SWPPP AMENDMENT LOG
Property Yard Complex and Remote Storage Yard

Date of Amendment: _____

Name of Individual Making Amendment: _____

Amendment No.: _____

Description of the Amendment

_____

_____

_____

_____

_____

_____

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 gathered 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.

_____	_____
(Name)	**(Title)**
_____	_____
(Signature)	**(Date)**

GREEN FLEET
GREEN FLEET

APPENDIX R
NUTRIENT MANAGEMENT PLAN AND SOP

	SUBJECT: **Nutrient Management Plan Development**	Standard Operating Procedure Revision Date: February 1, 2014 Approved by: _____ *Jason Widstrom, P.E.*

NUTRIENT MANAGEMENT PLAN DEVELOPMENT AND TRACKING

OBJECTIVE

It is the goal and intent of the City of Falls Church to implement Nutrient Management Plans (NMPs) on the facilities under its control for the purposes of compliance with applicable components of the City's MS4 Program Plan.

RESPONSIBILITY

The City of Falls Church staff that coordinates, executes, and tracks the status of certified Nutrient Management Plans are responsible for executing the activities in this standard operating procedure, and coordinating with the Department of Public Works.

PROCEDURE

- The City of Falls Church Department of Public Works (DPW) will provide appropriate City staff with this SOP and the relevant tracking. Appropriate City staff is those licensed as Certified Nutrient Management Planners with the Virginia Department of Conservation and Recreation (DCR). Should the City not have a staff member that meets this designation, protocols have been written into this procedure such that city staff may coordinate with outside parties for the purposes of plan development. In this case, appropriate City staff are those involved with nutrient and habitat management activities that may assist the City to comply with Virginia's stormwater management regulations and the City's MS4 permit. Quarterly reviews of NMP plan tracking may also be performed by the latter.
- Certified Nutrient Management Plans shall be provided for all identified acres within all lands owned or operated by the City where nutrients are applied to a contiguous area greater than one acre. For the purposes of compliance, facilities that provide little regular nutrient inputs but may require some occasional landscape bed or turfgrass fertilizer for establishment. Practices such as seasonal over-seeding, shall be included in this definition. The City's certified NMPs shall be implemented on the following schedule at minimum:
    - Within 24 months of permit coverage (by July 1st, 2015): Coverage of not less than 15% of all identified acres.
    - Within 36 months of permit coverage (by July 1st, 2016): Coverage of not less than 40% of all identified acres.
    - Within 48 months of permit coverage (by July 1st, 2017): Coverage of not less than 75% of all identified acres.
    - Within 60 months of permit coverage (by July 1st, 2018): Coverage of not less than 100% of all identified acres.

    - There shall be no failure to meet these measurable goals for any two consecutive years.
- Sites greater than one acre under City control have been preliminarily identified. City staff shall provide quarterly review to determine if any new facilities should be added to the list for any reason, including changes in facility practices, knowledge of new facilities, or acquisition of property.
- On a quarterly basis, City staff shall review and update the City Facilities – Nutrient Management Plan Development Quarterly Review Log. At this time, an Activity Log – Quarterly Review Report shall be completed. One report should be completed at each quarterly review. The intent of the review is to track and determine needs for certified NMP preparation (both new and updates) within the upcoming year and beyond to remain in compliance with respective timelines and long-term continuous compliance.
- Quarterly Activity Log Reports (electronic pdfs) should be submitted via email at the end of each period to the City of Falls Church DPW point of contact (POC). The primary POC for this SOP is administrative staff (Joanna Grey); DPW Director or designee (Jason Widstrom, P.E.) should also be copied on communications. Any supporting materials (i.e. updated tracking sheets, notes, or new/updated copies of Certified Nutrient Management Plans) should be submitted along with the Activity Log Report at the same time (hyperlinks to a server folder locations are preferred). Electronic formats are preferred, pdf file formats and scanned hard copies.
- Staff that will be engaging in the quarterly review and tracking of certified NMPs or in certified NMP preparation should add a regularly recurring appointment to their Outlook calendar on the last day of each quarter as a reminder to submit their Activity Log Reports.
- For consistency, the subject line of all emails associated with this SOP should include in the title: "ACTIVITY LOG REPORT: Certified Nutrient Management Plan Development". This will also help DPW Administrative staff to sort through emails if necessary.
- The DPW POC will keep a list of appropriate City staff that may be involved in certified NMP review, tracking, or preparation and verify that quarterly activity reports have been submitted. Per this SOP, quarterly review and reporting internally is required. During the first week of each quarter, the received Activity Log Reports will be used by the POC to determine if any additional actions (i.e. internal plan updates, engagement of external services for the same, etc.) are needed. If action is required the POC shall recommend to the DPW Director or designee that the appropriate actions be taken.
- All files should be located on the City's server (not computer desktop) for common access and to better ensure that files are backed up regularly through City protocols. Additional backup copies to one's desktop is recommended for additional security, but not required.
- Any requested changes or guidance regarding the purpose and use of the Activity Log Report should be directed to the Department of Public Works POC, or the contact at the bottom of each Activity Log report.
- In the event the City does not have a Certified Nutrient Management Planner on staff or the on staff Certified Nutrient Management Planner is unable to perform those specific duties, City staff

may coordinate internally to acquire the external services required to perform this function. The procurement of these services shall follow all City requirements.

- As a need for new or updated certified NMPs is identified, the plans shall be drafted by a Nutrient Management Planner certified by the Virginia Department of Conservation and Recreation (DCR). The plans shall follow all applicable rules and regulations, conforming to the latest version of the *Virginia Nutrient Management Standards and Criteria*.
- As new facilities are acquired and/or identified within the Falls Church ownership and/or maintenance system, they shall be added to the NMP facilities list, and provided with certified NMPs accordingly.
- Additionally during review, City staff should note if based on their knowledge any opportunities exist at any specific facility to advance MS4 compliance initiatives, particularly with regard to public education efforts.

ACTIVITY LOGS, PLAN COMPLETION, AND TRACKING

- There is one (1) Activity Log Report Form and one (1) City Facilities -- Nutrient Management Plan Development Tracking Tool. Blank copies are attached to this SOP. If you are unsure of any particular aspect of the form, please inquire with the DPW POC.
    - Each Activity Log has a standard header for information pertaining to the individual who is using the form. This information includes the date the form is being filled out, the individuals first and last name, as well as the status of the activity.
    - Complete – The activity that is the subject of the form has been completed.
    - On-going (Explain below) – The activity is in process, but may be delayed due to an unforeseen issue, etc.
    - Other (Explain below) – To the best of the individual's ability, explain the status of the activity if no immediate action or progress has been taken, providing any additional concerns or actions needed for the long-term execution of the task.
- Some of the Activity Log response items require numeric entries, some require notation of particular facilities, and some are Yes or No (denoted by Y/N?) for questions that are more qualitative, in nature.
- Some fields may not be applicable, and should be either explained or marked "N/A."
- It is important that all associated material with the activity be submitted with the Activity Log (hyperlinks to locations on server or otherwise is acceptable). Associated material may be requested in the form, but the individual needs to ensure all other relevant material is provided.
- The Activity Log should be sent to the Administrator as indicated at the bottom of the form per SOP procedures.
- Copies of all Activity Log Reports and Tracking Tool sheets are included at the end of this SOP. Electronic copies or photocopies of the blank forms should be made prior to use.
- When a new facility comes under the control of the City, it shall be added to the tracking list and targeted for plan preparation accordingly.

Certified NMP Development Activity Log – Quarterly Review

The "Activity Log – Quarterly Review" form for Certified Nutrient Management Plan Development requests information required by the Falls Church Department of Public Works to accurately and effectively track City activities that contribute to compliance with applicable components of the City's MS4 Program Plan. The instructions below are not all-inclusive, but address frequent questions to ensure the form is filled out completely.

- *Event Date:* Provide the day, month, and year of the review completion.
- *Responsible party:* Provide a single individual and their City Department who was in charge of the review, even if it was a collaborative effort.
- *Review Period:* Check the appropriate box associated with the review period.
- *Properties/Plans Targeted For New NMPs within the next 12 Months:* Upon completion of review, note the facilities that will be targeted and/or required for NMP development within the next calendar year from the date of review. These are new plan developments that will be needed to meet permit implementation timelines.
- *Properties/Plans Targeted For New NMPs within the next 24 Months:* Upon completion of review, note the facilities that will be targeted and/or required for NMP development within the next two years from the date of review. These are new plan developments that will be needed to meet permit implementation timelines.
- *Properties/Plans Targeted For New NMPs within the next 36 Months:* Upon completion of review, note the facilities that will be targeted and/or required for NMP development within the next three years from the date of review. These are new plan developments that will be needed to meet permit implementation timelines.
- *Properties/Plans Targeted For New NMPs within the next 48 Months:* Upon completion of review, note the facilities that will be targeted and/or required for NMP development within the next four years from the date of review. These are new plan developments that will be needed to meet permit implementation timelines.
- *Existing NMPs Requiring Updates/Re-certification within the next Calendar Year:* Upon completion of review, note the facilities that will be targeted and/or required for NMP development within the next calendar year from the date of review. These are facilities with existing plans that will expire within the next year, hence requiring update or amendment.
- *Any New Facilities Added, via Change in Practices or through Acquisition?:* To the best knowledge of the respondent, note any facilities that through change in nutrient practices or City acquisition have been or should be added to the list of facilities for the purposes of tracking certified Nutrient Management Plans.
- *External Certified Nutrient Management Planner Engagement Required?:* To the best knowledge of the respondent and in effort to forecast timeline needs, note if any City staff availability issues (i.e. no current Certified Nutrient Management Planners on staff) that would require engagement of outside parties to remain in compliance.

Additional Comments: If applicable, include any additional information to clarify earlier responses and other pertinent information for documentation (such as the development of specific plans that have lagged behind schedule, or specific opportunities on a given facility to advance public relations efforts and/or MS4 initiatives.

City Facilities -- Nutrient Management Plan Development Tracking Tool

In support of the review and tracking efforts in preparation for documentation via the "Activity Log – Quarterly Review" form for Certified Nutrient Management Plan Development, City staff should utilized the "City Facilities – NMP Plan Development Tracking Tool". Updated tracking sheets should be provided with the associated Activity Log -- Quarterly Review submittals. The instructions below highlight the relevant fields for completion of this form, assisting with the review.

- Facilities under ownership or currently maintained by the City have been preliminarily identified. Properties should be reviewed quarterly to determine if any new facilities should be added to the tracking document.
- Certified Nutrient Management Plans shall be provided for all identified acres within all lands owned or operated by the MS4 operator where nutrients are applied to a contiguous area greater than one acre. Priority rankings shall follow the implementation schedule below and shall adhere to the following schedule:
    - Priority 1: Not less than 15% of all identified acres. These areas shall be covered by a certified NMP within 24 months of permit coverage (by July 1st, 2015). Staff shall identify the facilities that will cumulatively meet this acreage requirement. Premium consideration shall be given to any facilities that are located in more sensitive locations or downstream properties within the MS4 jurisdiction.
    - Priority 2: Between 15% and 40% of all identified acres. These areas shall be covered by a certified NMP within 36 months of permit coverage (by July 1st, 2016). Staff shall identify the facilities that will cumulatively meet this acreage requirement.
    - Priority 3: Between 40% and 75% of all identified acres. These areas shall be covered by a certified NMP within 48 months of permit coverage (by July 1st, 2017). Staff shall identify the facilities that will cumulatively meet this acreage requirement.
    - Priority 4: Between 75% and 100% of all identified acres. These areas shall be covered by a certified NMP within 60 months of permit coverage (by July 1st, 2018). Staff shall identify the facilities that will cumulatively meet this acreage requirement. These locations shall also be considered the properties that are located in the sensitive locations or downstream properties within the MS4 jurisdiction, to the extent practicable.
- After priority ranking is complete, staff shall review the facilities that do not have a valid NMP in place and designate target dates for plan completion in accordance with permit 'by area' coverage requirements. The determination of target dates may involve other consideration beyond the permit timelines, including but not limited to the environmental sensitivity of the facility location and long-term capital planning; however, permit terms shall be met.
- *Facility Identification:* Briefly denote the name of the facility.

- *Latitude & Longitude:* Note the coordinates (approximate centroid) of the facility. Coordinate formats should be kept consistent for all facilities.
- *Identified Acreage:* To the best knowledge of the reviewer, provide the approximate total acreage of the facility to be encompassed within the NMP.
- *Plan in Place:* State whether there is a valid certified NMP in place for the facility.
- *Priority:* Designate the priority (1-4) of the facility for plan preparation as defined with the SOP.
- *Target Completion Date:* Denote the intended target date for completion of the facilities certified NMP based on the priority designation and any additional considerations. The target date need not default to the permit timeline; however, all deviations must be in advance of the permit deadlines. If a plan has already been completed, denote with "N/A".
- *Date Plan Prepared:* If a plan has been prepared, note the date of preparation.
- *Date Plan Expires:* If a plan has been prepared, note the date of the plan expiration per the certified document.
- *Location of Content:* If applicable, include any digital link to the certified NMP and other applicable supporting documents.
- *Plan Comments/Special Provisions:* If applicable, include any additional pertinent notes regarding the special circumstances of the facility, plan, or upcoming needs that may impact future planning efforts and compliance.

	Falls Church **Certified Nutrient Management Plan Development** **Activity Log – Quarterly Review** For form instructions, see "Nutrient Management Plan Development and Tracking"
Today's Date: (dd/mm/yyyy)	
Your Name: (First and Last)	
Status: (Check one)	☐ Complete ☐ On-going (explain below) ☐ Other (explain below)

Responsible Party (First and Last name, and Department)	
Review Period	☐Q1 ☐Q2 ☐Q3 ☐Q4
Properties/Plans Targeted For New NMPs within the next 12 Months	
Properties/Plans Targeted For New NMPs within the next 24 Months	
Properties/Plans Targeted For New NMPs within the next 36 Months	
Properties/Plans Targeted For New NMPs within the next 48 Months	
Existing NMPs Requiring Updates/Re-certification within the next Calendar Year	
Any New Facilities Added, via Change in Practices or through Acquisition? If so, Where?	
External Certified Nutrient Management Planner Engagement Required?	☐ Yes ☐ No
Additional Comments	

Submit this Activity Log to:	ATTN: Joanna _____ Joanna@Fallschurch Phone # Falls Church Department of Public Works

City of Falls Church
Department of Public Works

City Facilities -- Nutrient Management Plan Development
Tracking Tool

Date: _____ Completed by: _____

Facility Identification	Latitude & Longitude	Identified Acreage	Plan In Place	Priority	Target Completion Date	Date Plan Prepared	Date Plan Expires	Plan Preparer	Preparer's License Number	Location of Content	Plan Comments/Special Provisions
Thomas Jefferson School			(Y/N?)	-	insert month/year	date	date	Glenn Muckley, P.E. - Stantec	728	insert hyperlink	insert comments
-			(Y/N?)		insert month/year	date	date	insert name		insert hyperlink	insert comments
-			(Y/N?)		insert month/year	date	date	insert name		insert hyperlink	insert comments
-			(Y/N?)		insert month/year	date	date	insert name		insert hyperlink	insert comments
-			(Y/N?)		insert month/year	date	date	insert name		insert hyperlink	insert comments
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			(Y/N?)		insert month/year	date	date	insert name		insert hyperlink	insert comments
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			(Y/N?)		insert month/year	date	date	insert name		insert hyperlink	insert comments

Nutrient Management Plan

Thomas Jefferson Elementary School

Prepared for:
The City of Falls Church, Virginia

Prepared by:
Glenn Muckley, P.E.
DCR Nutrient Management Planner
Certification #728

Planner Signature:

_____

April 1, 2014
Plan Expires: April 1, 2017

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Executive Summary

Thomas Jefferson Elementary School (TJES) is a public school within the City of Falls Church system, located at 601 South Oak Street. The site lies in the relative headwaters of Tripps Run, which drains to Holmes Creek, then to Cameron Run, to the Potomac River, and ultimately the Chesapeake Bay. The school is surrounded by a well-established neighborhood of single family residences, typically a quarter acre in size. More dense areas of townhomes and commercial properties are found northeast of the site, off of Route 7 (West Broad Street), and south of the property served by Route 29/237 (South Washington Street). While historical maintenance practices are limited at TJES, bermudagrass playing fields found at the school require some routine inputs.

This Nutrient Management Plan (NMP) has been developed to assist TJES, and entities responsible for its grounds maintenance, in the management of nutrients applied to the grounds over the next three years in order to maintain healthy, playable ball fields and school grounds while protecting water quality in Tripps Run and downstream water bodies. As such, it should be used as a resource for planning the quantity and timing of nutrient application based on sound agronomic practices.

Abbreviations

BMP	Best Management Practice
DCR	The Virginia Department of Conservation and Recreation
DPW	The City of Falls Church Department of Public Works
GIS	Geographic Information System
MS4	Municipal Separate Storm Sewer System
NMP	Nutrient Management Plan
RPA	Resource Protection Area
TJES	Thomas Jefferson Elementary School
T&L	Turf and Landscape
SCS	USDA Soil Conservation Service (formerly), now USDA-NRCS
USDA-NRCS	U.S. Department of Agriculture – Natural Resource Conservation Service

1.0 Introduction

Thomas Jefferson Elementary School (TJES) is a public school within the City of Falls Church system, located at 601 South Oak Street. The site lies in the relative headwaters of Tripps Run, which drains to Holmes Creek, then to Cameron Run, to the Potomac River, and ultimately the Chesapeake Bay. The school is surrounded by a well-established neighborhood of single family residences, typically a quarter acre in size. More dense areas of townhomes and commercial properties are found northeast of the site, off of Route 7 (West Broad Street), and south of the property served by Route 29/237 (South Washington Street).

Generally, the impervious school facilities (i.e. building and parking areas) are situated on upstream and southwester portions of the site. To the northeast and downstream of these facilities lie existing bermudagrass playing fields (baseball/soccer), which are directly upstream of Tripps Run. While historical maintenance practices are limited at TJES, bermudagrass playing fields require some routine inputs. See Figures 1.1 and 1.2 for vicinity and location maps of the school.

