# City of Fairfax
# Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan

Phase III

Prepared for:
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Department of Public Works
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August 27, 2024

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## Report Certification

As required by the MS4 General Permit, Part III. K. 4.

"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: Satoshi Eto

Signature: Digitally signed by Satoshi Eto Date: 2024.09.09 14:34:21 -04'00'

Title: Public Works Program Manager

Date: 09-09-2024

## Acronyms

| | |
|---|---|
| Blvd. | Boulevard |
| BMP | Best Management Practice |
| CBP | EPA's Chesapeake Bay Program |
| CBPA | Chesapeake Bay Preservation Act |
| CCTV | Closed-Circuit Television |
| CIP | Capital Improvement Plan |
| City | City of Fairfax, Virginia |
| CWA | Federal Clean Water Act |
| DEQ | Virginia Department of Environmental Quality |
| EPA | Environmental Protection Agency |
| FY | Fiscal Year |
| GIS | Geographic Information System |
| GM | Guidance Memo |
| IC | Impervious Cover |
| I&I | Inflow and Infiltration |
| L2 Run | Chesapeake Bay Model 5.2 Level 2 Scoping Run |
| Lat. | Latitude |
| Lbs. | Pounds |
| Long. | Longitude |
| MGD | Million Gallons per Day |
| Mi. | Miles |
| MS4 | Municipal Separate Storm Sewer System |
| MS4 General Permit | VPDES General Permit for Discharges of Stormwater from Small MS4s |
| NCPCP | Noman Cole Jr. Pollution Control Plant |
| NMP | Nutrient Management Plan |
| No. | Number |
| NPS | Nonpoint Source |
| POC | Pollutants of Concern (Nitrogen and Phosphorus) |
| Rd. | Road |
| SDC | Storm Drain Cleaning |
| SLAF | Virginia Stormwater Local Assistance Fund |
| St. | Street |
| SWM | Stormwater Management Facility |
| TMDL | Total Maximum Daily Load |
| VA WIP | Virginia Chesapeake Bay Watershed Implementation Plan |
| VESCP | Virginia Erosion and Sediment Control Program |
| VESMP | Virginia Erosion and Stormwater Management Program |
| VNCEA | Virginia Nutrient Credit Exchange Association |
| VPDES | Virginia Pollutant Discharge Elimination System |
| VRRM | Virginia Runoff Reduction Method |
| VSMP | Virginia Stormwater Management Program |
| WLA | Wasteload Allocation |
| Yr. | Year |

## Definitions

| | |
|---|---|
| Existing Sources | Pervious and impervious urban land uses served by the MS4 as of June 30, 2009. |
| Impaired Water Body | A water body that does not meet water quality standards because it will not support one or more of its designated uses. |
| New Sources | Pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009. |
| Phase I Chesapeake Bay TMDL Action Plan | The first phase of a three-phase approach provided to small MS4 operators to implement the total reductions required of MS4s as established by the Chesapeake Bay Model 5.2 Level 2 Scoping Run. Small MS4 operators were required to reduce the Existing Source POC (and applicable New Source) loads by 5% of the total required reductions as calculated in the 2013 MS4 General Permit. |
| Phase II Chesapeake Bay TMDL Action Plan | The second phase of a three-phase approach provided to small MS4 operators to implement the total reductions required of MS4s as established by the Chesapeake Bay Model 5.2 Level 2 Scoping Run. Small MS4 operators were required to reduce the Existing Source (and applicable New Source) POC loads by 40% of the total required reductions as calculated in the 2018 MS4 General Permit. |
| Phase III Chesapeake Bay TMDL Action Plan | The third phase of a three-phase approach provided to small MS4 operators to implement the total reductions required of MS4s as established by the Chesapeake Bay Model 5.2 Level 2 Scoping Run. Small MS4 operators were required to reduce the Existing Source (and applicable New Source) POC loads by 100% of the total required reductions as calculated in the 2023 MS4 General Permit. |
| Transitional Sources | Regulated land disturbing activities that are temporary in nature and discharge through the MS4. |
| Wasteload Allocation | The portion of the TMDL allocated to VPDES permitted discharges. |

## 1.0 Executive Summary

The City of Fairfax (City) operates a Municipal Separate Storm Sewer System (MS4) regulated under the Virginia Pollutant Discharge Elimination System (VPDES) and discharges into the tributaries of the Chesapeake Bay. The Chesapeake Bay is impaired due to excess nutrients (phosphorus and nitrogen) and sediment. As a regulated VPDES discharger, the City must implement pollutants of concern (POC) minimization strategies to address loads from Transitional Sources and New Sources. The City also has three (3) VPDES permit cycles to meet the required POC load reductions from Existing Sources defined as 100% of the cumulative reduction required by the Chesapeake Bay Watershed Model Progress Run Level 2 (L2) Run. This Action Plan is the third and final Chesapeake Bay TMDL Action Plan. It documents the City's intended means and methods for achieving 100% of the required Existing Source cumulative POC load reductions.

The Phase III Chesapeake Bay TMDL Action Plan documents the City of Fairfax's commitment to complete a minimum of 22 pollutant reduction strategies by October 31, 2028, which will result in the annual reduction of 1,276 lbs. of nitrogen and 651 lbs. of phosphorus. The City has entered into an agreement with Fairfax County to secure sufficient point source credits from the Noman Cole Jr. Pollution Control Plant (NCPCP) to guarantee pollutant loads will have been reduced to meet the required L2 Run.

## 2.0 Chesapeake Bay TMDL and Virginia MS4s

The Chesapeake Bay watershed encompasses over 64,000 mi.$^2$ of land in Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia, and the District of Columbia. Portions of the Bay and its tidal tributaries were identified as impaired for not meeting federal Clean Water Act (CWA) water quality standards in 1998. The United States Environmental Protection Agency published a TMDL on December 29, 2010, which identified nutrients (nitrogen and phosphorus) and sediment as the causes of the impairment. The TMDL also established the maximum quantity of POCs that can be discharged into the Bay and its tributaries and still allow it to meet water quality standards. The Commonwealth of Virginia developed the Virginia Chesapeake Bay Watershed Implementation Plan (VA WIP) in response to the federal action. The VA WIP outlined Virginia's strategies for implementing POC load reductions in Virginia waterways to meet the conditions of the TMDL from both point source and nonpoint source dischargers. The VA WIP outlined the Commonwealth's intention to regulate POC reductions from MS4s in the Chesapeake Bay watershed under the VPDES permitting program. Under VPDES permit conditions, the Commonwealth requires MS4 operators to implement both a Virginia Erosion and Sediment Control Program (VESCP) and a Virginia Stormwater Management Program (VSMP) consistent with State statutes and regulations. MS4 operators were also required to implement Nutrient Management Plans (NMPs) on municipal properties if fertilizers are applied to a contiguous area of one (1) acre or greater as a means to control POC discharges from New Sources (increases in impervious cover (IC) after July 1, 2009) and Transitional Sources (sources generating POC during land use transitions). The VA WIP also enumerated the reductions in POC loads from Existing Sources (land use identified as impervious and pervious urban served by the MS4 prior to July 1, 2009) that MS4 operators would need to implement to meet the Chesapeake Bay Watershed Model Progress L2 Run (Table 1).

**Table 1. Chesapeake Bay Watershed Model Progress L2 Run Existing Source Reduction Requirements**

| Land Use | POC Reductions | | |
|---|---|---|---|
| | Nitrogen | Phosphorus | Sediment |
| Impervious Regulated Lands | 9% | 16% | 20% |
| Pervious Regulated Lands | 6% | 7.25% | 8.75% |

Additionally, the L2 Run assumed that POC discharges from New Sources disturbing one acre or greater of land provided stormwater quality treatment based on the pre-2014 VSMP Baywide design criteria equivalent of 16% impervious cover (0.45 lbs./ac./year). The VA WIP required MS4 operators to offset any increases in POC loads from New Sources constructed after July 1, 2009, that were implemented based on a design other than the 16% Baywide design criteria.

The VA WIP describes Virginia's compliance strategy in which MS4 operators have three five-year VPDES permit cycles to implement the required Existing Source POC reductions and offset the increased POC loads from New Sources. The POC reduction requirements would be prorated among the three VPDES permit cycles to require 5% of the L2 Run reductions to be met by the end of the first permit cycle, 40% of the cumulative L2 Run reductions to be met by the end of the second permit cycle, and 100% of the cumulative L2 Run reductions to be met by the end of the third. For small MS4 operators covered under the VPDES General Permit for Stormwater Discharges from Small MS4s (MS4 General Permit), the three (3) permit cycles correspond with the following dates:

- Permit Cycle 1 – July 1, 2013 – October 31, 2018
- Permit Cycle 2 – November 1, 2018 – October 31, 2023
- Permit Cycle 3 – November 1, 2023 – October 31, 2028

On November 22, 2022, the Virginia Department of Environmental Quality (DEQ) notified the Environmental Protection Agency (EPA) of its decision to remove the specific sediment reduction requirements from MS4 General Permits to be consistent with the Chesapeake Bay Program Principals' Staff Committee's August 12, 2019, final decision. As a result, small MS4 operators will only need to meet 100% of the cumulative L2 Run reductions for nutrients and not sediment as required in the first two (2) MS4 General Permit cycles.

## 3.0 City of Fairfax MS4

The City of Fairfax is a 154-year-old, independent city of approximately 24,000 residents in the heart of Northern Virginia. The City encompasses 6.24 mi.2 of land, of which approximately 45% is impervious. The City operates a small MS4 approximately 14 miles west of Washington, D.C. Discharges from its MS4 are authorized to enter the Chesapeake Bay via the Potomac River under the MS4 General Permit. The City has previously developed and implemented both Phase I and Phase II Chesapeake Bay TMDL Action Plans. The City manages POC sources from Transitional Sources and New Sources through the implementation of the following programs:

- A DEQ-authorized VESCP [1]
- A DEQ-authorized VSMP
- NMPs on 21.24 acres at the six (6) City properties listed in Table 2.

[1] As of July 1, 2024, the City will operate a Virginia Erosion and Stormwater Management Program (VESMP) consistent with the consolidated Virginia Erosion and Sediment Control and Stormwater Management Regulations.

**Table 2. City of Fairfax Nutrient Management Plans for Application of Nutrients on One (1) Contiguous Acre or Greater**

| Facility Name | NMP Acreage | NMP Effective Date |
|---|---|---|
| Kutner Park | 1.68 | 1/1/2021 |
| Lanier Middle School | 5.31 | 1/1/2021 |
| Providence Elementary School | 4.70 | 1/1/2021 |
| Daniels Run Elementary School | 2.96 | 1/1/2021 |
| Green Acres Center | 3.68 | 1/1/2021 |
| Pat Rodio Park | 2.91 | 1/1/2021 |

Virginia Code § 62.1-44.15:68 defines the City as located in Tidewater, Virginia, under the Chesapeake Bay Preservation Act (CBPA). As such, the City has implemented stormwater requirements on land disturbance projects 2,500 $ft^2$ and larger.

## 3.1 Analysis of Legal Authorities

*12. Chesapeake Bay TMDL action plan requirements.*

*b. For permittees previously covered under the General VPDES Permit for the Discharge of Stormwater from MS4 effective November 1, 2018, no later than 12 months after the permit effective date, the permittee shall submit a third phase Chesapeake Bay TMDL action plan for the reductions required in Part II A 3, A 4, and A 5 that includes the following information:*

*1) Any new or modified legal authorities, such as ordinances, permits, policy, specific contract language, orders, and interjurisdictional agreements, implemented or needing to be implemented to meet the requirements of Part II A3, A4, & A5.*

The MS4 General Permit requires that the City identify any new or modified legal authorities necessary to meet the General Permit Special Condition for the Chesapeake Bay TMDL. The City believes it has sufficient legal authority to implement the Chesapeake Bay Special Condition with the following caveat.

- The City believes it has the legal authority to include necessary language in any future contracts, orders, or inter-jurisdictional agreements that may be required but have not been implemented during the development of this plan. As a locality in a Dillon Rule state, the City reserves the right to identify where the Commonwealth of Virginia has not provided adequate legal authority to implement any future legal agreements and documents.

## 3.2 City's Intended Use of Nutrient Credits Via Private Nutrient Exchange to Meet L2 Pollutant Load Reductions

Fairfax County operates the NCPCP (VPDES # VA0025364). The 2003 General Services Agreement between the City of Fairfax and Fairfax County reserves 4.2 million gallons/day (MGD) (6.27%) of the 67.00 MGD treatment capacity for the City's use. The City and the County have entered into a Water Quality Credit Agreement, dated October 6, 2020 (Appendix A). This agreement designates nutrient credits towards the City's MS4 Chesapeake Bay TMDL Action Plan as follows:

- Sufficient nutrient credits for the City to achieve a nutrient load reduction equivalent to 40% of the L2 Run nutrient load reductions through October 31, 2028.
- Sufficient nutrient credits for the City to achieve a nutrient load reduction equivalent to 100% of the L2 Run nutrient load reductions beginning October 31, 2028. The current agreement will expire after Compliance Year 2030 and must be renewed if the City wishes to continue utilizing point source credit trades to maintain compliance.

The NCPCP was designed and constructed to treat 67.00 million MGD of sanitary sewage to an average daily nitrogen concentration of 3.0 milligrams/Liter. The Chesapeake Bay TMDL allocated the NCPCP a nitrogen wasteload of 612,158 lbs./yr. based on this design. Based on the Virginia Nutrient Credit Exchange Association's (VNCEA) Compliance Plan 2023 Update, sufficient credits will be allocated to the City to ensure it maintains the minimum required reductions equivalent to 40% of the L2 Run during the current MS4 General Permit cycle (Table 3) and the total required L2 Run reductions by October 31, 2028 (Table 4).[2] While the City's agreement with the County secures sufficient credits based on the City not achieving pollutant reductions by any other means, as demonstrated in this action plan, the City will not solely rely on nutrient credits from the NCPCP.

**Table 3. City of Fairfax MS4 40% L2 Run Pollutant Load Reduction Compliance Security Via Private Exchange with NCPCP**

| Nutrient | NCPCP WLA | NCPCP Expected Credits (2023) | City Allocated Portion (6.27%) | 40% City's MS4 L2 Run Required Reductions | Phase II Compliance Secured |
|---|---|---|---|---|---|
| Nitrogen | 612,158 | 206,329 | 12,937 | 1,465 | ✓ |
| Phosphorus | 36,729 | 12,570 | 788 | 180 | ✓ |

**Table 4. City of Fairfax MS4 100% L2 Run Pollutant Load Reduction Compliance Security Via Private Exchange with NCPCP**

| Nutrient | NCPCP WLA | NCPCP Expected Credits (2028) | City Allocated Portion (6.27%) | 100% City's MS4 L2 Run Required Reductions | Phase III Compliance Secured |
|---|---|---|---|---|---|
| Nitrogen | 612,158 | 143,912 | 9,023 | 3,662 | ✓ |
| Phosphorus | 36,729 | 8,771 | 550 | 449 | ✓ |

The City recognizes the potential impact on available wastewater treatment capacity caused by using wastewater credits to meet stormwater requirements and has continued to strive to maximize the pollutant reductions through traditional stormwater management practices during the three phases of its Chesapeake Bay TMDL Action Plan. To maximize the availability of future credits, the City intends to continue its long-term sanitary sewer flow monitoring program to identify, prioritize, and minimize inflow and infiltration (I&I). Between 2010 and August 2022, the City's I&I reduction efforts have resulted in the closed-circuit television (CCTV) evaluation of approximately 25% (127,600 feet) and the lining of approximately 17% (87,600 feet) of the City's sanitary sewer; thus, significantly reducing the amount of non-sanitary sewage being sent to NCPCP. The City will also continue to enforce City ordinances that require maintenance of privately-owned sanitary sewer laterals while providing aid in offsetting the costs through programs such as the City's current sanitary sewer lateral repair and replacement program. As I&I programs continue to eliminate non-sewage flows from entering the sanitary sewer, reduced sanitary sewage treatment needs will offset the City's use of nitrogen credits to meet MS4 POC load reduction requirements.

Additionally, the City's efforts to eliminate I&I continue to reduce sewage exfiltration from the sanitary sewer into the City's MS4 and nearby receiving waters. DEQ's current Guidance Memo GM20-2003 does not recognize a method for calculating POC reductions for MS4s associated with this activity; however, the City understands that the Chesapeake Bay Urban Working Group Expert Panel published an October

[2] https://www.deq.virginia.gov/home/showpublisheddocument/6987/638417913809370000

22, 2014 panel report - "Recommendations of the Expert Panel to Define Removal Rates for the Elimination of Discovered Nutrient Discharges from Grey Infrastructure" – that recognizes nutrient loads (nitrogen and phosphorus) can enter the MS4 as a result of exfiltration of sewage from cracks and leaks in the sanitary sewer. The City hopes that DEQ publishes an economically and technically viable method for quantifying these reductions so that the City can account for the nitrogen reductions associated with its extensive activities.

## 4.0 City MS4 POC Loads

> *12. Chesapeake Bay TMDL action plan requirements….*
>
> *b. For permittees previously covered under the General VPDES Permit for the Discharge of Stormwater from MS4 effective November 1, 2018, no later than 12 months after the permit effective date, the permittee shall submit a third phase Chesapeake Bay TMDL action plan for the reductions required in Part II A 3, A 4, and A 5 that includes the following information:*
>
> *2) The load calculations for each river basin calculated in accordance with Part II A 3, A 4, and A 5.*

In estimating its Existing Source acreage for Phase I and Phase II of its Chesapeake Bay Action Plan, the City used a conservative jurisdictional approach in which aerial imagery was used to manually digitize four (4) land coverage types to estimate land use changes between July 1, 2009 and June 30, 2014. In 2021, the City completed the Updated Land Cover Analysis to refine its Existing Source acreages by analyzing Geographic Information System (GIS) datasets, aerial imagery, and field verification (Appendix B). As a result, the updated acreages associated with Existing Sources as of June 30, 2009, are:

- Impervious Urban Acres - 1,570 acres
- Pervious Urban Acres - 2,046 acres

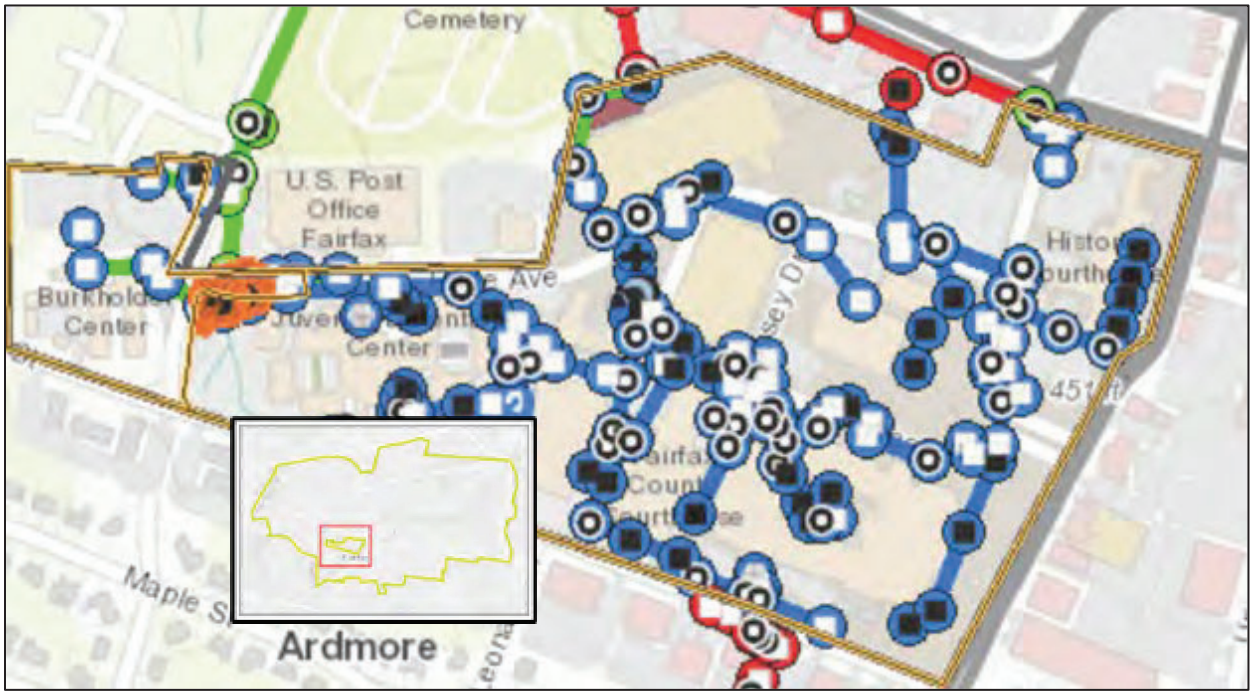


**Figure 1. Fairfax County Stormwater Infrastructure Physically Interconnected to the City's MS4 (Fairfax County Jade)**

The City further defined the MS4 Service Area by eliminating a 48.92-acre unincorporated segment of Fairfax County surrounded by the City. As shown in Figure 1, the County stormwater infrastructure (blue) associated with this property is physically interconnected with the City's MS4.

The City also identified and eliminated 90.41 acres of properties located in the City whose stormwater discharges are regulated under either individual VPDES permits or the VPDES General Permit for Discharges from Industrial Activities. The final adjusted MS4 Service Area for the City and for which the Chesapeake Bay TMDL Action Plan Existing Source Loads are based, is as follows:

- 1,508 Impervious Acres
- 1,968 Pervious Acres

Table 5 provides the calculations for adjusting the MS4 Service Area.

**Table 5. MS4 Service Area Adjustment for Unincorporated County Property and VPDES Permitted Facilities**

| Acreage Adjustment | Impervious, acres | Pervious, acres |
|---|---|---|
| Land Use (City of Fairfax 2021 GIS Analysis) | 1,570 | 2,046 |
| Unincorporated County Property (48.92 acres) | 30.35 | 18.57 |
| VPDES Industrial – Individual and VA05 General Permit | 31.36 | 59.05 |
| Motiva (58 3 02 026) - VA002283 | 4.92 | 11.18 |
| Joint Basin Corporation (58 1 02 029; 58 1 02 029a; 58 1 02 030; 58 3 02 025) - VA001872 | 17 | 42.27 |
| Fairfax County Jermantown Maintenance Facility (47 3 02 005) - VAR051770 | 9.44 | 5.6 |
| **Final REVISED Phase III TMDL Action Plan MS4 Service Area Acres** | **1,508** | **1,968** |

The Existing Source POC loads attributed to the City's Adjusted MS4 Service Area are as follows:

- Nitrogen – 45,243 lbs./yr.
- Phosphorus – 3,250 lbs./yr.

Table 6 provides the calculations for the existing source loads.

**Table 6. City of Fairfax Existing Source POC Loads**

| POC | Existing Source (Land Use) | Loading Rate, lbs./ac./yr. | Acres Served as of July 1, 2009 | Existing Source Load, lbs./yr. | Total Existing Source Load, lbs./yr.[3] |
|---|---|---|---|---|---|
| Nitrogen | Regulated Impervious | 16.86 | 1,508 | 25,425 | 45,243 |
| | Regulated Pervious | 10.07 | 1,968 | 19,818 | |
| Phosphorus | Regulated Impervious | 1.62 | 1,508 | 2,443 | 3,250 |
| | Regulated Pervious | 0.41 | 1,968 | 807 | |

The City also updated its previously calculated New Source loads. As a CBPA locality in place prior to the TMDL, the City had implemented a stormwater water quality design criteria based on local watershed impervious cover (45% impervious cover equivalent to 1.27 lbs./ac./yr. phosphorus) rather than the Baywide impervious cover assumption of 16%. As a result, the City reviewed previously approved plans

[3] Loading and reduction values greater than or equal to 10 lbs. must be calculated and reported to the nearest pound without regard to mathematical rules of precision. Those less than 10 lbs. must be calculated and reported to two significant digits.

to identify and mitigate the POC load difference between the City's water quality design criteria and the watershed water quality design criteria for projects that disturb one acre or greater and:

- Initiated construction between July 1, 2009, and June 30, 2019, in accordance with approved plans using the City's water quality technical criteria; or
- Initiated construction after July 1, 2014, using grandfathered plans using the City's water quality technical criteria.

Additionally, the City identified eight (8) projects that resulted in increased POC loads from New Sources because of the City's use of water quality criteria based on local impervious cover (Table 7). For these projects, the City revisited the previously City-approved stormwater plans and calculated the applicable increases in POC loads from New Sources using the following assumptions:

- Increases in New Source POC loads were identified when:
  - A land disturbing project utilized the design criteria associated with new development:
    - Increased loads were calculated based on the City design requirements, the 16% impervious cover, the site's acreage, and POC reductions associated with best management practice (BMP) implementation acreage identified in the site plan calculations.
  - A land disturbing project utilized the design criteria associated with redevelopment, and there was an increase in impervious cover.
    - Increased loads were calculated based on the predevelopment impervious cover and post-development impervious cover. Once BMP POC reductions were applied, increased loads were deducted from the credit associated with the 10% POC reduction requirement associated with the redevelopment design criteria.
- Decreases in New Source POC loads were identified when:
  - A land disturbing project utilized the design criteria associated with redevelopment and was required to reduce the POC load by the required 10%.
  - A land disturbing project resulted in a decrease in impervious cover from the predevelopment condition.

**Table 7. New Source Loads from Projects Initiating Construction Between July 1, 2009 and June 30, 2014**

| Activity Name | Activity Address | New or Redevelopment | New Nitrogen Load, lbs./yr. (Total P lbs. x 6.9 lbs. N)[4] | New Phosphorus Load, lbs./yr. |
|---|---|---|---|---|
| Fairfax Nursing Center - Commercial Addition to an Existing Building | 10701 Main St. | Redevelopment < 1 Acre | -14 | -1.97- |
| Farrish Dodge/Jeep - Commercial Building with Associated Parking | 9610 Fairfax Blvd. | Redevelopment | -12 | -1.71 |
| Madison Mews at Old Town Village | 3915 Chain Bridge Rd. | Redevelopment | -7.66 | -1.11 |
| Marriott Residence Inn - Hotel | 3565 Chain Bridge Rd. | Redevelopment | -13 | 1.93 |

[4] Negative pollutant loads represents a decrease in the pollutant load as a result of the redevelopment project.

| Activity Name | Activity Address | New or Redevelopment | New Nitrogen Load, lbs./yr. (Total P lbs. x 6.9 lbs. N)[4] | New Phosphorus Load, lbs./yr. |
|---|---|---|---|---|
| Providence Elementary Baseball Field - Providence Elementary School | 3616 Jermantown Rd. | Redevelopment Final Design < 16% Impervious cover | N/A | N/A |
| Providence Park Tennis Courts - Recreational Facility | 10615 Canfield St. | Redevelopment < 1 Acre | N/A | N/A |
| Lowrey Property (Clarks Corner) | Lowery Property | Redevelopment | 2.39 | 0.5 |
| Royal Legacy | Royal Legacy | New | 72 | 10 |
| The Army Navy Country Club | 3315 Old Lee Highway | Redevelopment Final Design < 16% Impervious cover | N/A | N/A |
| Walgreens - Store #11570 - 10980 Fairfax Blvd. | 10980 Fairfax Blvd. | Redevelopment | -8.90 | -1.29 |
| Yorktown Phase 1 - Jaguar | Yorktown Phase 1 - Jaguar | Redevelopment | -36 | -5.24 |
| Yorktown Phase 2 - Cameron Glen | Yorktown Phase 2 - Cameron Glen | New | 202 | 29.24 |
| | | **Total New** | **185** | **27** |

## 5.0 City MS4 POC Reductions

The City utilized the revised acreages associated with Existing Sources to calculate L2 Run reduction requirements associated with Existing Sources (Table 8).

**Table 8. Existing Source POC Load Reductions Necessary to Comply with the L2 Run**

| POC | Existing Source (Land Use) | Existing Source Load, lbs./yr. | Percent Reduction | Existing Source L2 Run Reductions Required, lbs./yr. |
|---|---|---|---|---|
| Nitrogen | Regulated Impervious | 25,425 | 9% | 3,477 |
| | Regulated Pervious | 19,818 | 6% | |
| Phosphorus | Regulated Impervious | 2,443 | 16% | 449 |
| | Regulated Pervious | 807 | 7.25% | |

As a result of the City's efforts, the cumulative 100% POC reductions from Existing Sources and increases in New Sources required to meet the L2 Run by October 31, 2028, are:

- **Nitrogen – 3,662 lbs./yr. (Existing Source 3,477 lbs./yr. + New Source 185 lbs./yr.)**
- **Phosphorus – 476 lbs./yr. (Existing Source 449 lbs./yr. + New Source 27 lbs./yr.)**

## 6.0 City Implementation of Phase I and Phase II Chesapeake Bay TMDL Action Plans

> *12. Chesapeake Bay TMDL action plan requirements….*
> *b. For permittees previously covered under the 2018 GP…*
> *(4) A list of BMPs implemented prior to November 1, 2023, to achieve reductions associated with the Chesapeake Bay TMDL, including:*
> *(a) The date of implementation; and*
> *(b) The reductions achieved.*

As of October 31, 2023, the City completed ten (10) POC reduction projects under Phase I and Phase II of the Chesapeake Bay TMDL Action Plans, including three (3) stream restoration projects, three (3) outfall and gully stabilization projects, three (3) BMP retrofits and one (1) Land Use Conversion.

1. Stream Restoration - Daniels Run
2. Stream Restoration - Tusico Creek Phase I
3. Stream Restoration - Tusico Creek Phase II
4. BMP Retrofit - City Pond
5. Outfall Restoration - 3501 Lion Run
6. Outfall Restoration - 3410 Pickett Road
7. Outfall Restoration - 10400 Shiloh Street
8. Land Use Conversion - Westmore Elementary
9. BMP Retrofit - Westmore Elementary/Dog Park
10. BMP Retrofit - University Drive Traffic Calming

In addition to the projects completed by the City, the City has:

- Achieved 10.10 lbs. of annual phosphorus reductions and 27.83 lbs. of annual nitrogen reduction as a condition of redevelopment
- Purchased 30 lbs. of phosphorus and 81 lbs. of nitrogen nonpoint source nutrient credits from the open market

The pollutant load reductions achieved by these are summarized in Table 9.

**Table 9. City of Fairfax Chesapeake Bay TMDL Action Plan Projects Completed by October 31, 2023**

| Project | Location | | Implementation Date | Nitrogen, lbs./yr. | | Phosphorus, lbs./yr. | |
|---|---|---|---|---|---|---|---|
| | Lat | Long | | Project Reduction | Remaining L2 Run Required Reduction | Project Reduction | Remaining L2 Run Required Reduction |
| **Required POC Load Reductions Remaining** | | | | | **3,662** | | **476** |
| Stream Restoration: Daniels Run | 38.8515 | -77.2939 | FY2016 | 57.38 | 3,605 | 52.02 | 424 |
| Stream Restoration: Tusico Creek Phase I & Phase II | 38.852 | -77.3105 | FY2023 | 141.38 | 3,463 | 128.18 | 296 |
| BMP Retrofit: City Pond | 38.8402 | -77.2075 | FY2023 | 7.36 | 3,456 | 0.40 | 295 |
| Outfall Restoration: 3501 Lion Run | 38.8625 | -77.2894 | FY2023 | 36.06 | 3,420 | 14.97 | 280 |
| Outfall Restoration: 3410 Pickett Road | 38.86042 | -77.2743 | FY2023 | 18.51 | 3,401 | 3.70 | 277 |
| Outfall Restoration: 10400 Shiloh Street | 38.86337 | -77.3028 | FY2023 | 17.09 | 3,384 | 9.25 | 267 |
| Land Use Conversion: Westmore Elementary | 38.8483 | -77.3278 | FY2012 | 4.44 | 3,380 | 0.00 | 267 |
| BMP Retrofit: Westmore Elementary | 38.8483 | -77.3278 | FY2019 | 4.39 | 3,375 | 0.60 | 267 |
| BMP Retrofit: University Drive Traffic Calming | 38.8569 | -77.3019 | FY2021 | 4.26 | 3,371 | 0.20 | 267 |
| VSMP Implementation: Redevelopment Reductions from Existing Sources | -- | | FY19-FY2023 | 27.83 | 3,343 | 10.10 | 257 |
| NPS Nutrient Credit Purchase: Whispering Hills | -- | | FY2023 | 81.00 | 3,262 | 30.00 | 227 |
| **Total Reductions, lbs./yr.** | | | | **400** | | **249** | |
| **Percent of L2 Run Met, %** | | | | **10.9 %** | | **52.4%** | |

Summary discussions of each project identified in Table 9 are provided below.

### *Stream Restoration - Daniels Run*

This project is a stream restoration of 765 linear feet of Daniels Run, located in the Accotink Creek watershed. The City received $285,000 in Virginia Stormwater Local Assistance Fund (SLAF) funding to assist with this project, which was completed in FY2016. The Daniels Run Stream Restoration Project resulted in the annual reduction of 57.38 lbs. of nitrogen and 52.02 lbs. of phosphorus. Final calculations are provided in Appendix C.

### *Stream Restoration - Tusico Branch (Two Phases)*

Tusico Creek Stream Restoration resulted in the restoration of 1,885 linear feet of stream in two phases. The first phase was completed in FY2021, and the second phase was completed in FY2023. The City received $650,000 in SLAF funding to assist with financing this project. Pollutant removal calculations were based on the interim rates and calculated as follows:

- Nitrogen Removed – 1,885 linear feet x 0.0375 lbs. of Nitrogen per linear foot = 141.38 lbs.
- Phosphorus Removed - 1,885 linear feet x 0.068 lbs. of Phosphorus per linear foot = 128.18 lbs.

### *BMP Retrofit - City Hall Pond*

This project is a retrofit of the pond on City Hall property, which converted an existing dry pond used for water quantity control to an extended detention pond. This retrofit installed a forebay located at the inflow and aquatic plantings and benches throughout the pond. This retrofit also slightly increased the total pond volume. The City completed the pond restoration in May 2023. The calculated POC removal provided was 9.05 lbs. total nitrogen per year and 0.66 lbs. total phosphorus per year. Calculations are provided in Appendix D.

### *Outfall Restoration - 3501 Lion Run Outfall and Gully Restoration Project*

The Lion Run Outfall and Gully Restoration Project consists of the stabilization of approximately 375 linear feet of an actively eroding outfall channel that discharges into Accotink Creek. Completion of this project in FY2023 resulted in the annual reduction of POC totaling 36.06 lbs. of nitrogen and 14.97 lbs. of phosphorus. The final design calculations are provided in Appendix E.

### *Outfall Restoration - 3410 Pickett Road Outfall and Gully Restoration Project*

The Pickett Road Outfall and Gully Restoration Project consists of stabilizing approximately 150 linear feet of an actively eroding outfall channel that discharges into Accotink Creek. Completion of this project in FY2023 resulted in the annual reduction of POC totaling 18.51 lbs. of nitrogen and 3.70 lbs. of phosphorus. The final design calculations are provided in Appendix F.

### *Outfall Restoration - 10400 Shiloh Street Outfall and Gully Restoration Project*

The Shiloh Street Outfall and Gully Restoration Project consists of stabilizing approximately 250 linear feet of an actively eroding outfall channel that discharges into Accotink Creek. Completion of this project in FY2023 resulted in an annual reduction of POC totaling 17.09 lbs. of nitrogen and 9.25 lbs. of phosphorus. The final design calculations are provided in Appendix G.

### *Land Use Conversion & BMP Retrofit - Westmore Elementary School/Dog Park*

This project was a redevelopment project that occurred in two phases. In FY2012, the Westmore Elementary School was demolished. In FY2019, the City constructed a dog park and level 2 bioretention stormwater management (SWM) facility within the school's original footprint. Combined, the two phases resulted in a net decrease of impervious cover of 1.04 acres (Figures 2 and 3). The level 2 bioretention SWM facility receives stormwater runoff from 0.24 acres of previously untreated impervious area and

0.27 acres of previously untreated pervious area, resulting in an annual pollutant load reduction of 8.82 lbs. of nitrogen/year and 0.59 lbs. of phosphorus/year.

**2011**

**Figure 2. Westmore Elementary School Land Use in 2011 (Aerial Imagery Courtesy of Fairfax County Jade)**

**2024**

**Figure 3. Westmore Elementary School Land Use in 2024 (Aerial Imagery Courtesy of Fairfax County Jade)**

Table 10 provides the calculations for determining the nutrient load reductions for the Westmore Elementary School redevelopment based on the reduction in impervious cover. Appendix H provides the calculations for determining the nutrient load reductions for treating 0.24 acres of previously untreated impervious land use and 0.27 acres of previously untreated pervious urban land use with the level 2 bioretention SWM facility.

**Table 10. Westmore Elementary School Pollutant Load Reductions Resulting from Land Use Conversion**

| Pollutant | Impervious Area Prior to Westmore Elementary School Demolition, acres | Impervious Area After Westmore Dog Park, acres | Net Reduction of Impervious Area, acres | Land Use Conversion Efficiency Table V.H.1. (Impervious to Turf) | Annual Pollutant Load Reduction |
|---|---|---|---|---|---|
| Nitrogen | 3.37 | 2.33 | 1.04 | (4.27) | (4.44) |
| Phosphorus | 3.37 | 2.33 | 1.04 | - | - |

### *BMP Retrofit - University Drive Traffic Calming*

This University Drive Traffic Calming Project resulted in the FY2021 installation of bioretention facilities as part of a larger overall project designed to reduce traffic and speeding on University Drive. The bioretention facilities provide stormwater management for 0.63 acres (0.20 acres of managed turf and 0.43 acres of impervious cover) of previously untreated developed urban land in the Accotink Creek watershed. The annual POC reduced from installing these bioretention facilities totals 4.26 lbs. of nitrogen and 0.20 lbs. of phosphorous. The final calculations are provided in Appendix I.

### *VSMP Implementation - Redevelopment on Prior Developed Lands*

The City operates a DEQ-approved VSMP Program through which it requires pollutant reductions on prior developed lands as part of the redevelopment process. Between FY2019 and FY2023, the City approved 48 plans where new developments were required to reduce pollutant loads to meet the VSMP

design standard for new development, and redevelopments were required to reduce the existing pollutant load by either 10% or 20%, based on the size of the land disturbance. The City developed and utilized the Calculating VSMP POC Reductions Creditable to Chesapeake Bay Existing Source Load Reductions SOPs (Appendix J) to identify the portion of the pollutant load reduction achieved that could be credited towards the existing load reduction requirements. The implementation of the VSMP program resulted in the pollutant load reduction of 227.83 lbs./year of nitrogen and 10.10 lbs./year of phosphorus. The location and applicable pollutant load associated with each redevelopment project are provided in Appendix K.

### *NPS Nutrient Credit Purchase: Whispering Hills*

The City purchased 30 lbs. of phosphorous credits and 81 lbs. of nitrogen credits on November 2, 2022, from the Whispering Hills nonpoint nutrient credit bank, located in the Accotink Creek watershed. The MS4 Nutrient Credit Acquisition Form for this purchase can be found in Appendix L.

## 6.1 Phase II Chesapeake Bay TMDL Action Plan Compliance Assessment

Projects completed throughout the implementation of the City's Phase II Chesapeake Bay TMDL Action Plan have resulted in the annual reduction of:

- 400 lbs./yr. of nitrogen (10.9% of the cumulative 100% L2 Run required nitrogen reduction)
- 249 lbs./yr. of phosphorus (52.4% of the cumulative 100% L2 Run required phosphorus reduction)

Figures 4 and 5 provide a breakdown of the pollutant reductions by the type of pollutant reduction strategy employed by the City.

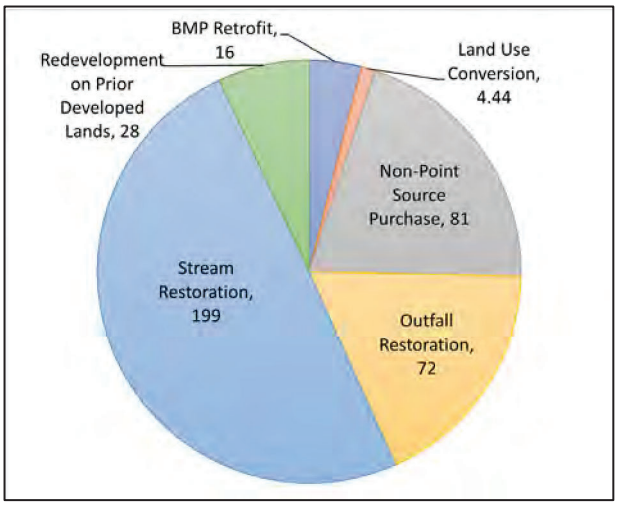


**Figure 4. Annual Nitrogen Load Reductions in Pounds per Year Completed Through Phase II**

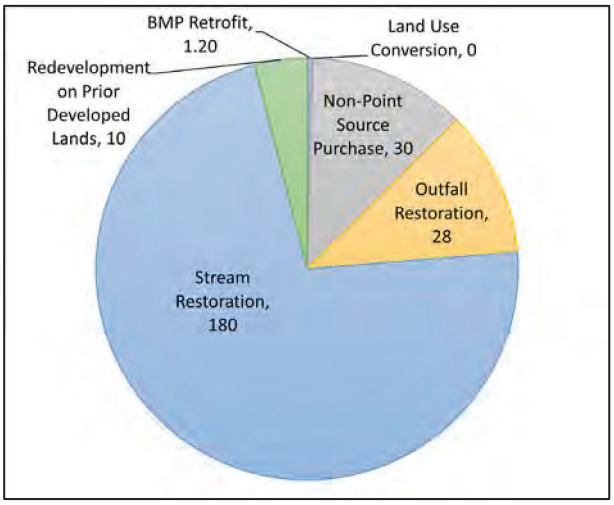


**Figure 5. Annual Nitrogen Load Reductions in Pounds per Year Completed Through Phase II**

**The City will rely on its Water Quality Credit Agreement with Fairfax County for the acquisition of annual nutrient credits from the NCPCP to maintain the minimum of a 40% compliance requirement of 40% of the L2 Run while implementing Phase III of the Chesapeake Bay TMDL Action Plan.**

The City will submit copies of the DEQ MS4 Nutrient Credit Acquisition Form as part of the Chesapeake Bay TMDL Implementation Annual Status Report, as required by the MS4 General Permit. A copy of the 2023 DEQ MS4 Nutrient Credit Acquisition Form is included in Appendix M.

## 7.0 City Phase III Chesapeake Bay TMDL Action Plan

> *12. Chesapeake Bay TMDL action plan requirements….*
> *b. For permittees previously covered under the 2018 GP…*
> *5) The BMPs to be implemented by the permittee within 60 months of the effective date of this permit to meet the cumulative reductions calculated in Part II A 3, A 4, and A 5, including as applicable:*
> *(a) Type of BMP;*
> *(b) Project name;*
> *(c) Location;*
> *(d) Percent removal efficiency for each pollutant of concern; and*
> *(e) Calculation of the reduction expected to be achieved by the BMP calculated and reported in accordance with the methodologies established in Part II A 9 for each pollutant of concern; and*
> *(f) A preliminary schedule for implementation of the BMPs included in the Chesapeake Bay TMDL action plan.*

The City has eleven (11) projects in various stages of design or construction that will be completed during the Phase III Chesapeake Bay TMDL Action Plan, including one (1) stream restoration project, six (6) outfall restoration projects, one (1) Land Cover Conversion, and three (3) BMP Retrofits:

1. Stream Restoration - Stafford Drive
2. Outfall Restoration #1 - 3300 Stafford Drive
3. Outfall Restoration #2 - 3300 Stafford Drive
4. BMP Retrofit - Ashby Pond Wet Pond
5. Land Cover Conversion - Van Dyck Park
6. Outfall Restoration - Van Dyck Park (Outfall #4)
7. Outfall Restoration - Traveler Street #1
8. Outfall Restoration - Traveler Street #2
9. Outfall Restoration - Providence Park
10. BMP Retrofit - Mathy Park
11. BMP Retrofit - Lion Run

The pollutant load reductions achieved by these are summarized in Table 11.

**Table 11. City of Fairfax Phase III Chesapeake Bay TMDL Action Plan Projects**

| Project | Location | | Anticipated Completion Date | Nitrogen, lbs./yr. | | Phosphorus, lbs./yr. | |
|---|---|---|---|---|---|---|---|
| | Lat | Long | | Project Reduction | Remaining L2 Run Reductions Required | Project Reduction | Remaining L2 Run Reductions Required |
| **Remaining POC Load Reductions** | | | | | **3,262** | | **227** |
| Stream Restoration: Stafford Drive | 38.8648 | -77.2919 | FY26 | 323.66 | 2,939 | 181.04 | 46 |
| Outfall Restoration #1: 3300 Stafford Drive | 38.86354 | -77.2943 | FY26 | 3.38 | 2,935 | 9.76 | 36 |
| Outfall Restoration #2: 3300 Stafford Drive | 38.86342 | -77.2942 | FY26 | 9.41 | 2,926 | 23.68 | 12 |
| BMP Retrofit: Ashby Pond Wet Pond | 38.8479 | -77.2861 | FY26 | 351.54 | 2,574 | 87.52 | -75[5] |
| Land Cover Conversion: Van Dyck Park | 38.8547 | -77.2989 | FY26 | 0.95 | 2,573 | 0.25 | -76 |
| Outfall Restoration: Van Dyck Park | 38.8547 | -77.2989 | FY27 | 134.27 | 2,439 | 81.47 | -157 |
| Outfall Restoration: Traveler Street #1 | 38.86 | -77.2929 | FY27 | 10.59 | 2,429 | 4.30 | -161 |
| Outfall Restoration: Traveler Street #2 | 38.8684 | -77.2933 | FY27 | 5.56 | 2,423 | 1.70 | -163 |
| Outfall Restoration: Providence Park | 38.8397 | -77.3145 | FY27 | 24.16 | 2,399 | 10.89 | -174 |
| BMP Retrofit: Mathy Park | 38.8397 | -77.3145 | FY27 | 5.63 | 2,417 | 0.40 | -174 |
| BMP Retrofit: Lion Run | 38.8626 | -77.2894 | FY27 | 7.60 | 2,391 | 0.64 | -175 |
| **Phase III Total Reductions, lbs./yr.** | | | | **Nitrogen** | **877** | **Phosphorus** | **401** |

Summary discussions of each project identified in Table 10 are provided below.

[5] 100% of L2 Run Phosphorus Load Reductions Achieved

### *Stream Restoration - Stafford Drive Stream Restoration*

The Stafford Drive Stream Restoration Project is a combination of 2,300 linear feet of restoration of the North Fork of Accotink Creek and the restoration of two actively eroding outfalls on Stafford Park property. The City received $1,175,000 in SLAF funding for the Stafford stream and outfall restoration projects and anticipates completing the stream restoration in FY2026. The City calculates the annual POC removed by the stream restoration portion of the project as 323.66 lbs. of nitrogen and 181.04 lbs. of phosphorus. The stream restoration calculations are provided in Appendix N.

### *Outfall Restoration - 3300 Stafford Drive Outfall #1*

The Stafford Drive Outfall #1 Restoration Project will result in the restoration of a 90-foot reach of an actively eroding outfall channel. Once completed, this project's calculated annual pollutant load reductions are 3.38 lbs. of nitrogen and 9.76 lbs. of phosphorus. Calculations are provided in Appendix N with the Stafford Stream Restoration.

### *Outfall Restoration - 3300 Stafford Drive Outfall #2*

The Stafford Drive Outfall #2 Restoration Project will restore a 48.57-foot reach of an actively eroding outfall channel. Once completed, this project's calculated annual pollutant load reductions are 9.41 lbs. of nitrogen and 23.68 lbs. of phosphorus. Calculations are provided in Appendix N with the Stafford Stream Restoration.

### *BMP Retrofit - Ashby Pond Wet Pond*

This project is an enhancement of an existing wet pond located in the Accotink Creek watershed to meet the current BMP Specification 14 (Wet Pond) Design Standards. This project involves the restoration and stabilization of both inflows and the outfall channel, the installation of two large forebays at the inflows, the addition of aquatic plantings/benches, and conducting a complete dredging of the pond. The anticipated completion date of this stream restoration is FY2026. The calculated annual POC load removed through the Ashby Pond Conservancy Project is 351.54 lbs. of nitrogen and 87.52 lbs. of phosphorous. Calculations for this project are provided in Appendix O.

### *Land Cover Conversion - Van Dyck Park*

The Van Dyck Park Land Cover Conversion Project converts 0.17 acres of turf in Van Dyck Park to forest with an anticipated completion date of FY2026. The calculated annual pollutant removal associated with the Van Dyck Land Cover Conversion project is calculated to total 0.95 lbs. of nitrogen and 0.25 lbs. of phosphorous. Calculations for this land cover conversion project are provided in Table 12.

**Table 12. Van Dyck Park Pollutant Load Reductions Resulting from Land Use Conversion**

| Pollutant | Area Converted from Turf to Forest, acres | Land Use Conversion Efficiency Table V.H.1. (Turf to Forest) | Annual Pollutant Load Reduction |
|---|---|---|---|
| Nitrogen | 0.17 | (5.58) | (0.95) |
| Phosphorus | 0.17 | (1.46) | (0.25) |

### *Outfall Restoration - Van Dyck Park (Outfall #4)*

The Van Dyck Park Outfall Restoration Project will result in the restoration of approximately 329 linear feet of actively eroding outfall channel in the Accotink Creek watershed, resulting in a calculated annual reduction of 134.27 lbs. of nitrogen and 81.47 lbs. of phosphorus. The City received $362,720 in SLAF

funding and anticipates completing this project in FY2027. The calculated pollutant load reductions for this project are provided in Appendix P.

### *Outfall Restoration - Traveler Street #1*

The Traveler Street Outfall Restoration Project will result in the the restoration of two currently eroding outfalls that discharge to the Dale Lestina tributary of Accotink Creek. Restoration of Channel #1 will result in the restoration of approximately 60 feet of actively eroding outfall channel, resulting in the calculated annual reduction of 10.59 lbs. of nitrogen and 4.30 lbs. of phosphorus. The City received $137,902 in SLAF funding and anticipates completion of this project in FY2027. The pollutant load reduction calculations are combined with the Outfall #2 calculations in Appendix Q.

### *Outfall Restoration - Traveler Street #2*

The second outfall of the Traveler Street Outfall Restoration Project will result in restoration of approximately 90 feet of actively eroding outfall channel, resulting in a calculated annual reduction of 5.56 lbs. of nitrogen and 1.70 lbs. of phosphorus. Pollutant load reduction calculations are combined with the Outfall #1 calculations in Appendix Q.

### *Outfall Restoration - Providence Park*

The Providence Park Outfall Restoration Project will result in the restoration of approximately 200 feet of actively eroding outfall channel in the Popes Head Run watershed, resulting in a calculated annual reduction of 24.16 lbs. of nitrogen and 10.89 lbs. of phosphorus. The City received $186,017 in SLAF funding and anticipates completion of this project in FY2027. The calculated estimated pollutant load reductions for this project are provided in Appendix R.

### *BMP Retrofit - Mathy Park*

The Mathy Park Stormwater Retrofit Project redirects stormwater from three locations in Mathy Park so that it discharges via Sheet Flow into Open Space, with an anticipated completion date of FY2027. Upon completion, the Mathy Park BMP retrofit will treat stormwater from 0.37 acres of previously untreated urban impervious acres and 0.50 acres of previously untreated urban pervious acres, resulting in the calculated annual reduction of an estimated 5.63 lbs. of nitrogen and 0.40 lbs. of phosphorous. The calculated pollutant load reductions for this project are provided in Appendix S.

### *BMP Retrofit - Lion Run*

The Lion Run BMP Retrofit Project will upgrade an existing dry pond at Fairfax High School to meet the Level 1 Extended Detention Pond design standards. The City will construct a forebay and aquatic benches and will install micropools while increasing the pond's overall storage capacity. When completed in FY2027, the Lion Run BMP Retrofit will result in a calculated annual reduction of 7.60 lbs. of nitrogen and 0.64 lbs. of phosphorous in the Accotink Creek watershed. The calculated pollutant load reductions for this project are provided in Appendix T.

## 7.1 Phase III Chesapeake Bay TMDL Action Plan Pollutant Additional Strategies

The City will also continue to identify and implement pollutant load reductions associated with the following strategies to further reduce its reliance on acquiring nutrients through annual private nutrient exchanges with the NCPCP.

### *Reductions Associated with Nonpoint Source Nutrient Credit Purchases*

The City will consider the purchase of additional nonpoint source nutrient credits from a DEQ-accredited nutrient bank if it is in the City's best interest. Future purchases will be reported in the appropriate City's Chesapeake Bay TMDL Implementation Annual Status Report.

### *Reductions Associated with Capital Improvement Projects*

The City maintains an updated Capital Improvement Plan (CIP) as part of its annual budget process. The City's CIP currently contains numerous future projects, including those identified specifically as drainage and flood relief projects. As these CIP projects progress through the design phase, the City will evaluate them for potential opportunities to implement pollutant reductions. The City will update its Chesapeake Bay TMDL Action Plan as warranted when opportunities are identified for implementation.

### *Reductions Associated with VESMP Implementation on Redevelopment*

Through the implementation of its VESMP, the City requires phosphorus load reductions of 10% from redevelopment projects with a land disturbance between 2,500 $ft.^2$ and one acre and 20% from redevelopment projects with land disturbances of one acre or greater. The City will utilize the Virginia Runoff Reduction Method (VRRM) Compliance Spreadsheets to obtain the pollutant load reduction equivalent to the phosphorus load reduction associated with existing impervious cover and any POC reduction implemented that is greater than the reduction required for new development. BMPs, including on-site stormwater management facilities and off-site nonpoint nutrient credits, will be reported to DEQ through the BMP Warehouse but will represent the BMP load reductions as applied to the entire redevelopment project and not be divided between POC load reductions assigned to new development or redevelopment of existing impervious cover.

