FORT BELVOIR

FINAL PHASE III CHESAPEAKE BAY TMDL ACTION PLAN

VPDES Small MS4 General Permit No. VAR040093

PREPARED FOR:
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ACRONYMS AND ABBREVIATIONS

AAFES	Army and Air Force Exchange Services
ac	Acres
ADFE	Aerospace Data Facility - East
AR	Army Regulation
AW	American Water
BANCS	Bank Assessment for Non-point source Consequences of Sediment
BMP	Best Management Practice
CAST	Chesapeake Bay Assessment and Scenario Tool
CBP	Chesapeake Bay Program
CBPO	Chesapeake Bay Preservation Ordinance
CGP	Construction General Permit
CPS	Contract Performance Specialist
CUA	Census Urban Area
CWA	Clean Water Act
DAAF	Davison Army Airfield
DC	District of Columbia
DECA	Defense Commissary Agency
DoD	Department of Defense
DPW	Directorate of Public Works
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
EMS	Environmental Management System
EOS	Edge of Stream
EPA	United States Environmental Protection Agency
ESC	Erosion and Sediment Control
FOG	Fats, Oils, and Grease
FBNA	Fort Belvoir North Area
ft	feet
GIS	Geographic Information System
HUC	Hydrologic Unit Code
IDDE	Illicit Discharge Detection and Elimination
ISW	Industrial Stormwater
l	liter
L2	Level 2
lbs.	Pounds
LID	Low Impact Development
MCM	Minimum Control Measures
MEP	Maximum Extent Practicable

MS4	Municipal Separate Storm Sewer System
NCE	New Campus East
NEIEN	National Environmental Information Exchange Network
NGA	National Geospatial Agency
NMP	Nutrient Management Plans
NMUSA	National Museum of the United States Army
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
POC	Pollutants of Concern
RO	Representative Outfalls
RPA	Resource Protection Areas
RSC	Regenerative Stormwater Conveyance
SCP	Street Cleaning Practice
SMF	Stormwater Management Facility
SWM	Stormwater Management
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
UDS	Underground Detention System
VADEQ	Virginia Department of Environmental Quality
VARNG	Virginia Army National Guard
VDOT	Virginia Department of Transportation
VPDES	Virginia Pollutant Discharge Elimination System
WinSLAMM	Windows Source Loading and Management Model
WIP	Watershed Implementation Plan
WLA	Waste Load Allocation
WQGIT	Water Quality Goal Implementation Team
yr	Year

EXECUTIVE SUMMARY

The purpose of this Phase III Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan is to comply with Part II "Special condition for the Chesapeake Bay TMDL" of the 2023-2028 General Virginia Pollution Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4), No. VAR040093 issued to Fort Belvoir.

The focus of the Action Plan is to provide the means and methods needed for Fort Belvoir to meet the 100% Chesapeake Bay TMDL reduction targets in the MS4 permit for phosphorus and nitrogen developed by the United States Environmental Protection Agency (EPA) in December 2010. Due to significant changes between the 2018-2023 and 2023-2028 MS4 Permit Cycle, sediment reductions are no longer required; however, these calculations for existing source loads and credits have still been included within this plan as a courtesy.

This Action Plan provides a review of all Best Management Practices (BMPs) implemented prior to November 1, 2023, the current MS4 program and demonstrates Fort Belvoir's ability to comply with 100% of the required Level 2 (L2) reductions by October 31, 2028. This plan walked through the critical steps including:

- Identifying the MS4 Service Area,
- Calculating Loads and required reductions,
- Detailing progress made for meeting the Phase II (40%) reductions
- Addressing reductions due to increased loads from grandfathered projects
- How to Maintain reduction credits already achieved, and
- Planning of projects that are to occur during Phase III Plan Implementation

Calculation of phosphorus, nitrogen, and sediment existing source loads are based on impervious and pervious land uses regulated by the MS4 permit. The existing pollutant loads, and the targeted reductions depend on the amount of regulated pervious and impervious land cover in the Fort Belvoir's MS4 service area. The area served by the MS4 includes those areas draining to a regulated stormwater outfall. Lands that are regulated under a separate VPDES stormwater permit, lands that sheet flow directly to waters of the state, wetlands and open waters, and forested areas are not considered part of the Fort Belvoir MS4 service area.

To perform this analysis, Fort Belvoir utilized local ArcGIS data, aerials, and calculation tools, the 2000, 2010 and 2020 census data covering urban areas for the Washington, DC Metropolitan Area, and completed review of other state stormwater permits under the VPDES program. After comparing the regulated areas based on 2000, 2010, 2020 census data to land use at the time and removing areas covered under a separate VPDES Permit, Fort Belvoir was left with a general area that is covered under the MS4 General Permit. With major upcoming changes in regulated areas associated with the Fort Belvoir Industrial Stormwater, expected to occur by January 2025, a recalculation of existing sources was completed in Section 3 of this Phase III plan to account for the additional MS4 service areas.

Following the determination of the MS4 service area and the breakdown of impervious and pervious land uses, the total baseline load from existing sources and the target reductions in pounds for phosphorus, nitrogen, and sediment was determined. MS4 general permit Table 3b assists in calculating existing source loads for regulated impervious and regulated pervious land use in the Potomac River Basin based on an assigned L2 loading reduction, and loading rates were calculated as such.

The required reductions were calculated for each permit cycle based on the Phase III Watershed Implementation Plan (WIP) and MS4 General Permit special conditions, which state that MS4 permittees will need to meet L2 scoping reduction requirements for existing sources. During the first MS4 permit cycle (2013-2018), practices were implemented sufficient to achieve 5% of the L2 reduction target. During the second permit cycle (2018-2023), Fort Belvoir implemented additional practices sufficient to achieve 35% of the L2 reduction target, for a total of 40%. The remaining 60%, or total reduction targets, need to be met by 2028. Note that The Chesapeake Bay Preservation Act requires these same reductions to be completed by 2025.

Table EX- 1: Cumulative 100% Reductions Required by end of permit term

Pollutant of Concern	Sub Source	Loading Rate[1] (lbs./ac/yr)	Existing Regulated Lands[2] (ac)	Existing loads[3] (lbs./yr)	Total L2 Reduction Required by 2025	L2 Reduction required by 2028	Reduction by Land Cover[4] (lbs./yr)	3rd Permit Cycle Required Reduction[5] (lbs./yr)
TN	Urban Impervious	16.86	939	15,832	9%	100 %	1,425	***3916***
	Urban Pervious	10.07	4,123	41519	6%		2,491	
TP	Urban Impervious	1.62	939	1521	16%		243	***366***
	Urban Pervious	0.41	4,123	1690	7.25%		123	
TSS[6]	Urban Impervious	1171.32	939	1,099,870	20%		219,974	***283,396***
	Urban Pervious	175.8	4,123	724,823	8.75%		63,422	

[1]Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2
[2]To determine the existing developed acres required in Column B, permittees should first determine the extent of their regulated service area based on the 2010 Census Urbanized Area (CUA). Next, permittees will need to delineate the lands within the 2010 CUA served by the MS4 as pervious or impervious as of the baseline date of 30 June 2009. **Note:** Belvoir used conservative approach delineating lands using the 2020 CUA
[3]Existing Loads = Loading Rate x Existing Regulated Lands
[4]Reduction by Land Cover = Existing Loads x (Total L2 Reduction by 2028 ÷ 100)
[5]3rd Permit Cycle Required Reduction = The sum of the sub source cumulative reduction required by 31 October 2028 (lbs./yr) as calculated in Reduction by Land Cover.
[6] Although formerly required under the 2018-2023 permit cycle, sediment load reductions are no longer a requirement of the current 2023-2028 permit cycle but have been kept in this plan as a courtesy.

Permit Part II.A.12.b requires the permittee to denote the total reductions achieved as of November 1, 2023, for each POC and provide a list of BMPs implemented to meet said reductions. To meet the reduction requirements, permittees are allowed to implement BMPs as presented in the Virginia Stormwater BMP Clearinghouse or those approved by the Bay Program. Fort Belvoir has used a mix of the following strategies to address the 40% reduction required by 31 October 2023:

- ***Urban Structural SMFs:*** Constructing local stormwater facilities when new development, re-development, and retrofits are considered..

- ***Urban Stream Restoration:*** Urban streams restored using one of the four expert panel report methodologies, as adjusted to account for the unregulated baseline load.
- ***Shoreline Management:*** Employing tidal shoreline practices that prevent and/or reduce tidal sediments to the Bay to include structural or hard practices, vegetated practices, or a mix of hardened and vegetative practices.
- ***Street Sweeping:*** Removing nutrients and sediment from roadways before transported offsite in stormwater flows.
- ***Land Use Change:*** Credit for lands converted to a land use with a lower associated pollutant load.

Each of these strategies are detailed in the following sections to include under what condition credits are earned, the date of implementation, the load reduction achieved. Table 19 below summarizes the achieved reductions by BMP type, as of November 1, 2023.

Table EX- 2: Total Reductions Achieved by BMP Type as of November 1, 2023

POC	BMP	40% Required Reduction Phase II (lbs./yr)	Reductions Achieved (lbs./yr)
Nitrogen	Urban Structural SMFs	**1,567**	2,970
	Stream Restoration		503
	Shoreline Management		8.55
	Street Sweeping		222
	Land Use Change		248
Total Nitrogen Reduction Achieved			***3,952***
Phosphorus	Urban Structural SMFs	**146**	255
	Stream Restoration		456
	Shoreline Management		6.04
	Street Sweeping		64
	Land Use Change		38
Total Phosphorus Reduction Achieved			***818***
Total Suspended Solids[1]	Urban Structural SMFs	**113,359**	286,791
	Stream Restoration		101,394
	Shoreline Management		29,484
	Street Sweeping		92,558
	Land Use Change		38,960
Total Suspended Solids Reduction Achieved			***549,187***

The reductions from each implemented BMP were compared to the cumulative load reduction (100%) required by the end of the third permit cycle (31 October 2028). The analysis found that Fort Belvoir has both met and exceeded the required reductions for all phases. The table below summarizes the progress towards meeting the 100% reductions.

Table EX- 3: Total Required Reductions vs. Reductions Achieved

Pollutant of Concern	Land Use	Existing Regulated Acres[1] (2009)	Phase III Reduction based on 2000 CUA[3] (lbs./yr)	Existing Regulated Acres[2] (2023)	Phase III Reduction based on recalculated MS4 Service Area[3] (lbs./yr)	Total Reductions Achieved[4] (lbs./yr)
Nitrogen	Urban Impervious	1050.73	***2,367***	939	***3,916***	***3,952***
	Urban Pervious	1279.2		4,123		
Phosphorus	Urban Impervious	1050.73	***310***	939	***366***	***819***
	Urban Pervious	1279.2		4,123		
Total Suspended Solids[5]	Urban Impervious	1050.73	***265,826***	939	***283,396***	***549,187***
	Urban Pervious	1279.2		4,123		

[1] Regulated Acres Calculated by the Phase I Chesapeake Bay TMDL Action Plan dated March 2016.
[2] Regulated Acres Calculated in Phase III Chesapeake Bay TMDL Action Plan based on 2020 census urban area and smaller area covered under the Fort Belvoir Industrial Permit.
[3] Total Phase III Reductions (100%) as calculated using the adjusted loading rates.
[4] Total achieved Reductions shown here are the sum of the reductions achieved through the implementation of all structural and non-structural methods. All calculations are provided in the following sections and were completed using methodologies presented in Appendix V of the Chesapeake Bay TMDL Special Condition Guidance (GM 20-2003).
[5] Although formerly required under the 2018-2023 permit cycle, sediment load reductions are no longer a requirement of the current 2023-2028 permit cycle but have been kept in this plan as a courtesy.

As the projects needed to satisfy all permit cycles are already complete. Although additional projects are still planned, no additional BMPs are required to be implemented to meet pollutant reduction goals for the Chesapeake Bay Special Condition. The completed/implemented projects exceed the L2 reduction requirements through Phase III for TN, TP and TSS. Therefore, the focus of this Action Plan has been to describe the efforts needed to maintain credits already earned. This includes requirements for reporting and verification of all BMPs as described in Reductions.

A Draft Phase III Action Plan was submitted along with the General Permit Reapplication Package as required under 9VAC25-890-30.B.10 of the General Permit. The Draft Phase III Action Plan was posted for public comment on the Fort Belvoir Home Page under Environmental Documents for Stormwater on 15 October 2024. A Notice of Availability for the document was posted on the Fort Belvoir Directorate of Public Works (DPW) Stormwater Facebook page and on the main Fort Belvoir Facebook page on 15 October 2024. Fort Belvoir kept the public comment period open until 31 October 2024. Details of the public comment period on the Draft document are included in this Final Document under the Public Comment Section

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1. INTRODUCTION AND BACKGROUND

The U.S. Army Garrison Fort Belvoir is in southeastern Fairfax County, Virginia, approximately 15 miles southwest of Washington, DC, and 95 miles north of Richmond, Virginia. Fort Belvoir's military history dates to the early 1900s, when the facility was known as Camp Belvoir and used as an Army rifle range and training camp. The post was re-named Fort Humphreys in 1922 and became Fort Belvoir in 1935. Since 1935, Fort Belvoir has supported major U.S. military operations throughout the world.

Fort Belvoir consists of more than 7,700-acres on Main Post and an 806-acre detachment parcel, Fort Belvoir North Area (FBNA), which is located on the west side of Interstate 95 as shown in Figure 1 in Appendix A. The Main Post is situated between Interstate 95 and Pohick Bay and Gunston Cove on the Potomac River. US Route 1 divides the Main Post into two distinct geographical areas, referred to as North Post and South Post.

In recent years, Fort Belvoir has functioned primarily as an administrative and logistics support center for the Army and as a host for over 150 tenant organizations from various government branches (including all branches of the armed services). It currently employs more than 35,000 civilian, military, and contractor personnel, and provides support services for over 200,000 military personnel, dependents, and retirees in the region. Development along US Route 1 consists of mixed-use commercial businesses and scattered residences. The surrounding area is developed with residential and commercial/retail businesses.

Fort Belvoir currently holds a General VPDES Permit for Discharges of Stormwater from Small MS4 (9VAC25-890-40), No. VAR040093, effective 1 November 2023 through 31 October 2028. The purpose of this Chesapeake Bay TMDL Action Plan is to comply with Part II.A of this permit. This Action Plan has been developed to provide a review of the current MS4 program and to demonstrate Fort Belvoir's ability to comply with the required target reductions during the first, second, and third implementation phases.

The Action Plan includes the requisite planning items found in permit Part II and has been updated according to the procedures provided in the VADEQ Guidance Memo No. 20-2003 dated 6 February 2021. The focus of the Action Plan is to provide the means and methods needed to meet the Chesapeake Bay TMDL 5%, 35%, and subsequent 60% reduction targets and offsets for phosphorus, nitrogen, and sediment developed by the United States Environmental Protection Agency (EPA) in December 2010. This Phase III Action Plan summarizes the final phase of these actions to achieve the full 100% reduction.

The Chesapeake Bay TMDL contains aggregate waste load allocations (WLAs) for regulated stormwater and no specific WLAs assigned to Fort Belvoir's MS4. The Phase I Virginia Watershed Implementation Plan (WIP) submitted to EPA on 29 November 2010 contained general requirements for permittees. The Phase II WIP was submitted to EPA on 30 March 2012 and built on the Phase I WIP as the state's primary planning tool to establish strategies, targets, and expectations for different sectors: including urban stormwater for local governments. The final Phase III WIP was submitted to EPA on 23 August 2019 and details best management practices (BMPs) along with programmatic actions necessary to achieve state basin planning targets for nitrogen and phosphorus.

According to the Phase III WIP, permittees will have three (3) full MS4 permit cycles to implement all the required reductions (2013-2018; 2018-2023; and 2023-2028). The percentage of the reduction targets are calculated as a percentage of the L2 implementation requirements in the Phase I WIP beyond the 2009 progress loads, which equates to an average reduction of 9% of nitrogen loads, 16% of phosphorus loads, and 20% of sediment loads from regulated impervious acreage; and 6% of nitrogen loads, 7.25% of phosphorus loads, and 8.75% sediment loads from regulated pervious acreage, as shown in Table 1.

Table 1: Required Load Reductions

Pollutant of Concern (POC)	Regulated Acreage % Load Reduction Target	
	Impervious	*Pervious*
Total Nitrogen (TN)	9%	6%
Total Phosphorus (TP)	16%	7.25%
Total Suspended Solids (TSS)[1]	20%	8.75%

[1] Although formerly required under the 2018-2023 permit cycle, sediment load reductions are no longer a requirement of the current 2023-2028 permit cycle but have been kept in this plan as a courtesy.

According to the MS4 permit, a permittee is required to reduce the load of total nitrogen and total phosphorus from existing developed lands served. Reductions should be achieved through implementing BMPs approved by the Chesapeake Bay Program (CBP), BMPs approved by the VADEQ, or acquired through a trading program. Fort Belvoir has goals, as presented in the Phase III WIP and enforced by the MS4 permit; to reduce a certain percent of Total Nitrogen (TN) loads and Total Phosphorus (TP) loads from impervious regulated acreage and pervious regulated acreage. Belvoir will need to implement practices sufficient to achieve 100% of the reduction targets to be met during the third permit cycle by 2028.

This Action Plan details Fort Belvoir's efforts and focus on meeting the 100% required reductions in the current MS4 Permit. The Action Plan contains updated analyses that focus on BMPs which have already been implemented through November 1, 2023, to meet or exceed the 40% reduction requirement. The plan also looks at BMPs that are currently in the planning and design phases and will aid in achieving the full 100% reduction. The following steps are required per the MS4 permit and VADEQ Guidance Memo No. 20-2003:

- Review of Current Program and Legal Authority
- Delineation of the MS4 Service Area
- Existing Source Loads and Calculation of Target Reductions
- Reductions Achieved as of November 1, 2023
- Increased Loads and offsets from 2009 – 2023 New Sources
- Increased Loads and estimated acreage from Grandfathered Projects
- Means and Methods to Maintain Credits Achieved
- Additional BMPs Proposed to Meet Phase III Target Reductions
- Public Comment on Plan

2. CURRENT PROGRAM AND LEGAL AUTHORITIES

The MS4 Program strives to improve environmental compliance and quality within the MS4 Service Area through effective management and implementation of technical guidelines, criteria, and practices for stormwater management and erosion and sediment control. The collective efforts under the MS4 Program result in significant reduction of all pollutants that may be discharged from the regulated MS4. In addition, Fort Belvoir has specifically developed its MS4 Program and other support programs such as local TMDL Action Plans to address specific pollutants, including the pollutants of concern (POCs) of the Chesapeake Bay TMDL (nitrogen, phosphorus, and suspended solids). Pollutant removal from the implementation of BMPs that address the six Minimum Control Measures (MCMs) should be accounted for in the evaluation of goals for meeting WLA targets, including those reductions required by the Chesapeake Bay TMDL. A review of the current MS4 Program Plan, dated June 2024, as well as existing, new, and modified legal authorities was conducted.

2.1. MS4 PROGRAM PLAN

As specified in the Chesapeake Bay TMDL Special Condition of the MS4 General Permit Part II.A, the permittee shall include the means and methods that will be utilized to address discharges into the MS4 from new sources. Implementation of the following existing BMPs from Belvoir's MS4 Program Plan represents implementation to the maximum extent practicable (MEP) and demonstrates adequate progress for this permit cycle and Belvoir's ability to meet the Special Condition of the MS4 General Permit:

- Implementation of the MCMs in Part I.E.4 related to construction site stormwater runoff and erosion and sediment control in accordance with the MS4 Permit shall address discharges from transitional sources: BMPs 4.1 through 4.3 of the MS4 Program Plan address the controls in place in relation to construction site runoff.
- Implementation of the means and methods to address discharges from new sources in accordance with the MCMs in Part I.E.5 related to post-construction stormwater management in new development and development of prior developed lands: These controls are addressed in BMPs 5.1 through 5.2 of the Program Plan as well as in the Fort Belvoir Stormwater Management Facility (SMF) Long-Term Operations and Maintenance Plan, dated September 2024.
- Implementation of Nutrient Management Plans (NMPs) in accordance with the schedule identified Part I.E.6 of the permit related to pollution prevention and good housekeeping for operations: The development and implementation of Nutrient Management plans are addressed in BMP 6.3 of the MS4 Program Plan. As required in Part I.E.6.p, Fort Belvoir has achieved the development of NMPs for 100% of all identified managed turf areas nutrients are applied to a contiguous area greater than one acre.

In addition to these BMPs, the MS4 Program Plan identifies BMPs that directly address the POCs of the Chesapeake Bay TMDL. Table 2 below provides a summary of BMPs found in the June 2024 MS4 Program Plan that are particularly effective in addressing discharges that may contribute to sediment and nutrient loads. Note that not all BMPs in the Program Plan are included in table 2, only those that may play a part in minimizing or eliminating sediment and nutrient loads.

Table 2: Current MS4 Program BMP Evaluation Summary

BMP	NAME	DESCRIPTION
BMP 1.1	Implement a Public Education and Outreach Plan	Distribution of educational materials regarding methods to reduce introduction of both nutrients and sediment, identified High Priority Stormwater Issues, into stormwater runoff.
BMP 2.1	Maintain a webpage dedicated to the MS4 Program and Stormwater Pollution Prevention	Maintaining the webpage which includes MS4 Program documents, the Current Chesapeake Bay TMDL Action Plan, Developed Operational procedures, as well Stormwater specific policies and guidance to persons living and working on the installation.
BMP 3.2	Prohibit Unauthorized Non-Stormwater Discharges into the MS4	Maintain Fort Belvoir Policy prohibiting Illicit/Unauthorized Discharges into the MS4 and Waterways.
BMP 3.3	Maintain and Implement an Illicit Discharge Detection and Elimination (IDDE) Plan	Implementing an IDDE Program that includes written procedures to detect, identify, and address non-stormwater discharges
BMP 4.1	Communicate the Requirements of the MS4 Program for Construction Activities	Distribute MS4 permit requirements to designers during initial planning phases of construction projects. All construction contract packages (including designs and specifications) shall incorporate a requirement to conform to the conditions of the MS4 Permit, MS4 Program Plan, and the Virginia Erosion and Stormwater Management Program (VESMP) Regulations. Conduct pre-construction training, and post Program Guidance documents, including bulletins, on Fort Belvoir Website. Require construction projects with land disturbance of an acre or greater to obtain a Construction General Permit (CGP) from VADEQ. Incorporate procedures under the utility clearance permit process to determine CGP applicability and verify existence of required erosion control plans prior to utility clearance permit approval. DPW Environmental Stormwater plan reviewer conducts project review for projects that result in land disturbance equal to or greater than 2,500 square feet to assess any cumulative impacts, impacts to MS4 and Industrial Stormwater outfalls, and SMFs.
BMP 4.2	Conduct Erosion and Sediment Control Site Inspections	Conduct ESC inspections of all active construction sites that involve land disturbance of 10,000 square feet or greater with Virginia-certified ESC Inspectors on all construction projects with CGP to ensure adherence to the approved ESC plan and the CGP and to evaluate performance of BMPs and/or engineering controls.

BMP	NAME	DESCRIPTION
BMP 4.3	Progressive Compliance Enforcement Strategy	Implement the compliance and enforcement strategy when construction contractors have repeated non-compliance findings on ESC inspections on an active construction site.
BMP 5.1	Conduct Annual Inspections and Maintenance of Stormwater Management Facilities (SMFs)	Conduct SWM inspections with Virginia-certified SWM Inspectors to assess the condition of all SMFs at least annually. Coordinate with ground maintenance contractor and tenant agencies to ensure maintenance is completed for any SMFs noted as deficient.
BMP 5.2	Maintain the SMF Tracking System	Maintaining an accurate database of SMFs is critical to the proper long-term management of the MS4 system as well as to maintaining credits achieved through installation of urban structural BMPs.
BMP 6.1	Written Procedures for Operations and Maintenance (O&M) Activities	Developing and Maintaining BMP Fact Sheets covering various O&M activities containing guidelines that identify best management practices for stormwater pollution prevention, and maintenance, if required, and spill response procedures. Current fact sheets which cover the target POCs in the ChesBay include: • Good Housekeeping • Outdoor Storage and Handling of Materials and Waste • Outdoor Storage and Handling of Raw Materials and Waste • Wash Rack Usage Guide • Waste Handling and Disposal • Fats, Oils and Grease (FOG) Handling • FOG Management Guide • Dewatering Activities • Outdoor Pressure Washing • Blasting & Painting Activities • Landscaping/Ground Maintenance • Dumpster Management
BMP 6.2	Implement Stormwater Pollution Prevention Plans (SWPPPs)	Implementation of the Fort Belvoir Master SWPPP and High Priority Facility (HPF) SWPPPs plays a critical role in minimizing discharges of nutrients, especially at HPF where landscaping and grounds maintenance activities or pesticide mixing occurs.
BMP 6.3	Implement Nutrient Management Plans	Implementation of Nutrient Management Plans for all identified managed turf areas plays a major role in minimizing use or fertilizers.
BMP 6.4	Implement Written Training Plan	TMDL information is included in both SWPPP required training and Stormwater General Awareness Training.

BMP	NAME	DESCRIPTION
BMP TSS.1	Sediment TMDL Action Plan Implementation and Reporting	The Sediment TMDL Action Plan was developed for the Lower Accotink Creek Watershed, of which all the drainage area is also within the Chesapeake Bay Watershed. The Sediment TMDL Action Plan includes sediment reductions achieved through various BMPs including urban structural SMFs, stream restoration projects, street sweeping, and storm drain cleaning. There is some overlap with BMPs presented within this Chesapeake Bay TMDL Action Plan.
BMP TSS.2	Sediment TMDL Action Plan Education and Training	Publish one article annually discussing steps that may be taken to reduce sediment sources. Provide specialized training directed towards engineers, O&M, base operations, and construction contractors focusing on sediment load reduction techniques.

2.2. LEGAL AUTHORITIES

As specified in the Chesapeake Bay TMDL Special Condition of the MS4 General Permit Part II.A.12.b.(1), the permittee shall include 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 the ChesBay reductions. Implementation of the following existing legal authorities and Fort Belvoir Policies represents implementation to the maximum extent practicable (MEP) and demonstrates adequate progress for this permit cycle and Belvoir's ability to meet the Special Condition of the MS4 General Permit.

2.2.1. SECTION 303(D) OF THE CLEAN WATER ACT (CWA) AND THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S (EPA'S) WATER QUALITY PLANNING AND MANAGEMENT REGULATIONS (40 CFR PART 130)

The CWA and EPA's Management regulations direct States to identify and list water bodies in which current required controls of a specified pollutant are inadequate to achieve water quality standards. For the Commonwealth of Virginia, Impaired Waters are outlined in the biennial Virginia Water Quality Assessment 305(b)/303(d) Integrated report. Most of the Chesapeake Bay and its tidal waters are listed as impaired due to excess nitrogen, phosphorus, and sediment. The TMDL is a combination of 92 smaller TMDLs for individual Chesapeake Bay tidal segments and includes pollution limits that are sufficient to meet state water quality standards for dissolved oxygen, water clarity, underwater Bay grasses and chlorophyll-*a* (EPA, 2010).

States are then required to establish TMDLs for water bodies that are exceeding water quality standards. TMDLs represent the total pollutant loading that a water body can receive without violating water quality standards. The TMDL process establishes the allowable loadings of a pollutant's WLA needed to achieve and maintain water quality standards. The TMDL, approved by the EPA in December 2010, identifies the necessary pollution reductions of nitrogen, phosphorus, and sediment across Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia, and the District of Columbia, and sets pollution limits necessary to meet applicable water quality standards in the Bay and its tidal rivers and embayment. Virginia's efforts and strategies are guided by the Chesapeake Bay Program, the Chesapeake Bay TMDL, and Phase I, II, and III WIPs.

2.2.2. 42 USC 17094 - ENERGY INDEPENDENCE AND SECURITY ACT OF 2007 TITLE IV SUBTITLE C SECTION 438

Section 438 of the Energy Independence and Security Act (EISA) instructs federal agencies to use design, construction, and maintenance strategies to maintain or restore the predevelopment hydrology for any project that exceeds 5,000 square feet of land disturbance and involves the construction of a federal facility. While the majority of the Act addresses energy efficiency and other topics, the following section addresses stormwater and sets strict requirements:

"Stormwater runoff requirements for federal development projects: The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to temperature, rate, volume, and duration of flow."

The USEPA, in coordination with other federal agencies, published the "Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act" (Dec 2009) to assist federal agencies in complying with the Act. The purpose of EISA Section 438 is to replicate the pre-development hydrology to protect and preserve both the water resources onsite and those downstream. Therefore, it necessitates that designs consider Low Impact Development (LID) in the form of engineered systems, such as the installation of site specific SMFs to meet all objectives of the Act.

2.2.3. EXECUTIVE ORDER 13508

In 2009, President Barrack Obama signed Executive Order 13508 declaring the Chesapeake Bay to be a "national treasure" and ordering Federal facilities to "protect and restore the health, heritage, natural resources, and social and economic value of the nation's largest estuarine ecosystem." Environmental initiatives of this act include increased regulatory pressure on municipalities to reduce or eliminate pollution entering the Chesapeake Bay.

The Order provides requirements intended for federal agencies to demonstrate leadership in stormwater management practices. These recommendations include employing site selection, layouts, and development strategies to minimize impacts from development and redevelopment. Section 202 of the EO tasks the DOD to lead on storm water management practices at Federal facilities and on Federal lands under subsection (c) which states

(c) strengthen storm water management practices at Federal facilities and on Federal lands within the Chesapeake Bay watershed and develop storm water best practices guidance.

2.2.4. 40 CFR §122.44 ESTABLISHING LIMITATIONS, STANDARDS AND OTHER PERMIT CONDITIONS APPLICABLE TO STATE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PROGRAMS

This permitting program was established by EPA to comply with Section 402 of the CWA. The NPDES program prohibits the discharge of pollutants through a point source into a water body of the U.S. unless a NPDES permit is obtained. The permit places limits on what can be discharged and includes monitoring and reporting requirements as well as other provisions to ensure that the discharge does not harm water quality or public health.

Section (d) (1) (vii) (B) requires that all new or revised NPDES permits must be consistent with assumptions and requirements of any applicable TMDL WLA. The Commonwealth of Virginia, Virginia Department of Environmental Quality (VADEQ), regulates the management of pollutants carried by stormwater runoff under the Virginia Pollutant Discharge Elimination System (VPDES) program.

2.2.5. VIRGINIA CHESAPEAKE BAY PRESERVATION ACT, TITLE 62.1, CHAPTER 3.1, ARTICLE 2.5 (§62.1-44.15:67 THROUGH §62.1-44.15:79) OF THE CODE OF VIRGINIA

The Chesapeake Bay Preservation Act (Bay Act) was enacted by the Virginia General Assembly in 1988 as a critical element of Virginia's non-point source management program. The Bay Act program is designed to improve water quality in the Chesapeake Bay and other waters of the State by requiring the use of effective land management and land use planning. At the heart of the Bay Act is the concept that land can be used and developed to minimize negative impacts on water quality.

The Bay Act requires that localities (counties, cities, and towns) within Tidewater Virginia employ the criteria promulgated by the Board to ensure that the use and development of land in Chesapeake Bay Preservation Areas shall be accomplished in a manner that protects the quality of state waters consistent with the provisions of this article. The Bay Act defines Chesapeake Bay Preservation Areas as an area delineated by localities in Tidewater Virginia in accordance with criteria established pursuant to §62.1-44.15:72. Tidewater Virginia is considered:

"The Counties of Accomack, Arlington, Caroline, Charles City, Chesterfield, Essex, Fairfax, Gloucester, Hanover, Henrico, Isle of Wight, James City, King and Queen, King George, King William, Lancaster, Mathews, Middlesex, New Kent, Northampton, Northumberland, Prince George, Prince William, Richmond, Spotsylvania, Stafford, Surry, Westmoreland, and York, and the Cities of Alexandria, Chesapeake, Colonial Heights, Fairfax, Falls Church, Fredericksburg, Hampton, Hopewell, Newport News, Norfolk, Petersburg, Poquoson, Portsmouth, Richmond, Suffolk, Virginia Beach, and Williamsburg."