The following is a brief summary of the site location and watershed characteristics:

Table 1 1.1 Watershed Summary

Virginia 6th Order HUC	Receiving Streams	D/S Stream-River Basins	Locale
PL26 (HUC12: 020700100302 Cameron Run)	Tripps Run	Holmes Creek – Cameron Run – Potomac River – Chesapeake Bay	City of Falls Church

According to the Falls Church, VA Real Estate Assessments Mapping Site, the school site is comprised of four (4) separate parcels owned by either the City or the City School Board: 1) 52-302-026, 2) 52-302-021, 3) 52-302-019, and 4) 52-302-051. GIS data queries noted the total project area (all four parcels) at 12.3 acres; however, per the City tax data, these parcels encompass a combined area of 11.4904 acres. As such, the 11.4904 acre value has been used as the total planning area for the school property. These parcels are shown on Figure 1.3 City Parcels and summarized in Table 1.2 Parcel Data Summary below. Note: Yellow areas are City Geographical Information System (GIS) data for Chesapeake Bay Resource Protection Areas (RPA), to be discussed in more detail in later sections.

2.4 MILES 1.2 0 MILES 2.4 MILES

SCALE: 1 INCH = 2.4 MILES

SOURCE: VIRGINIA ATLAS AND GAZETTEER, DeLORME MAPPING CO., 1995.

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.

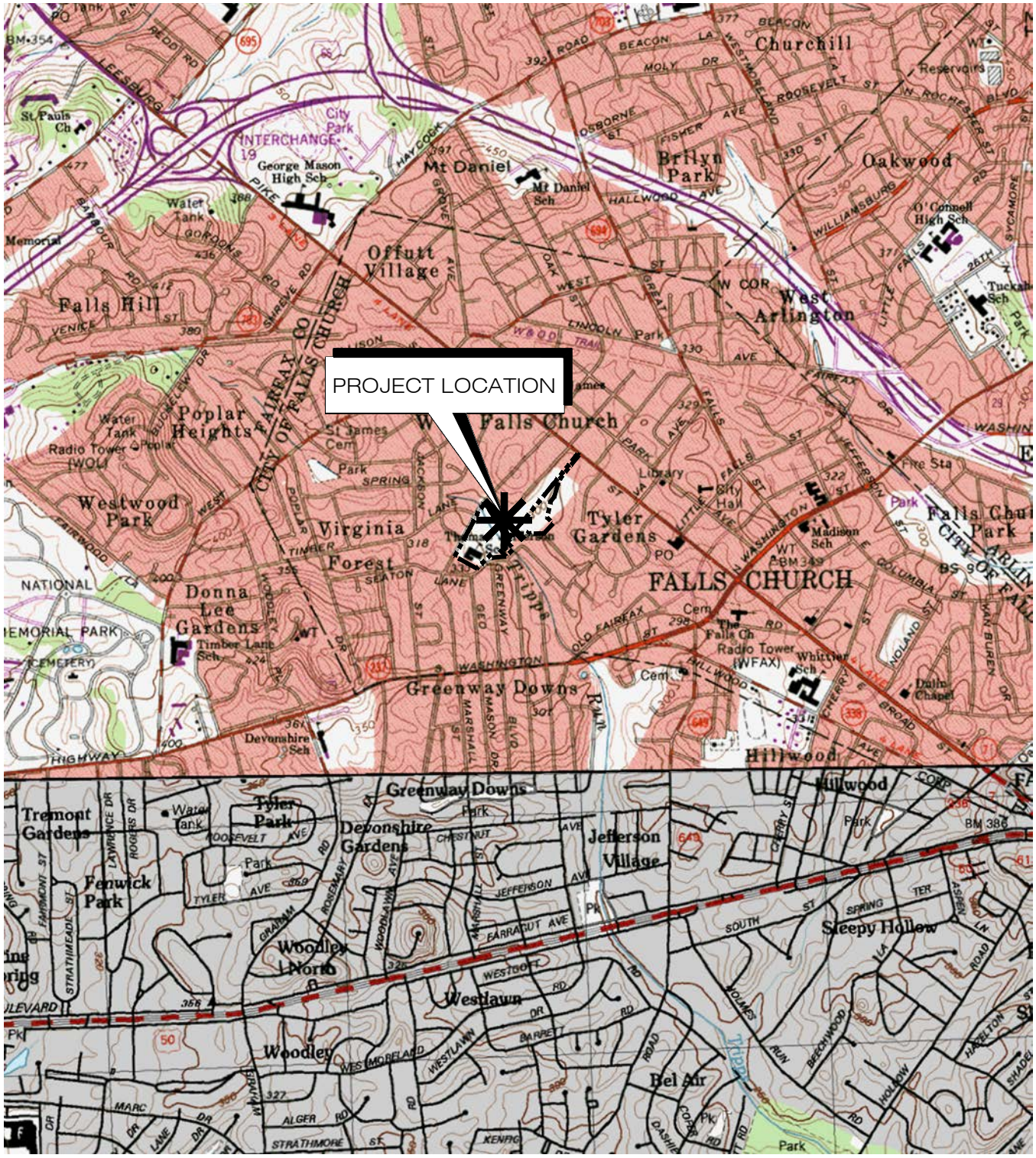
FIGURE 1.1

PROJECT VICINITY MAP

FALLS CHURCH MS4 SUPPORT

CITY OF FALLS CHURCH, VIRGINIA | MARCH, 2014

W:\WMBGcad\4900s\4976 - Falls Church MS4 Support\Loc & Vic\4976 Loc & Vic.dwg



LATITUDE: 38°53'0.28"N
LONGITUDE: 77°11'1.50"W

SOURCE: USGS 7.5 MINUTE SERIES TOPOGRAPHIC MAP,
FALLS CHURCH VA QUADRANGLE, 1994 (REV N/A)
ANNONDALE VA QUADRANGLE, 1998 (REV N/A)

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.

FIGURE 1.2
PROJECT LOCATION MAP
FALLS CHURCH MS4 SUPPORT

CITY OF FALLS CHURCH, VIRGINIA | MARCH, 2014

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Figure 3 1.3 City Parcels

Table 2 1.2 Parcel Data Summary

Parcel 1	Parcel 2	Parcel 3	Parcel 4
601 South Oak Street • RPC#: 52-302-026 • Area: 5.831 Ac • Approx. T&L: 3.02 Ac	223 West Cameron Road • RPC#: 52-302-021 • Area: 0.30610 Ac • Approx. T&L: 0.30 Ac	Sherrow Avenue • RPC#: 52-302-019 • Area: 0.98740 Ac • Approx. T&L: 0.10 Ac	601 West Broad Street • RPC#: 52-302-019 • Area: 4.36590 Ac • Approx. T&L: 0.00 Ac

Portions of the maintained TJES site are found on parcels one, two, and three, but there is no managed turf or landscaping to our knowledge on parcel 4, also known as Falls Park (containing a tributary to Tripps Run. As such, this plan will address nutrient applications to those managed areas on parcels one, two, and three, denoting any parcel four areas as natural or conserved. All areas will be included and discussed in the plan coverage and shall be treated as one property; however, no nutrient applications are anticipated on parcel four.

This Nutrient Management Plan (NMP) has been developed to assist TJES, and entities responsible for its grounds maintenance, in the management of nutrients applied to the grounds over the next three years in

order to maintain a healthy, playable ball fields and effective, mature landscaping and green space while protecting water quality in Tripps Run and downstream water bodies. As such, it should be used as a resource for planning the quantity and timing of nutrient application based on sound agronomic practices.

1.1 TURFGRASS AND LANDSCAPING COVERAGE

Across the whole of the roughly 11.5 acre site, only roughly 4.40 acres would be considered maintained to some degree. However, in reality only approximately 3.42 acres this managed area (3.10 acres of turfgrass and roughly 0.32 acres of more formal beds) would be considered to receive moderate to higher levels of management and maintenance.

The remainder of the managed/maintained areas (0.98 acres) should really be considered transitional areas, informal beds, or maintained understory. The resultant 7.10 acres of the total site is comprised of paths, parking, building (combined at roughly 1.95 acres), and relatively unmaintained forested canopy (approximately 5.15 acres). As such, the 3.42 acres of beds and turfgrass should be considered the nutrient management planning area, until maintenance practices and management of other areas are redefined and addressed in future nutrient management plans. These estimates are approximate based on take-offs from aerial photography.

The following provides additional detail into composition and historical management of these areas, and Figure 1.4: Thomas Jefferson Elementary School Facility Layout provides an overview of the property and its characteristics for reference.

1.1.1 Turfgrass Coverage

The majority of the turfgrass found at TJES is within the bermudagrasss ball field areas on the east side of the school site. As these are more high traffic areas, the City has recently installed a hardy, cold-tolerant, and dense Patriot variety of bermudagrass. There are other areas of limited-maintenance turfgrass areas (i.e. within parking islands etc.) that routinely mowed; however receive little nutrient input. These areas consist of a mixture of species, including fescues, annual bluegrass, and some more limited occurrences of white clover, chickweed, and ground ivy. For purposes of this plan, the associated recommendations for these areas will be consistent with cool-season (fescue) lawn grasses, although it is likely that no nutrient inputs will be applied in these area as a matter of practice that is currently the case.

1.1.1.1 Existing Turfgrass Maintenance Practices

Existing standard cultural practices for the turfgrass areas include routine mowing two or three times per week with a Toro ReelMaster Reel Mower with periodic slice aerification and deep tine aerification on an as needed basis determined by the maintenance staff. No over-seeding of the turfgrass is performed.

The current nutrient applications are limited with two seasonally timed applications of 21-0-0 (N-P-K) at a rate of 2 pounds per 1,000 square feet and 19-0-19 at 1 pound per 1,000 square feet (lbs/1,000 s.f.). No phosphorus is applied to the ball fields by the maintenance staff. Pre-emergent weed control applications

in the form of Ronstar are performed annually, while post-emergent (Revolver) weed control is performed on an as needed basis.

1.1.2 Landscaping Coverage

There is little formal landscaping at TJES; however, City staff has myriad initiatives and learning opportunities for students that take advantage of the small spaces that are utilized for landscaping. Birdhouses, benches, and rain gardens can be found that make the existing entry and other select areas of the school a living outdoor classroom. Beds consist of areas near the school building, in and around walkways, and some other isolated plantings within parking areas and the periphery. Several mature landscape trees are located at the school in the parking areas off of Seaton Lane and in front of the building on the South Oak Street boundary. All of these landscape areas receive little to no maintenance and no routine nutrients according to information provided by the City and their vendors.

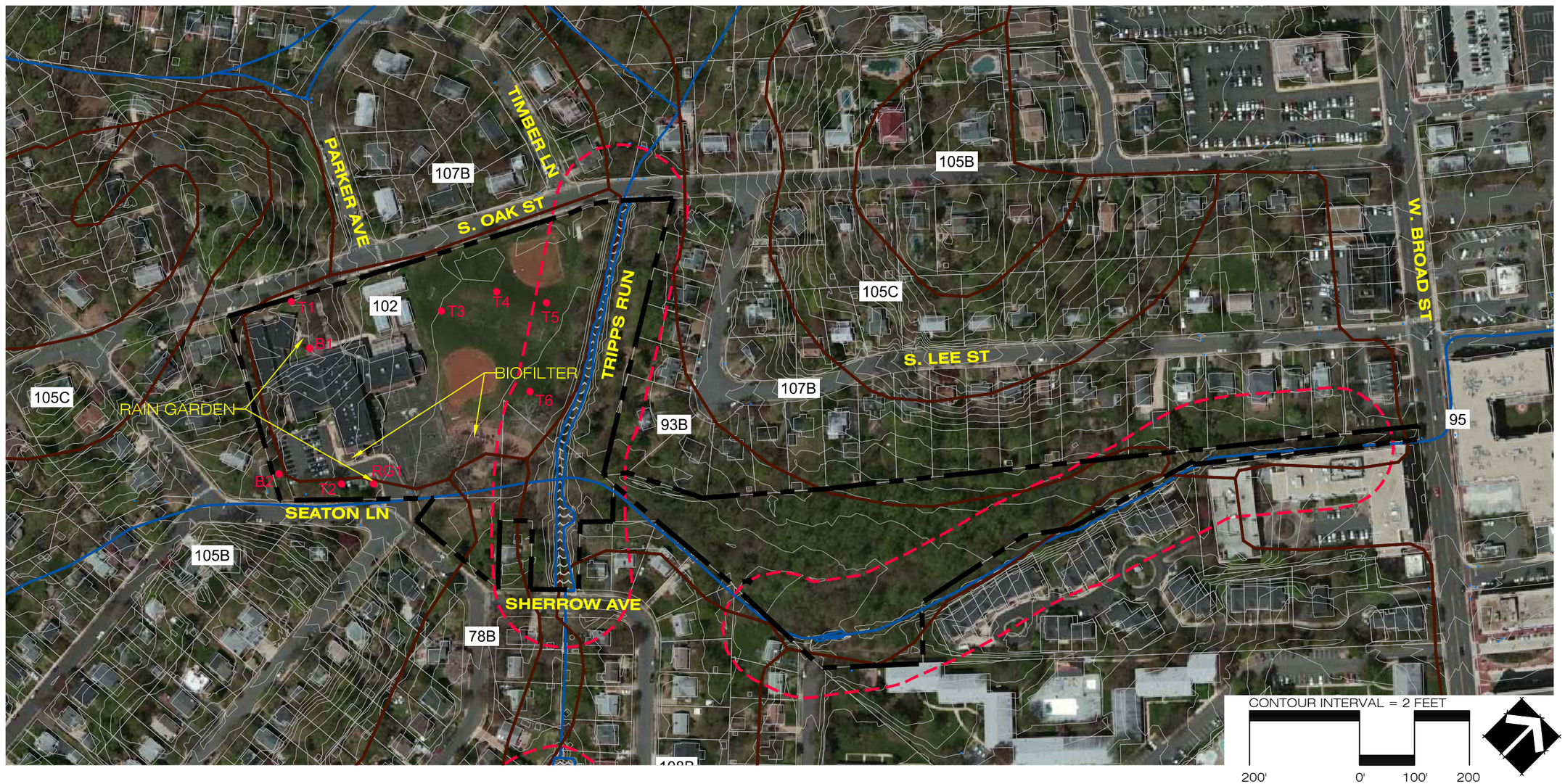
LEGEND

- APPROXIMATE WETLAND LIMITS
- APPROXIMATE STREAM CHANNEL
- APPROXIMATE OPEN WATER LIMITS
- EXISTING CONTOURS
- RESOURCE PROTECTION AREA (RPA) LINE
- 107B SOIL LINE AND TYPE
- ●T3 SOIL SAMPLE LOCATION

SOILS CHARACTERISTICS TABLE

SOIL GROUP	NAME	HSG	DEPTH TO WATER ft	DEPTH TO BEDROCK ft	PERMEABILITY in/hr
78B	MEADOWVILLE LOAM	A	3.4-6.6	>6	0.57-5.95
93B	SUMERDUCK SILT LOAM	C	2.0-3.3	>6	0.5-0.57
95	URBAN LAND	N/A	>6	>6	0.06-0.20
101	URBAN LAND-WHEATON COMPLEX	N/A	>6	>6	0.06-0.20
102	WHEATON LOAM	C	>6	>6	0.06-0.20
105B	WHEATON-GLENELG COMPLEX	C	>6	>6	0.06-0.20
105C	WHEATON-GLENLEG COMPLEX	C	>6	>6	0.06-0.20
107B	WHEATON-MEADOWVILLE COMPLEX	C	>6	>6	0.06-0.20
108B	WHEATON-SUMERDUCK COMPLEX	C	>6	>6	0.06-0.20

SOURCE: USDA-NRCS Soil Survey for The City of Falls Church, Virginia; Date: 2010



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WILLIAMSBURG ENVIRONMENTAL GROUP, INC.
Stantec
Environmental Consultants

THOMAS JEFFERSON ELEMENTARY SCHOOL FACILITY LAYOUT
FIGURE 1.4
FALLS CHURCH MS4 SUPPORT
CITY OF FALLS CHURCH, VIRGINIA

DATE: MARCH 11, 2014

JOB NUMBER: 4976

SCALE: 1 INCH = 200 FEET

SOURCE: BASE MAPPING PROVIDED BY CITY OF FALLS CHURCH GIS

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1.2 ENVIRONMENTALLY SENSITIVE AREAS

The initial step taken in developing this management plan for the TJES was a review of the overall physical setting and environmental resources, to the extent readily available. A general site analysis of the property and surrounding areas was conducted by desktop methods and some limited field inspection. Information evaluated in these studies included the following: topography, soils, existing vegetation, water features and/or drainage ways. Based on this review, there are several environmentally sensitive areas found on the TJES properties. These are comprised generally of the buffer areas associated with Tripps Run and its tributaries. As noted above, waters in these drainage features eventually make their way to Holmes Creek, then to Cameron Run, to the Potomac River, and ultimately the Chesapeake Bay.

Based on review of the City's GIS data, The terrain on the site is generally flat, particularly in the area of the playing fields. Slopes in this area vary from 1.0% to 2.6%. Upstream areas in turf may be slightly steeper in grade transitions from the building and parking areas, but generally these areas are also typically flattish. Slopes within the buffer areas of parcel 4 range from 1.3% to over 6%, areas within the Tripps Run forested areas adjacent to the playing fields, become steeper within the channel section approaching 45%. The banks of the Tripps Run Channel, which is approximately 12-33 feet wide in this area, are roughly 4-6 feet in height.

1.2.1 Maintained School Areas

These areas are found one the TJES areas on parcels 1, 2, and 3. Generally, they consist of the turfgrass areas on the northeast boundary of parcel 1 along Tripps Run. The following provides discussion of the areas that are typically maintained.

1.2.1.1 Chesapeake Bay Resource Protection Areas (RPA)

The existing ball fields in this area encroach within the noted City GIS layers for RPA, and as such represent an allowable pre-existing non-conforming use in these areas under the Chesapeake Bay Preservation Act. Based on rough estimations of available data, the approximate turf area with the RPA on parcels 1, 2, and 3 equates to roughly 0.95 acres. Routine management of this area is required for school operation; however, these areas should be maintained within limited nutrient inputs to protect downstream waters to the maximum extent practicable. The current limited nutrient inputs should fall within this limit, and is discussed in further detail in section 4.0 Nutrient Needs.