Pollutant load reductions associated with both private and public redevelopment projects to comply with VSMP redevelopment criteria will be credited toward the Existing Source load reductions. Creditable pollutant load reductions will be calculated using the Calculating VSMP POC Reductions Creditable to Chesapeake Bay Existing Source Load Reductions SOPs.

### *Reductions Associated with Local TMDL Action Plan Projects*

As of November 1, 2023, the City is required to develop and implement local TMDL Action Plans to address the following local TMDLs:

- Chloride TMDLs for the Accotink Creek Watershed, Fairfax County, Virginia
- Sediment TMDLs for the Accotink Creek Watershed, Fairfax County, Virginia
- Benthic TMDL Development for Bull Run, Virginia
- Benthic TMDL Development for Popes Head Creek, Virginia
- Benthic TMDL Development for Difficult Run, Virginia
- Fecal Coliform TMDL for Accotink Creek, Fairfax County, Virginia
- Bacteria TMDL for the Difficult Run Watershed, Virginia
- Bacteria TMDLs for Popes Head Creek, Broad Run, Kettle Run, South Run, Little Bull Run, Bull Run, and the Occoquan River, Virginia

The City will evaluate its POC reduction strategies implemented as part of Local TMDL Action Plans for equivalent pollutant reductions applicable to the Chesapeake Bay TMDL pollutant reduction requirements. Equivalent pollutant load reductions implemented through the implementation of local TMDL Action Plans will be credited toward the Existing Source load reductions.

### *Reductions Associated with Storm Drain Cleaning (Annual Reduction)*

With the February 6, 2021 publication of Guidance Memo No. 20-2003 (GM #20-2003), DEQ adopted the EPA Chesapeake Bay Program's (CBP) "Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning (SDC) Practices, Final Report, May 19, 2016, (CBP Final Report) as the sole acceptable methodology to quantify associated Chesapeake Bay TMDL POC reduction credits in Virginia after June 30, 2022. GM #20-2003 defines the requirements and expectations SDC programs must implement for associated POC reductions to be credited towards meeting Existing Source load reductions.

In response, the City assessed the potential for the City to obtain annual Existing Source POC load reductions for credit against the Existing Source pollutant loads (Appendix U - Storm Drain Cleaning Assessment and Procedures). Concurrent with its assessment, the City developed procedures consistent with the CBP Final Report designed to quantify the POC reductions associated with the City initiatives. The City has yet to implement these procedures at this time; however, it retains the possibility of implementing them in the future should the need become warranted.

### *Reductions Associated with Leaf Litter Collection and Disposal (Annual Reduction)*

The City has completed a desktop analysis regarding the potential of achieving Existing Load POC load reductions through the City's Leaf Litter Collection and Disposal Program (Appendix V - Chesapeake Bay POC Reduction and Crediting Associated with Leaf Litter Collection and Disposal Discussion). Although the City has not approached DEQ for approval of this non-traditional POC reduction strategy as a means of achieving the necessary pollutant reductions, the City retains the possibility of seeking DEQ approval in the future should the need become warranted. Future pollutant load reductions associated with leaf litter collection and disposal will be calculated and credited towards the Existing Source load reductions on an annual basis upon future DEQ approval conditions.

## 7.2 Phase III Chesapeake Bay TMDL Action Plan Compliance Assessment

Based on the achieved pollutant load reductions completed through Phase II of the Chesapeake Bay TMDL Action Plan and the anticipated pollutant load reductions that will be completed through Phase III, the City estimates that it will have implemented annual pollutant load reductions of:

- 1,276 lbs./yr. of nitrogen (35% of the required 100% L2 Reduction)
- 651 lbs./yr. of phosphorus (137% of the required 100% L2 Reduction)

Figure 6, in combination with Table 13, provides a geographic record of the locations at which the City will have completed Chesapeake Bay TMDL Action Plan pollutant load reduction projects by October 31, 2028. Figures 7 and 8 provide a record of the types of pollutant load reduction projects employed by the City.

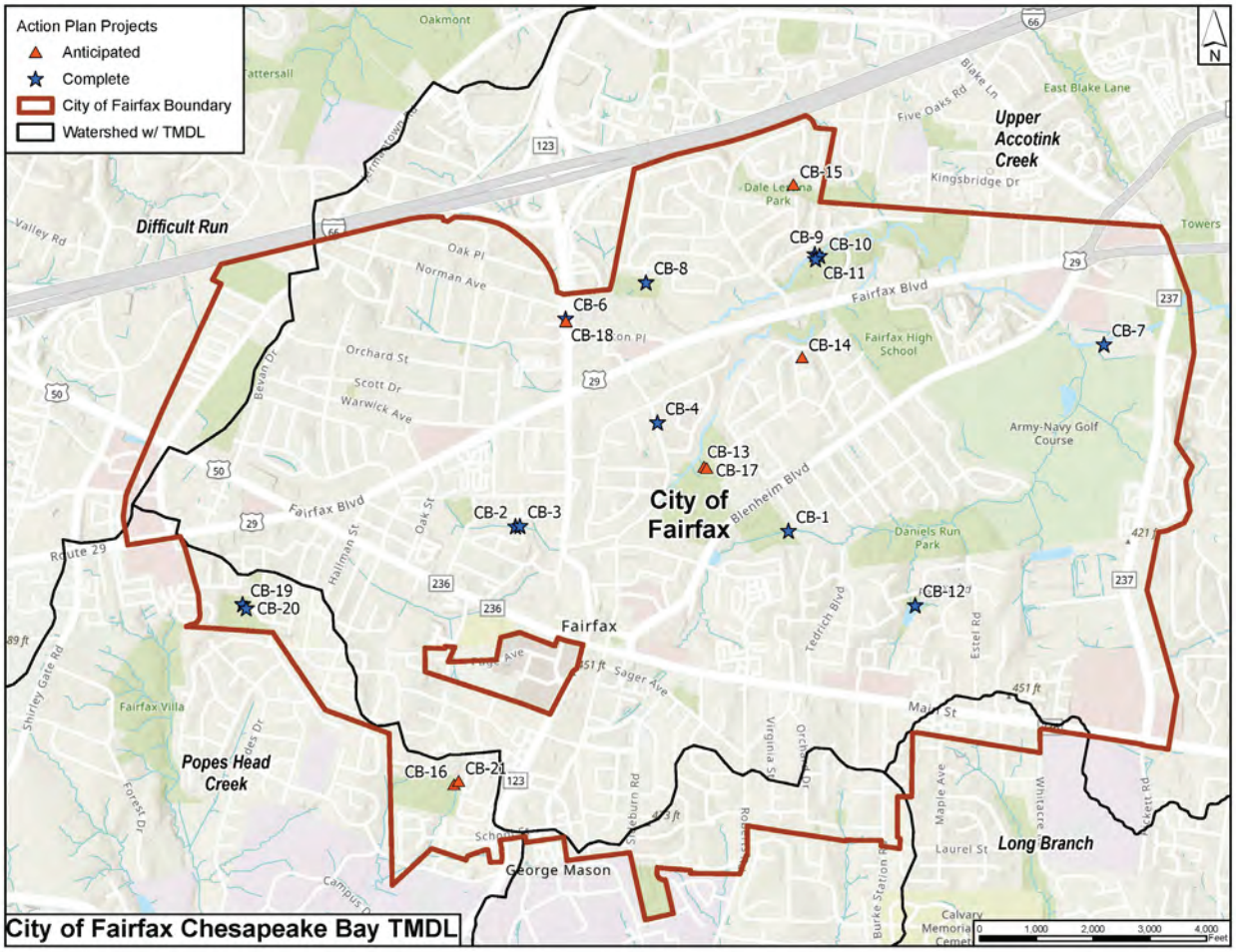


**Figure 6. Locations of Completed and Anticipated Chesapeake Bay TMDL Pollutant Load Reductions in the City of Fairfax, VA**

**Table 13. BMP Identification in Figure 6**

| BMP | Location | Description | BMP Type |
|---|---|---|---|
| CB-1 | Daniels Run Stream Restoration Project | Complete | Stream Restoration |
| CB-2 | Tusico Creek Restoration, Phase I | Complete | Stream Restoration |
| CB-3 | Tusico Creek Restoration, Phase II | Complete | Stream Restoration |
| CB-4 | University Drive Traffic Calming Retrofit | Complete | SWM Retrofit |
| CB-5 | City Pond Retrofit | Complete | SWM Retrofit |
| CB-6 | Outfall Restoration - Lion Run Site | Complete | Outfall Restoration |
| CB-7 | Outfall Restoration - Pickett Road Site | Complete | Outfall Restoration |
| CB-8 | Outfall Restoration - Shiloh Street Site | Complete | Outfall Restoration |
| CB-9 | Stafford Drive Stream Restoration | Complete | Stream Restoration |
| CB-10 | Stafford Drive Outfall Restoration 1 | Complete | Outfall Restoration |
| CB-11 | Stafford Drive Outfall Restoration 2 | Complete | Outfall Restoration |
| CB-12 | Ashby Pond Wet Pond Enhancement | Complete | SWM Retrofit |
| CB-13 | Van Dyck Park Outfall Restoration | Anticipated | Outfall Restoration |
| CB-14 | Traveler Street Outfall Restoration 1 | Anticipated | Outfall Restoration |
| CB-15 | Traveler Street Outfall Restoration 2 | Anticipated | Outfall Restoration |
| CB-16 | Mathy Park/FFX HS | Anticipated | SWM Retrofit |
| CB-17 | Van Dyck Land Cover Conversion | Anticipated | Land Cover Conversion |
| CB-18 | BMP Retrofit at Lion Run (FFX HS) | Anticipated | SWM Retrofit |

| BMP | Location | Description | BMP Type |
|---|---|---|---|
| CB-19 | Westmore Dog Park | Complete | Land Cover Conversion |
| CB-20 | Westmore Dog Park | Complete | SWM Retrofit |
| CB-21 | Providence Park Outfall | Anticipated | Outfall Restoration |

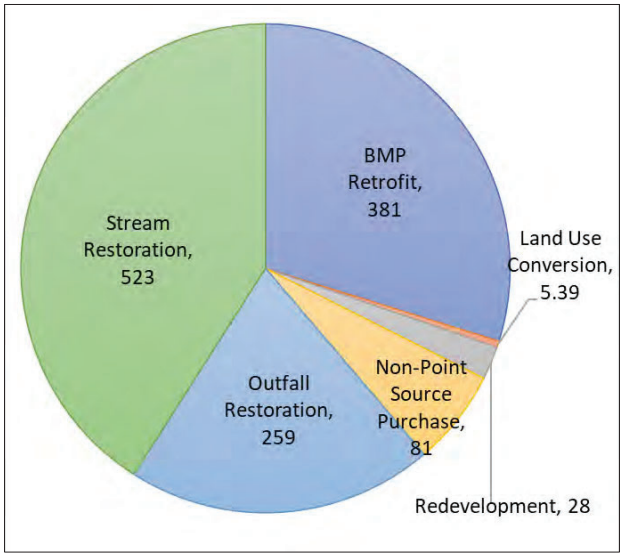


Figure 7. Anticipated Total Annual Nitrogen Load Reductions Achieved Through Phase III TMDL Action Plan – 1,276 lbs./yr.

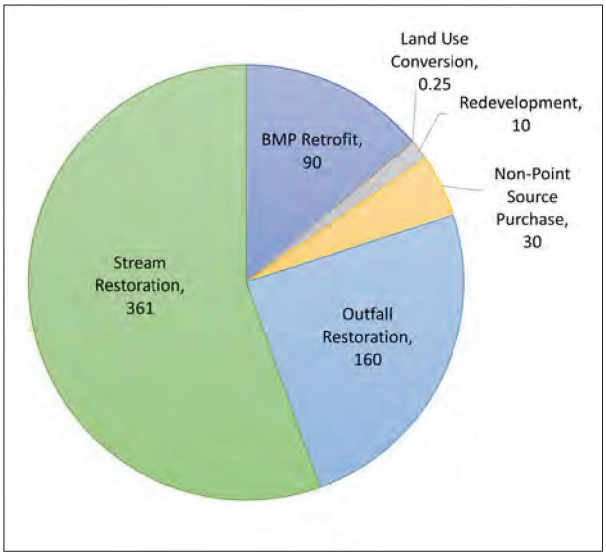


Figure 8. Anticipated Total Annual Phosphorus Load Reductions Achieved Through Phase III TMDL Action Plans - 651 lbs./yr.

Upon the completion of these projects, the City is estimated to still be responsible for these additional POC reductions by October 31, 2028:

- **Nitrogen reductions totaling 2,386 lbs./yr.**
- **Phosphorus – 0 additional phosphorus reductions are required. The L2 Run requirements will be met.**

The City's estimated responsibility does not include any of the identified strategies for which pollutant load reductions were not available. **The City will rely on its MOU with Fairfax County to acquire annual nutrient credits from the NCPCP to attain the compliance requirement of 100% of the L2 Run by October 31, 2028.** The City will submit copies of the DEQ MS4 Nutrient Credit Acquisition Form as part of the Chesapeake Bay TMDL Implementation Annual Status Report, as required by the MS4 General Permit.

## 8.0 Progress Tracking and Documentation

The MS4 General Permit, Chesapeake Bay TMDL Special Condition, requires tracking and documenting specific to implementing the TMDL Action Plan. Table 14 provides the City with an annual checklist of required tracking and documenting Chesapeake Bay TMDL Action Implementation, which must be submitted to DEQ when the City obtains nutrient credits that it intends to apply towards MS4 Existing Source load reductions.

Progress made annually between July 1 and June 30 must be reported in a stand-alone Chesapeake Bay TMDL Action Plan Annual Status Report that includes:

- A list of Chesapeake Bay TMDL Action Plan BMPs, not including annual practices implemented prior to the reporting period, that includes the following information for reported BMPs:
  - The number of BMPs for each BMP type.
  - The estimated reduction of POC achieved by each BMP type and reported in pounds of POC reduction per year.
  - A confirmation statement that the City electronically reported Chesapeake Bay TMDL Action Plan BMPs inspected using the DEQ BMP Warehouse.
  - A list of newly implemented BMPs, including annual practices implemented during the reporting period that includes the following information for each reported BMP or a statement that no BMPs were implemented during the reporting period:
    - The BMP type and a description of the location for each BMP.
    - The estimated reduction of POC achieved by each BMP and reported in pounds of POC reduction per year.
    - A confirmation statement that the City electronically reported the BMPs using the DEQ BMP warehouse.
  - If the City acquires credits during the reporting period to meet some or all of the POC reductions, a statement that credits were acquired.
  - The progress, using the final design efficiency of the BMPs, towards meeting the required cumulative reductions for the POC.
  - Any revisions made to the Chesapeake Bay TMDL Action Plan.
  - A list of BMPs planned to be implemented during the next reporting period.

**Table 14. City of Fairfax Chesapeake Bay TMDL Action Plan Annual Compliance Checklist**

| Requirement | Schedule / Due Date | Complete | | |
|---|---|---|---|---|
| | | Yes | No | N/A |
| VESCP implementation compliant with the MS4 General Permit | Continuous, until 6/30/2024 | □ | □ | □ |
| VSMP implementation compliant with the MS4 General Permit | Continuous, until 6/30/2024 | □ | □ | □ |
| VESMP implementation compliant with MS4 General Permit | Continuous, after 7/1/2024 | □ | □ | □ |
| CBPA implementation compliant with the MS4 General Permit | Continuous | □ | □ | □ |
| Nutrient Management Plan implementation compliant with the MS4 General Permit | Continuous | □ | □ | □ |
| Development and electronic submittal of a Chesapeake Bay TMDL Implementation Annual Status Report covering activities of the previous permit year (July 1 through June 30) | Annually, no later than November 1 | □ | □ | □ |
| Provide the public a minimum of 15 days to comment on the Phase III Chesapeake Bay TMDL Action Plan prior to its submittal to DEQ | Prior to October 31, 2024 | □ | □ | □ |
| Submit a Phase III Chesapeake Bay TMDL Action Plan to DEQ | October 31, 2024 | □ | □ | □ |
| Summary of Comments and Responses to Public Comments in Year 2 Chesapeake Bay TMDL Action Plan Implementation Annual Status Report | October 31, 2025 | □ | □ | □ |
| Maintain a Minimum POC Reduction Equivalent to 40% of the L2 Run POC Reduction Requirements | Annually through October 31, 2028 | □ | □ | □ |
| Utilize the MS4 Nutrient Credit Acquisition Form to certify the nitrogen credits that were obtained for the previous calendar year | Annually, no later than June 1 | □ | □ | □ |
| Report all BMPs newly installed between July 1 and June 30 of each permit year in which POC reductions are credited towards Chesapeake Bay TMDL POC load reduction compliance | Annually, no later than October 1 | □ | □ | □ |
| Inspect City owned or operated SWM facilities. Verify that the SWM facilities are functioning as designed and constructed | Annually | □ | □ | □ |
| Inspect privately owned SWM facilities | No less than once per five years | □ | □ | □ |
| Inspect ecosystem restoration projects (e.g., stream restoration) | At least once every 60 months | □ | □ | □ |
| Update the latest inspection date of all BMPs in which POC reductions are credited towards Chesapeake Bay TMDL POC load reduction compliance using the DEQ BMP warehouse | Annually, no later than October 1 | □ | □ | □ |
| Attain a POC Reduction Equivalent to 100% of the L2 Run POC Load Reduction Requirements | October 31, 2028 | □ | □ | □ |
| Maintain a Minimum POC Reduction Equivalent to 100% of the L2 Run POC Reduction Requirements | After October 31, 2028 | □ | □ | □ |

## 9.0 Opportunity for Public Comment Summary

13. Prior to submittal of the action plan required in Part II A 12 a and b, permittees shall provide an opportunity for public comment for no fewer than 15 days on the additional BMPs proposed in

The MS4 General Permit requires the City to allow the public to comment on the additional BMPs proposed as part of the Phase III Chesapeake Bay TMDL Action Plan. The City must provide an opportunity that is no less than 15 days. The opportunity to comment on the City of Fairfax's Phase II Chesapeake Bay Action was provided as documented below.

The public was notified of the opportunity to comment on 9/16/2024

| Check Applicable Box(es) | | |
|---|---|---|
| ☑ Publication on the City Website | ☐ Publication in Local Newspapers | ☐ Social Media |
| www.fairfaxva.gov | | |
| ☐ Publication in a City Publication | ☐ Other | ☐ Other |
| | | |

Public Comments were received between September 16, 2024 and October 1, 2024.
A summary of the comments received, and the City's responses are included in Appendix W.

**Appendix A – City/NCPCP Water Quality Agreement for Chesapeake Bay TMDL Implementation**

# County of Fairfax, Virginia

To protect and enrich the quality of life for the people, neighborhoods and diverse communities of Fairfax

October 19, 2020

Mr. Satoshi Eto
Stormwater Resource Engineer
City of Fairfax
Department of Public Works
10455 Armstrong Street
City Hall Annex, Suite 200
Fairfax, VA 22030

Reference: Water Quality Credit Agreement for Chesapeake Bay Total Maximum Daily Loads Implementation

Dear Mr. Eto:

Enclosed for your files is a fully executed original of the subject agreement for Chesapeake Bay Total Maximum Daily Loads (TMDL) Implementation.

Thank you for your assistance during the negotiation of this agreement. If you have any questions regarding this matter, please do not hesitate to contact me at 703-324-5026.

Sincerely,

Shahram Mohsenin, P.E.
Director

Encl: Water Quality Credit Agreement for Chesapeake Bay TMDL Implementation

cc: Michael McGrath, Director, Department of Public Works and Environmental Services (DPWES), Wastewater Treatment Division
Anand Goutam, Financial Manager, DPWES, Wastewater Planning and Monitoring Division

**WATER QUALITY CREDIT AGREEMENT**
**FOR CHESAPEAKE BAY TMDL IMPLEMENTATION**

**THIS WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY TMDL IMPLEMENTATION** (this "Agreement") is made this 6th day of October, 2020, by and between the County of Fairfax, Virginia (the "County") and the City of Fairfax, Virginia (the "City") (each a "Party" and jointly the "Parties").

**BACKGROUND**

A. The County's Wastewater Treatment Plant. The County owns and operates an advanced wastewater treatment plant known as the Noman M. Cole, Jr., Pollution Control Plant ("NCPCP"), which is authorized to discharge the nutrients total nitrogen ("TN") and total phosphorus ("TP") as well as sediment expressed as total suspended solids ("TSS") within the Chesapeake Bay watershed in accordance with (a) certain water quality plans or regulations including the Chesapeake Bay Total Maximum Daily Load ("TMDL") issued by the U.S. Environmental Protection Agency ("EPA"), the related Virginia Chesapeake Bay TMDL Watershed Implementation Plan ("WIP") issued by the Commonwealth of Virginia, and the Water Quality Management Planning Regulation, 9 VAC 25-720, issued by the State Water Control Board and Virginia Department of Environmental Quality (jointly, "DEQ"), and (b) the General Virginia Pollutant Discharge Elimination System ("VPDES") Watershed Permit Regulation for TN and TP Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia, 9 VAC 25-820, most recently reissued by DEQ effective February 8, 2017, as hereafter modified or reissued from time to time (the "Watershed General Permit"). Due to exceptional performance and current operating conditions, NCPCP currently discharges less TN, TP and TSS than authorized under the Watershed General Permit and Chesapeake Bay TMDL while protecting Chesapeake Bay water quality and, therefore, the County has the ability to generate and supply TN, TP and TSS credits on at least a temporary basis. The rated capacity of NCPCP is 67 million gallons per day ("MGD") and, pursuant to the Appendix IV of the General Services Agreement of 2003 (the "General Services Agreement"), the County has reserved 4.2 MGD of treatment capacity for the City's use.

B. The City's Stormwater System. The City owns and operates a municipal separate stormwater sewer system ("MS4") authorized to discharge nutrients and sediment to the Chesapeake Bay watershed. Like NCPCP, the MS4 is addressed under the Chesapeake Bay TMDL and WIP. The MS4 is subject to the General VPDES Permit for Stormwater Discharged from Small Municipal Separate Storm Sewer Systems (the "MS4 Permit") under which DEQ has issued coverage to the City. Pursuant to the Chesapeake Bay TMDL, WIP and MS4 Permit, it is anticipated that the City will reduce nutrient and sediment discharges from the MS4 pursuant to City-developed and DEQ-approved TMDL Action Plans for each of three, five-year permit cycles, which are referred to as the First Bay TMDL Permit Cycle (5% Progress), Second Bay TMDL Permit Cycle (40% Progress), and Third Bay TMDL Permit Cycle (100% Progress). During 2020, the City is in its Second Bay TMDL Permit Cycle (2018-2023).

C. The City's Plan for Continuing Compliance. The City achieved its Chesapeake Bay TMDL reduction goals for the First Bay TMDL Permit Cycle by implementation of certain best

management practices ("BMPs") by June 30, 2018. During the Second Bay TMDL Permit Cycle, a combination of factors present major compliance challenges including a substantially higher reduction target (40% compared to 5%), the possible statewide downrating of the benefits of the street sweeping credits, and financial obstacles stemming from the 2020 pandemic. To better manage these challenges and promote compliance, rather than relying exclusively on financing and constructing retrofit projects on a condensed 5-year schedule (*i.e.*, Second Bay TMDL Permit Cycle) or 10-year schedule (Third Bay TMDL Permit Cycle), the City is expanding its TMDL reduction strategies to include acquisition and use of TN, TP and TSS credits to be generated and supplied by NCPCP. This compliance method also better incorporates ongoing stormwater quality improvements from redevelopment projects, which are subject to TP reduction criteria (and associated TN and TSS reductions) under the applicable water quality design requirements of DEQ's Virginia Stormwater Management Program Regulation, 9VAC25-870-63.A.2. By aligning with the normal redevelopment cycle rather than scheduling retrofits prior to redevelopment activity, the City's Chesapeake Bay TMDL Action Plan will also conserve scarce state (Stormwater Local Assistance Fund) and local resources for other important water quality projects and public needs.

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

## AGREEMENT

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

1. Credit Quantities. Beginning for the compliance year (January 1 through December 31) which starts January 1, 2022 and for each compliance year thereafter through and including compliance year 2030, the County agrees to transfer annually to the City a pro rata share of the County's available NCPCP-generated TN, TP and TSS credits not to exceed (a) the City's actual credit need for MS4 Permit compliance or (b) the maximum quantity set forth on the City's Required Credit Schedule for MS4 Permit Compliance in Attachment A hereto, whichever is less on a parameter-by-parameter basis. Available credits are expected to vary annually based on the operating conditions experienced at NCPCP, the facility's actual performance, and applicable laws, regulations and permits then in effect. The City's pro rata share shall be based on the portion

of NCPCP treatment capacity reserved for the City's use (4.2 MGD) compared to total treatment capacity (currently 67 MGD). This Agreement does not guarantee to the City the availability of a sufficient quantity of credits in any year, nor does it impose upon the County any requirement to operate NCPCP in any particular manner or at any additional expense to provide such credits. For purposes of this Agreement, "credit" means a "point source nitrogen credit" or "point source phosphorus credit" as defined in the Watershed General Permit or "sediment credit" as defined in Virginia Code § 62.1-44.19:21.1.

2. Annual Transfer Procedure. For each compliance year for which this Agreement is in effect and subject to the requirements and limitations of Paragraph 1 above, the City shall request in writing and the County shall transfer the available credits to the City by May 20 immediately following the compliance year during which the County generated the credits. Such transfer shall be made in writing using the Water Quality Credit Transfer Form set forth in Attachment B hereto. The first such transfer shall occur by May 20, 2023 using compliance year 2022 credits.

3. Price of Credits. In light of the County's reservation of treatment capacity for the City and the City's responsibility for a certain portion of capital costs and operation and maintenance costs under the General Services Agreement, there shall be no additional monetary cost charged by the County to the City for the City's pro rata share of available credits up to and including the maximum quantities set forth on the credit schedule in Attachment A hereto; however, the City agrees that its share of any credit sales revenue obtained by the County from sale of NCPCP-generated credits through the Virginia Nutrient Credit Exchange Association, Inc. (the "Nutrient Exchange") or otherwise shall be reduced to account for the transfer of credits to City for its direct use. For example, if 100% of the City's pro rata share of NCPCP-generated credits are transferred to the City in a given year, the City shall receive no portion of the credit sales revenue derived from the remaining NCPCP credits in that year. As another example, if 50% of the City's pro rata share of NCPCP-generated credits are transferred to the City in a given year, the City shall receive only 50% of the amount of the credit sales revenue derived from the remaining NCPCP credits that it would otherwise have received.

4. Authorized Use. The City agrees that its sole and limited use of the credits transferred under this Agreement shall be for the purpose of MS4 Permit compliance and Chesapeake Bay TMDL implementation under such permit as described herein and that it shall not transfer any portion of the NCPCP-generated credits to any other person or entity.

5. Term. This Agreement shall be in effect as of the date first shown above upon execution by both Parties and shall expire on June 30, 2030. Notwithstanding the preceding sentence, if either Party fails to perform a material obligation hereunder, and fails to cure such failure to perform within thirty (30) days of written notice from the non-defaulting Party, the non-defaulting Party may terminate this Agreement upon written notice to the other Party.

6. Regulatory Plans & Approvals. In furtherance of this Agreement, the Parties shall collaborate on appropriate submittals to and requests from DEQ as set forth in this paragraph; however, the County shall have no responsibility for the failure or refusal of DEQ or other governmental authority to approve such transfers.

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

b. Exchange Compliance Plan. The County is a member of the Nutrient Exchange and a participant in its Exchange Compliance Plan previously submitted by the Nutrient Exchange to, and approved by, DEQ pursuant to the Watershed General Permit. During the next annual update of the Exchange Compliance Plan due to DEQ on or before February 1, 2021, the County shall notify the Nutrient Exchange of the credit transfer provided by this Agreement and request the Nutrient Exchange's next Exchange Compliance Plan annual update account for such transfer.

7. Further Cooperation. The Parties shall continue to cooperate with each other as reasonably necessary to confirm or bring about the transfers contemplated by this Agreement. If for any reason the County is prohibited or otherwise unable to transfer credits as provided herein, the City shall be solely responsible for otherwise meeting its TMDL and MS4 Permit obligations.

8. Force Majeure. The obligations of the County, including its credit transfer obligations, shall be suspended while and as long as performance is prevented or impeded by (a) strikes, disturbances, riots, fire, severe weather, acts of war, acts of terrorism, acts of God, epidemic, pandemic, government action, major technical, engineering or construction related delays, or any other cause similar or dissimilar to the forgoing that is beyond the reasonable control of and not due to the gross negligence of the County; (b) any facts or circumstances that qualify as an Extraordinary Condition within the meaning of the Water Quality Improvement Grant Agreement by and between DEQ and the County regarding nutrient removal technology installed at NCPCP; or (c) any facts or circumstances that qualify as an Upset within the meaning of the VPDES Permit Regulation, 9 VAC 25-31, or any permits issued thereunder to NCPCP. For clarity, the County assumes no obligation under this Agreement to install, upgrade, improve, or alter the operation of any of its facilities for purposes of providing credits to the City.

9. Change in Law. In the event of any material change in applicable laws or regulations, the Parties shall work together to attempt to amend this Agreement to conform to such change, while maintaining as closely as practicable the provisions and intent of this Agreement.

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

11. No Assignment. No Party may transfer or assign this Agreement, or its rights or obligations hereunder, without the prior written consent of the other Party, which consent shall not be unreasonably withheld.

12. Expenses; Commissions. Each Party shall pay its own fees and expenses, including its own counsel fees, incurred in connection with this Agreement or any transaction contemplated

hereby, except that within thirty (30) days of the date of an invoice issued by the County the City shall reimburse the County's counsel fees for developing this agreement in an amount not to exceed ten thousand dollars ($10,000) by check made payable to the County.

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

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

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

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

17. Authorization. Each Party represents that its execution, delivery and performance under this Agreement have been duly authorized by all necessary action on its behalf, and do not and will not violate any provision of its enabling legislation, charter, ordinances, articles of incorporation, bylaws, or regulations, as applicable, or result in a material breach of or constitute a material default under any agreement, indenture, or instrument of which it is a party or by which it or its properties may be bound or affected. To each Party's knowledge there are no actions, suits or proceedings, pending or threatened against such Party or any of its properties, before any court or governmental authority that, if determined adversely to such Party, would have a material adverse effect on the transactions contemplated by this Agreement.

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

**[SIGNATURES BEGIN ON FOLLOWING PAGE]**

**SIGNATURE PAGE OF WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY IMPLEMENTATION BY AND BETWEEN THE COUNTY OF FAIRFAX AND THE CITY OF FAIRFAX**

**COUNTY OF FAIRFAX, VIRGINIA**

By: _____

Bryan J. Hill
County Executive

APPROVED AS TO FORM:

_____

County Attorney

**SIGNATURE PAGE OF WATER QUALITY CREDIT AGREEMENT FOR CHESAPEAKE BAY IMPLEMENTATION BY AND BETWEEN THE COUNTY OF FAIRFAX AND THE CITY OF FAIRFAX**

**CITY OF FAIRFAX, VIRGINIA**

By: _____
Robert A. Stalzer
City Manager

ATTEST:

_____
City Clerk

APPROVED AS TO FORM:

_____
City Attorney

## WATER QUALITY CREDIT AGREEMENT
## FOR CHESAPEAKE BAY TMDL IMPLEMENTATION
## ATTACHMENT A

## CITY'S REQUIRED CREDIT SCHEDULE FOR MS4 PERMIT COMPLIANCE

| **Water Quality Credits (lbs/yr)** | | | |
|---|---|---|---|
| *Pollutant Parameter* | *2nd Permit Cycle* | *3rd Permit Cycle* | *Total Both Cycles* |
| TN | 1,499.71 | 2,249.57 | 3,749.28 |
| TP | 188.53 | 282.80 | 471.33 |
| TSS | 159,771.39 | 239,657.09 | 399,428.48 |

**CREDIT AGREEMENT**
**FOR CHESAPEAKE BAY TMDL IMPLEMENTATION**
**ATTACHMENT B**

**WATER QUALITY CREDIT TRANSFER FORM**

*Instructions: This form is to be completed and executed by the County and delivered to the City on or before each May 20 immediately following the calendar year of credit generation by the County.*

By execution and delivery of this Water Quality Credit Transfer Form, the following water quality credits, in the amounts specified below, are hereby transferred in accordance with, and for the specific and limited purposes of, the Water Quality Credit Agreement for Chesapeake Bay TMDL Implementation by and between the County of Fairfax and the City of Fairfax.

| | |
|---|---|
| Transferor: | County of Fairfax<br>Noman M. Cole, Jr., Pollution Control Plant |
| Transferee: | City of Fairfax<br>Municipal Separate Storm Sewer System |
| TN Credit Quantity: | _____ lbs |
| TP Credit Quantity: | _____ lbs |
| TSS Credit Quantity: | _____ lbs |
| Year Generated: | _____ |
| Date Transferred: | _____ |
| Signed (for the County): | _____ |
| Name (Print): | _____ |
| Title: | _____ |

## WATER QUALITY CREDIT AGREEMENT
## FOR CHESAPEAKE BAY TMDL IMPLEMENTATION
## ATTACHMENT C

## MS4 CHESAPEAKE BAY TMDL ACTION PLAN PROVISION FOR USE OF FAIRFAX COUNTY NCPCP-GENERATED WATER QUALITY CREDITS

This plan includes the generation and use of TN, TP and TSS water quality credits pursuant to the Water Quality Credit Agreement for Chesapeake Bay TMDL Implementation to which the City of Fairfax and the County of Fairfax are signatories and pursuant to any other water quality credit exchange the City may secure in accordance with applicable laws and regulations. This compliance method is in lieu of exclusive reliance on more traditional stormwater retrofit projects, which may not be feasible to execute on a condensed 10-year schedule (i.e., Second and Third Bay TMDL Permit Cycles). Not only does incorporation of this method have the advantage of more reliably meeting the MS4 Permit's short deadlines, but it is also beneficial to the public in that it will help meet the City's Chesapeake Bay TMDL reduction goals more cost-effectively than otherwise possible. This component of the plan is fully in accordance with Virginia Code §62.1-44.19:21 (TN and TP) and §62.1-44.19:21.1 (TSS).

**Appendix B. Updated Land Cover Analysis**

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

1001 Boulders Parkway
Suite 300
Richmond, VA 23225

P 804.200.6500
F 804.560.1016
www.timmons.com

# MEMORANDUM

**TO:** Satoshi Eto

**FROM:** Sheila Reeves, PE, CFM

**DATE:** 12/3/2021

**RE:** Updated Land Cover Analysis

Timmons has completed a land cover analysis to identify forested areas within the existing City of Fairfax MS4 regulated area as of June 30, 2009. The intent of this evaluation is to refine the land cover totals used to calculate the pollutant source loading for the Chesapeake TMDL Pollutants of Concern (POC). To perform this task, TG analyzed GIS datasets including VGIN land cover (2011) and 2009 aerial photography downloaded from the from Fairfax County website: https://www.fairfaxcounty.gov/nadar/services/AerialPhotography/2009AerialPhotography/ImageServer. City staff subsequently field verified the areas delineated as forested in the 2021 re-evaluation to verify that the forested areas have an unmanaged understory. Areas that were noted by City staff as having managed understories were recategorized as managed turf. A summary of the final land cover recategorization developed as part of this task is provided in Figure 1.

| Land Cover Accounting | | | |
|---|---|---|---|
| | 2015 Table (acres) | Revised 2021 (Acres) | Change (Acres) |
| Impervious | 1,549 | 1,570 | 21 |
| Pervious | 2,166 | 2,046 | (121) |
| Forested | 244 | 343 | 99 |
| Open Water | 4 | 4 | - |
| **TOTAL** | **3,963** | **3,963** | |

**Figure 1. Summary of Land Cover Categorization Changes**

Timmons has prepared updated POC Source loading calculations using the refined land cover analysis for 2009 land cover. It was determined that this exercise to refine the 2009 land cover categorization **removes 855-lb TN and 15-lb TP** from the TMDL POC Source Loading calculations. The increase in impervious cover results in a **3,829-lb increase in TSS** to the TMDL POC Source Loading calculations, see Figure 2.

| POC Loading | | | Original 2015 Action Plan | Revised 2021 Action Plan | *Original 2015 Action Plan | *Revised 2021 Action Plan | Change in POC Load |
|---|---|---|---|---|---|---|---|
| Subsource | Pollutant | EOS Loading Rate (lbs/ac/yr) | Estimated Total POC Load | Estimated Total POC Load | | | |
| Regulated Urban Impervious | Nitrogen | 16.86 | 26,111.76 | 26,472.48 | 47,928 | 47,072 | (855) |
| Regulated Urban Pervious | | 10.07 | 21,816.05 | 20,599.90 | | | |
| Regulated Urban Impervious | Phosphorus | 1.62 | 2,508.96 | 2,543.62 | 3,397 | 3,382 | (15) |
| Regulated Urban Pervious | | 0.41 | 888.24 | 838.72 | | | |
| Regulated Urban Impervious | TSS | 1171.32 | 1,814,070.14 | 1,839,130.53 | 2,194,930 | 2,198,759 | 3,829 |
| Regulated Urban Pervious | | 175.8 | 380,860.15 | 359,628.79 | | | |
| *Does not include load from "New Sources" as determined in Table 5 of the 2015 Action Plan | | | | | | | |

**Figure 2. POC Source Loading Calculation Comparison**

## Next Steps:

City staff will need to update Table 1 of the City's Chesapeake Bay Action Plan (which is MS4 Permit Table 3b) with the refined land cover acreage for Pervious and Impervious Cover shown Figure 1 of this memo in the "Revised 2021" column. Subsequently, Table 2 and Table 3 of the Action Plan will also need to be updated to reflect revised TMDL POC Reduction Requirements.

**Appendix C. Daniels Run Stream Restoration Calculations**

# DANIELS RUN STREAM RESTORATION

## FINAL DESIGN PLAN

## CITY OF FAIRFAX, VIRGINIA

**OWNER/APPLICANT:**

CITY OF FAIRFAX
C/O MS. CHRISTINA ALEXANDER
10455 ARMSTRONG STREET
ROOM 200
FAIRFAX, VIRGINIA 22030

**ENGINEER:**

FRANK R. GRAZIANO, P.E.
WETLAND STUDIES AND SOLUTIONS, INC.
5300 WELLINGTON BRANCH DRIVE
SUITE 100
GAINESVILLE, VIRGINIA 20155

**SITE NOTES:**

| | |
|---|---|
| TAX MAP PARCELS: | 57-2-02-182 |
| PARCEL ADDRESS: | 3705 OLD LEE HIGHWAY<br>FAIRFAX, VIRGINIA 22031 |
| PARCEL AREA: | 13.7 ACRES |
| DISTURBED AREA: | 1.4 ACRES |

RESPONSIBLE LAND DISTURBER
NAME: FRANK R. GRAZIANO, P.E.
CERTIFICATION No: PROFESSIONAL ENGINEER #032099
EXPIRATION DATE: 2/29/2016
CONTACT PHONE NO: (703) 679-5600

VICINITY MAP

Copyright ADC The Map People
Use Number 20711184

Scale: 1" = 2000'

SOILS MAP

| | | | | | |
|---|---|---|---|---|---|
| 29A | CODORUS SILT LOAM | POOR-F, W, B | POOR, F, W | LOW | III |
| 30A | CODORUS & HATBORO | POOR-F, W, B | POOR, F, W | LOW | III |
| 102 | WHEATON LOAM | GOOD | FAIR - S | HIGH | IVB |

Source: Fairfax County Digital Data

Scale: 1" = 500'

## SHEET INDEX


| | |
|---|---|
| SHEET 1 | COVER SHEET |
| SHEET 2 | OVERALL SITE EXHIBIT |
| SHEET 3 | GRADING PLAN & LONGITUDINAL PROFILE |
| SHEET 4 | SEDIMENT SIZING, REINFORCED BED MIXTURE SPECIFICATIONS, CONSTRUCTION TOLERANCES, GRADING NOTES, & SEQUENCE OF CONSTRUCTION |
| SHEET 5-6 | CONSTRUCTION DETAILS |
| SHEET 7 | EROSION & SEDIMENT CONTROL PLAN |
| SHEET 8 | EROSION & SEDIMENT CONTROL DETAILS |
| SHEET 9 | EROSION & SEDIMENT CONTROL NARRATIVE |
| SHEET 10 | GEOMETRY PLAN & STRUCTURE STAKEOUT |
| SHEET 11 | PLANTING PLAN |
| SHEET 12 | VEGETATION SCHEDULE |
| SHEET 13 | PLANTING NOTES & DETAILS |
| SHEET 14 | EXISTING CONDITIONS PLAN |
| SHEET 15 | TREE PRESERVATION PLAN |
| SHEET 16 | DESIGN NARRATIVE |
| SHEET 17 | 100-YEAR FLOODPLAIN ANALYSIS |
| SHEET 18 | 100-YEAR FLOODPLAIN ANALYSIS - CROSS SECTIONS |
| SHEET 19 | WATER QUALITY IMPACT ASSESSMENT |


**Table 8. Daniels Run Stream Restoration POC Credits**

| Table V.J.1 - Urban Stream Restoration Interim Approved Removal Rates | | | | |
|---|---|---|---|---|
| **BMPs** | **How Credited** | **TN** | **TP** | **TSS** |
| Stream Restoration | Mass reduction/length (lbs./linear ft.) | 0.075 | 0.068 | 44.88 |
| **City of Fairfax - Daniels Run Stream Restoration Project** | | | | |
| **Linear ft. of Stream Restoration** | **POC Removal provided (lbs./year)** | **TN** | **TP** | **TSS** |
| 765 | | **57.38** | **52.02** | **34333.20** |

Daniels Run is located behind Daniels Run Elementary School, within the City of Fairfax. The Latitude and Longitudinal coordinates of the project are 38°51'5.74"N; 77°17'37.98"W respectively, and the overall construction cost for the project was $563,000.00.


Wetland Studies and Solutions, Inc. a DAVEY company
5300 Wellington Branch Drive • Suite 100
Gainesville, Virginia 20155
Phone: 703-679-5600 • Fax: 703-679-5601
www.wetlandstudies.com


Daniels Run Stream Restoration
Final Design Plan
City of Fairfax, Virginia

Cover Sheet


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COMMONWEALTH OF VIRGINIA
FRANK R. GRAZIANO
Lic. No. 032099
PROFESSIONAL ENGINEER

REVISIONS

| No. | Date | Description | Rev. By | App. By |
|---|---|---|---|---|

SCALE: AS NOTED

DATE: JANUARY 2015

Horizontal Datum: VCS NAD 83
Vertical Datum: NGVD 29
Boundary and Topo Source: WSSI and City of Fairfax Digital Data

| Design | Draft | Approved |
|---|---|---|
| SRP | APE | FRG |

Sheet # 1 of 19

Computer File Name:
I:\2200s\2239\2239-02\CADD\v62NGR\104\final Planset COVER SHEET.dwg

**Appendix D. City Hall Pond Retrofit Calculations**

# CONSTRUCTION PLANS
# CITY HALL POND RETROFIT

SP-22-00507
PIN #: 57 4 02 013 A
10455 ARMSTRONG STREET
CITY OF FAIRFAX, VIRGINIA 22030

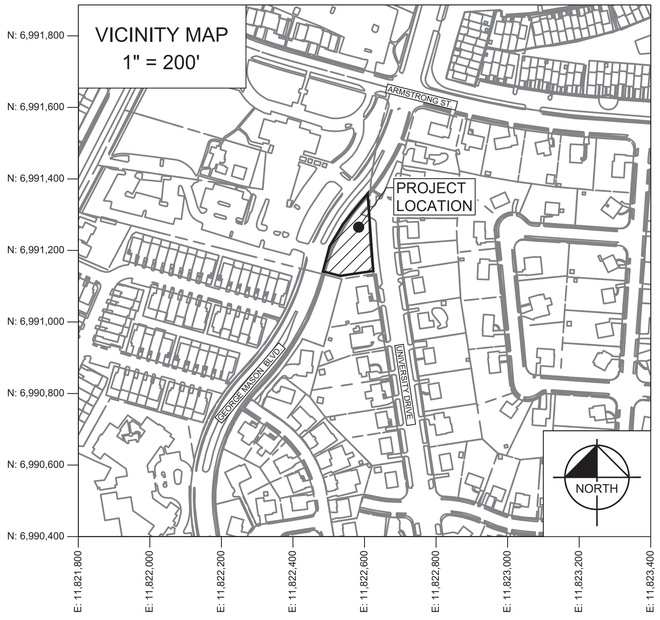
PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE MAINTENANCE, ENHANCEMENT, AND RETROFIT OF THE STORMWATER MANAGEMENT POND LOCATED AT 10455 ARMSTRONG STREET (CITY HALL POND). THE POND DRAINS APPROXIMATELY 3.49 ACRES FROM GEORGE MASON BOULEVARD AND ADJACENT NEIGHBORHOODS. THE POND RETROFIT PROJECT INCLUDES INSTALLATION OF A SEDIMENT FOREBAY AND INCREASE IN POND TREATMENT VOLUME. AS PART OF THE DESIGN, A VEGETATIVE BENCH HAS BEEN INCLUDED AND SINUOSITY HAS BEEN ADDED TO THE POND FLOOR TO INCREASE STORMWATER HYDRAULIC RESIDENCE TIME. THE ADDITION OF THE FOREBAY WILL PROVIDE A MAINTENANCE FEATURE FOR THE FACILITY THAT WILL ALLOW FOR EASE OF MAINTENANCE AFTER IMPLEMENTATION. THE POLLUTANT OF CONCERN (POC) CREDITS GENERATED FROM THE THE RETROFIT OF THIS POND WILL BE APPLIED TO THE THE CITY'S CHESAPEAKE BAY TMDL REDUCTION REQUIREMENTS. THE RETROFIT OF THIS POND WILL GENERATE 1130.94 LBS./YR. OF TOTAL SUSPENDED SOLIDS (TSS), 7.36 LBS./YR. OF NITROGEN, AND .40 LBS./YR. OF PHOSPHORUS. ALL CREDITING WAS PERFORMED IN ACCORDANCE WITH GUIDANCE MEMO NO. 20-2003 TITLED "CHESAPEAKE BAY TMDL SPECIAL CONDITION GUIDANCE" DATED FEBRUARY 6, 2021.

GENERAL NOTES

1. THE SUBJECT PROPERTY OF THIS PLAN IS THE FOLLOWING:
   - 1.1. TAX MAP NUMBER: 57 4 02 013 A
   - 1.2. PARCEL AREA: 8.26 ACRES (359,805.60 SF)
   - 1.3. DEED BOOK AND NUMBER: DB 1808, PG 166
   - 1.4. ESTIMATED DISTURBED AREA: 0.45 AC
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PREPARED BY RICE ASSOCIATES ON JUNE, 2021. THE HORIZONTAL DATUM IS NAD83 WHILE THE VERTICAL DATUM IS NAVD88. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM. NOTE: KIMLEY-HORN PERFORMED A VERTICAL DATUM CONVERSION ON APRIL 11, 2022 TO CONVERT THE ORIGINAL RICE ASSOCIATES SURVEY FROM NAVD88 TO NGVD29. AN ELEVATION ADJUSTMENT OF 0.78 FEET WAS APPLIED TO ALL POINT AND ELEVATION DATA THROUGHOUT THIS PLAN SET. THE DATUM SHIFT WAS PERFORMED USING THE NOAA "ORTHOMETRIC HEIGHT CONVERSION" TOOL.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
4. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO WORKING DAYS, BUT NOT MORE THAN 10 WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
5. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.
6. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAPS (FIRM), COMMUNITY PANEL NO. 5155240005D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006. FIRM PANEL NO. 5155240005D INDICATES THAT THE PROJECT AREA IS NOT LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA (SFHA).
7. TO THE BEST KNOWLEDGE OF THE ENGINEER, THERE ARE NO EXISTING GRAVES OR BURIAL SITES LOCATED ON THE PROPERTY. THE SUBJECT PROPERTY IS NOT LISTED UNDER THE NATIONAL REGISTER OF HISTORICAL PLACES.
8. TO THE BEST KNOWLEDGE OF THE ENGINEER, THIS SITE PLAN CONFORMS TO ALL APPLICABLE ORDINANCES, REGULATIONS AND ADOPTED STANDARDS, UNLESS OTHERWISE SPECIFICALLY NOTED.
9. TO THE BEST KNOWLEDGE OF THE ENGINEER, THERE ARE NO WETLANDS ON THIS SITE.
10. THERE ARE NO RESOURCE PROTECTION AREAS (RPA's) ON THE SUBJECT PROPERTY.

| | OWNER | CLIENT | ENGINEER |
|---|---|---|---|
| NAME | CITY OF FAIRFAX | CITY OF FAIRFAX | KIMLEY-HORN |
| ADDRESS | 10455 ARMSTRONG STREET FAIRFAX, VA | 10455 ARMSTRONG STREET FAIRFAX, VA | 11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA |
| CONTACT | SATOSHI ETO | SATOSHI ETO | JON D'ALESSANDRO, P.E. |
| PHONE | (703) 385-7810 | (703) 385-7810 | (703) 752-0589 |




| Sheet List Table | |
|---|---|
| Sheet Number | Sheet Title |
| 01 | COVER SHEET |
| 02 | NOTES AND DETAILS - 1 |
| 03 | NOTES AND DETAILS - 2 |
| 04 | EXISTING CONDITIONS |
| 05 | PHOTOSTATION LOCATION MAP |
| 06 | PHOTOSTATION LOCATION - PHOTOS |
| 07 | DEMOLITION AND ACCESS PLAN |
| 08 | EROSION AND SEDIMENT CONTROL PLAN - PHASE I |
| 09 | EROSION AND SEDIMENT CONTROL PLAN - PHASE II |
| 10 | EROSION AND SEDIMENT CONTROL - NOTES |
| 11 | EROSION AND SEDIMENT CONTROL - DETAILS I |
| 12 | EROSION AND SEDIMENT CONTROL - DETAILS II |
| 13 | POND HYDROLOGY |
| 14 | PROPOSED POND RETROFIT LAYOUT & GRADING |
| 15 | PROPOSED POND ROUTING & HYDRAULIC ANALYSIS |
| 16 | STORMWATER MANAGEMENT NOTES & CREDITING |
| 17 | PLANTING PLAN |
| 18 | PLANTING NOTES & DETAILS |
| 19 | BMP MAINTENANCE |
| 20 | HISTORICAL PLANS - 1 |
| 21 | HISTORICAL PLANS - 2 |
| 22 | HISTORICAL PLANS - 3 |
| 23 | HISTORICAL PLANS - 4 |
| 24 | HISTORICAL PLANS - 5 |
| 25 | HISTORICAL PLANS - 6 |

AGENT AUTHORIZATION LETTER

To Whom IT May Concern:

I/We, The City of Fairfax, the undersigned title owner(s) of the property identified below do hereby authorize Jon D'Alessandro of Kimley-Horn, to act as my/our agent(s) in the furtherance of an application for a Major Site Plan on my/our property located at: 10455 Armstrong Street in Fairfax, Virginia 22030

Tax Map No: 5 4 02 013 A

Thank you in advance for your cooperation.

Date: _____ By: _____

COMMONWEALTH/STATE OF: Virginia

CITY/COUNTY: City of Fairfax, TO WIT:

The forgoing instrument was acknowledged before me this _____ day of _____,

20____, by _____.

_____
Notary Public (Signature)

AFFIX NOTARY SEAL/STAMP

Notary Registration No: _____

My Commission Expires: _____

ALL TITLE OWNERS MUST SIGN IN PRESENCE OF NOTARY. IF THERE IS MORE THAN ON OWNER, FILL OUT MULTIPLE APPLICATIONS

**City of Fairfax**
APPROVED SITE PLAN

_____ _____
**Zoning Official** **Date**

**Review approval by:**

_____ **Fire Marshal (for water distribution system & fire hydrant location)**
_____ **Fairfax Water**
_____ **Director CDP**
_____ **Director of Public Works**
_____ **City Engineer**
_____ **PW Plan Reviewer**
_____ **Code Admin. Asst. Chief**
_____ **Site Plan Coordinator**
_____ **BAR Liaison**
_____ **Environmental Reviewer**
_____ **Wastewater Reviewer**
_____ **GIS Manager**
_____ **Bonding Administrator** _____
**Date**

**CITY OF FAIRFAX**
**Site Plan Checklist and Certification Statement**

The following affidavit and checklist must be printed on the cover page and signed by a certified engineer, architect or land surveyor.

Certification for Completeness and Accuracy

I Jon D'Alessandro do hereby certify that this site plan checklist is complete and accurate for use in staff's evaluation of the attached site plan that is required pursuant to Section 110-6.8 in the Code of the City of Fairfax.

(signature) _____ (date) _____ (SEAL)

Know what's **below.** **Call** before you dig.