2.2.6. VIRGINIA STORMWATER MANAGEMENT ACT, TITLE 62.1, CHAPTER 3.1, ARTICLE 2.3 (§62.1-44.15:24 THROUGH §62.1-44.15:50) OF THE CODE OF VIRGINIA

The Virginia Stormwater Management Law seeks to protect properties and aquatic resources from damages caused by increased volume, frequency, and peak rate of stormwater runoff. Additionally, the law seeks to protect those resources from increased non-point source pollution attributed to stormwater runoff. §62.1-44.15:24 defines a Chesapeake Bay Preservation Act land disturbing activity as:

"…land disturbance equal to or greater than 2,500 square feet and less than one acre in all areas of jurisdictions designated as subject to the regulations adopted pursuant to the Chesapeake Bay Preservation provisions of this chapter."

2.2.7. US ARMY REGULATION (AR) 200-1, ENVIRONMENTAL PROTECTION AND ENHANCEMENT

The AR 200-1 defines the framework for the Army Environmental Management System (EMS). It implements Federal, State, and local environmental laws and Department of Defense (DoD) policies for preserving, protecting, conserving, and restoring the quality of the environment. This regulation addresses environmental responsibilities of all Army organizations and agencies. Specifically, this regulation applies to Active Army, Army National Guard, United States Army Reserve, as well as Tenants, contractors, and lessees performing functions on real property under the jurisdiction of the Department of the Army (for example, Army and Air Force Exchange Services (AAFES), Defense Commissary Agency (DECA)) (Army, 2007). Chapter 4-2 of the AR requires compliance with all requirements, substantive and procedural, for control and abatement of water pollution, as outlined in the CWA, including implementation of TMDL regulations to ensure that mission and non-mission activities and construction designs utilize BMPs to minimize TMDL impacts. Chapter 4-2 requires a program that:

(a) Assesses the installation watershed impacts as appropriate, considering upstream and downstream water quality data or other background levels, proximity to potentially designated impaired waters, and any effects on mission activities.

(b) Carries out Army activities consistent with EPA/State approved plans/strategies to restore impaired or threatened water bodies to their designated use.

(c) Controls soil erosion in accordance with applicable and appropriate Federal, State, or local requirements.

2.2.8. FORT BELVOIR GENERAL VPDES PERMIT FOR DISCHARGES OF STORMWATER FROM MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4), MS4 GENERAL PERMIT NO. VAR040093

As required by Fort Belvoir's MS4 permit, TMDL WLAs are specifically addressed through the iterative implementation of programmatic BMPs. Only failure to implement the programmatic BMPs identified in this plan would be considered a permit noncompliance issue. The special conditions for the Chesapeake Bay TMDL found within the General VPDES Permit for Discharges of Stormwater from MS4s found at 9VAC25-890-40 Part II.A.1 that was approved by the State Water Control Board on 23 August 2023, are stated as follows:

"The Commonwealth in its Phase I, Phase II, and Phase III Chesapeake Bay TMDL Watershed Implementation Plans (WIP) committed to a phased approach for MS4s, affording MS4 permittees up to three full five-year permit cycles to implement necessary reductions. This permit is consistent with the Chesapeake Bay TMDL and the Virginia Phase I, Phase II, and Phase III WIPs to meet the Level 2 (L2) scoping run for existing developed lands as it represents an implementation of an additional 60% of L2 as specified in the Phase I, Phase II, and Phase III WIPs. In combination with the 40% reduction of L2 that has already been achieved, a total reduction no later than October 31, 2028 of 100% of L2 will be achieved. Conditions of future permits will be consistent with the TMDL or WIP conditions in place at the time of permit issuance."

2.2.9. MS4 PROGRAM PLAN

The MS4 Program Plan documents Fort Belvoir's compliance with Part II A of the MS4 General Permit and was revised November 2021. The Program Plan satisfies the requirements of this part as well as the appropriate water quality requirements of the CWA and regulations in the absence of a TMDL WLA. The Plan includes six (6) MCMs as listed in Part I.E and details the implementation of BMPs to reduce pollutants, protect water quality, and ensure compliance with water quality standards.

As per Part II.B.10 of the MS4 general permit, the approved Phase III Chesapeake Bay TMDL Action Plan shall be incorporated into the current MS4 Program Plan by reference. Once approved, this updated plan will replace the requirements of the Phase II plan. The new permit became effective on 1 November 2023, the MS4 Program Plan is updated to reflect the additional requirements presented in Part I.B and Part II.B.10 of the 2023 Permit which states:

"The MS4 Program Plan as required by Part I.B of this permit shall incorporate each local TMDL Action Plan. Local TMDL Action Plans may be incorporated by reference into the MS4 Program Plan provided that the Program Plan includes the date of the most recent local TMDL Action Plan and identification of the location where a copy of the local TMDL Action Plan may be obtained."

2.2.10. FORT BELVOIR CHESAPEAKE BAY TMDL ACTION PLAN

This action plan addresses the requirement to minimize the pollutants of concern; nutrients and sediment, by identifying legal authorities, BMPs and measurable goals for achieving compliance with the approved Phase III Chesapeake Bay TMDL Implementation Plan in accordance with 9VAC25-890-40, Part II.A. Special Conditions for the Chesapeake Bay TMDL of the General VPDES Permit for Discharges of Stormwater from MS4s, Permit VAR040093. As per Part II.A.12.b of the current MS4 permit:

"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 reductions required in Part II.A.3, A.4, and A.5."

2.2.11. FORT BELVOIR GARRISON POLICY MEMORANDUM, STORMWATER POLLUTION PREVENTION

An installation-wide Stormwater Pollution Prevention policy was developed to address compliance with the MS4 Permit, the Industrial Stormwater (ISW) major permit, the Clean Water Act and other stormwater regulations. The policy outlines proper protocols for minimizing stormwater pollution during activities that directly and indirectly impact water quality of the receiving waters. Section 5 of this policy states:

"Fort Belvoir is committed to protecting water quality of waterways on and surrounding Fort Belvoir to ensure that human health, ecosystem health, and the ability to conduct recreational opportunities are not impacted by stormwater pollution."

Section 5.a. specifically prohibits illicit discharges/illegal dumping at Fort Belvoir, including but not limited to:

"Sanitary sewer overflows, trash, paint, grease, motor oil or other lubricants, fuel, cooking oil, salt, fertilizer, pesticides chemicals, liquid materials, lawn wastes (grass clippings and leaves), mulch, cigarette butts, sand, soil, construction materials, wash waters containing soaps, detergents and degreasers of any kind, fire hydrant and water line flushing and potable water tank discharge without prior de-chlorination, and pet/animal waste."

This policy provides an avenue of enforcement for requirements set forth by Fort Belvoir's CWA permits.

2.2.12. FORT BELVOIR DIRECTORATE OF PUBLIC WORKS MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PROGRAM BULLETINS

Fort Belvoir's Directorate of Public Works (DPW) has issued multiple program bulletins applicable to Garrison, Tenant, and Contractor Operations which cover the requirements for complying with the MS4 Permit #VAR040093, Energy Independence and Security Act Section 438 (EISA 438) and the Virginia Erosion and Sediment Control, Stormwater Management and Chesapeake Bay laws and regulations. Specific guidelines of these bulletins must be followed during design and construction of projects disturbing areas of 2,500 square feet and greater.

All applicable guidance documents are made available to all designers, project proponents, contract specialists, and construction contractors during the Environmental Division project review process and are also posted on the Fort Belvoir Environmental Webpage under Programs and Documents, MS4 Stormwater Program. Fort Belvoir DPW guidance/policy documents include:

- ***MS4 Program Bulletin #1:*** *Stormwater Management and Erosion and Sediment Control Compliance Requirements and Procedures for Land Disturbance (revised 26 July 2023)*
- ***ESC Technical Bulletin #1****: Dewatering Operations (revised 26 July 2023)*
- ***ESC Technical Bulletin #2:*** *Stormwater Pollution Prevention Plan Requirements (revised 26 July 2023)*

- ***ESC Technical Bulletin #3:*** *Erosion and Sediment Control Requirements for Utility Installation (revised 26 July 2023)*
- ***ESC Technical Bulletin #4****: Stormwater Pollution Prevention Requirements for Small Projects and Renovation Projects (revised 26 July 2023)*

The MS4 Program Bulletins provide details on the procedures for SWM and ESC Plan design, review, and approval as well as compliance requirements for SWM and ESC during land disturbing activities. As Fort Belvoir falls within direct drainage of the Chesapeake Bay, the Bulletins takes into consideration the additional requirements set forth in the Chesapeake Bay Preservation Act. The Bulletins are provided to any persons proposing construction activities within Fort Belvoir and provides DPW-Environmental the ability to perform project reviews prior to any project approval, ensuring every project meets appropriate design criteria of post-development stormwater management. Table 3 shows the current development/redevelopment project thresholds along with the review and approval authorities.

Table 3: Land Disturbance Compliance Requirements and Procedures

Required Plans for Land Disturbance		
Land Disturbance Thresholds	***Plans Required***	***Plan Review and Approval Authority***
<2,500 square feet	*None*	*DPW-Environmental (Dig Permit Review)*
2,500 < 10,000 square feet	*ESC and SWM Plans*	*DPW-Environmental (ESC and SWM Plan Review)*
10,000 square feet < 1 acre	*ESC and SWM Plans*	*DPW-Environmental (ESC and SWM Plan Review) VADEQ (ESC Plan Approval)*
≥ 1 acre	*ESC and SWM Plans*	*DPW-Environmental (ESC and SWM Plan Review) VADEQ (ESC and SWM Plan Approval)*
Building with 5,000 square feet and greater total footprint (Including utilities, roads, etc.)	*ESC and SWM Plans to comply with EISA 438*	*Based on above land disturbance threshold criteria.*

2.2.13. OPERATION AND MAINTENANCE CONTRACT

The Operations and Maintenance (O&M) activities for the Installation are contracted through the Mission and Installation Contracting Command (MICC). The MICC issued contract that incorporates any needed work for O&M of the installation which is also referred to as the BaseOps Contract. The BaseOps Contract specifies all requirements and standards, work management, and personnel qualifications.

The Defense Acquisition Regulations prescribes Clauses that are incorporated in the Base Ops Contract, which specify compliance measures. The Overarching Performance Work Statement (PWS) specifies the overarching contract requirements that apply for all Attachments and Technical Exhibits (TEs). The PWS requires on Contract Line Item 2.21.2 Environmental Compliance:

"The Contractor shall comply with all Federal, State, local and installation environmental laws, rules, and plans."

Requirements for Applicable to maintenance of credits required to achieve reductions noted throughout this Plan are addressed in Attachment #4 – 408 Pavement Clearance, Attachment #5 Facility Maintenance – Vertical, and Attachment #6 – 420, Facility Maintenance Horizontal. Associated with these contract attachments are TEs that specify the details of each aspect of the work, which includes, but are not limited to applicable BMPs, inspection forms and plans, maps, requirements, and deliverables. These attachments and TEs cover activities such as:

- Inspection and maintenance of structural stormwater controls such as hydrodynamic separation units (swirl concentrators), catch basins, stormwater management facilities (SMFs), and oil/water separators.

- Storm sewer cleaning to remove build-up of sediment and debris that can block water flow.

- Street sweeping to remove large and small debris and pollutants that collect on city streets as well as snow removal to treat parking lots, roadways, and sidewalks, or other paved surfaces.

The contract is directly overseen by the Contracting Officer Representative (COR) and Contract Performance Specialists (CPS) that monitor contract performance and deliverables as their primary duty. The COR is in frequent contact with the Contracting Officer (KO) at the MICC for contract performance reporting and to discuss issues with the contract. Contract Deliverables must be received and performed work must be accepted for payment to be made. The CPSs inspect randomly selected lots and can reject the entire lot, if work on one or more of the samples of the lot is unacceptable. The COR can submit Contractor Deficiency Reports (CDRs) if work is not being performed in accordance with the contract which are being submitted to the Contracting Officer for further action.

Deliverables are also being submitted to the MS4 Program Manager (PM) for review and acceptance. If they are acceptable, then the PM will notify the COR that the deliverables were accepted. If they are found to be deficient, the PM will contact the COR to request and obtain compliant information, data, and revised deliverables. The ultimate enforcement of the contract is through the KO at the MICC.

3. DELINEATION OF THE MS4 SERVICE AREA

Fort Belvoir's MS4 permit is the regulatory mechanism used to require implementation of stormwater quality BMPs or purchase of nutrient credits necessary to meet the Chesapeake Bay TMDL. The MS4 permit requires Fort Belvoir to define the size and extent of the existing MS4 as well as the impervious and pervious area within the defined MS4 service area.

The first step in the analysis involved distinguishing between regulated and unregulated land areas to define the MS4 service area. Guidance Memo No. 20-2003 - Chesapeake Bay TMDL Special Condition Guidance, defines these terms as:

- **Regulated Land** – For Phase II MS4s regulated land is the conveyances and drainage area that falls within a Census Designated Urbanized Area.
- **Unregulated Land** – Unregulated land means those acres that are not owned or operated by the MS4 permittee AND are located outside the permittee's regulated land.

Additionally, the guidance specifies that the conveyances and drainage areas, within the jurisdictional boundary, covered under a separate MS4 Permit should not be included. While area covered under other VPDES permit for industrial discharges; forested land; agricultural lands; wetlands, and open waters may be excluded from the regulated MS4 service area.

To perform this analysis, Fort Belvoir utilized local ArcGIS data, aerials, and calculation tools, the 2000, 2010 and 2020 census data covering urban areas for the Washington, DC Metropolitan Area, and completed review of other state stormwater permits under the VPDES program. After comparing the regulated areas based on 2000, 2010, 2020 census data to land use at the time and removing areas covered under a separate VPDES Permit, Fort Belvoir was left with a general area that is covered under the MS4 General Permit. With major upcoming changes in regulated areas associated with the Fort Belvoir Industrial Stormwater, expected to occur by January 2025, a recalculation of existing sources was completed in this Phase III plan to account for the additional MS4 service areas. Finally, the breakdown of impervious and pervious area was determined by using the Open Space Study from the Fort Belvoir Real Property Master Plan (Master Plan).

The above approach coupled with GIS impervious surface data rendered a delineation of impervious versus pervious areas within the regulated and non-regulated areas. The step-by-step approach taken are detailed in the following sections.

3.1. TOTAL JURISDICTIONAL BOUNDARY

Fort Belvoir is broken into two separate land masses known as the Main Post and FBNA as discussed in the Introduction and Background section above and as shown in Figure 1 in Appendix A. Based on computed GIS data rounded to the nearest acre, the Main Post covers approximately 7,743 acres while the FBNA covers an additional 806 Acres for a total of 8,549 acres of land within the Fort Belvoir Jurisdictional Boundary.

3.2. REGULATED VS. NON-REGULATED

To further refine the MS4 service area, the 2000, 2010, and 2020 Census data designating urbanized areas within the Fort Belvoir Jurisdictional Boundary were mapped, as these areas are known to be regulated. Once mapped over Fairfax County Aerial Photography from both 2009 and 2024 (Fairfax, 2024), it was

clear that the urbanized areas designated by the census were not accurately representative of land use on Fort Belvoir over time. Figures 2 and 3 shows the changes urbanized areas and land use over time.

The 2000 urbanized area covered all of Fort Belvoir North Area and most of Main Post, except the southwest training area. Many of the areas covered were largely undeveloped forested land; wetlands, and open waters that could be excluded from the regulated MS4 service area. This is believed to be due to unrefined census data tracts.

The 2010 urbanized area covered all of Fort Belvoir North Area and the eastern portion of Main Post, excluding the southwest training area, Davison Army Airfield (DAAF), the Golf Course, The National Museum of the US Army (NMUSA), Alexander T. Augusta Military Medical Center (Hospital Complex), and some portions of the southern peninsula. This aligned closer to land use on Fort Belvoir and was found to be highly representative of where the Belvoir population was (i.e. housing areas), but excluded areas which were developed lands, or 'existing sources', as of June 30, 2009.

The 2020 urbanized covered all of Fort Belvoir North Area, The entire area north of Route 1 on Main post and the eastern portion of Main Post south of Route 1. Essentially, this is a more refined version of the 2000 census data and balanced out the missing exiting sources omitted from the 2010 data. Although this still covered some undeveloped forested land; wetlands, and open waters that could be excluded from the regulated MS4 service area, it was found to be the most representative of land use and 'existing sources', as of June 30, 2009.

Table 4 shows a breakdown of the jurisdictional boundary, and a comparison of regulated acres based on census data. Guidance Memo 20-2003, states:

> *"In all cases, permittees should use their best professional judgment and the best available data to estimate the number of regulated urban pervious and regulated urban impervious acres served by their MS4 system."*

Therefore, Fort Belvoir considered the 2020 census data of being the most representative of land use and 'existing sources', as of June 30, 2009. Therefore, this was used to set the baseline for regulated acreage subject to nutrient and sediment reductions.

Table 4: Summary of Urban Areas on Fort Belvoir

Location	Acres	Totals
Total Jurisdictional Boundary		
Main Post	7,743	8,549
North Area	806	
Regulated Areas Based on 2000 Census Data		
Urban Area - Main Post	5,729	6,535
Urban Area – North Area	806	
Regulated Areas Based on 2010 Census Data		
Urban Area - Main Post	2,251	3,057
Urban Area – North Area	806	
Regulated Areas Based on 2020 Census Data		
Urban Area - Main Post	4,819	**5,625**
Urban Area – North Area	806	

3.1. AREAS COVERED UNDER A SEPARATE VPDES PERMIT

Guidance Memo 20-2003 states that areas covered under a separate MS4 Permit should not be included in the MS4 Service Area calculation and allows areas covered under other VPDES permit for industrial discharges, to be excluded. Therefore, to properly determine the acreage for the MS4 regulated areas it was necessary to determine the acres covered under separate permits based on its regulatory status. Only three other VPDES Permits are known to cover areas within the jurisdictional boundary as shown in Figure 4. Table 5 below shows the breakdown of total acres covered under other permits.

- The Virginia Department of Transportation (VDOT) holds easements for multiple portions of roads along the jurisdictional boundary. VDOT easements cover approximately 118 acres on the Main Post to include sections of Route 1, Fairfax County Parkway, and Jeff Todd Way. VDOT easements cover an additional 159 acres in the Belvoir North Area to include areas of Fairfax County Parkway and Rolling/Barta Roads.

- The Fairfax County (Fairfax Co.) Permit covers a small section (19.8 acres), associated with Fort Belvoir Elementary School, of the jurisdictional area.

- Fort Belvoir currently holds a separate Individual Major Permit for Stormwater Discharges from Industrial (ISW) Activities (VA0092771). The current permit has 31 representative outfalls and covers discharges from those industrial facilities. Drainage areas associated with these 31 outfalls and their significantly identical outfall, total 762.5 acres. Approximately 751 acres on the Main Post and 11.5 acres on the Belvoir North Area. This permit is currently in the process of renewal and is expected to be reissued in by January 1, 2025. Fort Belvoir is expecting a significant reduction of areas covered with the reissuance. Therefore, has chosen to only excluded areas that will continue to by covered under the new permit, from the regulated MS4 service area. Additionally, under the 2017 ISW Permit Fort Belvoir completed an evaluation of the areas covered and assessed the need for development of an action plan. Quantitative sampling results were used to calculate actual loading values and compare to allowable TMDL loading values. It was determined that a TMDL Action Plan was not necessary for the areas covered under the permit.

Table 5: Areas Under Separate VPDES Permits

Permit Holder	Permit Type	Permit Number	Total Acres	Acres on Main Post	Acres in North Area
VDOT	MS4	VA040115	277	118	159
Fort Belvoir	Industrial[1]	VA0092771	300.5	300.5	0
Fairfax Co.	MS4	VA0088587	20	20	0
Total Acres Covered under separate Permit			**597.5**	**138.5**	**159**

[1] Only considers areas assumed to remain permitted after the reissuance of Permit No. VA0092771

With the removal of the areas associated with these permits, the MS4 service area is further refined. The potential MS4 service area on the Main Post is now approximately 4380.5 acres while the North Area is now 647 acres for a total of about 5027.5 acres. The acres covered under these separate permits were then further broken down into two categories: Regulated vs Non-Regulated areas based on the 2020 Census Urban Area, so they could be appropriately discounted from the overall MS4 regulated area. A summary of this breakdown is shown in Table 6, below.

Table 6: Summary of Separate VPDES Permits Based on Regulatory Status

Permit	Location	Total Area*	Regulated
Fort Belvoir Industrial Stormwater Permit (VA0092771)	RO-002 - Airfield East	145	145
	RO-003 - Airfield South	141	141
	RO-016 - Dogue Creek Marina	7	7
	RO-022 – 300 Area Marina	2.5	0
	RO-025 - Meade Road	5	5
TOTAL Acres covered under VA0092771		**300.5**	**298**
VDOT Permit (VA040115)	Richmond Highway (Route 1)	60	28
	Fairfax County Parkway (Main)	43	43
	Fairfax County Parkway (North)	148	148
	Backlick Road (North)	11	11
	Backlick Road	3	3
	Jeff Todd Way	12	12
TOTAL Acres covered under VA040115		**277**	**245**
Fairfax County Permit (VA0088587)	Fort Belvoir Elementary School	20	20
TOTAL Acres covered under VA0088587		**20**	**20**
Total Acres Covered Under Separate Permits		**597.5**	**563**

Based on the above analysis, the estimated land areas draining from the MS4 was calculated by starting with the original full jurisdictional area of 8,579 acres. The appropriate acreages from the analysis, totaling 562 acres, were removed from the associated MS4 land mass, depending on location. The remaining land was divided between regulated and non-regulated areas based on the 2020 census. The total regulated MS4 service area, the additional future MS4 service areas after the 2020 Census selected by Fort Belvoir, and non-regulated areas are summarized in Table 7.

Table 7: Summary of Regulated vs. Non-Regulated Areas

Land Area	Calculation	Final MS4 Acreage
MS4 Service Area – North Area *Based on 2020 Census Urban Area data*	Total Jurisdictional Area (806) - VDOT Easement (159) = MS4 Service Area (647)	647
MS4 Service Area – Main Post *Based on 2020 Census Urban Area data*	Regulated Area (4,819) - VDOT Easement (86) - ISW Permitted (298) - Fairfax County (20) = MS4 Service Area (4,415)	4,415
	Total Regulated MS4 Service Area	**5,062**

Land Area	Calculation	Final MS4 Acreage
Non-Regulated Areas – Main Post *Based on 2020 Census Urban Area data*	Total Jurisdictional Area (7,743) - Regulated Area (4,819) - VDOT Easement (32) - ISW Permitted (2.5) = Non-Regulated Area (2,889.5)	2,889.5
Total Non-Regulated Area within the MS4		**2,889.5**
Total Area Managed Under a Separate VPDES Permit		**597.5**
Total Jurisdictional Area of Fort Belvoir		**8,549**

3.2. PERVIOUS VS. IMPERVIOUS AREAS

The required L2 reductions from the Chesapeake Bay TMDL are calculated based upon the total pervious and impervious surfaces within the regulated MS4 Service Area. Therefore, the next step in the analysis involved reviewing data available to distinguish which portions of the MS4 regulated area are previous vs. impervious. GIS layers for watershed areas and the Fort Belvoir Master Plan for short term (2017) development were used to determine the impervious acres which includes airfield strips, buildings, roads, bridges, driveways, and parking lots. Any areas that were not impervious were considered open space and include forested and wetland areas. The estimated percent impervious from the Open Space study of the Master Plan (Table 5.3 in Appendix B) are displayed in Table 8 below. As these are estimated values and the Master Plan states that impervious areas may vary up to 3% of the value presented, the conservative percentage is used throughout the calculations for this plan.

Table 8: Regulatory Status by Watershed and Acreage

Watersheds	% Impervious	% Conservative	Total Acres	Regulated Acres	Non-Reg Acres	Separate VPDES
Accotink Bay	27	**30**	604	291.5	312.5	0
Accotink Creek	14	**17**	3190	1811.5	981.5	397
Accotink Creek - FBNA	13	**16**	806	647	0	159
Dogue Creek	16	**19**	1850	1750	61	39
Gunston Cove	18	**21**	671	322	346.5	2.5
Pohick Bay	0	**3**	563	0	563	0
Pohick Creek	0	**3**	628	3.5	624.5	0
Potomac River	14	**17**	237	236.5	0.5	0
Totals			***8549***	***5062***	***2889.5***	***597.5***

Each watershed was broken down in the same manner as the 2010 Census data and was divided into categories based on the regulatory status. A summary for each watershed is presented in Table 7. The regulated, non-regulated, and future additional areas covered after the 2020 Census were then multiplied by the conservative impervious surface estimate from the Master Plan and are summarized in Table 8 below.

Table 9: Percent Imperviousness by Watershed

Watersheds	% Impervious*	Regulated Acres	Regulated Impervious Acres	Non-Reg. Acres	Non-Reg. Impervious Acres
Accotink Bay	**30**	291.5	87.5	312.5	94
Accotink Creek	**17**	1811.5	308	981.5	167
Accotink Creek - FBNA	**16**	647	103.5	0	0
Dogue Creek	**19**	1750	332.5	61	11.5
Gunston Cove	**21**	322	67.5	346.5	73
Pohick Bay	**3**	0	0	563	17
Pohick Creek	**3**	3.5	0	624.5	18.5
Potomac River	**17**	236.5	40	0.5	0
Totals		***5062***	***939***	***2889.5***	***381***

Pervious acreages were determined by subtracting the calculated impervious surface acres from the total MS4 Acreage for each of the regulatory categories. The results from the analysis are summarized in Table 9 below. These results will be used to calculate the existing loads and required Phase III (60%) reductions for the Chesapeake Bay TMDL.

Table 10: Pervious vs. Impervious Surface for the MS4 Service Area

Land Area	Impervious Acres	Pervious Acres	Total MS4 Acreage
MS4 Service Area – North Area *Based on 2010 Census Urban Area data*	103.5	543.5	647
MS4 Service Area – Main Post *Based on 2010 Census Urban Area data*	835.5	3579.5	4415
Total Regulated Area (2023) – Phase III	***939***	***4123***	***5062***
Non-Regulated Areas	381	2508.5	2889.5

These new values for the MS4 Service Area will be used throughout the calculations because Fort Belvoir saw a significant change in regulated urban area when compared to the assumed 2009 service areas used in the Phase I plan. Which, as described above was not reflective of land use at the time. This change in regulated MS4 area was due to a smaller area being classified as urban between 2000 and 2010/2020 (Figure 2 and 3), additional easements being given to VDOT, land transfers accounting for over 550 acres, and changes to the Industrial Stormwater Permit which covers sections of the Garrison. All these changes made it difficult to compare progress based on the original baseline loads calculated for the Phase I Action Plan. Therefore, a conservative approach using the 2020 census data, which most accurately reflected both land use and urban areas and provided for the highest load reduction requirements.

4. EXISTING SOURCE LOADS AND TARGET REDUCTIONS

Calculation of existing loads, or a baseline, for each POC is needed to determine management strategies to meet the overall Chesapeake Bay pollution reduction requirements. As required in Part II.A.3 the annual POC loads discharged from existing sources were calculated. Baseline loads for nitrogen, phosphorus, and sediment were established using Fort Belvoir's impervious surface data, along with loading rate data for each POC found in Table 3b (Potomac River Basin) of the 2023 MS4 General Permit. Per Permit Part II.A.9 Loading and reduction values greater than or equal to 10 pounds are calculated and reported to the nearest pound without regard to mathematical rules of precision. Total loads from existing impervious and pervious sources are presented below in Table 11.

Table 11: Calculation of Existing Loads

Pollutant of Concern	Land Use	Regulated Acres	Loading Rate (lbs./ac/yr)	Load per Land Cover (lbs./yr)	Total Existing Load (lbs./yr)
Nitrogen	Urban Impervious	939	16.86	15,832	***57,351***
	Urban Pervious	4,123	10.07	41,519	
Phosphorus	Urban Impervious	939	1.62	1,521	***3,211***
	Urban Pervious	4,123	0.41	1,690	
Total Suspended Solids	Urban Impervious	939	1,171.32	1,099,869	***1,824,692***
	Urban Pervious	4,123	175.8	724,823	

The Phase III WIP and MS4 General Permit special conditions state that MS4 permittees will need to meet L2 scoping reduction requirements for existing sources. The L2 reductions for total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) applied to the regulated MS4 service area were presented in Table 1. Estimated total required reductions were calculated using the total L2 scoping requirements in the Phase III WIP (Table 1) and the existing loads above. Table 12 shows the 100% target reductions to be met by the end of the third MS4 general permit cycle (by 30 June 2028).

Table 12: Existing Loads and Total Required Reductions

Pollutant of Concern	Land Use	Existing Loads (lbs./yr)	Reduction Targets	Reduction by Land Cover (lbs./yr)	Estimated Required Reduction (lbs./yr)
Nitrogen	Urban Impervious	15,832	9%	1,425	***3,916***
	Urban Pervious	41,519	6%	2,491	
Phosphorus	Urban Impervious	1,521	16%	243	***366***
	Urban Pervious	1,690	7.25%	123	
Total Suspended Solids	Urban Impervious	1,099,869	20%	219,974	***283,396***
	Urban Pervious	724,823	8.75%	63,422	

4.1. REDUCTIONS BY PERMIT CYCLE

The estimated pollutant reductions were broken out by MS4 General Permit cycle based on meeting the required 5%, 35%, and 60% reduction by cycle and the total (100%) of the L2 scoping requirement by the end of Phase III. This breakdown is shown in Table 13 and discussed in detail in the following section. Per Permit Part II.A.9 Loading and reduction values greater than or equal to 10 pounds are calculated and reported to the nearest pound without regard to mathematical rules of precision.

Table 13: Estimated Pollutant Reductions by MS4 Permit Cycle

Permit Cycle	L2 Scoping Requirements	TN (lbs./yr)	TP (lbs./yr)	TSS[1] (lbs./yr)
1st Permit Cycle *(2013 – 2018)*	5%	196	18	14,170
2nd Permit Cycle *(2018 – 2023)*	35%	1371	128	99,189
Total Phase II	***40%***	***1567***	***146***	***113,359***
3rd Permit Cycle *(2023 – 2028)*	60%	2350	220	170,037
Total Phase III	***100%***	***3917***	***366***	***283,396***

The 2023 MS4 General Permit Part II.A.3 requires the Permittee to use permit Table 3b to determine the 100% reductions required by the end of the current permit cycle (30 June 2028). Calculated loading rates based on the 5%, 35%, and subsequent 60% reduction requirements were used to calculate each permit cycles required reductions. The following Tables 14 through 16 summarize the calculations for each permit cycle below.

Table 14: Phase I Reductions (5%) Required by 2018, Based on Calculated Loading Rates

Pollutant of Concern	Land Use	Existing Regulated Acres	Calculated Loading Rate (lbs./ac/yr)	Reduction by Land Cover (lbs./yr)	1st Permit Cycle Required Reduction (lbs./yr)
Nitrogen	Urban Impervious	939	0.07587	71	***196***
	Urban Pervious	4,123	0.03021	125	
Phosphorus	Urban Impervious	939	0.01296	12	***18***
	Urban Pervious	4,123	0.00148625	6.13	
Total Suspended Solids	Urban Impervious	939	11.7132	10,999	***14,170***
	Urban Pervious	4,123	0.769125	3,171	

Table 15: Phase II Reductions (35%) required by 2023, Based on Calculated Loading Rates

Pollutant of Concern	Land Use	Existing Regulated Acres	Calculated Loading Rate (lbs./ac/yr)	Reduction by Land Cover (lbs./yr)	2nd Permit Cycle Required Reduction (lbs./yr)
Nitrogen	Urban Impervious	939	0.53109	499	***1,371***
	Urban Pervious	4,123	0.21147	872	
Phosphorus	Urban Impervious	939	0.09072	85	***128***
	Urban Pervious	4,123	0.01040375	43	
Total Suspended Solids	Urban Impervious	939	81.9924	76,991	***99,189***
	Urban Pervious	4,123	5.383875	22,198	

Table 16: Phase III Reductions (60%) required by 2028, Based on Calculated Loading Rates

Pollutant of Concern	Land Use	Existing Regulated Acres	Calculated Loading Rate (lbs./ac/yr)	Reduction by Land Cover (lbs./yr)	3rd Permit Cycle Required Reduction (lbs./yr)
Nitrogen	Urban Impervious	939	0.91044	855	***2,350***
	Urban Pervious	4,123	0.36252	1,495	
Phosphorus	Urban Impervious	939	0.15552	146	***220***
	Urban Pervious	4,123	0.017835	74	
Total Suspended Solids	Urban Impervious	939	140.5584	131,984	***170,037***
	Urban Pervious	4,123	9.2295	38,053	

4.2. TOTAL REQUIRED PHASE III REDUCTION

As per the Phase I, Phase II, Phase III WIPs and the MS4 General Permit #VAR040093 Part II.A, the permittee, Fort Belvoir, is required to reduce source loads of POCs by 100% by the end of the permit cycle on 31 October 2028. All Phase III permit reductions are to be calculated using Table 3b of the MS4 General Permit #VAR040093. The results are presented in Table 17 below. The reductions required by the end of 2028 match the combined reductions based on meeting 5%, 35%, and 60% of the L2 scoping requirements as shown in Table 13. The total third permit cycle required reduction reflects the minimum goals for BMP implementation to offset pollutant loads for the 2023-2028 MS4 General permit cycle.