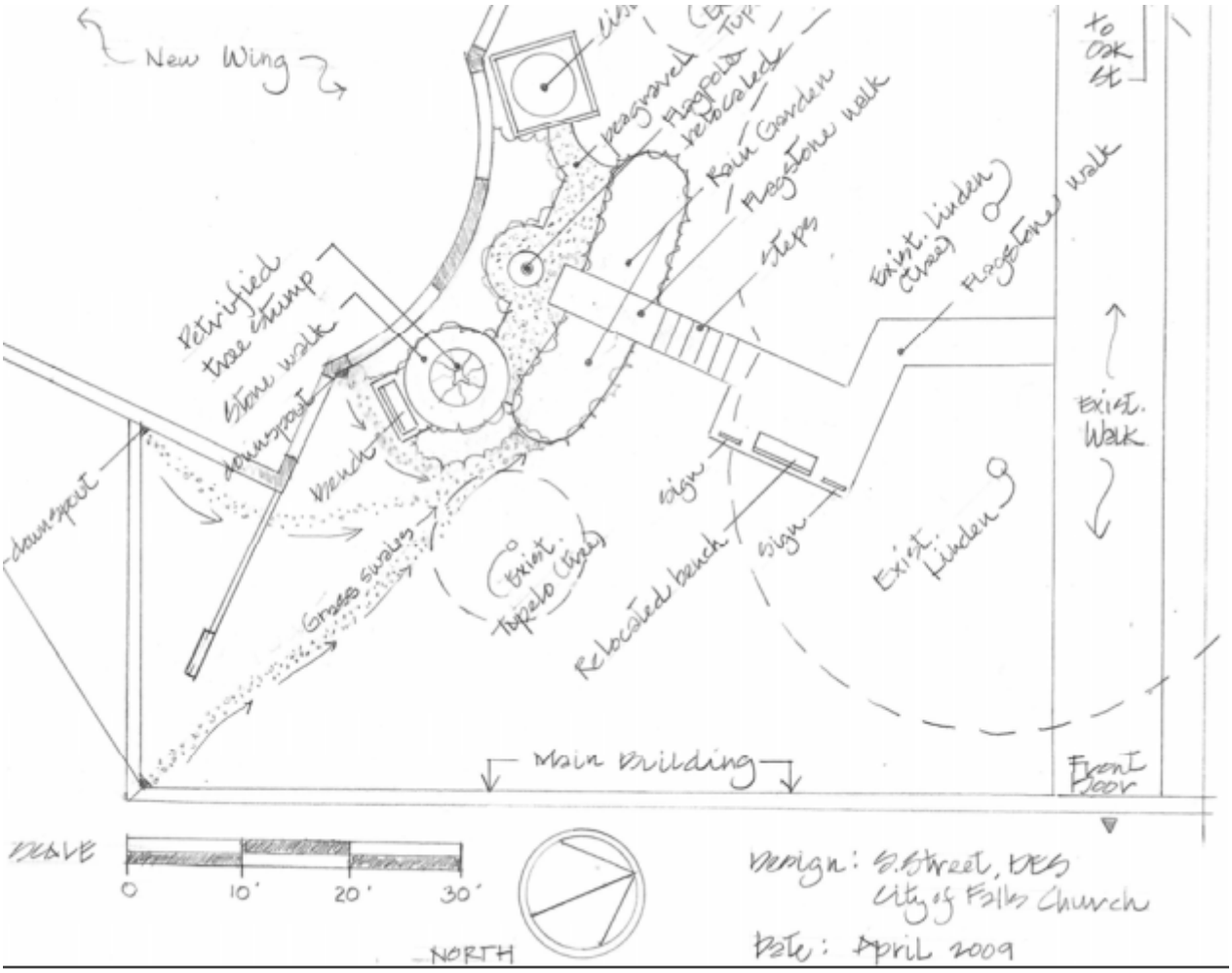
Currently a buffer of variable width (typically 20 feet to 45 feet) exists on the southwest side of Trips Run. This buffer should be maintained, and nutrient inputs within the RPA should be kept to the minimum levels needed to promote a healthy, stable, and non-eroding turfgrass surface. As a planning measure, no nutrients should be applied within 25 feet of the stream. If possible, this zone should be extended beyond these limits to the extent practicable, depending on the field limits. The application of fertilizers, herbicides, insecticides, fungicides, and other pesticides should be limited within these areas. Consideration should be given to providing vegetative buffers and "no-spray zones" to the extent possible.

If the application of any type of selective herbicide is required within twenty-five feet of a jurisdictional area, such applications should be made by hand using back-pack sprayers. No disposal of clippings, brush, or other debris should be allowed in these areas.

1.2.1.2 Stormwater Management Facilities

In addition, there are several stormwater management facilities are located on the school grounds. As noted on Figure 1.4, there are several rain gardens and bioretention filters on-site. The City engaged in a deliberate initiative in 2009, obtaining grant funding from the Virginia Department of Conservation and Recreation (DCR), to implement rain garden retrofits at the school, inclusive of educational signage. Several of these rain gardens can be found at the entry walk off Oak Street shown on Figure 1.5.

Figure 5 1.5 Entry Rain Garden Locations



Additionally, a curb cut rain garden was installed at the entry to the parking lot from Seaton Lane, inclusive of educational signage. See Figures 1.6 and 1.7 for more detail.

Figure 6 1.6 Rain Garden Educational Sign

Figure 7 1.6 Corner Rain Garden at Parking Entry

Additionally, several newer stormwater management facilities in the form of bioretention filters have been constructed. One such facility is located near the school building (Figure 1.8), while a larger biofilter (Figure 1.9) is located adjacent to the paved playground and ball field areas. All of these facilities are intended to provide water quality treatment from the developed areas of the site, and ultimately drain to Tripps Run.

Figure 8 1.7 Biofilter near School Building

Figure 9 1.8 Biofilter near Playground and Ball Fields

As such, care must be taken around these facilities in effort to ensure that no nutrients are applied directly to these structural best management practices (BMP). Ideally, a small application buffer should be provided around each facility if nutrients are needed in the vicinity.

1.2.1.3 Parking, Playgrounds, & Other Impervious Surfaces

While impervious areas are not in of themselves considered environmentally sensitive, they do pose management issues with regard to nutrient application and the protection of downstream environmentally sensitive areas. For example, granular overlap onto existing parking or curb and gutter sections promotes rapid runoff to storm sewers and downstream resources. Grounds staff should take note of these areas and limit any distribution of applications to these areas. Should nutrients be applied directly to these areas via overspray or granular applications, staff should immediately clean or sweep these areas in an effort to either completely remove the nutrients or relocate them to areas intended for their application.

1.2.2 Adjacent Unmaintained Areas

Additionally, there exists a well-established forested buffer on portions of all four parcels. These include part of the buffer noted above on the southwest boundary of Tripps Run (parcels 1, 2, &3), an established buffer on the northeast boundary of Tripps Run (which also includes an existing City trail), and the entirety of parcel four, which envelopes a significant drainage tributary to Tripps Run, which joins with that stream on parcel 3. In effect, the total natural wooded area consisting of portions of all four properties should be managed as conservation areas. Hence, no nutrients should generally be applied to these areas.

The application of fertilizers, herbicides, insecticides, fungicides, and other pesticides should be limited or prohibited within these buffer areas, unless deemed specifically required by qualified City staff under extenuating and City-approved circumstances. These vegetated buffers will provide for infiltration and filtering of stormwater runoff before reaching the jurisdictional areas, therefore the use of chemicals should not be permitted in these areas, unless specifically required and approved by the Department of Public Works (DPW) Director or designee. No formal conservation easements were noted based on a cursory review of the City's online GIS mapping; however some apparent drainage easements were noted on parcel four.

1.2.3 Sensitive Area Education and Outreach

As this facility is a central point of gathering for the neighborhood and its youth, it represents a substantial opportunity for education and outreach efforts to local citizens as to the presence of , and need to protect, Virginia's natural resources. As noted previously, City staff has already invested substantial effort in environmental education efforts; however, even more opportunities may be available on-site. Since school children interact routinely with the buffer areas along Tripps Run while playing on the fields, frequent and safely-positioned signage could be added along this interface to both A) inform the children and others of the resource and management program, and B) reinforce the importance of the management practices to maintenance personnel. Additionally, notices and/or signage could be placed at school entrances and bulletin boards, further educating the public as to both the importance of these practices and the on-going City efforts to protect the environment. This represents and exciting avenue to further youth education, and advance the City's MS4 Phase II General Permit compliance efforts.

1.3 IRRIGATION WATER SOURCES AND CONSIDERATIONS

There is no irrigation system installed at TJES, and there is no routine practice for temporary seasonal irrigation, such as roller bases. As such, there are no on-site nutrient inputs or management issues related to irrigation water.

2.0 Management Areas

As the nutrient management areas at the TJES site are located predominantly on similar soils and generally drain to a common outfall (Tripps Run), management of the nutrient input areas can be broken down into four general areas: 1) managed bermudagrass turfgrass areas, and 2) managed fescue lawn grass areas, 3) managed landscape beds, and 4) forested and/or conservation areas. All forested/conservation areas should be generally left free from nutrient inputs as described above. The following is a brief summary of these four management areas:

Table 3 2.1 Management Area Summary

1 - Bermudagrass Ball Fields	2 - Fescue Lawn	3 - Landscape Beds	4 - Forested/Conservation
2.26 Acres	0.84 Acres	0.32 Acres	5.15 Acres

3.0 Soils

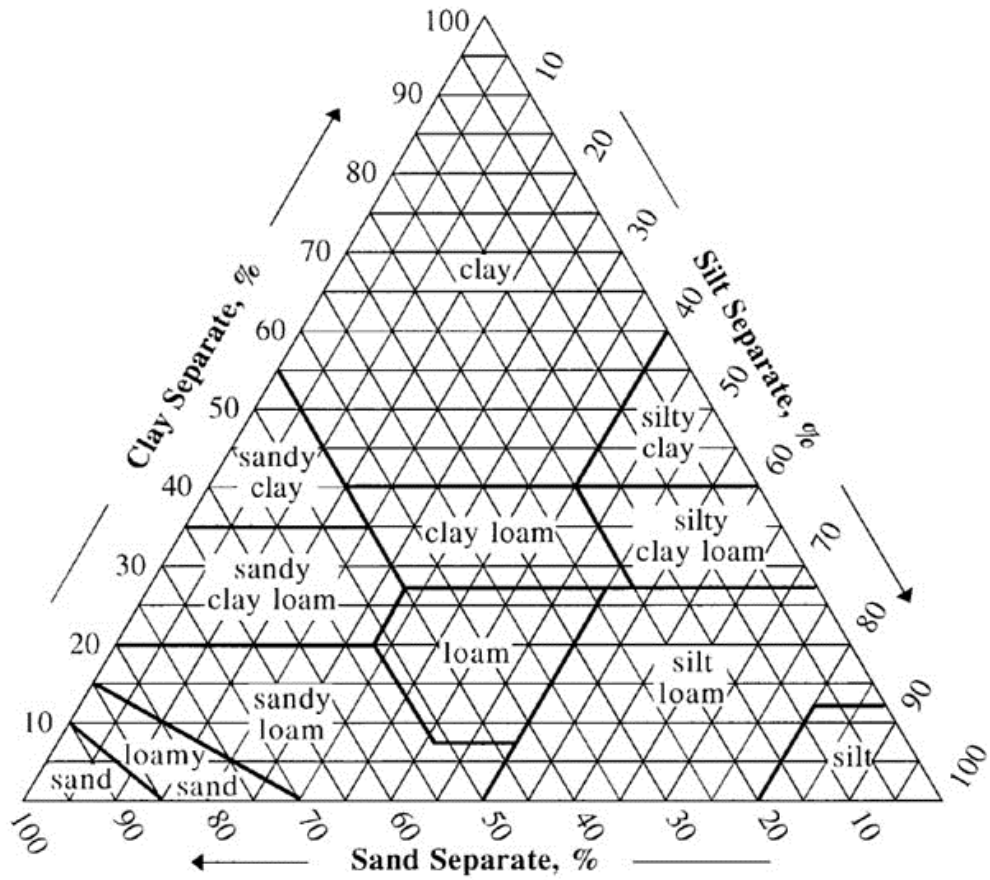
Both USDA Soil Survey information and on-site soil samples were referenced in the preparation of this plan. The following provides discussion of these findings.

3.1 USDA-NRCS SOILS SURVEY

Information on soils located on the TJES site was obtained from the USDA-NRCS Soil Survey for the City of Falls Church, Virginia (2010). Two primary soils are found within the main management areas (ball fields, lawn, and beds). These are defined as the Wheaton Loam and Wheaton-Glenelg Complex. The soils types are predominantly well-drained soils; although both soil types fall within hydrologic soil group C with moderately low to moderately high permeability (0.06 – 0.20 inches/hour).

Under the USDA Soil Classification System, loams are characterized as having a clay content roughly between 7 and 27%, a silt content between 28 and 50%, and a sand content between 24 and 50% (see "soil textural triangle" in Figure 3.1).

Figure 10 3.1 USDA Soil Textural Triangle (USDA 1993)



The Wheaton Loam series soils are generally characterized as being deep and well drained, found on slopes ranging from 2% to 25%. Typically, depth to both seasonally high water table and bedrock are greater than six feet. The Wheaton-Glenelg Complex is also deep and well drained, and found on slopes ranging from 2% to 15%, with similar water table and bedrock depths as the Wheaton Loam series.

No series specific rating for either soil series was found according to the Virginia Nutrient Management Standards and Criteria, Table 1-4, which is used to determine the soils environmental sensitivity and related category. However, the Glenelg series, a relative component of the Wheaton-Glenelg Complex is rated as Moderate for nitrogen loss risk and environmental sensitivity due to leaching. Generally, the soils are deep and well drained, however, with a variably (potentially high) permeability the soils on-site should be managed with the knowledge that there is potential for nitrogen loss due to leaching. Particularly attention should be paid to amended soils and profiles with underdrains, in and around ball fields and certainly near augmented soil profiles with drains such as near bioretention filters.

Figure 1.4 provides the distribution of soils on-site and a legend detailing the soil characteristics. Detailed soil information from the Soil Survey is included in Appendix A.

3.2 SOIL TESTING

As part of this plan development, Stantec performed soil samples comprehensively across the property, nine in total. These samples were taken in mid-March 2014 and at representative locations to provide insight to existing nutrient levels within the routinely maintained areas. No sampling was performed within forested/conservation areas, or management area four.

The samples were provided to A&L Eastern Laboratories in Richmond, Virginia, which is an approved lab according to DCR. The laboratory provides soil test results and nutrient recommendations based upon the Mehlich III procedure. The Mehlich I procedure is required to determine phosphorous soil levels for writing nutrient management plans in Virginia. As such the Virginia Nutrient Management Standards and Criteria (Revised October 2005) were utilized to convert the Mehlich III reporting values to Mehlich I. Additionally, A&L utilizes the SMP Single Buffer method to determine Soil Buffer pH.

Generally, phosphorus and potassium levels were moderate to optimum within the more highly maintained areas of the ball fields. One sample, RG1, was taken at the rain garden along Seaton Lane and the parking entry. The keystone nutrients of phosphorus and potassium were both found to very high in this location. This is not intended to be a management area in terms of nutrients, but should provide additional insight as to nutrient mobility on-site, and reinforce the importance of eliminating nutrient applications in the stormwater management features.

The Soil Test Reports from the recent sampling event are included in Appendix B. Table 3.1 provides a summary of the soil test reports. The results of the soil test reports are used in the recommendation of soil amendments proposed in the plan as discussed later in Section 4.

Table 4 3.1 Soil Test Summary

Sample	Man. Area	Use	P	Mehlich I	P_2O_5	K	Mehlich I	K_2O	Soil pH	Buffer
			(ppm)	(ppm)	Rating	(ppm)	(ppm)	Rating		pH
T1	2	Lawn	9	0.86	L-	174	123.54	H	7.2	
T2	2	Lawn	13	2.69	L	75	53.25	M	5.9	6.82
T3	1	Field	253	135.59	VH	159	112.89	H	5.9	6.79
T4	1	Field	111	47.58	H+	121	85.91	M+	5.8	6.84
T5	1	Field	63	25.59	H-	143	101.53	H-	5.9	6.85
T6	1	Field	81	33.84	H	143	101.53	H-	5.7	6.8
B1	3	Bed	68	27.88	H-	268	190.28	VH	7	
B2	3	Bed	24	7.73	M-	144	102.24	H-	6.5	
RG1	-	SWM	102	43.46	H+	244	173.24	VH	7.4	

*Note initial values are noted in Mehlich III, converted to Mehlich I in table to provide recommendations.

3.3 FUTURE SOIL TESTING

Soil testing is important in managing the future application of nutrients at TJES. Even though typical nutrient inputs at the school are well below annual thresholds and guidance, there may come times when greater inputs are needed to re-vitalize or re-invigorate plant health based on turfgrass or plant stress and visible field indicators. Without a measure of soil nutrient availability to balance with plant needs, it will be difficult to accurately determine plant nutrient needs and develop relevant, justifiable recommendations in these instances. TJES is encouraged to continue soil collection and sampling on a frequent basis, and maintaining test-critical information. Not only is the soil information recommended every three years for developing credible nutrient management plans and adaptations in the future, it is also important in the operational and management decision-making process and for ensuring that the facility proper nutrient distribution to keep the grounds in good, stable health without becoming a threat to water quality on-site or downstream waters. While it is not necessary to test at a several times a year, it is recommended that test be taken every, or every other, growing season, if possible. But again, at minimum soil test should be performed once every three years, as this will provide information for use in revising the plan in the future.

4.0 Nutrient Needs

Nutrient needs in the form of soil amendments are based upon the type of turfgrass and bed plants, the level of maintenance provided, and the existing soil fertility. The following sections discuss the nutrient needs for TJES, including the macronutrients nitrogen (N), phosphorous (P), and potassium (K). Micronutrients and soil pH and buffer capacity are also discussed below, as they are essential to good plant growth. The timing and application rates for nutrient applications are discussed later in Section 5.0.