COMMONWEALTH OF VIRGINIA
JONATHAN JOSEPH D'ALESSANDRO
Lic No. 052336
05/09/2022
PROFESSIONAL ENGINEER

| No. | REVISIONS | DATE | BY |
|---|---|---|---|
| 1 | FROM CITY OF FAIRFAX | 08/07/2022 | KH |

Kimley»Horn

© 2021 KIMLEY-HORN AND ASSOCIATES, INC.
11400 COMMERCE PARK DR., SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

KHA PROJECT 110557005
DATE 08/25/2022
SCALE AS SHOWN
DESIGNED BY J.J.D
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET

FAIRFAX CITY HALL POND RETROFIT
PREPARED FOR
CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

PROPERTY INFORMATION

1. TAX REFERENCE NUMBER: 57 4
2. PROPERTY PARCEL NUMBER: 57 4 02 013 A
3. ADDRESS: 10455 ARMSTRONG STREET FAIRFAX, VA 22030
4. GEOGRAPHIC COORDINATES: LATITUDE 38.841025, LONGITUDE -77.308268

PROPERTY OWNER INFORMATION

1. NAME: CITY OF FAIRFAX
2. ADDRESS: 10455 ARMSTRONG STREET FAIRFAX, VA 22030
3. TELEPHONE NUMBER: 703-385-7810

THIS PROJECT CONSISTS OF THE MAINTENANCE, ENHANCEMENT, AND RETROFIT OF THE STORMWATER MANAGEMENT POND LOCATED AT 10455 ARMSTRONG STREET (CITY HALL POND). THE POND DRAINS APPROXIMATELY 3.49 ACRES FROM GEORGE MASON BOULEVARD AND ADJACENT NEIGHBORHOODS. THE POND RETROFIT PROJECT INCLUDES INSTALLATION OF A SEDIMENT FOREBAY AND INCREASE IN POND TREATMENT VOLUME. AS PART OF THE DESIGN, A VEGETATIVE BENCH HAS BEEN INCLUDED AND SINUOSITY HAS BEEN ADDED TO THE POND FLOOR TO INCREASE STORMWATER HYDRAULIC RESIDENCE TIME. THE ADDITION OF THE FOREBAY WILL PROVIDE A MAINTENANCE FEATURE FOR THE FACILITY THAT WILL ALLOW FOR EASE OF MAINTENANCE AFTER IMPLEMENTATION. THE PROPOSED STORMWATER MANAGEMENT FACILITY WILL BE MAINTAINED THROUGH THE CITY OF FAIRFAX'S PUBLIC BMP MAINTENANCE PROGRAM.

NO MODIFICATIONS WILL BE MADE TO THE EXISTING STORM SEWER INFRASTRUCTURE ON SITE AND NO ADDITIONAL STORMWATER INFLOWS WILL BE ADDED TO THE STORMWATER MANAGEMENT FACILITY. THERE IS ONE (1) EXISTING 18" RCP INFLOW PIPE THAT DISCHARGES INTO THE FACILITY. FLOW ATTENUATION IS PROVIDED BY A 48" DIAMETER RISER STANDPIPE WITH A 1.5" DIAMETER ORIFICE PLATE AND AN 18" PRINCIPAL SPILLWAY PIPE. THE PRINCIPAL SPILLWAY PIPE TIES THE STORMWATER MANAGEMENT FACILITY BACK INTO THE CITY'S MS4 THROUGH A 36" RCP.

CITY HALL POND DISCHARGES THROUGH A SERIES OF PIPES, TO DANIELS RUN WHICH IS A MAIN TRIBUTARY OF ACCOTINK CREEK. ACCOTINK CREEK HAS A BENTHIC (SEDIMENT), CHLORIDE, AND FECAL COLIFORM TMDL. THE RETROFIT OF THIS FACILITY WILL NOT ONLY PROVIDE THE CHESAPEAKE BAY TMDL CREDIT FOR THE CITY, BUT WILL ALSO HELP ADDRESS THE CITY'S LOCAL TMDL REQUIREMENTS FOR SEDIMENT IMPAIRMENTS IN ACCOTINK CREEK.

## VRRM RE-DEVELOPMENT COMPLIANCE SITE SHEET

*DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet – Version 3.0*

☐ 2011 BMP Standards and Specifications ☑ 2013 Draft BMP Standards and Specifications

CLEAR ALL (Ctrl+Shift+R) — data input cells; constant values; calculation cells; final results

Project Name: City Hall Poind Retrofit - 100% Design
Date: 6/7/2022
Linear Development Project? No

**Site Information**

**Post-Development Project (Treatment Volume and Loads)**

Enter Total Disturbed Area (*acres*) → 0.45

Check: BMP Design Specifications List: 2013 Draft Stds & Specs

| | | |
|---|---|---|
| Maximum reduction required: | 10% | Linear project? No |
| The site's net increase in impervious cover (acres) is: | 0 | Land cover areas entered correctly? ✓ |
| Post-Development TP Load Reduction for Site (lb/yr): | 0.51 | Total disturbed area entered? ✓ |

**Pre-ReDevelopment Land Cover (acres)**

| | A Soils | B Soils | C Soils | D Soils | Totals |
|---|---|---|---|---|---|
| Forest/Open Space (acres) -- undisturbed forest/open space | | | | | 0.00 |
| Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed | | | 0.63 | 0.89 | 1.52 |
| Impervious Cover (acres) | | | 0.08 | 1.89 | 1.97 |
| | | | | | 3.49 |

**Post-Development Land Cover (acres)**

| | A Soils | B Soils | C Soils | D Soils | Totals |
|---|---|---|---|---|---|
| Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land | | | | | 0.00 |
| Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed | | | 0.63 | 0.89 | 1.52 |
| Impervious Cover (acres) | | | 0.08 | 1.89 | 1.97 |
| Area Check | OK. | OK. | OK. | OK. | 3.49 |

**Constants**

| | |
|---|---|
| Annual Rainfall (inches) | 43 |
| Target Rainfall Event (inches) | 1.00 |
| Total Phosphorus (TP) EMC (mg/L) | 0.26 |
| Total Nitrogen (TN) EMC (mg/L) | 1.86 |
| Target TP Load (lb/acre/yr) | 0.41 |
| Pj (unitless correction factor) | 0.90 |

**Runoff Coefficients (Rv)**

| | A Soils | B Soils | C Soils | D Soils |
|---|---|---|---|---|
| Forest/Open Space | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |

**LAND COVER SUMMARY -- PRE-REDEVELOPMENT**

*Land Cover Summary-Pre*

| Pre-ReDevelopment | Listed | Adjusted* |
|---|---|---|
| Forest/Open Space Cover (acres) | 0.00 | 0.00 |
| Weighted Rv(forest) | 0.00 | 0.00 |
| % Forest | 0% | 0% |
| Managed Turf Cover (acres) | 1.52 | 1.52 |
| Weighted Rv(turf) | 0.24 | 0.24 |
| % Managed Turf | 44% | 44% |
| Impervious Cover (acres) | 1.97 | 1.97 |
| Rv(impervious) | 0.95 | 0.95 |
| % Impervious | 56% | 56% |
| **Total Site Area (acres)** | **3.49** | **3.49** |
| **Site Rv** | **0.64** | **0.64** |

**LAND COVER SUMMARY -- POST DEVELOPMENT**

*Land Cover Summary-Post (Final)*

| Post ReDev. & New Impervious | |
|---|---|
| Forest/Open Space Cover (acres) | 0.00 |
| Weighted Rv(forest) | 0.00 |
| % Forest | 0% |
| Managed Turf Cover (acres) | 1.52 |
| Weighted Rv (turf) | 0.24 |
| % Managed Turf | 44% |
| Impervious Cover (acres) | 1.97 |
| Rv(impervious) | 0.95 |
| % Impervious | 56% |
| **Final Site Area (acres)** | **3.49** |
| **Final Post Dev Site Rv** | **0.64** |

*Land Cover Summary-Post*

| Post-ReDevelopment | |
|---|---|
| Forest/Open Space Cover (acres) | 0.00 |
| Weighted Rv(forest) | 0.00 |
| % Forest | 0% |
| Managed Turf Cover (acres) | 1.52 |
| Weighted Rv (turf) | 0.24 |
| % Managed Turf | 44% |
| ReDev. Impervious Cover (acres) | 1.97 |
| Rv(impervious) | 0.95 |
| % Impervious | 56% |
| **Total ReDev. Site Area (acres)** | **3.49** |
| **ReDev Site Rv** | **0.64** |

*Land Cover Summary-Post*

| Post-Development New Impervious | |
|---|---|
| New Impervious Cover (acres) | 0.00 |
| Rv(impervious) | -- |

**Treatment Volume and Nutrient Load**

| | | |
|---|---|---|
| **Pre-ReDevelopment Treatment Volume (acre-ft)** | 0.1861 | 0.1861 |
| **Pre-ReDevelopment Treatment Volume (cubic feet)** | 8,104 | 8,104 |
| **Pre-ReDevelopment TP Load (lb/yr)** | **5.09** | **5.09** |
| Pre-ReDevelopment TP Load per acre (lb/acre/yr) | 1.46 | 1.46 |
| Baseline TP Load (lb/yr) (0.43 lbs/acre/yr applied to pre-redevelopment area excluding pervious land proposed for new impervious cover) | *1.43* | |

**Treatment Volume and Nutrient Load**

| | | |
|---|---|---|
| **Final Post-Development Treatment Volume (acre-ft)** | 0.1861 | |
| **Final Post-Development Treatment Volume (cubic feet)** | 8,104 | |
| **Final Post-Development TP Load (lb/yr)** | **5.09** | |
| Final Post-Development TP Load per acre (lb/acre/yr) | 1.46 | |

**Treatment Volume and Nutrient Load**

| | | |
|---|---|---|
| **Post-ReDevelopment Treatment Volume (acre-ft)** | 0.1861 | |
| **Post-ReDevelopment Treatment Volume (cubic feet)** | 8,104 | |
| **Post-ReDevelopment Load (TP) (lb/yr)*** | **5.09** | |
| Post-ReDevelopment TP Load per acre (lb/acre/yr) | 1.46 | |
| **Max. Reduction Required (Below Pre-ReDevelopment Load)** | 10% | |
| **TP Load Reduction Required for Redeveloped Area (lb/yr)** | **0.51** | |

| | | |
|---|---|---|
| **Post-Development Treatment Volume (acre-ft)** | -- | |
| **Post-Development Treatment Volume (cubic feet)** | -- | |
| **Post-Development TP Load (lb/yr)** | -- | |
| **TP Load Reduction Required for New Impervious Area (lb/yr)** | **0** | |

* Adjusted Land Cover Summary:
Pre-ReDevelopment land cover minus pervious land cover (forest/open space or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requirement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).

**Post-Development Requirement for Site Area**

| | |
|---|---|
| **TP Load Reduction Required (lb/yr)** | **0.51** |

**Nitrogen Loads (Informational Purposes Only)**

| | | | |
|---|---|---|---|
| Pre-ReDevelopment TN Load (lb/yr) | 36.43 | Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr) | 36.43 |

## VRRM RE-DEVELOPMENT COMPLIANCE DRAINAGE AREA A SHEET

**Drainage Area A**

**Drainage Area A Land Cover (acres)**

| | A Soils | B Soils | C Soils | D Soils | Totals | Land Cover Rv |
|---|---|---|---|---|---|---|
| Forest/Open Space (acres) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| Managed Turf (acres) | 0.00 | 0.00 | 0.63 | 0.89 | 1.52 | 0.76 |
| Impervious Cover (acres) | 0.00 | 0.00 | 0.08 | 1.89 | 1.97 | 0.90 |
| | | | | Total: | 3.49 | |

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. A (lb/yr): 5.09
Post-Development Treatment Volume in D.A. A (ft³): 8,104

**Stormwater Best Management Practices (RR = Runoff Reduction)**

--Select from dropdown lists--

| Practice | Runoff Reduction Credit (%) | Managed Turf Credit Area (acres) | Impervious Cover Credit Area (acres) | Volume from Upstream Practice (ft³) | Runoff Reduction (ft³) | Remaining Runoff Volume (ft³) | Total BMP Treatment Volume (ft³) | Phosphorus Removal Efficiency (%) | Phosphorus Load from Upstream Practices (lb) | Untreated Phosphorus Load to Practice (lb) | Phosphorus Removed By Practice (lb) | Remaining Phosphorus Load (lb) | Downstream Practice to be Employed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A. Extended Detention Pond (ED) | | | | | | | | | | | | | |
| BA 13 #1 (Spec #13) | 0 | 1.52 | 1.97 | 0 | 0 | 8,104 | 8,104 | 55 | 0.00 | 5.09 | 2.79 | 4.62 | |

| Nitrogen Removal Efficiency (%) | Nitrogen Load from Upstream Practices | Untreated Nitrogen Load to Practice | Nitrogen Removed By Practice (lbs) | Remaining Nitrogen Load (lbs) |
|---|---|---|---|---|
| 0 | 0.00 | 36.43 | 0.64 | 10.25 |

TOTAL IMPERVIOUS COVER TREATED (ac) 1.97 — AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac) 1.52 — AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft³) 0

TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr): 5.09
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr): 0.76
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr): 4.33

*SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS*

TOTAL RUNOFF REDUCTION IN D.A. A (ft³): 0
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr): 0.64

*SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS (Information Only)*

TOTAL IMPERVIOUS COVER TREATED (ac) 1.97 — AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac) 1.52 — AREA CHECK: OK.

TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr): 0.51

TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr): 5.09
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr): 2.00
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr): 0.76
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr): 5.76
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr): 4.33

*SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS*

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr): 0.64
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr): 0.00
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr): 0.64

## CITY HALL POND RETROFIT CHESAPEAKE BAY TMDL POLLUTANT OF CONCERN (POC) - REDUCTION CALCULATIONS

Methodology used was obtained from the *DEQ Guidance Memo No. 20-2003 - Chesapeake Bay TMDL Special Condition Guidance* , dated November 12, 2020.

| | |
|---|---|
| BMP Retrofit Type: | BMP Enhancement |
| BMP Treatment Practice: | Dry Detention Pond |

Note: Classification obtained from Table V.C.1 - Chesapeake Bay Program BMPs, Established Efficiencies

| | | |
|---|---|---|
| **Drainage Basin Information** | | |
| Drainage Basin = | Potomac River Basin | - |
| **Nitrogen Loading Rate** | | |
| Regulate Impervious = | 16.86 | lbs/ac/yr |
| Regulate Pervious = | 10.07 | lbs/ac/yr |
| **Phosphorus Loading Rate** | | |
| Regulate Impervious = | 1.62 | lbs/ac/yr |
| Regulate Pervious = | 0.41 | lbs/ac/yr |
| **Total Suspend Solids Loading Rate** | | |
| Regulate Impervious = | 1,171.32 | lbs/ac/yr |
| Regulate Pervious = | 175.8 | lbs/ac/yr |

Note: Loading rates obtained from Table 3b of the Virginia Administrative Code (9VAC25-890-40) General Permit

| | | |
|---|---|---|
| **BMP Drainage Basin Information** | | |
| Total Drainage Area = | 3.49 | ac |
| Impervious = | 1.56 | ac |
| Pervious = | 1.93 | ac |
| **Total Pollutant Load In The BMP Drainage Basin** | | |
| Nitrogen = | 45.74 | lbs/yr |
| Phosphorus = | 3.32 | lbs/yr |
| Total Suspend Solids = | 2,166.55 | lbs/yr |
| **Existing BMP Effiency** | | |
| Nitrogen = | 5 | % |
| Phosphorus = | 10 | % |
| Total Suspend Solids = | 10 | % |

Note: Efficiencies obtained from Table V.C.1 - Chesapeake Bay Program BMPs, Established Efficiencies (Dry Detention Pond)

| | | |
|---|---|---|
| **Existing BMP Effiency Modification** | | |
| Missing Forebay= | 10 | % |
| Missing Micropool = | 10 | % |
| Missing Length/Width = | 2 | % |
| Total = | 22 | % |
| **Revised Existing BMP Effiency** | | |
| Nitrogen = | 3.9 | % |
| Phosphorus = | 7.8 | % |
| Total Suspend Solids = | 7.8 | % |
| **Proposed BMP Effiency** | | |
| Nitrogen = | 20 | % |
| Phosphorus = | 20 | % |
| Total Suspend Solids = | 60 | % |

Note: Efficiencies obtained from Table V.C.1 - Chesapeake Bay Program BMPs, Established Efficiencies (Dry Extended Detention Pond)

| | | |
|---|---|---|
| **BMP Effiency Difference** | | |
| Nitrogen = | 16.1 | % |
| Phosphorus = | 12.2 | % |
| Total Suspend Solids = | 52.2 | % |
| **Final Polutant Load Recution** | | |
| Nitrogen = | 7.36 | lbs/yr |
| Phosphorus = | 0.40 | lbs/yr |
| Total Suspend Solids = | 1130.94 | lbs/yr |

COMMONWEALTH OF VIRGINIA — JONATHAN JOSEPH D'ALESSANDRO — Lic No. 052336 — 05/09/2022 — PROFESSIONAL ENGINEER

| No. | REVISIONS | DATE | BY |
|---|---|---|---|
| 1 | FROM CITY OF FAIRFAX | 08/07/2022 | KH |

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KHA PROJECT 110557005
DATE 08/25/2022
SCALE AS SHOWN
DESIGNED BY J.J.D
DRAWN BY J.A.C
CHECKED BY J.J.D

STORMWATER MANAGEMENT NOTES & CREDITING

FAIRFAX CITY HALL POND RETROFIT
PREPARED FOR
CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER 16

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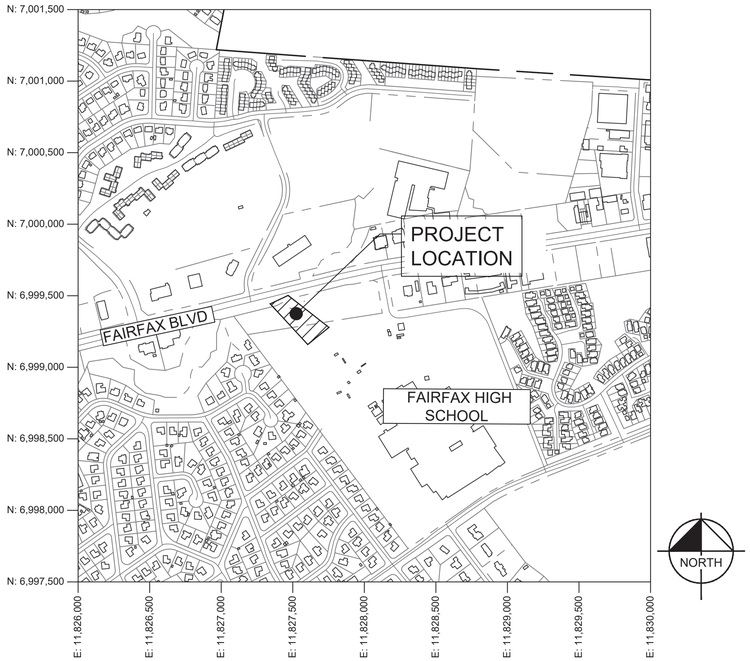
**Appendix E. Lion Run Outfall Restoration POC Reduction Calculations**

# 100% CONSTRUCTION PLANS
# LION RUN SITE
# OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 48 3 02 020 & 58 1 02 003
3501 LION RUN
CITY OF FAIRFAX, VIRGINIA

## VICINITY MAP

1" = 500'




PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF APPROXIMATELY 375 LINEAR FEET OF AN ACTIVELY ERODING OUTFALL CHANNEL. THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A 60" RCP PIPE AND END AT THE CONFLUENCE OF ACCOTINK CREEK. THE PROJECT IS LOCATED IN THE VICINITY OF FAIRFAX HIGH SCHOOL IN THE CITY OF FAIRFAX, VIRGINIA. THE LIMITS OF DISTURBANCE ARE 0.85 ACRES. THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION. THE SOIL SAMPLE BULK DENSITY WAS 78.66 LB/FT$^3$ AND THE CONCENTRATIONS WERE 0.66 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.60 LBS OF NITROGEN PER 1 TON OF SEDIMENT.THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 45,077.02 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 36.06 LBS/YR OF NITROGEN, AND 14.97 LBS/YR OF PHOSPHORUS.

GENERAL NOTES

1. THE SUBJECT PROPERTIES OF THIS PROJECT IS TAX MAP NUMBER: 48 3 02 020 & 58 1 02 003
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PERFORMED BY RICE ASSOCIATES ON JULY, 2021. THE TOPOGRAPHIC INFORMATION HAS BEEN CONVERTED FROM VERTICAL DATUM NAVD88 TO NGVD29 BY KIMLEY-HORN. THE HORIZONTAL DATUM IS NAD83. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
4. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO WORKING DAYS, BUT NOT MORE THAN 10 WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
5. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.

**DECLARATION OF NO IMPACT TO THE FLOODPLAIN NARRATIVE:** THE DEVELOPMENT WITHIN THE FLOODPLAIN IS RELATED TO THE MAINTENANCE AND RESTORATION OF THE EXISTING MANMADE STORM SEWER OUTFALL CHANNEL. THE INTENT OF THE CHANNEL REPAIR AND RESTORATION IS TO RETURN THE ERODED RECEIVING CHANNEL TO A STABLE CONDITION AND PREVENT FUTURE EROSION. THE PROJECT EARTHWORK IS A NET CUT AND THE PROPOSED CHANGES IN THE FLOODPLAIN CROSS SECTIONAL AREA ARE ASSUMED AS NEGLIGIBLE WHEN COMPARED TO THE OVERALL FLOODPLAIN CROSS SECTIONAL AREA. THE PROPOSED CHANNEL REPAIR WILL NOT MODIFY THE EXISTING FLOODPLAIN HYDRAULICS, NOR WILL IT IMPACT OFFSITE PROPERTY OR THE EXISTING FLOODPLAIN BOUNDARY / BASE FLOOD ELEVATIONS. THERE WILL BE NO CHANGE TO PRE AND POST DEVELOPMENT FLOODPLAIN FLOWRATE AND VELOCITY ONSITE, UPSTREAM OR DOWNSTREAM WITHIN THE STREAM CORRIDOR. ALL WORK PROPOSED AS PART OF THIS CHANNEL MAINTENANCE PROJECT IS IN COMPLIANCE WITH CITY CODE SECTION 4.15.8 APPROVAL CRITERIA.

| Checklist of Submittal Requirements | | |
|---|---|---|
| Impervious surface in the floodplain: | 0.17 | ac. |
| Area of floodplain vegetation disturbed: | 0.85 | ac. |
| Area of floodplain land graded: | 0.35 | ac. |
| Maximum depth of cut or fill on floodplain land: | 5.21 (cut) | ft. |

| Sheet List Table | |
|---|---|
| Sheet Number | Sheet Title |
| 01 | COVER SHEET |
| 02 | GENERAL NOTES & DETAILS |
| 03 | CORRESPONDENCE |
| 04 | EXISTING CONDITIONS |
| 05 | EXISTING CONDITIONS |
| 06 | PHOTO LOCATION MAP |
| 07 | EROSION & SEDIMENT CONTROL PHASE I |
| 08 | EROSION & SEDIMENT CONTROL PHASE II |
| 09 | EROSION & SEDIMENT CONTROL NOTES & DETAILS |
| 10 | EROSION & SEDIMENT CONTROL NOTES & DETAILS |
| 11 | EROSION & SEDIMENT CONTROL NOTES & DETAILS |
| 12 | EROSION & SEDIMENT CONTROL NOTES & DETAILS |
| 13 | EXISTING HYDROLOGY |
| 14 | LAND COVER ANALYSIS (TR55) |
| 15 | EXISTING CONDITIONS HYDROGRAPH |
| 16 | POC CREDITING SUMMARY |
| 17 | OUTFALL RESTORATION |
| 18 | LANDSCAPING PLAN |
| 19 | PLANTING DETAILS |
| 20 | EXISTING TREE INVENTORY |
| 21 | EXISTING TREE INVENTORY |

| | OWNER | CLIENT | ENGINEER |
|---|---|---|---|
| NAME | CITY OF FAIRFAX SCHOOL BOARD | CITY OF FAIRFAX | KIMLEY-HORN |
| ADDRESS | 10455 ARMSTRONG STREET FAIRFAX, VA | 10455 ARMSTRONG STREET FAIRFAX, VA | 11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA |
| CONTACT | SATOSHI ETO | SATOSHI ETO | JON D'ALESSANDRO |
| PHONE | (703) 385-7810 | (703) 385-7810 | (703) 752-0589 |

Kimley»Horn

Know what's **below.** **Call** before you dig.

JUAN A. CAMPOS
Lic. No. 0402061628
PROFESSIONAL ENGINEER
COMMONWEALTH OF VIRGINIA
07/27/2022

| No. | REVISIONS | DATE | BY |
|---|---|---|---|
| 1 | PUBLIC WORKS COMMENTS | 06/16/2022 | J.A.C |
| 2 | PUBLIC WORKS COMMENTS | 07/27/2022 | J.A.C |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KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET

OUTFALL AND GULLY RESTORATION
LION RUN SITE

PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

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| Field Data | | |
|---|---|---|
| Bulk Density = | 78.66 | *lb./ft³* |
| 1 ton of sediment = | 0.664 | *lb. of (P)* |
| 1 ton of sediment = | 1.6 | *lb. of (N)* |

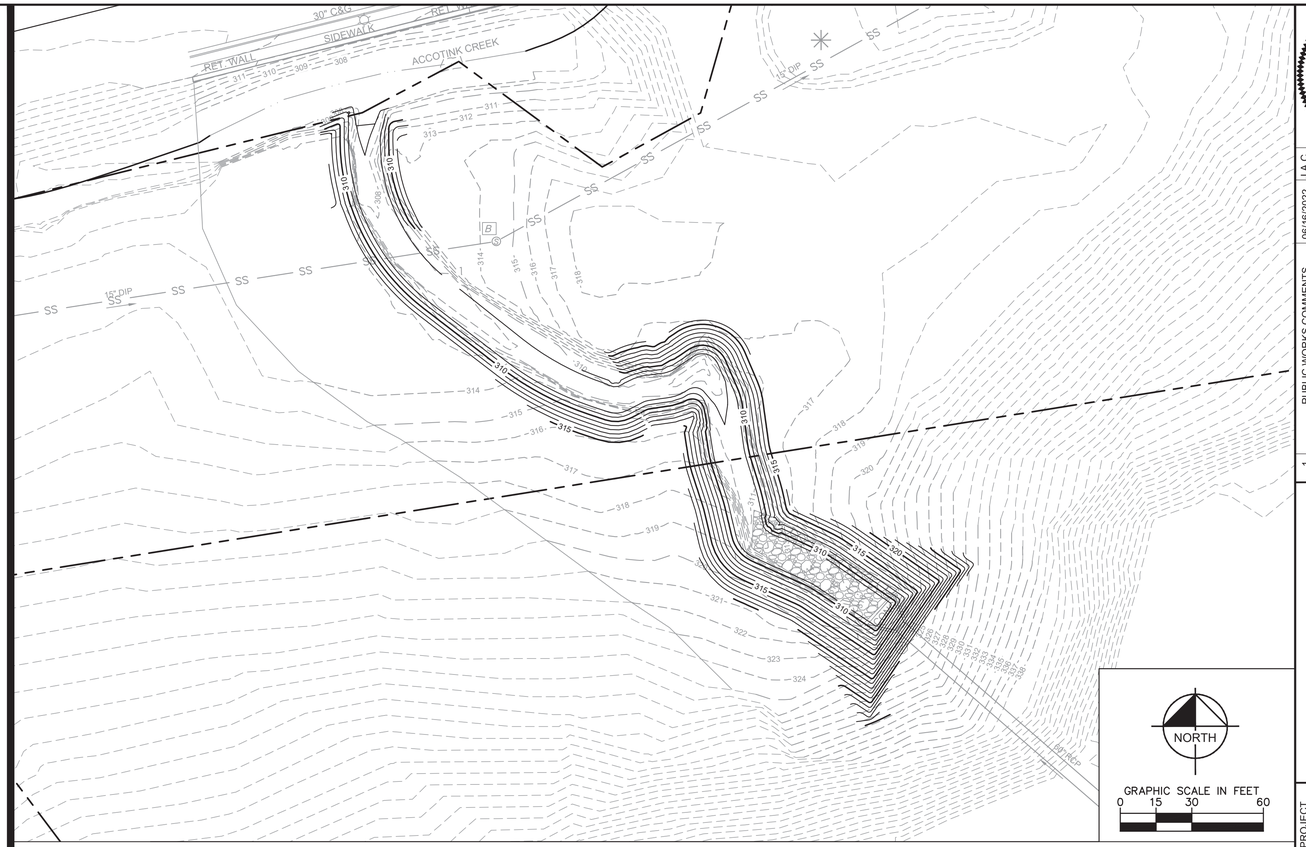
| Project Information | |
|---|---|
| Project Name: | CITY OF FAIRFAX OUTFALL AND GULLY STABILIZATION |
| Project Number: | 110557012 |
| Date: | 5/19/2022 |
| Design By: | JJD |

## Existing Outfall Channel Condition Parameters

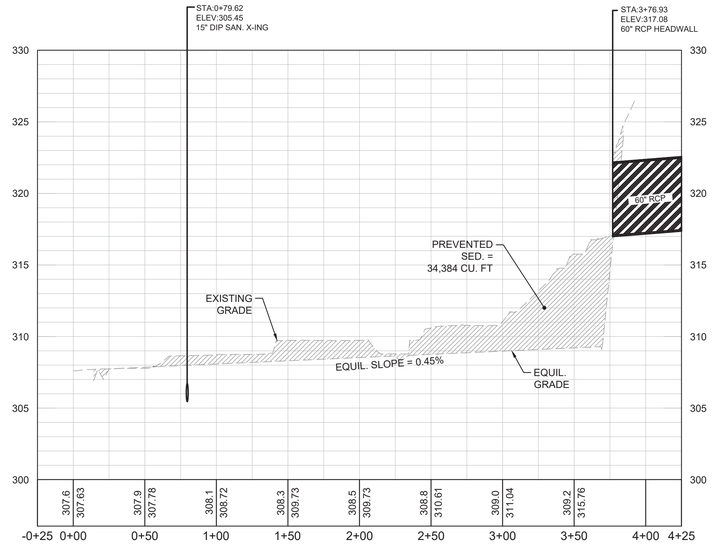
| | | |
|---|---|---|
| Drainage Area ($A_d$) = | 56.8 | *ac* |
| Drainage Area ($A_d$) = | 0.2300 | *km²* |
| Mean Flow Depth = | 3.500 | *ft* |
| ***Step 1 - Define the Existing Channel Conditions*** | | |
| Length of Proposed Reach = | 376.930 | *ft* |
| Channel Slope = | 0.025 | *ft/ft* |
| Bank Height = | 5.363 | *ft* |
| Bottom Width = | 9.633 | *ft* |
| Top Width = | 27.233 | *ft* |
| Bulk Density (Estimate) = | 84.278 | *lb./ft³* |
| ***Step 2 - Define the Equilibrium Channel Conditions*** | | |
| Is there a pipe outfall or other defining infrastructure present upstream of the restoration site? | | Yes |
| ***Upstream Limit*** | | |
| $L_{max} = 153A_d^{0.6}$ | | |
| Maximum Upstream Channel Length ($L_{max}$) = | Not Applicable | *ft* |
| ***Equilibrium Bed Slope*** | | |
| Choose Bed Condition = | Bed Condition 1 | |
| Bed Condition 1 = | Cohesive Bed | |
| Bed Condition 2 = | Sand and Fine Grave (0.1-5mm particle size) | |
| Bed Condition 3 = | Beds Coarser than Sand (>5mm particle size) | |
| ***Bed Condition 1: Cohesive Bed*** | | |
| $S_{eq} = 0.0028A^{-0.33}$ | | |
| Equilibrium Slope ($S_{eq}$)= | 0.0045 | *ft/ft* |
| ***Sand and Fine Gravel*** | | |
| $S_{eq} = 0.06 / (y * 62.43)$ | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Bed Coarser than Sand*** | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Equilibrium Bank Slopes*** | | |
| Bank Slopes = | | - |
| ***Future Bottom Width (est)*** | | |
| Bottom Width = | 10 | ft |
| ***Step 3: Calculate the Total Prevented Sediment*** | | |
| ***Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition*** | | |
| Volume of Prevented Sediment ($S_v$)= | 1,273.47 | *Cu. Yd.* |
| Volume of Prevented Sediment ($S_v$)= | 34,383.69 | *Cu. ft.* |
| ***Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load*** | | |
| *Adjust for Reduction in Efficiency and Timescale* | | |
| $S_p = 0.5 (S_v / 30)$ | | |
| Annual Volume of Prevented Sediment ($S_p$)= | 573.06 | *Cu. ft. / year* |
| ***Adjust for Soils Bulk Density*** | | |
| *Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density* | | |
| Annual Prevented Sediment Load (Estimate) = | Not Applicable | lb./year |
| Annual Prevented Sediment Load (Field Verified) = | 45,077.02 | lb./year |
| **Step 5: Determine the Annual Prevented Nutrients** | | |
| ***Estimated Conversion Factors*** | | |
| 1.05 lb. of Phosphorus (P) = | 1 ton of sediment | |
| 2.28 lb. of Nitrogen (N) = | 1 ton of sediment | |
| Estimated Phosphorus (P) Removal Rate = | Not Applicable | *lbs./year* |
| Estimated Nitrogen (N) Removal Rate = | Not Applicable | *lbs./year* |
| ***Site Specific Adjusted Results*** | | |
| Bulk Density = | 78.66 | *lb./ft³* |
| 1 ton of sediment = | 0.66 | *lb. of (P)* |
| 1 ton of sediment = | 1.60 | *lb. of (N)* |
| Site Adjusted Total Suspended Solids (TSS) Removal Rate = | 45,077.02 | *lbs./year* |
| Site Adjusted Phosphorus (P) Removal Rate = | 14.97 | *lbs./year* |
| Site Adjusted Nitrogen (N) Removal Rate = | 36.06 | *lbs./year* |

## Pollutant of Concern (POC) Crediting Summary

| | | |
|---|---|---|
| Total Suspended Solids (TSS) Removal Rate = | 45,077.02 | *lbs./year* |
| Phosphorus (P) Removal Rate = | 14.97 | *lbs./year* |
| Nitrogen (N) Removal Rate = | 36.06 | *lbs./year* |




THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 04/21/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 05/02/2022. THE SOIL SAMPLE BULK DENSITY WAS 78.66 LB/FT$^3$ AND THE CONCENTRATIONS WERE 0.66 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.60 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 0.45%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 34,383.69 CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, IT IS ANTICIPATED THAT AN ESTIMATED 45,077.02 LB/YR OF SEDIMENT, 14.97 LB/YR OF PHOSPHORUS, AND 36.06 LB/YR OF NITROGEN REMOVAL WILL BE PROVIDED THROUGH CHANNEL RESTORATION.




OUTFALL CHANNEL
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

JUAN A. CAMPOS
Lic. No. 0402061628
COMMONWEALTH OF VIRGINIA
PROFESSIONAL ENGINEER
07/27/2022

| No. | REVISIONS | DATE | BY |
|---|---|---|---|
| 1 | PUBLIC WORKS COMMENTS | 06/16/2022 | J.A.C |
| 2 | PUBLIC WORKS COMMENTS | 07/27/2022 | J.A.C |

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KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

# POC CREDITING SUMMARY

## OUTFALL AND GULLY RESTORATION
## LION RUN SITE

PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
16

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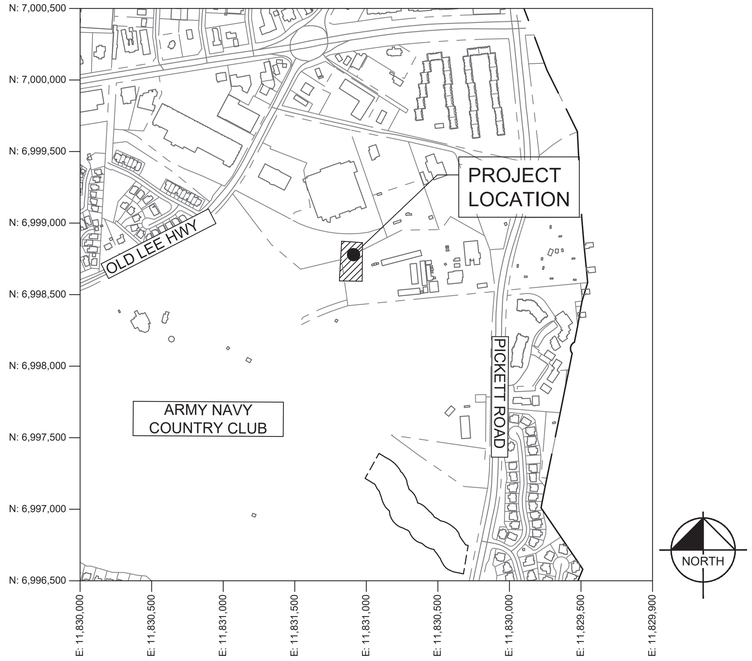
**Appendix F. Pickett Road Outfall Restoration POC Reduction Calculations**

# 100% CONSTRUCTION PLANS
# PICKETT ROAD SITE
# OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 58 1 02 28
3410 PICKETT ROAD
CITY OF FAIRFAX, VIRGINIA

## VICINITY MAP

1" = 500'




PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF APPROXIMATELY 150 LINEAR FEET OF AN ACTIVELY ERODING OUTFALL CHANNEL. THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A CONCRETE CHANNEL AND END AT THE CONFLUENCE OF ACCOTINK CREEK. THE PROJECT IS LOCATED IN THE VICINITY OF THE CITY OF FAIRFAX PROPERTY YARD. THE LIMITS OF DISTURBANCE ARE 0.49 ACRES. THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION. THE SOIL SAMPLE BULK DENSITY WAS 71.17 LB/FT$^3$ AND THE CONCENTRATIONS WERE 0.64 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 3.20 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 11,570.53 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 18.51 LBS/YR OF NITROGEN, AND 3.70 LBS/YR OF PHOSPHORUS.

GENERAL NOTES

1. THE SUBJECT PROPERTY OF THIS PROJECT IS TAX MAP NUMBER: 58 1 02 28
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PERFORMED BY RICE ASSOCIATES ON JULY, 2021. THE TOPOGRAPHIC INFORMATION HAS BEEN CONVERTED FROM VERTICAL DATUM NAVD88 TO NGVD29 BY KIMLEY-HORN. THE HORIZONTAL DATUM IS NAD83. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
4. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO WORKING DAYS, BUT NOT MORE THAN 10 WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
5. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.

**DECLARATION OF NO IMPACT TO THE FLOODPLAIN NARRATIVE:** THE DEVELOPMENT WITHIN THE FLOODPLAIN IS RELATED TO THE MAINTENANCE AND RESTORATION OF THE EXISTING MANMADE STORM SEWER OUTFALL CHANNEL. THE INTENT OF THE CHANNEL REPAIR AND RESTORATION IS TO RETURN THE ERODED RECEIVING CHANNEL TO A STABLE CONDITION AND PREVENT FUTURE EROSION. THE PROJECT EARTHWORK IS A NET CUT AND THE PROPOSED CHANGES IN THE FLOODPLAIN CROSS SECTIONAL AREA ARE ASSUMED AS NEGLIGIBLE WHEN COMPARED TO THE OVERALL FLOODPLAIN CROSS SECTIONAL AREA. THE PROPOSED CHANNEL REPAIR WILL NOT MODIFY THE EXISTING FLOODPLAIN HYDRAULICS, NOR WILL IT IMPACT OFFSITE PROPERTY OR THE EXISTING FLOODPLAIN BOUNDARY / BASE FLOOD ELEVATIONS. THERE WILL BE NO CHANGE TO PRE AND POST DEVELOPMENT FLOODPLAIN FLOWRATE AND VELOCITY ONSITE, UPSTREAM OR DOWNSTREAM WITHIN THE STREAM CORRIDOR. ALL WORK PROPOSED AS PART OF THIS CHANNEL MAINTENANCE PROJECT IS IN COMPLIANCE WITH CITY CODE SECTION 4.15.8 APPROVAL CRITERIA.

| Checklist of Submittal Requirements | | |
|---|---|---|
| Impervious surface in the floodplain: | 0.23 | ac. |
| Area of floodplain vegetation disturbed: | 0.49 | ac. |
| Area of floodplain land graded: | 0.10 | ac. |
| Maximum depth of cut or fill on floodplain land: | 4.61 (cut) | ft. |

| | OWNER | CLIENT | ENGINEER |
|---|---|---|---|
| NAME | CITY OF FAIRFAX | CITY OF FAIRFAX | KIMLEY-HORN |
| ADDRESS | 10455 ARMSTRONG STREET FAIRFAX, VA | 10455 ARMSTRONG STREET FAIRFAX, VA | 11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA |
| CONTACT | SATOSHI ETO | SATOSHI ETO | JON D'ALESSANDRO |
| PHONE | (703) 385-7810 | (703) 385-7810 | (703) 752-0589 |

| Sheet List Table | |
|---|---|
| Sheet Number | Sheet Title |
| 01 | COVER SHEET |
| 02 | GENERAL NOTES & DETAILS |
| 03 | CORRESPONDENCE |
| 04 | EXISTING CONDITIONS |
| 05 | PHOTO LOCATION MAP |
| 06 | EROSION & SEDIMENT CONTROL PHASE I |
| 07 | EROSION & SEDIMENT CONTROL PHASE II |
| 08 | EROSION & SEDIMENT CONTROL NOTES & DETAILS |
| 09 | EROSION & SEDIMENT CONTROL NOTES & DETAILS |
| 10 | EROSION & SEDIMENT CONTROL NOTES & DETAILS |
| 11 | EROSION & SEDIMENT CONTROL NOTES & DETAILS |
| 12 | EXISTING HYDROLOGY |
| 13 | LAND COVER ANALYSIS (TR55) |
| 14 | EXISTING CONDITIONS HYDROGRAPH |
| 15 | POC CREDITING SUMMARY |
| 16 | OUTFALL RESTORATION |
| 17 | LANDSCAPING PLAN |
| 18 | PLANTING DETAILS |
| 19 | EXISTING TREE INVENTORY |

Know what's **below.** **Call** before you dig.

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COMMONWEALTH OF VIRGINIA
JUAN A. CAMPOS
Lic. No. 0402061628
PROFESSIONAL ENGINEER
07/27/2022

| No. | REVISIONS | DATE | BY |
|---|---|---|---|
| 1 | PUBLIC WORKS COMMENTS | 06/16/2022 | J.A.C |
| 2 | PUBLIC WORKS COMMENTS | 07/27/2022 | J.A.C |

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11400 COMMERCE PARK DR, SUITE 400, RESTON, VA 20191
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KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET

OUTFALL AND GULLY RESTORATION
PICKETT ROAD SITE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

| Field Data | | |
|---|---|---|
| Bulk Density = | 71.17 | *lb./ft³* |
| 1 ton of sediment = | 0.64 | *lb. of (P)* |
| 1 ton of sediment = | 3.2 | *lb. of (N)* |

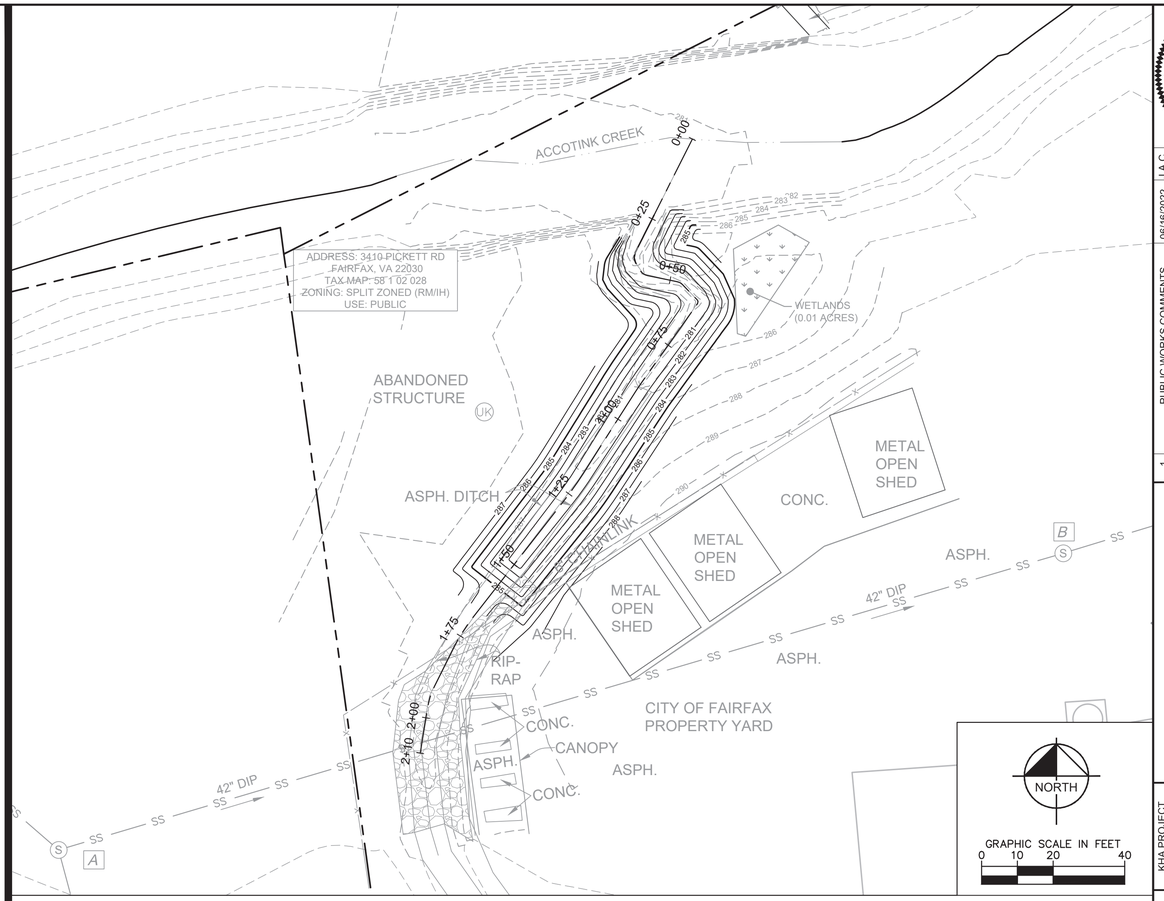
| Project Information | |
|---|---|
| Project Name: | CITY OF FAIRFAX OUTFALL AND GULLY STABILIZATION |
| Project Number: | 110557012 |
| Date: | 5/19/2022 |
| Design By: | JJD |

## Existing Outfall Channel Condition Parameters

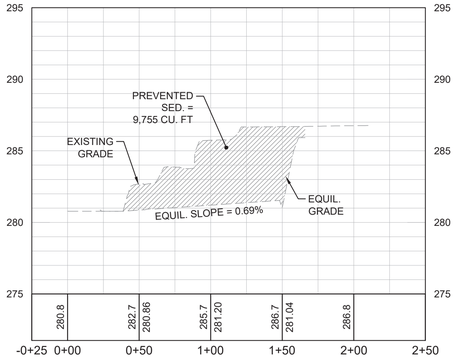
| | | |
|---|---|---|
| Drainage Area ($A_d$) = | 15.98 | *ac* |
| Drainage Area ($A_d$) = | 0.0647 | *km²* |
| Mean Flow Depth = | 1.330 | *ft* |
| ***Step 1 - Define the Existing Channel Conditions*** | | |
| Length of Proposed Reach = | 150.000 | *ft* |
| Channel Slope = | 0.039 | *ft/ft* |
| Bank Height = | 3.733 | *ft* |
| Bottom Width = | 4.133 | *ft* |
| Top Width = | 18.533 | *ft* |
| Bulk Density (Estimate) = | 84.278 | *lb./ft³* |
| ***Step 2 - Define the Equilibrium Channel Conditions*** | | |
| Is there a pipe outfall or other defining infrastructure present upstream of the restoration site? | | Yes |
| ***Upstream Limit*** | | |
| $L_{max} = 153A_d^{0.6}$ | | |
| Maximum Upstream Channel Length ($L_{max}$) = | Not Applicable | *ft* |
| ***Equilibrium Bed Slope*** | | |
| Choose Bed Condition = | Bed Condition 1 | |
| Bed Condition 1 = | Cohesive Bed | |
| Bed Condition 2 = | Sand and Fine Grave (0.1-5mm particle size) | |
| Bed Condition 3 = | Beds Coarser than Sand (>5mm particle size) | |
| ***Bed Condition 1: Cohesive Bed*** | | |
| $S_{eq} = 0.0028A^{-0.33}$ | | |
| Equilibrium Slope ($S_{eq}$) = | 0.0069 | *ft/ft* |
| ***Sand and Fine Gravel*** | | |
| $S_{eq} = 0.06 / (y * 62.43)$ | | |
| Equilibrium Slope ($S_{eq}$) = | Not Applicable | *ft/ft* |
| ***Bed Coarser than Sand*** | | |
| Equilibrium Slope ($S_{eq}$) = | Not Applicable | *ft/ft* |
| ***Equilibrium Bank Slopes*** | | |
| Bank Slopes = | | - |
| ***Future Bottom Width (est)*** | | |
| Bottom Width = | 3.5 | ft |
| ***Step 3: Calculate the Total Prevented Sediment*** | | |
| ***Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition*** | | |
| Volume of Prevented Sediment ($S_v$) = | 361.28 | *Cu. Yd.* |
| Volume of Prevented Sediment ($S_v$) = | 9,754.56 | *Cu. ft.* |
| ***Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load*** | | |
| *Adjust for Reduction in Efficiency and Timescale* | | |
| $S_p = 0.5 (S_v / 30)$ | | |
| Annual Volume of Prevented Sediment ($S_p$) = | 162.58 | *Cu. ft. / year* |
| ***Adjust for Soils Bulk Density*** | | |
| *Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density* | | |
| Annual Prevented Sediment Load (Estimate) = | Not Applicable | lb./year |
| Annual Prevented Sediment Load (Field Verified) = | 11,570.53 | lb./year |
| **Step 5: Determine the Annual Prevented Nutrients** | | |
| ***Estimated Conversion Factors*** | | |
| 1.05 lb. of Phosphorus (P) = | 1 ton of sediment | |
| 2.28 lb. of Nitrogen (N) = | 1 ton of sediment | |
| Estimated Phosphorus (P) Removal Rate = | Not Applicable | *lbs./year* |
| Estimated Nitrogen (N) Removal Rate = | Not Applicable | *lbs./year* |
| ***Site Specific Adjusted Results*** | | |
| Bulk Density = | 71.17 | *lb./ft³* |
| 1 ton of sediment = | 0.64 | *lb. of (P)* |
| 1 ton of sediment = | 3.20 | *lb. of (N)* |
| Site Adjusted Total Suspended Solids (TSS) Removal Rate = | 11,570.53 | *lbs./year* |
| Site Adjusted Phosphorus (P) Removal Rate = | 3.70 | *lbs./year* |
| Site Adjusted Nitrogen (N) Removal Rate = | 18.51 | *lbs./year* |

## Pollutant of Concern (POC) Crediting Summary

| | | |
|---|---|---|
| Total Suspended Solids (TSS) Removal Rate = | 11,570.53 | *lbs./year* |
| Phosphorus (P) Removal Rate = | 3.70 | *lbs./year* |
| Nitrogen (N) Removal Rate = | 18.51 | *lbs./year* |




THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 04/21/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 05/02/2022. THE SOIL SAMPLE BULK DENSITY WAS 71.17 LB/FT$^3$ AND THE CONCENTRATIONS WERE 0.64 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 3.20 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 0.69%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 9,755 CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, IT IS ANTICIPATED THAT AN ESTIMATED 11,570.53 LB/YR OF SEDIMENT, 3.70 LB/YR OF PHOSPHORUS, AND 18.51 LB/YR OF NITROGEN REMOVAL WILL BE PROVIDED THROUGH CHANNEL RESTORATION.




OUTFALL CHANNEL
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

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07/27/2022

| No. | REVISIONS | DATE | BY |
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KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

# POC CREDITING SUMMARY

## OUTFALL AND GULLY RESTORATION
## PICKETT ROAD SITE
## PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
15

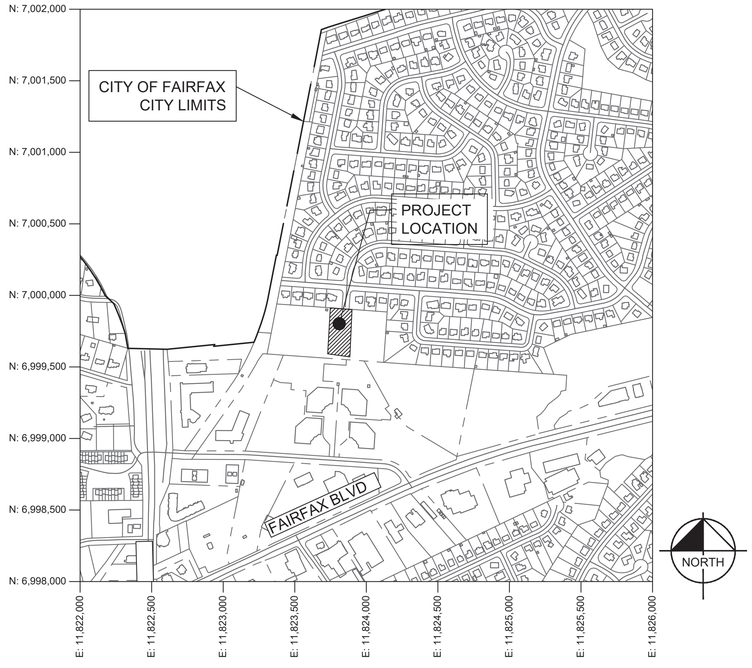
**Appendix G. Shiloh Street Outfall Restoration POC Reduction Calculations**

# 100% CONSTRUCTION PLANS
# SHILOH STREET SITE
# OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 47 4 01 002 C
10400 SHILOH STREET
CITY OF FAIRFAX, VIRGINIA

## VICINITY MAP

1" = 500'




PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF APPROXIMATELY 250 LINEAR FEET OF AN ACTIVELY ERODING OUTFALL CHANNEL. THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A 36" RCP PIPE AND END AT THE CONFLUENCE OF ACCOTINK CREEK. THE PROJECT IS LOCATED IN THE VICINITY OF RANGER ROAD PARK IN THE CITY OF FAIRFAX, VIRGINIA. THE LIMITS OF DISTURBANCE ARE 0.51 ACRES. THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION. THE SOIL SAMPLE BULK DENSITY WAS 87.40 LB/FT$^3$ AND THE CONCENTRATIONS WERE 0.66 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.22 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 28,100.89 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 17.09 LBS/YR OF NITROGEN, AND 9.25 LBS/YR OF PHOSPHORUS.