It should be noted that the 2010 and 2020 CUA covered significantly less of Fort Belvoir then the 2000 CUA (Figures 2 and 3). Additionally, as discussed in section 3 the 2010 CUA excluded significant portions of development on the installation It is Belvoir's best professional judgment to apply the full 100% reduction to the existing developed lands served by the MS4 located within the 2020 CUA considered to be most reflective of actual land use on the installation in 2009. This provides for a conservative calculation towards reduction goals and results in higher reduction requirements than originally assessed in the Phase I Action Plan.

Table 17: Summary of L2 Phase III Reduction Requirements

Pollutant of Concern	Sub Source	Loading Rate[1] (lbs./ac/yr)	Existing Regulated Lands[2] (ac)	Existing loads[3] (lbs./yr)	Total L2 Reduction Required	L2 Reduction required by 2028	Reduction by Land Cover[4] (lbs./yr)	3rd Permit Cycle Required Reduction[5] (lbs./yr)
TN	Urban Impervious	16.86	939	15,832	9%	100 %	1,425	***3,916***
	Urban Pervious	10.07	4,123	41519	6%		2,491	
TP	Urban Impervious	1.62	939	1521	16%		243	***366***
	Urban Pervious	0.41	4,123	1690	7.25%		123	
TSS[6]	Urban Impervious	1171.32	939	1,099,870	20%		219,974	***283,396***
	Urban Pervious	175.8	4,123	724,823	8.75%		63,422	

[1]Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2
[2]To determine the existing developed acres required in Column B, permittees should first determine the extent of their regulated service area based on the 2010 Census Urbanized Area (CUA). Next, permittees will need to delineate the lands within the 2010 CUA served by the MS4 as pervious or impervious as of the baseline date of 30 June 2009. **Note:** Belvoir used conservative approach delineating lands using the 2020 CUA
[3]Existing Loads = Loading Rate x Existing Regulated Lands
[4]Reduction by Land Cover = Existing Loads x (Total L2 Reduction by 2028 ÷ 100)
[5]3rd Permit Cycle Required Reduction = The sum of the sub source cumulative reduction required by 31 October 2028 (lbs./yr) as calculated in Reduction by Land Cover.
[6] Although formerly required under the 2018-2023 permit cycle, sediment load reductions are no longer a requirement of the current 2023-2028 permit cycle but have been kept in this plan as a courtesy.

5. REDUCTIONS ACHIEVED AS OF NOVEMBER 1, 2023

Permit Part II.A.12.b requires the permittee to denote the total reductions achieved as of November 1, 2023, for each POC and provide a list of BMPs implemented to meet said reductions. To meet the reduction requirements, permittees are allowed to implement BMPs as presented in the Virginia Stormwater BMP Clearinghouse or those approved by the Bay Program. Fort Belvoir has used a mix of the following strategies to address the 40% reduction required by 31 October 2023:

- ***Urban Structural SMFs:*** Constructing local stormwater facilities when new development, re-development, and retrofits are considered..
- ***Urban Stream Restoration:*** Urban streams restored using one of the four expert panel report methodologies, as adjusted to account for the unregulated baseline load.
- ***Shoreline Management:*** Employing tidal shoreline practices that prevent and/or reduce tidal sediments to the Bay to include structural or hard practices, vegetated practices, or a mix of hardened and vegetative practices.
- ***Street Sweeping:*** Removing nutrients and sediment from roadways before transported offsite in stormwater flows.
- ***Land Use Change:*** Credit for lands converted to a land use with a lower associated pollutant load.

Each of these strategies are detailed in the following sections to include under what condition credits are earned, the date of implementation, the load reduction achieved. Table 19 below summarizes the achieved reductions by BMP type, as of November 1, 2023.

Table 18: Total Reductions Achieved by BMP Type

POC	BMP	40% Required Reduction Phase II (lbs./yr)	Reductions Achieved (lbs./yr)
Nitrogen	Urban Structural SMFs	**1,567**	2,970
	Stream Restoration		503
	Shoreline Management		8.55
	Street Sweeping		222
	Land Use Change		248
Total Nitrogen Reduction Achieved			***3,952***
Phosphorus	Urban Structural SMFs	**146**	255
	Stream Restoration		456
	Shoreline Management		6.04
	Street Sweeping		64
	Land Use Change		38
Total Phosphorus Reduction Achieved			***818***
Total Suspended Solids[1]	Urban Structural SMFs	**113,359**	286,791
	Stream Restoration		101,394
	Shoreline Management		29,484
	Street Sweeping		92,558
	Land Use Change		38,960
Total Suspended Solids Reduction Achieved			***549,187***

Fort Belvoir found that using both structural and non-structural BMPs applied during the first permit cycle was enough to meet the reductions required up through Phase III, or the full 100% or above for all three POCs. This was found to be true both when using the original 2009 loads, based on the 2000 CUA from the Phase I plan and when using the adjusted loads calculated as a part of this Phase III plan as discussed in Section 4, as shown in table 19 below.

Table 19: Total Required Reductions vs. Reductions Achieved

Pollutant of Concern	Land Use	Existing Regulated Acres[1] (2009)	Phase III Reduction based on 2000 CUA[3] (lbs./yr)	Existing Regulated Acres[2] (2023)	Phase III Reduction based on recalculated MS4 Service Area[3] (lbs./yr)	Total Reductions Achieved[4] (lbs./yr)
Nitrogen	Urban Impervious	1050.73	***2,367***	939	***3,916***	***3,952***
	Urban Pervious	1279.2		4,123		
Phosphorus	Urban Impervious	1050.73	***310***	939	***366***	***819***
	Urban Pervious	1279.2		4,123		
Total Suspended Solids[5]	Urban Impervious	1050.73	***265,826***	939	***283,396***	***549,187***
	Urban Pervious	1279.2		4,123		

[1] Regulated Acres Calculated by the Phase I Chesapeake Bay TMDL Action Plan dated March 2016.
[2] Regulated Acres Calculated in Phase III Chesapeake Bay TMDL Action Plan based on 2020 census urban area and smaller area covered under the Fort Belvoir Industrial Permit.
[3] Total Phase III Reductions (100%) as calculated using the adjusted loading rates.
[4] Total achieved Reductions shown here are the sum of the reductions achieved through the implementation of all structural and non-structural methods. All calculations are provided in the following sections and were completed using methodologies presented in Appendix V of the Chesapeake Bay TMDL Special Condition Guidance (GM 20-2003).
[5] Although formerly required under the 2018-2023 permit cycle, sediment load reductions are no longer a requirement of the current 2023-2028 permit cycle but have been kept in this plan as a courtesy.

5.1. URBAN STRUCTURAL SMFS

Fort Belvoir maintains a current inventory of SMFs that have been built to meet Virginia water quality requirements or that have been implemented as retrofits. Data collected from field assessments are used to maintain the Fort Belvoir SMF Database. The SMF Database serves as a tracking and record keeping tool and can also be used to determine the pollutant reductions provided by implementing various SMFs. When Fort Belvoir implements additional stormwater SMFs, the database is expanded and used to manage urban SMFs over time.

As of November 1, 2023, Fort Belvoir has installed approximately 369 urban SMFs including one (1) Regional facility and 368 smaller SMFs, that have been installed since the 2005 Base Realignment and Closure (BRAC) implementation. Table 20 below provides a summary of all SMF types installed. More are being installed regularly to meet Virginia's Water quantity and quality requirements for new development and redevelopment projects. Credits attributed to these BMPs are reported via the VADEQ BMP Warehouse as well as secondarily reported through the annual DoD Chesapeake Bay Data Call.

Table 20: Fort Belvoir Urban SMF Inventory

BMP Type	Practice Description	Number of Practices Implemented	Total Practices
Basins (P-BAS)	Extended Detention Pond	58	73
	Wet Pond	7	
	Constructed Wetlands	2	
	Rainwater Harvesting	6	
Filtration and Infiltration Practices (P-FIL)	Vegetated Roof	6	113
	Permeable Pavement	11	
	Bioretention	91	
	Filtering Practice (Sand Filters)	2	
	Filter Strips w/ Compost Amendment	3	
	Infiltration Practices (Basins, Trenches, Underground Detention w/ Infiltration, etc.)	32	32
Conveyances (P-CNV)	Grassed Channels	4	14
	Dry Swales	10	
Manufactured Treatment Devices (P-MTD)	Hydrodynamic Devices	17	88
	Filtering/Biofiltering Devices	71	
Miscellaneous	Underground Detention System	49	49
	Total Number of Installed SMFs		***369***

Credits described in this section were only applied to the SMFs that were installed after January 1, 2006, have been accepted by the VADEQ BMP Warehouse, have been assigned a BMP Warehouse ID, have received adequate inspections and maintenance, and are continuing to function as designed as of November 1, 2023. As summarized in Table 21 and shown in Figure 5, out of the 369 total SMFs on Fort Belvoir, credit was only taken for 239 SMFs, with 130 SMFs being excluded for the following reasons:

- 115 were installed prior to January 1, 2006, – and were removed from further consideration for credits, leaving a total of 254 SMFs that could be considered towards meeting the required 40% Phase II reductions. (it should be noted that these SMFs may receive credit for a retrofit if additional credits are necessary in the future).
- Six (6) were cisterns or rain barrels, of which no credits for TN or TP were included since Zero pollutant removal rate is applied to the rainwater harvesting system only. Nutrient removal rates for secondary practices will be in accordance with the design criteria for those practices.
- Three (3) were vegetated filter strip with compost amendments, of which no credits apply under the VADEQ BMP Clearinghouse.
- Six (6) were vegetative roofs, where not enough information was available during this assessment to determine whether Level 1 or Level 2 design criteria under the VADEQ BMP Clearinghouse were met, and thus these were excluded. (it should be noted that if further information on these facilities is found credit may be applicable to these units in the future)

Table 21: Summary of SMFs determined to qualify for credits installed prior to November 1, 2023

BMP Type	Practice Description	Number of Practices Implemented		Total Practices	Total Acres Treated
Basins (P-BAS)	Extended Detention Pond	Level 1	26	30	239
		Level 2	1		59
	Wet Pond	Level 1	3		25
Filtration and Infiltration Practices (P-FIL)	Permeable Pavement	Level 1	10	80	19
		Level 2	1		5.18
	Bioretention	Level 1	48		100
		Level 2	19		33
	Filtering Practice (Sand Filters)	Level 1	2		4.22
	Infiltration Practices (Basins, Trenches, Underground Detention w/ Infiltration, etc.)	Level 1	23	27	66
		Level 2	4		10
Conveyances (P-CNV)	Grassed Channels	N/A	3	13	0.68
	Dry Swales	Level 1	9		5.29
		Level 2	1		2.24
Manufactured Treatment Devices (P-MTD)	Hydrodynamic Devices	N/A	8	64	9.01
	Filtering/Biofiltering Devices	N/A	56		26
Miscellaneous	Underground Detention System	N/A	25	25	76
Total Number of Installed SMFs				***239***	***680***

The SMFs' efficiency can be translated into pounds by first calculating what the site's POC loading would be without the facility being installed. This is done by using the 2009 Edge of Stream (EOS) loading rates, acquired within Permit Table 3b for the Potomac River Basin. Table 22 summarizes the existing loads from lands treated by these SMFs.

Table 22: Baseline Loading Rate for Regulated Acres Treated by SMFs

Pollutant of Concern	Land Use	Regulated Acres	2009 EOS Loading Rate (lbs./ac./yr.)	Load per Land Cover (lbs. /yr.)	Total Existing Load (lbs. /yr.)
Nitrogen	Impervious	348	16.86	5,867	**9,220**
	Pervious	333	10.07	3,353	
Phosphorus	Impervious	348	1.62	564	**701**
	Pervious	333	0.41	137	
Total Suspended Solids	Impervious	348	1,171.32	407,619	**466,160**
	Pervious	333	175.8	58,541	

According to Appendix V.A of the Chesapeake Bay TMDL Special Condition Guidance, the SMF must meet all the design requirements that are listed in the Virginia Stormwater BMP Clearinghouse's technical specification for that SMF, not just the one-inch requirement for runoff depth treated. Where sufficient information was available to determine that SMFs met all the design requirements, Table V.A.1 reductions were used in calculations. Where insufficient information was available then the Bay Program Established Efficiencies from Appendix Table V.C.1 was utilized, as stated in GM20-2003.

> *These efficiencies may be used for BMPs that do not meet the Virginia Stormwater BMP Clearinghouse design specifications.*

The guidance additionally states that there are no established efficiencies for TSS in the Virginia Stormwater BMP Clearinghouse. To calculate the TSS reductions, the Bay Program Established Efficiencies from Appendix Table V.C.1 was utilized. Table 23 summarizes the TN, TP, TSS reduction efficiencies used in the calculations.

Table 23: Summary of Efficiencies used in Credit Calculations

BMP Type	Practice Description	TN	TP	TSS[1]
Basins (P-BAS)	Extended Detention Pond	Level 1: 10 Level 2: 24	Level 1: 15 Level 2: 31	60
	Wet Pond	Level 1: 20[2] Level 2: 30[2]	Level 1: 45[2] Level 2: 65[2]	60
Filtration and Infiltration Practices (P-FIL)	Permeable Pavement	Level 1: 59 Level 2: 81	Level 1: 59 Level 2: 81	70
	Bioretention	Level 1: 64 Level 2: 90	Level 1: 55 Level 2: 90	80
	Filtering Practice (Sand Filters)	Level 1: 30 Level 2: 45	Level 1: 60 Level 2: 65	80
	Infiltration Practices (Basins, Trenches, Underground Detention w/ Infiltration, etc.)	Level 1: 57 Level 2: 92	Level 1: 63 Level 2: 93	95
Conveyances (P-CNV)	Grassed Channels	28[3]	24[3]	70
	Dry Swales	Level 1: 55 Level 2: 74	Level 1: 52 Level 2: 76	70
Manufactured Treatment Devices (P-MTD)	Hydrodynamic Devices	5[4]	10[4]	10
	Filtering/Biofiltering Devices	40[5]	60[5]	80
Miscellaneous	Underground Detention System	5[4]	10[4]	10

[1] From Bay Program Established Efficiencies for sediment from Appendix Table V.C.1
[2] Lower nutrient removal efficiency from Table V.A.1 applicable to wet ponds in coastal plain terrain.
[3] From BMP Clearinghouse Design Specification for Grass Channels, conservatively assuming C and D Soils with no Compost Amendments
[4] From Bay Program Established Efficiencies for Dry Detention Ponds and Hydrodynamic Structures from Appendix Table V.C.1
[5] From Bay Program Established Efficiencies for Urban Filtering Practices from Appendix Table V.C.1 – Conservative approach ignores known higher efficiencies for some proprietary systems

Applying the efficiencies noted in Table 23 to the existing baseline loads calculated for the area serviced by an SMF the total achieved reductions were calculated and are summarized by SMF Type in Table 24, below.

Table 24: Summary of Reductions Achieved By Urban Structural SMF Type

Practice Description	Number of Practices		Nitrogen Reduction Achieved (lbs./yr)	Phosphorus Reduction Achieved (lbs./yr)	TSS Reduction Achieved (lbs./yr)
Extended Detention Pond	Level 1	26	314	34	89,744
	Level 2	1	192	19	23,852
Wet Pond	Level 1	3	72	13	11,894
Permeable Pavement	Level 1	10	147	11	8,644
	Level 2	1	71	6.80	4,247
Bioretention	Level 1	48	851	54	52,087
	Level 2	19	387	27	15,731
Filtering Practice	Level 1	2	18	2.80	2,521
Infiltration Practices	Level 1	23	525	46	46,852
	Level 2	4	124	9.18	6,145
Grassed Channels	N/A	3	4.70	0.30	258
Dry Swales	Level 1	9	36	2.32	1,972
	Level 2	1	24	1.98	1,244
Hydrodynamic Devices	N/A	8	6.92	1.22	857
Filtering/Biofiltering Devices	N/A	56	143	16	14,360
Underground Detention Systems	N/A	25	56	9.26	6,382
	Totals	**239**	**2,970**	**255**	**286,791**

5.2. URBAN STREAM RESTORATION

Stream restoration is a carefully designed intervention to improve the hydrologic, hydraulic, geomorphic, water quality, and biological condition of degraded urban streams. According to Appendix V.J of the Guidance, urban stream restoration projects that have been installed on or after January 1, 2006 may receive credit using the following four (4) protocols:

1. Prevented Sediment during Storm Flow
2. In-Stream and Riparian Nutrient Processing During Base Flow
3. Floodplain Reconnection Volume
4. Dry Channel Regenerative Stormwater Conveyance (RSC) as an Upland Stormwater Retrofit

Each protocol has certain requirements that need to be met to qualify. As the completed stream restoration projects at Fort Belvoir are stream restoration practices that prevent channel or bank erosion that would otherwise be delivered downstream from an actively enlarging or incising urban stream, Protocol 1 is most applicable.

All streams that are candidates for restoration, the U.S. Environmental Protection Agency Rapid Bio Assessment Protocol is used for evaluation. Since 2013, Fort Belvoir has also used the Bank Assessment for Non-point source Consequences of Sediment (BANCS) method to quantitatively predict stream bank erosion rates for each stream evaluation. Natural stream design is employed and takes into consideration the site conditions and any known proposed changes in flows. All urban stream restoration projects completed prior to November 1, 2023, obtained the appropriate Section 404 permits and have maps clearly identifying the project area including drainage areas, photographs of the project area demonstrating the degraded nature of the project area; and proposed verification activities such as periodic visual inspections to demonstrate ongoing performance of the project. at a minimum these projects are originally monitored per the approved permit to ensure proper establishment, and then enter a long-term verification cycle described in Section 7 of this plan.

All urban stream restoration was completed prior to the 2021 guidance document and therefore not all specific data needed is not readily available, for completion of calculations under Protocol 1. Guidance Memo 20-2003, issued in 2021, after the most recent project, allows for:

> *"Completed projects previously approved by DEQ that use established crediting methods in place at that time, will continue to receive those credits."*

As such, the interim approved removal rates which were applied at the time will continue to be used for stream restoration projects reported during the Phase I and Phase II Chesapeake Bay TMDL Action Plan. This allows for a more conservative and consistent approach in calculating credits. These rates are presented in the Table 25 below.

Table 25: Default Removal Rates in 2014 Expert Panel Report

Credits	TN	TP	TSS
Mass Reduction/length (lbs./linear foot)	0.075	0.068	44.88 *non-coastal plain* 15.13 *coastal plain*

Not all projects qualify for credits when it comes to nutrient and sediment load reductions. The Expert Panel report defining removal rates from individual restoration projects states that any sections that are tidally influenced or projects that are primarily designed to protect public infrastructure by bank armoring or rip rap do not qualify for credit. The following qualifying conditions for acceptable stream restoration credit are as follows:

- An entire urban stream reaches greater than 100 ft in length that is still actively enlarging or degrading in response to upstream development.
- Comprehensive stream restoration design, involving the channel, banks, and floodplain using state approved design methods.
- Special consideration is given to projects that are explicitly designed to reconnect the stream with its floodplain and/or create in stream habitat features known to promote nutrient uptake and/or de-nitrification.
- Pre- and post-project monitoring may be required to substantiate bank/channel erosion rates, using bank pins, cross-sectional surveys, or other methods to be eligible for credits under all protocols above. (Schueler & Stack, 2014)

As of November 1, 2023, ten (10) stream restoration projects have been completed on Fort Belvoir between the years 2009 and 2019, prior to February 2021 (when the new guidance 20-2003 was published). One project required an individual permit, but all completed projects qualified for the conditions of Nationwide Permit, Aquatic Habitat Restoration, Establishment and Enhancement Activities (USACE, 2016). In addition, all completed projects were located completely within the regulated MS4 service area defined in Delineation of the MS4 Service Area and consisted of over 100 linear feet of project area. The stream restoration projects considered for credits to meet the 40% reduction requirements are summarized in Table 26 below, Figure 6 shows the location of these projects.

Table 26: Completed Stream Restoration Projects

Project Site	Type	Master Plan EIS Site #	Year Completed	Linear Feet (LF)	Considered for Credits?
Surveyor Road	Natural Channel Design	7	2009	1,635	Yes
Hospital – West	Natural Channel Design	8	2010	920	Yes
North Area	Natural Channel Design	9	2011	128	Yes
Herryford Village	Natural Channel Design	10	2011	1,335[1]	Yes
Meade Road	Natural Channel Design	11	2016	695	Yes
AW – 5	Legacy Sediment Removal	N/A	2017	140	Yes
AW – 7	Legacy Sediment Removal	N/A	2017	295	Yes
AW – 8	Legacy Sediment Removal	N/A	2017	235	Yes
ADFE Culvert #3	Natural Channel Design	N/A	2019	1,109	Yes
NMUSA Stream	Natural Channel Design	25	2019	210	Yes
			Total Projects Considered for Credits:	***18,718***	***10***

[1] Originally 1,455 linear feet, lost credit on Reach 8 (120 LF) after the 2019 verification inspection/evaluation was completed

A total of 6,822 linear feet of streams have been restored between 2009 and 2023 for which may qualify for credits. As of November 1, 2023, only a total of 6,702 linear feet have continued to meet design performance standards and qualify for credits. All permit closeout certifications, continued verification inspections, mapping, etc. are kept by DPW-Environmental and available upon request. Details on credits maintenance for urban stream restoration projects are further discussed in Section 7.2.

Appendix V.J of the Guidance (GM20-2003) was used to determine the achieved reductions from stream restorations to include the adjustments for unregulated lands. The Guidance states that permittees may receive the following adjusted credits from:

1. **Regulated Urban Acres:** The full reduction credits for the portion of the project that receives drainage from regulated acres.
2. **Unregulated Acres:** An adjusted reductions credit for the portion of the project that receives drainage from unregulated acres. Either half of the total credit calculated from the chosen protocol, or the difference between the calculated credits minus the required L2 reductions, whichever is less.
3. **Forested or Agricultural Acres:** The full reduction credits for the portion of the project that receives drainage from forested lands as there is no baseline requirement for these lands.

Table 27 below summarizes the reductions achieved as of November 1, 2023, from the qualifying urban stream restoration projects. Fort Belvoir Main Post is located within the Coastal Plain while North Area is on the Piedmont Upland Region. Since only a small portion of stream has been considered for credits within the Piedmont Region, a conservative approach was taken and only the smaller removal rate for the coastal plain of 15.13 is used in all calculations. Additionally, due to the locations of the restored stream channels no adjustments for unregulated portions of land were required.

Table 27: Reductions Achieved from Urban Stream Restoration Projects

POC	Linear Feet Restored (ft)	Removal Rates (lbs./ft/yr)	Reduction Achieved (lbs./yr)
Nitrogen	6,702	0.075	***503***
Phosphorus	6,702	0.068	***456***
Total Suspended Solids	6,702	15.13	***101,394***

5.3. URBAN SHORELINE MANAGEMENT

Shoreline Management is defined as any tidal shoreline practice that prevents and/or reduces tidal sediments to the Bay. Shoreline Management practices can include living shorelines, revetments and/or breakwater systems, bulkheads, and seawalls. The Chesapeake Bay Expert Panel on Shoreline Management has recommended that all new shoreline management projects could receive credit for reducing nutrients and sediment through the following four distinct protocols which target different aspects of typical shoreline management designs, plus a default rate, making a total of five protocols.

1. Prevented Sediment
2. Credit for De-nitrification
3. Credit for Sedimentation
4. Credit for Marsh Redfield Ratio
5. Default Removal Rates

Practices that have vegetated areas and are designed to prevent sediment may qualify for reductions from protocols 1 through 4 while practices without any vegetative surface areas do not qualify for credits from protocols 2, 3, and 4. (Drescher & Stack, 2015). Although the protocols 1 through 4 for shoreline management can be used, the Expert Panel suggests that the use of the Default Removal Rates is viable for credits when projects do not conform to the individual reporting requirements for the protocols. Since Fort Belvoir has taken a conservative approach in calculating credits, the default removal rates developed by the Expert Panel, presented in Table 28 below, will be used. The values for TN and TP removal are based on the 2014 stream restoration removal rates. The stream restoration removal rates are important as shoreline management practices are commonly if not exclusively reported as stream restoration to the EPA Chesapeake Bay Program Office. (Drescher & Stack, 2015)

Table 28: Shoreline Management Default Removal Rates

Credits	TN		TP		TSS (lb/ft/yr)	
Mass Reduction/length (lbs./linear foot)	0.04756 0.01218	*Maryland* *Virginia*	0.03362 0.00861	*Maryland* *Virginia*	164.0 42.0	*Maryland* *Virginia*

Not all shoreline management projects may qualify for sediment or nutrient reduction credits. Basic qualifying conditions are extremely important, and each shoreline management practice must pass all conditions prior to any credits being claimed. On all occasions, living shorelines are preferred. No credits are offered for projects that were required for mitigation. The Expert Panel on Shoreline Management states that the basic requirements for credits are dependent on the type of practice used. Table 29 below shows the qualifying conditions for each type of practice.

Table 29: Basic Qualifying Criteria for Shoreline Management Projects

Shoreline Management Practice	The Practice Must Meet these Criteria for TMDL Pollutant Load Reduction[1]
Living Shoreline – a) non-structural b) hybrid system including a sill c) hybrid system including a breakwater	1. The site is currently experiencing shoreline erosion or is replacing existing armor. The site was graded, vegetated, and excess sediment was removed or used.[2] AND 2. When a marsh fringe habitat (a or b) or beach/dune habitat (c) is created, enhanced, or maintained.

Shoreline Management Practice	The Practice Must Meet these Criteria for TMDL Pollutant Load Reduction[1]
Revetment AND/OR Breakwater system without a living shoreline	1. The site is currently experiencing shoreline erosion, AND 2. A living shoreline is not technically feasible or practicable as determined by substrate, depth, or other site constraints. AND 3. When the breakwater footprint would not cover Submerged Aquatic Vegetation (SAV), shellfish beds, and/or wetlands.
Bulkhead/Seawalls	1. The site is currently experiencing shoreline erosion. AND 2. The site consists of port facilities, marine industrial facilities, or other marine commercial areas where immediate offshore depth (e.g., depths deeper than 10 feet 35 feet from shore) precludes living shoreline stabilization or the use of a breakwater or revetment.
[1]Projects that impact the Chesapeake Bay Preservation Act protected vegetation without mitigation receive no Chesapeake Bay TMDL pollutant load reduction. Further, the Water Quality Goal Implementation Team (WQGIT) agreed to allow States to determine, on a case-by-case basis, when the unintended consequences of negative impacts to wetlands and SAVs caused by these shoreline management techniques, outweigh the benefits, in which case the practice will not be reported to the Bay Program for model credit.	

As of November 1, 2023, Fort Belvoir has completed two (2) shoreline restoration projects both located in Gunston Cove. The first project was completed in 2010 and involved the replacement of approximately 500 ft of bulkhead with vegetative practices. The second project was done in 2014 and was the reconstruction of 104 linear feet of a deteriorating seawall at the 300-area marina and installation of a 196 ft wave screen to encourage natural regeneration of existing shoreline vegetation. A total of 800 linear feet of shoreline restoration was originally considered for credits using the default removal rates for Virginia; however, the protocols were not used because sufficient information was not available for the acreages of vegetation post construction and the erosion rates pre-construction. Table 30 below summarizes the updated reductions achieved from these projects based on the verification data.

Table 30: Reductions Achieved from Shoreline Management Projects

POC	Linear Feet Restored (ft)	Removal Rates (lbs./ft/yr)	Reduction Achieved (lbs./yr)
Nitrogen	702[1]	0.01218	***7.28***
Phosphorus	702[1]	0.00861	***5.15***
Total Suspended Solids	702[1]	42.0	***25,116***
[1] Originally 1,455 linear feet, lost credit on Reach 8 (120 LF) after the 2019 verification inspection/evaluation was completed			

A total of 800 linear feet of streams have been restored between 2009 and 2023 for which may qualify for credits. As of November 1, 2023, only a total of 702 linear feet have continued to meet design performance standards and qualify for credits. All permit closeout certifications, continued verification inspections, mapping, etc. are kept by DPW-Environmental and available upon request. Details on credits maintenance for urban shoreline management projects are further discussed in Section 7.3.

5.4. STREET SWEEPING

Street sweeping is an effective strategy of removing nutrient and sediment loads prior to them being transported in stormwater runoff, making frequent sweeping of prioritized areas an effective strategy to receive pollutant reduction credits to meet Bay TMDL targets. Formerly, there were two approaches for calculating pollutant removal: the mass loading approach and the qualifying street lanes method. These methods are being phased out and are no longer accepted as a crediting method.

The revised street cleaning approach uses the Windows Source Loading and Management Model (WinSLAMM), to determine allowable street cleaning credit. This revised method is outlined in Appendix V.G of the Chesapeake Bay TMDL Special Condition Guidance and is now used to calculate load reductions. The process by which this was implemented is as follows:

1. Determine which street cleaning scenario your program falls under.
2. Calculate loading rate associated with the impervious area swept.
3. Calculate your load reductions.

Table 31 below summarizes the street sweeping practices available for credit, according to Appendix V.G of the Chesapeake Bay TMDL Special Condition Guidance.

Table 31: Street Cleaning Practices Available for Credit

	Practice #	Description	Passes/Year (approx.)	% TSS Removal	% TN Removal	%TP Removal
Advanced Sweeping Technology (vacuum or regenerative air sweeping technologies)	SCP-1	2 passes per week	100	21	4	10
	SCP-2	1 pass per week	50	16	3	8
	SCP-3	1 pass every 2 weeks	25	11	2	5
	SCP-4	1 pass every 4 weeks	10	6	1	3
	SCP-5	1 pass every 8 weeks	6	4	0.7	2
	SCP-6	1 pass every 12 weeks	4	2	0	1
	SCP-7	Seasonal scenario 1 or 2	15	7	1	4
	SCP-8	Seasonal scenario 3 or 4	20	10	2	5
Mechanical Broom Technology	SCP-9	2 passes per week	100	1.0		
	SCP-10	1 pass per week	50	0.5		
	SCP-11	1 pass every 4 weeks	10	0.1		
Seasonal scenarios are defined as follows: S1: Spring – One pass every week from March to April. Monthly otherwise. S2: Spring – One pass every other week from March to April. Monthly otherwise. S3: Spring and Fall – One pass every week (March to April, October to November). Monthly otherwise. S4: Spring and Fall – One pass every other week during the season. Monthly otherwise.						

Fort Belvoir has an existing street sweeping program executed by a contractor already in place. The Operation and Maintenance Contractor uses a regenerative vacuum sweeper (TYMCO Model 600) to conduct sweeping on roads and parking lots once a month. The current contract specifies 13,000,481 sq.yd. (2,686 ac.) of land that should be swept monthly. During the 2020-2021 reporting period, DPW Environmental calculated that of the total area swept, only 6,376,212 sq.yd. (1,317 ac.) or 49% fell within the regulated MS4 area.