4.1 NITROGEN

Nitrogen is a macronutrient essential for healthy plants. It is a mobile nutrient in plant useable forms, so it is not generally available in the soils for any length of time, unless it is applied in insoluble forms that are not plant available. Nitrogen recommendations are based upon the turfgrass needs, not soil fertility. The Virginia Nutrient Management Standards and Criteria provide recommended nitrogen fertilization rates for athletic fields and lawns. These rates vary by turfgrass (cool vs. warm season) and level of management (standard vs. intensive). The following nitrogen rates are recommended for TJES; however, City and/or maintenance staff may elect to limit nitrogen based on field experience and desired turf performance. The timing of fertilizer application and type of nitrogen fertilizer recommended is discussed in Section 5.

Table 5 4.1 Nitrogen Rates

Feature	Plant Type	Maximum Rate Per Application (lbs/1,000 ft^2)	Total Maximum Annual Rate (lbs/1,000 ft^2)
Fields	Bermudagrss	1[a]	4
Lawns	Fescue	0.5	3.5
Beds[b]	Variable	0.5	2.5

[a] Water Soluble Nitrogen (WSN) sources must be applied as two applications not to exceed 0.5 lbs/1,000 ft^2 each, with a minimum of 15 days between applications. Alternatively, Water Insoluble Nitrogen (WIN) sources with greater than 50% WIN may be applied in a single applicationf of no more than 1 lbs/1,000 ft^2 with a minimum of 30 days between applications. [b] Based on recommendations from A&L Eastern Laboratories.

4.2 PHOSPHORUS AND POTASSIUM

Phosphorous (P2O5) and potassium (K2O) are required where indicated by soil fertility testing. Review of the recent soil test results for TJES shows phosphorous levels vary from extremes of Low- (L-) to Very High (VH), but generally trend towards the high end of the spectrum. The potassium levels range from Medium (M) to Very H (H). Table 4.2 provides a summary of the recommended P2O5 and K2O application rates for various features, based upon the test results.

Table 6 4.2 Annual Phosphorus and Potassium Needs

Area	Based on Sample	P_2O_5 Level	P_2O_5 Needs (lbs/1,000 ft^2)	K_2O Level	K_2O Needs (lbs/1,000 ft^2)
Fields	T3	VH	0	H	0.75
Lawn	T2	L	2.5	M	1.5
Bed	B1	H-	0.5	VH	0

4.3 SECONDARY AND MICRONUTRIENTS

Secondary nutrients tested in the soil include Calcium (Ca) and Magnesium (Mg). The micronutrients Zinc (Zn), Manganese (Mn), Copper (Cu), Iron (Fe), and Boron (B) are also reported in the soils test results. Generally, the test results noted good to low levels of both Ca and Mg; however some lower Calcium levels were found within the more intensively maintained ball field area. Most other levels were near optimum in the ball field area; however some deficits in Boron and Sulfur were noted. Some Sulfur and Magnesium deficiencies were noted with the landscape beds. See the soil test results when considering any minor supplemental inputs of secondary micronutrients.

4.4 LIME

Lime is important for correcting low pH, adding acid buffering capacity, and providing secondary nutrients Ca and Mg and some micronutrients needed for turfgrass to grow. Soil acidity is critical to plants because it affects the availability of nutrients in the soil and potential leaching of nutrients from the soil. Turfgrass generally prefers soil pH that is slightly acidic. Many Virginia soils are generally very acidic without the addition of lime, so lime periodic lime application is important for managing plant health. Lime application rates are based on the type of turfgrass and the soil pH and buffering capacity reported from soil testing. For TJES, lime recommendations are based upon SMP Buffer Test and Buffer Index from Table 3-2 of the *Virginia Nutrient Management Standards and Criteria*. Table 4.3 summarizes the range of pH and buffer pH by feature with recommendations for lime application rates. Reductions in lime application may be necessary based on individual area observations, additional test results, and composition of the liming agent. No lime is recommended within bed areas.

Table 7 4.3 pH, Buffer pH, and Lime Recommendations

Feature	Based on Sample	pH	Buffer pH	Target Soil pH	Lime Application (lbs/1,000ft^2)
Fields	T3	5.9	6.79	6.2	30
Lawn	T2	5.9	6.82	6.2	25

*Lime Application Recommendation provided by A&L

5.0 Nutrient Application

This section provides details on the application of soil amendments for TJES and the timing of applying the soil amendments, including fertilizer and lime as discussed in Section 4.0. In addition to the amount of nutrients required, the application rate is dependent upon the growing season, form of fertilizer applied, and method of application. Landscape beds found on-site appear to be self-sustaining, and based on the soil results are at good levels for phosphorus and potassium. Individual bed recommendations may be consulted from the test results shown in Appendix B. The following sub-sections discuss nutrient application in detail and provide recommendations for fertilization and soil amendments based upon the turfgrass needs, soil fertility, and current types of fertilizer and methods of application used at TJES.

5.1 NITROGEN APPLICATION (GROWING) SEASON

TJES uses cool season (Fescue) turfgrasses on its lawn areas, and warm season (bermudagrass) turfgrass in the higher traffic and maintenance areas associated with the ball fields. The growing seasons for these different types of turfgrasses varies in the northern Piedmont of Virginia. The timing of nutrient applications will vary based upon the growing season, especially for Nitrogen. For cool season grasses, the Nitrogen application season begins six weeks prior to the last spring killing frost and ends six weeks past the first fall killing frost. Separately, warm season grasses have a different window – between the last average killing frost date in the spring and one month prior to the first average fall killing frost date. The landscape beds do not currently receive any nitrogen and appear to be vigorous; however, individual plant recommendations can be consulted if any performance issues are determined. Table 5.1 provides the approximate dates for Nitrogen application based upon the growing season as determined by average dates of the first fall and last spring frost killing dates, and Table 5.2 details the maximum recommended nutrient inputs per management area. For landscape beds, it is advisable to generally follow the timing recommendations for cool season turf in addition to any plant specific requirements that may apply. Appendix B provides additional guidance on related to gardens via the DCR publication *A Virginian's Year-Round Guide to Yard Care*.

Table 8 5.1 Growing Season/Nitrogen Application Summary

Turfgrass	Feature	Last Spring Killing Frost	Nitrogen Application Start	First Fall Killing Frost	Nitrogen Application End
Bermudagrass	Ball Fields	April 10	April 10	October 25	September 25
Fescue	Lawn	April 10	February 27	October 25	December 6

Table 9 5.2 Nutrient Application Summary

Area	Based on Sample	Annual N-P-K Application Recommendation (lbs/1,000 ft^2)
Fields	T3	4.0-0-0.75
Lawn	T2	3.5-2.5-1.5
Bed	B1	2.5-0.5-0

5.2 TYPES OF FERTILIZER USED

TJES currently uses only a small variety of fertilizers to provide the nutrients required to manage the turf on the ball fields at the school, as previously mentioned. No other applications to lawns and beds are planned. These inputs have provided for acceptable quality, and will likely remain in place moving forward. This is understandable and even advisable given limited financial resources. The actual fertilizers applied may vary as noted, provided that the maximum rate per application and total annual rate are not exceeded as detailed in Tables 4.1 and 4.2 above.

5.3 METHODS OF FERTILIZER APPLICATION

Only a limited few fertilizers are currently used at TJES, although additional options are provided for in Table 5.3. It includes the fertilizers in use as well as other options to meet the maximum allowable inputs per this plan. However, as previously stated the school may continue to input lower levels of nutrients based on availability, need, and satisfaction with existing plant performance.

Table 10 5.3 Fertilizers and Application Methods

Form	Application Method	N-P-K %	Nutrients Provided	% WIN
Granular	Spreader	21-0-0	N	0.00%
Granular	Spreader	19-0-19	N, K	Low (2.5-10%)
Granular	Spreader	10-0-20	N, K	Low (2.5-10%)
Granular	Spreader	10-0-0	N	65.00%
Granular	Spreader	16-4-8	N, P, K	50.00%
Granular	Spreader	21-3-7	N, P, K	2.00%

5.4 RECOMMENDED NUTRIENT APPLICATION

The following pages present the recommended nutrient application schedules for TJES, based the Virginia Nutrient Management Standards and Criteria. However, recommended values may be in excess

of normal inputs and/or are cost prohibitive for the facility based on application records provided. Particularly with respect to nitrogen applications, these values exceed recent past application records for TJES. It should be noted that the grounds management staff may continually check turf conditions, and may find adjustments may be required. If applicable, the grounds staff should adjust schedules and amounts accordingly while keeping to below maximum annual and maximum per application recommendations. If drastic changes are noted, plan revision may be appropriate in the future.

Nutrient Application Worksheet

Prepared Date 4/1/2014 Expires Date 4/1/2017

Management Area ID One

Feature/Species Ball Fields / Bermudagrass

Needs N-P-K (lb/1,000 ft²)	Application Date(s) MM/DD[1]	N-P-K (%) (lb/1,000 ft²)			% SAN	N (lb/1,000 ft²)	P (lb/1,000 ft²)	K (lb/1,000 ft²)	Lime (lb/1,000 ft²)
4.0-0-0.75	4/15	19	0	19		0.48		0.48	
		2.5							
	5/15	10	0	0		1.00		0.00	
		10							
	6/15	21	0	0		1.00		0.00	
		4.75							
	7/15	19	0	19		0.27		0.27	
		1.4							
	8/15	10	0	0	65	0.50		0.00	
		5							
	9/1	21	0	0		0.74		0.00	
		3.5							
	9/1	Dolomitic Lime							30.00
Annual Totals						3.97	0.00	0.74	30.00

[1]The Month/Day designations may not always be followed due to weather, etc. Experience and judgement of the grounds superintendent shall intercede as to the applicability of individual products and timing based on conditions. Standard maximums as defined herein regarding individual and annual applications shall apply.

Nutrient Application
March 30, 2014

Nutrient Application Worksheet

Prepared Date 4/1/2014 Expires Date 4/1/2017

Management Area ID Two

Feature/Species Lawn / Fescue

Needs N-P-K (lb/1,000 ft²)	Application Date(s) MM/DD[1]	N-P-K (%) (lb/1,000 ft²)	% SAN	N (lb/1,000 ft²)	P (lb/1,000 ft²)	K (lb/1,000 ft²)	Lime (lb/1,000 ft²)
3.5-2.5-1.5	3/1	19 0 19 2.5		0.48	0.00	0.48	
	4/1	16 4 8 3	50	0.48	0.12	0.24	
	5/1	21 0 0 2.75		0.58	0.00	0.00	
	6/1	16 4 8 3	50	0.48	0.12	0.24	
	7/1	19 0 19 2		0.38	0.00	0.38	
	8/1	21 0 0 1		0.21	0.00	0.00	
	9/1	21 0 0 2.5		0.53	0.00	0.00	
	10/1	21 0 0 1.25		0.26	0.00	0.00	
	11/1	21 0 0 0.5		0.11	0.00	0.00	
	11/1	Dolomitic Lime					25.00
Annual Totals				3.50	0.24	1.34	25.00

[1]The Month/Day designations may not always be followed due to weather, etc. Experience and judgement of the grounds superintendent shall intercede as to the applicability of individual products and timing based on conditions. Standard maximums as defined herein regarding individual and annual applications shall apply.

Nutrient Application
March 30, 2014

Nutrient Application Worksheet

Prepared Date 4/1/2014 Expires Date 4/1/2017

Management Area ID Three

Feature/Species Landscape Beds / Variety of Shrubs, Etc.

Needs N-P-K (lb/1,000 ft²)	Application Date(s) MM/DD[1]	N-P-K (%) (lb/1,000 ft²)			% SAN	N (lb/1,000 ft²)	P (lb/1,000 ft²)	K (lb/1,000 ft²)	Lime (lb/1,000 ft²)
2.5-0.5-0	3/1	21	0	0		0.42	0.00	0.00	
		2							
	4/1	21	0	0		0.42	0.00	0.00	
		2							
	5/1	21	0	0		0.42	0.00	0.00	
		2							
	6/1	0	0	0		0.00	0.00	0.00	
		0							
	7/1	21	0	0		0.21	0.00	0.00	
		1							
	8/1	0	0	0		0.00	0.00	0.00	
		0							
	9/1	21	0	0		0.42	0.00	0.00	
		2							
	10/1	21	0	0		0.42	0.00	0.00	
		2							
	11/1	21	0	0		0.11	0.00	0.00	
		0.5							
Annual Totals						2.42	0.00	0.00	0.00

[1]The Month/Day designations may not always be followed due to weather, etc. Experience and judgement of the grounds superintendent shall intercede as to the applicability of individual products and timing based on conditions. Standard maximums as defined herein regarding individual and annual applications shall apply.

6.0 Equipment Calibration

Equipment calibration is critical to nutrient management plan implementation. Plan recommendations will do little to save money and protect water quality if they are not followed due to inaccurate nutrient application. Calibration of all application equipment should be checked on a periodic basis. Without necessary adjustments indicated by calibration testing, the result may be the application of too few or too many nutrients. Too little nutrients could result in unacceptable turf durability, playability, and aesthetics. Applying excess nutrients could be costly, not only because of the unnecessary expense, but also because of a negative impact on water quality. Information on application equipment calibration is available in Chapter 10 of the Urban Nutrient Management Handbook, from the Virginia Cooperative Extension, and from equipment manufacturers and vendors. Equipment calibration records can be maintained in Appendix D of this document.

7.0 Records

Another area to emphasize for proper plan implementation is record keeping. Without records, it is impossible to know what has been applied and if any progress or improvements in nutrient management are made. Important information to retain with the plan includes soil tests reports; calibration settings; dates of fertilizer application and rates applied; seeding or renovation; and unusual stresses caused by disease, drought, and pests. These items could impact the health and appearance of the turfgrasses on the grounds. This information will also provide the background needed for fine-tuning future plan revisions. Soil test results can be maintained in Appendix B of the plan. A section has been provided in Appendix C for Nutrient Application information, and Appendix D includes a place to maintain application equipment calibration information. We recommend that documents and records be maintained for at least 3 years, unless a longer period of record is required.

8.0 Plan Revisions

There are several reasons for revising the plan, including the expiration of the plan, which is only good for a maximum of three years. The plan can also be refined to take advantage of what has been learned from the previous growing season, including updated soil test results or results for features not previously tested. Some factors may result in the need for significant plan revisions, such as changes in the turfgrasses used on the grounds. Nutrient management plans are dynamic documents that always be evolving. A Log of Plan Revisions is included in Appendix E to maintain a record of the changes that occur during the three year life of the plan.

Appendix A – USDA-NRCS Soil Information

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Falls Church City, Virginia

March 17, 2014

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

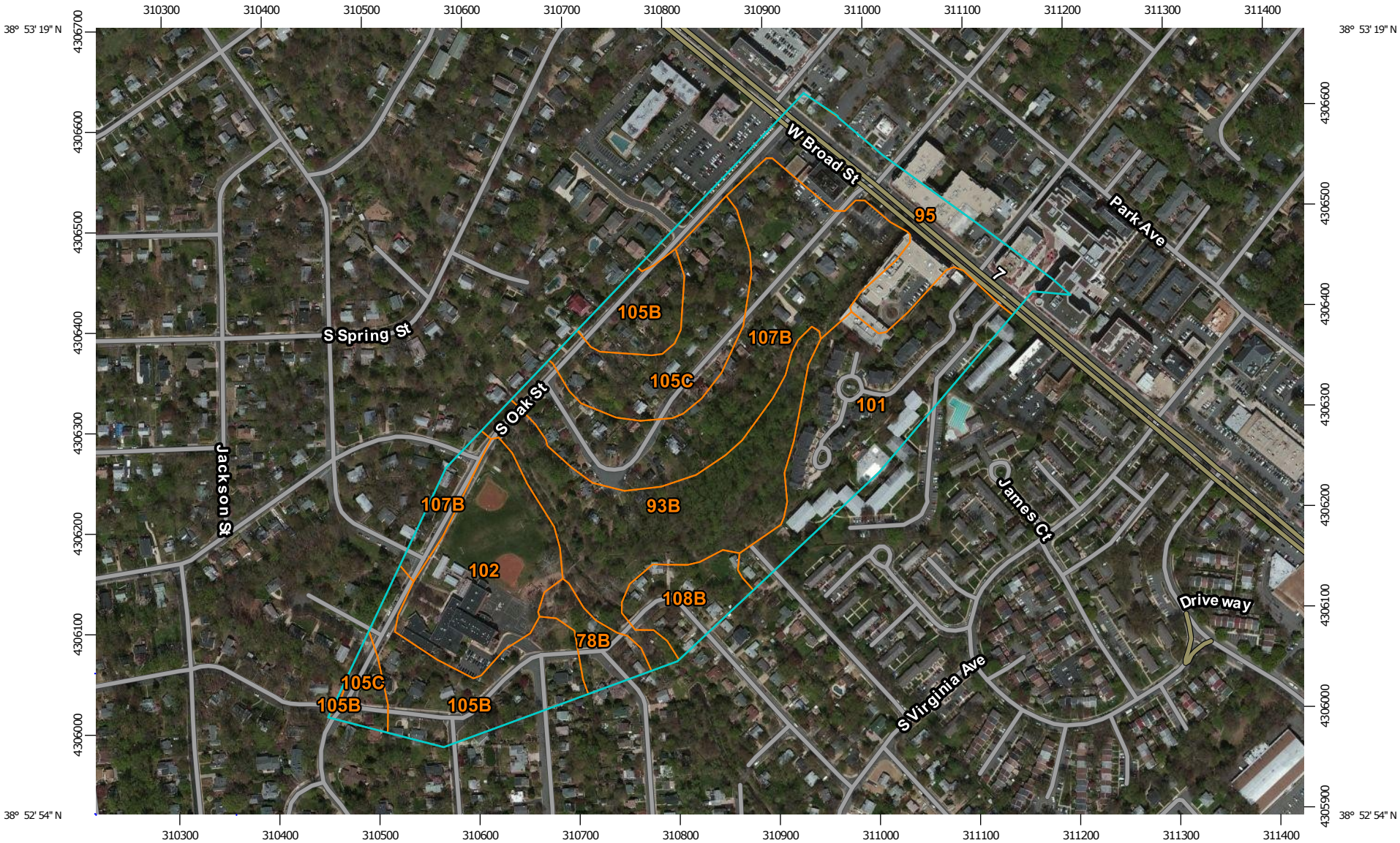
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:5,520 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Falls Church City, Virginia
Survey Area Data: Version 6, Dec 11, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 14, 2011—Nov 7, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Falls Church City, Virginia (VA610)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
78B	Meadowville loam, 2 to 7 percent slopes	1.2	2.4%
93B	Sumerduck silt loam, 2 to 7 percent slopes	7.8	15.0%
95	Urban land	6.1	11.8%
101	Urban land-Wheaton complex	7.5	14.3%
102	Wheaton loam, 2 to 25 percent slopes	5.5	10.6%
105B	Wheaton-Glenelg complex, 2 to 7 percent slopes	6.1	11.6%
105C	Wheaton-Glenelg complex, 7 to 15 percent slopes	5.3	10.2%
107B	Wheaton-Meadowville complex, 2 t0 7 percent slopes	10.5	20.2%
108B	Wheaton-Sumerduck complex, 2 to 7 percent slopes	2.0	3.9%
Totals for Area of Interest		**52.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used.

Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Falls Church City, Virginia

78B—Meadowville loam, 2 to 7 percent slopes

Map Unit Setting

Mean annual precipitation: 37 to 49 inches
Mean annual air temperature: 45 to 67 degrees F
Frost-free period: 185 to 212 days

Map Unit Composition

Meadowville and similar soils: 85 percent

Description of Meadowville

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Local alluvium over residuum weathered from schist

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 41 to 79 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.8 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 2w
Hydrologic Soil Group: A

Typical profile

0 to 12 inches: Loam
12 to 31 inches: Clay loam
31 to 39 inches: Gravelly loam
39 to 72 inches: Sandy loam

93B—Sumerduck silt loam, 2 to 7 percent slopes

Map Unit Setting

Mean annual precipitation: 37 to 49 inches
Mean annual air temperature: 45 to 67 degrees F
Frost-free period: 185 to 212 days

Map Unit Composition

Sumerduck and similar soils: 85 percent
Minor components: 2 percent

Description of Sumerduck

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from schist and/or alluvium derived from phyllite

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 2w
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Loam
4 to 31 inches: Silty clay loam
31 to 100 inches: Silt loam

Minor Components

Hatboro

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

95—Urban land

Map Unit Setting

Mean annual precipitation: 28 to 58 inches
Mean annual air temperature: 87 to 89 degrees F
Frost-free period: 175 to 200 days

Map Unit Composition

Urban land: 95 percent

Description of Urban Land

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

101—Urban land-Wheaton complex

Map Unit Setting

Mean annual precipitation: 37 to 49 inches
Mean annual air temperature: 45 to 67 degrees F
Frost-free period: 185 to 212 days

Map Unit Composition

Urban land: 50 percent
Wheaton and similar soils: 49 percent

Description of Urban Land

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

Description of Wheaton

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mine spoil or earthy fill derived from phyllite

Properties and qualities

Slope: 2 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 9 inches: Loam
9 to 60 inches: Loam

102—Wheaton loam, 2 to 25 percent slopes

Map Unit Setting

Mean annual precipitation: 37 to 49 inches
Mean annual air temperature: 45 to 67 degrees F
Frost-free period: 185 to 212 days

Map Unit Composition

Wheaton and similar soils: 100 percent

Description of Wheaton

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mine spoil or earthy fill derived from phyllite

Properties and qualities

Slope: 2 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 9 inches: Loam
9 to 60 inches: Loam

105B—Wheaton-Glenelg complex, 2 to 7 percent slopes

Map Unit Setting

Mean annual precipitation: 37 to 49 inches
Mean annual air temperature: 45 to 67 degrees F
Frost-free period: 185 to 212 days

Map Unit Composition

Wheaton and similar soils: 45 percent
Glenelg and similar soils: 40 percent

Description of Wheaton

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mine spoil or earthy fill derived from phyllite

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 9 inches: Loam
9 to 60 inches: Loam

Description of Glenelg

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Residuum weathered from mica schist and/or residuum weathered from phyllite

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 2e
Hydrologic Soil Group: B

Typical profile

0 to 6 inches: Silt loam
6 to 27 inches: Silt loam
27 to 71 inches: Channery loam

105C—Wheaton-Glenelg complex, 7 to 15 percent slopes

Map Unit Setting

Mean annual precipitation: 37 to 49 inches
Mean annual air temperature: 45 to 67 degrees F
Frost-free period: 185 to 212 days

Map Unit Composition

Wheaton and similar soils: 45 percent
Glenelg and similar soils: 40 percent

Description of Wheaton

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mine spoil or earthy fill derived from phyllite

Properties and qualities

Slope: 2 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Available water capacity: High (about 10.5 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile
0 to 9 inches: Loam
9 to 60 inches: Loam

Description of Glenelg

Setting
Landform: Interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Residuum weathered from mica schist and/or residuum weathered from phyllite

Properties and qualities
Slope: 7 to 14 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.6 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B

Typical profile
0 to 6 inches: Silt loam
6 to 27 inches: Silt loam
27 to 71 inches: Channery loam

107B—Wheaton-Meadowville complex, 2 t0 7 percent slopes

Map Unit Setting
Mean annual precipitation: 37 to 49 inches
Mean annual air temperature: 45 to 67 degrees F
Frost-free period: 185 to 212 days

Map Unit Composition

Wheaton and similar soils: 46 percent
Meadowville and similar soils: 44 percent

Description of Wheaton

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mine spoil or earthy fill derived from phyllite

Properties and qualities

Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 9 inches: Loam
9 to 60 inches: Loam

Description of Meadowville

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Local alluvium over residuum weathered from schist

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 41 to 79 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.8 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 2w
Hydrologic Soil Group: A

Typical profile
0 to 12 inches: Loam
12 to 31 inches: Clay loam
31 to 39 inches: Gravelly loam
39 to 72 inches: Sandy loam

108B—Wheaton-Sumerduck complex, 2 to 7 percent slopes

Map Unit Setting
Mean annual precipitation: 37 to 49 inches
Mean annual air temperature: 45 to 67 degrees F
Frost-free period: 185 to 212 days

Map Unit Composition
Wheaton and similar soils: 45 percent
Sumerduck and similar soils: 40 percent
Minor components: 2 percent

Description of Wheaton

Setting
Landform: Interfluves
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Mine spoil or earthy fill derived from phyllite

Properties and qualities
Slope: 2 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 10.5 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile
0 to 9 inches: Loam
9 to 60 inches: Loam

Description of Sumerduck

Setting

Landform: Drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Alluvium derived from schist and/or alluvium derived from phyllite

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 to 40 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 2w
Hydrologic Soil Group: C

Typical profile

0 to 4 inches: Loam
4 to 31 inches: Silty clay loam
31 to 100 inches: Silt loam

Minor Components

Hatboro

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear

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Appendix B – Soil Test Results

A&L Eastern Laboratories

7621 Whitepine Road Richmond, Virginia 23237 (804) 743-9401 Fax (804) 271-6446

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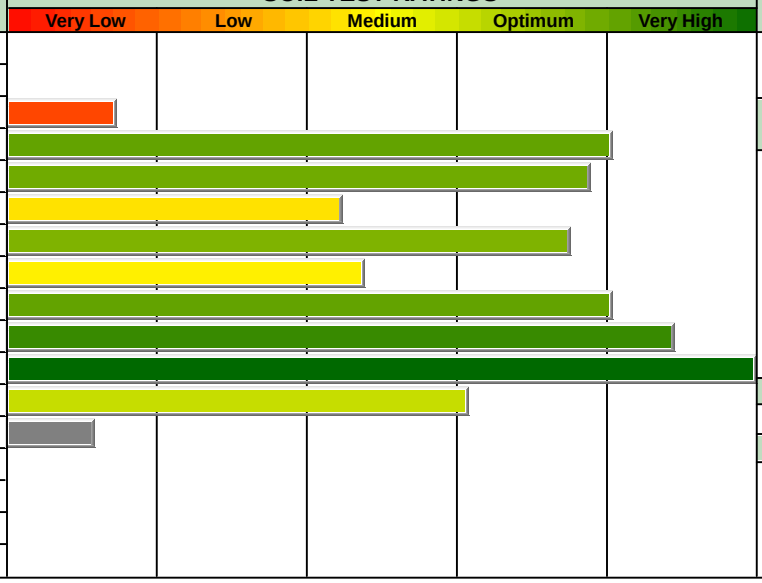
3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC PO:	Report No: 14-076-0509 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 Date Analysis : 03/18/2014 Page : 1 of 4

Lab Number : 03210 **Field Id :** **Sample Id :** T1

Test	Results
Soil pH	7.2
Buffer pH	
Phosphorus (P)	9 ppm
Potassium (K)	174 ppm
Calcium (Ca)	2147 ppm
Magnesium (Mg)	177 ppm
Sulfur (S)	17 ppm
Boron (B)	0.8 ppm
Copper (Cu)	3.0 ppm
Iron (Fe)	158 ppm
Manganese (Mn)	102 ppm
Zinc (Zn)	3.9 ppm
Sodium (Na)	29 ppm
Soluble Salts	
Organic Matter	3.6 % ENR 104
Nitrate Nitrogen	

SOIL TEST RATINGS



Calculated Cation Exchange Capacity

12.8 meq/100g

Calculated Cation Saturation

%K	3.5
%Ca	83.9
%Mg	11.5
%H	0.0
Hmeq	0.0
%Na	1.0

K : Mg Ratio 0.30

Ca : Mg Ratio 7.30

SOIL FERTILITY GUIDELINES

Crop : Lawn **Rec Units:** LB/1000 SF

(lbs)	LIME	(tons)	N	P_2O_5	K_2O	Mg	S	B	Cu	Mn	Zn	Fe
0			3.5	3.0	0	0	0.41	0	0	0	0	0

Crop : **Rec Units:**

Comment :

Pauric McGroary

Analysis prepared by: A&L Eastern Laboratories, Inc. Pauric McGroary

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3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	Report No: 14-076-0509
STANTEC	STANTEC	Cust No: 78538
ALEX FORASTE		Date Printed: 03/18/2014
1011 BOULDERS SPRING DRIVE		Date Received : 03/17/2014
SUITE 225		Date Analysis : 03/18/2014
RICHMOND VA 23225	PO:	Page : 2 of 4

Lab Number : 03210 **Field Id :** **Sample Id :** T1

SUGGESTED FERTILIZATION PROGRAM

First Application		Second Application		Third Application		Fourth Application	
#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer
8	16-4-8	8	16-4-8	6	21-3-7		

Pauric McGroary

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Pauric McGroary

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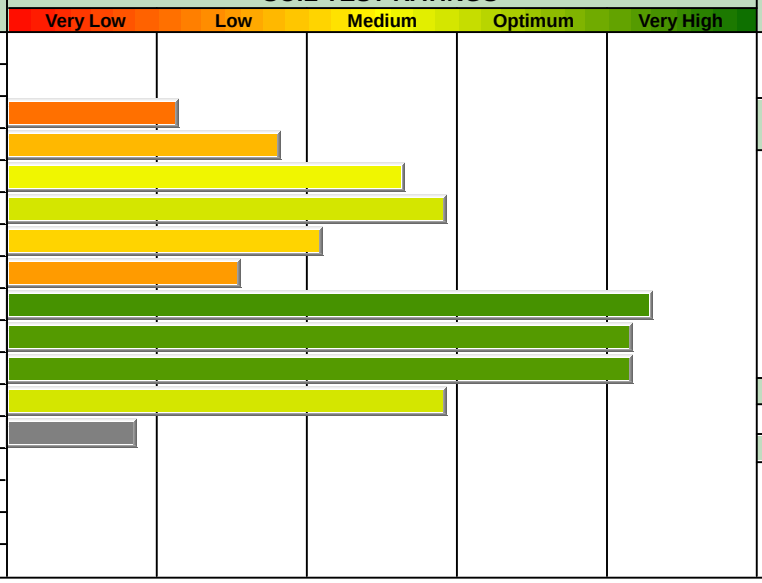
3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC PO:	Report No: 14-076-0509 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 Date Analysis : 03/18/2014 Page : 3 of 4

Lab Number : 03211 **Field Id :** **Sample Id :** T2

Test	Results
Soil pH	5.9
Buffer pH	6.82
Phosphorus (P)	13 ppm
Potassium (K)	75 ppm
Calcium (Ca)	827 ppm
Magnesium (Mg)	115 ppm
Sulfur (S)	8 ppm
Boron (B)	0.5 ppm
Copper (Cu)	3.9 ppm
Iron (Fe)	127 ppm
Manganese (Mn)	61 ppm
Zinc (Zn)	3.4 ppm
Sodium (Na)	23 ppm
Soluble Salts	
Organic Matter	4.4 % ENR 129
Nitrate Nitrogen	

SOIL TEST RATINGS



Calculated Cation Exchange Capacity

6.5 meq/100g

Calculated Cation Saturation	
%K	3.0
%Ca	63.6
%Mg	14.7
%H	17.2
Hmeq	1.1
%Na	1.5

K : Mg Ratio	Ca : Mg Ratio
0.20	4.33

SOIL FERTILITY GUIDELINES

Crop : Lawn **Rec Units:** LB/1000 SF

(lbs)	LIME (tons)	N	P_2O_5	K_2O	Mg	S	B	Cu	Mn	Zn	Fe
25		3.5	3.0	3.0	0	0.63	0	0	0	0	0
Crop :								**Rec Units:**			

Comment :

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3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC PO:	Report No: 14-076-0509 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 Date Analysis : 03/18/2014 Page : 4 of 4

Lab Number : 03211 **Field Id :** **Sample Id :** T2

SUGGESTED FERTILIZATION PROGRAM

First Application		Second Application		Third Application		Fourth Application	
#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer
8	16-4-8	8	16-4-8	6	21-3-7		

Comments:

Lawn

Limestone application is targeted to bring soil pH to 6.2.

Pauric McGroary

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Pauric McGroary

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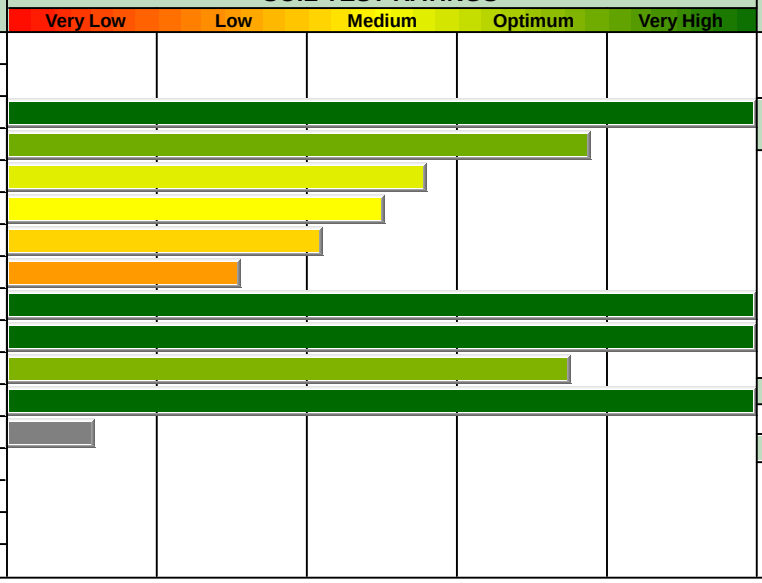
3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC PO:	Report No: 14-076-0510 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 Date Analysis : 03/18/2014 Page : 1 of 8

Lab Number : 03212 **Field Id :** **Sample Id :** T3

Test	Results
Soil pH	5.9
Buffer pH	6.79
Phosphorus (P)	253 ppm
Potassium (K)	159 ppm
Calcium (Ca)	1033 ppm
Magnesium (Mg)	121 ppm
Sulfur (S)	8 ppm
Boron (B)	0.5 ppm
Copper (Cu)	6.1 ppm
Iron (Fe)	496 ppm
Manganese (Mn)	43 ppm
Zinc (Zn)	24.5 ppm
Sodium (Na)	20 ppm
Soluble Salts	
Organic Matter	4.9 % ENR 137
Nitrate Nitrogen	

SOIL TEST RATINGS



Calculated Cation Exchange Capacity

8.0 meq/100g

Calculated Cation Saturation

%K	5.1
%Ca	64.6
%Mg	12.6
%H	17.3
Hmeq	1.4
%Na	1.1

K : Mg Ratio 0.40

Ca : Mg Ratio 5.13

SOIL FERTILITY GUIDELINES

Crop : Bermudagrass Athl. Field **Rec Units:** LB/1000 SF

(lbs)	LIME (tons)	N	P_2O_5	K_2O	Mg	S	B	Cu	Mn	Zn	Fe
30		3.5	0	2.0	0	0.63	0	0	0	0	0

Crop : **Rec Units:**

Comment :

Pauric McGroary

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3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	Report No: 14-076-0510
STANTEC	STANTEC	Cust No: 78538
ALEX FORASTE		Date Printed: 03/18/2014
1011 BOULDERS SPRING DRIVE		Date Received : 03/17/2014
SUITE 225		Date Analysis : 03/18/2014
RICHMOND VA 23225	PO:	Page : 2 of 8

Lab Number : 03212 **Field Id :** **Sample Id :** T3

SUGGESTED FERTILIZATION PROGRAM

First Application		Second Application		Third Application		Fourth Application	
#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer
10	10-0-20	6	21-0-0	6	21-0-0		

Comments:

Bermudagrass Athl. Field

Limestone application is targeted to bring soil pH to 6.2.

Pauric McGroary

Analysis prepared by: A&L Eastern Laboratories, Inc.