GENERAL NOTES

1. THE SUBJECT PROPERTY OF THIS PROJECT IS TAX MAP NUMBER: 47 4 01 002 C
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PERFORMED BY RICE ASSOCIATES ON JULY, 2021. THE TOPOGRAPHIC INFORMATION HAS BEEN CONVERTED FROM VERTICAL DATUM NAVD88 TO NGVD29 BY KIMLEY-HORN. THE HORIZONTAL DATUM IS NAD83. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
4. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO WORKING DAYS, BUT NOT MORE THAN 10 WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
5. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.

**DECLARATION OF NO IMPACT TO THE FLOODPLAIN NARRATIVE:** THE DEVELOPMENT WITHIN THE FLOODPLAIN IS RELATED TO THE MAINTENANCE AND RESTORATION OF THE EXISTING MANMADE STORM SEWER OUTFALL CHANNEL. THE INTENT OF THE CHANNEL REPAIR AND RESTORATION IS TO RETURN THE ERODED RECEIVING CHANNEL TO A STABLE CONDITION AND PREVENT FUTURE EROSION. THE PROJECT EARTHWORK IS A NET CUT AND THE PROPOSED CHANGES IN THE FLOODPLAIN CROSS SECTIONAL AREA ARE ASSUMED AS NEGLIGIBLE WHEN COMPARED TO THE OVERALL FLOODPLAIN CROSS SECTIONAL AREA. THE PROPOSED CHANNEL REPAIR WILL NOT MODIFY THE EXISTING FLOODPLAIN HYDRAULICS, NOR WILL IT IMPACT OFFSITE PROPERTY OR THE EXISTING FLOODPLAIN BOUNDARY / BASE FLOOD ELEVATIONS. THERE WILL BE NO CHANGE TO PRE AND POST DEVELOPMENT FLOODPLAIN FLOWRATE AND VELOCITY ONSITE, UPSTREAM OR DOWNSTREAM WITHIN THE STREAM CORRIDOR. ALL WORK PROPOSED AS PART OF THIS CHANNEL MAINTENANCE PROJECT IS IN COMPLIANCE WITH CITY CODE SECTION 4.15.8 APPROVAL CRITERIA.

| Checklist of Submittal Requirements | | |
|---|---|---|
| Impervious surface in the floodplain: | 0.08 | ac. |
| Area of floodplain vegetation disturbed: | 0.51 | ac. |
| Area of floodplain land graded: | 0.11 | ac. |
| Maximum depth of cut or fill on floodplain land: | 2.23 (cut) | ft. |

| | OWNER | CLIENT | ENGINEER |
|---|---|---|---|
| NAME | CITY OF FAIRFAX | CITY OF FAIRFAX | KIMLEY-HORN |
| ADDRESS | 10455 ARMSTRONG STREET FAIRFAX, VA | 10455 ARMSTRONG STREET FAIRFAX, VA | 11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA |
| CONTACT | SATOSHI ETO | SATOSHI ETO | JON D'ALESSANDRO |
| PHONE | (703) 385-7810 | (703) 385-7810 | (703) 752-0589 |

| Sheet List Table | |
|---|---|
| Sheet Number | Sheet Title |
| 01 | COVER SHEET |
| 02 | GENERAL NOTES & DETAILS |
| 03 | CORRESPONDENCE |
| 04 | EXISTING CONDITIONS |
| 05 | PHOTO LOCATION MAP |
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| 19 | EXISTING TREE INVENTORY |

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COMMONWEALTH OF VIRGINIA
07/27/2022

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KHA PROJECT 110557012
DATE 06/15/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET

OUTFALL AND GULLY RESTORATION
SHILOH STREET SITE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01

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| Field Data | | |
|---|---|---|
| Bulk Density = | 87.4 | *lb./ft$^3$* |
| 1 ton of sediment = | 0.658 | *lb. of (P)* |
| 1 ton of sediment = | 1.216 | *lb. of (N)* |

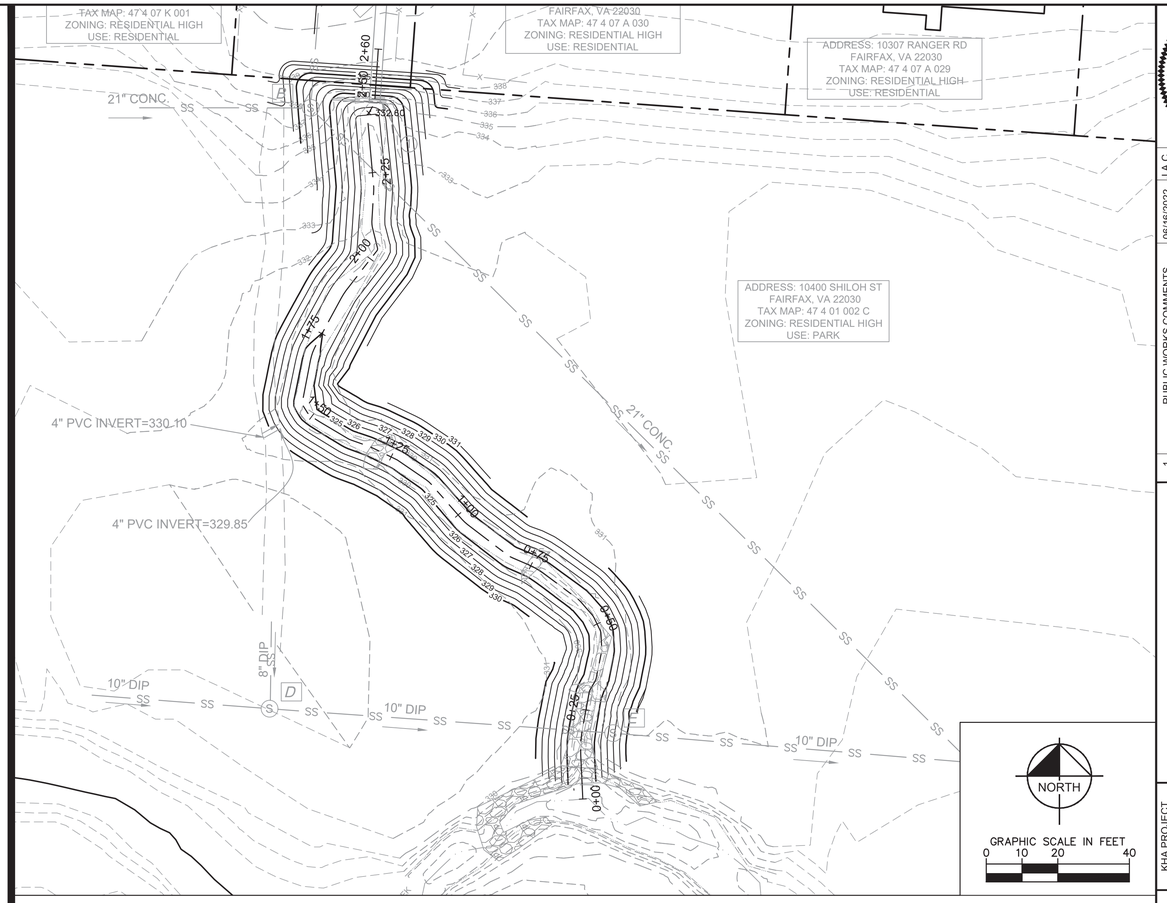
| Project Information | |
|---|---|
| Project Name: | CITY OF FAIRFAX OUTFALL AND GULLY STABILIZATION |
| Project Number: | 110557012 |
| Date: | 5/19/2022 |
| Design By: | JJD |

## Existing Outfall Channel Condition Parameters

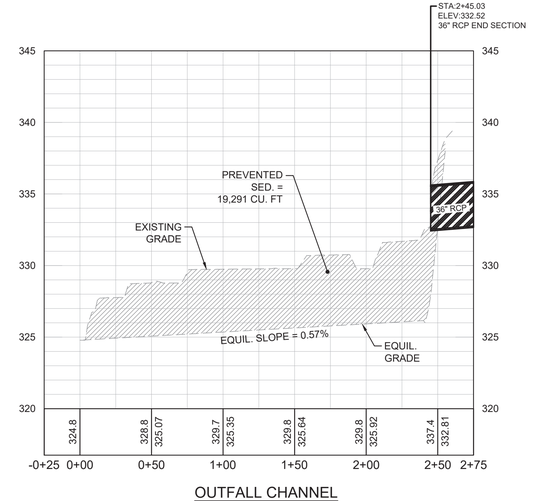
| | | |
|---|---|---|
| Drainage Area ($A_d$) = | 28.77 | *ac* |
| Drainage Area ($A_d$) = | 0.1165 | *km$^2$* |
| Mean Flow Depth = | 1.933 | *ft* |
| ***Step 1 - Define the Existing Channel Conditions*** | | |
| Length of Proposed Reach = | 245.120 | *ft* |
| Channel Slope = | 0.032 | *ft/ft* |
| Bank Height = | 2.457 | *ft* |
| Bottom Width = | 7.600 | *ft* |
| Top Width = | 30.100 | *ft* |
| Bulk Density (Estimate) = | 84.278 | *lb./ft$^3$* |
| ***Step 2 - Define the Equilibrium Channel Conditions*** | | |
| Is there a pipe outfall or other defining infrastructure present upstream of the restoration site? | | Yes |
| ***Upstream Limit*** | | |
| $L_{max}= 153A_d^{0.6}$ | | |
| Maximum Upstream Channel Length ($L_{max}$) = | Not Applicable | *ft* |
| ***Equilibrium Bed Slope*** | | |
| Choose Bed Condition = | Bed Condition 1 | |
| Bed Condition 1 = | Cohesive Bed | |
| Bed Condition 2 = | Sand and Fine Grave (0.1-5mm particle size) | |
| Bed Condition 3 = | Beds Coarser than Sand (>5mm particle size) | |
| ***Bed Condition 1: Cohesive Bed*** | | |
| $S_{eq} = 0.0028A^{-0.33}$ | | |
| Equilibrium Slope ($S_{eq}$)= | 0.0057 | *ft/ft* |
| ***Sand and Fine Gravel*** | | |
| $S_{eq} = 0.06 / (y * 62.43)$ | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Bed Coarser than Sand*** | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Equilibrium Bank Slopes*** | | |
| Bank Slopes = | | - |
| ***Future Bottom Width (est)*** | | |
| Bottom Width = | 6 | ft |
| ***Step 3: Calculate the Total Prevented Sediment*** | | |
| ***Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition*** | | |
| Volume of Prevented Sediment ($S_v$)= | 714.49 | *Cu. Yd.* |
| Volume of Prevented Sediment ($S_v$)= | 19,291.23 | *Cu. ft.* |
| ***Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load*** | | |
| *Adjust for Reduction in Efficiency and Timescale* | | |
| $S_p = 0.5 (S_v / 30)$ | | |
| Annual Volume of Prevented Sediment ($S_p$)= | 321.52 | *Cu. ft. / year* |
| ***Adjust for Soils Bulk Density*** | | |
| *Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density* | | |
| Annual Prevented Sediment Load (Estimate) = | Not Applicable | lb./year |
| Annual Prevented Sediment Load (Field Verified) = | 28,100.89 | lb./year |
| **Step 5: Determine the Annual Prevented Nutrients** | | |
| ***Estimated Conversion Factors*** | | |
| 1.05 lb. of Phosphorus (P) = | 1 ton of sediment | |
| 2.28 lb. of Nitrogen (N) = | 1 ton of sediment | |
| Estimated Phosphorus (P) Removal Rate = | Not Applicable | *lbs./year* |
| Estimated Nitrogen (N) Removal Rate = | Not Applicable | *lbs./year* |
| ***Site Specific Adjusted Results*** | | |
| Bulk Density = | 87.40 | *lb./ft$^3$* |
| 1 ton of sediment = | 0.66 | *lb. of (P)* |
| 1 ton of sediment = | 1.22 | *lb. of (N)* |
| Site Adjusted Total Suspended Solids (TSS) Removal Rate = | 28,100.89 | *lbs./year* |
| Site Adjusted Phosphorus (P) Removal Rate = | 9.25 | *lbs./year* |
| Site Adjusted Nitrogen (N) Removal Rate = | 17.09 | *lbs./year* |

## Pollutant of Concern (POC) Crediting Summary

| | | |
|---|---|---|
| Total Suspended Solids (TSS) Removal Rate = | 28,100.89 | *lbs./year* |
| Phosphorus (P) Removal Rate = | 9.25 | *lbs./year* |
| Nitrogen (N) Removal Rate = | 17.09 | *lbs./year* |




THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 04/21/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 05/02/2022. THE SOIL SAMPLE BULK DENSITY WAS 87.40 LB/FT$^3$ AND THE CONCENTRATIONS WERE 0.66 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.22 LBS OF NITROGEN PER 1 TON OF SEDIMENT.THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 0.57%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 19,291.23 CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, IT IS ANTICIPATED THAT AN ESTIMATED 28,100.89 LB/YR OF SEDIMENT, 9.25 LB/YR OF PHOSPHORUS, AND 17.09 LB/YR OF NITROGEN REMOVAL WILL BE PROVIDED THROUGH CHANNEL RESTORATION.




OUTFALL CHANNEL
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

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CHECKED BY J.J.D

# POC CREDITING SUMMARY
## OUTFALL AND GULLY RESTORATION
## SHILOH STREET SITE
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
15

**Appendix H. Westmore Elementary School/Dog Park Bioretention Calculations**

# WESTMORE SCHOOL DOG PARK

## 11000 BERRY STREET
## CITY OF FAIRFAX, VIRGINIA 22030
## TAX MAP ID: 57101009
## PLAN NUMBER: 18-00225

### NOTICE REQUIRED

*CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS, PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION. NAMES AND TELEPHONE NUMBERS OF THE OPERATORS OF UNDERGROUND UTILITY LINES APPEAR BELOW. THESE NUMBERS SHALL ALSO BE USED TO SERVE IN AN EMERGENCY CONDITION.*

| PRIMARY UTILITY COMPANIES | EMERGENCY |
|---|---|
| DOMINION VIRGINIA POWER | 1-866-366-4357 |
| FAIRFAX CO. WASTEWATER COLLECTION DIVISION | 703-323-1211 |
| FAIRFAX COUNTY PUBLIC SAFETY | 703-691-2131 OR 911 |
| FAIRFAX WATER | 703-289-6395 OR 703-289-6323 |
| VERIZON (BELL ATLANTIC) | 1-800-837-4966 |
| WASHINGTON GAS | 703-750-1000 (GAS LEAK 703-750-4831) |

### EMERGENCY

*Police/Fire/Rescue: 911*
*Non Emergency No.: (703) 993- 8370*
*Miss Utility: 1-800-552-7001 OR 811*

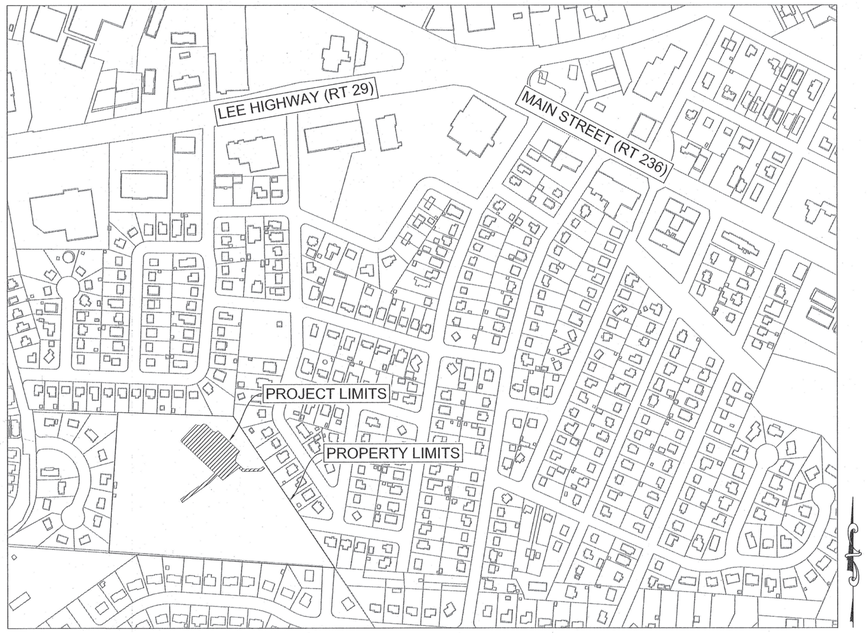
*CALL "MISS-UTILITY" AT LEAST 48 HOURS IN ADVANCE OF ANY EARTH DISTURBING ACTIVITIES.*

### ZONING TABULATIONS

| | |
|---|---|
| TOTAL PROPERTY AREA: | 10.00 AC |
| PROJECT AREA: | 0.68 AC |
| CURRENT ZONE: | RH |
| EXISTING USE: | OPEN SPACE/PARK |
| PROPOSED USE: | OPEN SPACE/PARK |

### SITE TABULATIONS

| | REQUIRED | PROPOSED |
|---|---|---|
| MINIMUM YARDS: | | |
| FRONT: | 20 FT | 113.6 FT |
| SIDE: | 15 FT | 75 FT |
| REAR: | 25 FT | 322 FT |




SCALE: 1" = 300'

**PROJECT NARRATIVE**

THIS SITE IS LOCATED WITHIN THE CITY OF FAIRFAX CORPORATE LIMITS AT 11000 BERRY STREET, FAIRFAX, VA 22030 AND IS ADJACENT TO RESIDENTIAL SINGLE FAMILY DETACHED HOUSES. THIS PROJECT CONSISTS OF THE DEVELOPMENT OF A DOG PARK.

**Sheet List Table**

| Sheet Number | Sheet Title |
|---|---|
| C0.0 | COVER |
| S1.0 | EXISTING SURVEY |
| C1.0 | NOTES AND DETAILS |
| C1.1 | NOTES AND DETAILS |
| C2.0 | EXISTING CONDITIONS |
| C3.0 | DEMOLITION PLAN |
| C4.0 | EROSION AND SEDIMENT CONTROL PHASE I |
| C4.1 | EROSION AND SEDIMENT CONTROL PHASE II |
| C4.2 | E&S NOTES & DETAILS |
| C4.3 | E&S NOTES & DETAILS |
| C4.4 | E&S NOTES & DETAILS |
| C4.5 | E&S NOTES & DETAILS |
| C5.0 | LAYOUT PLAN |
| C5.1 | SITE NOTES & DETAILS |
| C5.2 | SITE NOTES & DETAILS |
| C5.3 | SITE NOTES & DETAILS |
| C6.0 | GRADING PLAN |
| C6.1 | STORM SEWER PROFILES AND COMPUTATIONS |
| C6.2 | STORM SEWER DETAILS |
| C6.3 | DITCH COMPUTATIONS |
| C7.0 | BMP AREA MAP |
| C7.1 | BMP COMPUTATIONS |
| C7.2 | BMP COMPUTATIONS |
| C7.3 | PRE & POST DRAINAGE ANALYSIS |
| C7.4 | SWM COMPUTATIONS |
| C7.5 | SWM COMPUTATIONS |
| C8.0 | BIORETENTION PLAN & PROFILE |
| C8.1 | SWM NOTES & DETAILS |
| C8.2 | SWM NOTES & DETAILS |
| C8.3 | SWM NOTES & DETAILS |
| L1.0 | LANDSCAPE PLAN |
| L1.1 | LANDSCAPE NOTES & DETAILS |
| 32 | TOTAL SHEETS |


## OWNER
CITY OF FAIRFAX
10455 ARMSTRONG STREET
FAIRFAX, VIRGINIA 22030
PHONE: (703) 385-7800

## APPLICANT
CITY OF FAIRFAX PARKS AND RECREATION
10455 ARMSTRONG STREET
FAIRFAX, VIRGINIA 22030
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## ENGINEER
TIMMONS GROUP
20110 ASHBROOK PLACE, SUITE 100
ASHBURN, VIRGINIA 20147
CONTACT: CASEY KIGHT, LA
PHONE: (703) 554-6710


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FAIRFAX WATER
DATE 7/5/2018
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City of Fairfax
APPROVED SITE PLAN
Zoning Official — 7/9/18 Date
Review approval by:
Fire Marshal (for water distribution system & fire hydrant location)
Fairfax Water
Director CDP
Director of Public Works
City Engineer
PW Plan Reviewer
Code Admin. Asst. Chief
Site Plan Coordinator
BAR Liaison
Environmental Reviewer
GIS Manager
NOT REQUIRED Bonding Administrator — 7/9/18 Date
Stormwater

COMMONWEALTH OF VIRGINIA
CASEY M. KIGHT
Lic. No. 001348
JULY 2, 2018
LANDSCAPE ARCHITECT


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20110 Ashbrook Place, Suite 100 | Ashburn, VA 20147
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| REVISION DESCRIPTION | DATE |
|---|---|
| 1ST SUBMISSION | 03/14/2018 |
| 2ND SUBMISSION | 05/17/2018 |
| 3RD SUBMISSION | 07/02/2018 |

DATE: JAN. 26, 2018
DRAWN BY: PVN
DESIGNED BY: CK
CHECKED BY: LF
SCALE: SEE PLAN

TIMMONS GROUP

WESTMORE SCHOOL DOG PARK
CITY OF FAIRFAX, VIRGINIA
COVER

JOB NO. 40906
SHEET NO. C0.0


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*DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet* - Version 3.0

○ 2011 BMP Standards and Specifications ⊙ 2013 Draft BMP Standards and Specifications

Project Name: Westmore School Dog Park
Date:
Linear Development Project? No

CLEAR ALL

| |
|---|
| data input cells |
| constant values |
| calculation cells |
| final results |

## Site Information

## Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* → 0.68

| | |
|---|---|
| *Maximum reduction required:* | *10%* |
| *The site's net increase in impervious cover (acres) is:* | *0.194* |
| *Post-Development TP Load Reduction for Site (lb/yr):* | *0.38* |

*Check:*
*BMP Design Specifications List:* 2013 Draft Stds & Specs
*Linear project?* No
*Land cover areas entered correctly?* ✓
*Total disturbed area entered?* ✓

Pre-ReDevelopment Land Cover (acres)

| | A Soils | B Soils | C Soils | D Soils | Totals |
|---|---|---|---|---|---|
| **Forest/Open Space (acres)** -- undisturbed, protected forest/open space or reforested land | | | | | 0.00 |
| **Managed Turf (acres)** -- disturbed, graded for yards or other turf to be mowed/managed | | | | 0.64 | 0.64 |
| **Impervious Cover (acres)** | | | | 0.04 | 0.04 |
| | | | | | 0.68 |

Post-Development Land Cover (acres)

| | A Soils | B Soils | C Soils | D Soils | Totals |
|---|---|---|---|---|---|
| **Forest/Open Space (acres)** -- undisturbed, protected forest/open space or reforested land | | | | | 0.00 |
| **Managed Turf (acres)** -- disturbed, graded for yards or other turf to be mowed/managed | | | | 0.45 | 0.45 |
| **Impervious Cover (acres)** | | | | 0.24 | 0.24 |
| Area Check | OK. | OK. | OK. | OK. | 0.68 |

Constants

| | |
|---|---|
| Annual Rainfall (inches) | 43 |
| Target Rainfall Event (inches) | 1.00 |
| Total Phosphorus (TP) EMC (mg/L) | 0.26 |
| Total Nitrogen (TN) EMC (mg/L) | 1.86 |
| Target TP Load (lb/acre/yr) | 0.41 |
| Pj (unitless correction factor) | 0.90 |

Runoff Coefficients (Rv)

| | A Soils | B Soils | C Soils | D Soils |
|---|---|---|---|---|
| Forest/Open Space | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |

### LAND COVER SUMMARY -- PRE-REDEVELOPMENT

| *Land Cover Summary-Pre* | | |
|---|---|---|
| **Pre-ReDevelopment** | **Listed** | **Adjusted[1]** |
| Forest/Open Space Cover (acres) | 0.00 | 0.00 |
| Weighted Rv(forest) | 0.00 | 0.00 |
| % Forest | 0% | 0% |
| Managed Turf Cover (acres) | 0.64 | 0.45 |
| Weighted Rv(turf) | 0.25 | 0.25 |
| % Managed Turf | 94% | 91% |
| Impervious Cover (acres) | 0.04 | 0.04 |
| Rv(impervious) | 0.95 | 0.95 |
| % Impervious | 6% | 9% |
| **Total Site Area (acres)** | **0.68** | **0.49** |
| **Site Rv** | **0.30** | **0.31** |

Treatment Volume and Nutrient Load

| | | |
|---|---|---|
| Pre-ReDevelopment Treatment Volume (acre-ft) | 0.0168 | 0.0128 |
| Pre-ReDevelopment Treatment Volume (cubic feet) | 732 | 556 |
| Pre-ReDevelopment TP Load (lb/yr) | 0.46 | 0.35 |
| Pre-ReDevelopment TP Load per acre (lb/acre/yr) | 0.67 | 0.71 |
| Baseline TP Load (lb/yr) (0.41 lbs/acre/yr applied to pre-redevelopment area excluding pervious land proposed for new impervious cover) | | 0.20 |

[1] *Adjusted Land Cover Summary:*
*Pre ReDevelopment land cover minus pervious land cover (forest/open space or managed turf) acreage proposed for new impervious cover.*

*Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).*

*Column I shows load reduction requriement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).*

### LAND COVER SUMMARY -- POST DEVELOPMENT

| *Land Cover Summary-Post (Final)* | |
|---|---|
| **Post ReDev. & New Impervious** | |
| Forest/Open Space Cover (acres) | 0.00 |
| Weighted Rv(forest) | 0.00 |
| % Forest | 0% |
| Managed Turf Cover (acres) | 0.45 |
| Weighted Rv (turf) | 0.25 |
| % Managed Turf | 65% |
| Impervious Cover (acres) | 0.24 |
| Rv(impervious) | 0.95 |
| % Impervious | 35% |
| **Final Site Area (acres)** | **0.68** |
| **Final Post Dev Site Rv** | **0.49** |

| *Land Cover Summary-Post* | |
|---|---|
| **Post-ReDevelopment** | |
| Forest/Open Space Cover (acres) | 0.00 |
| Weighted Rv(forest) | 0.00 |
| % Forest | 0% |
| Managed Turf Cover (acres) | 0.45 |
| Weighted Rv (turf) | 0.25 |
| % Managed Turf | 91% |
| ReDev. Impervious Cover (acres) | 0.04 |
| Rv(impervious) | 0.95 |
| % Impervious | 9% |
| **Total ReDev. Site Area (acres)** | **0.49** |
| **ReDev Site Rv** | **0.31** |

| *Land Cover Summary-Post* | |
|---|---|
| **Post-Development New Impervious** | |
| New Impervious Cover (acres) | 0.19 |
| Rv(impervious) | 0.95 |

Treatment Volume and Nutrient Load

| | | | |
|---|---|---|---|
| Final Post-Development Treatment Volume (acre-ft) | 0.0281 | Post-ReDevelopment Treatment Volume (acre-ft) | 0.0128 | Post-Development Treatment Volume (acre-ft) | 0.0154 |
| Final Post-Development Treatment Volume (cubic feet) | 1,225 | Post-ReDevelopment Treatment Volume (cubic feet) | 556 | Post-Development Treatment Volume (cubic feet) | 669 |
| Final Post-Development TP Load (lb/yr) | 0.77 | Post-ReDevelopment Load (TP) (lb/yr)* | 0.35 | Post-Development TP Load (lb/yr) | 0.42 |
| Final Post-Development TP Load per acre (lb/acre/yr) | 1.13 | Post-ReDevelopment TP Load per acre (lb/acre/yr) | 0.71 | | |
| | | Max. Reduction Required (Below Pre-ReDevelopment Load) | 10% | | |
| | | TP Load Reduction Required for Redeveloped Area (lb/yr) | 0.03 | TP Load Reduction Required for New Impervious Area (lb/yr) | 0.34 |

### Post-Development Requirement for Site Area

| | |
|---|---|
| TP Load Reduction Required (lb/yr) | 0.38 |

Nitrogen Loads (Informational Purposes Only)

| | | | |
|---|---|---|---|
| Pre-ReDevelopment TN Load (lb/yr) | 3.29 | Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr) | 5.50 |

COMMONWEALTH OF VIRGINIA
CASEY M. KIGHT
Lic. No. 001348
JULY 2, 2018
LANDSCAPE ARCHITECT

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DATE: JAN. 26, 2018
DRAWN BY: PVN
DESIGNED BY: CK
CHECKED BY: LF
SCALE: SEE PLAN

TIMMONS GROUP

WESTMORE SCHOOL DOG PARK
CITY OF FAIRFAX, VIRGINIA
**BMP COMPUTATIONS**

JOB NO. 40906
SHEET NO. C7.1

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## Drainage Area A

CLEAR BMP AREAS

Drainage Area A Land Cover (acres)

| | A Soils | B Soils | C Soils | D Soils | Totals | Land Cover Rv |
|---|---|---|---|---|---|---|
| Forest/Open Space (acres) | | | | | 0.00 | 0.00 |
| Managed Turf (acres) | | | | 0.45 | 0.45 | 0.25 |
| Impervious Cover (acres) | | | | 0.24 | 0.24 | 0.95 |
| | | | | Total | 0.68 | |

| | |
|---|---|
| Total Phosphorus Available for Removal in D.A. A (lb/yr) | 0.77 |
| Post Development Treatment Volume in D.A. A ($ft^3$) | 1,225 |

## Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

| Practice | Runoff Reduction Credit (%) | Managed Turf Credit Area (acres) | Impervious Cover Credit Area (acres) | Volume from Upstream Practice ($ft^3$) | Runoff Reduction ($ft^3$) | Remaining Runoff Volume ($ft^3$) | Total BMP Treatment Volume ($ft^3$) | Phosphorus Removal Efficiency (%) | Phosphorus Load from Upstream Practices (lb) | Untreated Phosphorus Load to Practice (lb) | Phosphorus Removed By Practice (lb) | Remaining Phosphorus Load (lb) | Downstream Practice to be Employed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **6. Bioretention (RR)** | | | | | | | | | | | | | |
| 6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9) | 40 | | | 0 | 0 | 0 | 0 | 25 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9) | 80 | 0.27 | 0.24 | 0 | 850 | 213 | 1,063 | 50 | 0.00 | 0.67 | 0.60 | 0.07 | |

| | | |
|---|---|---|
| TOTAL IMPERVIOUS COVER TREATED (ac) | 0.24 | AREA CHECK: OK. |
| TOTAL MANAGED TURF AREA TREATED (ac) | 0.27 | AREA CHECK: OK. |
| TOTAL RUNOFF REDUCTION IN D.A. A ($ft^3$) | 850 | |
| TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr) | 0.77 | |
| TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) | 0.60 | |
| TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) | 0.17 | |

*SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS*

| | | |
|---|---|---|
| TOTAL IMPERVIOUS COVER TREATED (ac) | 0.24 | AREA CHECK: OK. |
| TOTAL MANAGED TURF AREA TREATED (ac) | 0.27 | AREA CHECK: OK. |
| TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr) | 0.38 | |
| TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr) | 0.77 | |
| TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) | 0.00 | |
| TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) | 0.60 | |
| TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr) | 0.60 | |
| TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr) | 0.17 | |

*SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS*

| | |
|---|---|
| NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) | 4.39 |
| NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) | 0.00 |
| TOTAL NITROGEN REMOVED IN D.A. A (lb/yr) | 4.39 |

## Runoff Volume and Curve Number Calculations

Enter design storm rainfall depths (in):

| 1-year storm | 2-year storm | 10-year storm |
|---|---|---|
| 2.62 | 3.17 | 4.87 |

*Use NOAA Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/)*

### Drainage Area Curve Numbers and Runoff Depths*

*Curve numbers (CN, CNadj) and runoff depths ($RV_{Developed}$) are computed with and without reduction practices.*

| Drainage Area A | | A Soils | B Soils | C Soils | D Soils |
|---|---|---|---|---|---|
| Forest/Open Space -- undisturbed, protected forest/open space or reforested land | Area (acres) | 0.00 | 0.00 | 0.00 | 0.00 |
| | CN | 30 | 55 | 70 | 77 |
| Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed | Area (acres) | 0.00 | 0.00 | 0.00 | 0.45 |
| | CN | 39 | 61 | 74 | 80 |
| Impervious Cover | Area (acres) | 0.00 | 0.00 | 0.00 | 0.24 |
| | CN | 98 | 98 | 98 | 98 |

| | |
|---|---|
| Total Area (acres): | 0.68 |
| Runoff Reduction Volume ($ft^3$): | 850 |

$CN_{(D.A. A)}$ = 86

| | 1-year storm | 2-year storm | 10-year storm |
|---|---|---|---|
| $RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction* | 1.34 | 1.81 | 3.35 |
| $RV_{Developed}$ *(watershed-inch)* with Runoff Reduction* | 1.00 | 1.47 | 3.00 |
| Adjusted CN* | 80 | 81 | 82 |

### Site Results (Water Quality Compliance)

| Area Checks | D.A. A | D.A. B | D.A. C | D.A. D | D.A. E | AREA CHECK |
|---|---|---|---|---|---|---|
| FOREST/OPEN SPACE (ac) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | OK. |
| IMPERVIOUS COVER (ac) | 0.24 | 0.00 | 0.00 | 0.00 | 0.00 | OK. |
| IMPERVIOUS COVER TREATED (ac) | 0.24 | 0.00 | 0.00 | 0.00 | 0.00 | OK. |
| MANAGED TURF AREA (ac) | 0.45 | 0.00 | 0.00 | 0.00 | 0.00 | OK. |
| MANAGED TURF AREA TREATED (ac) | 0.27 | 0.00 | 0.00 | 0.00 | 0.00 | OK. |
| AREA CHECK | OK. | OK. | OK. | OK. | OK. | |

Site Treatment Volume ($ft^3$) 1,225

Runoff Reduction Volume and TP By Drainage Area

| | D.A. A | D.A. B | D.A. C | D.A. D | D.A. E | TOTAL |
|---|---|---|---|---|---|---|
| RUNOFF REDUCTION VOLUME ACHIEVED ($ft^3$) | 850 | 0 | 0 | 0 | 0 | 850 |
| TP LOAD AVAILABLE FOR REMOVAL (lb/yr) | 0.77 | 0.00 | 0.00 | 0.00 | 0.00 | 0.77 |
| TP LOAD REDUCTION ACHIEVED (lb/yr) | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.60 |
| TP LOAD REMAINING (lb/yr) | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.17 |
| NITROGEN LOAD REDUCTION ACHIEVED (lb/yr) | 4.39 | 0.00 | 0.00 | 0.00 | 0.00 | 4.39 |

### Total Phosphorus

| | |
|---|---|
| FINAL POST-DEVELOPMENT TP LOAD (lb/yr) | 0.77 |
| TP LOAD REDUCTION REQUIRED (lb/yr) | 0.38 |
| TP LOAD REDUCTION ACHIEVED (lb/yr) | 0.60 |
| TP LOAD REMAINING (lb/yr): | 0.17 |
| REMAINING TP LOAD REDUCTION REQUIRED (lb/yr): | 0.00 ** |

** TARGET TP REDUCTION EXCEEDED BY 0.22 LB/YEAR **

### Total Nitrogen (For Information Purposes)

| | |
|---|---|
| POST-DEVELOPMENT LOAD (lb/yr) | 5.50 |
| NITROGEN LOAD REDUCTION ACHIEVED (lb/yr) | 4.39 |
| REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr) | 1.11 |

COMMONWEALTH OF VIRGINIA
CASEY M. EIGHT
Lic. No. 001348
JULY 2, 2018
LANDSCAPE ARCHITECT

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TIMMONS GROUP

WESTMORE SCHOOL DOG PARK
CITY OF FAIRFAX, VIRGINIA
BMP COMPUTATIONS

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SHEET NO. C7.2

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**Appendix I. University Drive Traffic Calming Calculations**

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DEPARTMENT OF PUBLIC WORKS

Transportation Division
10455 Armstrong St. Room 200A
Fairfax, VA 22030

Phone: 703-385-7889

# UNIVERSITY DRIVE TRAFFIC CALMING

## PROJECT DESCRIPTION

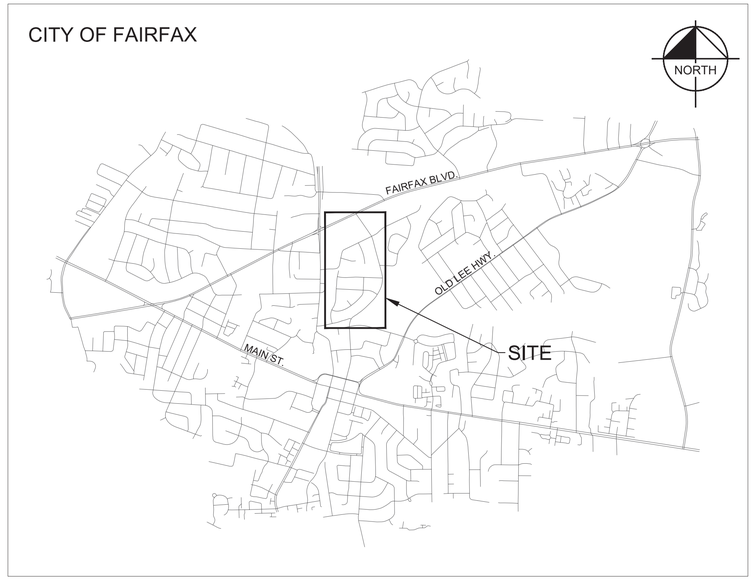
THE PURPOSE OF THE UNIVERSITY DRIVE TRAFFIC CALMING IMPROVEMENTS IS TO IMPROVE THE SAFETY OF THE LOCAL RESIDENTS WITH THE POTENTIAL INCREASE IN TRAFFIC ON UNIVERSITY DRIVE.
THE WORK OF THIS PROJECT INCLUDES THE FOLLOWING IMPROVEMENTS:

1. SIDEWALK CONSTRUCTION BETWEEN WOOD ROAD AND STRATFORD AVENUE
2. CURB EXTENSION CONSTRUCTION AT THE FORD ROAD INTERSECTION AND STRATFORD AVENUE INTERSECTION
3. CHICANE CONSTRUCTION BETWEEN FORD ROAD AND WOOD ROAD AND JEAN STREET AND STRATFORD AVENUE
4. CURB REALIGNMENT AT THE KENMORE DRIVE INTERSECTION
5. PEDESTRIAN ACCESSIBLE ADA RAMPS
6. SIGNING AND PAVEMENT MARKING
7. LANDSCAPING
8. LIGHTING

THE WORK OF THIS PROJECT WILL INCLUDE, BUT IS NOT LIMITED TO, DEMOLITION, EXCAVATION, RESTORATION, LANDSCAPING, SIGNING AND PAVEMENT MARKING, AND MAINTENANCE OF TRAFFIC.

THE CONTRACTOR SHALL COMPLETE THE WORK IN ACCORDANCE WITH THESE PLANS, REFERENCE SPECIFICATIONS, AND OTHER CONTRACT DOCUMENTS.

## Location Map

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CITY OF FAIRFAX

DEPARTMENT OF PUBLIC WORKS

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Seal

COMMONWEALTH OF VIRGINIA
MICHAEL R. ALBRIGHT
Lic. No. 46643
06/17/2020
PROFESSIONAL ENGINEER

Revisions | Date

DESIGNED BY
DRAWN BY
CHECKED BY

CITY OF FAIRFAX, VIRGINIA
DEPARTMENT OF PUBLIC WORKS

UNIVERSITY DRIVE TRAFFIC CALMING
KENMORE DRIVE TO STRATFORD AVENUE
JUNE 17, 2020

UPC # 113121

SCALE
SEE GRAPHIC SCALE

SHEET
1

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

NOTE: THE TOTAL TREATMENT AREA (0.63 AC) FOR THE PROPOSED BMP'S IS GREATER THAN THE SITE DISTURBED AREA OF 0.45 AC DUE TO OFF-SITE IMPERVIOUS FLOW WHICH IS CURRENTLY UNTREATED NOR DETAINED IN EXISTING SWM/BMP FACILITIES

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

*BMP Design Specifications List:* **2013 Draft Stds & Specs**

## Site Summary - Linear Development Project***

Project Title: University Drive Traffic Calming
Date: 43859

| | |
|---|---|
| Total Rainfall (in): | 43 |
| Total Disturbed Acreage: | 0.63 |

### Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)

| | A soils | B Soils | C Soils | D Soils | Totals | % of Total |
|---|---|---|---|---|---|---|
| Forest/Open (acres) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| Managed Turf (acres) | 0.00 | 0.00 | 0.00 | 0.28 | 0.28 | 44 |
| Impervious Cover (acres) | 0.00 | 0.00 | 0.00 | 0.35 | 0.35 | 56 |
| | | | | | 0.63 | 100 |

Post-ReDevelopment Land Cover (acres)

| | A soils | B Soils | C Soils | D Soils | Totals | % of Total |
|---|---|---|---|---|---|---|
| Forest/Open (acres) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| Managed Turf (acres) | 0.00 | 0.00 | 0.00 | 0.20 | 0.20 | 32 |
| Impervious Cover (acres) | 0.00 | 0.00 | 0.00 | 0.43 | 0.43 | 68 |
| | | | | | 0.63 | 100 |

### Site Tv and Land Cover Nutrient Loads

| | Final Post-Development (Post-ReDevelopment & New Impervious) | Post-ReDevelopment | Post-Development (New Impervious) | Adjusted Pre-ReDevelopment |
|---|---|---|---|---|
| Site Rv | 0.73 | 0.70 | 0.95 | 0.70 |
| Treatment Volume (ft³) | 1,664 | 1,388 | 276 | 1,388 |
| TP Load (lb/yr) | 1.05 | 0.87 | 0.17 | 0.87 |

| Pre-ReDevelopment TP Load per acre (lb/acre/yr) | Final Post-Development TP Load per acre (lb/acre/yr) | Post-ReDevelopment TP Load per acre (lb/acre/yr) |
|---|---|---|
| 1.59 | 1.66 | 1.59 |

| | | | |
|---|---|---|---|
| Total TP Load Reduction Required (lb/yr) | 0.31 | N/A*** | N/A*** |

****This is a linear development project***

| | Final Post-Development Load (Post-ReDevelopment & New Impervious) | Pre-ReDevelopment |
|---|---|---|
| TN Load (lb/yr) | 7.48 | 6.57 |

### Site Compliance Summary - ***Linear Development Project

| | |
|---|---|
| Maximum % Reduction Required Below Pre-ReDevelopment Load | 20% |

| | |
|---|---|
| Total Runoff Volume Reduction (ft³) | 593 |
| Total TP Load Reduction Achieved (lb/yr) | 0.51 |
| Total TN Load Reduction Achieved (lb/yr) | 4.26 |
| Remaining Post Development TP Load (lb/yr) | 0.53 |
| Remaining TP Load Reduction (lb/yr) Required | 0.00 |

** TARGET TP REDUCTION EXCEEDED BY 0.2 LB/YEAR **

### Drainage Area Summary

| | D.A. A | D.A. B | D.A. C | D.A. D | D.A. E | Total |
|---|---|---|---|---|---|---|
| Forest/Open (acres) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Managed Turf (acres) | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.20 |
| Impervious Cover (acres) | 0.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.43 |
| Total Area (acres) | 0.63 | 0.00 | 0.00 | 0.00 | 0.00 | 0.63 |

Drainage Area Compliance Summary

| | D.A. A | D.A. B | D.A. C | D.A. D | D.A. E | Total |
|---|---|---|---|---|---|---|
| TP Load Reduced (lb/yr) | 0.51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.51 |
| TN Load Reduced (lb/yr) | 4.26 | 0.00 | 0.00 | 0.00 | 0.00 | 4.26 |

### Drainage Area A Summary

Land Cover Summary

| | A Soils | B Soils | C Soils | D Soils | Total | % of Total |
|---|---|---|---|---|---|---|
| Forest/Open (acres) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| Managed Turf (acres) | 0.00 | 0.00 | 0.00 | 0.20 | 0.20 | 32 |
| Impervious Cover (acres) | 0.00 | 0.00 | 0.00 | 0.43 | 0.43 | 68 |
| | | | | | 0.63 | |

BMP Selections

| Practice | Managed Turf Credit Area (acres) | Impervious Cover Credit Area (acres) | BMP Treatment Volume (ft³) | TP Load from Upstream Practices (lbs) | Untreated TP Load to Practice (lbs) | TP Removed (lb/yr) | TP Remaining (lb/yr) | Downstream Treatment to be Employed |
|---|---|---|---|---|---|---|---|---|
| 2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A) | | 0.43 | 1,482.86 | 0.00 | 0.93 | 0.51 | 0.42 | |

| | |
|---|---|
| Total Impervious Cover Treated (acres) | 0.43 |
| Total Turf Area Treated (acres) | 0.00 |
| Total TP Load Reduction Achieved in D.A. (lb/yr) | 0.51 |
| Total TN Load Reduction Achieved in D.A. (lb/yr) | 4.26 |

### Runoff Volume and CN Calculations

| | 1-year storm | 2-year storm | 10-year storm |
|---|---|---|---|
| Target Rainfall Event (in) | 2.60 | 3.14 | 4.82 |

| Drainage Areas | RV & CN | Drainage Area A | Drainage Area B | Drainage Area C | Drainage Area D | Drainage Area E |
|---|---|---|---|---|---|---|
| CN | | 92 | 0 | 0 | 0 | 0 |
| RR (ft³) | | 593 | 0 | 0 | 0 | 0 |
| 1-year return period | RV wo RR (ws-in) | 1.79 | 0.00 | 0.00 | 0.00 | 0.00 |
| | RV w RR (ws-in) | 1.53 | 0.00 | 0.00 | 0.00 | 0.00 |
| | CN adjusted | 89 | 0 | 0 | 0 | 0 |
| 2-year return period | RV wo RR (ws-in) | 2.29 | 0.00 | 0.00 | 0.00 | 0.00 |
| | RV w RR (ws-in) | 2.03 | 0.00 | 0.00 | 0.00 | 0.00 |
| | CN adjusted | 89 | 0 | 0 | 0 | 0 |
| 10-year return period | RV wo RR (ws-in) | 3.91 | 0.00 | 0.00 | 0.00 | 0.00 |
| | RV w RR (ws-in) | 3.65 | 0.00 | 0.00 | 0.00 | 0.00 |
| | CN adjusted | 89 | 0 | 0 | 0 | 0 |

COMPLIANCE WITH THE WATER QUALITY DESIGN CRITERIA IS DETERMINED UTILIZING THE VIRGINIA RUNOFF REDUCTION METHOD. MICRO-BIORETENTION IS THE SELECTED BMP TO REDUCE POLLUTANT LOADS AND/OR RUNOFF VOLUME. THE PEAK DISCHARGE REQUIREMENTS ARE DETERMINED IN ACCORDANCE WITH THE VDOT DRAINAGE MANUAL.

THE MAXIMUM PEAK FLOW RATE IS DETERMINED FROM THE ENERGY BALANCE EQUATION IN THE VDOT DRAINAGE MANUAL.
THE MAXIMUM PEAK FLOW RATE FROM THE 1-YR 24 HOUR STORM IN THE POST DEVELOPMENT CONDITION IS 1.65 CFS.

HYDRAFLOW IS USED TO DETERMINE THE PROPOSED SITE RUNOFF TREATED BY THE RAIN GARDENS.
THE PROPOSED SITE RUNOFF IS 1.62 CFS, MEETING THE MAXIMUM PEAK FLOW RATE REQUIREMENT.

$$Q_{Developed} = \text{I.F.} \times \left( \frac{Q_{Pre\text{-}Developed} \times RV_{Pre\text{-}Developed}}{RV_{Developed}} \right)$$

$$Q_{Developed} = .90 \left( \frac{1.840cfs \; x \; 3829cuft}{3829cuft} \right)$$

$$Q_{Developed} = 1.65 \; cfs$$

Where:

I.F. (Improvement Factor) = 0.8 for sites > 1 acre LDA or 0.9 for sites ≤ 1 acre LDA
$Q_{Developed}$ = the allowable peak flow rate of runoff from the developed site for the 1-yr 24-hour storm.
$RV_{Developed}$ = the volume of runoff from the site in the developed condition for the 1-yr 24-hour storm.
$Q_{Pre\text{-}Developed}$ = the peak flow rate of runoff from the site in the pre-developed condition for the 1-yr 24-hour storm.
$RV_{Pre\text{-}Developed}$ = the volume of runoff from the site in pre-developed condition for the 1-yr 24-hour storm.
$Q_{Forest}$ = the peak flow rate of runoff from the site in a forested condition for the 1-yr 24-hour storm.
$RV_{Forest}$ = the volume of runoff from the site in a forested condition for the 1-yr 24-hour storm.

## Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SCS Runoff | 1.840 | 2 | 716 | 3,829 | ------ | ------ | ------ | Existing Total Site Drainage |
| 2 | SCS Runoff | 1.840 | 2 | 716 | 3,829 | ------ | ------ | ------ | Proposed Site Drainage - No Treatme |
| 3 | SCS Runoff | 1.622 | 2 | 716 | 3,307 | ------ | ------ | ------ | Proposed Site Drainage - Treated |

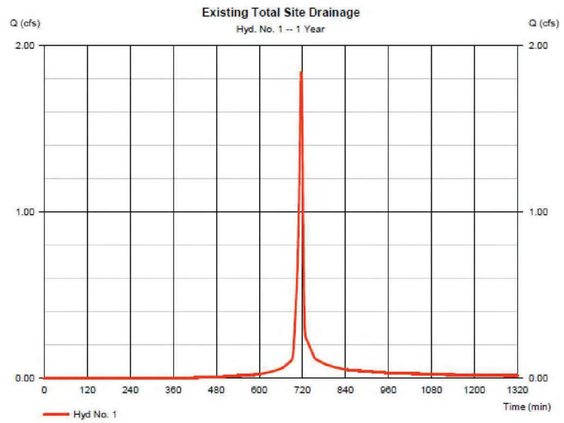
## Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Thursday, 01 / 30 / 2020

### Hyd. No. 1

Existing Total Site Drainage

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 1.840 cfs |
| Storm frequency | = 1 yrs | Time to peak | = 716 min |
| Time interval | = 2 min | Hyd. volume | = 3,829 cuft |
| Drainage area | = 0.630 ac | Curve number | = 92 |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = User | Time of conc. (Tc) | = 5.00 min |
| Total precip. | = 2.60 in | Distribution | = Type II |
| Storm duration | = 24 hrs | Shape factor | = 484 |




URBAN BIORETENTION SIZING

MINIMUM SIZING REQUIREMENT WAS DETERMINED PER VA DCR STORMWATER DESIGN SPECIFICATION 9, APPENDIX 9-A

PROPOSED BMP's MEET THE MINIMUM SIZING REQUIREMENT

$$Tv_{BMP} = [(1)(R_v)(A)/12]$$
$$Tv_{BMP} = [(1)(1664)(.63)/12]$$
$$Tv_{BMP} = 87.36 \text{ cuft}$$
$$\frac{87.36ft^3}{4} = 21.84ft^3 \; per \; BMP$$

CITY OF FAIRFAX

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MICHAEL R. ALBRIGHT
Lic. No. 46643
06/17/2020
PROFESSIONAL ENGINEER

Revisions | Date

DESIGNED BY
DRAWN BY
CHECKED BY

CITY OF FAIRFAX, VIRGINIA
DEPARTMENT OF PUBLIC WORKS

# UNIVERSITY DRIVE TRAFFIC CALMING

KENMORE DRIVE TO STRATFORD AVENUE

## BMP CALCULATIONS

UPC # 113121

SCALE
SEE GRAPHIC SCALE

SHEET
2H

**Appendix J. Calculating VSMP Pollutant Reductions Creditable to Chesapeake Bay Existing Source Load Reductions**

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Version 01.23.2023

# STORMWATER STANDARD OPERATING PROCEDURE

# CALCULATING VSMP POLLUTANT REDUCTIONS CREDITABLE TO CHESAPEAKE BAY

# EXISTING SOURCE LOAD REDUCTIONS

DRAFT INTERNAL DISCUSSION ONLY
Do Not Distribute

## OBJECTIVE

Identify and quantify pollutant load reductions associated with redevelopment projects that can be credited against the City's Chesapeake Bay TMDL Special Condition requirement to reduce pollutants from Existing Sources.

## ACRONYMS AND DEFINITIONS

| | |
|---|---|
| Existing Sources | Existing Sources – Pervious and impervious urban land uses served by the MS4 as of June 30, 2009 |
| MS4 | Municipal Separate Storm Sewer System |
| New Sources | Pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009 |
| VPDES | Virginia Pollutant Discharge Elimination System |
| VSMP | Virginia Stormwater Management Program |

## RATIONALE

As a DEQ-authorized VSMP located in the Chesapeake Bay Protection Act's Tidewater Virginia, the City is required to ensure that projects disturbing 2,500 ft.$^2$ or greater of land meet VSMP post-development water quality design criteria. For new impervious cover at new and redevelopment projects, the VSMP post-development water quality design criterium is 0.41 lbs./ac./yr. of phosphorus for new impervious cover[1]. For existing impervious cover at redevelopment projects, the design criterium requires the reduction of phosphorus loads by 10% for projects less than one (1) acre in land disturbance or 20% for projects one acre or greater in land disturbance. Developers can use either on-site stormwater management practices or if local water quality allows off-site mitigation such as the purchase of nonpoint source nutrient credits to meet the VSMP design criteria.

Concurrently, as an operator of a small municipal separate storm sewer system (MS4) regulated under the VPDES General Permit for Stormwater Discharges from Small MS4s, the City is required to reduce pollutant loads from Existing Sources as shown below:

[1] The water quality design criteria for new development of 0.41 lbs./ac./yr. is based on a presumption that the pollutant load associated with a land use of 60% forest, 30% open, and 10% impervious cover is protective of Chesapeake Bay water quality.

| Existing Source Land Use | Pollutant Reductions | |
|---|---|---|
| | Nitrogen | Phosphorus |
| Impervious Regulated Lands | 9% | 16% |
| Pervious Regulated Lands | 6% | 7.25% |

The VSMP pollutant reductions associated redevelopment also provide a reduction in the VPDES Existing Source loads. However, pollutant reductions required for new development under the VSMP do not represent a reduction in the VPDES Existing Load as these pollutant reductions are done to ensure Chesapeake Bay water quality protection from New Sources. Excess pollutant removal above the required VSMP pollutant reductions for both new and redevelopment are creditable towards the VPDES MS4 Existing Loads reduction requirements.