Because this is an enforceable contractual requirement, and a conservative approach was used in determining the acres swept within the regulated MS4 area (i.e. in 2021 the MS4 regulated acres accounted for less area than expected after the reduction in areas covered under the industrial permit.) although this is an annual operation BMP, it is assumed that the minimum reduction credits shown below will be effective for the life of the permit.

The following steps were taken to determine reductions from the street sweeping:

1. Determine which street cleaning scenario your program falls under: There is a total of 6,376,212 sq.yd. of roadways and parking lots that are currently swept once per month. Due to this, sweeping will occur on a basis of one pass every four weeks, meeting Practice SCP-4. As these values were given in square yards, this needs to be converted to acres using the conversion factor of 4,840 sq.yd. in an acre:

$$\left(6{,}376{,}212\ sq.yd.\left(\frac{1\ acre}{4{,}840\ sq.yd.}\right)\right) = 1{,}317.40\ acres$$

   Acreage may then be converted to curb-lane miles swept using the conversion factor of one acre = once curb-lane mile rule of thumb, making 1,317.40 curb-lane miles swept once every month.

2. Calculate loading rate associated with the impervious area swept: Multiplying the curb-lane miles swept by the values for the pre-sweeping loading rates for urban impervious cover within the Potomac River Basin is the next step. The pre-sweeping loading rates were acquired from the MS4 Permit Part II.A.3, Table 3b. This calculation is summarized in Table 32 below.

Table 32: Calculate drain Loading Rate for the Potomac River Basin

POC	Curb-Lane Miles Swept (ac)	Pre-Sweeping Load (lbs./ac/yr)	Pre-Sweep Baseline Load (lbs./yr)
TN	1,317	16.86	22,204
TP	1,317	1.62	2,134
TSS	1,317	1,171.32	1,542,628

3. Calculate your load reductions: The last step is to determine reductions from street sweeping by multiplying the loading rate by the removal rate for SCP-4 shown in step 1. This calculation is summarized below in Table 33.

Table 33: Reductions Achieved Through Street Sweeping

POC	Pre-Sweep Baseline Load (lbs./yr)	Removal Rate Percentage	Reduction Achieved (lbs./yr)
TN	22,204	0.01	***222***
TP	2,134	0.03	***64***
TSS	1,542,628	0.06	***92,558***

5.5. LAND USE CHANGE

As part of the "all of the above" approach, Fort Belvoir looks for opportunities to receive credit for land use change conversions and apply the appropriate credit as per Appendix V.H of the Guidance. This may include converting impervious to forest, impervious to mixed open, impervious to turf, turf to forest, turf to mixed open, or mixed open to forest. Upon completion of a land use change BMP, Table V.H.1 Land Use Change Conversion Efficiency table found in the Guidance can be used to calculate the reductions. The Guidance goes on to define the land uses as:

1. Forest – must meet the tree density per acre as described in the Virginia Department of Forestry's Land Use Tax Assessment Standards.
2. Mixed Open – herbaceous cover that is minimally disturbed (periodically bush hogged, meadows, etc.) and is unmanaged (i.e., no nutrient application).
3. Turf – managed grass or lawns.

The conversion efficiencies for the Potomac River Basin are presented in Table 34, below.

Table 34: Land Use Change Efficiencies for the Potomac River Basin

Original Land Use	Post Conversion Land Use	EOS Reductions TN (lbs./ac/yr)	EOS Reductions TP (lbs./ac/yr)	EOS Reductions TSS (lbs./ac/yr)
Impervious	Forest	9.85	0.80	1797
Impervious	Mixed Open	9.55	0.48	877
Impervious	Turf	4.27	0.00	1240
Turf	Forest	5.58	1.46	557
Turf	Mixed Open	5.28	1.15	0
Mixed Open	Forest	0.30	0.32	920

Multiple sites across Fort Belvoir were considered for the land use change credits, to include sites at Belvoir North Area and on the Main Post. Each site was reviewed to see which category of conversion it would fall under. The sites considered, the acreage converted prior to November 1, 2023, and the conversion status are presented in Table 35 below.

Table 35: Sites Considered for Land Use Changes

Site	Acres	Notes	Original Land Use	Post Conversion Land Use
Belvoir North – West	23.71	500 seedlings/acre	Turf	Forest
Belvoir North – East	2.88	300 seedlings/acre	Impervious	Mixed Open
Main post – Roadside	1.65	Managed Turf	Impervious	Turf
Old Dewitt Hospital	3.51	Demolition – Managed Turf	Impervious	Turf
Buildings 807 and 808	0.68	Demolition – Managed Turf	Impervious	Turf
NCE Parking Lot	2.32	500 seedlings/acre	Impervious	Forest
ADFE Bldg 2834, 2855, and Parking Lot	0.58	Demolition – Managed Turf	Impervious	Turf
Old Commissary	8.95	Demolition – Managed Turf	Impervious	Turf

The projects above were all considered as land use changes with the potential for credits. The first three were completed as a part of the Phase I TMDL Action plan. It should be noted that while the Belvoir North – East project planted 300 seedlings/acre, this does not meet the minimum of 400 seedlings/acre tree density to qualify as a change to forest as described in Virginia Department of Forestry's Land Use Tax Assessment Standards and was thus taken credit as a change to mixed open instead. Table 34 below summarizes the total reductions achieved through changes in land cover.

Table 36: Reductions Achieved Through Land Use Changes

Original Land Use	Post Conversion Land Use	Total Acres Converted	Reduction TN (lbs./yr)	Reduction TP (lbs./yr)	Reduction TSS (lbs./yr)
Impervious	Forest	2.32	22.85	1.86	1,797
Impervious	Mixed Open	2.88	27.50	1.38	2,526
Impervious	Turf	15.37	65.63	0.00	19,059
Turf	Forest	23.71	132.30	34.62	13,206
Turf	Mixed Open	0.00	-	-	-
Mixed Open	Forest	0.00	-	-	-
Total Reductions Achieved:			***248***	***38***	***38,960***

6. INCREASED LOADS FROM 2009-2023 NEW SOURCES

Permit Part II.A.4 and 5 requires the permittee to offset increased loads from 'grandfathered' projects including those:

- new sources initiating construction between 1 July 2009 and 31 October 2023 that disturb one acre or greater, because of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities.
- Projects grandfathered in accordance with 9VAC25-875-490 that begin construction after July 1, 2014, if they disturb one acre or greater and utilize of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities.

Additionally, Part II A.12 requires that the permittee defines the means and methods for meeting these additional reductions. Fort Belvoir has determined that there are no additional loads to offset for the following reasons:

- The MS4 Service Area delineated in Delineation of the MS4 Service Area is based on 2023 land use because of significant changes in regulated lands. By redefining the MS4 Service Area using 2023 data as a baseline, the construction activities occurring during the defined period have inherently been captured.
- The Fort Belvoir Master Plan performed an Open Space Analysis in 2011 which showed more than 87 percent (over 7,000 acres) of open space upon completion of anticipated 2023 development. The short term (2017) and long term (2030) open space analysis has set the average land cover condition at 13% and 14% impervious area respectively.
- In 1993, Fairfax County adopted the Chesapeake Bay Preservation Ordinance (CBPO) that protects Resource Protection Areas (RPAs) from most forms of development. Fort Belvoir's RPAs, established as a component of Fairfax County's CBPO, are corridors of environmentally sensitive land that lie alongside or near the shorelines of streams, rivers, creeks, and other waterways which drain into the Potomac River and eventually into the Chesapeake Bay. RPAs protect the Chesapeake Bay and its tributaries from non-point source pollution associated with the use and development of land.
- The EISA of 2007 was adopted in 2009 and required consideration of Low Impact Development (LID) goals for any new federal facility exceeding 5,000 sq. ft. This is substantially lower than the greater than one (1) acre projects that must be considered.
- Fort Belvoir has required the use of the Virginia Runoff Reduction Spreadsheet since 1 July 2012 for all new and redevelopment construction projects. This means that any project approved through VADEQ review past that point used the technology-based criteria and was designed to meet the 0.45 lbs. TP/ac/yr requirement, which is the equivalent TP load for a project with a 16% average land cover condition.
- According to the approved Phase I Chesapeake Bay Actions Plan, VADEQ representative, Kelsey Brooks, communicated through email on 19 August 2014 that Fort Belvoir "is not subject to Special Condition Requirements 7 and 8 because, as a federal facility, any construction projects completed after 30 June 2009 should have met the CGPs design standards for post-development stormwater management facilities (0.45 lbs. P/ac/yr)". Essentially, installations do not have grandfathered projects. (USACE, 2016)

7. MAINTENANCE OF CREDITS

The MS4 Permit Part II.A.7 requires that Fort Belvoir maintain the 40% L2 reductions for total nitrogen and total phosphorus achieved for the entirety of the permit term. As discussed in Section 4, although Fort Belvoir has exceeded the required Phase II reductions (40%) an additional 60% reduction is necessary in Phase III. Therefore, maintenance of reductions achived is critical for continued compliance.

Most BMPs implemented become impacted over time due stormwater runoff and neighboring activities. Some BMPs are operational in nature and therefore credits achived may differ from year to year depending on implementation. The MS4 Permit Part II.A.14 requires that a Chesapeake Bay TMDL implementation annual status report by submitted to account for changes in achieved reduction over time. The annual report requires inclusion of information including:

> *(1) 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 BMP;*
>
> *(a) The number of BMPs for each BMP type;*
>
> *(b) The estimated reduction of pollutants of concern achieved by each BMP type and reported in pounds of pollutant reduction per year; and*
>
> *(c) A confirmation statement that the permittee electronically reported Chesapeake Bay TMDL action plan BMPs **inspected** using the DEQ BMP Warehouse in accordance with Part III B 5.*

And notes that:

> *f. Pollutant load reductions generated by annual practices, such as street and storm drain cleaning, shall only be applied to the compliance year in which the annual practice was implemented.*

The sections below describe the processes and procedures required for maintaining credits based on BMP type.

7.1. URBAN STRUCTURAL SMFS

To maintain credits associated with any urban stormwater BMP, a regular inspection and maintenance schedule must be followed. The Fort Belvoir Stormwater Management Facility Long Term Operation and Maintenance Plan (Long-term SMF O&M Plan) dated 2024 specifies all requirements for maintenance of credits associated with Urban structural SMFs. This plan dictates the inspection schedule for each type of facility with a minimum occurrence of once every five years, consistent with the Virginia Stormwater BMP Clearing house and Virginia Handbook. If an inspection indicates that the SMF performance has been diminished, corrective actions are required to be completed within one year to ensure credits are maintained. If corrective actions are not completed within the timeframe, credits associated with the SMF unit will be lost until the facility is restored to full performance.

The MS4 Permit (VAR040093) requires Fort Belvoir to report all SMFs, including the status and inspection dates, to the Virginia BMP Warehouse located at: https://apps.deq.virginia.gov/BMP/. Prior to this requirement, the DoD Chesapeake Bay Program consolidated records for all DoD facilities and reported them to the BMP Warehouse. A list of current facilities registered in the BMP Warehouse and included in this plan is included in Appendix C. From the Warehouse, the SMF data is then loaded into the National Environmental Information Exchange Network (NEIEN). The NEIEN then processes the data that assigns nutrient and sediment reductions to DoD in the Phase 6 Model via Chesapeake Bay Assessment and Scenario Tool (CAST).

Credits will only continue to apply if the facility remains functional. Credits currently applied should be assessed yearly to determine if continuing credits may be taken for each SMF. The SMF Condition Rating System, detailed in the 2024 Long-term SMF O&M Plan is used to determine a practices' functionality and whether it can continue to receive credits. Per the Long-term SMF O&M Plan – inspections are performed by Virginia Stormwater Management Certified Inspectors. Based upon the results of the field inspections, an overall rating is assigned to each SMF. These ratings assist Fort Belvoir in prioritizing maintenance and improvement activities for each stormwater BMP.A description of the facility rating system is provided in Table 37 below, facilities rated as failing lose credits towards reduction credits accounted for in this plan. The annual assessment results will be included in the Chesapeake Bay TMDL implementation annual status report.

Table 37: Urban SMF Inspection Rating System

Rating	Description
Excellent	The stormwater facility is functioning as designed with no problem conditions identified. No signs of impending deterioration. Routine preventive maintenance has been conducted in accordance with this SMF Plan or BMP Clearinghouse specifications, whichever is more stringent.
Average	Minor problems observed; however, the stormwater facility is functioning as designed and no critical parameters have problem conditions. Needed repairs can be achieved through routine maintenance.
Below Average	Moderate problems are observed, and the stormwater facility has small changes in functionality that do not change the water level or impact its structural integrity. Routine maintenance may address some of the required repairs, but some non-routine repairs are necessary.
Failing	Major/Severe problems are observed, and the stormwater facility is not functioning as designed with critical parameters requiring immediate repairs. Conditions associated with the facility have compromised its performance and/or raised the water level, potentially impacting the structural integrity. The facility shows signs of impending deterioration with potential for failure. Deficiencies require repair and restoration.**.**

Additional SMFs installed on Fort Belvoir property may be included within this Action Plan as updated, once accepted to the VADEQ BMP Warehouse, and assigned a BMP Warehouse ID. As additional SMFs are constantly being installed at Fort Belvoir to meet water quantity and water quality requirements, this is expected to occur Annually. Per the MS4 Permit Part III, no later than October 1 of each year the Fort Belvoir shall electronically report new SMFs implemented and inspected as applicable between July 1 and June 30 of each year into the BMP Warehouse which formally accounts for credits from SMFs in this Action Plan. New BMPs implemented will be included in the Chesapeake Bay TMDL implementation annual status report including:

(a) The BMP type and a description of the location for each BMP;

(b) The estimated reduction of pollutants of concern achieved by each BMP and reported in pounds of pollutant reduction per year; and

(c) A confirmation statement that the permittee electronically reported BMPs using the DEQ BMP Warehouse in accordance with Part III B 3.

7.2. STREAM RESTORATION

Verification of the initial and long-term performance of stream restoration projects is critical to ensuring that the nutrient and sediment reduction is met. According to the Chesapeake Bay Program Stream Restoration Workgroup's BMP Verification Guidance, the following should be maintained to keep the load reduction credits associated with each project above:

- Length of qualifying stream projects completed each year.
- Post construction certification that the stream restoration practices were installed properly for each project reach and are working as designed.
- Maintain project files for each site for the lifetime of the project.
- Duration of the credit is 5 years but can be renewed if field inspection indicates the stream restoration project is still meeting its design objectives. (CSN, 2011)

The length of each qualifying stream length for which Fort Belvoir is receiving credit is shown in Table 24 and post construction certifications are kept by DPW-Environmental. Inspections of stream restoration projects will occur two (2) years after initial construction and once every five (5) years afterwards. This inspection schedule shall occur for the lifetime of the project to ensure that individual projects are still capable of removing nutrients and sediment. If a field inspection indicates that the original design criteria has been diminished, Fort Belvoir will have one (1) year to take corrective actions and restore the stream to its original design capacity. If corrective actions are not taken within the required timeframe, the BMP credits will be eliminated but can be credited once again after restoring to its original performance. (Workgroup, 2014)

Table 38 below provides a summary of all credit verification inspections completed and presents the next inspection due date. Detailed findings are discussed below.

Table 38: Summary of Urban Stream Restoration Credit Verification Inspections and Results

Project Site	Year Completed	Year Last Verified	Next Inspection Due	Original Linear Feet (LF) Restored	Linear Feet (LF) Currently Qualifying for Credits[1]
Surveyor Road	2009	2019	2024	1,635	1,635
Hospital – West	2010	2019	2024	920	920
North Area	2011	2019	2024	128	128
Herryford Village	2011	2019	2024	1,455	1,335
Meade Road	2016	2020	2025	695	695
AW – 5	2017	2022	2027	140	140
AW – 7	2017	2022	2027	295	295
AW – 8	2017	2022	2027	235	235
ADFE Culvert #3	2019	2020	2025	1,109	1,109
NMUSA Stream	2019	2023	2028	210	210
				Total LF Considered for Credits:	***6,702***

[1]As of November 1, 2023
[2] Originally 1,455 linear feet, lost credit on Reach 8 (120 LF) after the 2019 verification inspection/evaluation was completed

Verifications of the long-term performance of the urban stream restorations are completed using Fort Belvoir Stream Assessment Form 1, Form 2, and the associated Habitat Assessment Field Data every 100 feet for stream restorations of less than 1,000 linear feet and every 200 linear feet for stream restoration sites that exceed 1,000 linear feet, were used to assess the functionality of the stream restoration projects. The effort provided updated data on restored length and verified the long-term performance of the restoration to maintain any associated credits for the next five (5) years. As of October 30, 2024 verification inspections has been completed as follows:

- Hospital – West, Surveyor Road, North Area and Herryford Village were completed during the 2018-2019 reporting period. These streams segments are planned for re-verification by the end of 2024.
- Meade Road was completed in during the 2020-2021 reporting period. This stream segment is planned for re-verification by the end of 2025.
- American Water (AW) Stream Restorations 5a/5b, 7, and 8 was completed during the 2022-2023 reporting period. Re-Verification will be necessary prior to the end of the current permit term.
- ADFE Culvert #3 Stream Restoration is still under its initial 5-year monitoring plan, in accordance with their Section 401 permit, Year 5 monitoring is expected to occur during the 2024-2025 reporting period.
- NMUSA Stream completed its initial 5-year monitoring plan, in accordance with their Section 401 permits during the 2023-2024 reporting period. Re-verification will be necessary within the next five years.

Below is a summary of the conclusions for the verified projects; the full reports are available upon request.

Surveyor Road: In 2019, a stream and habitat assessment was conducted of the Surveyor Road Stream Restoration component of the larger Fort Belvoir Community Hospital Outfall/Stream Restoration Project. The Surveyor Road Stream Restoration project originally proposed 2,253 linear feet of an unnamed tributary to Dogue Creek in 2009, but field verification showed the actual amount was smaller at 1,635 linear feet. Field assessments indicate the stream restoration is preventing erosion within the restored area successfully. The restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle, with the next assessment due in 2024. Although not completed at the time of this plan update, this re-verification inspection is planned to occur during the 2024-2025 permit reporting period.

Hospital-West: In 2019, a stream and habitat assessment was conducted of the Hospital West Restoration component of the larger Fort Belvoir Community Hospital Outfall/Stream Restoration Project. The Hospital West Stream Restoration originally proposed 418 linear feet of stream restoration, but field verification showed the actual amount was larger at 920 linear feet. Field assessments indicate the stream restoration has successfully prevented erosion within the restored area. The restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle, with the next assessment due in 2024. Although not completed at the time of this plan update, this re-verification inspection is planned to occur during the 2024-2025 permit reporting period.

North Area: In 2019, a stream and habitat assessment was conducted of the North Area Stream Restoration Project. The North Area Stream Restoration restored 128 linear feet of stream restoration along an unnamed tributary to Accotink Creek completed in 2011. Field assessments indicate the stream restoration is preventing erosion within the restored area successfully. The restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle, with the next assessment due in 2024. Although not completed at the time of this plan update, this re-verification inspection is planned to occur during the 2024-2025 permit reporting period.

Herryford Village: In 2019, a stream and habitat assessment were conducted of the Herryford Village Stream Restoration Project, also known as the Pohick Road Stream Restoration. The Herryford Stream Restoration project originally proposed 1,210 linear feet of stream restoration completed in 2011, but field verification showed the actual amount was larger at 1,455 linear feet. Field assessments indicate the stream restoration has successfully prevented erosion within the restored area. However, the restoration could benefit from additional planting at the bottom of Reach 6. Furthermore, Reach 8 exhibited signs of active erosion, most notably on the right bank. Matting or other erosion prevention methods are recommended for the current permit cycle to continue TMDL crediting along this reach. Pending completion of these maintenance items, the restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle. A work order was submitted to install EC3 matting on the stream bank at Reach 8 where active erosion is in the vicinity of the stream restoration. The corrective actions were scheduled to be completed prior to January 2020; however, this did not occur. Additional inspection of reach 8 was completed in 2023 which noted continued erosion on the banks As such, credits for Reach 8 (120 LF) were not included, leaving 1,335 linear feet for which credits may be taken, with the next assessment due in 2024. Although not completed at the time of this plan update, this re-verification inspection is planned to occur by the end of the 2024

Meade Road: In 2020, a stream assessment was completed to determine if the project was functioning as intended. It was found that the overall site criteria were met for both the in-stream restoration work as well as the establishment of the riparian buffer. Monitoring data and inspections completed throughout 2020 indicated that the restored sections exhibited no notable degradation or shifting. The restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle, with the next assessment due in 2025.

AW Stream 5: In 2022, a stream assessment for existing riparian and habitat conditions was conducted by the Fort Belvoir Directorate of Public Works. The project restored 140 linear feet of an unknown tributary to Dogue Creek originally. The field assessments indicates that the stream restoration is successfully preventing erosion within the restored area. The restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle, with the next assessment due in 2027.

AW Stream 7: In 2022, a stream assessment for existing riparian and habitat conditions was conducted by the Fort Belvoir Directorate of Public Works. The project restored 295 linear feet of an unknown tributary to Dogue Creek originally. The field assessments indicates that the stream restoration is successfully preventing erosion within the restored area. The restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle, with the next assessment due in 2027.

AW Stream 8: In 2022, a stream assessment for existing riparian and habitat conditions was conducted by the Fort Belvoir Directorate of Public Works. The project restored 234.50 linear feet of an unknown tributary to Dogue Creek originally. The field assessments indicates that the stream restoration is successfully preventing erosion within the restored area. The restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle, with the next assessment due in 2027.

ADFE Culvert #3: In 2020, Year 3 of the initial monitoring phase was completed to determine if the project was functioning as intended. It was found that the stream physical form including pebble count, riffles and pools, and structure success criteria was met indicating successful stabilization. There as continued successful establishment of native riparian vegetation along the reach. Shifting of some bed material as noted as the stream reaches a state of equilibrium.. The restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle, with the next assessment due in 2025.

NMUSA Stream: In 2023, Year 5 of the initial monitoring phase was completed to determine if the project was functioning as intended. It was found that the woody stem, physical form, and structure success criteria was met and that the restored channel was not eroding or shifting. Although some invasive species were noted, the establishment of the riparian buffer was considered successful with the native trees healthy and growing. The restoration project is functioning as expected and should continue to generate credits for the next five (5) year cycle, with the next assessment due in 2028.

7.3. URBAN SHORELINE MANAGEMENT

Reporting, tracking, and verification are needed to ensure that shoreline management practices are performing as designed. According to the Chesapeake Bay Program Recommendations of Expert Panel on Shoreline Management, the following should be maintained to keep the load reduction credits associated with each project regardless of the protocols used:

- Parameters associated with qualifying projects completed each year.
- Post construction documentation that the restoration practices were installed properly for each project reach and are working as designed.
- Maintain project files for each site for the lifetime of the project.
- Duration of the credit is five (5) years but can be renewed if field inspection indicates the stream restoration project is still meeting its design objectives. (CSN, 2011)

The parameters of each qualifying shoreline for which Fort Belvoir is receiving credit will be reported in the MS4 Annual Report; available post-construction certifications are kept by DPW-Environmental. Any new shoreline restoration projects will be reported and the MS4 Annual Report will be updated. The MS4 Annual Report will document the following for each individual stream restoration project installed:

- Type of BMP
    - Urban Shoreline Management; Urban Shoreline Non-Vegetated; Urban Shoreline Vegetated; Ag Shoreline Management; Ag Shoreline Non-Vegetated; or Ag Shoreline Vegetated
- Associated Parameters
    - Length Restored (ft); Acres Planted (ac); Height of Project (ft); Erosion rates (ft/yr); net increase in vegetation (ac)
- Location coordinates
- Year of installation and maximum duration of credits
- 12-digit watershed in which it is located
- Protocol(s) used
- Projected sediment, nitrogen, and phosphorus reductions

Shoreline restoration is considered a wetland BMP. Wetland BMPs require field assessments to identify if the project is still intact and whether projects are still functioning properly or require preventative or corrective maintenance. On-site monitoring is required within the first three (3) years following construction. The pollutant load reductions are available for five (5) years and renewable upon field verification to ensure they are still working as designed. If a field inspection indicates that the original design criteria has been diminished, Fort Belvoir will have one year to take corrective actions and restore the shoreline to its original design capacity. If corrective actions are not taken within the required timeframe, the BMP credits will be eliminated but can be credited once again after restoring to its original performance. (Drescher & Stack, 2015)

Table 36 below provides a summary of all credit verification inspections completed and presents the next inspection due date. Detailed findings are discussed below.

Table 39: Summary of Urban Shoreline Management Credit Verification Inspections and Results

Project Site	Year Completed	Year Last Verified	Next Inspection Due	Original Linear Feet (LF) Restored	Linear Feet (LF) Currently Qualifying for Credits[1]
Thompkins Basin	2010	2018	2023	500	500
300 Area	2014	2018	2023	300	202[2]
				Total LF Considered for Credits:	***702***

[1]As of November 1, 2023
[2] The shoreline verification of the 300 Area Shoreline determined that the 104-foot seawall remained intact but only 98 linear feet of shoreline are adequately protected by the wave screen, versus the 196 linear feet that were originally assumed. Only 202 feet would qualify for credits

Verification of the long-term performance of the shoreline management projects for the 300 Area and Thompkins Basin was completed during the 2018-2019 permit cycle. The Fort Belvoir Shoreline Assessment Form was used to assess the functionality of the shoreline management projects. The form captures shoreline characteristics, sediment type, bank conditions, and general field observations. The effort provided updated data on restored length and verified the long-term performance of the restoration to maintain any associated credits for the next five years. Below is a summary of the conclusions for the verified projects, and the full reports are available upon request:

Thompkins Basin: In 2018, a shoreline assessment of the Thompkins Basin Shoreline Restoration Project, which included repairs and backfill of an existing metal bulkhead, removal of deteriorated bulkhead and debris, minor bank grading, and riparian plantings along approximately 500 linear feet of shoreline, was completed. Field assessments suggest that most of the bulkhead is in good condition, and the entire project shoreline is stable. Planting native riparian vegetation and repairing two small sections of bulkhead could serve to further stabilize the shoreline. The Thompkins Basin Shoreline Restoration Project is functioning as expected and should continue to generate credits under the default value for the next five (5) year cycle, with the next assessment due in 2023. Although not completed at the time of this plan update, this re-verification inspection is planned to occur during the 2024-2025 permit reporting period.

300 Area: In 2018, a shoreline assessment of the 300 Area Shoreline Project, which included the installation of a 196-foot wave screen to abate erosion along the shoreline adjacent to Pier 7339, was completed. The 300 Area Shoreline Project site has a broad intertidal shoreline comprised of sandy, rocky, cobbly substrate with a discernable upland bank along the southeastern shoreline and a gradual slope into a vegetated upland along the northwestern project site. Field assessments suggest that the wave screen is in good condition. The northwestern shoreline was observed to be stable; however, the southeastern shoreline showed signs of active bank erosion. Original crediting for the site was calculated using the 196-foot of shoreline that would be protected based on the 196-foot-long wave screen. Although the 300 Area Shoreline Project is functioning as designed along the northwestern shoreline, it is not functioning as designed along the southeastern shoreline. It was recommended to remove the southeastern shoreline from the credit generating portion of the project site, because of the active signs of erosion and the indeterminable influence of the wave screen relative to the fetch along the southeastern shoreline. As described above, only the northwestern shoreline of the site should continue to generate credits for the next five (5) year cycle. The shoreline verification of the 300 Area Shoreline determined that only 98 linear feet of shoreline are adequately protected by the wave screen, versus the 196 linear feet that were originally assumed; the next assessment is due in 2023. Although not completed at the time of this plan update, this re-verification inspection is planned to occur during the 2024-2025 permit reporting period.

7.4. STREET SWEEPING

Street sweeping is considered an operational BMP and verification is done by ensuring that it is being conducted appropriately. This verification process with involve the submittal of monthly reports by the contractor performing the work as well as inspections and approval from the Contract Performance Specialist (CPS) prior to payment for services. In addition, windshield inspections are conducted on eight separate routes quarterly by the stormwater program to identify issues or areas of concern.

Fort Belvoir relies on information within the Technical Exhibit of the Base Operations (BaseOps) Contract for all street sweeping calculations and expects major changes which will require a re-evaluation of swept areas soon. Changes expected to impact the number of acres swept include:

- Reissuance of the Fort Belvoir Industrial Stormwater Permit VA0092771 which is anticipated to cover less areas of Fort Belvoir effectively increasing the regulated MS4 area, as discussed in Section 3.

- A new BaseOps contract that is scheduled to be awarded in 2025 which may change the frequency and number of areas expected to be swept.

Annually, monthly street sweeping records will be reviewed to determine the number of acres swept within the MS4 service areas, as well as the appropriate street sweeping practices based on actual sweeping completed, equipment used, and number of passes, according to Appendix V.G of the Chesapeake Bay TMDL Special Condition Guidance. Actual acres swept, the frequency at which sweeping occurred, type of technology used, and the reduction achieved will be reported as an annual practice in the Chesapeake Bay TMDL implementation annual status report.

7.5. LAND USE CHANGES

On site monitoring during the first three years after a land use conversion is and shall be conducted to ensure stabilization of the change. Land use change projects are designed to minimize long-term maintenance and can be assumed to be maintained in perpetuity.

The demolition projects (Dewitt Hospital, Buildings 807/808, ADFE, and Old Commissary) were converted to a land use of managed turf from impervious. Credits have been taken for these land use changes; however, if these areas are redeveloped in the future these credits will be lost. These sites should be assessed annually to determine if credits may still be applied.

8. BMPs Planned or Proposed for Phase III Reductions

VA TMDL Guidance provides an overall timeline for when all pollutant load reductions must be implemented by to include long term maintenance. Fort Belvoir has been able to exceed all required TMDL reductions for both Phase I, Phase II, and Phase III implementation. As of the end of Phase II implementation, November 1, 2023, Fort Belvoir has met all three-permit cycle required reductions. Table 40 below summarizes the cumulative required reductions by the end of Phase III in comparison to already implemented practices.

Table 40: Cumulative Reductions Achieved and Progress towards Phase III Goals

POC	BMP	Required Reduction By 2025 (lbs./yr)	Reductions Achieved By 2023 (lbs./yr)	Cumulative Load Reduced vs. Required
Nitrogen	Urban Structural SMFs	***3,916***	***2,970***	***76%***
	Stream Restoration		***503***	***13%***
	Shoreline Management		***9***	***0%***
	Street Sweeping		***222***	***6%***
	Land Use Change		***248***	***6%***
Total Nitrogen Reduction Achieved			***3,952***	***101%***
Phosphorus	Urban Structural SMFs	***366***	***255***	***70%***
	Stream Restoration		***456***	***125%***
	Shoreline Management		***6***	***2%***
	Street Sweeping		***64***	***17%***
	Land Use Change		***38***	***10%***
Total Phosphorus Reduction Achieved			***819***	***224%***
Total Suspended Solids[1]	Urban Structural SMFs	***283, 396***	***286,791***	***101%***
	Stream Restoration		***101,394***	***36%***
	Shoreline Management		***29,484***	***10%***
	Street Sweeping		***92,558***	***33%***
	Land Use Change		***38,960***	***14%***
Total Suspended Solids Reduction Achieved			***549,187***	***194%***

[1] Although formerly required under the 2018-2023 permit cycle, sediment load reductions are no longer a requirement of the current 2023-2028 permit cycle but have been kept in this plan as a courtesy.

As the projects needed to satisfy all permit cycles are already complete. Although additional projects are still planned, no additional BMPs are required to be implemented to meet pollutant reduction goals for the Chesapeake Bay Special Condition. The completed/implemented projects exceed the L2 reduction requirements through Phase III for TN, TP and TSS. Therefore, the focus of this Action Plan has been to describe the efforts needed to maintain credits already earned. This includes requirements for reporting and verification of all BMPs as described in Reductions.

Part II.A.12.b.(5).(f) requires a preliminary schedule for implementation of the BMPs included in the Chesapeake Bay. Since no BMPs are required an implementation schedule is not necessary and only short-term plans for projects are included in this TMDL Action Plan. The following sections provide an overview of planned or proposed projects that could result in additional credits in the future.