Pauric McGroary

A&L Eastern Laboratories

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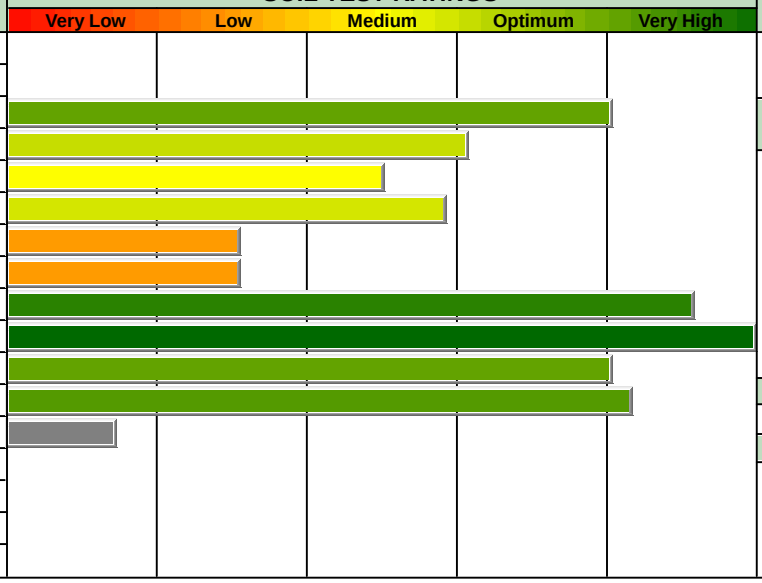
3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC PO:	Report No: 14-076-0510 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 Date Analysis : 03/18/2014 Page : 3 of 8

Lab Number : 03213 **Field Id :** **Sample Id :** T4

Test	Results
Soil pH	5.8
Buffer pH	6.84
Phosphorus (P)	111 ppm
Potassium (K)	121 ppm
Calcium (Ca)	583 ppm
Magnesium (Mg)	85 ppm
Sulfur (S)	6 ppm
Boron (B)	0.5 ppm
Copper (Cu)	4.8 ppm
Iron (Fe)	462 ppm
Manganese (Mn)	51 ppm
Zinc (Zn)	10.4 ppm
Sodium (Na)	15 ppm
Soluble Salts	
Organic Matter	2.5 % ENR 93
Nitrate Nitrogen	

SOIL TEST RATINGS



Calculated Cation Exchange Capacity

4.9 meq/100g

Calculated Cation Saturation	
%K	6.3
%Ca	59.5
%Mg	14.5
%H	19.2
Hmeq	0.9
%Na	1.3

K : Mg Ratio	Ca : Mg Ratio
0.44	4.10

SOIL FERTILITY GUIDELINES

Crop : Bermudagrass Athl. Field **Rec Units:** LB/1000 SF

(lbs)	LIME	(tons)	N	P_2O_5	K_2O	Mg	S	B	Cu	Mn	Zn	Fe
20			3.5	0	4.0	0	0.69	0	0	0	0	0

Crop : **Rec Units:**

Comment :

Pauric McGroary

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3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	Report No: 14-076-0510
STANTEC	STANTEC	Cust No: 78538
ALEX FORASTE		Date Printed: 03/18/2014
1011 BOULDERS SPRING DRIVE		Date Received : 03/17/2014
SUITE 225		Date Analysis : 03/18/2014
RICHMOND VA 23225	PO:	Page : 4 of 8

Lab Number : 03213 **Field Id :** **Sample Id :** T4

SUGGESTED FERTILIZATION PROGRAM

First Application		Second Application		Third Application		Fourth Application	
#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer
10	10-0-20	6	21-0-0	6	21-0-0		

Comments:

Bermudagrass Athl. Field

Limestone application is targeted to bring soil pH to 6.2.

Pauric McGroary

Analysis prepared by: A&L Eastern Laboratories, Inc.

Pauric McGroary

A&L Eastern Laboratories

7621 Whitepine Road Richmond, Virginia 23237 (804) 743-9401 Fax (804) 271-6446

www.aleastern.com

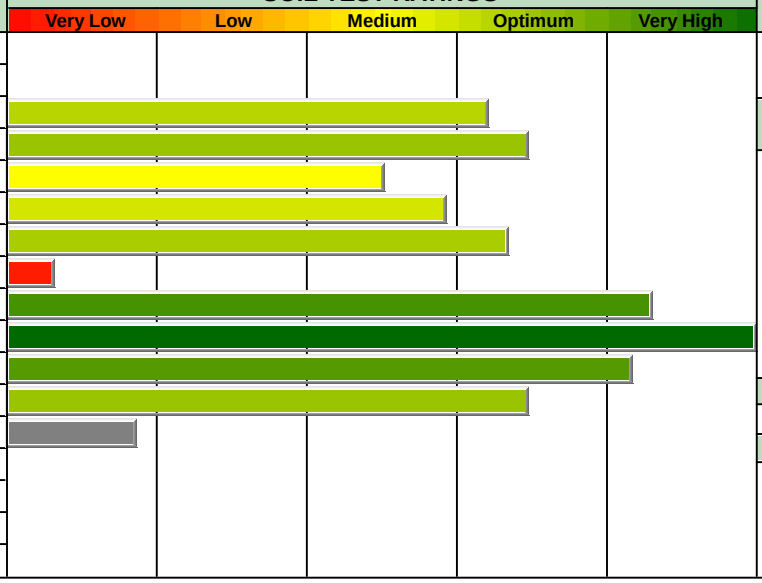
3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC PO:	Report No: 14-076-0510 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 Date Analysis : 03/18/2014 Page : 5 of 8

Lab Number : 03214 **Field Id :** **Sample Id :** T5

Test	Results
Soil pH	5.9
Buffer pH	6.85
Phosphorus (P)	63 ppm
Potassium (K)	143 ppm
Calcium (Ca)	559 ppm
Magnesium (Mg)	82 ppm
Sulfur (S)	15 ppm
Boron (B)	0.1 ppm
Copper (Cu)	3.9 ppm
Iron (Fe)	415 ppm
Manganese (Mn)	60 ppm
Zinc (Zn)	5.8 ppm
Sodium (Na)	16 ppm
Soluble Salts	
Organic Matter	3.4 % ENR 111
Nitrate Nitrogen	

SOIL TEST RATINGS



Calculated Cation Exchange Capacity

4.7 meq/100g

Calculated Cation Saturation	
%K	7.8
%Ca	59.5
%Mg	14.5
%H	17.2
Hmeq	0.8
%Na	1.5

K : Mg Ratio	Ca : Mg Ratio
0.54	4.10

SOIL FERTILITY GUIDELINES

Crop : Bermudagrass Athl. Field **Rec Units:** LB/1000 SF

(lbs)	LIME	(tons)	N	P_2O_5	K_2O	Mg	S	B	Cu	Mn	Zn	Fe
20			3.5	0.5	3.0	0	0.46	0	0	0	0	0

Crop : **Rec Units:**

Comment :

Pauric McGroary

Analysis prepared by: A&L Eastern Laboratories, Inc. Pauric McGroary

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3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	Report No: 14-076-0510
STANTEC	STANTEC	Cust No: 78538
ALEX FORASTE		Date Printed: 03/18/2014
1011 BOULDERS SPRING DRIVE		Date Received : 03/17/2014
SUITE 225		Date Analysis : 03/18/2014
RICHMOND VA 23225	PO:	Page : 6 of 8

Lab Number : 03214 **Field Id :** **Sample Id :** T5

SUGGESTED FERTILIZATION PROGRAM

First Application		Second Application		Third Application		Fourth Application	
#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer
8	16-4-8	8	16-4-8	6	21-3-7		

Comments:

Bermudagrass Athl. Field

Limestone application is targeted to bring soil pH to 6.2.

Pauric McGroary

Analysis prepared by: A&L Eastern Laboratories, Inc.

Pauric McGroary

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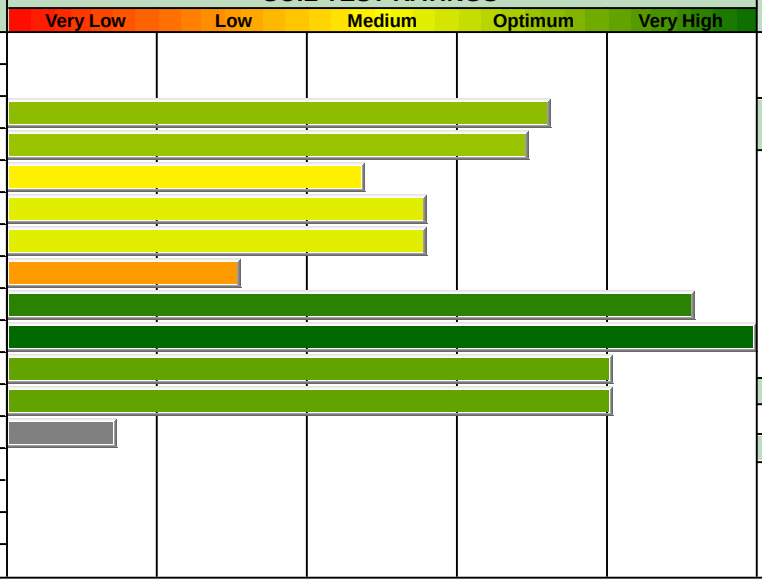
3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC PO:	Report No: 14-076-0510 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 Date Analysis : 03/18/2014 Page : 7 of 8

Lab Number : 03216 **Field Id :** **Sample Id :** T6

Test	Results
Soil pH	5.7
Buffer pH	6.80
Phosphorus (P)	81 ppm
Potassium (K)	143 ppm
Calcium (Ca)	699 ppm
Magnesium (Mg)	102 ppm
Sulfur (S)	12 ppm
Boron (B)	0.5 ppm
Copper (Cu)	4.8 ppm
Iron (Fe)	431 ppm
Manganese (Mn)	56 ppm
Zinc (Zn)	8.1 ppm
Sodium (Na)	17 ppm
Soluble Salts	
Organic Matter	4.1 % ENR 123
Nitrate Nitrogen	

SOIL TEST RATINGS



Calculated Cation Exchange Capacity

6.1 meq/100g

Calculated Cation Saturation

%K	6.0
%Ca	57.3
%Mg	13.9
%H	20.9
Hmeq	1.3
%Na	1.2

K : Mg Ratio 0.43

Ca : Mg Ratio 4.12

SOIL FERTILITY GUIDELINES

Crop : Bermudagrass Athl. Field **Rec Units:** LB/1000 SF

(lbs)	LIME (tons)	N	P_2O_5	K_2O	Mg	S	B	Cu	Mn	Zn	Fe
35		3.5	0.5	3.0	0	0.53	0	0	0	0	0

Crop : **Rec Units:**

Comment :

Pauric McGroary

Analysis prepared by: A&L Eastern Laboratories, Inc. Pauric McGroary

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3/18/2014 **SOIL ANALYSIS**

Client :	Grower :	Report No: 14-076-0510
STANTEC	STANTEC	Cust No: 78538
ALEX FORASTE		Date Printed: 03/18/2014
1011 BOULDERS SPRING DRIVE		Date Received : 03/17/2014
SUITE 225		Date Analysis : 03/18/2014
RICHMOND VA 23225	PO:	Page : 8 of 8

Lab Number : 03216 **Field Id :** **Sample Id :** T6

SUGGESTED FERTILIZATION PROGRAM

First Application		Second Application		Third Application		Fourth Application	
#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer	#/1000 Sq. Ft.	Fertilizer
8	16-4-8	8	16-4-8	6	21-3-7		

Comments:

Bermudagrass Athl. Field

Limestone application is targeted to bring soil pH to 6.2.

Pauric McGroary

Analysis prepared by: A&L Eastern Laboratories, Inc.

Pauric McGroary

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SOIL ANALYSIS

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC	Report No: 14-076-0511 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 PO: Page : 1 of 3

Lab Number : 03217 **Field Id :** **Sample Id :** B1

Test	Method	Results
Soil pH	1:1	7.0
Buffer pH		
Phosphorus (P)	M3	68 ppm
Potassium (K)	M3	268 ppm
Calcium (Ca)	M3	2867 ppm
Magnesium (Mg)	M3	255 ppm
Sulfur (S)	M3	9 ppm
Boron (B)	M3	1.7 ppm
Copper (Cu)	M3	3.6 ppm
Iron (Fe)	M3	184 ppm
Manganese (Mn)	M3	70 ppm
Zinc (Zn)	M3	10.8 ppm
Sodium (Na)	M3	19 ppm
Soluble Salts		
Organic Matter	LOI	8.8 % ENR 150
Nitrate Nitrogen		

SOIL TEST RATINGS

Calculated Cation Exchange Capacity

17.2
meq/100g

Calculated Cation Saturation

%K	4.0
%Ca	83.3
%Mg	12.4
%H	0.0
Hmeq	0.0
%Na	0.5

K : Mg Ratio
0.32

Ca : Mg Ratio
6.72

SOIL FERTILITY GUIDELINES

Crop : Shrubs **Yield Goal :** 0 **Rec Units:** LB/1000 SF

(lbs)	LIME	(tons)	N	P_2O_5	K_2O	Mg	S	B	Cu	Mn	Zn	Fe
0			2.5	0.5	0	0	0.47	0	0	0	0	0

Crop : **Rec Units:**

Comments :

M3 - Mehlich 3 BPH - Lime Index LOI - Loss On Ignition 1:1 - Water pH
Analysis prepared by: A&L Eastern Laboratories, Inc.

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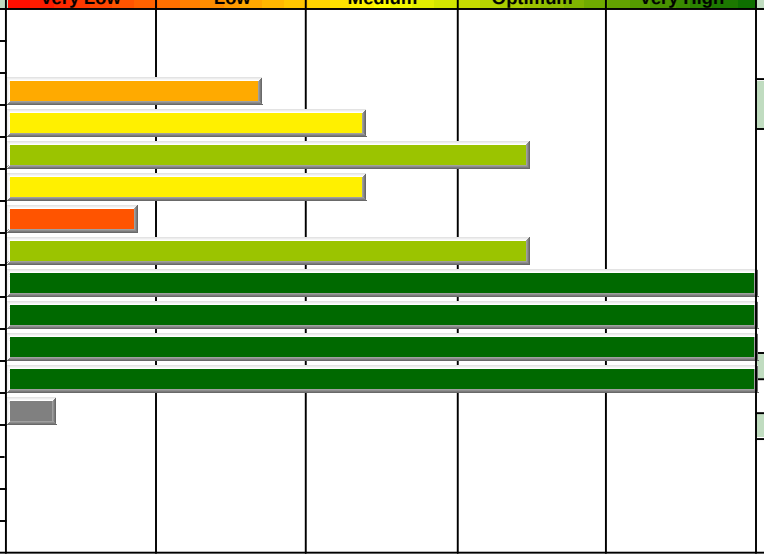
SOIL ANALYSIS

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC	Report No: 14-076-0511 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 PO: Page : 2 of 3

Lab Number : 03218 **Field Id :** **Sample Id :** B2

Test	Method	Results
Soil pH	1:1	6.5
Buffer pH		
Phosphorus (P)	M3	24 ppm
Potassium (K)	M3	144 ppm
Calcium (Ca)	M3	2594 ppm
Magnesium (Mg)	M3	242 ppm
Sulfur (S)	M3	8 ppm
Boron (B)	M3	1.9 ppm
Copper (Cu)	M3	6.6 ppm
Iron (Fe)	M3	240 ppm
Manganese (Mn)	M3	111 ppm
Zinc (Zn)	M3	32.2 ppm
Sodium (Na)	M3	17 ppm
Soluble Salts		
Organic Matter	LOI	7.9 % ENR 150
Nitrate Nitrogen		

SOIL TEST RATINGS



Calculated Cation Exchange Capacity

16.7
meq/100g

Calculated Cation Saturation

%K	2.2
%Ca	77.7
%Mg	12.1
%H	7.4
Hmeq	1.2
%Na	0.4

K : Mg Ratio
0.18

Ca : Mg Ratio
6.42

SOIL FERTILITY GUIDELINES

Crop : Shrubs **Yield Goal :** 0 **Rec Units:** LB/1000 SF

(lbs)	LIME	(tons)	N	P_2O_5	K_2O	Mg	S	B	Cu	Mn	Zn	Fe
0			2.5	2.5	3.0	0	0.49	0	0	0	0	0

Crop : **Rec Units:**

Comments :

M3 - Mehlich 3 BPH - Lime Index LOI - Loss On Ignition 1:1 - Water pH
Analysis prepared by: A&L Eastern Laboratories, Inc.

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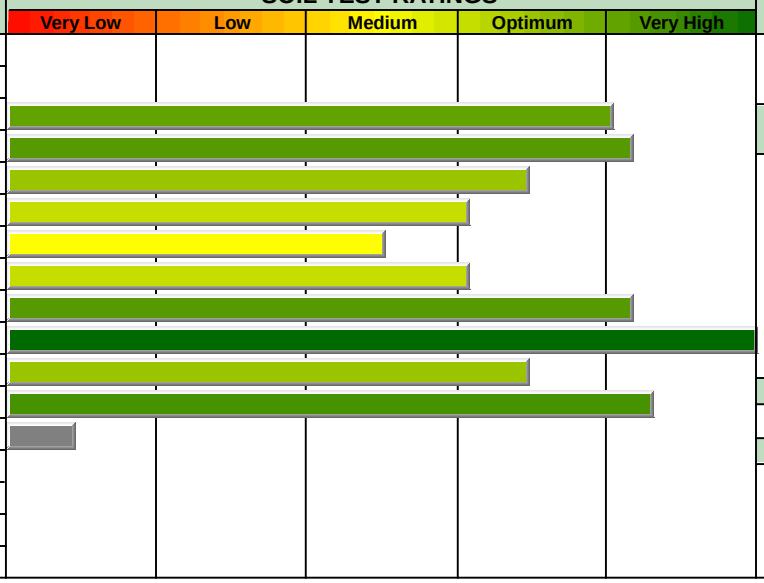
SOIL ANALYSIS

Client :	Grower :	
STANTEC ALEX FORASTE 1011 BOULDERS SPRING DRIVE SUITE 225 RICHMOND VA 23225	STANTEC	Report No: 14-076-0511 Cust No: 78538 Date Printed: 03/18/2014 Date Received : 03/17/2014 PO: Page : 3 of 3

Lab Number : 03219 **Field Id :** **Sample Id :** RG1

Test	Method	Results
Soil pH	1:1	7.4
Buffer pH		
Phosphorus (P)	M3	102 ppm
Potassium (K)	M3	244 ppm
Calcium (Ca)	M3	2262 ppm
Magnesium (Mg)	M3	284 ppm
Sulfur (S)	M3	21 ppm
Boron (B)	M3	1.4 ppm
Copper (Cu)	M3	3.7 ppm
Iron (Fe)	M3	166 ppm
Manganese (Mn)	M3	38 ppm
Zinc (Zn)	M3	10.8 ppm
Sodium (Na)	M3	24 ppm
Soluble Salts		
Organic Matter	LOI	6.6 % ENR 150
Nitrate Nitrogen		

SOIL TEST RATINGS



Calculated Cation Exchange Capacity

14.4
meq/100g

Calculated Cation Saturation

%K	4.3
%Ca	78.5
%Mg	16.4
%H	0.0
Hmeq	0.0
%Na	0.7

K : Mg Ratio
0.26

Ca : Mg Ratio
4.79

SOIL FERTILITY GUIDELINES

Crop : Shrubs **Yield Goal :** 0 **Rec Units:** LB/1000 SF

(lbs)	LIME	(tons)	N	P_2O_5	K_2O	Mg	S	B	Cu	Mn	Zn	Fe
0			2.5	0	0	0	0.17	0	0	0	0	0

Crop : **Rec Units:**

Comments :

M3 - Mehlich 3 BPH - Lime Index LOI - Loss On Ignition 1:1 - Water pH
Analysis prepared by: A&L Eastern Laboratories, Inc.