These SOPs have been created to allow the City to identify and quantify the VSMP pollutant load reductions creditable to the VPDES MS4 Existing Source load reduction requirements.

**PROCEDURES**

As part of the VSMP plan approval process, projects are required to submit calculations demonstrating pollutant loads, pollutant load reduction requirements, and documentation and calculation verifying compliance with VSMP water quality requirements. This documentation is provided through the use and submission of the Virginia Runoff Reduction Method (VRRM) spreadsheets. The VRRM site worksheet for redevelopment projects calculates the total phosphorus load reduction required for the entire project and automatically separates the applicable portion for redeveloped acreages and the applicable portion for newly developed acreages (Figure 1). The total phosphorus (TP) load reduction for Redeveloped Area (lb./yr.) is creditable towards the VPDES MS4 Existing Source load reduction requirements. The TP load reduction for New Impervious Area (lb./yr.) is not creditable. The TP load reduction for Redeveloped Area (lb./yr.) is creditable towards the VPDES MS4 Existing Source load reduction requirements. Additionally, any TP Reduction Exceeded identified on the VRRM Summary worksheet is creditable towards the VPDES MS4 Existing Source load reduction requirements (Figure 2).

DRAFT INTERNAL DISCUSSION ONLY
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The VRRM spreadsheet should also be utilized to determine the creditable nitrogen reductions associated with the redevelopment project. To do so, the following should be followed:

1. Determine the percentage of the TP Reduction Achieved that is attributable to the Total TP Reduction Required. This provides you the percentage of the total load reduction achieved that is required. The remaining percentage is overtreatment and is creditable to the VPDES MS4 Existing Source load.
2. Determine the percentage of the TP Required that is the TP Required for Redevelopment. This gives you the percentage of the pollutant reduction that is creditable to the VPDES MS4 Existing Source load.
3. Obtain the TN load reduction achieved from the VRRM Summary worksheet (Figure 3).
    a. Multiply the TN Load reduction achieved by the percentage attributable to the TP Reduction Required.
        i. Multiply the remainder by the percentage of the TP Required that is the TP Required for Redevelopment. The answer is the amount of TN associated with redevelopment that is creditable to the VPDES MS4 Existing Source load for Nitrogen
    b. Repeat multiplying the TN Load reduction achieved by the percentage attributable to the TP Reduction Required.

i. Subtract the answer from the TN Load Reduction Achieved. The remainder is overtreatment and creditable to the VPDES MS4 Existing Source load for Nitrogen.

c. See example (Figure 4).

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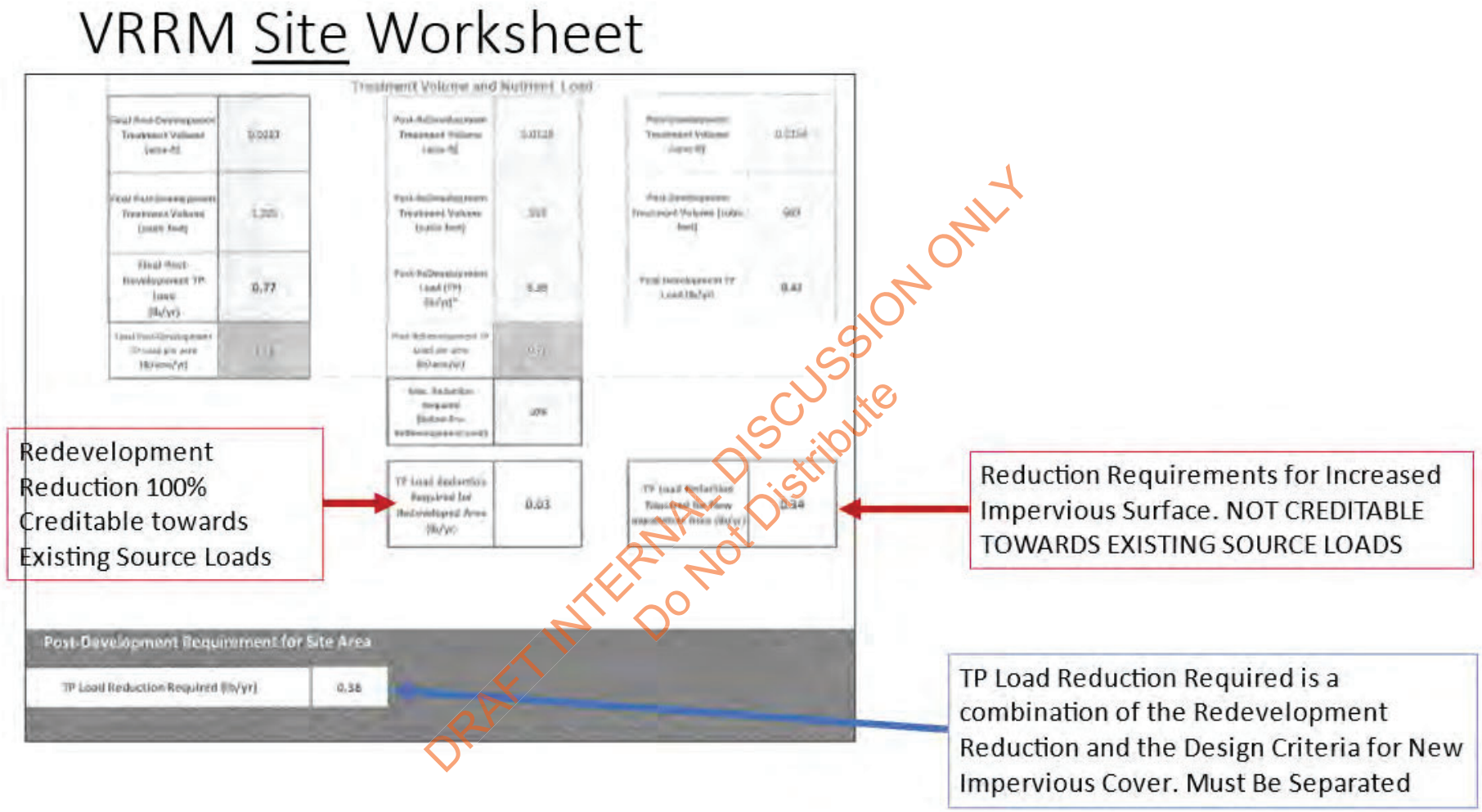



Figure 1. VRRM Redevelopment Site Worksheet Showing Phosphorus Load Reduction Requirements

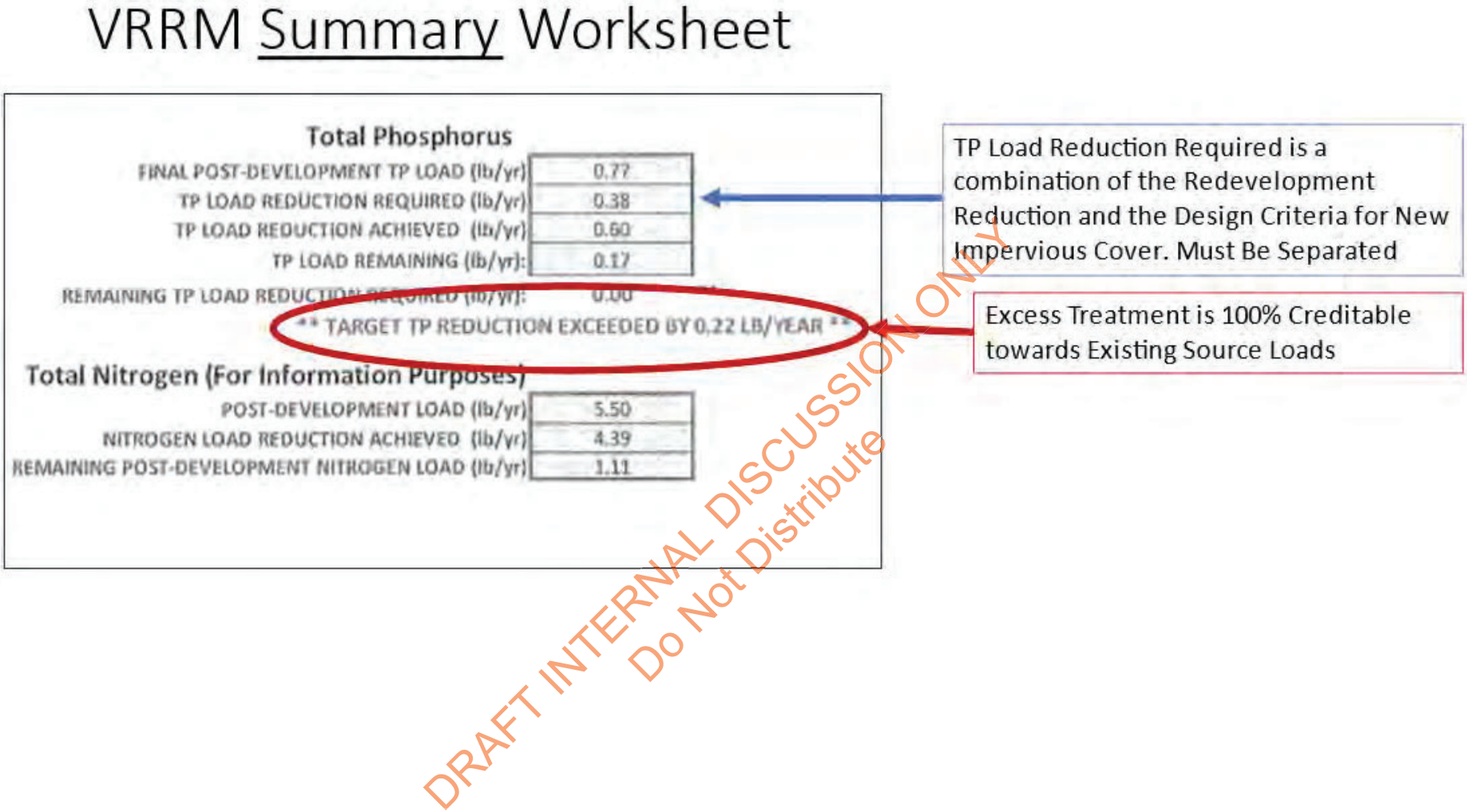
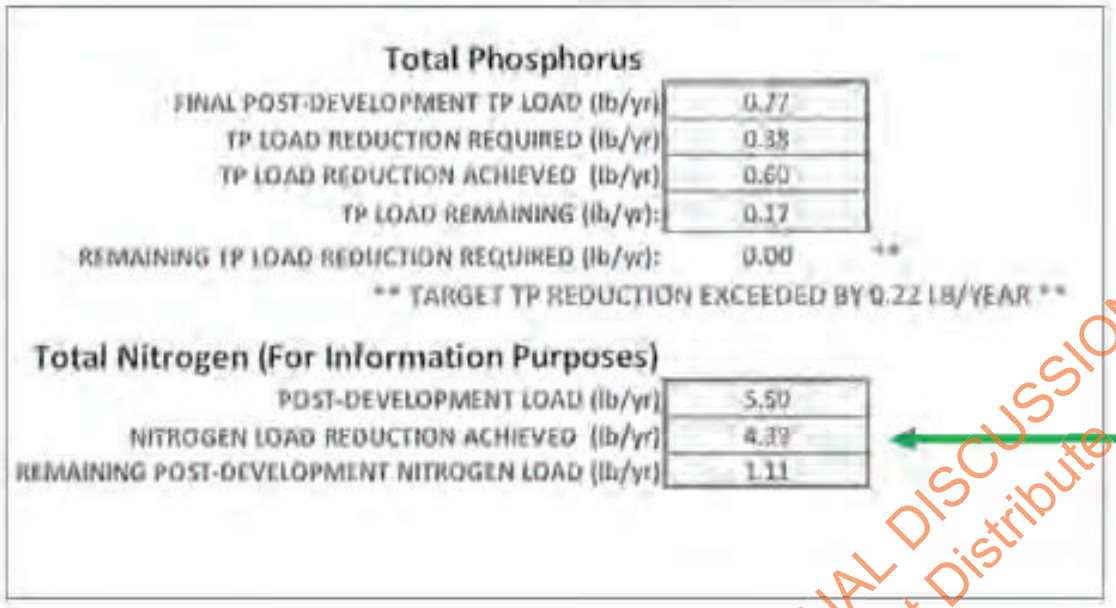



Figure 2. VRRM Redevelopment Summary Worksheet Showing Excess Treatment Above Required Reductions

# VRRM Summary Worksheet



**Total Phosphorus**

| | |
|---|---|
| FINAL POST-DEVELOPMENT TP LOAD (lb/yr) | 0.77 |
| TP LOAD REDUCTION REQUIRED (lb/yr) | 0.38 |
| TP LOAD REDUCTION ACHIEVED (lb/yr) | 0.60 |
| TP LOAD REMAINING (lb/yr): | 0.17 |
| REMAINING TP LOAD REDUCTION REQUIRED (lb/yr): | 0.00 ** |

** TARGET TP REDUCTION EXCEEDED BY 0.22 LB/YEAR **

**Total Nitrogen (For Information Purposes)**

| | |
|---|---|
| POST-DEVELOPMENT LOAD (lb/yr) | 5.50 |
| NITROGEN LOAD REDUCTION ACHIEVED (lb/yr) | 4.39 |
| REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr) | 1.11 |

TN Reduction Achieved – *Note for Nitrogen Crediting*

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Figure 3. Total Nitrogen Reduction Achieve

Redevelopment Project A required a TP reduction associated with redevelopment of 0.03 lbs./yr. and a TP reduction of 0.35 lbs./yr. associated with new impervious cover. Redevelopment Project A achieved TP Load Reductions of 0.60 lbs./yr. and 4.39 lbs./yr. of TN.

**To obtain the amount of phosphorus reduction creditable to the VPDES MS4 Existing Source load reduction requirements:**

- The TP reductions totaled 0.60 lbs./yr. The required VSMP TP reductions totaled 0.38 lbs./yr. (0.03 + 0.35). The difference of 0.22 lbs./yr. of TP is creditable to the VPDES MS4 Existing Source load reduction requirements.
- The TP required for redevelopment (0.03 lbs./yr.) is creditable to the VPDES MS4 Existing Source load reduction requirements.
- The total amount of phosphorus reduction creditable from the entire project creditable to the VPDES MS4 Existing Source load reduction requirements is 0.25 lbs./yr. (0.22 + 0.03).

**To obtain the amount of nitrogen reduction creditable to the VPDES MS4 Existing Source load reduction requirements:**

- The TN reductions totaled 4.39 lbs./yr.
- The percentage of the TP Reductions achieved associated with Required TP reductions is 63.3%
    - The associated TN reduction is 2.80 lbs./yr. (4.39 x 63.3%)
    - The TN associated with overtreatment is 1.59 lbs./yr. (4.39 – 2.80). This is creditable to the VPDES MS4 Existing Source load reduction requirements.
- The percentage of the TP Required Reductions associated with TP required for redevelopment is 7.9%
    - The associated TN reduction is 0.22 lbs./yr. (2.80 x 7.9%)
- The total amount of phosphorus reduction creditable from the entire project creditable to the VPDES MS4 Existing Source load reduction requirements is 1.81 lbs./yr. (1.59 + 0.22).

Figure 4. VPDES MS4 Existing Source Calculations Using VSMP Redevelopment

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Do Not Distribute

**Appendix K. VSMP Implementation – Redevelopment Credits on Prior Developed Land**

| MS4 Permit Reporting Year | Address | Latitude | Longitude | Phosphorus | | | | | Nitrogen | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Total Reductions Achieved | Total Credited to ReDev | Total Credited to New Dev | Total Over Treated | Total Creditable To Existing Loads | Total Reductions Achieved | Total Credited to ReDev | Total Credited to New Dev | Total Over Treated | Total Creditable To Existing Loads |
| 2023 | 3509 Perry Street | 38.8615 | -77.3113 | 0.10 | 0.05 | 0.05 | 0.00 | **0.05** | 0.66 | 0.33 | 0.33 | 0.00 | **0.33** |
| 2023 | 3725 Anne Pl | 38.8498 | -77.2915 | 0.09 | 0.03 | 0.06 | 0.00 | **0.03** | 0.67 | 0.22 | 0.45 | 0.00 | **0.22** |
| 2023 | 3815 Mode St | 38.8465 | -77.2847 | 0.16 | 0.03 | 0.07 | 0.06 | **0.09** | 1.37 | 0.26 | 0.60 | 0.51 | **0.77** |
| 2023 | 3821 Mode St | 38.8461 | -77.2835 | 0.12 | 0.05 | 0.07 | 0.00 | **0.05** | 0.87 | 0.36 | 0.51 | 0.00 | **0.36** |
| 2023 | 3910 Estel Rd | 38.8440 | -77.2821 | 0.05 | 0.04 | 0.02 | -0.01 | **0.03** | 0.36 | 0.29 | 0.14 | -0.07 | **0.22** |
| 2023 | 4105 Addison Rd | 38.8423 | -77.3004 | 0.04 | 0.04 | 0.02 | 0.00 | **0.04** | 0.32 | 0.32 | 0.16 | -0.16 | **0.16** |
| 2023 | 9700 Fairfax Blvd | 38.8646 | -77.2797 | 0.50 | 0.44 | 0.00 | 0.06 | **0.50** | 1.97 | 1.73 | 0.00 | 0.24 | **1.97** |
| 2023 | 9709 Barlow Rd | 38.8494 | -77.2816 | 0.31 | 0.02 | 0.29 | 0.00 | **0.02** | 0.77 | 0.05 | 0.72 | 0.00 | **0.05** |
| 2023 | 9714 Ashby Rd | 38.8491 | -77.2821 | 0.09 | 0.06 | 0.00 | 0.03 | **0.09** | 0.71 | 0.47 | 0.00 | 0.24 | **0.71** |
| 2023 | 9919 Farr Dr | 38.8581 | -77.2900 | 0.05 | 0.03 | 0.02 | 0.00 | **0.03** | 0.36 | 0.22 | 0.14 | 0.00 | **0.22** |
| 2023 | 10510/10512 Cedar Ave | Multiple | Multiple | 0.22 | 0.05 | 0.09 | 0.08 | **0.13** | 1.56 | 0.35 | 0.64 | 0.57 | **0.92** |
| 2023 | 10533 Cedar Ave | 38.8532 | -77.3117 | 0.03 | 0.03 | 0.01 | 0.00 | **0.03** | 0.23 | 0.23 | 0.08 | -0.08 | **0.15** |
| 2023 | 10602 Oliver St | 38.8505 | -77.3108 | 0.19 | 0.07 | 0.11 | 0.00 | **0.07** | 1.37 | 0.50 | 0.79 | 0.07 | **0.58** |
| 2023 | 10614 Norman Ave | 38.8642 | -77.3135 | 0.17 | 0.04 | 0.12 | 0.01 | **0.05** | 1.28 | 0.30 | 0.90 | 0.08 | **0.38** |
| 2023 | 10615 Elmont Ct | 38.8665 | -77.3142 | 0.52 | 0.06 | 0.42 | 0.04 | **0.10** | 3.53 | 0.41 | 2.85 | 0.27 | **0.68** |
| 2023 | 10615 Oak Pl | 38.8652 | -77.3143 | 0.22 | 0.04 | 0.14 | 0.04 | **0.08** | 1.60 | 0.29 | 1.02 | 0.29 | **0.58** |
| 2022 | 10101 Fairfax Blvd | 38.8617 | -77.2933 | 0.39 | 0.16 | 0.00 | 0.23 | **0.39** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** |
| 2022 | 10909 Marilta Ct | 38.8643 | -77.3244 | 0.10 | 0.03 | 0.07 | 0.00 | **0.03** | 0.85 | 0.24 | 0.61 | 0.00 | **0.24** |
| 2022 | 10420 Darby St | 38.8395 | -77.3062 | 0.07 | 0.03 | 0.04 | 0.00 | **0.03** | 0.46 | 0.19 | 0.27 | 0.01 | **0.20** |
| 2022 | 10823 Woodhaven Dr | 38.8566 | -77.3205 | 0.05 | 0.02 | 0.03 | 0.00 | **0.02** | 0.43 | 0.17 | 0.26 | 0.00 | **0.17** |
| 2021 | 3600 Old Post Rd | 38.8541 | -77.2932 | 0.36 | 0.05 | 0.25 | 0.06 | **0.11** | 2.38 | 0.33 | 1.65 | 0.40 | **0.73** |
| 2021 | 9995 Fairfax Blvd | | | 3.35 | 3.28 | 0.00 | 0.07 | **3.35** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** |
| 2021 | Point 50 (10334 Fairfax Blvd) | | | 1.56 | 1.45 | 0.00 | 0.11 | **1.56** | 4.64 | 4.31 | 0.00 | 0.33 | **4.64** |
| 2021 | 10706 Warwick Ave | 38.8572 | -77.3155 | 0.13 | 0.03 | 0.09 | 0.01 | **0.04** | 0.92 | 0.21 | 0.64 | 0.07 | **0.28** |
| 2021 | Stonewood (9901-9909 Mosby Rd) | Multiple | Multiple | 1.20 | 0.26 | 0.84 | 0.09 | **0.35** | 9.39 | 2.03 | 6.57 | 0.78 | **2.82** |
| 2021 | 3414 Burrows Ave | 38.8646 | -77.3130 | 0.30 | 0.00 | 0.25 | 0.05 | **0.05** | 2.09 | 0.00 | 1.74 | 0.35 | **0.35** |

| MS4 Permit Reporting Year | Address | Latitude | Longitude | Phosphorus | | | | | Nitrogen | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Total Reductions Achieved | Total Credited to ReDev | Total Credited to New Dev | Total Over Treated | Total Creditable To Existing Loads | Total Reductions Achieved | Total Credited to ReDev | Total Credited to New Dev | Total Over Treated | Total Creditable To Existing Loads |
| 2021 | Cobbs Grove Lane subdivision | Multiple | Multiple | 1.15 | 0.27 | 0.88 | 0.01 | **0.28** | 8.16 | 1.92 | 6.24 | 0.00 | **1.92** |
| 2020 | 4221 University Dr | 38.8385 | -77.3066 | 0.08 | 0.02 | 0.06 | 0.00 | **0.02** | 0.58 | 0.15 | 0.44 | 0.00 | **0.15** |
| 2020 | 10713 Jones St | 38.8448 | -77.3169 | 0.16 | 0.04 | 0.11 | 0.01 | **0.05** | 1.13 | 0.28 | 0.78 | 0.07 | **0.35** |
| 2020 | 10341 Main St | | | 0.73 | 0.10 | 0.49 | 0.14 | **0.24** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** |
| 2020 | 9820 Hampton Lane | 38.8536 | -77.2875 | 0.20 | 0.04 | 0.09 | 0.07 | **0.11** | 1.02 | 0.20 | 0.46 | 0.36 | **0.56** |
| 2020 | 4107 and 4109 Virginia Avenue | Multiple | Multiple | 0.14 | 0.04 | 0.08 | 0.01 | **0.06** | 1.05 | 0.34 | 0.63 | 0.09 | **0.43** |
| 2020 | 10805 and 10807 First St | Multiple | Multiple | 0.23 | 0.00 | 0.23 | 0.00 | **0.00** | 1.62 | 0.00 | 1.62 | 0.00 | **0.00** |
| 2020 | 3508 Winston Pl | 38.8630 | -77.3168 | 0.08 | 0.05 | 0.03 | 0.00 | **0.05** | 0.69 | 0.43 | 0.26 | 0.00 | **0.43** |
| 2020 | 3504 Cornell Rd | 38.8578 | -77.2851 | 0.07 | 0.06 | 0.02 | 0.00 | **0.06** | 0.50 | 0.43 | 0.14 | -0.07 | **0.36** |
| 2020 | 3410 Pickett Rd | 38.8601 | -77.2718 | 0.21 | 0.08 | 0.09 | 0.04 | **0.12** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** |
| 2019 | 4040 Jermantown Rd | 38.8542 | -77.3331 | 0.12 | 0.02 | 0.05 | 0.05 | **0.07** | 0.00 | 0.00 | 0.00 | 0.00 | **0.00** |
| 2019 | 9711 Ashby Rd | 38.8483 | -77.2819 | 0.09 | 0.04 | 0.05 | 0.00 | **0.04** | 0.79 | 0.35 | 0.44 | 0.00 | **0.35** |
| 2019 | 4116 William Pl | 38.8496 | -77.3296 | 0.05 | 0.01 | 0.03 | 0.01 | **0.02** | 0.38 | 0.08 | 0.23 | 0.08 | **0.15** |
| 2019 | 4115 Burke Station Rd | 38.8382 | -77.2878 | 0.14 | 0.03 | 0.09 | 0.02 | **0.05** | 0.93 | 0.20 | 0.60 | 0.13 | **0.33** |
| 2019 | 4019 Roberts Rd | 38.8430 | -77.2965 | 0.07 | 0.02 | 0.06 | 0.00 | **0.02** | 0.56 | 0.16 | 0.48 | -0.08 | **0.08** |
| 2019 | 3563 Old Lee Hwy | 38.8562 | -77.2888 | 0.26 | 0.09 | 0.06 | 0.10 | **0.19** | 1.69 | 0.61 | 0.41 | 0.66 | **1.27** |
| 2019 | 3504 Mavis Ct | 38.8620 | -77.3103 | 0.26 | 0.00 | 0.26 | 0.00 | **0.00** | 1.87 | 0.00 | 1.87 | 0.00 | **0.00** |
| 2019 | 4100 Addison Rd | 38.8428 | -77.3005 | 0.07 | 0.02 | 0.05 | 0.00 | **0.02** | 0.47 | 0.13 | 0.34 | 0.00 | **0.13** |
| 2019 | 10912 Byrd Dr | 38.8462 | -77.3202 | 0.81 | 0.33 | 0.12 | 0.37 | **0.70** | 0.54 | 0.21 | 0.08 | 0.25 | **0.46** |
| 2019 | 4020 Stonewall Ave | 38.8404 | -77.2903 | 0.17 | 0.06 | 0.07 | 0.04 | **0.10** | 1.21 | 0.43 | 0.50 | 0.28 | **0.71** |
| 2019 | Mount Vineyard | | | 3.99 | 1.17 | 3.48 | -0.66 | **0.51** | 14.11 | 4.14 | 12.31 | -2.33 | **1.80** |
| 2019 | 10709 Orchard St | 38.8596 | -77.3155 | 0.15 | 0.04 | 0.11 | 0.00 | **0.04** | 1.29 | 0.34 | 0.95 | 0.00 | **0.34** |
| 2019 | 10514 Oak Pl | 38.8649 | -77.3105 | 0.11 | 0.04 | 0.07 | 0.00 | **0.04** | 0.76 | 0.28 | 0.48 | 0.00 | **0.28** |
| | | | **Total** | 20 | 8.96 | 9.64 | 1.15 | **10** | 78 | 25 | 50 | 3.32 | **28** |

**Appendix L. NPS Nutrient Credit Purchase: Whispering Hills**

# CITY OF FAIRFAX, VIRGINIA

## Contract Number: 23031
## Purchase of Nutrient Credits for the City of Fairfax Storm Sewer System

This contract entered into this 2 day of November 2022, by CBAY-VA, LLC (Resource Environmental Solutions, LLC) , 1408 B Roseneath Road, Richmond, VA 23230, hereinafter called the "Contractor" and City of Fairfax, VA, 22030.

WITNESSETH that the Contractor and City of Fairfax, VA, in consideration of the mutual covenants, promises and agreements herein contained, agree as follows:

SCOPE OF CONTRACT: The Contractor shall serve as a Nutrient Trader for the Purchase of Nutrient Credits for the City of Fairfax, VA. The Contractor shall provide qualified nutrient mitigation banks for the purchase of up to thirty (30) pounds of perpetual phosphorous credits. The credits will assist the City in reaching nutrient reductions required by its Municipal Separate Storm Sewer System (MS4) Permit Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan. The credits are required to be located within the MS4 locality or within the locality's Chesapeake Bay Tributary (Potomac) and must be applicable to City of Fairfax in accordance with § 62.1-44.19:21 of the Code of Virginia.

PERIOD OF PERFORMANCE: From date of award through June 30, 2023. This contract may be renewed by the City upon written agreement of both parties for three (3) successive one-year periods, under the terms of the current contract.

PAYMENT TERMS: Net 30

INVOICES: accountspayable@fairfaxva.gov

The contract documents shall consist of:

(1) This signed form;

(2) Invitation for Bid #23031, dated September 27, 2022:

(3) CBAY-VA, LLC bid dated October 24, 2022.

IN WITNESS WHEREOF, the parties have caused this Contract to be duly executed intending to be bound thereby.

| CONTRACTOR: | FAIRFAX CITY, VA: |
|---|---|
| By: _____ | By: _____ |
| Ben Eubanks | Patricia Innocenti |
| Title: VP, East Region & GM, Mid-Atlantic | Title: Purchasing Agent |

**Note: This public body does not discriminate against faith-based organizations in accordance with the *Code of Virginia*, § 2.2-4343.1 or against a bidder or offeror because of race, religion, color, sex, sexual orientation, gender identity, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment.**

Contact Information:

Amy Staley, Credit Sales Manager
919-209-1055
astaley@res.us

| A | B | C | D | E | F | G* |
|---|---|---|---|---|---|---|
| **Bank Name / HUC8** | **Number of Phosphorous Credits** | **Unit Price per Phosphorous Credit** | **Extended Price** | **Total Number of Corresponding Nitrogen Credits** | **Total Number of Corresponding Sediment Credits** | **Price per Nitrogen Credit (Column D divided by Column E)*** |
| Whispering Hills / 02070008 | 30 | $8,500.00 | $255,000.00 | 81 | $37,735.50 | $3,148.15 |

**Exhibit C**

**CBAY-VA, LLC**

**AFFIDAVIT OF PHOSPHORUS CREDIT SALE**

CBAY-VA, LLC, a Virginia limited liability company (the "Seller"), hereby certifies the following:

1. Pursuant to that certain Purchase and Sale Agreement dated **November 2, 2022** (as the same may have been amended prior to the date hereof, the "Agreement"), between the Seller and **City of Fairfax, Virginia** ("Buyer"), the Seller, for the benefit of the Buyer agreed to sell **30.00** nonpoint source nutrient phosphorus Credits to Buyer and retire the associated ratio of nonpoint source nitrogen and sediment Credits at the credit generating facility in the amount of **81.00** pounds of nitrogen Credits and **37,735.50** pounds of sediment Credits.

2. The Seller and the Buyer as of the date hereof, have closed the transaction contemplated by the Agreement and the Company has sold to Buyer the credits described above.

WITNESS the following signature:

CBAY-VA LLC,
a Virginia limited liability company

By: _____
Authorized Signatory

Date: 2/1/2023

Sworn to and subscribed before me this 1 day of February, 2023, by Ben Eubanks, Authorized Signatory, on behalf of CBAY-VA LLC, a Virginia limited liability company.

State of Virginia
City / County of: Richmond

Notary registration number: 7746382
My commission expires: 01-31-25

CRISTY LYNN CAPPS
Electronic Notary Public
Commonwealth of Virginia
Registration No. 7746382
My Commission Expires Jan 31, 2025

Cristy Lynn Capps
Notary Public

**Permit #:** Pending
**Project Description:** City of Fairfax Storm Sewer System– Fairfax, VA
**Permittee:** City of Fairfax, Virginia
**Phosphorus Credits:** 30.00 pounds
**Associated Nitrogen Credits:** 81.00 pounds
**Associated Sediment Credits:** 37,735.50 pounds

**Exhibit D**

**CBAY-VA LLC**

**BILL OF SALE**

**BILL OF SALE,** made as of **February 1, 2023**, by **CBAY-VA LLC,** a Virginia limited liability company ("Seller"), to **City of Fairfax, Virginia** ("Buyer").

**WHEREAS,** Seller and Buyer have entered into that certain Purchase and Sale Agreement as of **November 2, 2022** (the "Agreement"), with respect to the sale by the Seller and purchase by the Buyer of nonpoint source phosphorus Credits generated within the **Whispering Hills Nutrient Bank** Property in Loudoun County, Virginia.

NOW, THEREFORE, for and in consideration of the payment of the Purchase Price (as defined in the Agreement) and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Seller hereby sells, transfers, assigns, conveys, delivers and sets over to Buyer, its successors and assigns, **30.00** pounds of phosphorus Credits and retires **81.00** pounds of nitrogen Credits and **37,735.50** pounds of sediment Credits associated with the phosphorous Credits generated at the **Whispering Hills** Property as such are described in the Agreement.

**TO HAVE AND TO HOLD** all such phosphorus Credits hereby sold and transferred to Buyer and its successors and assigns forever.

**IN WITNESS WHEREOF**, Seller has caused this Bill of Sale to be executed by its duly authorized representative as of the date first above written.

**CBAY-VA LLC,**
**a Virginia Limited Liability Company**

By:_____

Authorized Signatory

# MS4 Nutrient Credit Acquisition Form

Pursuant to Code of Virginia sections § 62.1-44.19:21.A and Part II.A.10 of the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, the below named Permittees hereby certify that credits have been transferred between their two facilities as outlined below in full or partial satisfaction of compliance obligations:

Facility generating credits: Whispering Hills (Facility Name) VAN _____ (Registration No.)

Facility acquiring credits: City of Fairfax (Facility Name) VAR 040064 (Registration No.)

Credits Transferred

Compliance Year: 2023

Delivered Total Nitrogen Credits : 81.00 lbs

Delivered Total Phosphorus Credits : 30.00 lbs

Delivered Total Sediment Credits: 37,735.50 lbs

I certify under penalty of law that this notification 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 or imprisonment for knowing violations.

Facility generating credits:
Principal Executive Officer or Authorized Agent:

Amy Staley
Typed or Printed Name

Amy Staley
Signature

919-209-1055
Area Code/Phone Number

2/15/2023
Date

Facility acquiring credits:
Principal Executive Officer or Authorized Agent:

Robert A. Stalzer
Type or Printed Name

RA Stalzer
Signature

703 385 7850
Area Code/Phone Number

2-16-23
Date

**Appendix M. DEQ MS4 Nutrient Credit Acquisition Form**

# MS4 Nutrient Credit Acquisition Form

Pursuant to Code of Virginia sections § 62.1-44.19:21.A and Part II.A.10 of the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, the below named Permittees hereby certify that credits have been transferred between their two facilities as outlined below in full or partial satisfaction of compliance obligations:

Facility generating credits: _____ VAN _____
Facility Name Registration No.

Facility acquiring credits: _____ VAR _____
Facility Name Registration No.

Credits Transferred

Compliance Year: _____

Delivered Total Nitrogen Credits : _____ lbs

Delivered Total Phosphorus Credits : _____ lbs

I certify under penalty of law that this notification 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 or imprisonment for knowing violations.

Facility generating credits:
Principal Executive Officer or Authorized Agent:

_____
Typed or Printed Name

_____
Signature

_____
Area Code/Phone Number

_____
Date

Facility acquiring credits:
Principal Executive Officer or Authorized Agent:

_____
Type or Printed Name

_____
Signature

_____
Area Code/Phone Number

_____
Date

**Appendix N. Stafford Drive Stream and Outfall Restoration Calculations**

# STAFFORD DRIVE STREAM RESTORATION
# 60% DESIGN

SP-##-#####

3300 STAFFORD DRIVE, FAIRFAX, VA 22030

PIN #: 47402001A, 47402002

CITY OF FAIRFAX, VA

## PROJECT NARRATIVE

THIS PROJECT OUTLINES THE USE OF NATURAL CHANNEL DESIGN (NCD) TECHNIQUES FOR THE RESTORATION OF APPROXIMATELY 2,300 LINEAR FEET OF STREAM CHANNEL ON THE NORTH FORK OF ACCOTINK CREEK. THE PROJECT LIMITS BEGIN AT A 8' DIAMETER DOUBLE-BARREL CULVERT UNDERNEATH PLANTATION PARKWAY AND ENDS AT THE CONFLUENCE OF THE NORTH FORK OF ACCOTINK CREEK WITH THE MAIN STEM OF ACCOTINK CREEK. THERE IS A 9' X 8' DOUBLE-BOX CULVERT THAT PASSES UNDERNEATH STAFFORD DRIVE AND 5 PIPED INFLOWS ALONG THE PROPOSED RESTORATION REACH. THE PROJECT AREA IS LOCATED IN STAFFORD DRIVE PARK AND THE PROJECT LIMITS ENCOMPASS 2 SEPARATE PARCELS, BOTH OF WHICH ARE OWNED BY THE CITY OF FAIRFAX. THE ESTIMATED LIMITS OF DISTURBANCE IS 7.90 AC. THE OVERALL GOAL OF THIS PROJECT IS TO PROVIDE THE CITY WITH POLLUTANT OF CONCERN (POC) CREDITS THAT CAN BE APPLIED TO THEIR OVERALL CHESAPEAKE BAY TMDL REQUIREMENTS THROUGH THE RESTORATION OF THE DEGRADED STREAM CHANNEL.THE TOTAL POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 78,492.86 LB/YR OF TOTAL SUSPENDED SOLIDS (TSS), 323.66 LB/YR OF NITROGEN, AND 181.04 LB/YR OF PHOSPHORUS.

## UTILITY CONTACTS

NAMES AND TELEPHONE NUMBERS OF POSSIBLE OPERATORS OF UNDERGROUND UTILITY LINES APPEAR BELOW. THESE NUMBERS SHALL ALSO BE USED TO SERVE IN AN EMERGENCY CONDITION.

| | | |
|---|---|---|
| GAS | COLUMBIA GAS TRANSMISSION CORP. | (703) 327 - 6331 |
| | WASHINGTON GAS | (800) 752 - 7520 |
| | CNG TRANSMISSION CORP. | (814) 583 - 5171 |
| ELECTRIC | DOMINION VIRGINIA POWER | (888) 667 - 3000 |
| | NOVEC | (888) 335 - 0500 |
| TELEPHONE | AT&T | (800) 288 - 2747 |
| | VERIZON | (800) 256 - 4646 |
| CABLE | COMCAST | (888) 375 - 4888 |
| WATER & SEWER | FAIRFAX WATER | (703) 698 - 5600 |
| OTHER | CENTURY LINK | (800) 366 - 8201 |

MISS UTILITY
DIAL 811, OR 1-800-552-7001
BEFORE DIGGING

## NON-EMERGENCY

FIRE AND RESCUE: (703) 385 - 7940
FOR EMERGENCIES, CALL 911

## SOURCE OF TITLE:

THE SUBJECT PROJECT COVERS TWO (2) DISTINCT PARCELS. THE PARCEL SITES SHOWN HEREON ARE LOCATED IN THE CITY OF FAIRFAX. THE PARCEL INFORMATION IS INCLUDED BELOW:

1. PARCEL ID: 47 4 02 001 A ; DEED BOOK 16304 PAGE 911 ; AREA = 14.07 ACRES (612,737 SF) ; OWNER OF RECORD: CITY OF FAIRFAX
2. PARCEL ID: 47 4 02 002 ; DEED BOOK 16304 PAGE 911 ; AREA = 9.17 ACRES (399,262 SF) ; OWNER OF RECORD: CITY OF FAIRFAX

## GENERAL NOTES

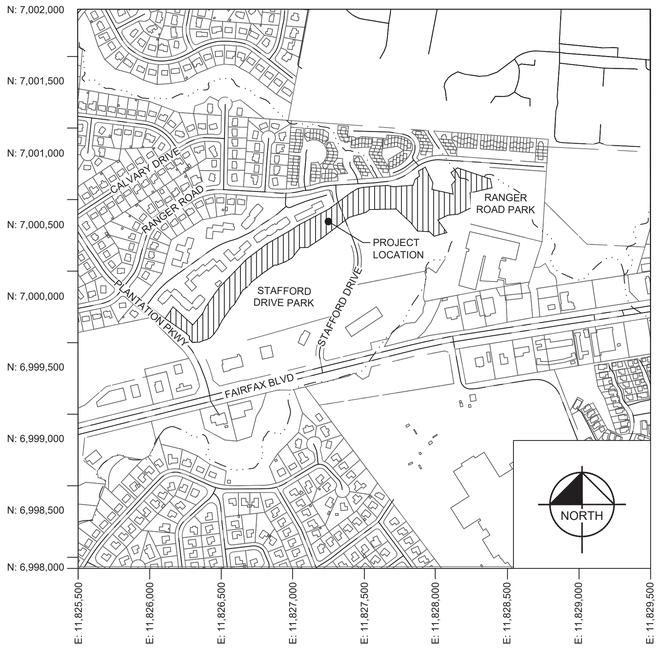
1. THE TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEYS PERFORMED BY TIMMONS GROUP ON AUGUST, 2020 - SEPTEMBER, 2020. THE SURVEY HAS BEEN SUPPLEMENTED WITH AN ADDITIONAL GROUND SURVEY CONDUCTED BY RICE ASSOCIATES ON JULY, 2021. THE HORIZONTAL DATUM IS NAD83 AND THE VERTICAL DATUM IS NGVD29. THE GROUND SURVEYS HAVE ALSO BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY OF FAIRFAX GEOGRAPHIC INFORMATION SYSTEM.
2. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES AND TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN AND ASSOCIATES..
3. CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION.
4. APPROVAL OF THESE PLANS IN NO WAY RELIEVES THE CONTRACTOR OF ALL APPLICABLE FEDERAL, STATE, AND LOCAL ORDINANCES.
4. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAPS (FIRM), COMMUNITY PANEL NO. 5155240002D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006.
5. TO THE BEST KNOWLEDGE OF THE ENGINEER, THERE ARE NO EXISTING GRAVES OR BURIAL SITES LOCATED ON THE PROPERTY. THE SUBJECT PROPERTY IS NOT LISTED UNDER THE NATIONAL REGISTER OF HISTORICAL PLACES.
6. TO THE BEST KNOWLEDGE OF THE ENGINEER, THIS SITE PLAN CONFORMS TO ALL APPLICABLE ORDINANCES, REGULATIONS AND ADOPTED STANDARDS, UNLESS OTHERWISE SPECIFICALLY NOTED.
7. WETLAND INFORMATION IS BASED ON WETLAND DELINEATION CONDUCTED BY TIMMONS GROUP ON 08/06/2020.
8. DUE TO THE PROJECT BEING A STREAM RESTORATION, RESOURCE PROTECTION AREAS (RPA) ARE LOCATED ON THE SUBJECT PROPERTIES.

| | OWNER | CLIENT | ENGINEER |
|---|---|---|---|
| NAME | CITY OF FAIRFAX | CITY OF FAIRFAX DEPARTMENT OF PUBLIC WORKS | KIMLEY-HORN |
| ADDRESS | 10455 ARMSTRONG STREET FAIRFAX, VA | 10455 ARMSTRONG STREET FAIRFAX, VA | 11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA |
| CONTACT | SATOSHI ETO | SATOSHI ETO | JON D'ALESSANDRO |
| PHONE | (703) 385-7810 | (703) 385-7810 | (703) 752-0589 |

Kimley»Horn

## VICINITY MAP

1" = 500'




**City of Fairfax**
APPROVED SITE PLAN

_____ _____
**Zoning Official** **Date**

**Review approval by:**

_____ **Fire Marshal (for water distribution system & fire hydrant location)**
_____ **Fairfax Water**
_____ **Director CDP**
_____ **Director of Public Works**
_____ **City Engineer**
_____ **PW Plan Reviewer**
_____ **Code Admin. Asst. Chief**
_____ **Site Plan Coordinator**
_____ **BAR Liaison**
_____ **Environmental Reviewer**
_____ **Wastewater Reviewer**
_____ **GIS Manager**
_____ **Bonding Administrator** _____ **Date**

AGENT AUTHORIZATION LETTER

To Whom IT May Concern:

I/We, The City of Fairfax, the undersigned title owner(s) of the property identified below do hereby authorize Jon D'Alessandro of Kimley-Horn, to act as my/our agent(s) in the furtherance of an application for a Major Site Plan on my/our property located at:
Stafford Drive Park

Tax Map No: 47402001A & 47402002

Thank you in advance for your cooperation.

Date: _____ By: _____

COMMONWEALTH/STATE OF: Virginia

CITY/COUNTY: City of Fairfax, TO WIT:

The forgoing instrument was acknowledged before me this _____ day of _____.

20____, by _____.

_____
Notary Public (Signature)

AFFIX NOTARY SEAL/STAMP

Notary Registration No: _____

My Commission Expires: _____

| Sheet List Table | |
|---|---|
| Sheet Number | Sheet Title |
| 01 | COVER SHEET |
| 02 | LEGENDS AND SYMBOLS |
| 03 | GENERAL NOTES |
| 04 | GENERAL NOTES |
| 05 | CORRESPONDENCE |
| 06 | VIEWPORT LEGEND |
| 07 | EXISTING CONDITIONS |
| 08 | EXISTING CONDITIONS |
| 09 | EXISTING CONDITIONS |
| 10 | PHOTO LOCATION MAP |
| 11 | PHOTO LOCATION MAP |
| 12 | PHOTO LOCATION MAP |
| 13 | EXISTING SITE PHOTOS |
| 14 | EXISTING SITE PHOTOS |
| 15 | DESIGN TABLE AND NARRATIVE |
| 16 | EXISTING PROFILE AND MORPHOLOGY |
| 17 | EXISTING PROFILE AND MORPHOLOGY |
| 18 | EXISTING MORPHOLOGY TABLE |
| 19 | EXISTING CROSS-SECTIONS & PEBBLE COUNT |
| 20 | EXISTING STREAM HYDROLOGY |
| 21 | EXISTING STREAM HYDROLOGY |
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**CITY OF FAIRFAX**
**Site Plan Checklist and Certification Statement**

The following affidavit and checklist must be printed on the cover page and signed by a certified engineer, architect or land surveyor.

Certification for Completeness and Accuracy

I Jon D'Alessandro do hereby certify that this site plan checklist is complete and accurate for use in staff's evaluation of the attached site plan that is required pursuant to Section 110-6.8 in the Code of the City of Fairfax.

(signature) _____ (date) _____ (SEAL)

Know what's **below.**
**Call** before you dig.

LICENSED PROFESSIONAL

| No. | REVISIONS | DATE | BY |
|---|---|---|---|

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KHA PROJECT 110557018
DATE 09/09/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

COVER SHEET

STAFFORD DRIVE STREAM RESTORATION DESIGN
PREPARED FOR
CITY OF FAIRFAX -DEPARTMENT OF PUBLIC WORKS
CITY OF FAIRFAX - VIRGINIA

SHEET NUMBER
01

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

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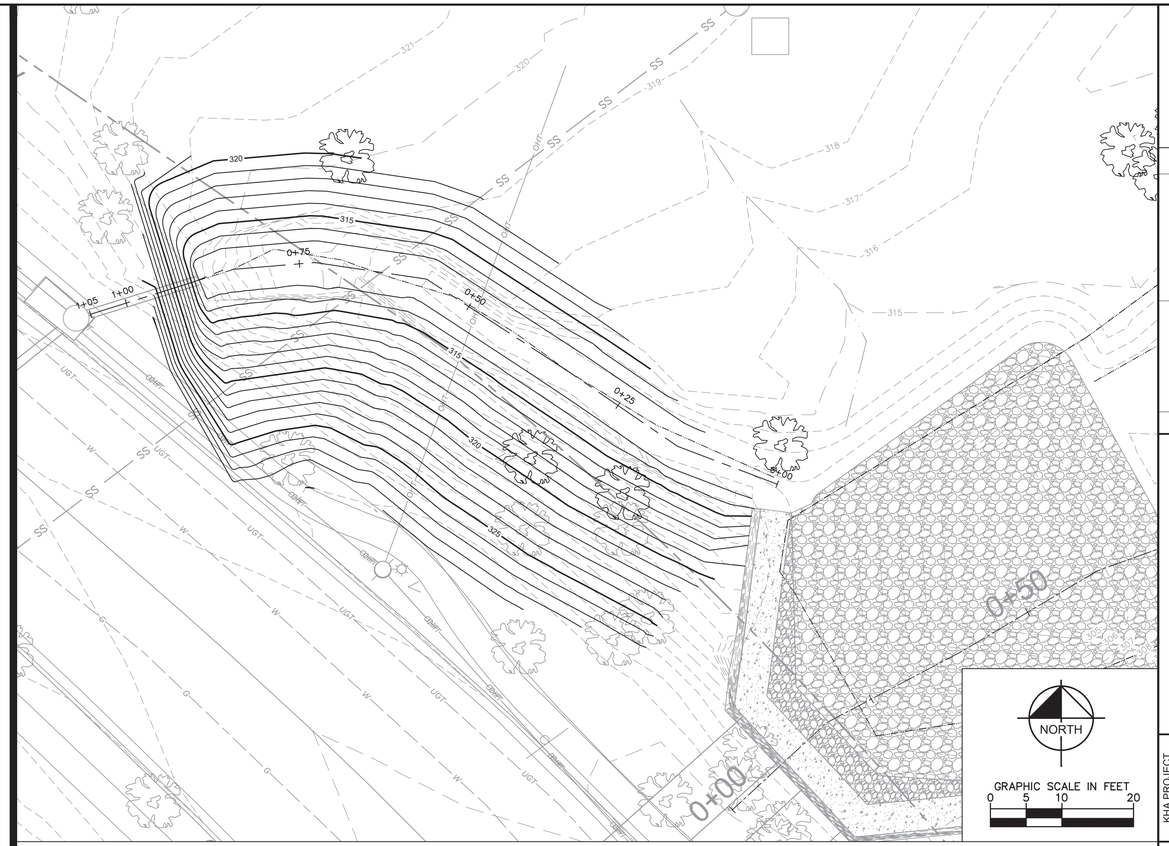
## Existing Outfall Channel Condition Parameters

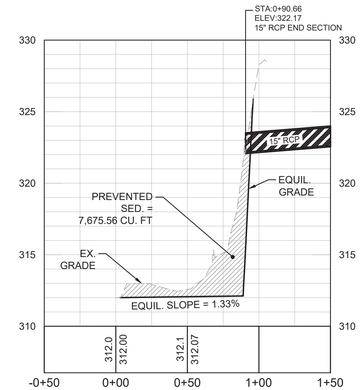
| | | |
|---|---|---|
| Drainage Area ($A_d$)= | 2.21 | *ac* |
| Drainage Area ($A_d$)= | 0.0089 | *$km^2$* |
| Mean Flow Depth = | 0.400 | *ft* |
| ***Step 1 - Define the Existing Channel Conditions*** | | |
| Length of Proposed Reach = | 90.660 | *ft* |
| Channel Slope = | 0.11 | *ft/ft* |
| Bank Height = | 2.62 | *ft* |
| Bottom Width = | 5.55 | *ft* |
| Top Width = | 11.04 | *ft* |
| Bulk Density (Estimate) = | 84.28 | *lb./$ft^3$* |
| ***Step 2 - Define the Equilibrium Channel Conditions*** | | |
| Is there a pipe outfall or other defining infrastructure present upstream of the restoration site? | | Yes |
| ***Upstream Limit*** | | |
| $L_{max}= 153A_d^{0.6}$ | | |
| Maximum Upstream Channel Length ($L_{max}$) = | Not Applicable | *ft* |
| ***Equilibrium Bed Slope*** | | |
| Choose Bed Condition = | Bed Condition 1 | |
| Bed Condition 1 = | Cohesive Bed | |
| Bed Condition 2 = | Sand and Fine Grave (0.1-5mm particle size) | |
| Bed Condition 3 = | Beds Coarser than Sand (>5mm particle size) | |
| ***Bed Condition 1: Cohesive Bed*** | | |
| $S_{eq} = 0.0028A^{-0.33}$ | | |
| Equilibrium Slope ($S_{eq}$)= | 0.0133 | *ft/ft* |
| ***Sand and Fine Gravel*** | | |
| $S_{eq} = 0.06 / (y * 62.43)$ | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Bed Coarser than Sand*** | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Equilibrium Bank Slopes*** | | |
| Bank Slopes = | | - |
| ***Future Bottom Width (est)*** | | |
| Bottom Width = | 3 | ft |
| ***Step 3: Calculate the Total Prevented Sediment*** | | |
| ***Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition*** | | |
| Volume of Prevented Sediment ($S_v$)= | 284.28 | *Cu. Yd.* |
| Volume of Prevented Sediment ($S_v$)= | 7,675.56 | *Cu. ft.* |
| ***Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load*** | | |
| *Adjust for Reduction in Efficiency and Timescale* | | |
| $S_p = 0.5 (S_v / 30)$ | | |
| Annual Volume of Prevented Sediment ($S_p$)= | 127.93 | *Cu. ft. / year* |
| ***Adjust for Soils Bulk Density*** | | |
| *Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density* | | |
| Annual Prevented Sediment Load (Estimate) = | Not Applicable | lb./year |
| Annual Prevented Sediment Load (Field Verified) = | 7,506.70 | lb./year |
| **Step 5: Determine the Annual Prevented Nutrients** | | |
| ***Estimated Conversion Factors*** | | |
| 1.05 lb. of Phosphorus (P) = | 1 ton of sediment | |
| 2.28 lb. of Nitrogen (N) = | 1 ton of sediment | |
| Estimated Phosphorus (P) Removal Rate = | Not Applicable | *lbs./year* |
| Estimated Nitrogen (N) Removal Rate = | Not Applicable | *lbs./year* |
| ***Site Specific Adjusted Results*** | | |
| Bulk Density = | 58.68 | *lb./$ft^3$* |
| 1 ton of sediment = | 2.60 | *lb. of (P)* |
| 1 ton of sediment = | 0.90 | *lb. of (N)* |
| Site Adjusted Total Suspended Solids (TSS) Removal Rate = | 7,506.70 | *lbs./year* |
| Site Adjusted Phosphorus (P) Removal Rate = | 9.76 | *lbs./year* |
| Site Adjusted Nitrogen (N) Removal Rate = | 3.38 | *lbs./year* |

## Pollutant of Concern (POC) Crediting Summary

| | | |
|---|---|---|
| Total Suspended Solids (TSS) Removal Rate = | 7,506.70 | *lbs./year* |
| Phosphorus (P) Removal Rate = | 9.76 | *lbs./year* |
| Nitrogen (N) Removal Rate = | 3.38 | *lbs./year* |




THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 07/13/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 07/22/2022. THE SOIL SAMPLE BULK DENSITY WAS 58.68 LB/$FT^3$ AND THE CONCENTRATIONS WERE 0.90 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 2.60 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 1.33%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 7,675.56 CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, THIS OUTFALL RESTORATION WILL PROVIDE 7,506.70 LB/YR OF SEDIMENT, 9.76 LB/YR OF PHOSPHORUS, AND 3.38 LB/YR OF NITROGEN.