8.1. STREAM RESTORATION - PLANNED

Fort Belvoir streams are periodically evaluated for stability and potential impacts to future development including stormwater management issues, contamination issues, and constructability. The evaluations are used to rank the streams systems for potential and priority restoration prior to being submitted for design funding and construction. Streams where rapid erosion is occurring and/or is potentially adversely impacting vital infrastructure (i.e., water and wastewater lines, roads, facilities, and other utilities) are ranked higher than other streams. The evaluation includes photographic documentation of the stream systems, evaluation of watershed influences, and identification of potential impacts to vital infrastructure.

In addition to the already completed stream restoration projects on Fort Belvoir, multiple other sites have been identified for restoration in the Master Plan EIS and are in different stages of design, construction, and funding. The projects, shown in the Table 41 below, were not considered in the load reduction totals achieved as of November 1, 2023, but may be implemented prior to the third permit cycle ending in 2028. For these projects to receive credit, one of the newer four protocols discussed in Section 5.2 will need to be utilized.

Table 41: Potential Phase III Stream Restoration Projects and Reductions

Project Site	Status	Linear Feet (ft)	Potential Reduction on TN (lb/yr)	Potential Reduction on TP (lb/yr)	Potential Reduction on TSS (lb/yr)
AW – 3, 12, and 13	**Construction Complete June 2024**	2286	171	155	34,587
George Washington Village	Under Construction	948	71	64	14,348
AW – 2	Construction Planned for 2025/2026	409	31	28	6,188
AW – 4	Construction Planned for 2025/2026	238	18	168	3,601
AW – 6	Construction Planned for 2025/2026	599	45	41	9,063
Totten Road	Design Complete - Awaiting Funding	3,780	284	257	57,191
Tracy Loop Pond	Proposed	1,486	111	101	22,483
1st and 3rd	Proposed	2,810	211	191	42,515
Behind Dewitt	Proposed	3,148	236	214	47,629
Railroad Corridor Stream	Proposed	1167	88	79	17,657
Community Club	Proposed	1,525	114	104	23,073
O-Club Stream	Proposed	N/A	-	-	-
Patrick Beach	Proposed	N/A	-	-	-
Jackson Loop South	Proposed	N/A	-	-	-
Jackson Loop North	Proposed	N/A	-	-	-
Old Washington Road	Proposed	N/A	-	-	-
Woodlawn Road	Proposed	N/A	-	-	-
Sharon Lane	Proposed	N/A	-	-	-
	Totals	***18,396***	***1,380***	***1,402***	***278,335***

The proposed projects shown in Table 41 show an approximate linear footage as site conditions may change throughout implementation from design to construction. Additionally, without details on the protocols used for each project, the default removal rates from the 2014 Expert Panel, shown in Table 25, are used here to calculate as estimated reduction.

Some projects are further along in implementation and therefore more specific data is available, as discussed below.

Streams AW – 3, 12, and 13: were completed in 2024 under a TMDL Regional General Permit (RGP) which authorizes activities with the specific purpose of reducing nutrient and sediment pollution in accordance with the Chesapeake Bay. A nutrient reduction study based on the BANCS assessment was conducted and showed that the proposed stream load without repairs resulted in a Nitrogen and Phosphorous load of 481 and 405 lbs./yr., respectfully. The study used Protocol 1 to calculate reductions based on both the Default rate (50%) found in the Expert Panel Report and the site-specific rate (85%) based on design Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS). The assessment projects a reduction of 240-409 lb./yr of nitrogen and 202-344 lb./yr. of phosphorous.

Streams AW –2, 4, and 6: are planned for construction during 2025. Similar calculations using protocol 1 were completed and found that the stream loads without repairs resulted in a Nitrogen and Phosphorous load of 28 and 115 lbs./yr., respectfully at stream 2; 23 and 101 lbs./yr., respectfully at stream 4; 57 and 103 lbs./yr., respectfully at stream 6. The assessment projects a total reduction of between 54-92 lb./yr of nitrogen and 160-271 lb./yr. of phosphorous.

Actual stream restoration linear footage will be reported within the MS4 Annual Report. The MS4 Annual Report will document the following for each individual stream restoration project installed:

- Type, length, and width of the project
- Location coordinates
- Year of installation and maximum duration of credits
- 12-digit watershed in which it is located
- Protocol(s) used
- Projected sediment, nitrogen, and phosphorus reductions

8.2. STORM DRAIN CLEANING - PLANNED

Storm Drain Cleaning is another effective method at removing sediment from stormwater systems prior to being transported to water bodies. Sediment reduction credits are provided for solids that are directly removed from catch basins, within storm drainpipes, or captured at the storm drain outfalls. Credits also apply to sediment removal from concrete-lined conveyance channels but does not apply to sediment removal during ditch maintenance along open section roads.

The following three qualifying conditions should be observed to achieve credits for the storm drain cleaning as follows:

1. *To maximize reduction, efforts should target 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. *The loads must be tracked and verified using a field protocol to measure the mass or volume of solids collected within the storm drain system. The locality must demonstrate that they have instituted a standard operating procedure (SOP) to keep track of the mass of the sediments and/or organic matter that are removed.*

3. *The material collected and measured for the credit must be properly disposed so that it cannot migrate back into the watershed.*

According to Appendix V.G.2, the first step is to determine the pounds of solids and organic matter that is collected or removed from catch basins, storm drainpipes, at the storm drain outfall, or from within concrete-line conveyance channels. This credit is conducted on an annual basis and all solids collected are combined for a single-year value. From there, the initial wet mass may be converted to dry weight.

Although storm drain cleaning is being conducted, Fort Belvoir has yet to develop a formal procedure in place that allows for tracking, verification, or reporting of this type of operational BMP that would require annual reporting. As noted in section 7.4, a new BaseOps contract that is scheduled to be awarded in 2025 which may change processes and procedures which could allow for additional reductions in the future.

To determine an estimated reduction for this BMP some historical data was reviewed and the average dry weight material for the entirety of Fort Belvoir was reported in 2018 as 137,680 pounds or 68.84 tons. If at least 100,000 lbs. of sediment , organic debris, and leaf litter can be removed annually, once a tracking and reporting program is put in place, Fort Belvoir could conservatively see an additional reduction of 60 lb./yr of Nitrogen and 270 lbs./yr of Phosphorous from this practice, as shown in Table 42.

Table 42: Potential Storm Drain Cleaning Reductions

Dry Weight (lbs./yr.)	TN Nutrient Enrichment Factor	TN Reductions Achieved (lbs./yr.)	TP Nutrient Enrichment Factor	TP Reductions Achieved (lbs./yr.)
100,000	0.06	75	0.27	270

The actual reduction would have to be evaluated annually to determine how much weight was disposed in the previous year for reporting purposes.

9. PUBLIC COMMENT

Part II A.12 of the General Permit requires that Fort Belvoir provides an opportunity for receipt and consideration of public comment regarding the Draft Phase III Chesapeake Bay TMDL Action Plan. The EPA states in Federal Register Volume 64, No. 235, page 68,750 on 8 December 1999, regarding "public" and its applicability to MS4 programs, the following:

> *"EPA agrees with the suggested interpretation of 'public' for DOD facilities as 'the resident and employee population within the fence line of the facility.' The department recommends that nontraditional MS4 operators, such as state and federal entities and local school districts, utilize this statement as guidance when determining their applicable 'public' for compliance with this permit."*

Therefore, Fort Belvoir has adopted this definition and defines the "public" as anyone who lives or works within the jurisdictional boundary of the Garrison as shown in Figure 1.

For the Phase I TMDL Action Plan, finalized in March 2016, the public comment period involved the posting of the Draft Phase I plan on the Fort Belvoir Home Page under Environmental Documents for Stormwater on 19 October 2015. A Notice of Availability for the document was:

- Posted on the Fort Belvoir DPW stormwater Facebook page on 10 November 2015.
- Posted on the main Fort Belvoir Facebook page on 10 November 2015.
- Published in the Fort Belvoir newspaper, *The Belvoir Eagle*, on 5 November 2015.

The public review period for the Phase I plan closed on 5 December 2015. There were no public comments received. The Plan was finalized in March 2016.

The Draft Phase II Action Plan was submitted along with the General Permit Reapplication Package as required under the 2013-2018 General Permit. The Application package was submitted by 1 June 2018 as per the most recent guidance by VADEQ. The Draft Phase II Action Plan allowed for a similar public comment period by being posted on the Fort Belvoir Home Page under Environmental Documents for Stormwater in May 2018. A Notice of Availability for the document was:

- Posted on the Fort Belvoir DPW stormwater Facebook page 15 May 2018.
- Posted on the main Fort Belvoir Facebook page on 15 May 2018.
- Published in the Fort Belvoir newspaper, *The Belvoir Eagle* on 17 May 2018.

Fort Belvoir provided for the public comment period to be open until 30 June 2018 and formally addressed the two comments received in this updated Final Phase II Action Plan. Table 36 below summarizes the comments received and how they were addressed; further details are available upon request.

Table: Public Comment Responses on Draft Phase II Plan

Comment	Response
Requested corrections to the DoD's official reporting mechanism and process	Fort Belvoir contacted the DoD ChesBay Program managers for more information on the reporting process and their role in submittal of information to the BMP Warehouse and NEIEN and how credits are assigned in the Phase 6 Model CAST system. Urban Structural SMFs was updated with the most up to date process for reporting of structural BMPs for credits.

Comment	Response
Requested more information as to the 'Additional Coverage Areas' considered under Delineation of the MS4 Service Area	Fort Belvoir directly contacted the commenter to address specific questions on the areas considered under the 'Additional Coverage Area' and explained that these areas were outside the 2010 census area but have since been developed and could therefore be considered urban during the next census to be conducted in 2020. The areas were looked at as a planning tool for assessing ChesBay needs in reference to future requirements for credits. Language within Delineation of the MS4 Service Area was revised to clarify that these areas are not currently regulated but were considered for their potential to effect necessary credits to meet reductions for the third cycle.

This Final Phase II Action Plan was completed as per Part II.A of the 2013-2018 General Permit. This Final Phase II Action Plan allowed for a similar public comment period by being posted on the Fort Belvoir Home Page under Environmental Documents for Stormwater in October 2019. A Notice of Availability for the document was:

- Posted on the Fort Belvoir Environmental Facebook page on 3 October 2019.
- Posted on the Fort Belvoir Home Page on 3 October 2019.
- Published in the Fort Belvoir newspaper, *The Belvoir Eagle* on 10 October 2019.

Fort Belvoir provided for the public comment period to be open until 25 October 2019 allowing for at least 15 days for public comment as required under Part II.A.12. Fort Belvoir DPW did not receive any comments during this period therefore, the Final Phase II Plan was submitted to VADEQ on 28 October 2019.

The Draft Phase III Action Plan was submitted along with the General Permit Reapplication Package as required under the 2018-2023 General Permit. The Application package was submitted by 1 October 2023 as per the most recent guidance by VADEQ. The Draft Phase III Action Plan did not allow for a public comment period as it was not required. Fort Belvoir received a set of comments on the Draft Phase III Plan from VADEQ on 29 May 2024 and Table 43 summarizes the comments received and how they were addressed in this Final Phase III Plan.

Table 43: Comment Responses on Draft Phase III Plan

Comment	Response
Your MS4 program prima facie did not meet the required 40% L2 Reductions	To make the achieved reductions easier and clearer a separate section was added to this Phase III Plan detailing the required 40% reductions as well as how they were achieved and exceeded.
Ensure the Final Third Phase Chesapeake Bay TMDL Action Plan contains all required elements described in Part II.A.12.b of the General Permit	The 2023-2028 permit Part II.A.12.b was reviewed and compared to the Draft Plan. Additional information was provided covering new or modified legal authorities, such as ordinances, permits, policy, specific contract language, a section was added covering the total reductions achieved as of November 1,

Comment	Response
	2023, and an Appendix was added showing a map of locations and list of BMPs implemented prior to November 1, 2023.
The Draft Action Plan and FY2023 MS4 Annual Report contained information that made it difficult to determine whether your MS4 program fully implemented all projects necessary to meet the 40% L2 Reductions. Ensure the Final Third Phase Chesapeake Bay TMDL Action Plan identifies and distinguishes projects which have been fully implemented or completed, and which projects are in planning, design, or construction phases.	The Plan was revised and broken up into distinct sections covering reductions achieved in Section 5 and projects that are planned in Section 8. To provide a

The Draft Final Phase III Action Plan was completed as per Part II.A of the 2023-2028 General Permit. This Draft Final Phase III Action Plan was posted on the Fort Belvoir Home Page under Environmental Documents for Stormwater along with a Notice of Availability on 15 October 2024. Fort Belvoir provided for the public comment period to be open until 31 October 2024.

No comments were received during this comment period and therefore, the plan was finalized. The Final Phase III Action Plan will continue to be available on the public facing website throughout the permit term, allowing for the public to submit comments at any point in time. If any comments are received, Fort Belvoir will evaluate the need for updating the plan and provide a formal response to the commenter. Any comments received and changes made in the plan will be reported in the Chesapeake Bay TMDL implementation annual status report as required under Part II.A.14.h. Additionally, per Part II A.14.c the year two Chesapeake Bay TMDL implementation annual status report will contain a summary of any public comments on the Chesapeake Bay TMDL action plan received and how they were responded to.

10. REFERENCES

Army, D. o. (2007, December 13). Environmental Protection and Enhancement. *Army Regulation 200–1*. Washington, DC: Headquarters - Department of the Army.

Atkins. (2014). *Real Property Master Plan; Installation Vision and Development Plan.* Fort Belvoir, Virginia: Installation Management Command.

Belvoir, U. A. (2015). *Final Environmental Impact Statement for Short-Term Projects & Real Property Master Plan Update, Volume I.* Fort Belvoir: Directorate of Public Works - Environmental and Natural Resources Division.

Commonwealth of Virginia. (2019). *Chesapeake Bay TMDL Phase III Watershed Implementation Plan.*

CSN. (2011). *CSN techinical Bulletin No. 9 - Nutrient Accounting Methods to Document Local Stormwater Load Reductions in the Cheasapeake Bay Watershed.* Baltimore, MD: Chesapeake Stormwater Network.

Drescher, S., & Stack, B. (2015). *Recommendations of the Expert Panel to Define Removal Rates for Shoreline Management Projects.* Chesapeake Bay Partnership. Retrieved from https://www.chesapeakebay.net/what/publications/recommendations_of_the_expert_panel_to_define_removal_rates_for_shoreline_m

EPA. (2009). *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act.* Washington, DC: U.S. Environmental Protection Angency Office of Water. Retrieved from www.epa.gov/owow/nps/lid/section438

EPA. (2010). *Chesapeake Bay TMDL.* PA: U.S. Environmental Protection Agency - Region III.

Fairfax, C. o. (2024, July 15). 2024 3-inch aerial photography of Fairfax County, Virginia. Virginia, USA. Retrieved from https://www.fairfaxcounty.gov/gisimagery/rest/services/AerialPhotography/2024AerialPhotography3inch/ImageServer

Fort Belvoir. (2023). *Environmental Division*. Retrieved from U.S. Army Fort Belvoir - Directorate of Public Works: https://home.army.mil/belvoir/index.php/about/Garrison/directorate-public-works/environmental-division

Schueler, T., & Stack, B. (2014). *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects.* Chesapeake Bay Program. Retrieved April 2018, from https://www.chesapeakebay.net/what/publications/20723

U.S Army Garrison, Fort Belvoir. (2017). *Fort Belvoir Policy Memorandum #73, Stormwater Pollution Prevention Plan.* Fort Belvoir.

U.S. EPA. (2002). *Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on those WLAs.* Washington, DC: U.S. EPA.

USACE. (2016). *Chesapeake Bay Total Maximim Daily Load (TMDL) Study for Fort Belvoir.* Fort Belvoir: US Army Garrison Fort Belvoir. Retrieved from http://www.belvoir.army.mil/environdocssection.asp

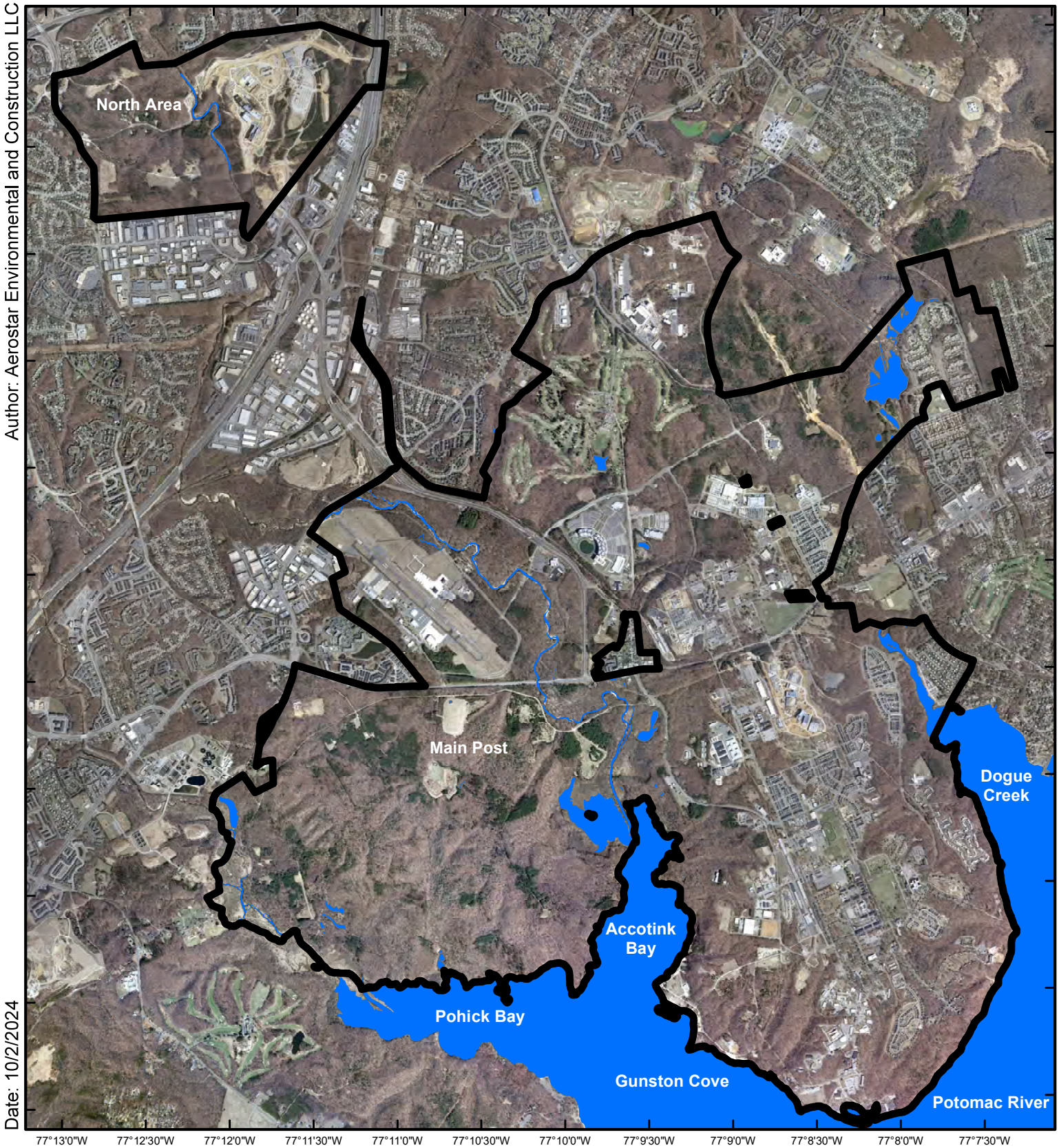
VADEQ. (2013, September 23). Virginia Register. *VA.R. Doc. No. R14-3682 October 23, 2013, 30(2).* Richmond, Virginia, USA: Virginia Register of Regulations. Retrieved from http://register.dls.virginia.gov/details.aspx?id=3944

VADEQ. (2016, December). Virginia Pollutant Discharge Elimination System (VPDES) Permit No. VA0092771. Virginia, USA.

VADEQ. (2021, February 6). Guidance Memo No. 20-2003. *Chesapeake Bay TMDL Special Condition Guidance*. VADEQ.

Workgroup, C. B. (2014). *Stream Restoration BMP Verification Guidance.* Chesapeake Bay Program.

APPENDIX A
FIGURES



Author: Aerostar Environmental and Construction LLC

Date: 10/2/2024

Figure 1:
Jurisdictional Boundary

N

2,300 1,150 0 2,300 4,600

Feet

Legend

Fort Belvoir Boundaries

Major Waterway

Fort Belvoir Chesbay Plan: 2024
Sources: ArcGIS, Fort Belvoir, Fairfax County

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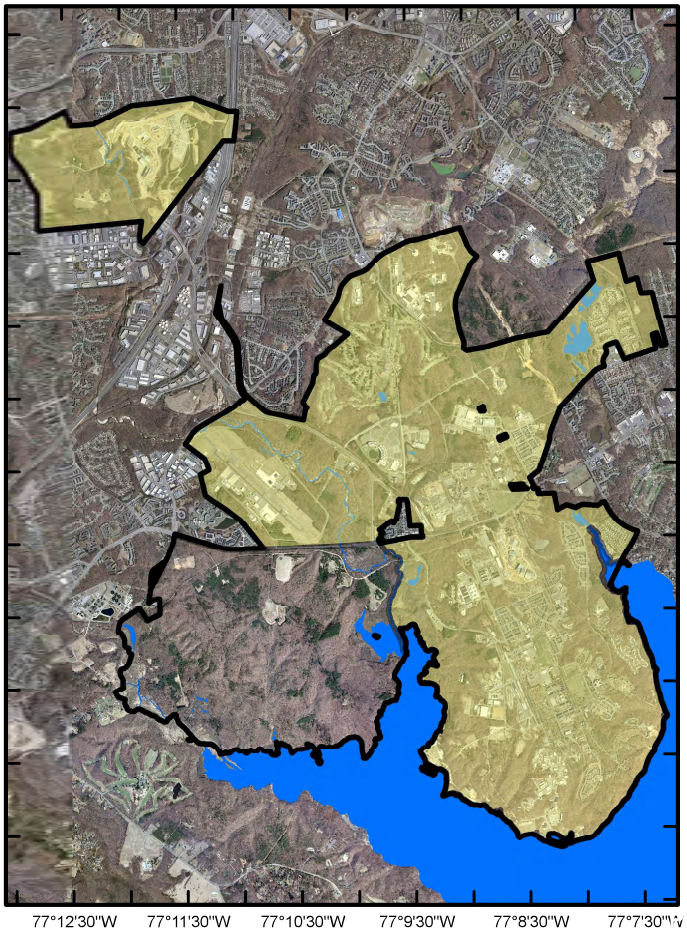
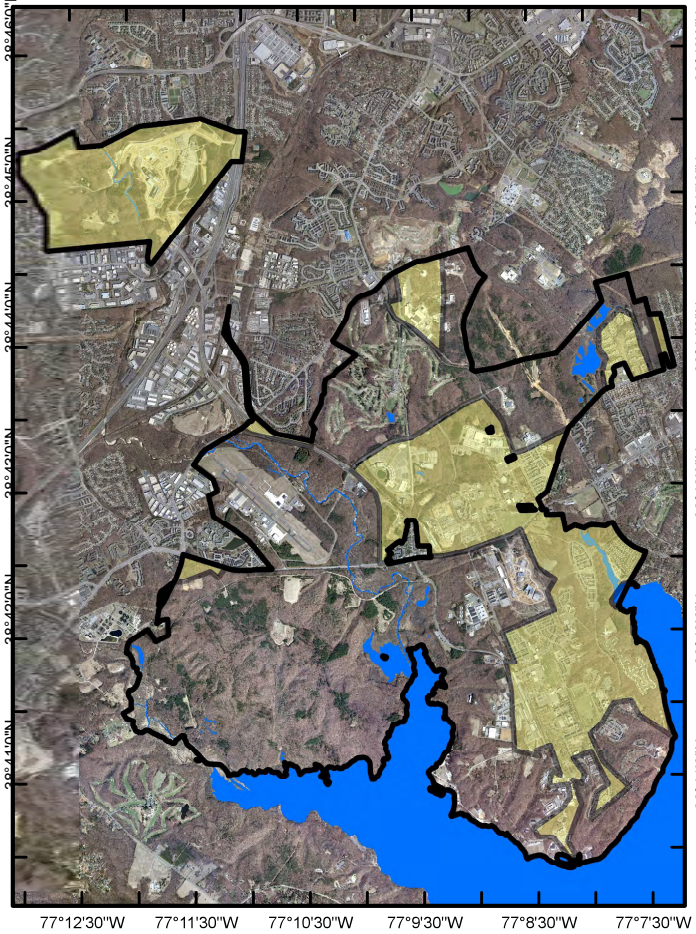
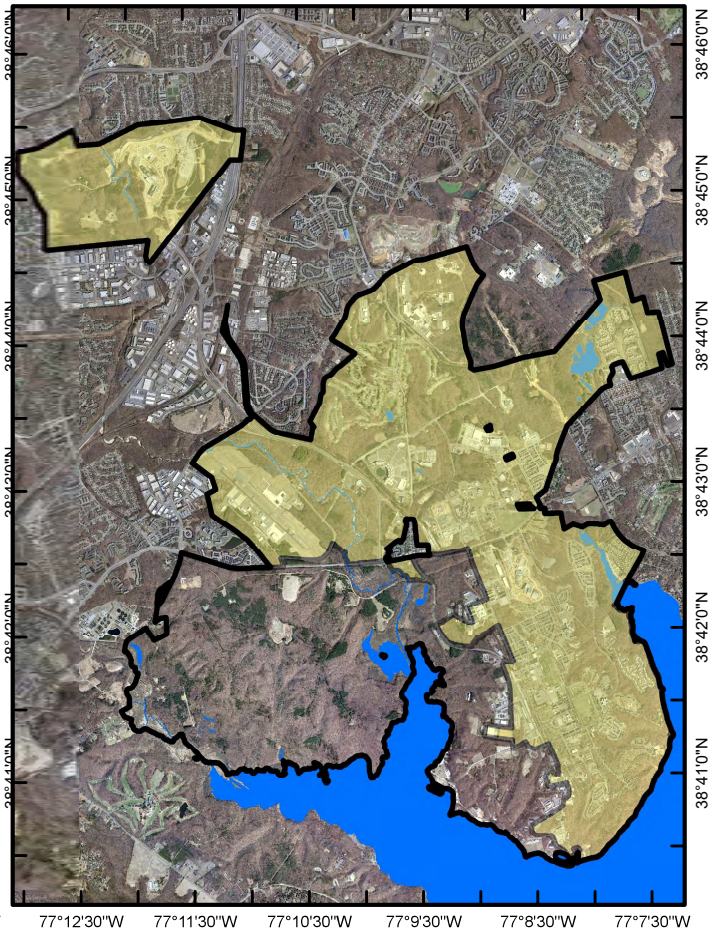
Date: 10/2/2024



2000 Urbanized Area
2009 Land Use

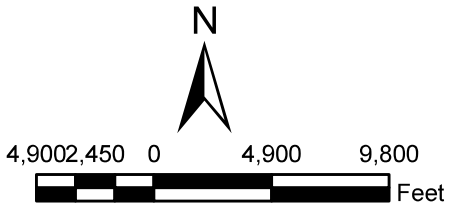


2010 Urbanized Area
2009 Land Use



2020 Urbanized Area
2009 Land Use

Figure 2:
Change in Urbanized Area



Legend

- Fort Belvoir Boundaries
- Census Urban Areas
- Major Waterway

Fort Belvoir Chesbay Plan: Urban Areas
Sources: ArcGIS, Fort Belvoir, Fairfax County, Census Bureau

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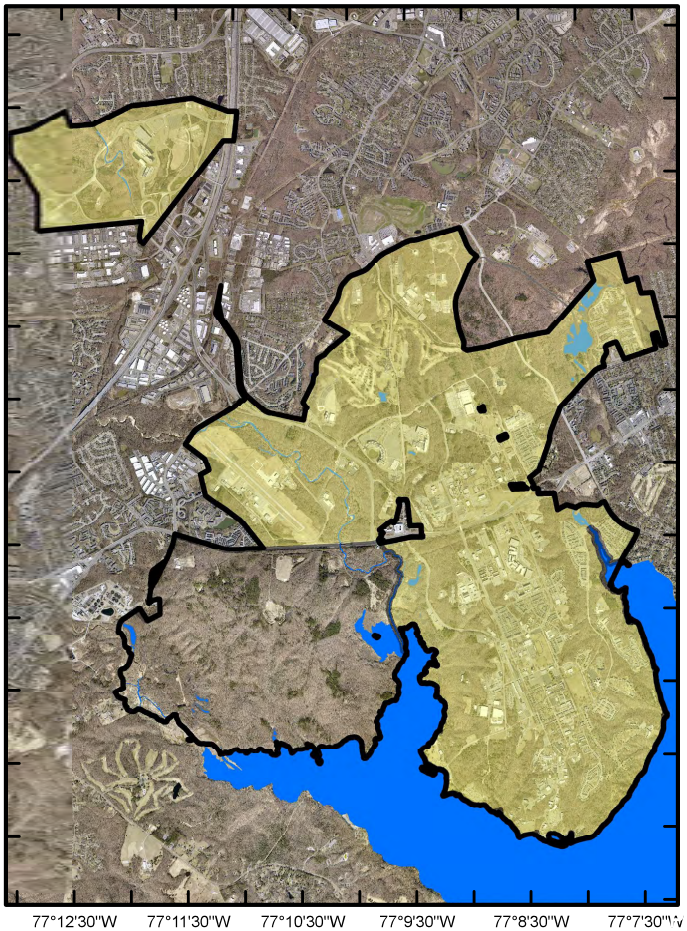
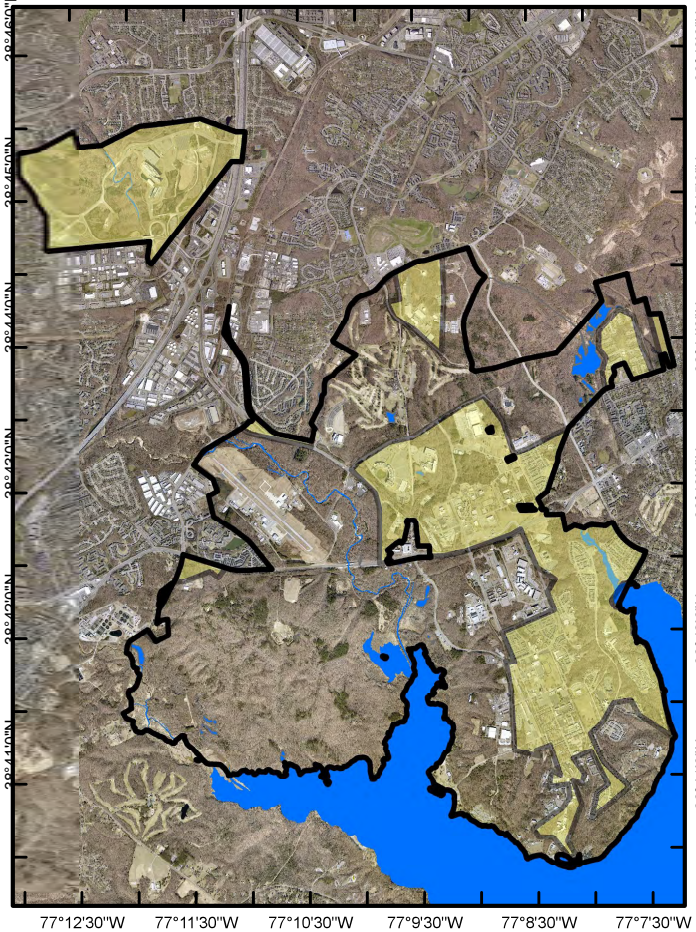
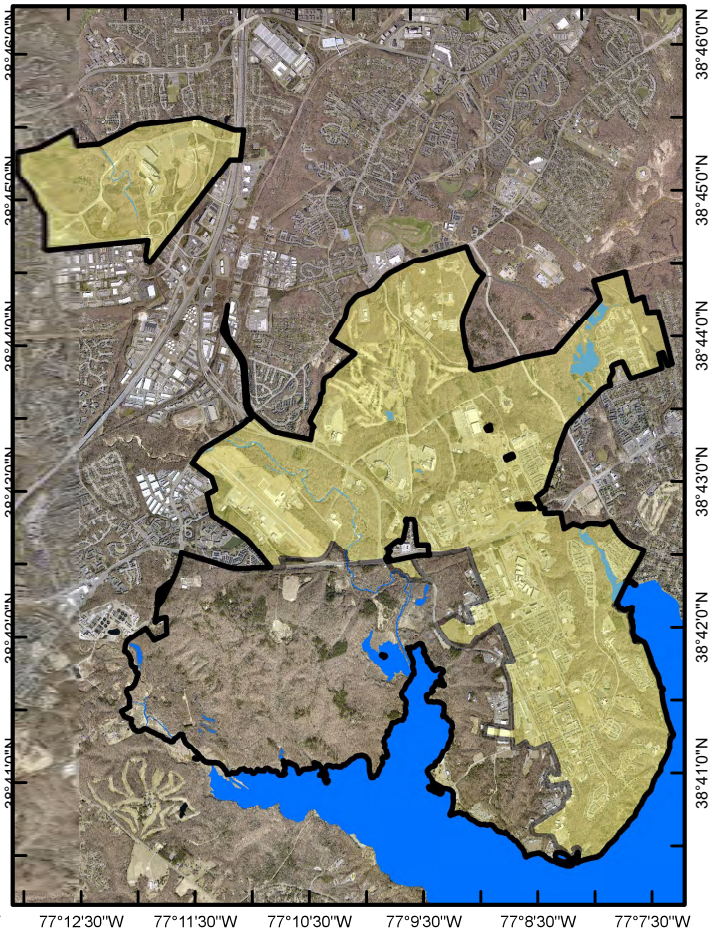
Date: 10/2/2024