Appendix C – Equipment Calibration Records

Appendix D – Log of Plan Revision

Appendix D – Log of Plan Revision
March 30, 2014

LOG OF PLAN REVISIONS

Revision Date	Revised By	Revision

Appendix E – *A Virginian's Year-Round Guide to Yard Care*

A Virginian's Year-Round Guide to Yard Care

Tips and techniques for healthy lawns and gardens

Contents

Understanding Plant Nutrition	3–4
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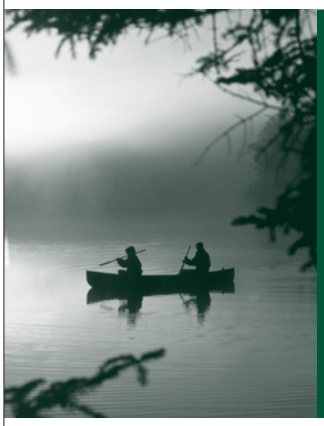
This project was funded by the Environmental Protection Agency's Chesapeake Bay Program and the Virginia Department of Conservation and Recreation (DCR).

The Health of Virginia's Waterways Begins in Your Backyard



Green lawns, tall trees, bright flowers—Virginians love the outdoors, even when it's just the backyard. The way you maintain your yard, however, can have surprising impacts on the natural world.

You probably know that pesticides and herbicides are powerful chemicals that can injure wildlife if overused. But, did you know that overfertilization and erosion are major threats to Virginia waterways and wildlife?

Carried with rainwater into lakes, rivers or the Chesapeake Bay, nitrogen from fertilizer feeds toxic algae to create dead zones where nothing else can survive. Sediment from erosion clouds waterways, preventing the growth of aquatic grasses—the base of the food chain for many fish and waterfowl.

The good news is that you can help protect Virginia's waterways and wildlife and still enjoy a vibrant, healthy yard. This guide will help.

Arranged in a convenient seasonal format, it will help you decide what to plant and when to fertilize; it will help you restore ailing plants and enrich your soil. Many of the steps outlined in the guide will save you both time and money, making it even easier to enjoy your lawn or garden.

Fertilizers are not plant food! This is a misnomer. Plants produce their own food using water, carbon dioxide and energy from the sun.

The Six Macronutrients

Plants need 17 nutrients for health but these six are the most important.

Nitrogen (N): Building block for proteins, enzymes, chlorophyll and growth regulators; excess produces excess leaf growth with little fruit

Phosphorus (P): Used in metabolism, respiration and photosynthesis; often lacking in acid and alkaline soils

Potassium (K): Aids in starch formation, water regulation, disease resistance, chlorophyll development and tuber formation; found in potash

Magnesium (Mg): Building block for chlorophyll, an enzyme activator; excess interferes with calcium

Calcium (Ca): Needed for cell wall structure and cell division, an enzyme activator; excess blocks micronutrient absorption

Sulfur (S): Component of proteins and amino acids, important in respiration; generally present in Virginia soil

Fertilizer Analysis

All fertilizers are labeled with three numbers. These three numbers give the percentage by weight of nitrogen (N), phosphate (P_20_5) and potash (K_20). Examples of commonly used fertilizers are 23-3-7 and 20-10-5. An “incomplete” fertilizer lacks one of the three nutrients.

Cottonseed meal, blood meal, bone meal, hoof and horn meal, fish emulsion and manures are examples of organic fertilizers. Organic fertilizers may contain lower concentrations of nutrients, but they perform important functions that synthetic formulas do not, improving the physical structure of your soil and promoting beneficial bacterial and fungal activity.

Effects of Over-Fertilizing

Not only is over-fertilizing a waste of time and money, it can do serious harm to the plants you intend to help. Fertilizers are salts, much like table salt. If tender plant roots are close to fertilizer granules, water is drawn away from these roots and they dehydrate. Over-fertilizing trees or shrubs, particularly with slow-release fertilizer, can also cause them to keep growing into the fall when they should be hardening off for winter.

TIP:

Organic fertilizers are a source of slowly available, water-insoluble nitrogen (WIN). These slow-release fertilizers require fewer applications.

Excess fertilizer poses a serious threat to water quality. Rainwater runoff carries it into streams and lakes, where it promotes the growth of harmful algae. Excess fertilizer can also leach into the groundwater supply.

Avoid getting fertilizer on sidewalks and driveways so it is not washed into storm drains that flow into streams. To minimize leaching and runoff, provide your soil with holding power by planting groundcovers in bare spots.

Nutrient Troubleshooting for the Garden

Here are some common symptoms of nutrient deficiency. It is recommended that you test your soil and consult a professional before beginning fertilizer treatments.

Problem	Missing Nutrient
Yellowing, especially of older leaves	N
Yellowing of new growth	S
Yellowing between veins	K
Yellow leaf edges	Mg
Leaves turn lighter green	N
Leaves turn brown or purple	P
Brown leaf tips	P
Brown leaf edges	K
Tendency to wilt	K
Cupping of mature leaves	Ca
New leaves irregularly shaped	Ca
Reduced flowering	P
Reduced seed production	Mg
Inhibited bud growth	Ca

Testing Your Soil

Winter

It is important to apply the optimum amounts of fertilizer, lime and other soil amendments and to do so at the proper time of year. A soil test supplies valuable guidance for improving your soil. Perform a soil test every 3 to 4 years. If possible, test in the fall so that lime and other soil amendments can alter pH over the winter.

Types of tests

Soil test kits are available from your local Virginia Cooperative Extension office (find your office at www.ext.vt.edu). Follow the instructions when collecting a sample, complete the enclosed form, then mail the kit to Virginia Tech according to the instructions provided. Your results will arrive by mail, along with recommendations on what fertilizer or other soil amendments to use for specific plants. Results show pH and availability of phosphorus, potassium, calcium and magnesium.

Some nurseries also sell soil test kits for at-home use. Private testing companies can provide detailed reports but may be expensive.

The accuracy of any soil test is a reflection of the soil sample. Be sure your sample is representative of the area to be treated. Using a stainless steel or chrome-plated shovel or spade, sample the soil from 10 random areas, avoiding border areas such as those near roads, compost or brush piles, or under eaves. Place the samples in a clean pail or container and mix them thoroughly, then submit the combined soil for testing.

How deep should I dig for a soil sample?

Established lawns	2–4 inches
Vegetable and flower gardens	6–8 inches or tillage depth
Trees and shrubs	6 inches

Common Soil Types in Virginia

- Sandy soil is coarse and grainy. Sandy soil drains well but dries out rapidly.
- Clay soil is very thick, like putty. It holds water like a sponge, but when it does dry out becomes hard and very solid.
- Silty soil is between sandy and clay soil. It holds water but does not dry into a hard, solid mass.
- Loam is the ideal mixture of sand, clay and silt. Through the addition of organic amendments, loam can become the perfect soil for your vegetable garden.

TIP:

Do not use brass, bronze or galvanized tools to collect soil samples because they will contaminate samples with copper and/or zinc.

Erosion Control

Winter

Soil erosion begins when rainfall detaches soil particles. Runoff then carries the particles away.

Erosion robs your lawn or garden of the nutrients and organic material your plants need. It also contributes to water pollution. Soil is the largest volume pollutant in Virginia waterways, and most of the phosphate and pesticides in our waters arrive attached to soil particles.

Signs of Erosion

- Exposed tree roots or stones
- Small rills or gullies
- Silt accumulation in low areas
- Soil splashed on windows and outside walls
- Widening or deepening of stream channels

The destructive process of erosion can be controlled. Reducing the quantity and velocity of runoff will abate erosion. This may require regrading steep slopes, building terraces or installing drainage pipes. Groundcovers are a more cost-effective way to slow erosion. These plants cover the ground surface so that rain does not directly strike the soil. Their roots hold the soil in place and absorb water and nutrients.

Turfgrass is one important type of groundcover, but newly cut banks and slopes greater than 12 percent are best treated with groundcovers other than sod. Around buildings, groundcovers are superior to paving or structural controls for reducing heat, glare, noise and dust.

Groundcovers can:

- Conserve soil moisture and lower soil temperatures during periods of extreme heat.
- Reduce lawn maintenance and fill narrow, odd-shaped areas where mowing and edging might be difficult.
- Obstruct foot traffic without impeding view.
- Produce interesting patterns with variation in height, texture and color.

Significant maintenance is necessary for the first one to three years after planting until groundcovers become established. Use organic mulch, such as wood chips or pine straw, to control weeds in your groundcover plantings.

TIP:

Cover pathways and high-traffic areas in your yard with a permeable surface such as pea gravel or wood chips. More attractive than exposed dirt, these surfaces allow your soil to absorb water and keep mud out of your house.

Non-turf Groundcovers

Allegheny spurge, *Pachysandra procumbens*
Wild ginger, *Asarum canadense*
Green and Gold, *Chrysogonum virginianum*
Eastern foam flower, *Tiarella cordifolia*
Eastern alumroots, *Heuchera spp.*
Woodland phlox, *Phlox divaricata*
Creeping phlox, *Phlox stolonifera*

Rain Gardens

Puddles in your back yard? Rain gardens are an attractive solution to drainage and erosion problems. Rain gardens are slight depressions planted with hardy perennials that soak up more stormwater than a typical lawn. Besides absorbing pesticides and fertilizers that would otherwise enter waterways, rain gardens create habitat for songbirds and butterflies. Once established, they require minimal maintenance. In Virginia, most rain gardens consist of flood- and drought-tolerant trees and shrubs (red maples, river birch, winterberry) surrounded by a strip of grasses, ferns and flowers (cardinal flower, Virginia bluebells, sensitive fern). Some include a shallow, pebble-bottomed ponding area near the center. Hardwood mulch will keep your rain garden weed-free and improve water absorption and filtration.

Tilling the Soil

Tilling or plowing your garden correctly preserves the soil and its fertility, enhancing the absorption of rainfall and protecting local streams from sediment runoff.

When to Till

Gardeners often wonder whether to till in the spring or in the fall. Spring plowing is better for sandy soils. In most of Virginia, however, working the soil in the fall is far more beneficial:

- Turning under organic matter in the fall results in better decomposition because there are more warm days for the process to take place.
- Incorporating limestone or rock fertilizers in the fall gives them time to interact chemically with the soil.
- Insects and perennial weeds are reduced by exposing soil and roots to harsh winter weather.
- Finally, tilled soil retains more moisture by trapping snow between its furrows.

Steep Slopes

Fall plowing alone is not recommended for hillside garden plots. Sloped soil left exposed all winter is subject to erosion. Till sloped areas, then plant a winter cover crop of rye and hairy vetch. Turn the green cover crop under in the spring.

Minimum-till Gardening

Vegetable gardeners: consider a move to minimum-till gardening, also known as conservation tillage. This method is ideal for transplants, and you can start on a test plot within your garden.

1. In the fall, till under summer crop wastes. Remove tomato vines and corn stalks to make tilling easier.
2. Plant a combination cover crop such as rye and hairy vetch. Use 2 pounds of winter rye grain and 0.75 pounds of hairy vetch seed (coated with a Rhizobium innouculant) per 1000 square feet.
3. In the spring, cut the cover crop to a manageable level with a scythe or string-line trimmer. Rake the clippings aside and save them. Use a lawn mower to completely trim the cover crop to the ground.
4. A week later, mow the area again. Now your area is ready for planting. Dig a hole for each plant, pulling out the surrounding vegetation. Mulch the area between plants with the clippings reserved from the week before.
5. As the plants grow, add mulch or weed as needed.

Fertilizing Your Vegetables

Spring

Fertilizers are designed to supplement the nutrients already present in your soil. Too much fertilizer can damage roots, and the excess can pollute groundwater or local waterways.

Different Plants, Different Needs

Proper use of nutrients, particularly nitrogen, can control the rate and character of a plant's growth, but certain crops require more of some nutrients than others. If tomatoes are fertilized heavily with nitrogen into the summer, the plants may be all vine and no fruit. This is also the case with potatoes, which will produce vines instead of tubers. Corn, however, may require nitrogen fertilization every month.

Remember that a nitrogen application will have its greatest effect three to four weeks after application. Slow-release fertilizers or heavy amounts of manure will keep plants producing leaves or vines, with fruit or vegetables developing very late in the season.

Application Methods

Broadcasting. Fertilizer is spread over the growing area then left to filter into the soil or incorporated into the soil with a tiller or spade.

Banding. Narrow bands of fertilizer are applied in furrows 2 to 3 inches from the seeds or plants and 1 to 2 inches deeper. If the fertilizer band is placed too close to the seeds, it will burn the roots of the seedlings. For plants widely spaced, such as tomatoes, fertilizers can be placed in a circle 4 inches from the plant base. Banding is a good way to satisfy the needs of plants like tomatoes for phosphorus as the first roots develop.

Side Dressing. Dry fertilizer is applied as a side dressing after plants are up and growing. Scatter fertilizer on both sides of the row, 6 to 8 inches from the plants. Rake it into the soil and water thoroughly.

Foliar Feeding. Nutrients applied to foliage are absorbed and used by the plant quite rapidly. Absorption begins within minutes and is complete within two days. Foliar feeding is best when your soil is too cold for plants to extract dry fertilizer. Foliar nutrition can be a supplement at a critical time, but cannot replace soil fertilization.

TIP:

Plant crops with similar fertilizer needs close together to avoid improper application rates as nitrogen enters the soil.

Irrigation

Adequate soil moisture is essential for good crop growth. A healthy plant is 75 to 90 percent water; water is necessary for photosynthesis, provides rigidity to plant tissues and transports nutrients and sugars to various parts of the plant.

There are several options for watering plants: a watering can, a garden hose with a spray attachment or portable lawn sprinkler, a perforated soaker hose, or an irrigation system.

Careful irrigation helps local streams and reservoirs by reducing fertilizer and pesticide runoff and conserving water.

When to Water your Lawn

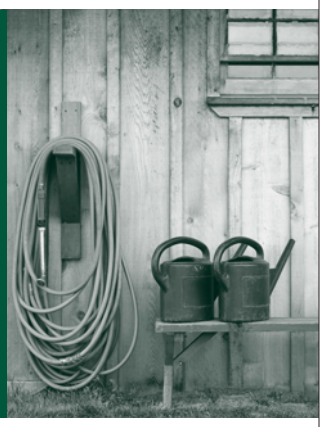
Your lawn can use an inch or more of water per week in hot, dry weather. Water the lawn when the soil begins to dry out but before the grass wilts. Here's a tip: Look at your footprints. On a thirsty lawn, footprints will make a lasting imprint instead of bouncing back.

Basic Principles for Watering Lawns and Gardens

- Morning watering is preferred. Do not sprinkle foliage in the evening. Wet foliage overnight may encourage disease. Avoid watering during the heat of the day, as water will be lost to evaporation.
- Apply water at a rate of half an inch per hour. Faster application will cause runoff, wasting water and money. Test the application rate for a sprinkler by placing small cans at within the sprinkler's reach, and checking the level of water in them at 15-minute intervals.

TIP:

Trickle or drip irrigation systems and soaker hoses are the most efficient ways to water your plants; a timer even allows your system to water in the morning, while you're getting ready for work.



- When using an oscillating lawn sprinkler, place the sprinkler on a platform higher than your garden plants to prevent water from being diverted by their leaves. Water evenly by moving the sprinkler often and overlapping about half of each spray pattern.
- Perforated soaker hoses should be placed with holes down along one side of the row of plants. Semi-permanent soaker hoses can be placed underneath mulch.
- Frequent, light waterings encourage shallow rooting, which causes plants to suffer more during drought. On the other hand, too much water can be as damaging to plants as too little.

When to Water Vegetables

Be sure to water the following vegetables at these critical phases of development.

Asparagus	Spear production, fern development
Broccoli, cabbage, cauliflower	Head development
Beans, peas	Pod filling
Carrots	Seed emergence, root development
Corn	Silking, tasseling, ear development
Eggplant, tomatoes cucumber, melons	Flowering, fruiting
Lettuce	Throughout head development

Selecting Turfgrass

The first step toward a beautiful, healthy lawn is to select the right turfgrass variety—one that is adapted to your climate and maintenance preferences. Cool season grasses provide winter lawn color in most areas of Virginia, whereas warm season grasses go dormant after the first hard frost, requiring less maintenance and water.

In order to flourish, turfgrass requires a soil depth of six to eight inches for good root growth, a soil pH of approximately 6.2, about an inch of water weekly and adequate sunshine. If your yard doesn't meet these criteria, consider an alternative groundcover (see page 7).

Turfgrass Varieties for Virginia

In the Northern Piedmont and the Blue Ridge Mountains, the cool-season species Kentucky bluegrass and tall fescue generally produce the best year-round lawns. In the Southern Piedmont and Eastern Virginia, tall fescue is preferable. For a shade-tolerant cool-season grass, use fine leaf fescue (creeping red fescue, hard fescue, chewings fescue or sheep fescue).

Warm-season bermudagrass and zoysiagrass produce a dense sod like Kentucky bluegrass. Select a winter-hardy cultivar of bermudagrass if you live in northern Virginia. Also be aware that bermudagrass spreads rapidly, often invading shrub or garden beds.