OUTFALL CHANNEL 1
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

LICENSED PROFESSIONAL

| No. | REVISIONS | DATE | BY |
|---|---|---|---|

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KHA PROJECT 110557018
DATE 09/09/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

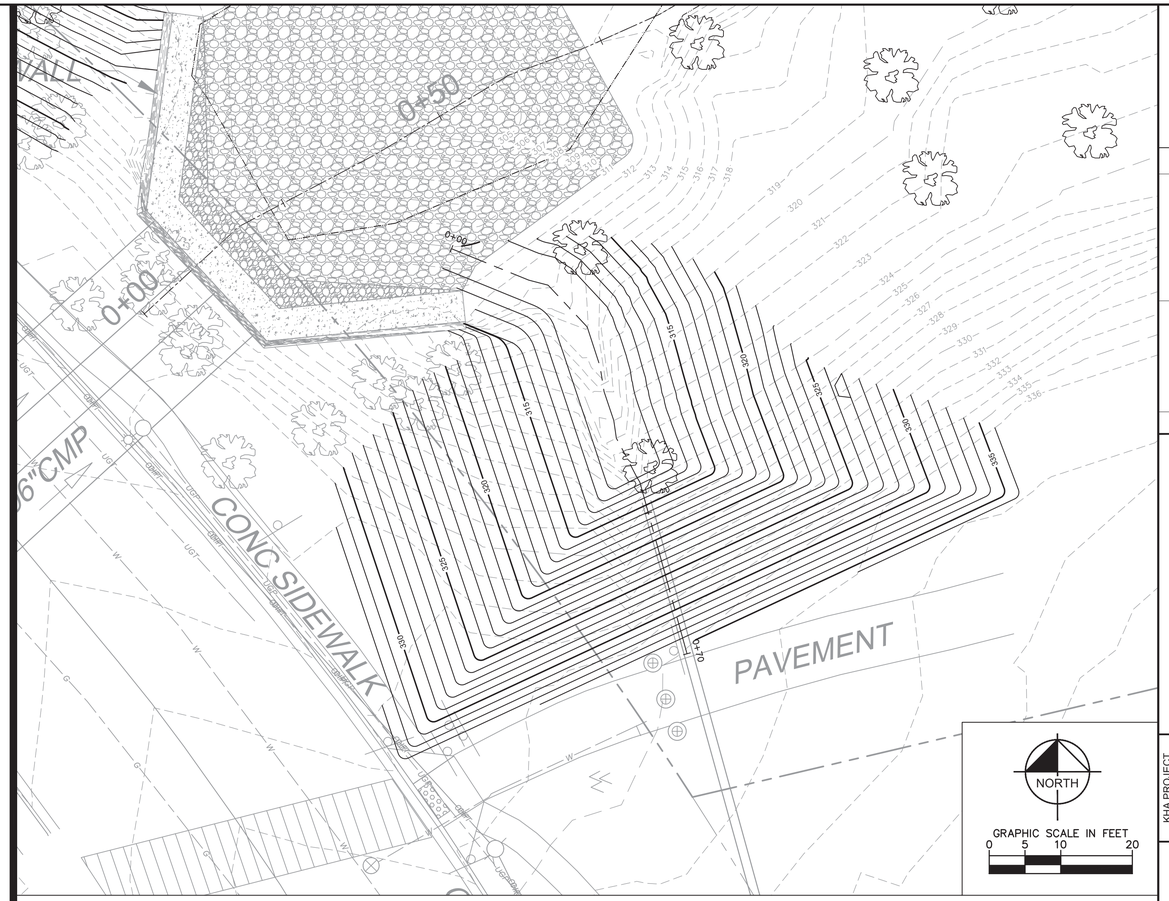
# POC CREDITING SUMMARY (OUTFALL 1)

STAFFORD DRIVE STREAM RESTORATION DESIGN
PREPARED FOR
CITY OF FAIRFAX -DEPARTMENT OF PUBLIC WORKS
CITY OF FAIRFAX - VIRGINIA

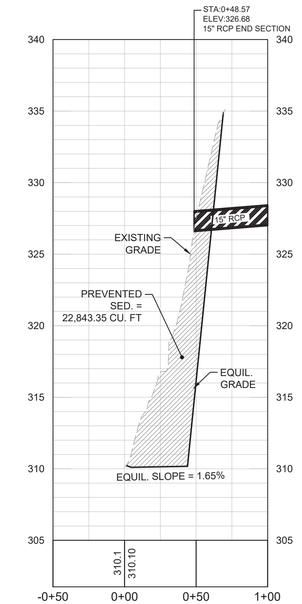
SHEET NUMBER
54

## Existing Outfall Channel Condition Parameters

| | | |
|---|---|---|
| Drainage Area ($A_d$)= | 1.15 | *ac* |
| Drainage Area ($A_d$)= | 0.0047 | *$km^2$* |
| Mean Flow Depth = | 0.53 | *ft* |
| ***Step 1 - Define the Existing Channel Conditions*** | | |
| Length of Proposed Reach = | 48.57 | *ft* |
| Channel Slope = | 0.28 | *ft/ft* |
| Bank Height = | 2.40 | *ft* |
| Bottom Width = | 2.70 | *ft* |
| Top Width = | 6.87 | *ft* |
| Bulk Density (Estimate) = | 84.28 | *lb./$ft^3$* |
| ***Step 2 - Define the Equilibrium Channel Conditions*** | | |
| Is there a pipe outfall or other defining infrastructure present upstream of the restoration site? | | Yes |
| ***Upstream Limit*** | | |
| $L_{max}= 153A_d^{0.6}$ | | |
| Maximum Upstream Channel Length ($L_{max}$) = | Not Applicable | *ft* |
| ***Equilibrium Bed Slope*** | | |
| Choose Bed Condition = | Bed Condition 1 | |
| Bed Condition 1 = | Cohesive Bed | |
| Bed Condition 2 = | Sand and Fine Grave (0.1-5mm particle size) | |
| Bed Condition 3 = | Beds Coarser than Sand (>5mm particle size) | |
| ***Bed Condition 1: Cohesive Bed*** | | |
| $S_{eq} = 0.0028A^{-0.33}$ | | |
| Equilibrium Slope ($S_{eq}$)= | 0.0165 | *ft/ft* |
| ***Sand and Fine Gravel*** | | |
| $S_{eq} = 0.06 / (y * 62.43)$ | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Bed Coarser than Sand*** | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Equilibrium Bank Slopes*** | | |
| Bank Slopes = | | - |
| ***Future Bottom Width (est)*** | | |
| Bottom Width = | 3 | ft |
| ***Step 3: Calculate the Total Prevented Sediment*** | | |
| ***Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition*** | | |
| Volume of Prevented Sediment ($S_v$)= | 846.05 | *Cu. Yd.* |
| Volume of Prevented Sediment ($S_v$)= | 22,843.35 | *Cu. ft.* |
| ***Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load*** | | |
| *Adjust for Reduction in Efficiency and Timescale* | | |
| $S_p = 0.5 (S_v / 30)$ | | |
| Annual Volume of Prevented Sediment ($S_p$)= | 380.72 | *Cu. ft. / year* |
| ***Adjust for Soils Bulk Density*** | | |
| *Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density* | | |
| Annual Prevented Sediment Load (Estimate) = | Not Applicable | lb./year |
| Annual Prevented Sediment Load (Field Verified) = | 21,628.85 | lb./year |
| **Step 5: Determine the Annual Prevented Nutrients** | | |
| ***Estimated Conversion Factors*** | | |
| 1.05 lb. of Phosphorus (P) = | 1 ton of sediment | |
| 2.28 lb. of Nitrogen (N) = | 1 ton of sediment | |
| Estimated Phosphorus (P) Removal Rate = | Not Applicable | *lbs./year* |
| Estimated Nitrogen (N) Removal Rate = | Not Applicable | *lbs./year* |
| ***Site Specific Adjusted Results*** | | |
| Bulk Density = | 56.81 | *lb./$ft^3$* |
| 1 ton of sediment = | 2.19 | *lb. of (P)* |
| 1 ton of sediment = | 0.87 | *lb. of (N)* |
| Site Adjusted Total Suspended Solids (TSS) Removal Rate = | 21,628.85 | *lbs./year* |
| Site Adjusted Phosphorus (P) Removal Rate = | 23.68 | *lbs./year* |
| Site Adjusted Nitrogen (N) Removal Rate = | 9.41 | *lbs./year* |
| **Pollutant of Concern (POC) Crediting Summary** | | |
| Total Suspended Solids (TSS) Removal Rate = | 21,628.85 | *lbs./year* |
| Phosphorus (P) Removal Rate = | 23.68 | *lbs./year* |
| Nitrogen (N) Removal Rate = | 9.41 | *lbs./year* |




THE POLLUTANT OF CONCERN (POC) CREDITING FOR THIS OUTFALL RESTORATION PROJECT WAS PERFORMED UNDER PROTOCOL 5 AND IN ACCORDANCE WITH THE GUIDANCE MEMO "*RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED*", DATED OCTOBER 15, 2019. SITE SAMPLES WERE COLLECTED ON 07/13/2022 AND ANALYZED BY WAYPOINT ANALYTICAL ON 07/22/2022. THE SOIL SAMPLE BULK DENSITY WAS 56.81 LB/$FT^3$ AND THE CONCENTRATIONS WERE 0.87 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 2.19 LBS OF NITROGEN PER 1 TON OF SEDIMENT. THROUGH IN-SITU SITE OBSERVATIONS, THE OUTFALL CHANNEL BED WAS ASSUMED TO HAVE A COHESIVE BED PLACING THE EQUILIBRIUM SLOPE UNDER BED CONDITION 1. THE EQUILIBRIUM SLOPE WAS FOUND TO BE 1.65%. THE TOTAL VOLUME OF PREVENTED SEDIMENT WAS OBTAINED THROUGH A COMPARISON OF THE EXISTING CHANNEL CONDITIONS WITH THE USE OF SURFACE COMPARISON MODELING IN AUTODESK CIVIL 3D SOFTWARE. A TOTAL PREVENT SEDIMENT VOLUME (SV) OF 22,843.35. CUBIC FEET WAS OBTAINED. BASED ON THE PREVENTED SEDIMENT CALCULATIONS, THIS OUTFALL RESTORATION WILL PROVIDE 21,628.85 LB/YR OF SEDIMENT, 23.68 LB/YR OF PHOSPHORUS, AND 9.41 LB/YR OF NITROGEN.




OUTFALL CHANNEL 2
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

LICENSED PROFESSIONAL

| No. | REVISIONS | DATE | BY |
|---|---|---|---|

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KHA PROJECT 110557018
DATE 08/09/2022
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY J.A.C
CHECKED BY J.J.D

# POC CREDITING SUMMARY (OUTFALL 2)

STAFFORD DRIVE STREAM RESTORATION DESIGN
PREPARED FOR
CITY OF FAIRFAX -DEPARTMENT OF PUBLIC WORKS
CITY OF FAIRFAX - VIRGINIA

SHEET NUMBER
55

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**Appendix O. Ashley Pond Conservancy Wet Pond Enhancement Calculations**

# ASHBY POND CONSERVANCY

## WET POND ENHANCEMENT PLANS (30% DESIGN)

### 9817 ASHBY ROAD, FAIRFAX, VA, 22031

### PIN#: 58 1 03 000 A

### CITY OF FAIRFAX, VA

NOTICE REQUIRED

CONTRACTORS SHALL NOTIFY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AND/OR BLASTING AT LEAST TWO (2) WORKING DAYS, BUT NOT MORE THAN TEN (10) WORKING DAYS PRIOR TO COMMENCEMENT OF EXCAVATION OR DEMOLITION. NAMES AND TELEPHONE NUMBERS OF POSSIBLE OPERATORS OF UNDERGROUND UTILITY LINES APPEAR BELOW. THESE NUMBERS SHALL ALSO BE USED TO SERVE IN AN EMERGENCY CONDITION.

UTILITY CONTACTS

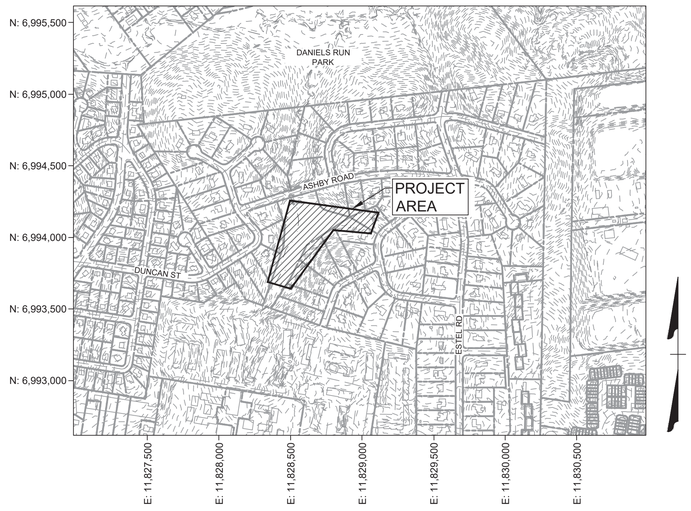
| | | |
|---|---|---|
| GAS | COLUMBIA GAS TRANSMISSION CORP. | (703) 327-6331 |
| | WASHINGTON GAS | (800) 752-7520 |
| | CNG TRANSMISSION CORP. | (814) 583-5171 |
| ELECTRIC | DOMINION VIRGINIA POWER | (888) 667-3000 |
| | NOVEC | (888) 335-0500 |
| TELEPHONE | AT&T | (800) 288-2747 |
| | VERIZON | (800) 256-4646 |
| CABLE | COMCAST | (888) 375-4888 |
| WATER & SEWER | FAIRFAX WATER | (703) 698-5800 |
| OTHER | CENTURY LINK | (800) 366-8201 |

MISS UTILITY
DIAL 811, OR 1-800-552-7001
BEFORE DIGGING

NON-EMERGENCY

POLICE: (703) 385-7924
FIRE AND RESCUE: (703) 385-7940
(FOR EMERGENCY CALL: 911)

LOCATION MAP




## VICINITY MAP

SCALE: 1" = 500'

HORIZONTAL DATUM: NAD 83
VERTICAL DATUM: NGVD29


OWNER/CLIENT:
CITY OF FAIRFAX
DEPARTMENT OF PUBLIC WORKS
10455 ARMSTRONG ST
FAIRFAX, VA 22030
CONTACT: SATOSHI ETO
PHONE: (703) 273 6073

CIVIL ENGINEER:
TIMMONS GROUP
20110 ASHBROOK PLACE, SUITE 100
ASHBURN, VA 20147
CONTACT: JON D'ALESSANDRO, P.E.
PHONE: (703) 554-6713


PROJECT NARRATIVE

THIS PROJECT IS THE 30% PLAN DEVELOPMENT OUTLINING THE PROPOSED METHODOLOGY TO RETROFIT, RESTORE, AND ENHANCE ASHBY POND AND ITS INFLOW CHANNELS IN THE CITY OF FAIRFAX. THE DESIGNED RETROFIT AIMS TO RESTORE THE DETENTION VOLUME OF THE POND TO THE ORIGINAL 2010-2011 DESIGN CONDITIONS, AS WELL AS ENHANCE THE NUTRIENT REMOVAL CAPABILITY OF THE POND. THE POND ENHANCEMENTS OUTLINED IN THIS PLAN HAVE BEEN EVALUATED IN ACCORDANCE WITH SPECIFICATION NO. 14 IN THE VIRGINIA BMP CLEARINGHOUSE. THIS PLAN ILLUSTRATES THE INCLUSION OF TWO (2) LARGE FOREBAYS WITHIN THE POND IMPOUNDMENT AREA, AS WELL AS AN AQUATIC PLANTING AREA, AND A RESTORATION OF ONE (1) INFLOW CHANNEL UTILIZING PROTOCOL 5. IT IS ASSUMED THAT THE POND WILL BE DREDGED AT THE TIME OF ENHANCEMENT, WHICH HAS BEEN REFLECTED IN THE PRELIMINARY GRADING.

THIS PROJECT IS INTENDED TO PROVIDE PHOSPHORUS, NITROGEN, AND TOTAL SUSPENDED SOLIDS (TSS) REDUCTIONS WITHIN THE ACCOTINK CREEK (POTOMAC RIVER) WATERSHED. THE NUTRIENT REMOVAL CREDITS ACHIEVED THROUGH THE POND RETROFIT, RESTORATION, AND ENHANCEMENT WILL BE APPLIED TO THE CITY OF FAIRFAX'S CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD (TMDL) REQUIREMENTS. A PRELIMINARY CHESAPEAKE BAY TMDL POLLUTANT OF CONCERN (POC) REDUCTION ANALYSIS HAS BEEN PERFORMED ON THE 30% DESIGN AND IS INCLUDED IN THIS PLAN SET.

**Sheet List Table**


| Sheet Number | Sheet Title |
|---|---|
| 0.0 | COVER |
| 1.0 | LEGENDS & SYMBOLS |
| 1.1 | GENERAL NOTES |
| 1.2 | PERMIT CORRESPONDENCE |
| 2.0 | EXISTING CONDITIONS |
| 3.0 | PHOTOSTATION LOCATION MAP |
| 4.0 | BATHYMETRIC SURVEY - TOP OF SILT |
| 4.1 | BATHYMETRIC SURVEY - BOTTOM OF SILT |
| 4.2 | PRELIMINARY DREDGING VOLUMETRIC ANALYSIS |
| 5.0 | EROSION AND SEDIMENT CONTROL PHASE I |
| 5.1 | EROSION AND SEDIMENT CONTROL PHASE II |
| 5.2 | EROSION AND SEDIMENT CONTROL NOTES AND DETAILS |
| 5.3 | EROSION AND SEDIMENT CONTROL NOTES AND DETAILS |
| 5.4 | EROSION AND SEDIMENT CONTROL NOTES AND DETAILS |
| 5.5 | EROSION AND SEDIMENT CONTROL NOTES AND DETAILS |
| 6.0 | PRELIMINARY LAYOUT AND GRADING PLAN |
| 6.1 | 30% GRADING PROFILE |
| 7.0 | EXISTING CONDITIONS HYDROLOGY |
| 7.1 | EXISTING CONDITIONS HYDROLOGY - TR55 |
| 7.2 | POND ROUTING CALCULATIONS AND ANALYSIS |
| 7.3 | CREDITING SUMMARY |
| 8.0 | HISTORIC PLANS |
| 8.1 | HISTORIC PLANS |
| 23 | TOTAL SHEETS |


AGENT AUTHORIZATION LETTER

To Whom IT May Concern:

I/We, _____, the undersigned title owner(s) of the property identified below do hereby authorize _____of _____, to act as my/our agent(s) in the furtherance of an application for a _____on my/our property located at: _____

Tax Map No: _____

Thank you in advance for your cooperation.

Date: _____ By: _____

COMMONWEALTH/STATE OF: _____

CITY/COUNTY: _____, TO WIT:

The forgoing instrument was acknowledged before me this _____ day of _____, 20____, by _____.

_____
Notary Public {Signature}

AFFIX NOTARY SEAL/STAMP

Notary Registration No: _____

My Commission Expires: _____

**City of Fairfax**
APPROVED SITE PLAN

_____ _____
**Zoning Official** **Date**

**Review approval by:**

_____ **Fire Marshal (for water distribution system & fire hydrant location)**
_____ **Fairfax Water**
_____ **Director CDP**
_____ **Director of Public Works**
_____ **City Engineer**
_____ **PW Plan Reviewer**
_____ **Code Admin. Asst. Chief**
_____ **Site Plan Coordinator**
_____ **BAR Liaison**
_____ **Environmental Reviewer**
_____ **Wastewater Reviewer**
_____ **GIS Manager**
_____ **Bonding Administrator** _____ **Date**

COMMONWEALTH OF VIRGINIA
JONATHAN JOSEPH D'ALESSANDRO
Lic. No. 039356
PROFESSIONAL ENGINEER
NOT FOR CONSTRUCTION


THIS DRAWING PREPARED AT THE
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REVISION DESCRIPTION

DATE

DATE 12/15/2020
DRAWN BY JJD
DESIGNED BY JJD
CHECKED BY JJD
SCALE AS SHOWN

TIMMONS GROUP

WET POND ENHANCEMENT PLANS (30% DESIGN)
9817 ASHBY ROAD, FAIRFAX, VA 22031
COVER

JOB NO. 45558.014
SHEET NO. 0.0


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# Pollution Reduction Calculation Methodology narrative

The pollutant reduction calculations for the Ashby Pond Wet Pond Enhancements project were determined multiple ways due to the different components of the project. A cumulative summary of the pollutant reductions provided by the proposed restoration and enhancement is shown in Table 1.

**Table 1. Ashby Pond Wet Pond Enhancement Project Pollutant of Concern (POC) Reduction Summary**

| Ashby Pond Potential Project(s) and corresponding estimated Chesapeake Bay Total Maximum Daily Load (TMDL) - Pollutant of Concern (POC) Load Reduction Summary | | | |
|---|---|---|---|
| Pollutant of Concern (POC) | Project 1<br>Ashby Pond Outfall Channel Restoration | Project 2<br>Restoration of Ashby Pond to 2011 (Original) Design Conditions | Total estimated POC Reductions provided by Projects 1 and 2 |
| Est. Sediment (TSS) Removal (lbs./yr.) | 27,662.76 | 20,000.00 | 47,662.76 |
| Est. Phosphorous (P) Removal (lbs./yr.) | 14.52 | 73.00 | 87.52 |
| Est. Nitrogen (N) Removal (lbs./yr.) | 31.54 | 320.00 | 351.54 |
| Estimated Pollutant of Concern Reduction Crediting Source | *Channel 2 - Outfall Restoration (30% Design) - Prepared by Timmons Group (July 2020)* | *Ashby Pond Demonstration Project Plans - Prepared by William H. Gordon Associates, et.al. (January 2011)* | Notes: These POC reductions are preliminary estimates only. Future iterations of design and analysis will further refine these numbers, and could potentially increase the POC reductions provided by each potential project. |

Narratives for the Outfall Channel 2 Restoration, as well as Pond Restoration and Enhancement are outlined below.

## Outfall Channel 2 Restoration – Crediting Narrative

Crediting for the Outfall Channel 2 Restoration was performed utilizing the methodologies outlined in Protocol 5 (*Recommendations for Crediting Outfall and Gully Stabilization Projects in the Chesapeake Bay Watershed*). Calculation methodologies and preliminary crediting for the outfall restoration can be found in the Plan Set Assemblies located in the Section F Appendix.

## Pond Restoration, Enhancement, and Retrofit

In determining a calculation methodology for the pond, consideration of the pond being credited, designed, and constructed in 2010 – 2011 during the infancy of the Virginia Runoff Reduction Method (VRRM) and BMP Clearinghouse Specification Development cannot be ignored. During this time there was a loose interpretation of design regulations, standards, and calculation methodologies because of the change from the Technical II.C Design Criteria to the Technical II.B Design Criteria.

*DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet* - **Version 3.0**

☐ 2011 BMP Standards and Specifications ☒ 2013 Draft BMP Standards and Specifications

**Project Name:** Ashby Pond Wet Pond Enhancements - SLAF Grant Section E
**Date:** 7/14/2021
*BMP Design Specifications List:* 2013 Draft Stds & Specs

CLEAR ALL *(Ctrl+Shift+R)*

data input cells
constant values
calculation cells
final results

## Site Information

## Post-Development Project (Treatment Volume and Loads)

**Land Cover (acres)**

| | A Soils | B Soils | C Soils | D Soils | Totals |
|---|---|---|---|---|---|
| **Forest/Open Space (acres)** -- undisturbed, protected forest/open space or reforested land | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Managed Turf (acres)** -- disturbed, graded for yards or other turf to be mowed/managed | 0.00 | 7.14 | 53.86 | 23.16 | 84.16 |
| **Impervious Cover (acres)** | 0.00 | 0.30 | 13.56 | 37.82 | 51.68 |
| | | | | | 135.84 |

**Constants**

| | |
|---|---|
| Annual Rainfall (inches) | 43 |
| Target Rainfall Event (inches) | 1.00 |
| Total Phosphorus (TP) EMC (mg/L) | 0.26 |
| Total Nitrogen (TN) EMC (mg/L) | 1.86 |
| Target TP Load (lb/acre/yr) | 0.41 |
| Pj (unitless correction factor) | 0.90 |

**Runoff Coefficients (Rv)**

| | A Soils | B Soils | C Soils | D Soils |
|---|---|---|---|---|
| Forest/Open Space | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |

**Post-Development Requirement for Site Area**

| | |
|---|---|
| **TP Load Reduction Required (lb/yr)** | **99.76** |

**LAND COVER SUMMARY -- POST DEVELOPMENT**

**Land Cover Summary**

| | |
|---|---|
| Forest/Open Space Cover (acres) | 0.00 |
| Weighted Rv (forest) | 0.00 |
| % Forest | 0% |
| Managed Turf Cover (acres) | 84.16 |
| Weighted Rv (turf) | 0.23 |
| % Managed Turf | 62% |
| Impervious Cover (acres) | 51.68 |
| Rv (impervious) | 0.95 |
| % Impervious | 38% |
| Site Area (acres) | **135.84** |
| Site Rv | **0.50** |

**Treatment Volume and Nutrient Loads**

| | |
|---|---|
| **Treatment Volume (acre-ft)** | 5.6800 |
| **Treatment Volume (cubic feet)** | 247,423 |
| **TP Load (lb/yr)** | 155.46 |
| **TN Load (lb/yr) (Informational Purposes Only)** | 1,112.10 |

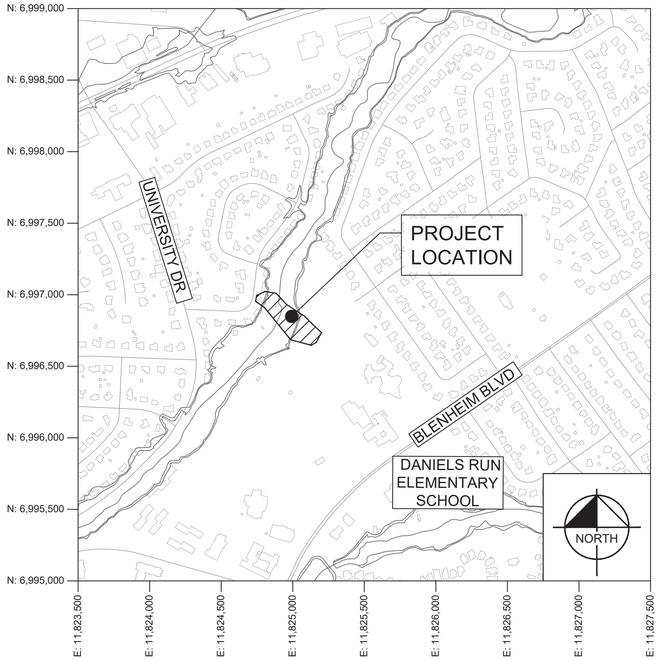
**Appendix P. Van Dyck Park Outfall Restoration Calculations**

# 30% CONSTRUCTION PLANS
# VAN DYCK PARK
# OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 57 2 02 176 & 57 2 02 175
3720 BLENHEIM BOULEVARD
CITY OF FAIRFAX, VIRGINIA

## VICINITY MAP

1" = 500'




PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION AN ACTIVELY ERODING OUTFALL CHANNEL. THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A 15" RCP PIPE AND END AT THE CONFLUENCE OF ACCOTINK CREEK. THE PROJECT IS LOCATED IN VAN DYCK PARK IN THE CITY OF FAIRFAX, VIRGINIA.

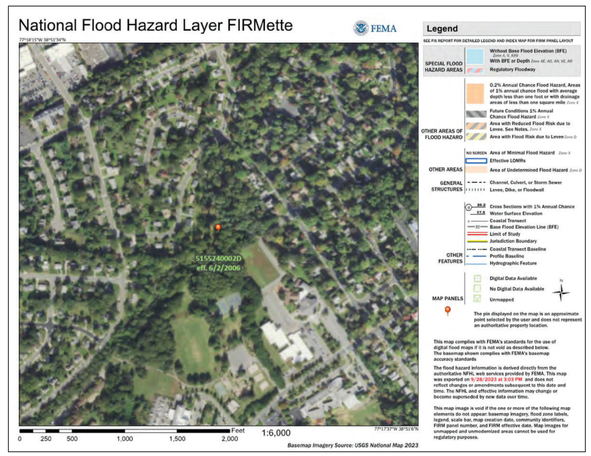
THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019.REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION.

THE SOIL SAMPLE BULK DENSITY WAS 62.43 LB/FT$^3$ AND THE CONCENTRATIONS WERE 1.08 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.78 LBS OF NITROGEN PER 1 TON OF SEDIMENT.THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 150,862.10 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 134.27 LBS/YR OF NITROGEN, AND 81.47 LBS/YR OF PHOSPHORUS.

GENERAL NOTES:

1. THE SUBJECT PROPERTY OF THIS PROJECT IS THE FOLLOWING:
   TAX MAP NUMBER: 57 2 02 176 & 57 2 02 175
   PARCEL AREA: 8.87 ACRES (386,380 SF) & 13.21 ACRES (575,430 SF)
   DEED BOOK AND NUMBER: N/A & N/A
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON THE READILY AVAILABLE GEOGRAPHIC INFORMATION SYSTEM (GIS) FOR THE PROJECT AREA. THE SITE IS INTENDED TO BE SURVEYED AS PART OF THE NEXT STAGE OF THE DESIGN PROCESS.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN.
4. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAP (FIRM), COMMUNITY PANEL NO. 5155240002D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006. FIRM PANEL NO. 5155240002D INDICATES THAT THE PROJECT AREA IS NOT LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA (SFHA).

| Sheet List Table | |
|---|---|
| Sheet Number | Sheet Title |
| 01 | COVER SHEET |
| 02 | GENERAL NOTES & DETAILS |
| 03 | GENERAL NOTES & DETAILS |
| 04 | PHOTO STATION MAP |
| 05 | EXISTING CONDITIONS |
| 06 | EXISTING HYDROLOGY |
| 07 | PRELIMINARY POC CREDITING SUMMARY |




| | OWNER | CLIENT | ENGINEER |
|---|---|---|---|
| NAME | CITY OF FAIRFAX | CITY OF FAIRFAX | KIMLEY-HORN |
| ADDRESS | 10455 ARMSTRONG STREET FAIRFAX, VA | 10455 ARMSTRONG STREET FAIRFAX, VA | 11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA |
| CONTACT | SATOSHI ETO | SATOSHI ETO | JON D'ALESSANDRO |
| PHONE | (703) 385-7810 | (703) 385-7810 | (703) 752-0589 |

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11400 COMMERCE PARK DR. SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM



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KHA PROJECT 110057041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY C.D.C
CHECKED BY J.J.D

COVER SHEET
OUTFALL AND GULLY STABILIZATION PROJECT
VAN DYCK PARK
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01


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# Pollution Reduction Calculation Methodology narrative

Preliminary crediting for the Van Dyck Park Outfall Restoration Projects was determined utilizing the crediting methodology outlined in the *"Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed"* – specifically Protocol 5 (*Recommendations for Crediting Outfall and Gully Stabilization Projects in the Chesapeake Bay Watershed*). Calculation methodologies and crediting for the outfall restoration can be found in the Conceptual Plan Set Assembly located in the Section F Appendix. Table 1 outlines the Pollutant of Concern (POC) Reduction summary for the potential restoration of the outfall channel.

**Table 1. Van Dyck Park – Outfall Restoration Project – Preliminary Pollutant of Concern Reduction Summary**

| Outfall-ID | Outfall Length (ft.) | Outfall Drainage Area (Ac.) | Estimated Phosphorous Reduction Provided (lbs./yr.) | Estimated Nitrogen Reduction Provided (lbs./yr.) | Estimated TSS Reduction Provided (lbs./yr.) |
|---|---|---|---|---|---|
| Outfall 1 | 329.00 | 3.30 | 81.47 | 134.27 | 150,862.10 |

*DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet* - **Version 3.0**

○ 2011 BMP Standards and Specification ◉ 2013 Draft BMP Standards and Specification

**Project Name:** Van Dyck Outfall #1
**Date:** 9/20/2023
*BMP Design Specifications List:* 2013 Draft Stds & Specs

CLEAR ALL *(Ctrl+Shift+R)*

data input cells | constant values | calculation cells | final results

## Site Information

## Post-Development Project (Treatment Volume and Loads)

**Land Cover (acres)**

| | A Soils | B Soils | C Soils | D Soils | Totals |
|---|---|---|---|---|---|
| **Forest/Open Space (acres)** -- undisturbed, protected forest/open space or reforested land | 0.00 | 0.82 | 0.22 | 0.00 | 1.04 * |
| **Managed Turf (acres)** -- disturbed, graded for yards or other turf to be mowed/managed | 0.00 | 0.00 | 0.97 | 0.33 | 1.30 |
| **Impervious Cover (acres)** | 0.00 | 0.02 | 0.19 | 0.70 | 0.91 |
| | | | | | 3.25 |

** Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method*

**Constants**

| | |
|---|---|
| Annual Rainfall (inches) | 43 |
| Target Rainfall Event (inches) | 1.00 |
| Total Phosphorus (TP) EMC (mg/L) | 0.26 |
| Total Nitrogen (TN) EMC (mg/L) | 1.86 |
| Target TP Load (lb/acre/yr) | 0.41 |
| Pj (unitless correction factor) | 0.90 |

**Runoff Coefficients (Rv)**

| | A Soils | B Soils | C Soils | D Soils |
|---|---|---|---|---|
| Forest/Open Space | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |

**Post-Development Requirement for Site Area**

| | |
|---|---|
| **TP Load Reduction Required (lb/yr)** | **1.39** |

**LAND COVER SUMMARY -- POST DEVELOPMENT**

Land Cover Summary

| | |
|---|---|
| Forest/Open Space Cover (acres) | 1.04 |
| Weighted Rv (forest) | 0.03 |
| % Forest | 32% |
| Managed Turf Cover (acres) | 1.30 |
| Weighted Rv (turf) | 0.23 |
| % Managed Turf | 40% |
| Impervious Cover (acres) | 0.91 |
| Rv (impervious) | 0.95 |
| % Impervious | 28% |
| Site Area (acres) | **3.25** |
| Site Rv | **0.37** |

Treatment Volume and Nutrient Loads

| | |
|---|---|
| **Treatment Volume (acre-ft)** | 0.0997 |
| **Treatment Volume (cubic feet)** | 4,341 |
| **TP Load (lb/yr)** | 2.73 |
| **TN Load (lb/yr) (Informational Purposes Only)** | 19.51 |

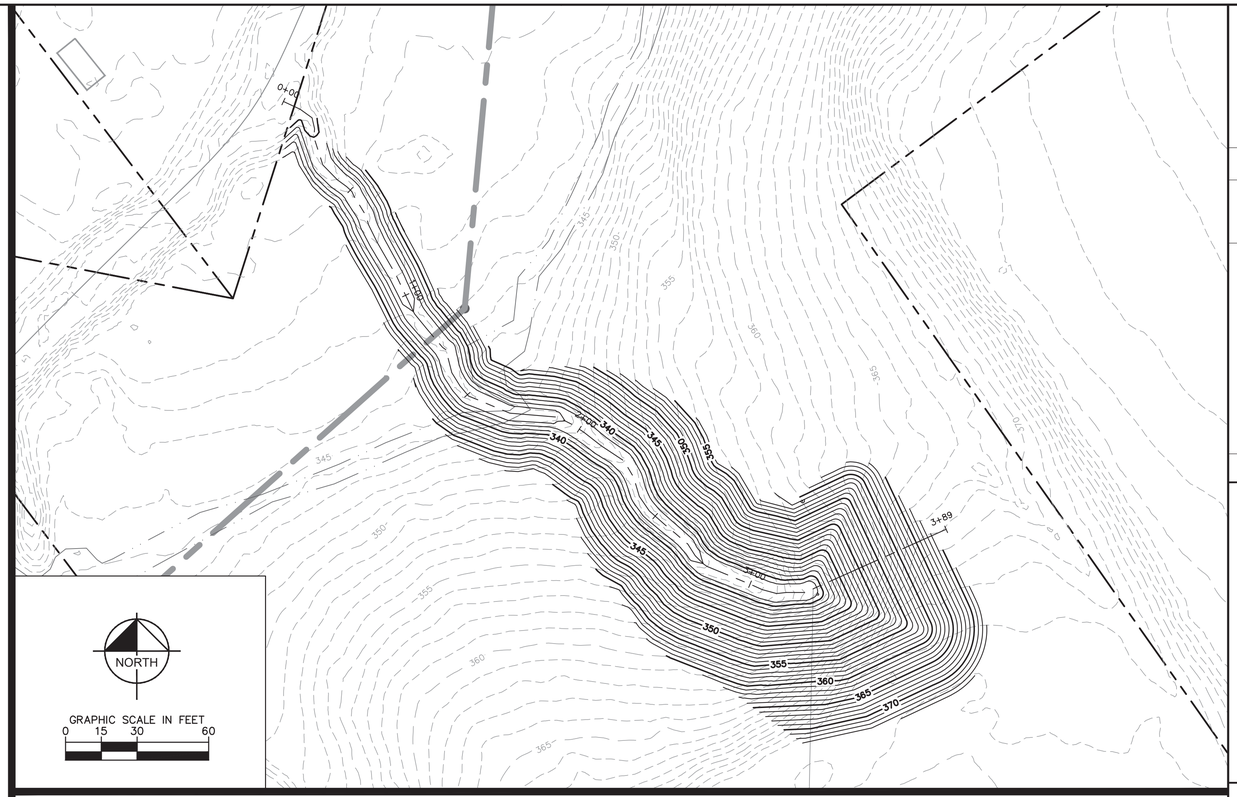
This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

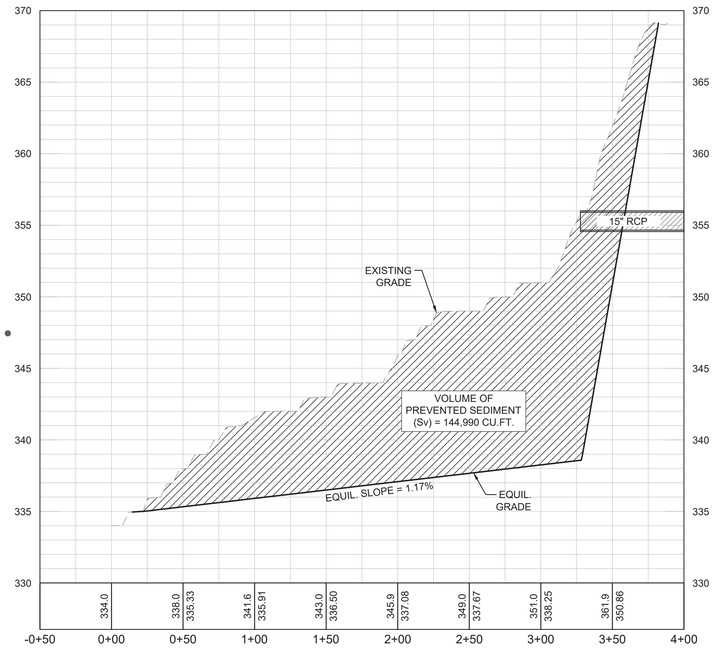
## Existing Outfall Channel Condition Parameters

| | | |
|---|---|---|
| Drainage Area ($A_d$)= | 3.28 | *ac* |
| Drainage Area ($A_d$)= | 0.0133 | *$km^2$* |
| Mean Flow Depth = | 0.433 | *ft* |
| ***Step 1 - Define the Existing Channel Conditions*** | | |
| Length of Proposed Reach = | 328.640 | *ft* |
| Channel Slope = | 0.063 | *ft/ft* |
| Bank Height = | 2.80 | *ft* |
| Bottom Width = | 5.57 | *ft* |
| Top Width = | 18.43 | *ft* |
| Bulk Density (Estimate) = | 70.00 | *lb./$ft^3$* |
| ***Step 2 - Define the Equilibrium Channel Conditions*** | | |
| Is there a pipe outfall or other defining infrastructure present upstream of the restoration site? | | Yes |
| ***Upstream Limit*** | | |
| $L_{max}= 153A_d^{0.6}$ | | |
| Maximum Upstream Channel Length ($L_{max}$) = | Not Applicable | *ft* |
| ***Equilibrium Bed Slope*** | | |
| Choose Bed Condition = | Bed Condition 1 | |
| Bed Condition 1 = | Cohesive Bed | |
| Bed Condition 2 = | Sand and Fine Grave (0.1-5mm particle size) | |
| Bed Condition 3 = | Beds Coarser than Sand (>5mm particle size) | |
| ***Bed Condition 1: Cohesive Bed*** | | |
| $S_{eq} = 0.0028A^{-0.33}$ | | |
| Equilibrium Slope ($S_{eq}$)= | 0.0117 | *ft/ft* |
| ***Bed Condition 2: Sand and Fine Gravel*** | | |
| $S_{eq} = 0.06 / (y * 62.43)$ | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Bed Condition 3: Bed Coarser than Sand*** | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Equilibrium Bank Slopes*** | | |
| Bank Slopes = | | - |
| ***Future Bottom Width (est)*** | | |
| Bottom Width = | 5.5 | ft |
| ***Step 3: Calculate the Total Prevented Sediment*** | | |
| ***Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition*** | | |
| Volume of Prevented Sediment ($S_v$)= | 5,370.00 | *Cu. Yd.* |
| Volume of Prevented Sediment ($S_v$)= | 144,990.00 | *Cu. ft.* |
| ***Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load*** | | |
| *Adjust for Reduction in Efficiency and Timescale* | | |
| $S_p = 0.5 (S_v / 30)$ | | |
| Annual Volume of Prevented Sediment ($S_p$)= | 2,416.50 | *Cu. ft. / year* |
| ***Adjust for Soils Bulk Density*** | | |
| *Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density* | | |
| Annual Prevented Sediment Load (Estimate) = | Not Applicable | lb./year |
| Annual Prevented Sediment Load (Field Verified) = | 150,862.10 | lb./year |
| **Step 5: Determine the Annual Prevented Nutrients** | | |
| ***Estimated Conversion Factors*** | | |
| 1.05 lb. of Phosphorus (P) = | 1 ton of sediment | |
| 2.28 lb. of Nitrogen (N) = | 1 ton of sediment | |
| Estimated Phosphorus (P) Removal Rate = | Not Applicable | *lbs./year* |
| Estimated Nitrogen (N) Removal Rate = | Not Applicable | *lbs./year* |
| ***Site Specific Adjusted Results*** | | |
| Bulk Density = | 62.43 | *lb./$ft^3$* |
| 1 ton of sediment = | 1.08 | *lb. of (P)* |
| 1 ton of sediment = | 1.78 | *lb. of (N)* |
| Site Adjusted Total Suspended Solids (TSS) Removal Rate = | 150,862.10 | *lbs./year* |
| Site Adjusted Phosphorus (P) Removal Rate = | 81.47 | *lbs./year* |
| Site Adjusted Nitrogen (N) Removal Rate = | 134.27 | *lbs./year* |

## Pollutant of Concern (POC) Crediting Summary

| | | |
|---|---|---|
| Total Suspended Solids (TSS) Removal Rate = | 150,862.10 | *lbs./year* |
| Phosphorus (P) Removal Rate = | 81.47 | *lbs./year* |
| Nitrogen (N) Removal Rate = | 134.27 | *lbs./year* |




VAN DYCK CREDITING PROFILE
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

| No. | REVISIONS | DATE | BY |
|---|---|---|---|
| | | | |

Kimley»Horn
11400 COMMERCE PARK DR, SUITE 400, RESTON, VA 20191
PHONE: 703-674-1300 FAX: 703-674-1350
WWW.KIMLEY-HORN.COM

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KHA PROJECT 110557041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY C.D.C
CHECKED BY J.J.D

# PRELIMINARY POC CREDITING SUMMARY
# OUTFALL AND GULLY STABILIZATION PROJECT
# VAN DYCK PARK
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
07

**Appendix Q. Traveler Street Outfall Restoration Calculations**

# 30% CONSTRUCTION PLANS
# OLD ROBIN STREET
# (FORMALLY TRAVELER STREET)
# OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 47 4 01 039
3157 FAIR WOODS PKWY
CITY OF FAIRFAX, VIRGINIA

PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF TWO ACTIVELY ERODING OUTFALL CHANNELS.

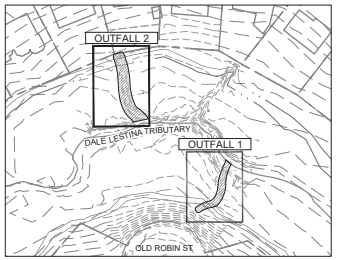
THE PROJECT LIMITS OF OUTFALL 1 BEGIN AT THE DISCHARGE OF A 15" RCP PIPE AND END AT THE CONFLUENCE OF THE OUTFALL CHANNEL WITH THE DALE LESTINA TRIBUTARY. THE PROJECT LIMITS OF OUTFALL 2 BEGIN AT THE DISCHARGE OF A 21" RCP AND END AT THE CONFLUENCE OF THE OUTFALL CHANNEL WITH THE DALE LESTINA TRIBUTARY. BOTH OUTFALLS ARE LOCATED WITHIN DALE LESTINA PARK.

THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITES AND PROCESSED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION.

THE SOIL SAMPLE RESULTS FOR OUTFALL 1 ARE AS FOLLOWS:
- BULK DENSITY - 64.3 LB/FT$^3$
- 0.86 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT
- 2.11 LBS OF NITROGEN PER 1 TON OF SEDIMENT

THE SOIL SAMPLE RESULTS FOR OUTFALL 2 ARE AS FOLLOWS:
- BULK DENSITY - 56.19 LB/FT$^3$
- 0.79 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT
- 2.60 LBS OF NITROGEN PER 1 TON OF SEDIMENT

THE TOTAL POLLUTANT OF CONCERN CREDIT REDUCTION FROM BOTH OUTFALL LOCATIONS IS 14,300 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 16 LBS/YR OF NITROGEN, AND 6 LBS/YR OF PHOSPHORUS.

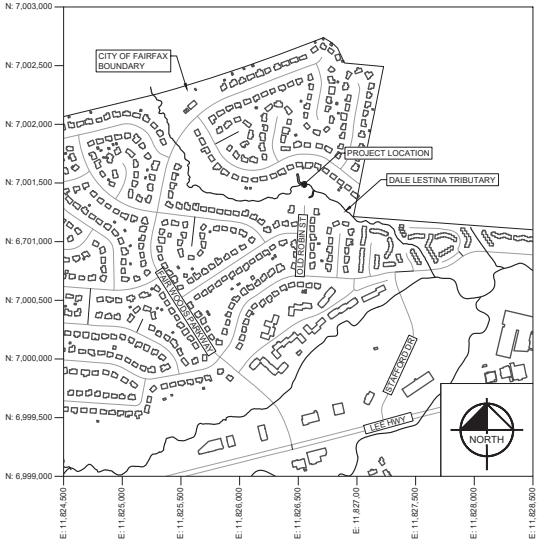



GENERAL NOTES

1. THE SUBJECT PROPERTY OF THIS PROJECT IS THE FOLLOWING:
   TAX MAP NUMBER: 47 4 01 039
   PARCEL AREA: 7.78 ACRES (339,000 SF)
   DEED BOOK AND NUMBER: UNKNOWN
   ESTIMATED DISTURBED AREA: 0.66 ACRES
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON GROUND SURVEY PREPARED BY JOHNSON, MIRIAM, & THOMPSON (JMT) ON OCTOBER 3, 2022. THE HORIZONTAL DATUM IS NAD83 WHILE THE VERTICAL DATUM IS NGVD29. THE GROUND SURVEYS HAVE BEEN SUPPLEMENTED WITH THE BEST AVAILABLE DATA FROM THE CITY'S OPEN GIS DATA HUB.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN.
4. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAP (FIRM), COMMUNITY PANEL NO. 5155240002D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006. FIRM PANEL NO. 5155240002D INDICATES THAT THE PROJECT AREA IS LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA (SFHA) ZONE AE.

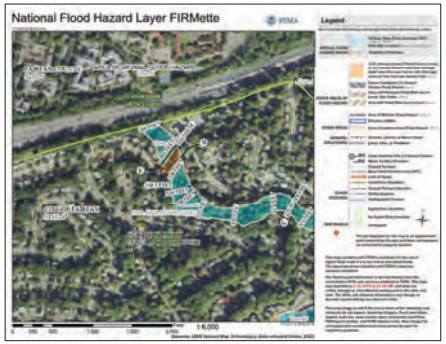
## VICINITY MAP

1" = 500'




| | OWNER | CLIENT | ENGINEER |
|---|---|---|---|
| NAME | CITY OF FAIRFAX | CITY OF FAIRFAX | KIMLEY-HORN |
| ADDRESS | 10455 ARMSTRONG STREET FAIRFAX, VA | 10455 ARMSTRONG STREET FAIRFAX, VA | 11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA |
| CONTACT | SATOSHI ETO | SATOSHI ETO | JON D'ALESSANDRO |
| PHONE | (703) 385-7810 | (703) 385-7810 | (703) 752-0589 |

| Sheet List Table | |
|---|---|
| Sheet Number | Sheet Title |
| 01 | COVER SHEET |
| 02 | GENERAL NOTES & DETAILS |
| 03 | GENERAL NOTES & DETAILS |
| 04 | PHOTO LOCATION MAP - OUTFALL 1 |
| 05 | PHOTO LOCATION MAP - OUTFALL 2 |
| 06 | EXISTING CONDITIONS - OUTFALL 1 |
| 07 | EXISTING CONDITIONS - OUTFALL 2 |
| 08 | EXISTING HYDROLOGY |
| 09 | POC CREDITING SUMMARY |

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KHA PROJECT 110057037
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.J.D
DRAWN BY M.J.M
CHECKED BY J.J.D

COVER SHEET
OUTFALL AND GULLY STABILIZATION PROJECT
OLD ROBIN STREET
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER 01

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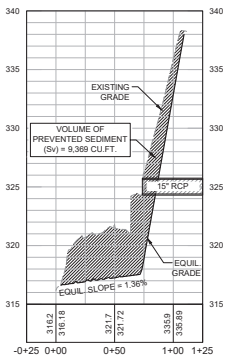
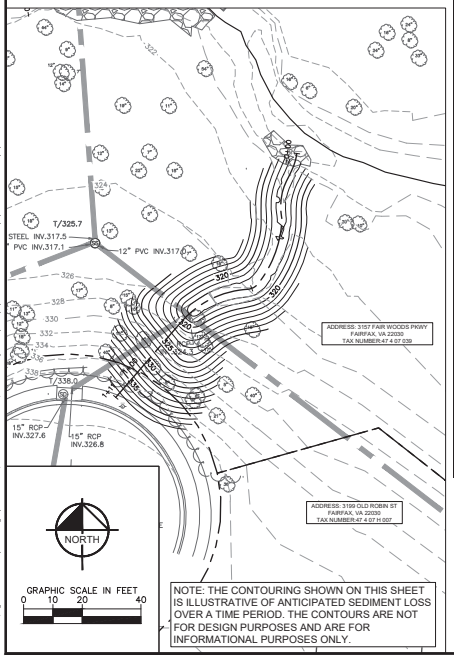
# OUTFALL 1




OUTFALL 1 LONGITUDINAL PROFILE
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

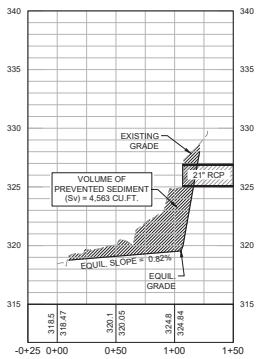
| Existing Outfall Channel Condition Parameters | | |
|---|---|---|
| Drainage Area ($A_d$) = | 2.06 | ac |
| Drainage Area ($A_d$) = | 0.0083 | sq mi |
| Mean Flow Depth = | 0.767 | ft |
| *Step 1 - Define the Existing Channel Conditions* | | |
| Length of Proposed Reach = | 69.310 | ft |
| Channel Slope = | 0.31 | ft/ft |
| Bank Height = | 2.37 | ft |
| Bottom Width = | 2.73 | ft |
| Top Width = | 6.83 | ft |
| Bulk Density (Estimate) = | 84.28 | lb/ft³ |
| *Step 2 - Define the Equilibrium Channel Conditions* | | |
| Is there a pipe outfall or other defining infrastructure present upstream of the restoration site? | | Yes |
| *Upstream Limit* | | |
| Maximum Upstream Channel Length ($L_{max}$) = | Not Applicable | ft |
| *Equilibrium Bed Slope* | | |
| Choose Bed Condition = | Bed Condition 1 | |
| Bed Condition 1 = | Cohesive Bed | |
| Bed Condition 2 = | Sand and Fine Gravel (0.1-5mm particle size) | |
| Bed Condition 3 = | Beds Coarser than Sand (>5mm particle size) | |
| *Bed Condition 1: Cohesive Bed* | | |
| Equilibrium Slope ($S_{eq}$) = | 0.0236 | ft/ft |
| *Sand and Fine Gravel* | | |
| Equilibrium Slope ($S_{eq}$) = | Not Applicable | ft/ft |
| *Bed Coarser than Sand* | | |
| Equilibrium Slope ($S_{eq}$) = | Not Applicable | ft/ft |
| *Equilibrium Bank Slopes* | | |
| Bank Slopes = | | |
| *Future Bottom Width (est)* | | |
| Bottom Width = | 2.73 | ft |
| *Step 3: Calculate the Total Prevented Sediment* | | |
| *Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition* | | |
| Volume of Prevented Sediment ($S_v$) = | 347.00 | cu. yd |
| Volume of Prevented Sediment ($S_v$) = | 9,369.00 | cu. ft |
| *Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load* | | |
| *Adjust for Bed and Bank Recession Efficiency and Timescale* | | |
| Annual Volume of Prevented Sediment ($S_v$) = | 156.15 | cu. yd / year |
| *Adjust for Soils Bulk Density* | | |
| *Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density* | | |
| Annual Prevented Sediment Load (Estimate) = | Not Applicable | lb/year |
| Annual Prevented Sediment Load (Field Verified) = | 10,040.45 | lb/year |
| *Step 5: Determine the Annual Prevented Nutrients* | | |
| *Estimated Conversion Factors* | | |
| 1.05 lb. of Phosphorus (P) = | 1 ton of sediment | |
| 2.28 lb. of Nitrogen (N) = | 1 ton of sediment | |
| Estimated Phosphorus (P) Removal Rate = | Not Applicable | lbs/year |
| Estimated Nitrogen (N) Removal Rate = | Not Applicable | lbs/year |
| *Site Specific Adjusted Results* | | |
| Bulk Density = | 84.30 | lb/ft³ |
| 1 ton of sediment = | 0.85 | cu. yd (%) |
| 1 ton of sediment = | 2.21 | cu. yd (%) |
| Site Adjusted Total Suspended Solids (TSS) Removal Rate = | 10,040.45 | lbs/year |
| Site Adjusted Phosphorus (P) Removal Rate = | 4.30 | lbs/year |
| Site Adjusted Nitrogen (N) Removal Rate = | 10.59 | lbs/year |

| Pollutant of Concern (POC) Crediting Summary | | |
|---|---|---|
| Total Suspended Solids (TSS) Removal Rate = | 10,040.45 | lbs/year |
| Phosphorus (P) Removal Rate = | 4.30 | lbs/year |
| Nitrogen (N) Removal Rate = | 10.59 | lbs/year |




NOTE: THE CONTOURING SHOWN ON THIS SHEET IS ILLUSTRATIVE OF ANTICIPATED SEDIMENT LOSS OVER A TIME PERIOD. THE CONTOURS ARE NOT FOR DESIGN PURPOSES AND ARE FOR INFORMATIONAL PURPOSES ONLY.