2000 Urbanized Area
2024 Land Use



2010 Urbanized Area
2024 Land Use



2020 Urbanized Area
2024 Land Use

Figure 3:
Change in Urbanized Area

N

4,9002,450 0 4,900 9,800

Feet

Legend

- Fort Belvoir Boundaries
- Census Urban Areas
- Major Waterway

Fort Belvoir Chesbay Plan: Urban Areas
Sources: ArcGIS, Fort Belvoir, Fairfax County, Census Bureau

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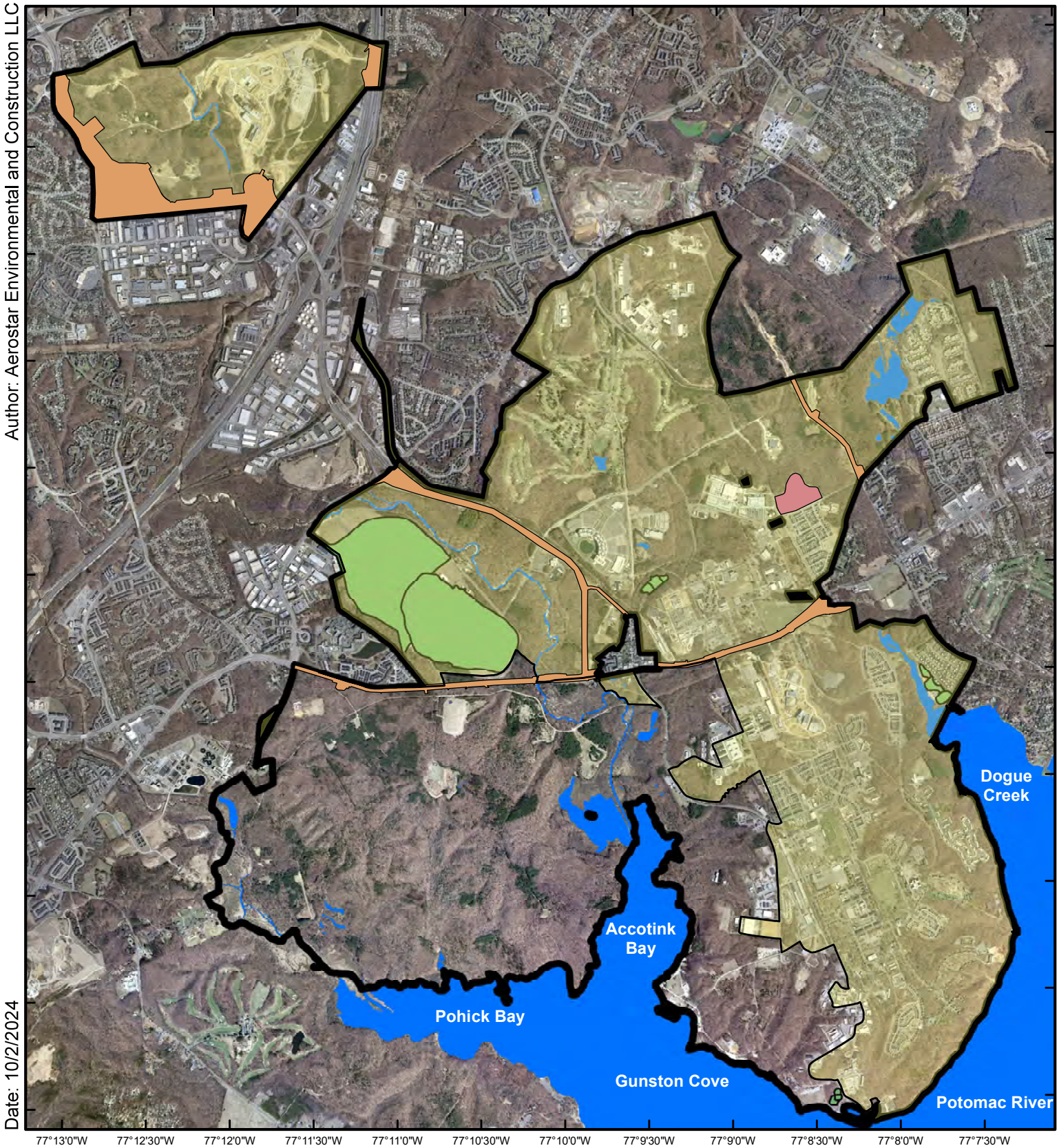

Figure 4:
Areas Covered Under Other VPDES Permits

N

2,300 0 1,150 2,300 4,600 Feet

Legend

- Fort Belvoir Boundaries
- Major Waterway
- Census Urban Area
- ISW Permit (VA0092771)
- VDOT Permit (VA040115)
- Fairfax County (VA0088587)

Fort Belvoir Chesbay Plan: 2024
Sources: ArcGIS, Fort Belvoir, Fairfax County

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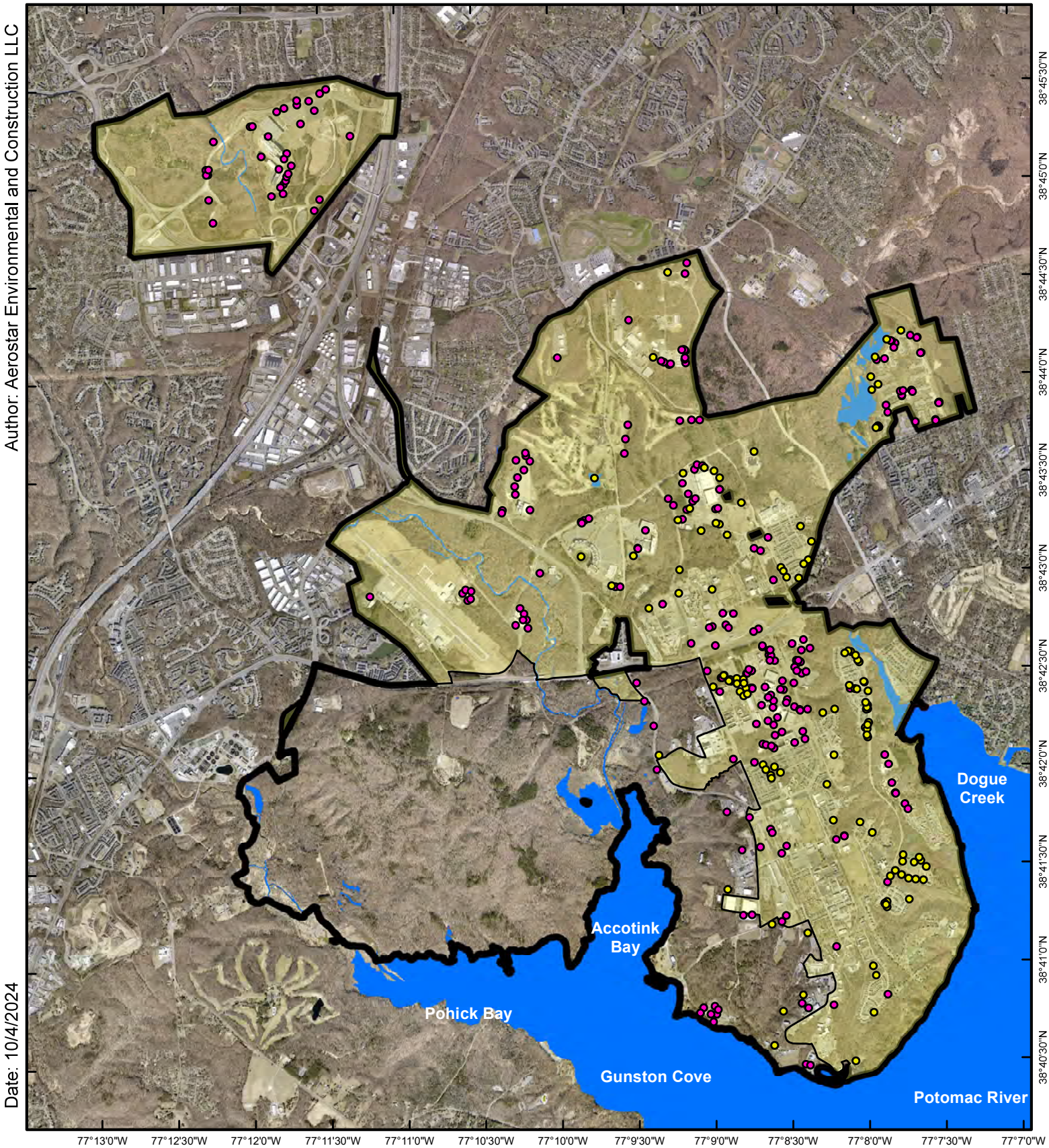

Figure 5:
Urban Structural SMFs

N

2,400 0 1,200 2,400 4,800

Feet

Legend

- Fort Belvoir Boundaries
- Major Waterway
- MS4 Regulated Area
- Not Credited
- Credited

Fort Belvoir Chesbay Plan: 2024
Sources: ArcGIS, Fort Belvoir, Fairfax County

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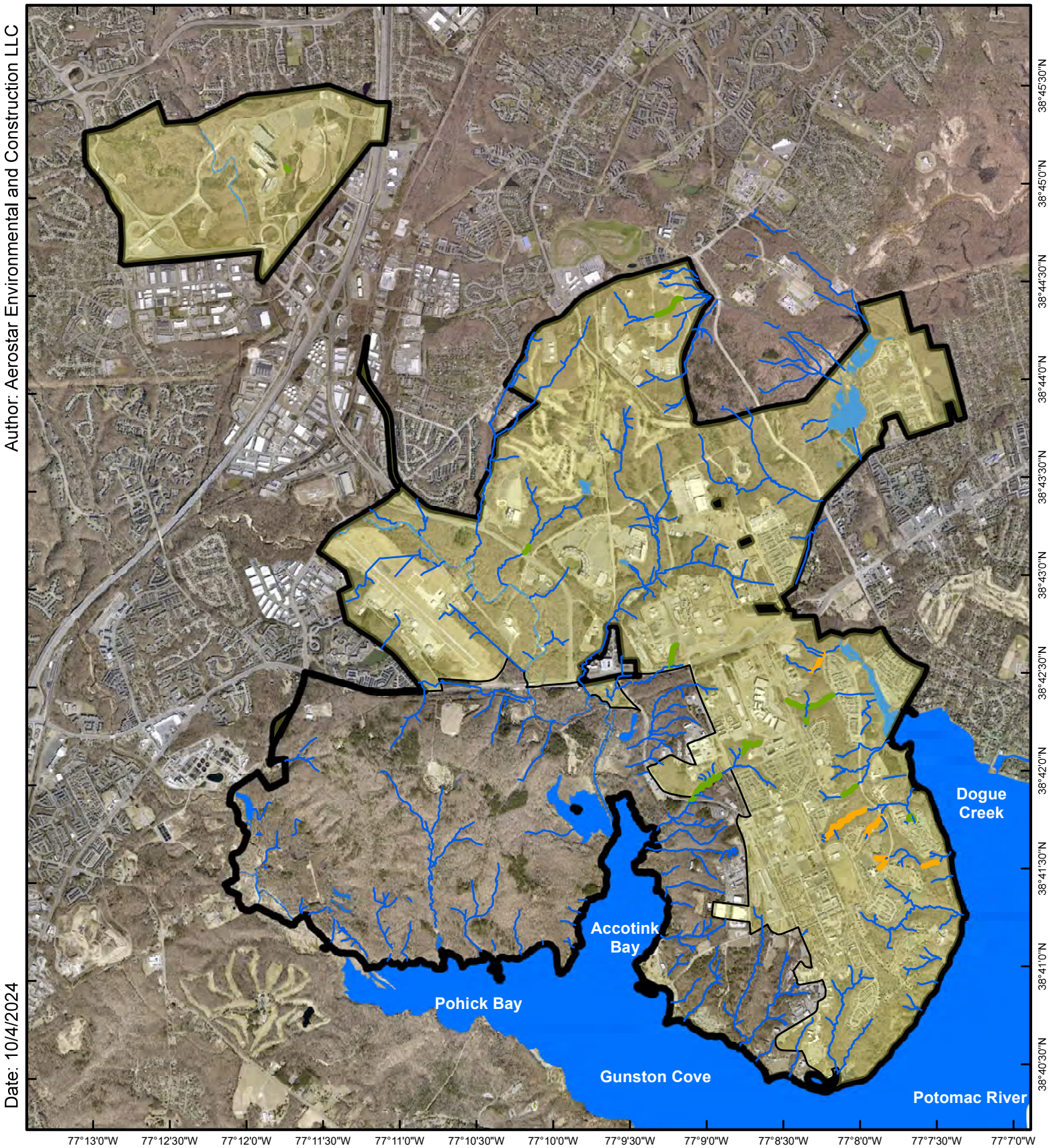

Figure 6:
Urban Stream Restoration

N

2,400 0 1,200 2,400 4,800
Feet

Legend

- Fort Belvoir Boundaries
- Major Waterway
- MS4 Regulated Area
- Planned for Phase III
- Completed (Prior to November 1, 2023)

Fort Belvoir Chesbay Plan: 2024
Sources: ArcGIS, Fort Belvoir, Fairfax County

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APPENDIX B
OPEN SPACE STUDY OF THE MASTER PLAN

that appears higher than the actual energy consumption per square foot. A growth of data center and cybersecurity operations from 2004 through 2007 without a sizable increase in building square footage likely contributed to the reported increase in energy consumption.

Despite the uncertainties of relating energy use and building square footage, the overall energy trends projected in Table 5.2 are assumed to be valid for planning purposes.

Implementing Energy Reduction Goals

The Sustainable Design and Development Policy Update on Environmental and Energy Performance (U.S. Army, 2010h) provide guidance for how aspects of the EPAct05, EISA07, EO 13423, and EO 13514 apply to Army facility construction. Achieving these federal mandates and the energy reduction vision described in the CEWMP are carried out on two main levels. These are:

Planning Level

At a large scale, implementing renewable energy projects such as geothermal energy for direct use or electricity generation is largely dependent on subsurface geological conditions of hot water and steam reservoirs. These projects are generally not feasible. Fort Belvoir's region is not well-suited to the continuously high wind speeds required for significant wind power potential; in addition, wind turbines would impact migratory bird routes. Solar photovoltaic technology for converting sunlight into electricity has been too costly to pursue without access to the federal and state tax incentives available for the commercial and residential sector.

However, smaller scale renewable energy systems (i.e., building rooftop solar panels and geothermal systems) may be possible in certain select areas. Additionally, clustered buildings, particularly those with offsetting peak energy demands, could share common heating/cooling systems. This approach would be cost effective and increase energy efficiency throughout the life cycle. Mixed-use buildings and/or new development clustered around common open spaces areas as shown in **Section 4: Framework Plan** and in the regulating plans presented in the IPS support the notion of shared uses in a campus style setting.

Project and Building Level

Energy reduction and sustainability goals to meet federal mandates are achieved largely measured and incorporated at the project or building level. It is during the site development phase when planning and engineering studies begin to incorporate sustainable design and development principles to minimize water consumption and optimize energy efficiency. The Army will incorporate the high performance building requirements of EO 13514 into any facility design. Starting with the FY 2013 military construction program, new buildings and structures, and major renovations shall be built to achieve a minimum silver level through the Leadership in Energy and Environmental Design (LEED) green building rating system, one performance level above LEED-certified and two levels below LEED platinum. Several excellent examples of this energy-efficient building can are found, such as the new Fort Belvoir Community Hospital on the Main Post.

Additional information regarding the Army energy policy, including energy reduction goals, can be found in **Appendix B4 Army Directive 2014-02 Net Zero Installation Policy** (issued 28 January 2014).

Regulating Plans in the Fort Belvoir IPS align with and support energy reduction goals. They include open space areas that could incorporate low impact design features that enhance protection of the streams and watersheds.

FBNA Short-Term (2017) Utility Systems Requirements

Sanitary Sewers

As part of BRAC 2005, a network of new sanitary sewer lines was installed at FBNA that connects to the Fairfax County trunk sewer that runs along Accotink Creek. These lines have been located and sized to serve potential additional development on FBNA. The Fairfax County trunk sewer varies in diameter from 42 to 54 inches. Fairfax County DPWES-WMD staff indicate that this existing trunk sewer and the existing County wastewater treatment plant both have adequate capacity to serve the potential additional development at FBNA. Sewer service to FBNA was previously metered, but (according to Installation staff) these meters were pulled prior to construction of the NGA complex. The Installation is negotiating a new contract with the Fairfax County DPWES-WMD for sewer service to FBNA.

Water Distribution

As part of BRAC 2005, a water distribution network was installed that connects to the existing Fairfax Water system on Backlick Road. Fairfax Water indicates that the existing County water system has adequate capacity to serve both existing and anticipated future development at FBNA. Water infrastructure at FBNA includes a distribution system and a new water tank sized for future development at FBNA.

A new water storage tank is proposed at FBNA to provide emergency storage; the tank site will allow construction of two additional tanks if required. Water service to FBNA is metered at the connection to the Fairfax Water system at Backlick Road.

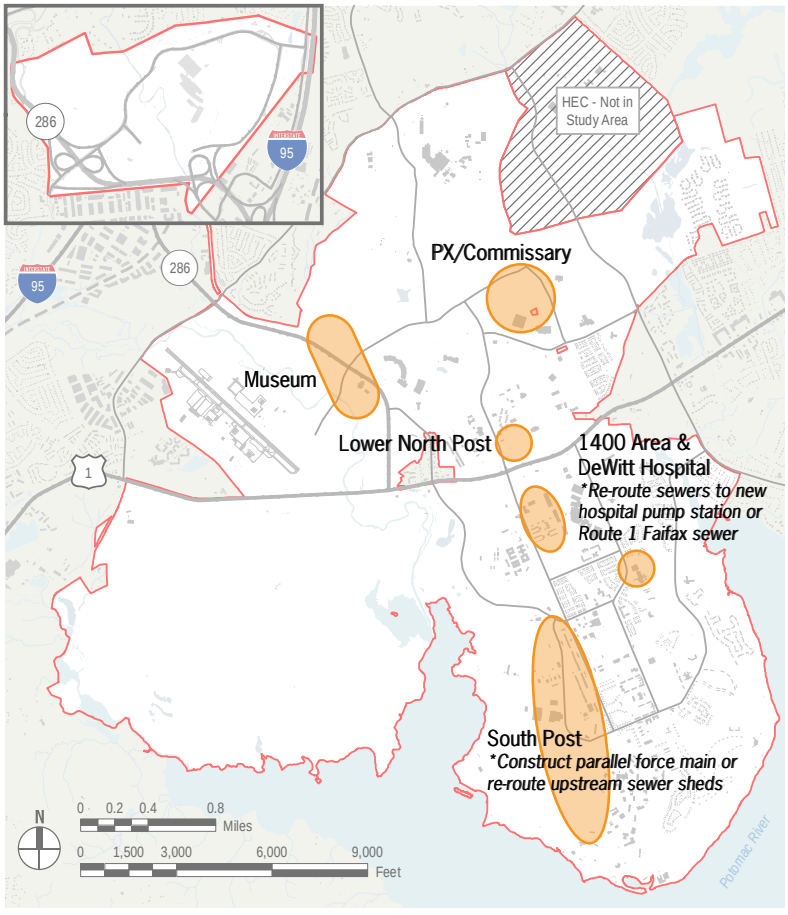
Electric and Natural Gas

Both electric and natural gas service at FBNA are privatized. Dominion Virginia Power (DVP) and Washington Gas provide electric and natural gas service, respectively, to the Installation boundary, as well as distribution and service lines within the Installation. DVP has constructed off-site transmission lines and a new substation to provide permanent electric service. These facilities have capacity for some additional development; however, the anticipated trend for more intensive electrical/energy service demands as described in the CEWMP, are expected to increase with the number of secure campuses that require large data processing facilities to operate. The Installation and DVP shall remain engaged in the planning process for any significant new construction at FBNA. Washington Gas has extended service to FBNA and does not foresee any difficulty in providing service for future development. In summary, utility service providers will be able to support new development at the levels proposed. Depending on the size and location of the project, advance planning is recommended to identify the specific load requirements in order to allow time to construct any new facilities that may be needed.

Stormwater Management

The development at FBNA includes extensive drainage conveyance and stormwater management facilities, providing both quality and quantity control. These facilities convey runoff to the existing on-site channels that eventually drain into Accotink Creek. In general, the types of stormwater management quality and quantity control facilities, including LID measures that were constructed with the NGA project, represent an improved post-development condition from previous uses on the site. Future development on FBNA would deploy similar SWM design measures. For further information on SWM design strategies that apply to all new projects, see the section on Stormwater Management.

Figure 5.2 - Sanitary Sewer Improvements - Short Term (2017)



Main Post Short-Term (2017) Utility Systems Requirements

Sanitary Sewers

The sewer system was privatized to American Water Military Systems in 2010. American Water (AW) is preparing a Capital Improvement Plan that includes repair and replacement to existing pump stations, and repairs and upgrades to existing sanitary lines. Based on existing conditions and projected sewer demands created by the near-term project, AW has identified several areas of concern (See Figure 5.2):

- American Water has prepared a hydraulic study of the sewer system using limited survey and metering data. From observation, no significant capacity problems exist on Post. Pump Stations 00097 and 00687, serving the southern part of Main Post, sometimes overflow into holding tanks during wet weather events. American Water plans pump replacements at these two facilities and also plans pipe lining which shall reduce infiltration. American Water does not see any major infrastructure problems in the system to support near-term growth. Some pipe surcharging occurs during wet weather events, but there are no overflows.
- Construction of the new Fort Belvoir Community Hospital complex included a rerouting of sanitary lines in the area around the Hospital. This area previously flowed to a trunk line east of Belvoir Road and south to Pump Station 687. It now ties to a new

pump station near the Hospital and then flows north to the Fairfax County sewer line along Route 1. This diversion has relieved capacity issues on the trunk line east of Belvoir Road as well as at Pump Station 687. The Hospital pump station has capacity to serve the Hospital complex. It may also have capacity for additional development in the 1400 Area.

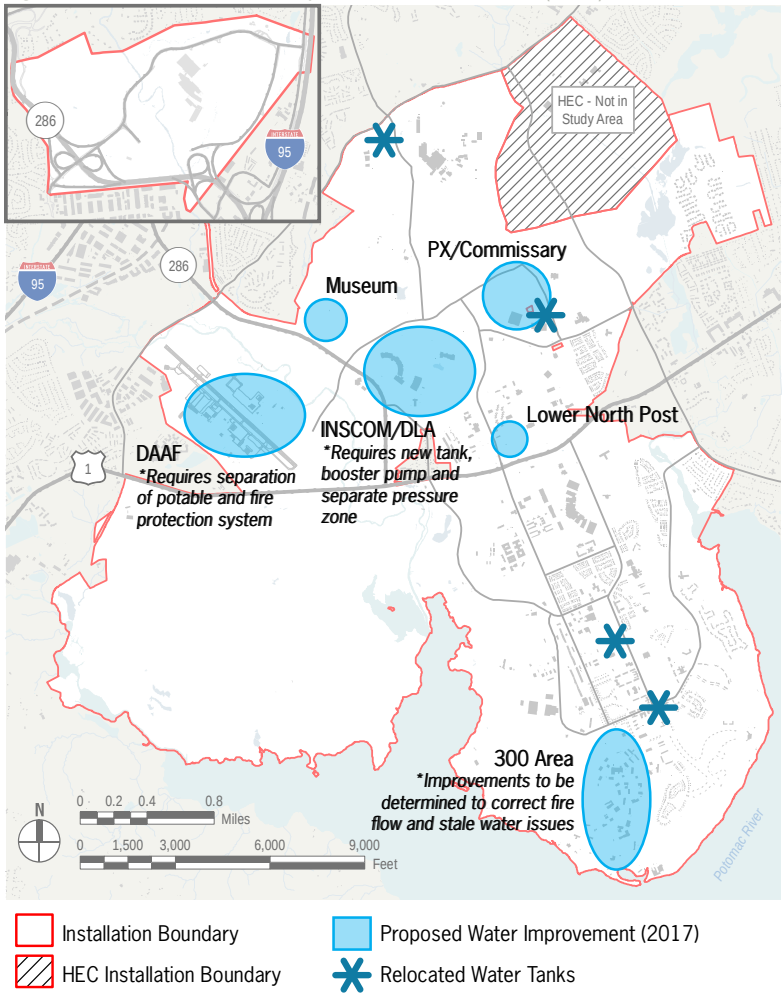
- Future development of the NMUSA and at the DLA complex will need to evaluate the capacity of the 15 inch sewer which runs from DLA southwest toward Davison Field. Based on preliminary studies, this line is at or near capacity.
- The proposed INSCOM expansion shall evaluate the capacity of the existing pump station east of the site and the gravity sewers downstream to insure that adequate capacity exists for the additional population.
- Anticipated development at the PX/Commissary, on Lower North Post, and on South Post will require extension of the sanitary sewer collection system to serve these areas. No capacity problems are expected.

Water Distribution

A water capacity study at Main Post conducted in 2007 analyzed existing conditions and considered requirements to serve growth to the year 2015. The study identified several areas of concern and suggested improvements to the water system. The BRAC infrastructure program and Fort Belvoir Community Hospital included several of the projects required to alleviate these problems. See Figure 5.3.

- The water system was privatized to American Water Military Systems in 2010. American Water is preparing a Capital Improvement Plan that includes repair, replacement, and upgrades of pipes, pumps and tanks.
- American Water has prepared a hydraulic study of the water system. The study indicates that there are no significant capacity or pressure problems on Post. Nearly all areas have pressure of 38 psi or more under peak (non fire flow) conditions. No location on post has pressure below 30 psi. In some areas, buildings higher than three or four floors will require fire pumps to insure adequate fire flows. (Providing system pressures adequate to meet fire flow requirements will typically require pressure reducing valves on domestic services at each building.) There are concerns with inadequate circulation in the 300 Area.
- The infrastructure projects completed in 2011 as a result of BRAC provided upgrades to the existing water system and shall provide adequate pipe capacity for anticipated growth to 2017.
- American Water is evaluating the replacement of several of the existing water tanks and relocating to new locations with higher elevations as shown in Figure 5.3. Placing a new tank near DLA will provide additional storage and pressure near an area of high demand and high fire flow requirements; however, Davison Army Airfield's proximity to DLA will limit the tank height. Providing elevated tanks at new locations or at slightly higher elevations can improve water pressure at DLA.
- The system includes several pressure reducing valves (PRVs) to regulate water pressure between the higher areas on Upper North Post and lower areas farther south. Relocating some of these PRVs can provide improved pressure to several areas.
- Anticipated development at INSCOM, DLA, the Museum, and the Lower North Post will require extension of the water distribution system to serve new facilities and may require the tank and pressure improvements noted above to accommodate the additional demand.
- Development at the PX/Commissary, Lower North Post, and South Post will require extension and/or replacement of the water distribution systems in these areas.

Figure 5.3 - Water Distribution Improvements - Short Term (2017)



Electric

Dominion Virginia Power (DVP) has an extensive network of distribution lines throughout the Post. New projects must provide a load letter to DVP, and DVP determines the extent of improvements to provide service. Each project must fund any required improvements. For most small projects, the costs for service extensions will not be significant. Projects with high loads may require significant infrastructure improvements depending on site location and program requirements.

Natural Gas

Washington Gas has an extensive network of distribution lines covering large parts of the Post. New projects must provide a load letter to Washington Gas to determine the extent of improvements required to provide service. Each project must fund any required improvements. For small projects adjacent to existing gas mains, service can be provided at low or no costs. Projects that require extension of gas mains for a significant distance may incur substantial costs to provide service.

Steam

In 2007, the existing steam plants and distribution system were analyzed to determine their adequacy for current and future needs. The steam system is old, inefficient, and leaky. The Installation is phasing out the steam system and replacing it with gas boilers in individual buildings. There are no plans to expand the steam system. It will be several years before the entire steam system is abandoned. The existing steam lines will be abandoned in place and will not be removed.

Storm Sewer System

The existing Main Post storm sewer system includes 280,241 linear feet (LF) of storm drainage pipe and 597 culvert crossings (representing an additional 32,181 LF of pipe). Pipe diameters range from 6 inches to 54 inches, and vary in material: reinforced concrete, asbestos cement, cast iron, brick, corrugated metal, ductile iron, and polyvinyl chloride (PVC). There are about 501 manholes and 2,140 inlets. In addition, 43 storm basins, primarily dry ponds, exist on Main Post. The storm system drains via a series of piping that discharges to various streams and tributaries, and ultimately, to the Potomac River and its tributaries. Installation staff maintains the system.

Prior to BRAC, the previous development at Main Post occurred without the provision of stormwater management. The increased runoff exceeds the capacity of receiving water courses, resulting in serious erosion of natural channels.

Installation staff have indicated that existing stream erosion is their primary concern associated with the drainage system. A study called “Stormwater Management Guidance” (dated March 2007) was developed to summarize design criteria, provide guidelines for meeting the Fairfax County and VDEQ design criteria, and suggest methods of providing quality and quantity control. While stormwater management regulations have changed since the study was completed, elements of this document continue to be carried forward to guide decision making.

The BRAC projects completed in 2011 (both new buildings and the Infrastructure projects) included extensive drainage conveyance and stormwater management facilities upgrades, providing both quality and quantity control. The infrastructure projects also included several stream restoration projects to remediate stream erosion.

Areas of the Installation with well developed storm drainage systems, adequate inlets, an extensive network of storm sewers, and stormwater management (SWM) facilities, include:

- Tracy Loop and Theote Road-16th Street areas
- New RCI housing areas, such as Vernondale and Herryford Village
- DLA and DTRA complex

Several areas on the Installation have limited inlet and pipe networks and no storm water management facilities:

- The block between 16th and 18th Streets and Gunston and Belvoir Roads. (The 6-8 inch pipes in this area appear to be undersized for the drainage area. Paved areas are relatively flat, but there are very few inlets.)
- The block between 12th and 16th Streets and Gunston and Middleton Roads, in the vicinity of Buildings 1150, 1155, and 1190. (Very little storm drainage exists.)
- East of Gunston Road, between U.S. Route 1 and 9th Street, within the 3rd, 4th, 5th, and 6th Streets vicinity (the 1400 Area). Pipes within this area appear to be undersized for the amount of impervious area associated with full build-out conditions.