Mow Regularly

Proper mowing is important for a well-kept lawn. Although recommended cutting heights vary by type of grass, you should cut no more than one-third of the plant at any mowing. For cool-season grasses, increase mowing height during the summer to reduce stress on the turf.

Bagging grass clippings robs your lawn of valuable nutrients. Clippings left on a properly mowed lawn act as fertilizer. During peak growing periods, usually in April, it may be necessary to collect grass clippings. In this case, add them to your compost pile to produce mulch.

TIP:

To determine the pH of your soil, obtain a soil test kit from your local Virginia Cooperative Extension office. The soil report will also tell you what kind of fertilizer to use and how much.

Recommended Turfgrass Mowing Heights (inches)

Kentucky bluegrass	1.5–2.5
Tall fescue	2–3
Fine fescue	2–3
Perennial ryegrass	1.5–2.5
Bermudagrass	0.5–1
Zoysiagrass	0.5–1

Fertilize in the Fall

Fall fertilizer application is the most beneficial to cool-season grasses in Virginia. Applications of fertilizer containing nitrogen should be made from September through November. By leaving grass clippings on the lawn all summer, you can reduce the need for artificial nitrogen 20 to 30 percent after the first year and 35 to 45 percent after the second year.

Water if Needed

Except during the most severe drought, grasses common to Virginia will survive without watering. If you wish to maintain a green yard in dry weather, add about 1 inch of water a week, preferably in the early morning and only as much as will soak into the ground. Water that is allowed to run off carries with it nutrients that are valuable to the lawn but harmful to streams and reservoirs.

Save Time and Money

By leaving their grass clippings on the lawn rather than bagging them as trash, homeowners in Virginia save more than time. Annual homeowner savings for a typical quarter-acre lot amount to $25 to $50 in fertilizer costs and $25 to $45 for plastic bags. In addition, you will help your local government keep a lid on refuse disposal costs. A typical quarter-acre lot generates 3,500 to 4,000 pounds of grass clippings a year. Disposing of them costs the homeowner $50 to $90 a year in public service charges, private collector fees or taxes.

Saving your Soil

What happens to soil nutrients during a drought? Nothing. The good news about drought is that it does not rob your soil of nutrients.

But, heavy rainfall after a dry period can wash away clay, and with it valuable nutrients and topsoil. To hold on to your soil:

- Incorporate organic matter into clays and other soil types to improve soil structure.
- Mulch your plants to conserve moisture and control erosion.
- Use trickle irrigation near the base of plants to reduce runoff.

Watering during a Drought

There is no substitute for water during a dry spell. However, you should adhere to local water restrictions, if applicable. Your water conservation ensures safe drinking water for your community.

Avoid afternoon watering, which results in a 20 to 25 percent loss of water through heat and evaporation. And if foliage is watered, it can create a magnifying-glass effect that burns leaf tissue. The best time to water is early morning, when humidity is high and moisture loss is minimal.

Watering in the evening prevents evaporation, but it increases the risk of fungal disease and damage from nocturnal insects searching for water.

Dormancy or Death?

When rainfall is sparse, Mother Nature has provided your lawn with a built-in protection plan: dormancy. Grass turns brown as moisture reserves dry up, but it is far from dead. By going into a dormant state, grass halts the process of photosynthesis. This is why grass grows at a slower pace in hot, dry periods. When rains do come, your grass will green up, especially fescues, bluegrass, zoysiagrass and bermudagrass.

Never apply fertilizer to a dormant lawn, because it could kill your grass.

TIP:

Restrict the use of herbicides to reduce stress on your lawn. Grass uses water to detoxify these chemicals, so avoid them during drought.

Pest Control

TIP:

Enlist the aid of wild birds in your garden. They feed on pest insects. Consider planting shrubs and trees with fruits that attract them–and distract them from your fruits and vegetables. You can protect ripening fruits and vegetables with bird netting.

The best way to control insects and disease is to prevent them before they get a foothold in your yard. A few important things to remember:

- Use native plants when possible, as these are most resistant to indigenous pests.
- Buy plants from a reputable grower who can assure you that they are pest-free; use disease-free, certified seed.
- Water in the morning. This allows plants to dry before the cool evening, making them less susceptible to disease. It also discourages the presence of many insects that feed at night.
- Avoid overcrowding in your garden beds. This will slow the spread of diseases and insects, giving you more time to deal with them.
- Weed your garden beds. Weeds and grasses often harbor pests. Organic mulches and fabric covers are extremely effective for weed control and also reduce soil splash, which can bring soil-borne diseases into contact with lower leaves.
- Avoid injury to plants. Broken limbs, cuts, bruises, cracks and insect damage are often sites of infection. Remove and dispose of diseased or infested leaves from as soon as you observe them. Remove severely damaged plants before they contaminate others.
- Inspect plants for egg clusters, beetles, caterpillars and other insects as often as possible. Hand-pick as many pests as you can. Avoid sprays until the population has reached a critical level.
- If slugs are a problem, try to create drier conditions. Placing diatomaceous earth, crushed eggshells and hydrated lime near plants may deter slug activity.

Using Pesticide and Herbicide

Before applying a pesticide, be certain to identify the target pest accurately. Also, make sure it is causing harm to your plants. Poor growing conditions (moisture or nutrient levels, severe weather) cause most plant problems, not pests.

Always read the label before applying chemicals in your yard. Select products targeted to the pest or weeds in your yard to avoid damaging beneficial insects or even your own flowers and vegetables.

Never spray chemicals near water, polluted runoff is a threat to your local water supply and to wildlife. Also avoid spraying on windy days and near paved surfaces.

Beneficial Bugs

Many insects prey on pest insects. Here are a few bugs you want to see in the yard and the pests they feed on.

Assassin bug, *Reduviidaye*	Aphids, caterpillars, potato beetles, Japanese beetles, leafhoppers, Mexican bean beetles
Damsel bug, *Nabidae*	Aphids, leafhoppers, mites, caterpillars
Big-eyed bug, *Lygaeidae*	Aphids, caterpillar eggs and larvae, immature bugs, leafhoppers, spider mites
Predacious stink bug, *Pentatomidae*	Potato beetles, caterpillar larvae
Syrphid fly larvae, *Syrphidae*	Aphids, mealybugs
Lady beetle, *Hippodamia convergens*	Aphids, mealybugs, spider mites
Green lacewing larvae, *Chrysopa camea*	Insect eggs, aphids, spider mites, thrips, leafhopper nymphs, caterpillar larvae
Trichogramma wasp, *Trichogrammatidae*	200 pest insect eggs including cutworms, corn borers, corn earworms, armyworms, codling moths, cabbage moths
Encarsia wasp, *Encyrtidae*	Greenhouse whiteflies

TIP:

Purchase only the pesticide, herbicide and fertilizer you need for one season to avoid the storage and disposal problems associated with strong chemicals. Never pour pesticide down a sink, toilet or storm drain.

Pest-Control Plants

Many plants produce natural chemicals that repel insects. When planted among flowers and vegetables, these plants help keep pests away.

Pest	Plant Repellent
Ant	Mint, tansy, pennyroyal
Aphids	Mint, garlic, chives, coriander, anise
Bean leaf beetle	Potato, onion, turnip
Codling moth	Common oleander
Colorado potato bug	Green beans, coriander, nasturtium
Cucumber beetle	Radish, tansy
Flea beetle	Garlic, onion, mint
Imported cabbage worm	Mint, sage, rosemary, hyssop
Japanese beetle	Garlic, larkspur, tansy, rue, geranium
Leaf hopper	Geranium, petunia
Mexican bean beetle	Potato, onion, garlic, radish, petunia, marigolds
Slugs	Prostrate rosemary, wormwood
Spider mites	Onion, garlic, cloves, chives
Squash bug	Radish, marigolds, tansy, nasturtium
Stink bug	Radish
Thrips	Marigolds
Tomato hornworm	Marigolds, sage, borage
Whitefly	Marigolds, nasturtium

Fertilizing Your Lawn

When the weather warms and spring is on the horizon, many people make plans to fertilize their lawns. However, spring may not be the best time to apply fertilizer. Be sure you apply the right kind of fertilizer, in the right amount, at the right time.

Selecting a Fertilizer

Before beginning a fertilization program, use a soil test to determine the fertility of your soil. The results will indicate the amounts of nutrients already present and the acidity (pH) of your soil.

Based on the results, choose a fertilizer with the appropriate amounts of nitrogen, phosphate and potash for your lawn. Acidic soils may need lime in addition to fertilizer (apply it in the fall so it can break down during the winter). Mature lawns generally require more nitrogen than phosphorus and potassium.

Applying at the Proper Time

Proper timing of fertilizer applications is different for warm-season and cool-season turfgrasses because of their different growth cycles. Most yards in Virginia are made up of cool-season grasses, including Kentucky bluegrass, tall fescue, perennial ryegrass and fine fescues (creeping red fescue, hard fescue, sheep fescue and chewings fescue). The best time to fertilize cool-season grasses is from mid-August through November. Warm-season grasses, including bermudagrass, zoysiagrass and centipedegrass, perform best when fertilized between early April and late August in Virginia.

Monthly Fertilizer Needs of Cool-Season Grasses (Lbs per 1000 square feet)

	May 15 to June 15	Aug.	Sept.	Oct.
Less than 50% slowly available nitrogen	0–0.5	0	1	1
More than 50% slowly available nitrogen	0–1	0–0.5	1	1–1.5

Monthly Fertilizer Needs of Warm-Season Grasses (Lbs per 1000 square feet)

	April	May	June	July or Aug.
Less than 50% slowly available nitrogen	1	1	0	0
More than 50% slowly available nitrogen	0.5	1	1	0.5

TIP:

Choose a fertilizer with slowly available nitrogen; look for the percentage of water insoluble nitrogen (WIN) on the label.

TIP:

Excessive spring fertilizer application leads to leaf growth at the expense of food reserves and root growth, increasing injury to lawns from summer disease and drought.

Choosing Application Equipment

It is important to apply lawn fertilizers uniformly for even growth. Proper application by hand is very difficult. Drop-type or rotary fertilizer spreaders are most effective.

Rotary spreaders tend to cover a broader swath, but take care to avoid application of any fertilizer to driveways, roads or bare soil, as it could be washed into the water supply.

Use the following chart to determine the correct amount of fertilizer to apply for a desired amount of nitrogen

Fertilizer analysis	**Lbs of fertilizer per 1000 square ft.**	
6-2-0	8.3	16.6
10-10-10	5.0	10.0
12-4-8	4.1	8.3
16-8-8	3.1	6.2
20-0-16	2.5	5.0
23-3-7	2.1	4.3
28-0-12	1.8	3.6
31-0-0	1.6	3.2
33.5-0-0	1.5	3.0
38-0-0	1.3	2.6
46-0-0	1.1	2.2
	0.5	**1**
	Lbs of nitrogen per 1000 square ft.	

Fall

Applied correctly, soil amendments conserve moisture, improve infiltration of rainfall water and unlock existing nutrients in the soil. Common soil amendments include lime, sulfur, ash, compost and manure.

Changing the pH of your Soil

The correct soil pH is essential for optimum plant growth. Sulfur and lime are common amendments used to balance soil pH. Elemental sulfur makes soil more acidic. Dolomitic limestone adds calcium and magnesium as it increases pH to make soil more alkaline. Wood ashes also raise soil pH, but you must apply twice as much ash as limestone. Never use coal ashes or more than 20 pounds of wood ash per 1000 square feet, as toxicity may result.

Adding Nutrients to your Soil

Commercial fertilizers are the most common amendments for adding nutrients to soil. Other nutrient sources include cottonseed meal, kelp meal, leather meal and worm castings, each of which contains nitrogen, phosphorus and potassium in some amount. Common potassium sources also include granite meal, which releases potassium slowly, and greensand, which is more readily dissolved.

The regular addition of manure, compost and other organic matter can improve soil structure and nutrient content to the point that little or no synthetic fertilizer is needed. This rarely happens with a single addition but requires a long-term program.

Fresh manure is quite high in nitrogen and may burn plants in a growing garden. It is best applied in the fall and tilled under. Compost, typically made by gardeners from plant wastes such as yard clippings and fallen leaves, can be added to gardens when tilled in the spring or placed beneath mulch in plant beds. Composting produces a valuable source of nutrients, and the resulting dark earth, called humus, helps soil retain moisture.

Making Use Of Fallen Leaves

Deciduous trees provide cooling shade through the summer and let sunlight warm your home in the winter. But if you have large trees adorning your property, you may consider yourself cursed in the fall, when all those leaves need to be raked and carted away. This year, try a different strategy. Instead of turning leaves into garbage, turn them into beneficial compost for next year's flower and vegetable beds. A compost pile need not take up a large area. Nor does a properly maintained compost pile produce offensive odors.

TIP:

Organic fertilizers typically contain more calcium, magnesium and micronutrients than commercial fertilizers.

Build a compost pile

- Select a location for composting. Many people build wooden or wire enclosures for composting, and some purchase mounted rotating bins. However, the microbes that produce good compost are content with a simple pile of leaves and grass clippings.
- Rake clippings from tall grass to use in your compost pile. They provide an excellent nitrogen source, especially if you are without access to manure. If the grass is green, however, do not add too much at once.
- Add other lawn wastes such as leaves (dry and fresh), straw, sawdust and woodchips. These provide carbon and nitrogen to the compost. Consider using your lawn mower to shred leaves before composting them.
- You can compost kitchen waste such as orange peels and apple cores, but avoid adding scraps that will attract pets or wild animals.
- Add diseased or insect-infested plant parts and weeds only if you are certain your compost pile will heat up enough to kill the pest organisms and weed seeds.
- Add an occasional layer of soil and some ground limestone to aid the decomposition process. Turn the compost occasionally.

Winterize Your Yard

It is often necessary to give your plants a little extra attention in the fall to help them make it through winter and start spring in peak condition.

Landscape with Winter in Mind

Begin by selecting hardy plants, particularly if you live in a region where snow and ice are common, such as Virginia's Blue Ridge Mountains. Native plants are your best bet because they are uniquely adapted to a region's climate.

Also be sure to plant trees and shrubs in an appropriate site. Avoid poorly drained soil, low spots that create frost pockets and sites that experience rapid fluctuations in temperature. Consider the wintertime patterns of sun and shade in your yard.

Garden Cover Crops

Cover crops maintain and even improve the nutrients in your garden soil during the winter. The cover crop's roots hold the soil, decreasing erosion. When tilled under the in the spring, the crop adds valuable organic material to the soil.

Plant winter cover crops in September or October. Till under plant wastes from the summer, then broadcast the seed and rake it evenly into the soil. If you have fall crops growing, you can sow cover crop seed between rows within a month of harvest without hampering your vegetables.

Some cover crops are legumes such as crimson clover, fava beans or hairy vetch. Others include barley, winter rye and winter wheat. Mixtures of two cover crops are often very effective.

Prune at the Right Time

Proper pruning throughout the year reduces damage by ice and snow. Trim branches so that limbs are not weighted down by ice and snow. Avoid late summer pruning, however, as it stimulates new growth, exhausting the nutrients a plant needs to survive winter.

TIP:

Many varieties of rhododendron, azalea, camellia, daphne and holly should be planted on the northern or eastern side of a building or wall to protect them from prevailing winds and intense winter sun.

TIP:

Remove snow from branches with a broom. Always sweep upward with the broom to lift snow off. When branches are frozen and brittle, avoid disturbing them. Wait until a warmer day.

Water Properly

Be sure your plants have enough water. If autumn rains have been insufficient, give plants a deep soaking that will supply water to the entire root system before the ground freezes. This practice is especially important for evergreens. Watering on warm days in January, February and March is also important.

Apply Mulch

Mulch helps to control erosion, retain moisture and stabilize soil temperature. A two-inch layer of mulch material, such as fir bark, pine needles or wood chips, will reduce water loss and maintain uniform soil moisture around roots. Mulch also reduces repeat freezing and thawing of the soil, which causes significant damage to some shallow-rooted plants. Mulch can even be applied to garden beds in lieu of cover crops to prevent winter erosion.

Protect Newly Planted Trees

Bark splitting, especially dangerous to young trees, results from extreme fluctuations in temperature. Afternoon sun warms exposed trunks, and the sudden temperature drop at nightfall causes splits and cracks. Prevent bark splitting by wrapping trunks with burlap strips or a commercial tree wrap.

More Information

Virginia Department of Conservation and Recreation (DCR)
Native plants, backyard wildlife habitats, soil and water conservation

www.dcr.virginia.gov
(804) 786-1712

Virginia Cooperative Extension
Local Extension agents, Master Gardeners groups, soil tests

www.ext.vt.edu
More than 100 local offices across Virginia

Virginia Department of Forestry
Tree care, urban forestry, fire prevention, rain gardens

www.dof.virginia.gov
(434) 977-6555

Virginia Department of Game and Inland Fisheries
Backyard habitats, nuisance wildlife control

www.dgif.virginia.gov
(804) 367-1000

Virginia Department of Environmental Quality
Water monitoring, recycling, litter prevention

www.deq.virginia.gov
(804) 698-4447

Chesapeake Bay Program
BayScaping, native wildlife, water quality

www.chesapeakebay.net
(800) YOUR BAY

Alliance for the Chesapeake Bay
BayScaping, rain gardens, green roofs

www.acb-online.org
(804) 775-0951

U.S. Department of Agriculture, Natural Resources Conservation Service
Backyard conservation

www.nrcs.usda.gov
(804) 287-1691

U.S. Environmental Protection Agency
Conservation, water quality

www.epa.gov
(202) 272-0167

U.S. Fish and Wildlife Service
Wildlife habitat

www.fws.gov
(800) 344-WILD

American Horticultural Society
SmartGarden program, seasonal yard-care tips
www.ahs.org

(800) 777-7931

Virginia Nursery and Landscape Association
Plant sources

www.vnla.org
(800) 476-0055

Virginia Native Plant Society
Native plants, invasive species removal, Wildflowers across Virginia program

www.vnps.org
(540) 837-1600

To download this publication: www.dcr.virginia.gov/soil_&_water/documents/yardcare.pdf

Virginia Department of Conservation & Recreation

Chesapeake Bay Program
A Watershed Partnership

Designed by the Office of Graphic Communications, Virginia Department of General Services