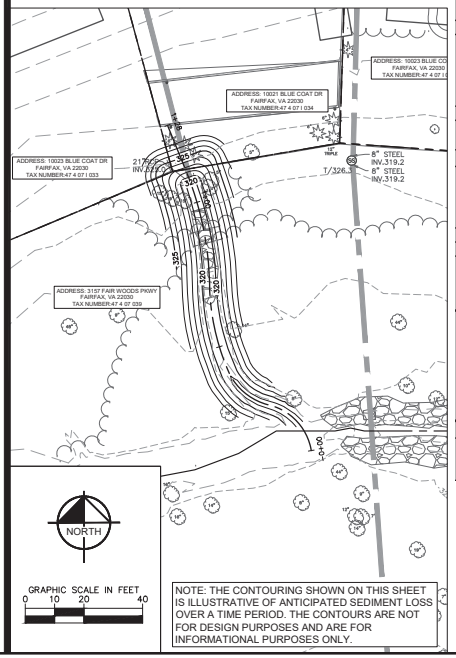
# OUTFALL 2




OUTFALL 2 LONGITUDINAL PROFILE
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

| Existing Outfall Channel Condition Parameters | | |
|---|---|---|
| Drainage Area ($A_d$) = | 9.411 | ac |
| Drainage Area ($A_d$) = | 0.0381 | sq mi |
| Mean Flow Depth = | 2.211 | ft |
| *Step 1 - Define the Existing Channel Conditions* | | |
| Length of Proposed Reach = | 58.000 | ft |
| Channel Slope = | 0.06 | ft/ft |
| Bank Height = | 3.27 | ft |
| Bottom Width = | 2.07 | ft |
| Top Width = | 0.00 | ft |
| Bulk Density (Estimate) = | 84.28 | lb/ft³ |
| *Step 2 - Define the Equilibrium Channel Conditions* | | |
| Is there a pipe outfall or other defining infrastructure present upstream of the restoration site? | | Yes |
| *Upstream Limit* | | |
| Maximum Upstream Channel Length ($L_{max}$) = | Not Applicable | ft |
| *Equilibrium Bed Slope* | | |
| Choose Bed Condition = | Bed Condition 1 | |
| Bed Condition 1 = | Cohesive Bed | |
| Bed Condition 2 = | Sand and Fine Gravel (0.1-5mm particle size) | |
| Bed Condition 3 = | Beds Coarser than Sand (>5mm particle size) | |
| *Bed Condition 1: Cohesive Bed* | | |
| Equilibrium Slope ($S_{eq}$) = | 0.0082 | ft/ft |
| *Sand and Fine Gravel* | | |
| Equilibrium Slope ($S_{eq}$) = | Not Applicable | ft/ft |
| *Bed Coarser than Sand* | | |
| Equilibrium Slope ($S_{eq}$) = | Not Applicable | ft/ft |
| *Equilibrium Bank Slopes* | | |
| Bank Slopes = | | |
| *Future Bottom Width (est)* | | |
| Bottom Width = | 2.07 | ft |
| *Step 3: Calculate the Total Prevented Sediment* | | |
| *Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition* | | |
| Volume of Prevented Sediment ($S_v$) = | 169.00 | cu. yd |
| Volume of Prevented Sediment ($S_v$) = | 4,563.00 | cu. ft |
| *Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load* | | |
| *Adjust for Bed and Bank Recession Efficiency and Timescale* | | |
| Annual Volume of Prevented Sediment ($S_v$) = | 76.05 | cu. yd / year |
| *Adjust for Soils Bulk Density* | | |
| *Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density* | | |
| Annual Prevented Sediment Load (Estimate) = | Not Applicable | lb/year |
| Annual Prevented Sediment Load (Field Verified) = | 4,873.25 | lb/year |
| *Step 5: Determine the Annual Prevented Nutrients* | | |
| *Estimated Conversion Factors* | | |
| 1.05 lb. of Phosphorus (P) = | 1 ton of sediment | |
| 2.28 lb. of Nitrogen (N) = | 1 ton of sediment | |
| Estimated Phosphorus (P) Removal Rate = | Not Applicable | lbs/year |
| Estimated Nitrogen (N) Removal Rate = | Not Applicable | lbs/year |
| *Site Specific Adjusted Results* | | |
| Bulk Density = | 56.19 | lb/ft³ |
| 1 ton of sediment = | 0.79 | cu. yd (%) |
| 1 ton of sediment = | 2.60 | cu. yd (%) |
| Site Adjusted Total Suspended Solids (TSS) Removal Rate = | 4,873.25 | lbs/year |
| Site Adjusted Phosphorus (P) Removal Rate = | 1.70 | lbs/year |
| Site Adjusted Nitrogen (N) Removal Rate = | 5.56 | lbs/year |

| Pollutant of Concern (POC) Crediting Summary | | |
|---|---|---|
| Total Suspended Solids (TSS) Removal Rate = | 4,873.25 | lbs/year |
| Phosphorus (P) Removal Rate = | 1.70 | lbs/year |
| Nitrogen (N) Removal Rate = | 5.56 | lbs/year |

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KHA PROJECT 110057037
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.J.D
DRAWN BY M.J.M
CHECKED BY J.J.D

# POC CREDITING SUMMARY

## OUTFALL AND GULLY STABILIZATION PROJECT
## OLD ROBIN STREET

PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
09


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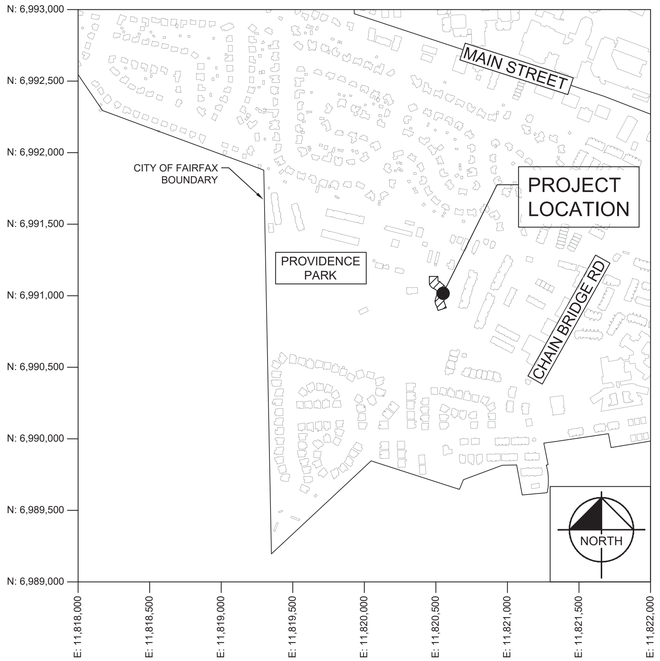
**Appendix R. Providence Park Providence Park Outfall Restoration Calculations**

# 30% CONSTRUCTION PLANS
# PROVIDENCE PARK
# OUTFALL AND GULLY STABILIZATION PROJECT

PIN#: 57 3 01 007
10715 WEST DR
CITY OF FAIRFAX, VIRGINIA

## VICINITY MAP

1" = 500'




PROJECT NARRATIVE

THIS PROJECT CONSISTS OF THE STABILIZATION OF APPROXIMATELY AN ACTIVELY ERODING OUTFALL CHANNEL.

THE PROJECT LIMITS BEGIN AT THE DISCHARGE OF A 15" RCP PIPE AND END AT THE CONFLUENCE OF LOWER BULL RUN. THE PROJECT IS LOCATED IN PROVIDENCE PARK IN THE CITY OF FAIRFAX, VIRGINIA.

THE POLLUTANT OF CONCERN (POC) CREDITING AND DESIGN FOR THE OUTFALL WAS DONE IN ACCORDANCE WITH THE GUIDANCE MEMO *"RECOMMENDATIONS FOR CREDITING OUTFALL AND GULLY STABILIZATION PROJECTS IN THE CHESAPEAKE BAY WATERSHED"*, DATED OCTOBER 15, 2019. REPRESENTATIVE SOIL FIELD SAMPLES WERE OBTAINED FROM THE PROJECT SITE AND PROCEED AT A LABORATORY TO OBTAIN THE SOILS BULK DENSITY, NITROGEN CONCENTRATION, AND PHOSPHORUS CONCENTRATION.

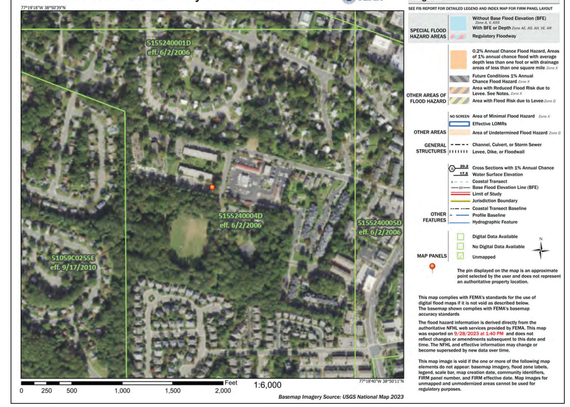
THE SOIL SAMPLE BULK DENSITY WAS 60.56 LB/FT$^3$ AND THE CONCENTRATIONS WERE 0.60 LBS OF PHOSPHORUS PER 1 TON OF SEDIMENT AND 1.34 LBS OF NITROGEN PER 1 TON OF SEDIMENT.THE POLLUTANT OF CONCERN CREDIT REDUCTION FROM THIS PROJECT IS 36,054.40 LBS/YR OF TOTAL SUSPENDED SOLIDS (TSS), 24.16 LBS/YR OF NITROGEN, AND 10.89 LBS/YR OF PHOSPHORUS.

GENERAL NOTES:

1. THE SUBJECT PROPERTY OF THIS PROJECT IS THE FOLLOWING:
   TAX MAP NUMBER: 57 3 01 007
   PARCEL AREA: 17 ACRES (740,520 SF)
   DEED BOOK AND NUMBER: UNKNOWN
2. TOPOGRAPHIC INFORMATION SHOWN IS BASED ON THE READILY AVAILABLE GEOGRAPHIC INFORMATION SYSTEM (GIS) FOR THE PROJECT AREA. THE SITE IS INTENDED TO BE SURVEYED AS PART OF THE NEXT STAGE OF THE DESIGN PROCESS.
3. THE EXISTING UTILITIES, AS SHOWN HEREON, ARE APPROXIMATE ONLY. NO GUARANTEE IS HEREIN MADE OR IMPLIED THAT ALL EXISTING UNDERGROUND UTILITIES ARE SHOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT ALL UTILITY COMPANIES TO VERIFY THE TYPE, SIZE, AND LOCATION OF ALL EXISTING UTILITIES PRIOR TO STARTING THE WORK. ANY DISCREPANCIES IN OR FROM THE INFORMATION SHOWN HEREON SHALL BE REPORTED TO KIMLEY-HORN.
4. THE AREA SHOWN HERON IS LOCATED ON THE FLOOD INSURANCE RATE MAP (FIRM), COMMUNITY PANEL NO. 5155240004D, WITH AN EFFECTIVE DATE OF JUNE 2, 2006. FIRM PANEL NO. 5155240004D INDICATES THAT THE PROJECT AREA IS NOT LOCATED IN A FEMA SPECIAL FLOOD HAZARD AREA (SFHA).

| Sheet List Table | |
|---|---|
| Sheet Number | Sheet Title |
| 01 | COVER SHEET |
| 02 | GENERAL NOTES & DETAILS |
| 03 | GENERAL NOTES & DETAILS |
| 04 | PHOTO LOCATION MAP |
| 05 | EXISTING CONDITIONS |
| 06 | EXISTING HYDROLOGY |
| 07 | POC CREDITING SUMMARY |

National Flood Hazard Layer FIRMette




| | OWNER | CLIENT | ENGINEER |
|---|---|---|---|
| NAME | CITY OF FAIRFAX | CITY OF FAIRFAX | KIMLEY-HORN |
| ADDRESS | 10455 ARMSTRONG STREET FAIRFAX, VA | 10455 ARMSTRONG STREET FAIRFAX, VA | 11400 COMMERCE PARK DRIVE, SUITE 400 RESTON, VA |
| CONTACT | SATOSHI ETO | SATOSHI ETO | JON D'ALESSANDRO |
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KHA PROJECT 110557041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY M.N.P
CHECKED BY J.J.D

COVER SHEET

OUTFALL AND GULLY STABILIZATION PROJECT
PROVIDENCE PARK

PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
01


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# Pollution Reduction Calculation Methodology narrative

Crediting for the Providence Park Outfall Restoration Project was performed utilizing the methodologies outlined in Protocol 5 of the *"Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed"* (*Recommendations for Crediting Outfall and Gully Stabilization Projects in the Chesapeake Bay Watershed*). Calculation methodologies and crediting for the outfall restoration can be found in the Plan Set Assembly located in the Section F Appendix. Table 1 outlines the Pollutant of Concern (POC) Reduction summary for the restoration of the outfall.

**Table 1. City of Fairfax – Providence Park Outfall Restoration Project - Pollutant of Concern Reduction Summary**

| Outfall-ID | Approximate Outfall Length (ft.) | Outfall Drainage Area (Ac.) | Estimated Phosphorous Reduction Provided (lbs./yr.) | Estimated Nitrogen Reduction Provided (lbs./yr.) | Estimated TSS Reduction Provided (lbs./yr.) |
|---|---|---|---|---|---|
| Providence Park Outfall | 200 | 2.08 | 10.89 | 24.16 | 36,054.00 |

*DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet* - **Version 3.0**

○ 2011 BMP Standards and Specification ◉ 2013 Draft BMP Standards and Specification

**Project Name:** Providence Park OTFL #1
**Date:** 9/20/2023
*BMP Design Specifications List:* 2013 Draft Stds & Specs

CLEAR ALL *(Ctrl+Shift+R)*

data input cells | constant values | calculation cells | final results

## Site Information

## Post-Development Project (Treatment Volume and Loads)

**Land Cover (acres)**

| | A Soils | B Soils | C Soils | D Soils | Totals |
|---|---|---|---|---|---|
| **Forest/Open Space (acres)** -- undisturbed, protected forest/open space or reforested land | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Managed Turf (acres)** -- disturbed, graded for yards or other turf to be mowed/managed | 0.00 | 0.25 | 0.00 | 0.23 | 0.48 |
| **Impervious Cover (acres)** | 0.00 | 0.06 | 0.00 | 1.52 | 1.57 |
| | | | | | 2.05 |

**Constants**

| | |
|---|---|
| Annual Rainfall (inches) | 43 |
| Target Rainfall Event (inches) | 1.00 |
| Total Phosphorus (TP) EMC (mg/L) | 0.26 |
| Total Nitrogen (TN) EMC (mg/L) | 1.86 |
| Target TP Load (lb/acre/yr) | 0.41 |
| Pj (unitless correction factor) | 0.90 |

**Runoff Coefficients (Rv)**

| | A Soils | B Soils | C Soils | D Soils |
|---|---|---|---|---|
| Forest/Open Space | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |

**Post-Development Requirement for Site Area**

| | |
|---|---|
| **TP Load Reduction Required (lb/yr)** | **2.81** |

**LAND COVER SUMMARY -- POST DEVELOPMENT**

Land Cover Summary

| | |
|---|---|
| Forest/Open Space Cover (acres) | 0.00 |
| Weighted Rv (forest) | 0.00 |
| % Forest | 0% |
| Managed Turf Cover (acres) | 0.48 |
| Weighted Rv (turf) | 0.22 |
| % Managed Turf | 23% |
| Impervious Cover (acres) | 1.57 |
| Rv (impervious) | 0.95 |
| % Impervious | 77% |
| Site Area (acres) | **2.05** |
| Site Rv | **0.78** |

Treatment Volume and Nutrient Loads

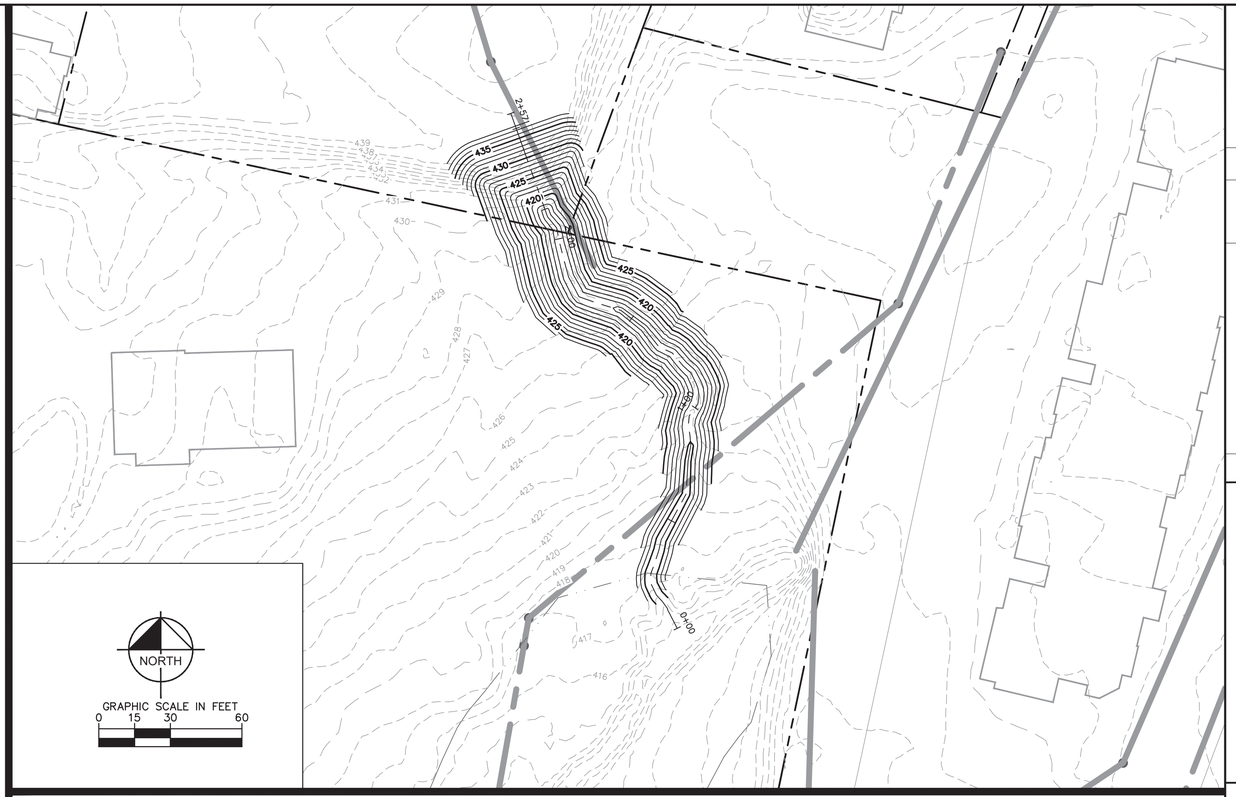
| | |
|---|---|
| **Treatment Volume (acre-ft)** | 0.1335 |
| **Treatment Volume (cubic feet)** | 5,817 |
| **TP Load (lb/yr)** | 3.65 |
| **TN Load (lb/yr) (Informational Purposes Only)** | 26.15 |

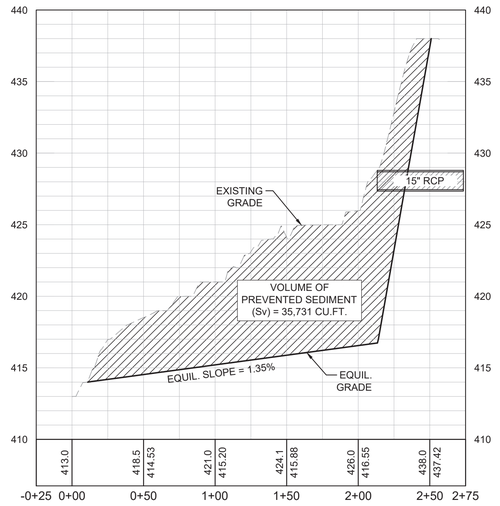
## Existing Outfall Channel Condition Parameters

| | | |
|---|---|---|
| Drainage Area ($A_d$)= | 2.08 | *ac* |
| Drainage Area ($A_d$)= | 0.0084 | $km^2$ |
| Mean Flow Depth = | 0.683 | *ft* |
| ***Step 1 - Define the Existing Channel Conditions*** | | |
| Length of Proposed Reach = | 211.990 | *ft* |
| Channel Slope = | 0.066 | *ft/ft* |
| Bank Height = | 14.53 | *ft* |
| Bottom Width = | 2.20 | *ft* |
| Top Width = | 16.93 | *ft* |
| Bulk Density (Estimate) = | 70.00 | $lb./ft^3$ |
| ***Step 2 - Define the Equilibrium Channel Conditions*** | | |
| Is there a pipe outfall or other defining infrastructure present upstream of the restoration site? | Yes | |
| ***Upstream Limit*** | | |
| $L_{max}= 153A_d^{0.6}$ | | |
| Maximum Upstream Channel Length ($L_{max}$) = | Not Applicable | *ft* |
| ***Equilibrium Bed Slope*** | | |
| Choose Bed Condition = | Bed Condition 1 | |
| Bed Condition 1 = | Cohesive Bed | |
| Bed Condition 2 = | Sand and Fine Grave (0.1-5mm particle size) | |
| Bed Condition 3 = | Beds Coarser than Sand (>5mm particle size) | |
| ***Bed Condition 1: Cohesive Bed*** | | |
| $S_{eq} = 0.0028A^{-0.33}$ | | |
| Equilibrium Slope ($S_{eq}$)= | 0.0135 | *ft/ft* |
| ***Bed Condition 2: Sand and Fine Gravel*** | | |
| $S_{eq} = 0.06 / (y * 62.43)$ | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Bed Condition 3: Bed Coarser than Sand*** | | |
| Equilibrium Slope ($S_{eq}$)= | Not Applicable | *ft/ft* |
| ***Equilibrium Bank Slopes*** | | |
| Bank Slopes = | | - |
| ***Future Bottom Width (est)*** | | |
| Bottom Width = | 2.2 | ft |
| ***Step 3: Calculate the Total Prevented Sediment*** | | |
| ***Volume of Prevented Sediment = Existing Channel Condition - Equilibrium Channel Condition*** | | |
| Volume of Prevented Sediment ($S_v$)= | 1,323.00 | *Cu. Yd.* |
| Volume of Prevented Sediment ($S_v$)= | 35,721.00 | *Cu. ft.* |
| ***Step 4: Convert the Total Sediment Volume to Annual Prevented Sediment Load*** | | |
| *Adjust for Reduction in Efficiency and Timescale* | | |
| $S_p = 0.5 (S_v / 30)$ | | |
| Annual Volume of Prevented Sediment ($S_p$)= | 595.35 | *Cu. ft. / year* |
| ***Adjust for Soils Bulk Density*** | | |
| *Annual Prevented Sediment Load = Annual Volume of Prevented Sediment * Bulk Density* | | |
| Annual Prevented Sediment Load (Estimate) = | Not Applicable | lb./year |
| Annual Prevented Sediment Load (Field Verified) = | 36,054.40 | lb./year |
| **Step 5: Determine the Annual Prevented Nutrients** | | |
| ***Estimated Conversion Factors*** | | |
| 1.05 lb. of Phosphorus (P) = | 1 ton of sediment | |
| 2.28 lb. of Nitrogen (N) = | 1 ton of sediment | |
| Estimated Phosphorus (P) Removal Rate = | Not Applicable | *lbs./year* |
| Estimated Nitrogen (N) Removal Rate = | Not Applicable | *lbs./year* |
| ***Site Specific Adjusted Results*** | | |
| Bulk Density = | 60.56 | $lb./ft^3$ |
| 1 ton of sediment = | 0.60 | *lb. of (P)* |
| 1 ton of sediment = | 1.34 | *lb. of (N)* |
| Site Adjusted Total Suspended Solids (TSS) Removal Rate = | 36,054.40 | *lbs./year* |
| Site Adjusted Phosphorus (P) Removal Rate = | 10.89 | *lbs./year* |
| Site Adjusted Nitrogen (N) Removal Rate = | 24.16 | *lbs./year* |

## Pollutant of Concern (POC) Crediting Summary

| | | |
|---|---|---|
| Total Suspended Solids (TSS) Removal Rate = | 36,054.40 | *lbs./year* |
| Phosphorus (P) Removal Rate = | 10.89 | *lbs./year* |
| Nitrogen (N) Removal Rate = | 24.16 | *lbs./year* |




PROVIDENCE CREDITING PROFILE
VERT. SCALE: 1" = 5'
HORZ. SCALE: 1" = 50'

| No. | REVISIONS | DATE | BY |
|---|---|---|---|


Kimley»Horn
11400 COMMERCE PARK DR., SUITE 400, RESTON, VA 20191
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KHA PROJECT 110557041
DATE 10/02/2023
SCALE AS SHOWN
DESIGNED BY J.A.C
DRAWN BY M.N.P
CHECKED BY J.J.D

# POC CREDITING SUMMARY

## OUTFALL AND GULLY STABILIZATION PROJECT
## PROVIDENCE PARK
PREPARED FOR CITY OF FAIRFAX PUBLIC WORKS

SHEET NUMBER
07


This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

**Appendix S. Mathy Park Retrofit Calculations**

# Memo

To: City of Fairfax

Attn: Mr. Satoshi Eto

From: Brice Kutch, PE
Sean Mowery, PE

Date: March 31, 2023

Re: Mathy Park BMP Project – TMDL Pollutant Removal Calculations (GKY TO#21)

---

## Project Information

GKY was tasked with performing an analysis regarding TMDL credits for the Mathy Park BMP (sheet flow to open space) project located at 10251 Main Street in Fairfax, Virginia. The goal of this analysis was to identify the total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) reductions for three (3) sheet flow to open space drainage divides (Figure 1) as follows:

**Area 1:** Sheet flow area treated to the existing curb line along the museum building and parking parcels (red area).

**Area 2:** Sheet flow area treated from Ratcliffe Park (blue area).

**Area 3:** Sheet flow area treated through residential lots along Sager Avenue (yellow area).



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WATER RESOURCES & ENVIRONMENTAL SOLUTIONS

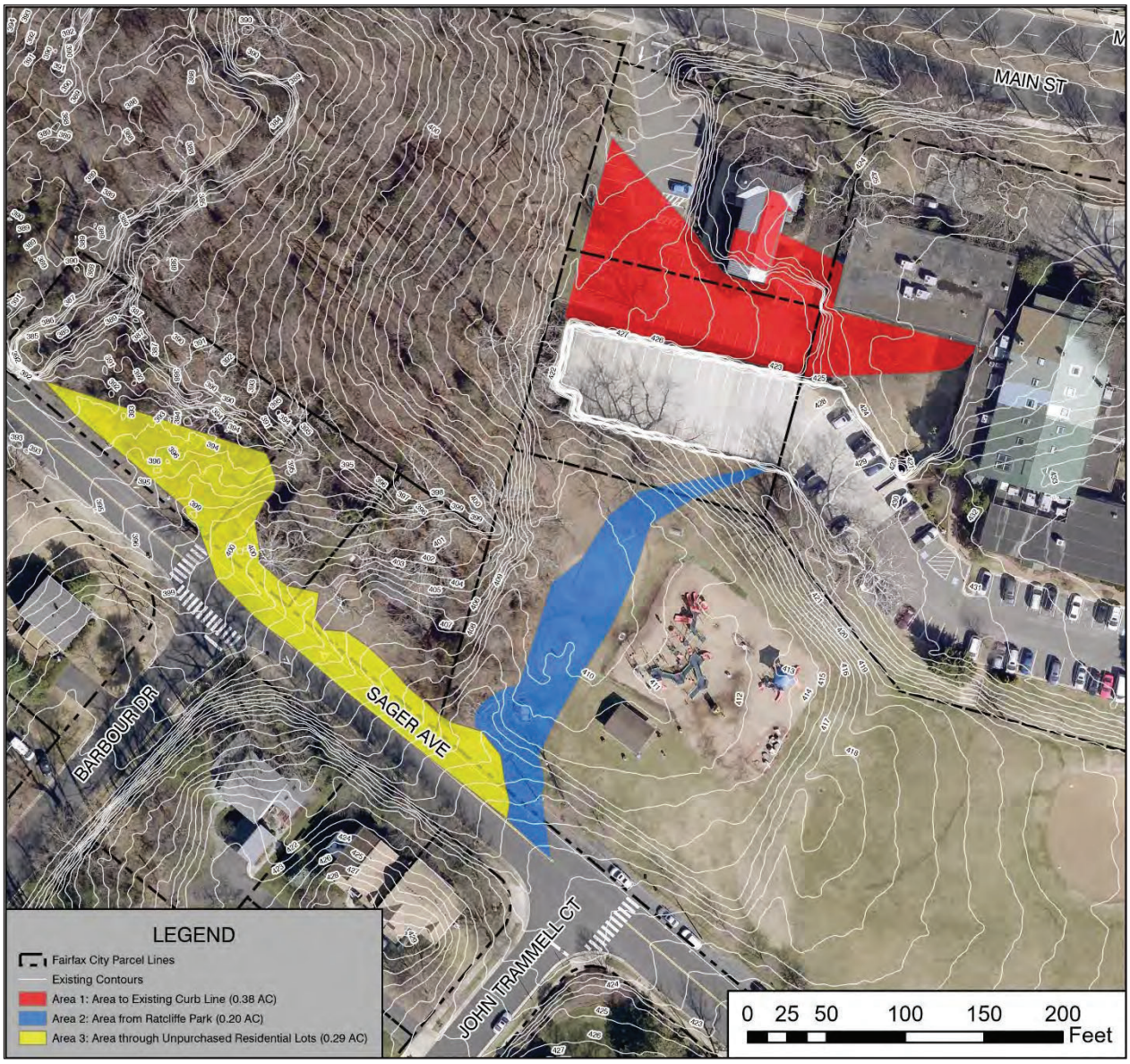



**Figure 1. Potential Sheet Flow to Open Space Drainage Areas**

GKY utilized the Chesapeake Bay TMDL Special Condition Guidance Memo No. GM20-2003 dated February 6, 2021 (DEQ Guidance) for the following analysis.

## Area 1. Sheet Flow to Open Space: Existing Curb Line Analysis

GKY evaluated the TMDL pollutant reduction credit for diverting flow from the museum building and parking parcels (57-4-02-138B and 57-4-02-138C, respectively) as sheet flow to the Mathy Park open space parcel (57-4-02-142). GKY first determined the total loads for all pollutants of concern (TN, TP, and TSS) within the drainage divide for this area and found that approximately *0.25 impervious acres* and *0.13 pervious acres* make up the 0.38-acre drainage divide for the sheet flow area to existing curb line. It was assumed that all areas of the drainage divide were within MS4 service areas. This drainage divide is shown in red on Figure 1.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the sheet flow area to existing curb line drainage divide. These results are presented in Table 1.

**Table 1. Total Pollutant Loads (TN, TP, and TSS) for the Sheet Flow Area to Existing Curb Line**

| Land Use | Drainage Area, ac | Loading Rate - TN, lbs/ac/yr | Total Load - TN, lbs/yr | Loading Rate - TP, lbs/ac/yr | Total Load - TP, lbs/yr | Loading Rate - TSS, lbs/ac/yr | Total Load - TSS, lbs/yr |
|---|---|---|---|---|---|---|---|
| Impervious | **0.25** | 16.86 | 4.22 | 1.62 | 0.41 | 1,171.32 | 292.83 |
| Pervious | **0.13** | 10.07 | 1.31 | 0.41 | 0.05 | 175.80 | 22.85 |
| | | Total Load - TN, lbs/yr | 5.52 | Total Load - TP, lbs/yr | 0.46 | Total Load - TSS, lbs/yr | 315.68 |

The baseline efficiency of all areas shown in Figure 1 is 0% for TN, TP, and TSS since the areas are currently not being treated by an existing BMP.

GKY then determined the efficiency of the proposed sheet flow to open space for all areas shown in Figure 1 using Table V.A.1 (Virginia Stormwater BMP Clearinghouse BMPs, Established Efficiencies Comparative Runoff Reduction and Nutrient Removal for Practices) in the DEQ Guidance. Using "Sheet Flow to Veg. Filter or Conserve Open Space" as the BMP and designed as flow to open space with C and D soils, the established efficiencies for TN and TP are shown in Table 2.

**Table 2. Sheet Flow to Open Space Pollutant Efficiencies for the Area Treated to the Existing Curb Line**

| BMP | TN | TP | TSS |
|---|---|---|---|
| Sheet Flow to Open Space (C/D Soils) | 50% | 50% | 75% |

TSS percent effectiveness was determined using the retrofit curves/equations found in Appendix V.B (Chesapeake Bay Program, Retrofit Curves/Equations) of the DEQ Guidance. The nutrient curves are divided into two categories: runoff reduction practices (RR) and stormwater treatment practices (ST). Sheet flow to open space was found to be an RR practice per Table V.B.1 (Chesapeake Bay Program, Established Efficiencies) in the DEQ Guidance; therefore, the RR curve shown in Figure 2 was used to determine the TSS efficiency for all sheet flow to open space areas as shown in Figure 1.

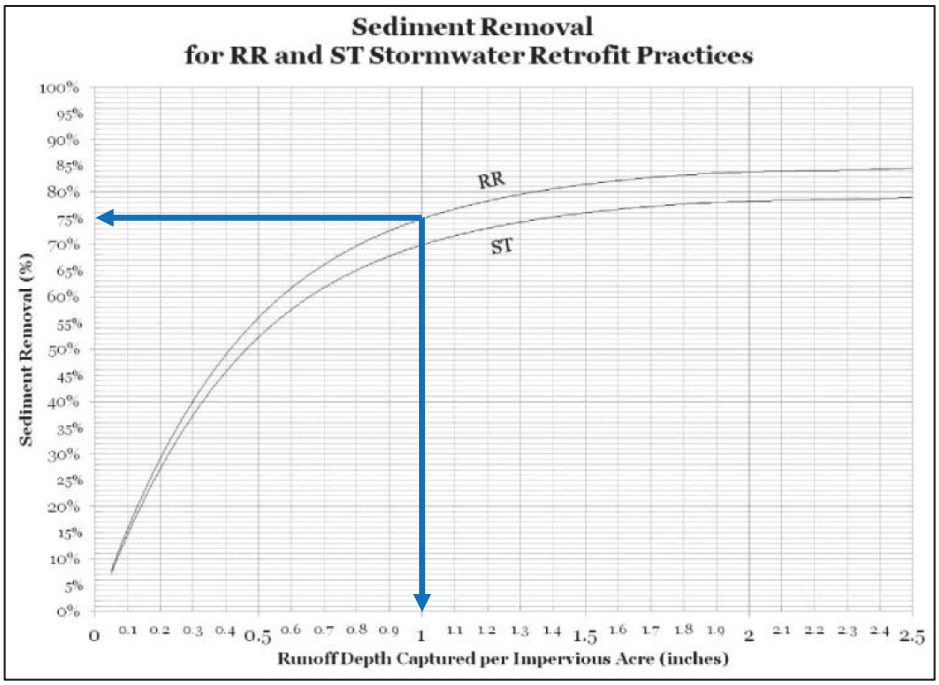



**Figure 2. Sediment Removal Percent Effectiveness Based on Runoff Depth Captured Per Impervious Acre**

For purposes of determining the sediment (TSS) removal efficiency, a runoff depth captured per impervious acre of 1" was used. Utilizing the RR curve shown in Figure 2, the sediment (TSS) removal efficiency for all sheet flow to open space areas entering Mathy Park (shown in Figure 1) was determined to be 75% as shown in Table 2.

See Table 3 for the resulting credits from converting the untreated area to the existing curb line to sheet flow to open space utilizing the efficiences shown in Table 2. The total credits gained for this conversion is *2.76 lbs/year* of TN, *0.23 lbs/year* of TP, and *236.76 lbs/year* of TSS as shown in Table 3.

**Table 3. Credits Gained: Converting Untreated Area to Sheet Flow to Open Space for the Area Treated to the Existing Curb Line**

| | Pollutants of Concern Credits Gained, lbs/year | | |
|---|---|---|---|
| | TN | TP | TSS |
| **Total Credits Gained for Sheet Flow to Open Space** | **2.76** | **0.23** | **236.76** |

## Area 2. Sheet Flow to Open Space: Ratcliffe Park Analysis

GKY evaluated the TMDL pollutant reduction credit for converting flow from the Ratcliffe Park parcel (57-4-02-138A) to sheet flow to the Mathy Park open space parcel (57-4-02-142). GKY first determined the total loads for all pollutants of concern (TN, TP, and TSS) within the drainage divide for this area and found that approximately *0.02 impervious acres* and *0.18 pervious acres* make up the 0.20-acre drainage divide for the sheet flow area from Ratcliffe Park. It was assumed that all areas of the drainage divide were within MS4 service areas. This drainage divide is shown in blue on Figure 1.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the sheet flow area from the Ratcliffe Park drainage divide. These results are presented in Table 4.

**Table 4. Total Pollutant Loads (TN, TP, and TSS) for the Sheet Flow Area from Ratcliffe Park**

| Land Use | Drainage Area, ac | Loading Rate - TN, lbs/ac/yr | Total Load - TN, lbs/yr | Loading Rate - TP, lbs/ac/yr | Total Load - TP, lbs/yr | Loading Rate - TSS, lbs/ac/yr | Total Load - TSS, lbs/yr |
|---|---|---|---|---|---|---|---|
| Impervious | **0.02** | 16.86 | 0.34 | 1.62 | 0.03 | 1,171.32 | 23.43 |
| Pervious | **0.18** | 10.07 | 1.81 | 0.41 | 0.07 | 175.80 | 31.64 |
| | | Total Load - TN, lbs/yr | 2.15 | Total Load - TP, lbs/yr | 0.11 | Total Load - TSS, lbs/yr | 55.07 |

See Table 5 for the resulting credits from converting the untreated area from Ratcliffe Park to sheet flow to open space utilizing the efficiences shown in Table 2. The total credits gained for this conversion is *1.07 lbs/year* of TN, *0.05 lbs/year* of TP, and *41.30 lbs/year* of TSS as shown in Table 5.

**Table 5. Credits Gained: Converting Untreated Area to Sheet Flow to Open Space for the Area Treated from Ratcliffe Park**

| | Pollutants of Concern Credits Gained, lbs/year | | |
|---|---|---|---|
| | TN | TP | TSS |
| **Total Credits Gained for Sheet Flow to Open Space** | **1.07** | **0.05** | **41.30** |

## Area 3. Sheet Flow to Open Space: Sager Avenue Analysis

GKY evaluated the TMDL pollutant reduction credit for converting flow from the Sager Avenue parcels (57-4-02-139, 57-4-02-140, and 57-4-02-141) to sheet flow to the Mathy Park open space parcel (57-4-02-142). GKY first determined the total loads for all pollutants of concern (TN, TP, and TSS) within the drainage divide for this area and found that approximately *0.10 impervious acres* and *0.19 pervious acres* make up the 0.29-acre drainage divide for the sheet flow area from the Sager Avenue parcels. It was assumed that all areas of the drainage divide were within MS4 service areas. This drainage divide is shown in yellow on Figure 1.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the sheet flow area from the Sager Avenue drainage divide. These results are presented in Table 6.

**Table 6. Total Pollutant Loads (TN, TP, and TSS) for the Sheet Flow Area from the Sager Avenue Parcels**

| Land Use | Drainage Area, ac | Loading Rate - TN, lbs/ac/yr | Total Load - TN, lbs/yr | Loading Rate - TP, lbs/ac/yr | Total Load - TP, lbs/yr | Loading Rate - TSS, lbs/ac/yr | Total Load - TSS, lbs/yr |
|---|---|---|---|---|---|---|---|
| Impervious | **0.10** | 16.86 | 1.69 | 1.62 | 0.16 | 1,171.32 | 117.13 |
| Pervious | **0.19** | 10.07 | 1.91 | 0.41 | 0.08 | 175.80 | 33.40 |
| | | Total Load - TN, lbs/yr | 3.60 | Total Load - TP, lbs/yr | 0.24 | Total Load - TSS, lbs/yr | 150.53 |

See Table 6 for the resulting credits from converting the untreated area from the Sager Avenue parcels to sheet flow to open space utilizing the efficiences shown in Table 2. The total credits gained for this conversion is *1.80 lbs/year* of TN, *0.12 lbs/year* of TP, and *112.90 lbs/year* of TSS as shown in Table 7.

**Table 7. Credits Gained: Converting Untreated Area to Sheet Flow to Open Space for the Area Treated from the Sager Avenue Parcels**

| | Pollutants of Concern Credits Gained, lbs/year | | |
|---|---|---|---|
| | **TN** | **TP** | **TSS** |
| **Total Credits Gained for Sheet Flow to Open Space** | **1.80** | **0.12** | **112.90** |

## Conclusion

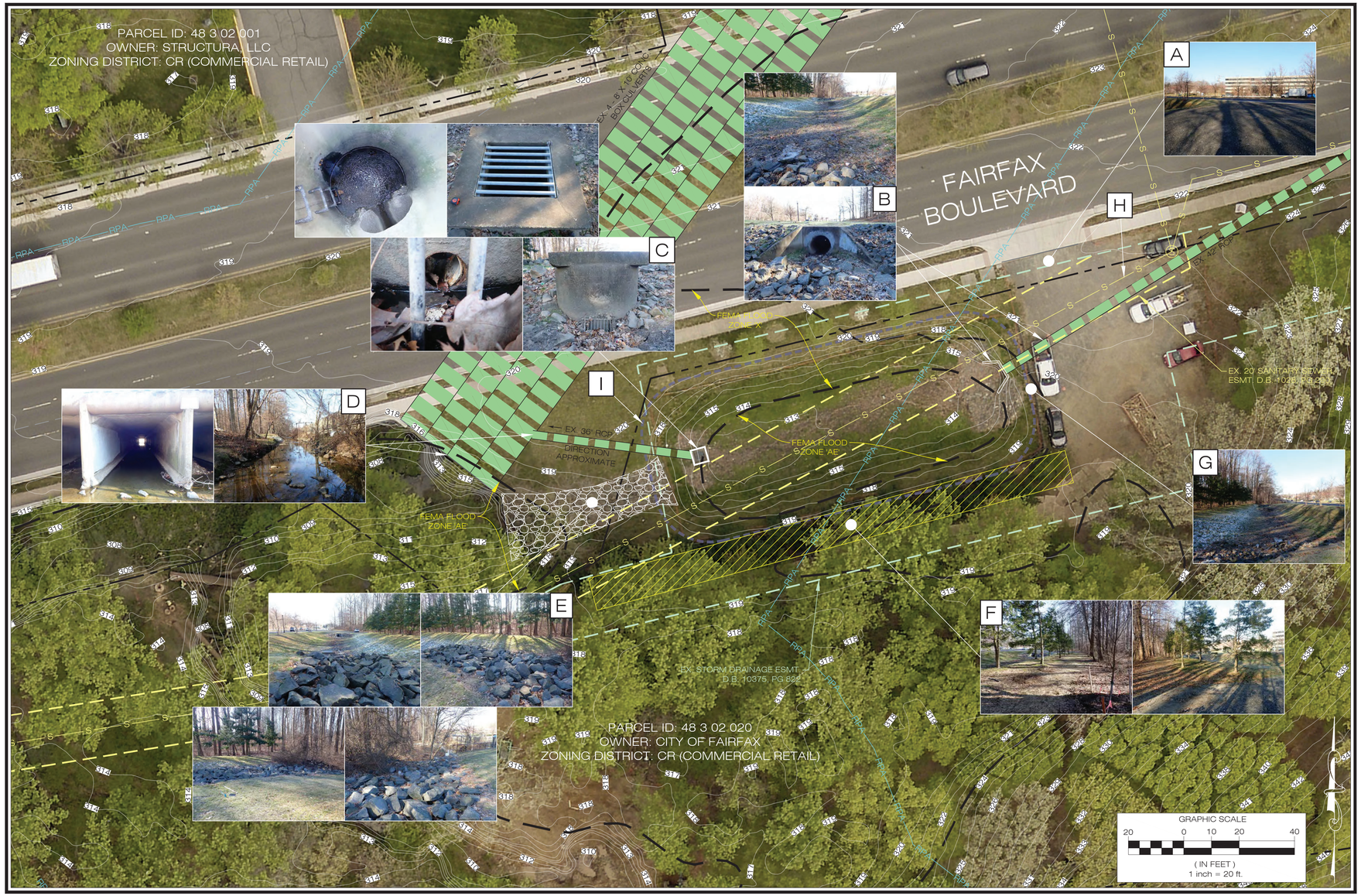
Table 8 identifies the total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) reductions for the three (3) sheet flow to open space drainage divides (Figure 1).

**Table 8. Credits Gained: Converting Untreated Area to Sheet Flow to Open Space for All Areas**

| Mathy Park Drainage Divides | Impervious Area (Acres) | Pervious Area (Acres) | TN Credits Gained (lbs/year) | TP Credits Gained (lbs/year) | TSS Credits Gained (lbs/year) |
|---|---|---|---|---|---|
| **Area 1** | 0.25 | 0.13 | 2.76 | 0.23 | 236.76 |
| **Area 2** | 0.02 | 0.18 | 1.07 | 0.05 | 41.3 |
| **Area 3** | 0.10 | 0.19 | 1.80 | 0.12 | 112.9 |
| | | **Total:** | **5.63** | **0.40** | **390.96** |

**Appendix T. Lions Run BMP Retrofit Concept Calculations**

# FAIRFAX HIGH SCHOOL POND RETROFIT CONCEPT PLAN




NOTE: ALL AERIAL IMAGERY, TOPOGRAPHIC, AND PIPE NETWORK DATA WAS RETRIEVED FROM THE FAIRFAX COUNTY AND CITY OF FAIRFAX GIS DATABASES. THE EASEMENT AND BOX CULVERT PIPE LINES WERE DIGITIZED FROM ATLA / ACSM LAND TITLE SURVEY OF THE PROPERTY OF MARGURITE O. PITTS, DATED DECEMBER 1987. SUPPLEMENTAL PHOTOGRAPHS WERE TAKEN BY GKY ENGINEERS DURING A SITE VISIT ON FEBRUARY 20TH, 2024.

ALL INFORMATION HEREIN, INCLUDING THE PLAN AND COST ESTIMATE, IS IN PRELIMINARY FORM AT A CONCEPTUAL LEVEL OF DESIGN, PRODUCED AS AN INTERIM PRODUCT. INFORMATION WILL CHANGE AS SUBSEQUENT LEVELS OF DESIGN ARE COMPLETED.

## PROJECT NARRATIVE

THE EXISTING FAIRFAX HIGH SCHOOL DRY POND FACILITY IS LOCATED AT 9985 FAIRFAX BOULEVARD, PARCEL ID 48 3 02 020, AND IS OWNED AND MAINTAINED BY THE CITY OF FAIRFAX. NO FACILITY DESIGN PLANS COULD BE LOCATED FOR THE POND. AN ATLA / ACSM LAND TITLE SURVEY OF THE PROPERTY OF MARGURITE O. PITTS, DATED DECEMBER 1987 SHOWS SOME PROPERTY, EASEMENT, AND UTILITY INFORMATION IN THE AREA OF THE EXISTING POND FACILITY. GKY PREVIOUSLY EVALUATED THIS POND AS A RETROFIT OPPORTUNITY TO PROVIDE EDUCATIONAL OUTREACH FOR THE COMMUNITY AND THE ADJACENT HIGH SCHOOL, AS WELL AS CLAIM SOME TMDL POLLUTANT REDUCTION CREDITS FOR THE CITY. THE EXISTING DELINEATED DRAINAGE AREA TO THE FACILITY IS 8.19 ACRES. THE OUTFALL OF THE FACILITY EXITS INTO EXISTING QUADRUPLE 8'X10' BOX CULVERTS CONVEYING ACCOTINK CREEK FROM SOUTHWEST TO NORTHEAST UNDERNEATH FAIRFAX BOULEVARD, AND ULTIMATELY EMPTIES INTO THE POTOMAC RIVER AT GUNSTON COVE.

THE OBJECTIVE FOR THIS PROJECT IS TO RETROFIT THE EXISTING DRY POND FACILITY TO A LEVEL 1 EXTENDED DETENTION POND. PROPOSED IMPROVEMENTS FOR THIS FACILITY INCLUDE A SEDIMENT FOREBAY AT THE INFLOW, TWO MICROPOOLS ON THE POND FLOOR, AQUATIC BENCHES AROUND THE FOREBAY AND MICROPOOLS, INCREASED STORAGE VOLUME TO MEET TREATMENT VOLUME DESIGN REQUIREMENTS, MEANDERING FLOW PATH, AND MODIFICATIONS TO THE EXISTING RISER STRUCTURE TO MEET ALLOWABLE FLOWS. APPROXIMATELY 0.54 ACRES ARE PROPOSED TO BE DISTURBED WITH THIS PROJECT.

THE REQUIRED TREATMENT VOLUME BASED ON VRRM CALCULATIONS (SEE SHEET 3) IS 15,758 CF. A MINIMUM OF 15% OF THE REQUIRED TREATMENT VOLUME SHALL BE CONTAINED BELOW THE PERMANENT POOLS OF THE FOREBAY AND MICROPOOLS. THE TOTAL PROPOSED STORAGE BELOW PERMANENT POOL WITH THIS PLAN IS 4,573 CF (29%) AS SHOWN IN THE WET STAGE-STORAGE TABLES ON SHEET 4. THE TOTAL TREATMENT VOLUME BELOW 314.91' (THE 2-YR ORIFICE INVERT ELEVATION OF THE MODIFIED CONTROL STRUCTURE) IS 15,766 CF, WHICH IS GREATER THAN THE REQUIRED TREATMENT VOLUME OF 15,758 CF.

GKY PERFORMED AN ANALYSIS REGARDING TMDL CREDITS TO CALCULATE POLLUTANT CREDITS GAINED FOR RETROFITTING THE EXISTING DRY POND FACILITY TO A LEVEL 1 EXTENDED DETENTION POND FACILITY. SEE SHEET 3 FOR THE TMDL CREDIT ANALYSIS SUMMARY.

THE FACILITY'S PROPOSED DRY DETENTION VOLUME CAPACITY IS PROPOSED TO INCREASE. EXISTING AND PROPOSED STAGE-STORAGE TABLES ARE SHOWN ON SHEET 4. EXISTING POND STAGE-STORAGE WAS DEVELOPED USING 2018 FAIRFAX COUNTY 1-FT CONTOUR GIS DATA. AN ANALYSIS OF PEAK OUTFLOWS AND ROUTED PEAK WATER SURFACE ELEVATIONS WAS PERFORMED FOR THE EXISTING POND AND THE PROPOSED LEVEL 1 EXTENDED DETENTION POND FACILITY WITH RESULTS SHOWN ON SHEET 4.