Since funding to improve the existing inadequate drainage systems is unlikely, all new development shall include: an adequate storm drainage system (including upgrades to the existing system where runoff is directed from new development), stormwater quality/quantity control, and an analysis of the existing downstream storm system to ensure adequate outfall is available.

Design of all new drainage facilities shall consider the ultimate anticipated development in the surrounding area, including the entire upstream sanitary or storm drainage-shed. New infrastructure shall be designed to serve the ultimate anticipated flow from the upstream area, based on the potential of achieving full build-out as reflected in the district regulating plans.

Drainage facilities at Fort Belvoir are regulated by DoD design criteria and by the Installation's MS-4 stormwater discharge permit, which is issued by the Commonwealth of Virginia's Department of Environmental Quality (VDEQ). The MS-4 permit requires that stormwater management and erosion control be provided in accordance with Fairfax County standards. Note that Fairfax County has no jurisdictional authority over Fort Belvoir; enforcement of the regulations is the responsibility of the Installation staff.

Stormwater Management

Stormwater management strategies for individual projects shall emphasize decentralized infiltration techniques to the maximum extent possible. This will achieve Low Impact Development goals and the requirements of the Energy Independence and Security Act 2007 Section 438. Low impact design techniques are especially appropriate when redeveloping on smaller infill parcels where land may not be able to support a traditional SWM facility and/or the site would not have access to a larger, centralized underground SWM facility that will be designed to serve existing and future projects.

The Installation has proposed one centralized stormwater management facility near Theote Road and 16th Street to serve existing and future development in the area. This proposed regional facility is located within the Accotink Bay sub-watershed (listed as Short-term Project #14, ST 14, in the EIS) and is currently on hold pending environmental remediation. There are no other centralized SWM facilities planned.

There are no other centralized SWM facilities planned. The Installation shall pursue additional funding for SWM facilities which may also include stream restoration, riparian buffer revegetation, and culvert crossing improvements to improve stream stability and in places where there is an inadequate outfall condition, consistent with the goals of the INRMP. In accordance with the MS-4 permit, all new development at Fort Belvoir must meet three specific stormwater management criteria:

- Runoff volume control: To reduce peak runoff of the developed Post to the same level as the pre-developed Post, for both the two-year and ten-year frequency storms.
- Quality control: To reduce pollutants in runoff caused by paved, roofed, and other impervious areas. (This is usually met by detaining the first half-inch of runoff from a site for 48 to 72 hours, which allows solids and other pollutants to settle before runoff is released).
- Adequate outfall: To ensure any new development discharges storm and other surface waters into a natural watercourse or man-made drainage facility, with sufficient capacity to preclude any adverse impacts to the land (over which waters are conveyed) or natural watercourse/facility (into which waters are discharged).

The Fairfax County Public Facilities Manual (Section 6-0203) defines the following requirements for an adequate outfall analysis. The extent of the review of the downstream drainage system shall be:

- To a point that is at least 150 feet (46 m) downstream to a point where the receiving pipe or channel is joined by another that has a drainage area that is at least 90 percent of the size of the first drainage area at the point of confluence; or
- To a point at which the total drainage area is at least 100 times greater than the contributing drainage area of the development site; or
- To a point that is at least 150 feet (45 m) downstream of a point where the drainage area is 360 acres (1.46 km2) or greater.

Additionally, there have been several culvert crossing improvements to install a base flow culvert and a second high flow culvert for storm events to provide stability to the stream system and allow self-maintenance.

Figure 5.4 - Open Space Analysis, 2017 (Short Term)

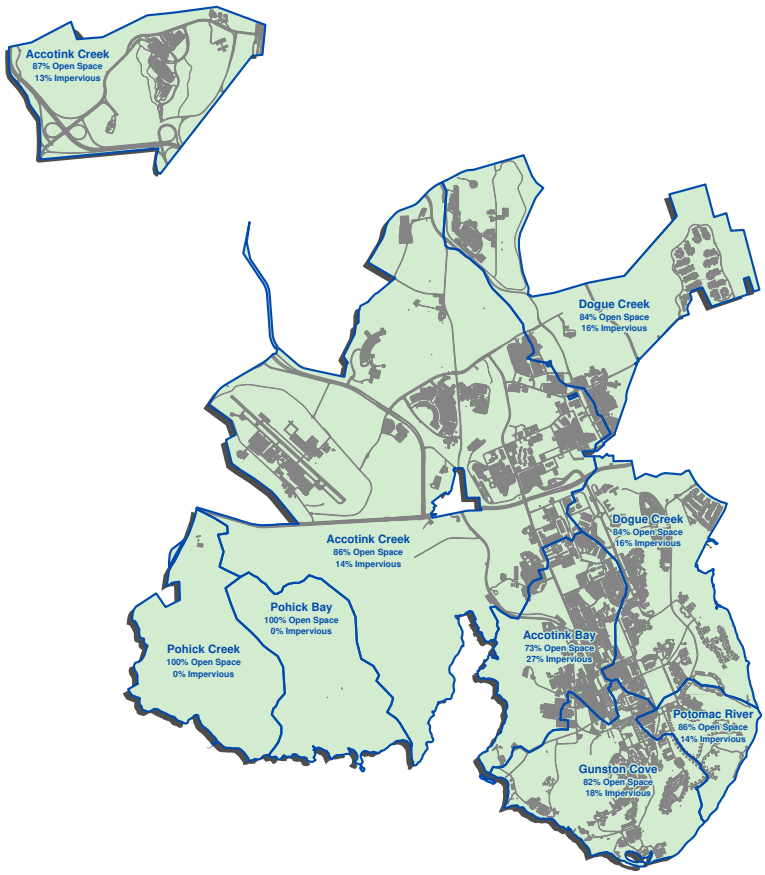


Table 5.3 - Open Space Analysis - Short Term (2017)

	2011 (Post-BRAC)				2017 (Near Term)			
Watersheds	**Open Space (Acres)**		**Impervious (Acres)[2]**		**Open Space (Acres)**		**Impervious (Acres)[2]**	
Accotink Bay	452	74%	156	26%	442	73%	166	27%
Accotink Creek	2,859	88%	392	12%	2,802	86%	449	14%
Accotink Creek - FBNA	702	87%	102	13%	700	87%	104	13%
Dogue Creek	1,507	85%	258	15%	1,489	84%	276	16%
Gunston Cove	559	83%	117	17%	557	82%	119	18%
Pohick Bay	566	100%	0	0%	566	100%	0	0%
Pohick Creek	635	100%	1	0%	635	100%	1	0%
Potomac River	203	88%	34	14%	203	86%	34	14%
Total	**7,484**	**88%**	**1,059**	**12%**	**7,394**	**87%**	**1,149**	**13%**

Notes: 1. Percentages shown in tables reflect estimates of future project footprints; therefore, impervious areas may vary by approximately 3%.
2. Impervious area does not include paved trails and sidewalks.

Impervious = Airfield Surfaces, Buildings, Parking Lots, Bridges, Driveways and Roads
Open Space = Everything Else

Locations for stormwater management facilities on Fort Belvoir are limited. The following factors will be considered in the design and siting of new SWM facilities:

- No interference with known locations for major facilities and roads
- No incursion into wetlands, waters of the U.S., or Chesapeake Bay Resource Protection Areas, or riparian buffers
- Avoids wetland, stream restoration, and revegetated mitigation areas
- Minimization of removal of forest cover
- No interference with known Threatened and Endangered Species sites
- Minimization of excavation requirements
- Conformance to local topography to the greatest extent possible
- Access from existing or planned roads
- Distribution of sites over all watersheds within the project area.
- Accessibility of facility for maintenance and inspection

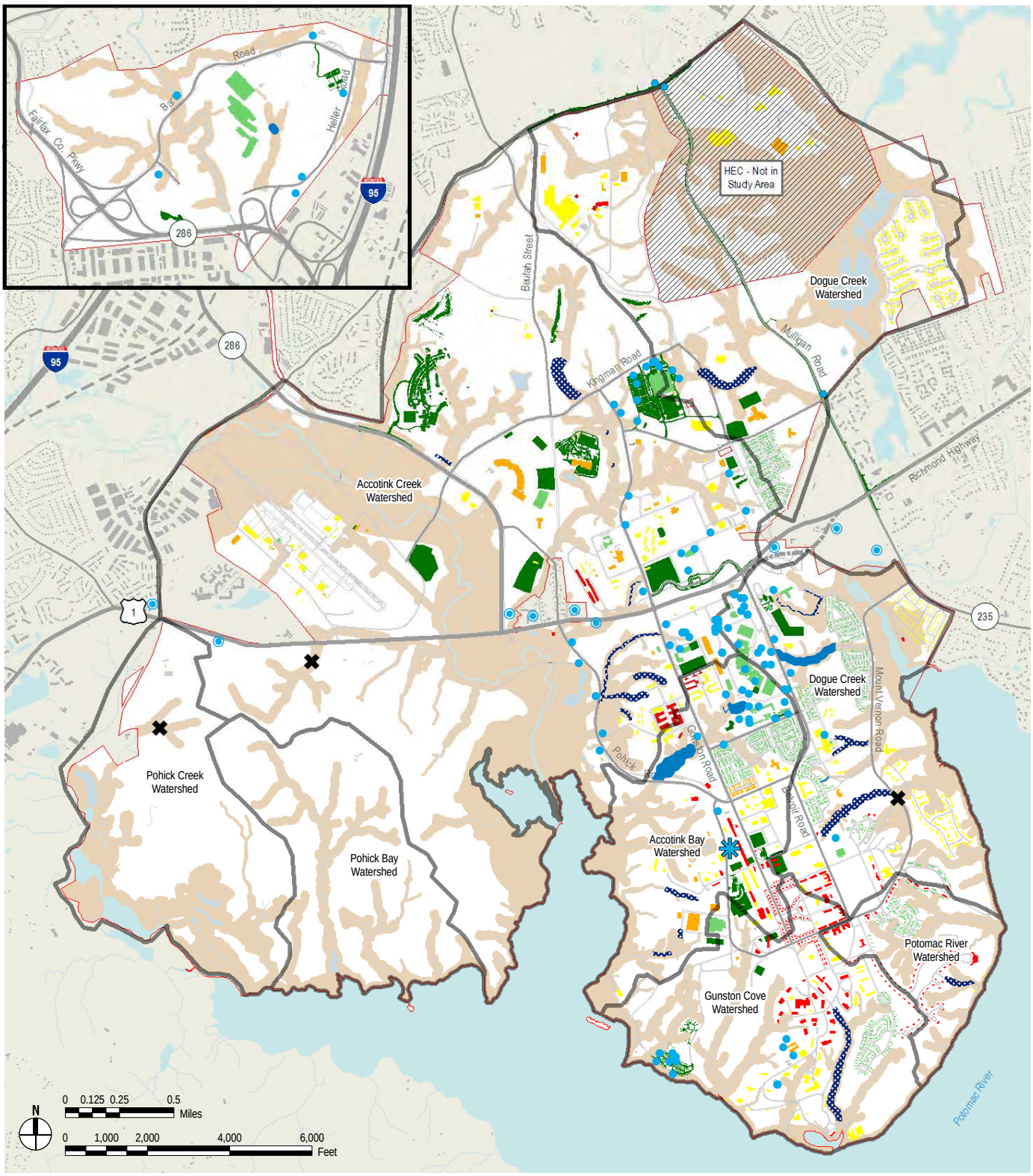
Stormwater management efforts should be designed as a comprehensive and integrated solution that addresses the existing watershed conditions as described in Section 2.

The following is a summary of the types of SWM facilities that will be required to support individual projects. The exact facility locations will be determined with the design of the project.

- Underground SWM facilities will generally be located in low areas within the open space areas as shown in the Regulating Plans Chapter 2 of the IPS or in surface parking lots and/or paved areas. One recent example is the underground facility in the parking lot within the WT campus.
- The expansion of existing and/or future aboveground SWM facilities (dry or wet ponds) where facilities have been sized to support additional runoff.
- Use of innovative low impact design solutions and facilities such as rain gardens, bioswales and porous pavement. Opportunities for stormwater reuse should also be considered.
- Outfall improvements, if required, will be determined by the condition of the drainage shed in accordance with regulations.

An Open Space Analysis prepared in 2011 showed that Fort Belvoir will retain more than 87 percent (over 7,000 acres) of open space upon completion of anticipated 2017 development. New development will fall largely within Accotink Creek and Dogue Creek watersheds. As shown in Figure 5.4 and Table 5.3, Accotink Creek watershed is anticipated to lose 57 acres of open space, and Dogue Creek will lose 18 acres of open space.

Figure 5.5 - Watershed Improvements



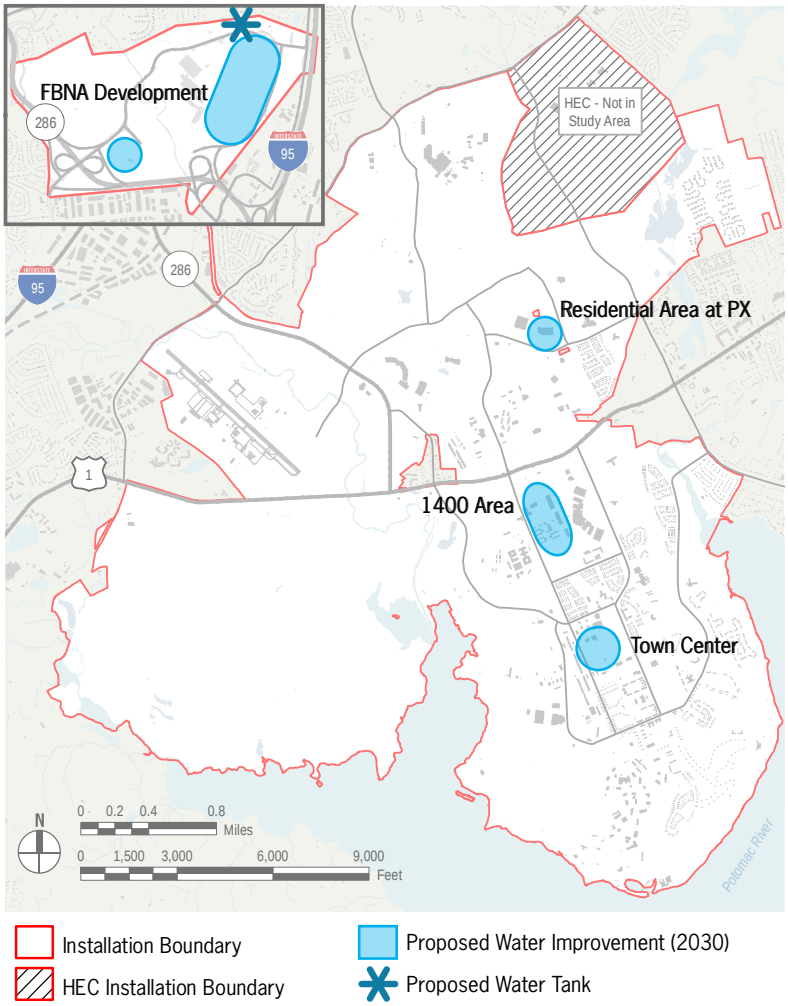
- Culvert Crossing Stream Improvement
- Existing Stormwater Management Area
- Proposed Stormwater Management Area
- Proposed Regional Stormwater Management Facility
- Watershed Boundary
- RPA Boundary & Riparian Buffer
- Completed Stream Restoration
- Proposed Stream Restoration
- Short Range Project with new SWM/LID design measures as required

Facility Stormwater Treatment Based on Age

- No SWM Treatment
- Minimal SWM, Limited to Quantity Control, Areas with No SWM
- SWM Generally Both Quantity and Quality Control
- Enhanced SWM Extended Detention, LID, Etc.

Typical locations for new, SWM facilities on smaller redevelopment sites will be determined in the short term (2017) on a project-by-project basis. Ideally, areas include the open lawn areas created by AT/FP building setbacks and in places where surface parking lots may be proposed that minimize their impact on the land. When possible, new SWM facilities should provide expansion for future projects within the sub-watershed. Lastly, SWM strategies must consider downstream conditions that may require enhanced SWM measures such as extended detention, water conservation, LID measures and/or stream restoration. See Figure 5.5 for location of proposed stream restoration areas and 2017 projects.

Figure 5.6 - Water Distribution Improvements - Long Term (2030)



Long-Term (2030) Utility Systems Improvements

Water

The FBNA water distribution network will need to be extended for anticipated new development at FBNA. The existing system shall have adequate capacity to serve anticipated development. If additional storage is required, a second tank can be constructed at FBNA.

At Main Post, construction of the residential area adjacent to the PX and redevelopment of the Town Center area will require extension of the water distribution system to these areas, and replacement of existing lines which conflict with proposed development redevelopment of the 1400 Area that requires a new pipe network, as most of the existing lines in the area west of the new hospital will need to be abandoned; (proposed buildings are in conflict with most existing water lines here). The new USALSA building has constructed the first portion of this new pipe network. The proposed 16-inch water line spanning from the Fairfax County Water System in the north to just south of U.S. Route 1 will provide adequate service for proposed 2030 development.

Some infrastructure upgrades will be required if all the projects anticipated are built; however, the exact scope of these depends on what will actually be built. See Figure 5.6.

Stormwater Management

The densest projected development in the 2030 plan is in the 1400 Area and redevelopment of the old DeWitt Hospital. Significant development is also proposed in the Lower North Post area. Stormwater conveyance and management facilities in these areas will be funded and constructed with individual projects, but facility design must consider the ultimate anticipated development in each area.

Site selection for each new building shall consider utility, drainage and stormwater requirements for future development and reserve utility corridors and adequate areas for future stormwater facilities. Preliminary design for each new building shall include preliminary infrastructure design for future buildings in the vicinity to demonstrate: 1) they can be efficiently served by expansion or extension of existing and proposed facilities, and 2) the new development infrastructure (e.g., will not be in conflict with future development) and projected building/parking facilities. All utilities (water, sanitary, storm, gas, electric) shall be designed with capacity for the ultimate anticipated development. Where feasible, design stormwater management facilities with capacity for future development in the area. The Installation must ensure that the siting of each building and its required infrastructure will not preclude the cost efficient provision of access, drainage or utilities for future planned development.

Due to site limitations, most stormwater management (quality and quantity control) facilities in the 1400 Area are likely to be underground storage systems, designed to serve only one or two new buildings. (The Gunston Road infrastructure project has constructed several small underground facilities; the USALSA building is served by an underground facility that is sized only for the USALSA site.) It may be possible to construct larger surface or underground facilities on the perimeter of the 1400 Area that can initially serve one building but be expanded with additional development.

The Lower North Post area drains toward a stream that runs to the southwest and eventually becomes Mason Run. Development here shall consider the use of shared surface or underground stormwater management facilities. OCAR has built a surface facility which can be expanded to serve additional development.

Drainage design in both the 1400 Area and Lower North Post areas shall consider adequate outfall in the downstream receiving waters.

The 2011 Open Space Analysis also evaluated the long range (to 2030) impacts of development by watershed. From 2017 to 2030, most development will again fall largely within Accotink, Dogue Creek, and Gunston Cove watersheds. Accotink Creek watershed loses 12 acres of open space on Main Post and 26 acres on FBNA. Dogue Creek and Gunston Cove both lose 9 acres of open space. See Figure 5.7 and Table 5.4.

Typical locations for new, SWM facilities on smaller redevelopment sites in the long range (2030) will be the same as noted for 2017 and will be determined on a project-by-project basis. In addition, several 2030 projects, such as the future campus at FBNA and the redevelopment of the 1400 Area, offer the opportunity to provide a more centralized SWM approach given a larger land area to support the facilities.

Figure 5.7 - Open Space Analysis, 2030 (Long Range)

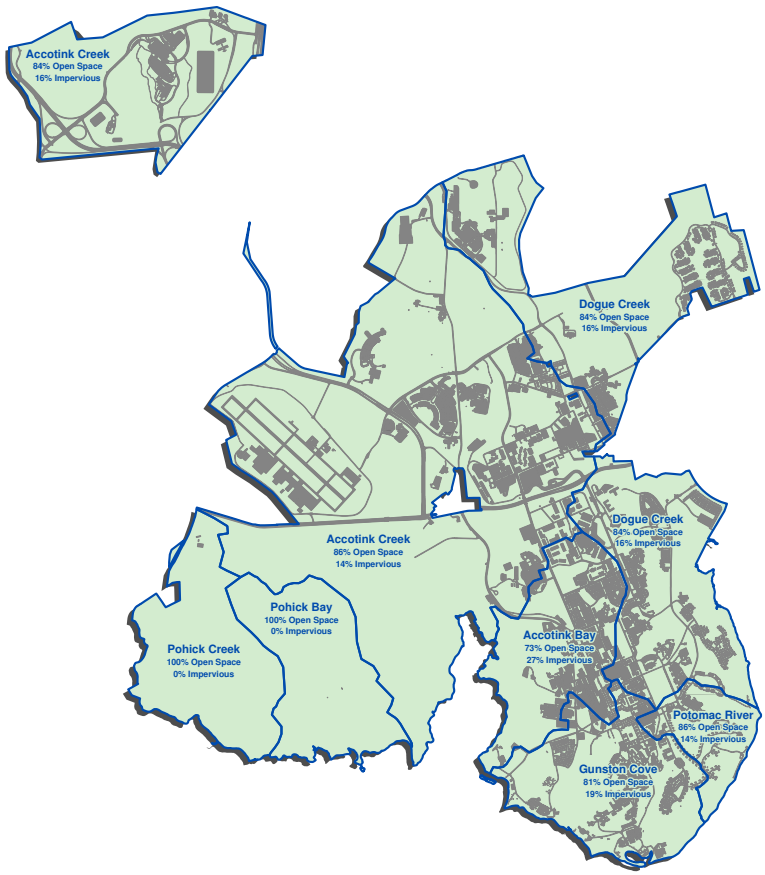


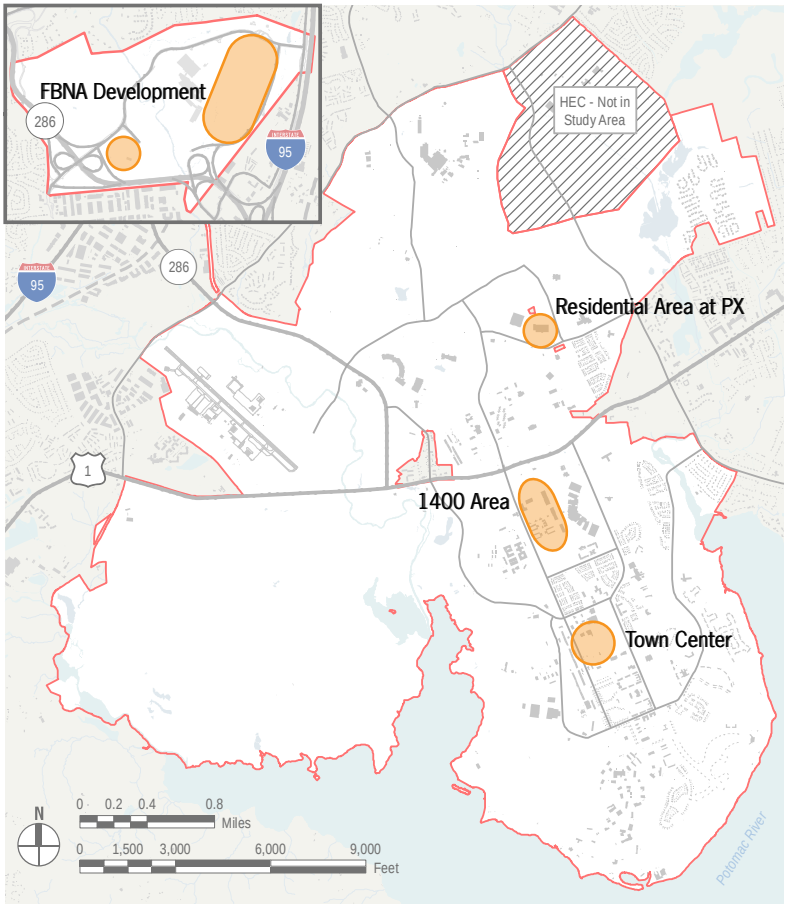
Table 5.4 - Open Space Analysis - Long Range (2030)

	2017 (Short Term)				2030 (Long Range)			
Watersheds	**Open (Acres)**		**Impervious (Acres)[2]**		**Open (Acres)**		**Impervious (Acres)[2]**	
Accotink Bay	442	73%	166	27%	442	73%	166	27%
Accotink Creek	2,802	86%	449	14%	2,790	86%	462	14%
Accotink Creek - FBNA	700	87%	104	13%	674	84%	130	16%
Dogue Creek	1,489	84%	276	16%	1,480	84%	285	16%
Gunston Cove	557	82%	119	18%	548	81%	127	19%
Pohick Bay	566	100%	0	0%	566	100%	0	0%
Pohick Creek	635	100%	1	0%	635	100%	1	0%
Potomac River	203	86%	34	14%	203	86%	34	14%
Total	7,394	87%	1,149	13%	7,339	86%	1,204	14%

Notes: 1. Percentages shown in tables reflect estimates of future project footprints; therefore, impervious areas may vary by approximately 3%.
2. Impervious area does not include paved trails and sidewalks.

Impervious = Airfield Surfaces, Buildings, Parking Lots, Bridges, Driveways and Roads
Open Space = Everything Else

Figure 5.8 - Sanitary Sewer Improvements - Long Term (2030)



Installation Boundary

HEC Installation Boundary

Proposed Sanitary Improvement (2030)

Sanitary Sewer

Potential development at FBNA will require extension of the sanitary sewer system to serve these areas. No capacity problems in serving these areas is anticipated.

At Main Post, construction of the residential area adjacent to the PX and redevelopment of the Town Center area will require extension of the sanitary collection system to these areas, and replacement of existing lines which conflict with proposed development. No capacity issues are anticipated. The densest projected development in the 2030 plan is the new construction in the 1400 Area. This development has the potential to overload the downstream gravity sewers and pump stations. Part or all of this area can be diverted to the new hospital pump station; if there is not adequate capacity for this flow in the pump station, a second pump station can be constructed adjacent to it. Redevelopment of the 1400 Area will require a new pipe network, as most of the existing lines in the area west of the new hospital will need to be abandoned; (proposed buildings are in conflict with most existing water lines here). The new USALSA building has constructed the first portion of this new pipe network.

Summary Utility Assessment

The utility construction work associated with BRAC 2005 and the ongoing replacement of aging water and sewer lines by American Water should be able to support the near-term projects. Any additional water and sewer line extensions that will be needed for these new projects should be sized to support future development. The ability of utility service providers to meet these future demands is expected to continue and should not hinder the Installation's ability to expand. The current demands for enhanced electric service associated with more energy intensive uses needed to meet the existing population as well as future growth levels are expected to continue. This trend will require advance planning with the service providers and the continuation of innovative project design solutions. Innovative examples include the recent LEED built projects such as the Fort Belvoir Community Hospital and the secure campus at FBNA that can offset these increased energy demands. See Figure 5.8.