## LEGEND

| | |
|---|---|
| A | EXISTING MAINTENANCE ACCESS ROAD ENTRANCE VIA FAIRFAX BOULEVARD. |
| B | EXISTING 42" RCP INFLOW, WITH 60" H X 72" W HEADWALL, AND WINGWALLS. SEE EXISTING INFLOW HEADWALL AND WINGWALL DETAIL ON SHEET 5. |
| C | EXISTING 6' DIA. CONCRETE CONTROL STRUCTURE WITH 64" X 64" X 8" TOP SLAB, 3' X 3' GRATE DROP INLET, 3" LOW-FLOW ORIFICE, AND 36" PRINCIPAL SPILLWAY PIPE. SEE EXISTING CONTROL STRUCTURE DETAIL ON SHEET 5. |
| D | FACILITY OUTFALLS INTO EXISTING QUADRUPLE 8' X 10' BOX CULVERTS CONVEYING ACCOTINK CREEK. |
| E | EXISTING EMERGENCY SPILLWAY CHANNEL; APPROXIMATE 10' BOTTOM WIDTH, 16' TOP WIDTH, AND 3:1 SIDE SLOPES. SEE EXISTING EMERGENCY SPILLWAY DETAIL ON SHEET 5. |
| F | EXISTING AREA OF LANDSCAPING ADJACENT TO POND; 19 TREES AND 2 SHRUBS TO BE REMOVED FOR POND EXPANSION. |
| G | EXISTING DRY POND FACILITY, OVERALL, LOOKING SOUTHWEST. |
| H | EXISTING 14" SANITARY SEWER LINE FROM CITY GIS DATA. THE EXISTING SANITARY SEWER LINE RUNS UNDERNEATH THE EXISTING POND AT AN APPROXIMATE ELEVATION BETWEN 302' AND 305' AS SHOWN ON ATLA / ACSM LAND TITLE SURVEY OF THE PROPERTY OF MARGURITE O. PITTS, DATED DECEMBER 1987. |
| I | EXISTING POND FOOTPRINT. |

## VICINITY MAP

SCALE 1" = 400' SOURCE: NATIONAL GEOGRAPHIC ESRI

## SHEET INDEX


1 EXISTING CONDITIONS
2 PROPOSED CONDITIONS
3 SWM ANALYSIS (1 OF 2)
4 SWM ANALYSIS (2 OF 2)
5 SWM STRUCTURE DETAILS
(5 TOTAL SHEETS)



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FAIRFAX HIGH SCHOOL POND RETROFIT CONCEPT PLAN
CITY OF FAIRFAX, VA

EXISTING CONDITIONS

NOT FOR CONSTRUCTION

| DATE | DESCRIPTION |
|---|---|
| 4/3/2024 | 1ST SUB. |

| | |
|---|---|
| H SCALE: | 1" = 20' |
| H DATUM: | NAD83 |
| V SCALE: | N/A |
| V DATUM: | NGVD29 |
| DESIGNED: | SM |
| DRAFTED: | BW |
| CHECKED: | BK |
| PROJECT#: | 2023-002 |
| CONTRACT#: | TO#11 |
| SHEET: | 1 OF 5 |

| Project: Fairfax High School Pond Retrofit | | | | | |
|---|---|---|---|---|---|
| Estimate Type: Conceptual Plan Estimate | | | | | |
| Prepared by: GKY & Associates, Inc. | | | | | |
| Date: Arpil 3, 2024 | | | | | |
| # | ITEM | QUANTITY | UNIT | UNIT COST | COST |
| 1 | **DEMOLITION** | | | | |
| 2 | Removal of Existing Inflow Endwall and Wing Walls | 1 | EA | $5,000 / EA | $5,000 |
| 3 | Removal of Existing Portion of 42" RCP Inflow and Disposal Offsite | 40 | LF | $130 / LF | $5,200 |
| 4 | Relocation of Trees Along South Side of Pond | 19 | EA | $1,050 / EA | $19,950 |
| 5 | Relocation of Shrubs Along South Side of Pond | 2 | EA | $500 / EA | $1,000 |
| 6 | Removal of Existing Trees (6"-12" diameter) | 15 | EA | $1,000 / EA | $15,000 |
| 7 | Removal of Emergency Spillway Riprap and Store on Site | 80 | TN | $150 / TN | $12,000 |
| 8 | | | | **DEMOLITION SUB TOTAL:** | **$58,150** |
| 9 | **EROSION & SEDIMENT CONTROL** | | | | |
| 10 | Erosion and Sediment Controls | 1 | LS | $150,000 / LS | $150,000 |
| 11 | | | | **EROSION & SEDIMENT CONTROL SUB TOTAL:** | **$150,000** |
| 12 | **PROPOSED IMPROVEMENTS** | | | | |
| 13 | Riser Modifications (low-flow trash rack, BMP orifice plate, new orifice) | 1 | LS | $10,000 / LS | $10,000 |
| 14 | Excavation and Hauling Excess Soil Off-Site | 1,350 | CY | $77 / CY | $103,950 |
| 15 | Fine Grading of Pond | 1,750 | SY | $20 / SY | $35,000 |
| 16 | Aquatic Bench Plantings | 1 | LS | $20,000 / LS | $20,000 |
| 17 | Inflow Headwall and Wing Walls | 1 | EA | $15,000 / EA | $15,000 |
| 18 | Riprap for Inflow and Emergency Spillway | 120 | TN | $150 / TN | $18,000 |
| 19 | Gravel for Access Road | 350 | SY | $12 / SY | $4,200 |
| 20 | Widening the Emergency Spillway Channel | 50 | CY | $80 / CY | $4,000 |
| 21 | Landscaping and Miscellaneous Restoration | 1 | LS | $8,000 / LS | $8,000 |
| 22 | | | | **PROPOSED IMPROVEMENTS SUB TOTAL:** | **$218,150** |
| 23 | **MISCELLANEOUS** | | | | |
| 24 | Maintenance of Traffic | 1 | LS | $5,000 / LS | $5,000 |
| 25 | Survey, Design, & Permitting | 1 | LS | $100,000 / LS | $100,000 |
| 26 | | | | **MISCELLANEOUS SUB TOTAL:** | **$105,000** |
| 27 | | | | | |
| 28 | | | | **PROJECT SUB TOTAL:** | **$531,300** |
| 29 | | | | **MOBILIZATION (5% of PROJECT SUB TOTAL):** | **$26,565** |
| 30 | | | | **TOTAL:** | **$557,865** |
| 31 | | | | **CONTINGENCY (30% of PROJECT SUB TOTAL):** | **$167,360** |
| 32 | | | | **PROJECT TOTAL:** | **$725,225** |

ALL INFORMATION HEREIN, INCLUDING THE PLAN AND COST ESTIMATE, IS IN PRELIMINARY FORM AT A CONCEPTUAL LEVEL OF DESIGN, PRODUCED AS AN INTERIM PRODUCT. INFORMATION WILL CHANGE AS SUBSEQUENT LEVELS OF DESIGN ARE COMPLETED.

| LEVEL 1 EXTENDED DETENTION POND DESIGN GUIDANCE MATRIX | | |
|---|---|---|
| Level 1 Design Criteria Per VA Stormwater BMP Clearinghouse | Proposed Level 1 Extended Detention Pond Design Per This Planset | Criteria Met? |
| Required Treatment Volume ($T_V$) is equal to the calculated Treatment Volume. | Required Treatment Volume is 15,758 $ft^3$ per the VRRM spreadsheet calculations shown on this sheet. The Treatment Volume proposed with this design, below elevation 314.91' (crest of BMP pool at modified riser), is 15,766 $ft^3$. | ✓ |
| A minimum of 15% of the Treatment Volume ($T_V$) is required below permanent pool of forebay and micropool(s). | One (1) forebay is proposed with 1,621 $ft^3$ of storage below permanent pool (313'). Two (2) micropools are proposed; one (1) with 2,595 $ft^3$ of storage below permanent pool (313') and one (1) with 357 $ft^3$ of storage below permanent pool (313'). The combined storage below permanent pool for the forebay and micropools is 4,573 $ft^3$, which is 29.0% of the required treament volume of 15,758 $ft^3$. | ✓ |
| Length/width ratio or flow path = 2:1 or more. Length of shortest flow path/overall length = 0.4 or more. In the case of multiple inflows, the flow path is measured from the dominant inflows (that comprise 80% or more of the total pond inflow). | The flow path length of the proposed extended detention pond is approximately 227 ft and the width of the proposed extended detention pond is approximately 80 ft, which is a length/width ratio of approximately 2.8:1. There is one (1) piped inflow to the facility. The piped inflow comprises more than 80% of the total pond inflow. | ✓ |
| Average Treatment Volume ($T_V$) extended detention time is required to be 24 hours. | The extended detention drawdown time is proposed to be 24 hours. | ✓ |
| Vertical Treatment Volume ($T_V$) extended detention fluctuation cannot extend more than 5 ft above the pond floor. | The maximum head corresponding to the required water quality volume is proposed to be 1.91 ft. | ✓ |
| Turf cover is required on the floor of the pond. | Turf cover is proposed on the pond floor. | ✓ |
| At least one (1) forebay and one (1) micropool are required in the design of the extended detention pond. | One (1) forebay and two (2) micropools are proposed with this design. | ✓ |



GKY

# Memo

To: City of Fairfax

From: Brian Wilson, EIT
Sean Mowery, PE

Date: April 3, 2024

Re: Fairfax High School Pond Retrofit – TMDL Credit Analysis (GKY TO#11)

## Project Information

GKY was tasked with performing an analysis regarding TMDL credits for the retrofit project of the existing Fairfax High School dry pond facility located at 9985 Fairfax Boulevard, in Fairfax, Virginia. The goal of this analysis was to identify the total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) reductions for the following retrofit:

1. Converting the existing dry pond to a Level 1 extended detention pond.

GKY utilized the Chesapeake Bay TMDL Special Condition Guidance Memo No. GM20-2003 dated February 6, 2021 (DEQ Guidance).

## 1. Existing Fairfax High School Dry Pond to Level 1 Extended Detention Pond Analysis

GKY evaluated the conversion of the existing Fairfax High School dry pond to a Level 1 Extended Detention Pond. GKY first determined the total loads for all pollutants of concern (TN, TP, and TSS) within the existing dry pond's drainage shed. GKY delineated the drainage shed for this facility under TO#11 and found that approximately *4.02 impervious acres* and *4.17 pervious acres* make up the 8.19-acre drainage shed for the existing dry pond. It was assumed that all areas of the drainage shed for the dry pond were within MS4 service areas.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the existing dry pond drainage shed. These results are presented in Table 1.

**Table 1. Total Pollutant Loads (TN, TP, and TSS) for the Existing Dry Pond**

| Land Use | Drainage Area, ac | Loading Rate - TN, lbs/ac/yr | Total Load - TN, lbs/yr | Loading Rate - TP, lbs/ac/yr | Total Load - TP, lbs/yr | Loading Rate - TSS, lbs/ac/yr | Total Load - TSS, lbs/yr |
|---|---|---|---|---|---|---|---|
| Impervious | **4.02** | 16.86 | 67.78 | 1.62 | 6.51 | 1,171.32 | 4,708.71 |
| Pervious | **4.17** | 10.07 | 41.99 | 0.41 | 1.71 | 175.80 | 733.09 |
| | | Total Load - TN, lbs/yr | 109.77 | Total Load - TP, lbs/yr | 8.22 | Total Load - TSS, lbs/yr | 5,441.79 |

GKY then determined the baseline efficiency of the existing dry pond using Table V.C.1 (Chesapeake Bay Program BMPs, Established Efficiencies) in the DEQ Guidance. Using "Dry Detention Ponds and Hydrodynamic Structures" as the BMP, the established efficiencies are presented in Table 2.



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**Table 2. Existing Dry Pond Pollutant Efficiencies**

| BMP | TN | TP | TSS |
|---|---|---|---|
| Dry Pond | 5% | 10% | 10% |

GKY also looked for missing design criteria for the existing dry pond to determine if the BMP efficiency should be modified downward. Specifically, 10% downward reductions in efficiency were applied for two missing water quality features as presented in Table 3. These included a missing sediment forebay and no micro pool near the outlet. No reduction in efficiency was applied for an undersized practice based on the existing water quality storage volume of 0.49 acre-feet (based on Fairfax County 1-ft contours), which is more than 2*$WQ_V$, where $WQ_V$ = 0.5" x impervious area draining to the pond or 0.17 acre-feet. Based on an impervious area of 4.02 acres, 2*$WQ_V$ = 0.34 acre-feet. Furthermore, no additional reduction in efficiency was applied as the existing 3' low-flow orifice has a calculated drawdown of 12.1 hours.

**Table 3. Existing Dry Pond Efficiency Adjustment**

| Dry Extended Detention Pond Efficiency Adjustments (Place a Y beside each one applicable) | | |
|---|---|---|
| Existing Dry Pond Criteria | Applicable | Efficency Reduction |
| Absence of sediment forebay | Y | 10% |
| Absence of micropool or other form of riser outlet protection | Y | 10% |
| Short circuting due to initial inlet placement (design flow only) | N | 0% |
| Drainage Area <5 acres and drainage orifice > 3 inches or | N | 0% |
| Less than 12-hour draw down time | N | 0% |
| Undersized practice based on the existing water quality storage volume | N | 0% |
| | Total Adjustment | 20% |

GKY modified the BMP efficiencies downward by 20% to obtain the adjusted existing dry pond pollutant efficiencies, as presented in Table 4.

**Table 4. Adjusted Existing Dry Pond Pollutant Efficiencies**

| BMP | TN | TP | TSS |
|---|---|---|---|
| Dry Pond | 4% | 8% | 8% |

GKY then determined the total loads for all pollutants of concern (TN, TP, and TSS) within the proposed level 1 extended detention pond's drainage shed. GKY delineated the drainage shed for this facility under TO#11 and found that approximately *4.02 impervious acres* and *5.08 pervious acres* make up the 9.20-acre drainage shed for the proposed level 1 extended detention pond. It was assumed that all areas of the drainage shed for the extended detention pond were within MS4 service areas.

Using the DEQ Guidance, GKY determined the total load of TN, TP, and TSS for the proposed level 1 extended detention pond drainage shed. These results are presented in Table 5.

**Table 5. Total Pollutant Loads (TN, TP, and TSS) for the Proposed Level 1 Extended Detention Pond**

| Land Use | Drainage Area, ac | Loading Rate - TN, lbs/ac/yr | Total Load - TN, lbs/yr | Loading Rate - TP, lbs/ac/yr | Total Load - TP, lbs/yr | Loading Rate - TSS, lbs/ac/yr | Total Load - TSS, lbs/yr |
|---|---|---|---|---|---|---|---|
| Impervious | **4.02** | 16.86 | 67.78 | 1.62 | 6.51 | 1,171.32 | 4,708.71 |
| Pervious | **5.18** | 10.07 | 52.16 | 0.41 | 2.12 | 175.80 | 910.64 |
| | | Total Load - TN, lbs/yr | 119.94 | Total Load - TP, lbs/yr | 8.64 | Total Load - TSS, lbs/yr | 5,619.35 |





GKY then determined the efficiency of the proposed level 1 extended detention pond using Table V.A.1 (Virginia Stormwater BMP Clearinghouse BMPs, Established Efficiencies Comparative Runoff Reduction and Nutrient Removal for Practices) in the DEQ Guidance. Using "Ext. Det. Ponds" as the BMP and design level 1, the established efficiencies for TN and TP are shown in Table 5.

TSS percent effectiveness was determined using Table V.C.1 (Chesapeake Bay Program BMPs, Established Efficiencies) in the DEQ Guidance. Using "Dry Extended Detention Ponds" as the BMP, the established efficiency for TSS is shown in Table 6.

**Table 6. Level 1 Extended Detention Pond Pollutant Efficiencies: Runoff Depth Captured Per Impervious Acre = 1.0"**

| BMP | TN | TP | TSS |
|---|---|---|---|
| Level 1 Extended Detention Pond | 10% | 15% | 60% |

Pollutant load reductions from converting the existing Fairfax High School dry pond to a level 1 extended detention pond were determined by taking the difference between the exsiting dry pond pollutant load efficiencies and level 1 extended detention pond pollutant load efficiencies. See Table 7 for the resulting credits for the level 1 extended detention pond retrofit.

**Table 7. Credits Gained: Converting Existing Dry Pond to Level 1 Extended Detention Pond (Runoff Depth Captured Per Impervious Acre = 1.0")**

| | Pollutants of Concern Credits Gained, lbs/year | | |
|---|---|---|---|
| | TN | TP | TSS |
| **Proposed Level 1 Extended Detention Pond** | 11.99 | 1.30 | 3,371.61 |
| **Existing Dry Pond** | (4.39) | (0.66) | (435.34) |
| **MS4 Area Credits Gained for Retrofit** | **7.60** | **0.64** | **2,936.27** |

Therefore, the total credits gained for converting the existing Fairfax High School dry pond to a level 1 extended detention pond is *7.60 lbs/year* of TN, *0.64 lbs/year* of TP, and *2,936.27 lbs/year* of TSS as shown in Table 7.



## FAIRFAX HIGH SCHOOL POND RETROFIT VRRM CALCULATIONS FOR TREATMENT VOLUME

### Site Information

### Post-Development Project (Treatment Volume and Loads)

**Land Cover (acres)**

| | A Soils | B Soils | C Soils | D Soils | Totals | |
|---|---|---|---|---|---|---|
| **Forest/Open Space (acres)** -- undisturbed, protected forest/open space or reforested | | 2.69 | 0.15 | 0.06 | 2.89 | * |
| **Managed Turf (acres)** -- disturbed, graded for yards or other turf to be | | 0.23 | 1.30 | 0.76 | 2.29 | |
| **Impervious Cover (acres)** | | 0.51 | 1.49 | 2.02 | 4.02 | |
| | | | | | 9.20 | |

** Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method*

| Land Cover Summary | |
|---|---|
| Forest/Open Space Cover (acres) | 2.89 |
| Weighted Rv (forest) | 0.03 |
| % Forest | 31% |
| Managed Turf Cover (acres) | 2.29 |
| Weighted Rv (turf) | 0.23 |
| % Managed Turf | 25% |
| Impervious Cover (acres) | 4.02 |
| Rv (impervious) | 0.95 |
| % Impervious | 44% |
| Site Area (acres) | **9.20** |
| Site Rv | **0.48** |

**Constants**

| | |
|---|---|
| Annual Rainfall (inches) | 43 |
| Target Rainfall Event (inches) | 1.00 |
| Total Phosphorus (TP) EMC (mg/L) | 0.26 |
| Total Nitrogen (TN) EMC (mg/L) | 1.86 |
| Target TP Load (lb/acre/yr) | 0.41 |
| Pj (unitless correction factor) | 0.90 |

**Runoff Coefficients (Rv)**

| | A Soils | B Soils | C Soils | D Soils |
|---|---|---|---|---|
| Forest/Open Space | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |

### Drainage Area A

**Drainage Area A Land Cover (acres)**

| | A Soils | B Soils | C Soils | D Soils | Totals | Land Cover Rv |
|---|---|---|---|---|---|---|
| Forest/Open Space (acres) | | 2.69 | 0.15 | 0.06 | 2.89 | 0.03 |
| Managed Turf (acres) | | 0.23 | 1.30 | 0.76 | 2.29 | 0.23 |
| Impervious Cover (acres) | | 0.51 | 1.49 | 2.02 | 4.02 | 0.95 |
| | | | | Total | 9.20 | |

**Post Development Treatment Volume in D.A. A ($ft^3$)** 15,758

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FAIRFAX HIGH SCHOOL
POND RETROFIT
CONCEPT PLAN
CITY OF FAIRFAX, VA

SWM ANALYSIS (1 OF 2)

NOT FOR CONSTRUCTION

| DATE | DESCRIPTION |
|---|---|
| 4/3/2024 | 1ST SUB. |

H SCALE: N/A
H DATUM: NAD83
V SCALE: N/A
V DATUM: NGVD29

DESIGNED: SM
DRAFTED: BW
CHECKED: BK

PROJECT#: 2023-002
CONTRACT#: TO#11

SHEET: 3 OF 5

**Appendix U. Storm Drain Cleaning Assessment and Procedures**

**City of Fairfax Department of Public Works**

**Stormwater Management**

# STORM DRAIN CLEANING ASSESSMENT AND PROCEDURES

**Draft - Version 1 - August 4, 2021**

Prepared for:

City of Fairfax, Virginia

Public Works - Stormwater

10455 Armstrong Street

Room 200

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Updated by:

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## Acronyms

| | |
|---|---|
| **BMP** | Best Management Practice |
| **CBP** | U.S. EPA Chesapeake Bay Program |
| **DEQ** | Virginia Department of Environmental Quality |
| **EPA** | U.S. Environmental Protection Agency |
| **GM** | DEQ Guidance Memo |
| **MS4** | Municipal Separate Storm Sewer System |
| **N** | Total Nitrogen |
| **P** | Total Phosphorus |
| **POC** | Pollutants of Concern – Nitrogen, Phosphorus and Sediment |
| **SDC** | Storm Drain Cleaning |
| **SOP** | Standard Operating Procedure |
| **TMDL** | Total Maximum Daily Load |
| **TSS** | Total Suspended Solids |

## 1.0 Background and Purpose

With the February 6, 2021 publication of Guidance Memo No. 20-2003 (GM #20-2003),[1] the Virginia Department of Environmental Quality (DEQ) adopted the United States Environmental Protection Agency (EPA) Chesapeake Bay Program's (CBP) "Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning (SDC) Practices, Final Report, May 19, 2016, (CBP Final Report) as the sole acceptable methodology to quantify associated Chesapeake Bay Total Maximum Daily Load (TMDL) Pollutants of Concern (POC) reduction credits in Virginia after June 30, 2022. GM #20-2003 defines the requirements and expectations SDC programs must implement for associated POC reductions to be credited towards meeting VPDES General Permit for the Discharge of Stormwater from Small MS4s Chesapeake Bay TMDL requirements.

The purpose of this document is to determine the applicability for the City to utilize SDC as a means to meet POC reduction requirements, assess potential POC load reductions, and provide a draft SDC Credit Tracking and Documentation Standard Operating Procedure (SOP) (Attachment 1) for consideration.

## 2.0 SDC POC Reduction Credit Applicability

The use of credits associated with SDC is an annual non-traditional BMP available to the City for meeting its Chesapeake Bay TMDL POC load reductions. The acceptable SDC BMP described in the CBP Final Report can be characterized as a systematic, well-defined, documented, and verifiable program rather than just quantification of the POC removed from stormwater infrastructure associated with response-oriented maintenance programs. To be applied towards meeting Chesapeake Bay TMDL POC reduction requirements, credits from SDC must meet the following requirements and expectations:

1. **The SDC program should target catch basins that trap the greatest organic matter loads, streets with the greatest overhead tree capacity, and/or outfalls with high sediment or debris loads.**

   The City targets stormwater infrastructure that is located within the MS4 service area and which the City conducts storm sewer maintenance as a result of historical knowledge or citizen complaints regarding drainage, flooding, or water quality issues caused by sediment, debris, or leaf litter.

2. **POC loads collected as part of the SDC must be tracked and verified using a field protocol to measure the mass or volume of solids collected within the storm drainage system.**

   The Tracking and Documenting SDC Activities and Quantifying Associated POC Reduction Credits SOP provides the direction for tracking and documenting POC load removal by volume for stormwater infrastructure cleaned for sediment removal and direction for tracking and documenting POC removal by weight for stormwater infrastructure cleaned as part of organic material removal activities.

   Volume has been selected as the means of estimating sediment removal loads as a means of program efficiency. Given City maintenance crews' daily workloads, it is not feasible or effective to keep sediment collected as part of the SDC program from sediment collected as part of other non-qualifying stormwater maintenance activities for the purposes of weighing.

3. **An SOP must be developed and implemented to keep track of the mass of sediments and/or organic matter that is removed.**

   The Tracking and Documenting SDC Activities and Quantifying Associated POC Reduction Credits SOP has been developed for implementation in conjunction with the City SOP for Storm Sewer System Cleaning and

[1] Official copies of DEQ GM #20-2003 - Chesapeake Bay TMDL Special Condition Guidance are available from the Virginia Regulatory Town Hall (https://townhall.virginia.gov/L/GDocs.cfm)

Maintenance to assure collection and disposal requirements are met and that tracking, documentation, and verification of records are properly recorded.

4. **Credits can only be generated from the cleaning of certain types of stormwater infrastructure.**

   POC load reductions associated with City SDC cleaning of the following types of stormwater infrastructure can be utilized to generate credits:

   a. Sediment and/or organic matter removed from catch basins, culverts, pipes, and concrete-lined channels by hand or use of equipment.
   b. Organic matter collected at the ends of stormwater outfalls within the stormwater system using nets or traps.

   The collection and removal of materials from road segments with open channel ditches during ditch maintenance are not applicable for SDC crediting and must not be included in the annual calculations. Similarly, materials collected and removed from stormwater facilities as part of routine maintenance are not applicable for credit as part of the SDC as the pollutant reductions are included as part of the stormwater facilities' pollutant removal efficiencies.

5. **POC loads must be characterized as either sediment or organic matter.**

   For City implementation of a SDC program and calculation of associated POC removal credits:

   a. Sediment is defined as material consisting primarily of solids that are collected and removed directly from catch basins, culverts, pipes, and concrete-lined channels.
   b. Organic matter is defined as material consisting primarily of organic materials (leaf litter, grass clippings collected and removed directly from catch basins, culverts, pipes, and concrete-lined channels or collected at the ends of stormwater outfalls within the stormwater system using nets or traps.

6. **POC loads removed from stormwater infrastructure must be disposed of in a manner that prevents their migration back into the Chesapeake Bay watershed.**

   The City SOP for Storm Sewer System Cleaning and Maintenance requires:

   a. Liquid collected during cleaning activities be disposed of at the dewatering facility at the City's fleet maintenance facility so that it is not discharged back into the storm sewer system or water bodies.
   b. Solids collected during cleaning activities are properly disposed of in such a manner as to prevent re-entry into the environment.

7. **The aggregate load captured over the course of a year must be reported in terms of pounds of sediment and nutrients.**

   The use of the City of Fairfax SDC POC Credit Tracking Log (Attachment 2), developed in conjunction with the Tracking and Documenting SDC Activities and Quantifying Associated POC Reduction Credits, automatically tracks and documents applicable SDC activities and allows for annual summation of credits for reporting to DEQ as part of the MS4 Annual Report and DEQ BMP Warehouse spreadsheet.

# 3.0 Relative Merits Associated with the Use of SDC to meet Chesapeake Bay TMDL POC Reductions

## 3.1 Advantages

The utilization of SDC as a means to address required Chesapeake Bay TMDL POC reductions is advantageous to the City in the following respects:

1. **SDC adds another tool to the City's compliance toolbox.**

   SDC provides the City a compliance tool that is different than traditional "in-the-ground" BMPs; thus, potentially relieving strain on existing capital improvement resources.

2. **The City can obtain credits for services already provided.**

   The City already provides storm sewer system maintenance as a general service. This maintenance is a valuable community service concerning drainage and flooding prevention. Implementation of a standardized SOP associated with this maintenance provides the ability to gain additional credit for its efforts.

3. **SDC can be implemented using existing City and/or contracted resources.**

   SDC is creditable based on its implementation process. As such, SDC can be implemented simply through modification of existing maintenance activities and integration of a comprehensive tracking and documentation process using the same City resources.

4. **SDC credits are quantifiable.**

   GM # 20-2003 and the CBP Expert Panel Report provide direction on how to quantify and report SDC credits. As such, they are a recognized BMP for meeting the Chesapeake Bay TMDL reduction requirements.

## 3.2 Disadvantages

Although there are advantages associated with the utilization of SDC to meet Chesapeake Bay TMDL POC reduction requirements, there are also disadvantages. These disadvantages include the following:

1. **SDC credits have a one-year life span.**

   Unlike traditional "in-the-ground" BMPs such as constructed wetlands, infiltration trenches, or wet ponds, SDC credits must be calculated and reported annually based upon the efforts completed during the reporting period.

2. **SDC credits are based on the quantity of material collected, not the level of effort employed.**

   SDC credits are based upon the quantity of material collected during each annual reporting period and not upon percent effectiveness associated with the level of effort employed. As such, the number of SDC credits available to the City will likely vary from year to year and cannot be accurately anticipated for future planning.

3. **Field crew efficiency may decrease.**

   Implementation of a creditable SDC is dependent upon significant tracking and documentation of the quantity of POC removed from qualifying stormwater infrastructure. The additional documentation effort may extend the amount of time required to complete individual cleaning events. Additionally, additional time and effort may be required to ensure that POC loads removed from non-qualifying stormwater infrastructure, such as sediment removal from grass-lined channels, are not inadvertently included in SDC verification efforts. This may require schedule modification and additional trips to dispose of SDC POC loads.

4. **Regulatory requirements and expectations associated with SDC credit calculations are unclear and incomplete.**

GM #20-2003 provides a mechanism to quantify nutrients through the use of both conversion and enrichment factors. However, the guidance does not provide a mechanism for quantifying sediments credits for application against Chesapeake Bay TMDL sediment reduction requirements. The CBP Expert Panel Report refers to large-, medium- and fine-grained particle sizes that are different than the TSS particle size of less than 250 microns generally associated with the Chesapeake Bay TMDL (Figure 1).

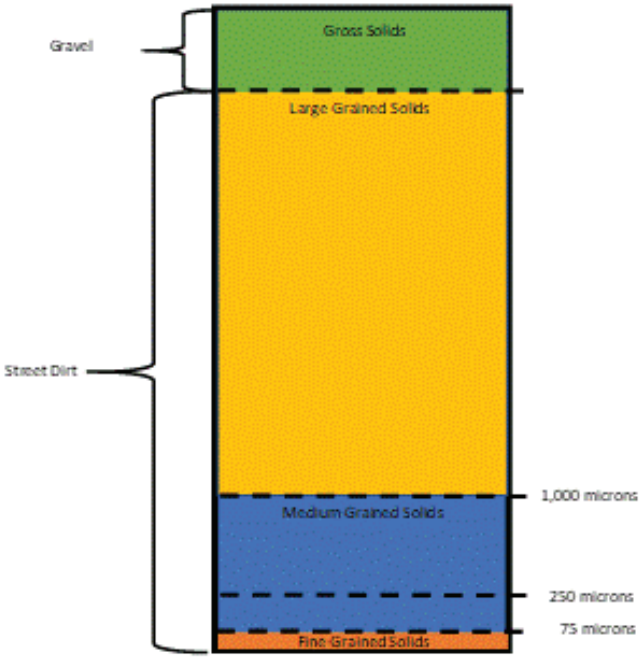


**Figure 1: Differences Between CBO Expert Panel Particle Sizes and Corresponding Chesapeake Bay Sediment Particle Size of Concern (250 microns).**

As it stands, GM #20-2003 requires the City to report the aggregate load captured over the course of a year expressed in pounds of sediment and that the loads be tracked and verified using field protocol to measure the mass or volume of solids collected within the storm drain while demonstrating the implementation of an SOP to keep track of the mass of the sediments and/or organic matter that is removed.

It is recommended that the City routinely, preferably quarterly, sample both the solids collected as part of the SDC program and the liquid decant collected as part of SDC implementation using a vacuum truck. Samples should be analyzed to determine the percentage of organic matter and sediment particle size.

5. **Verification of actual POC load reductions may be difficult.**

To be of legitimate value to the City, SDC must be implemented in a manner that is both effective and efficient. It is not logistically possible to weigh the POC removal from individual SDC activities. Additionally, materials collected as part of SDC include other non-related Chesapeake Bay TMDL-related materials, such as trash and gravel, and, based upon the equipment used, may be comprised of different size particles. For example, the composition of wet materials collected by hand may differ from that collected by vacuum trucks as fine-grain materials may be removed from the composite and disposed of as part of the vacuum truck decant.

It is for these reasons that the City SOP is based on the City of Baltimore Public Work's default values provided in the CBP Expert Panel Report. The Expert Panel Report found that the accumulation rate, particle size distribution, and that POC content follow a relatively consistent uniform pattern across the nation and that these relationships provide a strong empirical basis for modeling how solids are transported from the street to the storm drain.

## 4.0 Use of the City of Fairfax SOP for Tracking and Documenting SDC Activities and Quantifying Associated POC Credits

GM #20-2003 states that the POC loads must be tracked and verified using a field protocol to measure the mass or volume of solids collected within the storm drain system and that the City must have instituted an SOP to track the mass of the sediments and organic matter that is removed. The City of Fairfax SOP for Tracking and Documenting SDC Activities and Quantifying Associated POC Credits is designed to be used in conjunction with the City SOP for Storm Sewer System Cleaning and Maintenance (Attachment 1) and the City of Fairfax SDC POC Credit Tracking Log (Attachment 2) to meet these requirements. SDC implemented as directed by the SOP ensure the following:

1. City priorities are targeted towards catch basins that trap the greatest organic matter loads, streets with the greatest overhead tree canopy, and/or outfalls with high sediment or debris loads.
2. Only applicable stormwater infrastructure cleaning is credited.
3. Loads collected as part of SDC implementation are tracked and verified using a field measure:
    a. For sediment matter material loads, the SOP calls for tracking and verification by volume.
    b. For organic matter loads, the SOP calls for tracking and verification by weight.
4. The mass of sediment and organic matter is tracked by the use of an SOP that relies upon default values. The default values incorporated into the City of Fairfax SDC POC Credit Tracking Log (Attachment 2) calculations are:
    a. The bulk density of sediment-laden wet materials is 331 lbs./cubic yard.
    b. Wet materials are comprised of 8.9% trash.
    c. Sediment matter and organic matter comprise 301.54 lbs. per cubic yard of sediment-laden wet materials. This corresponds to credits totaling the following:
        i. 3.78 lbs. N/ton of collected wet material, not including trash.
        ii. 0.84 lbs. P/ton of collected wet material, not including trash.
        iii. 420 lbs. TSS/ton of collected wet material, not including trash.
    d. Nutrient credits associated with organic material collection incorporated as part of SDC are as follows:
        i. 4.44 lbs. N/ton of collected wet material.
        ii. 0.48 lbs. P/ton of collected wet material.
        iii. TSS is not credited as part of organic material collection.
5. The material collected and measured for credit is disposed of so that it cannot migrate back into the Chesapeake Bay watershed.
6. The use of the City of Fairfax SDC POC Credit Tracking Log requires verification of the date, location, and estimated volume of material collected for individual SDC activities as well as an acknowledgment that the appropriate SOPs have been adhered to.

# Attachment 1. Pollution Prevention/Good Housekeeping Standard Operating Procedure for Tracking and Documenting Storm Drain Cleaning (SDC) Activities and Quantifying Associated POC Credits

# CITY OF FAIRFAX

# POLLUTION PREVENTION/GOOD HOUSEKEEPING

# STANDARD OPERATING PROCEDURE (SOP) FOR

# TRACKING AND DOCUMENTING STORM DRAIN CLEANING (SDC) ACTIVITIES

# AND QUANTIFYING ASSOCIATED POC CREDITS

## OBJECTIVE

POC reductions associated with specific City SDC activities can be used as a compliance method for meeting its MS4 Chesapeake Bay TMDL requirements. This SOP is intended to be used in conjunction with the City's Storm Sewer System Cleaning and Maintenance SOP to identify the applicable SDC activities and quantify, document, and verify the associated load reductions.

## RESPONSIBILITIES

City employees conducting SDC activities are responsible for executing the activities in this operating procedure.

## PROCEDURE

### SDC Activities Applicable for Chesapeake Bay TMDL POC Reduction Compliance Credits

POC reductions from SDC activities are applicable for use in calculating Chesapeake Bay TMDL credits provided:

- SDC occurs within the City's MS4 service area without a formal agreement with adjoining MS4 operator allowing for the City to take credit for the POC removal.
- SDC occurs in an area prioritized by the City as having either a high sediment/debris load or a significant tree canopy. For the implementation of this SOP, prioritized areas are hereby identified as any area located within the MS4 service area in which the City conducts storm sewer maintenance as a result of historical knowledge or citizen complaints regarding drainage, flooding, or water quality issues caused by sediment, debris, or leaf litter.
- The SDC primarily collects either solid materials or organic materials.
  - For the purposes of SDC to collect solid materials, cleaning of the following stormwater infrastructure is applicable for quantification under this SOP:
    - » Catch basins and associated sumps.
    - » Pipes and culverts.
    - » Concrete-lined conveyance channels.
    - » Outfall aprons.
  - For the purposes of SDC to collect organic materials, the following are applicable for quantification under this SOP:
    - » Netting or traps utilized to trap organic materials within stormwater infrastructure system or at the MS4 outfall.
    - » Hand or equipment removal of accumulated leaf litter from catch basins, pipes and culverts, and concrete drainage conveyances provided the materials are disposed of in such a manner as to prevent entry back into the watershed (e.g., recycled into compost).
- POC reductions associated with the following are **not** eligible for credit consideration under this SOP:

- Cleaning activities that occur outside of the City's MS4 service area without a formal agreement allowing for the City to take credit for the POC removal.
- Cleaning of street gutters by hand or street sweepers.
- Cleaning of, including sediment removal, grass-lined channels, and swales.
- Routine or required maintenance activities of stormwater management facilities in which the City has identified as part of its Chesapeake Bay TMDL compliance initiative.

Materials collected as part of SDC are disposed of in accordance with the Storm Sewer System Cleaning and Maintenance SOP to prevent mitigation back into the Chesapeake Bay watershed.

**Tracking and Documenting SDC Field Efforts for Credit Generation**

Accurate and complete documentation is imperative to generate and verify POC load reduction credits. The following data must be collected and maintained for each individual SDC activity:

- The cleaning date
- The type of stormwater infrastructure cleaned
- The primary POC type collected:
  - Solid materials
  - Organic materials
- When cleaning solid materials from storm drains where the estimated volume of the material is removed.[2]

**Note: Volume is dependent upon the geometry of the infrastructure being cleaned and the estimate should be based on the overall length, width, and depth of the debris field. Large debris, such as tree branches and trash, should not be included in the estimated volume.** **The estimated volumes must be as accurate as possible as they will be the basis for Chesapeake Bay TMDL credit calculations.**

- When cleaning storm drains where the primary reasoning is for the collection of organic materials, the weight of the material collected.[3]

**Note: TSS credits are not calculated for crediting as a result of collecting organic materials as part of this SOP.**

- Certification that the Storm Sewer System Cleaning and Maintenance and SOP for Tracking and Documenting SDC Activities and Quantifying Associated POC Credits SOPs were followed.

**Tracking and Documenting SDC Material Disposal**

All materials collected under this SOP must be disposed of per the Storm Sewer System Cleaning and Maintenance SOP. The following data must be recorded, documented, and tracked for report verification:

- The total tonnage of solid debris disposed.
- Do not include large debris or tree branches when weighing the tonnage disposed.

[2] The volume is estimated as a matter of efficiency. There is not an efficient way to weigh solid materials in the field.

[3] Organic materials collected using netting or traps or collected by hand or equipment from applicable stormwater infrastructure should not be mixed with other materials but should be weighed independently prior to disposal.

- Debris for collection and disposal as part of the City's credited SDC protocol should be weighed independent of debris collected from non-qualifying City activities.
- Organic matter collected through the use of netting or traps should be weighed independent of all other forms of debris.
- Landfill and transfer station tipping receipts must be retained for verification with the distinction made between sediment-based and organic material-based collections. Receipts documenting disposal of organic material must remain separate from solid-based disposal receipts and should be identified as organic materials.

If a vacuum truck is utilized in the cleaning process, an estimated volume of the liquid vacuum truck decant disposed of via sanitary sewer should be recorded.

**Calculating Chesapeake Bay TMDL POC Reduction Annual Credits**

The collected field data from qualifying SDC activities must be entered into the City of Fairfax SDC POC Credit Tracking Log. The City of Fairfax SDC POC Credit Tracking Log will automatically calculate individual N, P, and TSS load reduction credits for individual activities. The total annual Chesapeake Bay TMDL POC reduction credits are aggregate for all activities completed between the first day of the MS4 permit reporting period and the last day of the annual MS4 permit reporting period (currently July 1 – June 30). Annual summations of the City's efforts and Chesapeake Bay TMDL POC load reduction credits should be reported to DEQ.

**Verifying SDC Annual Credits**

To verify the annual local reduction credits, field data for individual cleaning activities must be collected and entered into the City of Fairfax SDC POC Credit Tracking Log. Credits shall be generated using only the City of Fairfax SDC POC Credit Tracking Log entries in which all required data is entered (date, location, structure type, estimated volume collected). Associated work orders, landfill, and transfer station tipping fees must be maintained and made available during regulatory agency auditing.

**Reporting of SDC Annual Credits**

The credits and associated calculations should be included in the MS4 Annual Report:

- Wet load collected, lbs. during SDC
  - Solid material
  - Organic material
- Dry load calculated, lbs.
  - Solid material
  - Organic material
- TSS credits calculated, lbs.
- Total nitrogen credits calculated, lbs.
- Total phosphorus credits calculated, lbs.

Additionally, the City should report the TSS, TN, and TP credits to DEQ using the most recent Urban-Suburban BMP Template provided by DEQ.

## Attachment 2. City of Fairfax SDC POC Credit Tracking Log (Electronic)

# City of Fairfax SDC Pollutant Credit Tracking Log
# Solid Material

| Date Cleaned | Structure Identification (STRUCTUREI or Parcel Address/Structure Type) | | | SOP for Disposal Followed (Yes/No) | SOP for Tracking Followed (Yes/No) | Estimated Volume of Wet Material Collected, cf | Calculated Wet Sediment, lbs. | Calculated Sediment Credit, lbs. | Calculated Dry Sediment, lbs. | Calculated Nitrogen Credits, Lbs. | Calculated Phosphorus Credits, lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | StructureI | Parcel Address | Structure Type | | | | | | | | |
| | | | | | | | 0.00 | 0.00 | 0.00 | 0.0000 | 0.0000 

**Appendix V. Chesapeake Bay POC Reduction and Crediting Associated with Leaf Litter Collection and Disposal Discussion**

**City of Fairfax Department of Public Works**

**Stormwater Management**

# CHESAPEAKE BAY POC REDUCTION AND CREDITING ASSOCIATED WITH LEAF LITTER COLLECTION AND DISPOSAL DISCUSSION

**Version 1 – Effective Date August 31, 2021 (DRAFT)**

Prepared for:

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## Acronyms

| | |
|---|---|
| **C** | Carbon |
| **CBP** | U.S. EPA Chesapeake Bay Program |
| **DEQ** | Virginia Department of Environmental Quality |
| **GM** | Guidance Memo |
| **Mg/L** | Milligrams/Liter |
| **MS4** | Municipal Separate Storm Sewer System |
| **N** | Nitrogen |
| **P** | Phosphorus |
| **POC** | Pollutants of Concern (Nitrogen, Phosphorus, Total Suspended Sediment) |
| **TN** | Total Nitrogen |
| **TP** | Total Phosphorus |
| **SOP** | Standard Operating Procedure |
| **TMDL** | Total Maximum Daily Load |
| **TSS** | Total Suspended Solids |
| **VPDES** | Virginia Pollutant Discharge Elimination System |

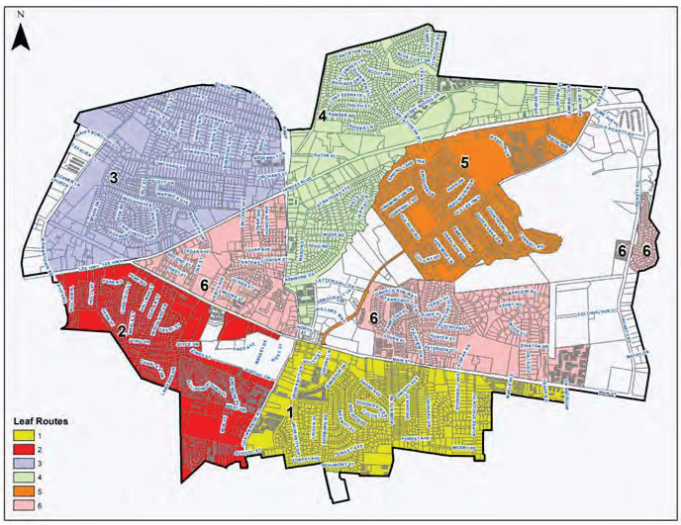
## 1.0 Background and Purpose

Discharges from the City of Fairfax's Municipal Separate Storm Sewer System (MS4) are authorized under the Virginia Pollutant Discharge Elimination System (VPDES) General Permit for Discharges of Stormwater from Small MS4s (MS4 General Permit). The MS4 General Permit includes conditions specific to MS4 discharges as well as standardized conditions applicable to all VPDES permits The MS4 General Permit also includes special conditions applicable to discharges identified in by a Total Maximum Daily Load (TMDL) study as contributing to a water quality impairment, including City MS4 discharges to the Chesapeake Bay. It is the City's regulatory responsibility to comply with the MS4 General Permit Chesapeake Bay TMDL Special Condition including the reduction of Pollutants of Concern (POC) from Existing Sources.

In determining the overall progress in addressing the Bay impairments, City implementation is documented in MS4 Annual Reports and provided to the Virginia Department of Environmental Quality (DEQ) for inclusion in the federal Environmental Protection Agency's (EPA) bay-wide watershed computer modeling efforts. While EPA's modeling efforts play a significant role in evaluating the overall watershed progress, it lacks the precision assess water quality impacts from relatively de minimus POC loads and associated POC load reductions such as those associated with the City's compliance efforts. As such, the City's compliance with meeting the required POC reductions is determined using calculation tables included in the MS4 General Permit Chesapeake Bay TMDL Special Condition. The MS4 General Permit Chesapeake Bay Special Condition dictates the acceptable POC reduction strategies and includes the use of those strategies approved by DEQ. DEQ Guidance Memo GM2-2003 provides further direction for the submission of strategies not previously DEQ-approved for the regulatory agencies review and approval. It is the City's responsibility to develop acceptable strategies that include means and methods for implementation of verifiable practices and accurately quantify the associated POC load reductions. The document lays out the rationale and potential direction for the City regarding receiving POC load reductions credits associated with its leaf litter collection and disposal programs for submission to DEQ for their consideration.

## 2.0 City Loose Leaf Collection and Disposal Program

The City operates a seasonal leaf collection and disposal program during the fall and spring months in which City crews collect loose leaves that are raked to the edge of the roadway from properties within the City. The loose leaves are collected on an approximate two-week rotational basis from six leaf collection routes (Figure 1). The collected loose leaves are then delivered to Loudoun Composting (44150 Wade Dr, Chantilly, VA 20152) where they are composted and converted into a marketable product for use in the Mid-Atlantic region, including the Chesapeake Bay Watershed. The Loudoun Composting operation, including leachate management, is regulated under a DEQ Solid Waste Permit By Rule (PBR141). In FY2021, the City transported 1,056 tons of loose leaf litter to Loudoun Composting.



## 3.0 Rationale for Consideration of Nutrient Reduction Credits from the City's Leaf Litter Collection and Disposal Program

The City's Leaf Collection and Disposal program is an exit ramp for nutrients entering the Chesapeake Bay. The difficulty is determining just how much actual nutrient reduction credit is attained and how it can be credited towards the City meeting its MS4 POC reduction requirements. The Chesapeake Bay Program Management Board Expert Panel included in its 2016 publication, 'Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices,' that studies in the City of Baltimore, MD found that the average nutrient load associated with leaf drop was estimated to be 28.8 lbs./ac/yr. for nitrogen and 2.95 lbs./ac/yr. for phosphorus. The potential for leaf litter to represent a significant nutrient source, and in turn, a potentially significant source control available to the City, was further reenforced by a 2020 U.S. Geological Survey (USGS) Scientific Investigations Report titled 'Reducing Leaf Litter Contributions of Phosphorus and Nitrogen to Urban Stormwater through Municipal Leaf Collection and Street Cleaning Practices.'[1] The USGS report found that

- "At its peak, fall leaf litter can rapidly accumulate on a street surface over a short period of time. Because the amount of leachable phosphorus in runoff is a function of the amount of time a leaf is exposed to stormwater, the timing of leaf collection and street cleaning is an important factor when maximizing phosphorus and nitrogen load reduction."
- [Municipal] "collection of leaf piles remains an important part of managing phosphorus and nitrogen loads, because most homeowners have come to rely on that service to dispose of excess yard waste."
- "The link between concentrations of phosphorus and nitrogen measured in storm drains and street tree canopy support stormwater management practices that are designed to limit accumulation of leaf litter on streets or encourage their removal before a storm event."
- "The majority of nutrient concentrations were in the dissolved fraction making source control through leaf collection and street cleaning more effective at reducing the amount of dissolved nutrients in stormwater runoff."

A City-specific example of the potential POC concentrations associated with leaf litter collection and disposal can be drawn from the CFP discussions regarding bulk collection of organic matter as part of storm drain cleaning. If, during FY2021, the City were to collect the 1,056 tons of leaves from within the storm drainage system rather than before they enter it, the City could potentially gain significant POC reduction credits based on the potential nutrients (Table 1).

Table 1. POC Nutrient Credit Example Using City FY2021 Leaf Collections and Calculations for Determining Credits if Leaf Litter Had Been Removed from the MS4.

| Bulk Leaves Collected and Disposed, lbs. (tons) | Wet Load to Dry Load Conversion Factor | Nutrient | Nutrient Enrichment Factor (Organic Matter / Leaf Litter | Nutrient Credit, lbs. |
|---|---|---|---|---|
| 2,112,000 (1,056) | 0.2 | Nitrogen | 0.12% | 675 |
| | | Phosphorus | 1.11% | 6,243 |

There are numerous factors that make the values calculated in Table 1 inappropriate to apply to towards the City's leaf collection and disposal program. These include:

[1] Selbig, W.R., Buer, N.H., Bannerman, R.T., and Gaebler, P., 2020, Reducing Leaf Litter Contributions of Phosphorus and Nitrogen to Urban Stormwater Through Municipal Leaf Collection and Street Cleaning Practices: U.S. Geological Survey Scientific Investigations Report 5109, 17 p.

1. **There is a re-introduction of an unknown percentage of nutrients into the delivery pathway leading to the Chesapeake Bay.**
   Collected leaf litter, such as the City's, is often composted and returned to the community in the form of mulch. The reuse of the leaf litter as mulch represents a pathway for some nutrients to re-enter the Chesapeake Bay watershed and, ultimately, reach the Bay. While limited research has shown that nutrients tend to leach from composting leaves rather quickly, the leaching rate depends on numerous physical factors such as amount of time the leaves are submersed in water. Any procedure designed to quantify the reduction of nutrients as a result of leaf litter collection must account for this reintroduction process.
2. **The nutrients in leachate collected during composting that are properly disposed (prevented from re-entering the Chesapeake Bay watershed) represent a POC reduction as it pertains to MS4 POC reductions.**
   Nutrients leach out of composting leaf litter when it comes into contact with precipitation. If this leachate is collected and prevented from discharge into the environment, there is a reduction in the quantity of nutrients being discharged to the Chesapeake Bay; however, difficulty lies with how to quantify the applicable nutrient load. Quantification of the applicable nutrient load for consideration must consider the following:
   a. The nutrient concentration in the leachate will vary throughout the season based on the chemical and physical factors associated with composting.
   b. Leaves are collected from mixed land uses consisting of both pervious and impervious surfaces. A percentage of the nutrients would infiltrate into the pervious lands and would not be discharged. Although it is technically removed from the environment, the fraction is an artificial 'load' enhancement that would not be released unless the City directed leaf litter to be raked to the edge of the property and collected. As such, it's removal should not count towards the City's overall POC reduction.
3. **The Nutrient Enrichment Factor included in the CFP publication, "Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices" is not appropriate for use in calculating the nutrient loads.**
   The Nutrient Enrichment Factor assumes that the nutrients are permanently prevented from re-entry into the Chesapeake Bay watershed. The reintroduction of mulch prevents this assumption from being fulfilled.

## 4.0 Recommendations for Proposing City Leaf Litter Collection as a Chesapeake Bay TMDL POC Reduction Credit

As discussed in this document's background and purpose, DEQ has the authority to approve other POC reduction methods outside of those included in GM20-2003; however, it is the City's responsibility to develop a verifiable process in which to quantify the POC reductions from a proposed alternative POC reduction method. The following actions are recommended if the City wishes to pursue the potential opportunity to utilize leaf litter collection as a means to meet Chesapeake Bay TMDL POC reduction requirements:

1. **Confirm that Loudoun Compost prevents its leachate from re-entry into the Chesapeake Bay watershed.**
   There is no applicable credit opportunity if the nutrients in the leachate are permitted to re-enter the Chesapeake Bay watershed.
2. **Obtain DEQ's acknowledgement, preferably in writing, that they will consider leaf litter collection as an alternative means of reducing POC loads.**
   If DEQ refuses to consider POC reductions associated with leaf litter collection, there is no sensible reason to pursue it any further.
3. **Develop a runoff coefficient for the portions of the City in which leaves are collected.**
   The development of a runoff coefficient will allow the City to adjust the volume of runoff to what would be expected from the portions of the City where leaf litter is collected. This will enable the City to account for areas of forest in which leaves would not be collected and for nutrients in stormwater runoff that would normally infiltrate into the ground and be discharged.

4. **Implement a pilot monitoring program to determine the seasonal nutrient concentration and overall load associated with the leachate.**
   The City should implement a monitoring program that runs concurrent with its leaf litter collection program and extends through the warmer spring months. The pilot monitoring program would consist of setting a known quantity of leaves on an impervious surface with exposure to the environment. The quantity of leachate should be measured throughout the pilot program and flow-based monitoring of nitrogen and phosphorus concentrations in the leachate should be monitored.
5. **Calculate the proposed POC reduction credits**
   Use the annual average nutrient concentration and the quantity of leachate to determine the POC load captured as part of the pilot project. Apply the results to the total amount of leaf litter collected and adjust downward using the collection area runoff coefficient. The results of this calculation project would represent the potential POC reduction credit for the City to submit to DEQ for review and approval.

**Appendix W. Summary of Public Comments Received During the Public Comment Period and City Responses**