APPENDIX C
LIST OF URBAN STRUCTURAL SMFS INSTALLED PRIOR TO NOVEMBER 1, 2023

MS4 Structure ID	BMP Type	Total Drainage Area	Impervious	Pervious	ChesBay Date Installed	Credit Taken?	Loading Rate, Impervious, Nitrogen (16.86 lbs./ac./yr/)	Loading Rate, Pervious, Nitrogen (10.07 lbs./ac./yr.)	Combined Nitrogen Loading Rate (lbs./yr.)	Nitrogen Removal Rate Efficiency %	2024 Nitrogen Reduction Achieved (lbs./yr.)	Loading Rate, Impervious, Phosphorous (1.62 lbs./ac./yr.)	Loading Rate, Pervious, Phosphorous (0.41 lbs./ac./yr.)	Combined Phosphorous Loading Rate (lbs./yr.)	Phosphorous Removal Rate Efficiency %	2024 Phosphorous Reduction Achieved (lbs./yr.)3	Loading Rate, Impervious, Suspended Solids (1,171.32 lbs./ac./yr.)	Loading Rate, Pervious, Suspended Solids (175.8 lbs./ac./yr.)	Combined Suspended Solids Loading Rate (lbs./yr.)	Suspended Solids Removal Rate Efficiency %	Suspended Solids Reduction Achieved (lbs./yr.)
5553	Dry Extended Detention - UDS	1.74	0.71	1.03	9/18/2006	Yes	11.97	10.37	22.34	5%	1.12	1.15	0.42	1.57	10%	0.16	831.64	181.07	1,012.71	10%	101.27
3489	Dry Extended Detention - UDS	2.70	1.36	1.34	1/2/2007	Yes	22.93	13.49	36.42	5%	1.82	2.20	0.55	2.75	10%	0.28	1,593.00	235.57	1,828.57	10%	182.86
9009	Permeable Pavement - Level 1	0.14	0.14	0.00	10/21/2008	Yes	2.36	0.00	2.36	59%	1.39	0.23	0.00	0.23	59%	0.13	163.98	0.00	163.98	70%	114.79
3096	Bioretention - Tree Box Filter	0.10	0.09	0.01	1/1/2009	Yes	1.52	0.10	1.62	40%	0.65	0.15	0.00	0.15	60%	0.09	105.42	1.76	107.18	80%	85.74
3097	Bioretention - Tree Box Filter	0.10	0.09	0.01	1/1/2009	Yes	1.52	0.11	1.63	40%	0.65	0.15	0.00	0.15	60%	0.09	105.42	1.93	107.35	80%	85.88
3883	Dry Extended Detention Ponds - Level 1	3.40	0.99	2.41	1/1/2009	Yes	16.69	24.27	40.96	10%	4.10	1.60	0.99	2.59	15%	0.39	1,159.61	423.68	1,583.28	60%	949.97
1030	Dry Extended Detention - UDS	2.10	1.03	1.07	4/24/2009	Yes	17.37	10.77	28.14	5%	1.41	1.67	0.44	2.11	10%	0.21	1,206.46	188.11	1,394.57	10%	139.46
6208	Bioretention - Level 2	12.80	6.46	6.34	6/30/2011	Yes	108.92	63.84	172.76	90%	155.48	10.47	2.60	13.06	90%	11.76	7,566.73	1,114.57	8,681.30	80%	6,945.04
6212	Bioretention - Micro Level 2	4.91	1.14	3.77	6/30/2011	Yes	19.22	37.96	57.18	90%	51.47	1.85	1.55	3.39	90%	3.05	1,335.30	662.77	1,998.07	80%	1,598.46
6213	Bioretention - Micro Level 2	0.87	0.20	0.67	6/30/2011	Yes	3.37	6.75	10.12	90%	9.11	0.32	0.27	0.60	90%	0.54	234.26	117.79	352.05	80%	281.64
6214	Bioretention - Micro Level 2	3.27	1.08	2.19	6/30/2011	Yes	18.21	22.05	40.26	90%	36.24	1.75	0.90	2.65	90%	2.38	1,265.03	385.00	1,650.03	80%	1,320.02
6215	Bioretention - Micro Level 2	2.23	0.61	1.62	6/30/2011	Yes	10.28	16.31	26.60	90%	23.94	0.99	0.66	1.65	90%	1.49	714.51	284.80	999.30	80%	799.44
6216	Bioretention - Micro Level 2	1.50	0.28	1.22	6/30/2011	Yes	4.72	12.29	17.01	90%	15.31	0.45	0.50	0.95	90%	0.86	327.97	214.48	542.45	80%	433.96
4635	Bioretention - Tree Box Filter	0.29	0.01	0.28	6/30/2011	Yes	0.24	2.78	3.02	40%	1.21	0.02	0.11	0.14	60%	0.08	16.40	48.52	64.92	80%	51.94
4637	Bioretention - Tree Box Filter	0.10	0.06	0.04	6/30/2011	Yes	1.01	0.40	1.41	40%	0.57	0.10	0.02	0.11	60%	0.07	70.28	7.03	77.31	80%	61.85
5867	Bioretention - Tree Box Filter	0.25	0.19	0.06	6/30/2011	Yes	3.20	0.60	3.81	40%	1.52	0.31	0.02	0.33	60%	0.20	222.55	10.55	233.10	80%	186.48
5868	Bioretention - Tree Box Filter	0.25	0.20	0.05	6/30/2011	Yes	3.37	0.50	3.88	40%	1.55	0.32	0.02	0.34	60%	0.21	234.26	8.79	243.05	80%	194.44
5883	Bioretention - Tree Box Filter	0.11	0.06	0.05	6/30/2011	Yes	1.01	0.50	1.52	40%	0.61	0.10	0.02	0.12	60%	0.07	70.28	8.79	79.07	80%	63.26
5886	Bioretention - Tree Box Filter	0.17	0.11	0.06	6/30/2011	Yes	1.85	0.60	2.46	40%	0.98	0.18	0.02	0.20	60%	0.12	128.85	10.55	139.39	80%	111.51
6940	Bioretention - Tree Box Filter	0.15	0.05	0.10	6/30/2011	Yes	0.84	1.01	1.85	40%	0.74	0.08	0.04	0.12	60%	0.07	58.57	17.58	76.15	80%	60.92
6942	Bioretention - Tree Box Filter	0.35	0.24	0.11	6/30/2011	Yes	4.05	1.11	5.15	40%	2.06	0.39	0.05	0.43	60%	0.26	281.12	19.34	300.45	80%	240.36
6944	Bioretention - Tree Box Filter	0.46	0.17	0.29	6/30/2011	Yes	2.87	2.92	5.79	40%	2.31	0.28	0.12	0.39	60%	0.24	199.12	50.98	250.11	80%	200.09
6946	Bioretention - Tree Box Filter	0.27	0.05	0.22	6/30/2011	Yes	0.84	2.22	3.06	40%	1.22	0.08	0.09	0.17	60%	0.10	58.57	38.68	97.24	80%	77.79
4826	Dry Extended Detention - UDS	9.87	8.83	1.04	6/30/2011	Yes	148.87	10.47	159.35	5%	7.97	14.30	0.43	14.73	10%	1.47	10,342.76	182.83	10,525.59	10%	1,052.56
6154	Dry Extended Detention - UDS	1.38	1.26	0.12	6/30/2011	Yes	21.24	1.21	22.45	5%	1.12	2.04	0.05	2.09	10%	0.21	1,475.86	21.10	1,496.96	10%	149.70
6165	Dry Extended Detention - UDS	1.40	1.36	0.04	6/30/2011	Yes	22.93	0.40	23.33	5%	1.17	2.20	0.02	2.22	10%	0.22	1,593.00	7.03	1,600.03	10%	160.00
7108	Dry Extended Detention - UDS	1.18	1.06	0.12	6/30/2011	Yes	17.87	1.21	19.08	5%	0.95	1.72	0.05	1.77	10%	0.18	1,241.60	21.10	1,262.70	10%	126.27
7158	Dry Extended Detention Ponds - Level 1	4.11	2.46	1.65	6/30/2011	Yes	41.48	16.62	58.09	10%	5.81	3.99	0.68	4.66	15%	0.70	2,881.45	290.07	3,171.52	60%	1,902.91
7210	Dry Extended Detention Ponds - Level 1	2.42	1.22	1.20	6/30/2011	Yes	20.57	12.08	32.65	10%	3.27	1.98	0.49	2.47	15%	0.37	1,429.01	210.96	1,639.97	60%	983.98
7196	Infiltration Practices - Level 1	0.76	0.42	0.34	6/30/2011	Yes	7.08	3.42	10.51	57%	5.99	0.68	0.14	0.82	63%	0.52	491.95	59.77	551.73	95%	524.14
6171	Permeable Pavement - Level 1	0.33	0.33	0.00	6/30/2011	Yes	5.56	0.00	5.56	59%	3.28	0.53	0.00	0.53	59%	0.32	386.54	0.00	386.54	70%	270.57
6900	Wet Pond - Level 1	4.62	1.80	2.82	6/30/2011	Yes	30.35	28.40	58.75	20%	11.75	2.92	1.16	4.07	45%	1.83	2,108.38	495.76	2,604.13	60%	1,562.48
2504	Dry Extended Detention - UDS	4.94	1.49	3.45	1/1/2012	Yes	25.13	34.74	59.87	5%	2.99	2.41	1.41	3.83	10%	0.38	1,745.85	606.42	2,352.27	10%	235.23
6102	Bioretention - Level 1	11.00	6.65	4.35	6/30/2012	Yes	112.12	43.80	155.92	64%	99.79	10.77	1.78	12.56	55%	6.91	7,789.28	764.73	8,554.01	80%	6,843.21
6121	Bioretention - Level 1	11.80	6.84	4.96	6/30/2012	Yes	115.32	49.95	165.27	64%	105.77	11.08	2.03	13.11	55%	7.21	8,011.83	871.97	8,883.80	80%	7,107.04
6286	Bioretention - Level 1	0.24	0.05	0.19	6/30/2012	Yes	0.84	1.91	2.76	64%	1.76	0.08	0.08	0.16	55%	0.09	58.57	33.40	91.97	80%	73.57
6306	Bioretention - Level 1	2.93	1.34	1.59	6/30/2012	Yes	22.59	16.01	38.60	64%	24.71	2.17	0.65	2.82	55%	1.55	1,569.57	279.52	1,849.09	80%	1,479.27
6380	Bioretention - Level 1	2.94	1.06	1.88	6/30/2012	Yes	17.87	18.93	36.80	64%	23.55	1.72	0.77	2.49	55%	1.37	1,241.60	330.50	1,572.10	80%	1,257.68
6386	Bioretention - Level 1	4.89	2.29	2.60	6/30/2012	Yes	38.61	26.18	64.79	64%	41.47	3.71	1.07	4.78	55%	2.63	2,682.32	457.08	3,139.40	80%	2,511.52
6457	Bioretention - Level 1	7.11	1.39	5.72	6/30/2012	Yes	23.44	57.60	81.04	64%	51.86	2.25	2.35	4.60	55%	2.53	1,628.13	1,005.58	2,633.71	80%	2,106.97
6466	Bioretention - Level 1	2.73	0.42	2.31	6/30/2012	Yes	7.08	23.26	30.34	64%	19.42	0.68	0.95	1.63	55%	0.90	491.95	406.10	898.05	80%	718.44
6479	Bioretention - Level 1	12.80	4.31	8.49	6/30/2012	Yes	72.67	85.49	158.16	64%	101.22	6.98	3.48	10.46	55%	5.75	5,048.39	1,492.54	6,540.93	80%	5,232.74
6749	Bioretention - Level 1	10.40	5.65	4.75	6/30/2012	Yes	95.26	47.83	143.09	64%	91.58	9.15	1.95	11.10	55%	6.11	6,617.96	835.05	7,453.01	80%	5,962.41
6145	Bioretention - Micro Level 1	2.74	1.47	1.27	6/30/2012	Yes	24.78	12.79	37.57	64%	24.05	2.38	0.52	2.90	55%	1.60	1,721.84	223.27	1,945.11	80%	1,556.09
6753	Bioretention - Micro Level 1	1.43	0.97	0.46	6/30/2012	Yes	16.35	4.63	20.99	64%	13.43	1.57	0.19	1.76	55%	0.97	1,136.18	80.87	1,217.05	80%	973.64
6758	Bioretention - Micro Level 1	1.19	0.47	0.72	6/30/2012	Yes	7.92	7.25	15.17	64%	9.71	0.76	0.30	1.06	55%	0.58	550.52	126.58	677.10	80%	541.68
7250	Bioretention - Micro Level 1	0.71	0.25	0.46	6/30/2012	Yes	4.22	4.63	8.85	64%	5.66	0.41	0.19	0.59	55%	0.33	292.83	80.87	373.70	80%	298.96
6462	Bioretention - Micro Level 2	1.65	0.84	0.81	6/30/2012	Yes	14.16	8.16	22.32	90%	20.09	1.36	0.33	1.69	90%	1.52	983.91	142.40	1,126.31	80%	901.05
6448	Bioretention - Tree Box Filter	0.12	0.12	0.00	6/30/2012	Yes	2.02	0.00	2.02	40%	0.81	0.19	0.00	0.19	60%	0.12	140.56	0.00	140.56	80%	112.45
6450	Bioretention - Tree Box Filter	0.11	0.08	0.03	6/30/2012	Yes	1.35	0.30	1.65	40%	0.66	0.13	0.01	0.14	60%	0.09	93.71	5.27	98.98	80%	79.18
7070	Bioretention - Tree Box Filter	1.31	0.66	0.66	6/30/2012	Yes	11.07	6.61	17.68	40%	7.07	1.06	0.27	1.33	60%	0.80	768.97	115.41	884.38	80%	707.51
7072	Bioretention - Tree Box Filter	0.94	0.47	0.47	6/30/2012	Yes	7.92	4.73	12.64	40%	5.06	0.76	0.19	0.95	60%	0.57	549.93	82.54	632.47	80%	505.98
7075	Bioretention - Tree Box Filter	0.75	0.38	0.38	6/30/2012	Yes	6.33	3.78	10.11	40%	4.04	0.61	0.15	0.76	60%	0.46	439.83	66.01	505.84	80%	404.67
7077	Bioretention - Tree Box Filter	0.77	0.38	0.38	6/30/2012	Yes	6.47	3.86	10.33	40%	4.13	0.62	0.16	0.78	60%	0.47	449.20	67.42	516.62	80%	413.30
7079	Bioretention - Tree Box Filter	2.91	1.45	1.45	6/30/2012	Yes	24.51	14.64	39.14	40%	15.66	2.35	0.60	2.95	60%	1.77	1,702.51	255.53	1,958.04	80%	1,566.43
7081	Bioretention - Tree Box Filter	3.61	1.80	1.80	6/30/2012	Yes	30.39	18.15	48.54	40%	19.42	2.92	0.74	3.66	60%	2.20	2,111.30	316.88	2,428.18	80%	1,942.55
7104	Bioretention - Tree Box Filter	0.39	0.19	0.19	6/30/2012	Yes	3.27	1.95	5.22	40%	2.09	0.31	0.08	0.39	60%	0.24	227.24	34.11	261.34	80%	209.07
7106	Bioretention - Tree Box Filter	0.30	0.15	0.15	6/30/2012	Yes	2.50	1.49	3.99	40%	1.59	0.24	0.06	0.30	60%	0.18	173.36	26.02	199.37	80%	159.50
7111	Bioretention - Tree Box Filter	0.41	0.20	0.20	6/30/2012	Yes	3.42	2.04	5.47	40%	2.19	0.33	0.08	0.41	60%	0.25	237.78	35.69	273.47	80%	218.77
7112	Bioretention - Tree Box Filter	0.40	0.20	0.20	6/30/2012	Yes	3.37	2.01	5.39	40%	2.15	0.32	0.08	0.41	60%	0.24	234.26	35.16	269.42	80%	215.54
7252	Bioretention - Tree Box Filter	0.32	0.11	0.21	6/30/2012	Yes	1.85	2.08	3.94	40%	1.58	0.18	0.08	0.26	60%	0.16	128.85	36.39	165.24	80%	132.19
7253	Bioretention - Tree Box Filter	0.25	0.08	0.17	6/30/2012	Yes	1.35	1.73	3.08	40%	1.23	0.13	0.07	0.20	60%	0.12	93.71	30.24	123.94	80%	99.15
7254	Bioretention - Tree Box Filter	0.33	0.03	0.30	6/30/2012	Yes	0.51	3.00	3.51	40%	1.40	0.05	0.12	0.17	60%	0.10	35.14	52.39	87.53	80%	70.02
7255	Bioretention - Tree Box Filter	0.75	0.04	0.71	6/30/2012	Yes	0.67	7.10	7.77	40%	3.11	0.06	0.29	0.35	60%	0.21	46.85	123.94	170.79	80%	136.63
6683	Dry Extended Detention - Hydrodynamic	4.12	2.76	1.36	6/30/2012	Yes	46.53	13.70	60.23	5%	3.01	4.47	0.56	5.03	10%	0.50	3,232.84	239.09	3,471.93	10%	347.19
5913	Dry Extended Detention - UDS	6.14	3.62	2.52	6/30/2012	Yes	61.03	25.38	86.41	5%	4.32	5.86	1.03	6.90	10%	0.69	4,240.18	443.02	4,683.19	10%	468.32
7241	Dry Extended Detention - UDS	1.94	1.94	0.00	6/30/2012	Yes	32.71	0.00	32.71	5%	1.64	3.14	0.00	3.14	10%	0.31	2,272.36	0.00	2,272.36	10%	227.24
7588	Dry Extended Detention - UDS	1.93	1.93	0.00	6/30/2012	Yes	32.54	0.00	32.54	5%	1.63	3.13	0.00	3.13	10%	0.31	2,260.65	0.00	2,260.65	10%	226.06
6240	Dry Extended Detention Ponds - Level 1	7.10	2.51	4.59	6/30/2012	Yes	42.32	46.22	88.54	10%	8.85	4.07	1.88	5.95	15%	0.89	2,940.01	806.92	3,746.94	60%	2,248.16
6818	Dry Extended Detention Ponds - Level 1	21.40	7.06	14.34	6/30/2012	Yes	119.03	144.40	263.44	10%	26.34	11.44	5.88	17.32	15%	2.60	8,269.52	2,520.97	10,790.49	60%	6,474.29
6851	Dry Extended Detention Ponds - Level 1	30.75	7.35	23.40	6/30/2012	Yes	123.92	235.64	359.56	10%	35.96	11.91	9.59	21.50	15%	3.23	8,609.20	4,113.72	12,722.92	60%	7,633.75
7223	Dry Extended Detention Ponds - Level 1	8.68	3.65	5.03	6/30/2012	Yes	61.54	50.65	112.19	10%	11.22	5.91	2.06	7.98	15%	1.20	4,275.32	884.27	5,159.59	60%	3,095.76
7257	Dry Extended Detention Ponds - Level 1	3.18	1.07	2.11	6/30/2012	Yes	18.04	21.25	39.29	10%	3.93	1.73	0.87	2.60	15%	0.39	1,253.31	370.94	1,624.25	60%	974.55
7251	Dry Swale	0.47	0.08	0.39	6/30/2012	Yes	1.35	3.93	5.28	55%	2.90	0.13	0.16	0.29	52%	0.15	93.71	68.56	162.27	70%	113.59
9006	Dry Swale - Level 1	0.67	0.00	0.67	6/30/2012	Yes	0.00	6.75	6.75	55%	3.71	0.00	0.27	0.27	52%	0.14	0.00	117.79	117.79	70%	82.45

MS4 Structure ID	BMP Type	Total Drainage Area	Impervious	Pervious	ChesBay Date Installed	Credit Taken?	Loading Rate, Impervious, Nitrogen (16.86 lbs./ac./yr/)	Loading Rate, Pervious, Nitrogen (10.07 lbs./ac./yr.)	Combined Nitrogen Loading Rate (lbs./yr.)	Nitrogen Removal Rate Efficiency %	2024 Nitrogen Reduction Achieved (lbs./yr.)	Loading Rate, Impervious, Phosphorous (1.62 lbs./ac./yr.)	Loading Rate, Pervious, Phosphorous (0.41 lbs./ac./yr.)	Combined Phosphorous Loading Rate (lbs./yr.)	Phosphorous Removal Rate Efficiency %	2024 Phosphorous Reduction Achieved (lbs./yr.)3	Loading Rate, Impervious, Suspended Solids (1,171.32 lbs./ac./yr.)	Loading Rate, Pervious, Suspended Solids (175.8 lbs./ac./yr.)	Combined Suspended Solids Loading Rate (lbs./yr.)	Suspended Solids Removal Rate Efficiency %	Suspended Solids Reduction Achieved (lbs./yr.)
6265	Filtering Practices - Level 1	2.23	0.73	1.50	6/30/2012	Yes	12.31	15.11	27.41	30%	8.22	1.18	0.62	1.80	60%	1.08	855.06	263.70	1,118.76	80%	895.01
6704	Infiltration Practices - Level 1	1.32	0.37	0.95	6/30/2012	Yes	6.24	9.57	15.80	57%	9.01	0.60	0.39	0.99	63%	0.62	433.39	167.01	600.40	95%	570.38
6708	Infiltration Practices - Level 1	1.42	0.39	1.03	6/30/2012	Yes	6.58	10.37	16.95	57%	9.66	0.63	0.42	1.05	63%	0.66	456.81	181.07	637.89	95%	605.99
7082	Infiltration Practices - Level 2	3.27	1.63	1.63	6/30/2012	Yes	27.56	16.46	44.02	92%	40.50	2.65	0.67	3.32	93%	3.09	1,914.52	287.35	2,201.87	95%	2,091.77
6287	Infiltration Practices - UDI1	15.98	8.37	7.61	6/30/2012	Yes	141.12	76.63	217.75	57%	124.12	13.56	3.12	16.68	63%	10.51	9,803.95	1,337.84	11,141.79	95%	10,584.70
7169	Infiltration Practices - UDI1	2.95	1.32	1.63	6/30/2012	Yes	22.26	16.41	38.67	57%	22.04	2.14	0.67	2.81	63%	1.77	1,546.14	286.55	1,832.70	95%	1,741.06
6160	Permeable Pavement - Level 1	0.33	0.33	0.00	6/30/2012	Yes	5.56	0.00	5.56	59%	3.28	0.53	0.00	0.53	59%	0.32	386.54	0.00	386.54	70%	270.57
6437	Wet Pond - Level 1	16.00	10.89	5.11	6/30/2012	Yes	183.61	51.46	235.06	20%	47.01	17.64	2.10	19.74	45%	8.88	12,755.67	898.34	13,654.01	60%	8,192.41
6681	Wet Pond - Level 1	4.65	2.76	1.89	6/30/2012	Yes	46.53	19.03	65.57	20%	13.11	4.47	0.77	5.25	45%	2.36	3,232.84	332.26	3,565.11	60%	2,139.06
2684	Filtering Practices - Level 1	1.99	1.69	0.30	1/1/2013	Yes	28.49	3.02	31.51	30%	9.45	2.74	0.12	2.86	60%	1.72	1,979.53	52.74	2,032.27	80%	1,625.82
3591	Bioretention - Level 1	1.06	0.43	0.63	6/30/2013	Yes	7.25	6.34	13.59	64%	8.70	0.70	0.26	0.95	55%	0.53	503.67	110.75	614.42	80%	491.54
7260	Bioretention - Level 1	1.18	0.69	0.49	6/30/2013	Yes	11.63	4.93	16.57	64%	10.60	1.12	0.20	1.32	55%	0.73	808.21	86.14	894.35	80%	715.48
5812	Dry Extended Detention - UDS	12.12	10.91	1.21	6/30/2013	Yes	183.86	12.20	196.07	5%	9.80	17.67	0.50	18.16	10%	1.82	12,773.60	213.02	12,986.61	10%	1,298.66
6080	Dry Extended Detention - UDS	1.83	0.84	0.99	6/30/2013	Yes	14.16	9.97	24.13	5%	1.21	1.36	0.41	1.77	10%	0.18	983.91	174.04	1,157.95	10%	115.80
6771	Dry Extended Detention - UDS	2.10	1.89	0.21	6/30/2013	Yes	31.80	2.11	33.92	5%	1.70	3.06	0.09	3.14	10%	0.31	2,209.58	36.85	2,246.43	10%	224.64
6785	Dry Extended Detention - UDS	1.48	1.34	0.15	6/30/2013	Yes	22.52	1.49	24.01	5%	1.20	2.16	0.06	2.22	10%	0.22	1,564.41	26.09	1,590.50	10%	159.05
7240	Dry Extended Detention - UDS	1.67	1.67	0.00	6/30/2013	Yes	28.16	0.00	28.16	5%	1.41	2.71	0.00	2.71	10%	0.27	1,956.10	0.00	1,956.10	10%	195.61
5621	Dry Extended Detention Ponds - Level 1	5.72	5.15	0.57	6/30/2013	Yes	86.80	5.76	92.56	10%	9.26	8.34	0.23	8.57	15%	1.29	6,029.96	100.56	6,130.51	60%	3,678.31
6098	Dry Extended Detention Ponds - Level 1	9.41	4.90	4.51	6/30/2013	Yes	82.61	45.42	128.03	10%	12.80	7.94	1.85	9.79	15%	1.47	5,739.47	792.86	6,532.33	60%	3,919.40
6793	Dry Extended Detention Ponds - Level 1	16.31	4.89	11.42	6/30/2013	Yes	82.45	115.00	197.44	10%	19.74	7.92	4.68	12.60	15%	1.89	5,727.75	2,007.64	7,735.39	60%	4,641.23
5213	Dry Swale - Level 1	0.50	0.33	0.17	6/30/2013	Yes	5.56	1.71	7.28	55%	4.00	0.53	0.07	0.60	52%	0.31	386.54	29.89	416.42	70%	291.50
5214	Dry Swale - Level 1	1.10	0.52	0.58	6/30/2013	Yes	8.77	5.84	14.61	55%	8.03	0.84	0.24	1.08	52%	0.56	609.09	101.96	711.05	70%	497.74
1177	Filtering Practices - Proprietary	0.36	0.32	0.04	6/30/2013	Yes	5.46	0.36	5.83	40%	2.33	0.52	0.01	0.54	60%	0.32	379.51	6.33	385.84	80%	308.67
6735	Infiltration Practices - UDI1	1.27	1.14	0.13	6/30/2013	Yes	19.21	1.27	20.49	57%	11.68	1.85	0.05	1.90	63%	1.20	1,334.60	22.26	1,356.86	95%	1,289.02
7258	Permeable Pavement - Level 2	5.18	5.18	0.00	6/30/2013	Yes	87.33	0.00	87.33	81%	70.74	8.39	0.00	8.39	81%	6.80	6,067.44	0.00	6,067.44	70%	4,247.21
7893	Bioretention - Level 1	0.93	0.58	0.35	7/1/2013	Yes	9.78	3.52	13.30	64%	8.51	0.94	0.14	1.08	55%	0.60	679.37	61.53	740.90	80%	592.72
5181	Bioretention - Tree Box Filter	0.30	0.06	0.24	7/1/2013	Yes	1.01	2.42	3.43	40%	1.37	0.10	0.10	0.20	60%	0.12	70.28	42.19	112.47	80%	89.98
5182	Bioretention - Tree Box Filter	0.25	0.06	0.19	7/1/2013	Yes	1.01	1.91	2.92	40%	1.17	0.10	0.08	0.18	60%	0.11	70.28	33.40	103.68	80%	82.94
7894	Dry Extended Detention Ponds - Level 1	0.53	0.30	0.23	7/1/2013	Yes	5.06	2.32	7.37	10%	0.74	0.49	0.09	0.58	15%	0.09	351.40	40.43	391.83	60%	235.10
7895	Dry Extended Detention Ponds - Level 1	0.43	0.29	0.14	7/1/2013	Yes	4.89	1.41	6.30	10%	0.63	0.47	0.06	0.53	15%	0.08	339.68	24.61	364.29	60%	218.58
7896	Dry Extended Detention Ponds - Level 1	0.41	0.15	0.26	7/1/2013	Yes	2.53	2.62	5.15	10%	0.51	0.24	0.11	0.35	15%	0.05	175.70	45.71	221.41	60%	132.84
7891	Permeable Pavement - Level 1	0.11	0.04	0.07	7/1/2013	Yes	0.67	0.70	1.38	59%	0.81	0.06	0.03	0.09	59%	0.06	46.85	12.31	59.16	70%	41.41
2110	Dry Extended Detention - UDS	3.39	3.12	0.27	1/1/2014	Yes	52.60	2.72	55.32	5%	2.77	5.05	0.11	5.17	10%	0.52	3,654.52	47.47	3,701.98	10%	370.20
1824	Dry Extended Detention Ponds - Level 1	3.56	2.07	1.49	1/1/2014	Yes	34.90	15.00	49.90	10%	4.99	3.35	0.61	3.96	15%	0.59	2,424.63	261.94	2,686.57	60%	1,611.94
3258	Dry Extended Detention Ponds - Level 1	3.95	3.44	0.51	1/1/2014	Yes	58.00	5.14	63.13	10%	6.31	5.57	0.21	5.78	15%	0.87	4,029.34	89.66	4,119.00	60%	2,471.40
4582	Dry Extended Detention Ponds - Level 1	49.90	18.81	31.09	1/1/2014	Yes	317.11	313.09	630.20	10%	63.02	30.47	12.75	43.22	15%	6.48	22,030.77	5,465.89	27,496.66	60%	16,497.99
4935	Dry Extended Detention Ponds - Level 1	7.32	2.02	5.30	1/1/2014	Yes	34.06	53.37	87.43	10%	8.74	3.27	2.17	5.45	15%	0.82	2,366.07	931.74	3,297.81	60%	1,978.68
5055	Dry Extended Detention Ponds - Level 1	31.40	18.30	13.10	1/1/2014	Yes	308.54	131.92	440.46	10%	44.05	29.65	5.37	35.02	15%	5.25	21,435.16	2,302.98	23,738.14	60%	14,242.88
5773	Dry Extended Detention Ponds - Level 1	9.94	7.35	2.59	1/1/2014	Yes	123.92	26.08	150.00	10%	15.00	11.91	1.06	12.97	15%	1.95	8,609.20	455.32	9,064.52	60%	5,438.71
5891	Dry Extended Detention Ponds - Level 1	2.59	1.80	0.79	1/1/2014	Yes	30.35	7.96	38.30	10%	3.83	2.92	0.32	3.24	15%	0.49	2,108.38	138.88	2,247.26	60%	1,348.35
7589	Bioretention - Micro Level 1	0.41	0.41	0.00	6/12/2014	Yes	6.91	0.00	6.91	64%	4.42	0.66	0.00	0.66	55%	0.37	480.24	0.00	480.24	80%	384.19
9010	Bioretention - Micro Level 1	2.64	1.33	1.31	6/12/2014	Yes	22.42	13.19	35.62	64%	22.79	2.15	0.54	2.69	55%	1.48	1,557.86	230.30	1,788.15	80%	1,430.52
9011	Bioretention - Micro Level 1	0.39	0.25	0.14	6/12/2014	Yes	4.22	1.41	5.62	64%	3.60	0.41	0.06	0.46	55%	0.25	292.83	24.61	317.44	80%	253.95
9012	Bioretention - Micro Level 1	0.61	0.34	0.27	6/12/2014	Yes	5.73	2.72	8.45	64%	5.41	0.55	0.11	0.66	55%	0.36	398.25	47.47	445.71	80%	356.57
9013	Bioretention - Micro Level 1	0.36	0.10	0.26	6/12/2014	Yes	1.65	2.64	4.29	64%	2.75	0.16	0.11	0.27	55%	0.15	114.79	46.06	160.85	80%	128.68
9014	Bioretention - Micro Level 1	1.92	1.06	0.86	6/12/2014	Yes	17.87	8.66	26.53	64%	16.98	1.72	0.35	2.07	55%	1.14	1,241.60	151.19	1,392.79	80%	1,114.23
9015	Bioretention - Micro Level 1	0.42	0.27	0.15	6/12/2014	Yes	4.60	1.48	6.08	64%	3.89	0.44	0.06	0.50	55%	0.28	319.77	25.84	345.61	80%	276.49
2528	Infiltration Practices - Level 1	1.11	0.71	0.40	1/1/2015	Yes	11.97	4.03	16.00	57%	9.12	1.15	0.16	1.31	63%	0.83	831.64	70.32	901.96	95%	856.86
9007	Bioretention - Level 1	0.27	0.12	0.15	4/30/2015	Yes	2.02	1.51	3.53	64%	2.26	0.19	0.06	0.26	55%	0.14	140.56	26.37	166.93	80%	133.54
9008	Bioretention - Level 1	0.32	0.10	0.22	4/30/2015	Yes	1.69	2.22	3.90	64%	2.50	0.16	0.09	0.25	55%	0.14	117.13	38.68	155.81	80%	124.65
9016	Bioretention - Micro Level 1	0.52	0.28	0.24	7/7/2015	Yes	4.74	2.42	7.15	64%	4.58	0.46	0.10	0.55	55%	0.30	329.14	42.19	371.33	80%	297.07
7598	Dry Extended Detention - UDS	3.41	0.07	3.34	7/20/2015	Yes	1.18	33.63	34.81	5%	1.74	0.11	1.37	1.48	10%	0.15	81.99	587.17	669.16	10%	66.92
7599	Dry Extended Detention - UDS	3.60	0.08	3.52	7/20/2015	Yes	1.35	35.45	36.80	5%	1.84	0.13	1.44	1.57	10%	0.16	93.71	618.82	712.52	10%	71.25
7600	Dry Extended Detention - UDS	2.91	0.14	2.77	7/20/2015	Yes	2.36	27.89	30.25	5%	1.51	0.23	1.14	1.36	10%	0.14	163.98	486.97	650.95	10%	65.10
7601	Dry Extended Detention - UDS	0.84	0.08	0.76	7/20/2015	Yes	1.35	7.65	9.00	5%	0.45	0.13	0.31	0.44	10%	0.04	93.71	133.61	227.31	10%	22.73
7596	Infiltration Practices - UDI1	1.59	0.08	1.51	7/20/2015	Yes	1.35	15.21	16.55	57%	9.44	0.13	0.62	0.75	63%	0.47	93.71	265.46	359.16	95%	341.21
7597	Infiltration Practices - UDI2	2.56	0.16	2.40	7/20/2015	Yes	2.70	24.17	26.87	92%	24.72	0.26	0.98	1.24	93%	1.16	187.41	421.92	609.33	95%	578.86
9017	Filtering Practices - Proprietary	0.20	0.18	0.02	10/2/2015	Yes	3.03	0.20	3.24	40%	1.29	0.29	0.01	0.30	60%	0.18	210.84	3.52	214.35	80%	171.48
7207	Vegetated Open Channels	0.23	0.17	0.06	3/10/2016	Yes	2.87	0.60	3.47	55%	1.91	0.28	0.02	0.30	52%	0.16	199.12	10.55	209.67	70%	146.77
230	Dry Swale	0.08	0.04	0.04	5/25/2016	Yes	0.62	0.38	1.01	55%	0.55	0.06	0.02	0.08	52%	0.04	43.34	6.68	50.02	70%	35.01
7127	Infiltration Practices - UDI1	4.18	3.86	0.32	6/30/2017	Yes	65.08	3.22	68.30	57%	38.93	6.25	0.13	6.38	63%	4.02	4,521.30	56.26	4,577.55	95%	4,348.67
3152	Bioretention - Level 1	0.74	0.38	0.36	7/27/2017	Yes	6.41	3.63	10.03	64%	6.42	0.62	0.15	0.76	55%	0.42	445.10	63.29	508.39	80%	406.71
3153	Bioretention - Level 1	1.10	0.64	0.46	8/30/2017	Yes	10.79	4.63	15.42	64%	9.87	1.04	0.19	1.23	55%	0.67	749.64	80.87	830.51	80%	664.41
3165	Bioretention - Level 1	1.01	0.25	0.76	8/30/2017	Yes	4.22	7.65	11.87	64%	7.60	0.41	0.31	0.72	55%	0.39	292.83	133.61	426.44	80%	341.15
3166	Bioretention - Level 1	1.09	0.35	0.74	8/30/2017	Yes	5.90	7.45	13.35	64%	8.55	0.57	0.30	0.87	55%	0.48	409.96	130.09	540.05	80%	432.04
2761	Dry Swale	1.23	0.14	1.09	8/30/2017	Yes	2.36	10.98	13.34	55%	7.34	0.23	0.45	0.67	52%	0.35	163.98	191.62	355.61	70%	248.92
1230	Infiltration Practices - UDI1	3.12	2.86	0.26	8/30/2017	Yes	48.22	2.62	50.84	57%	28.98	4.63	0.11	4.74	63%	2.99	3,349.98	45.71	3,395.68	95%	3,225.90
1229	Permeable Pavement - Level 1	6.72	3.62	3.10	8/30/2017	Yes	61.03	31.22	92.25	59%	54.43	5.86	1.27	7.14	59%	4.21	4,240.18	544.98	4,785.16	70%	3,349.61
2718	Permeable Pavement - Level 1	0.75	0.75	0.00	8/30/2017	Yes	12.65	0.00	12.65	59%	7.46	1.22	0.00	1.22	59%	0.72	878.49	0.00	878.49	70%	614.94
5750	Bioretention - Micro Level 2	0.30	0.14	0.16	10/30/2017	Yes	2.36	1.61	3.97	90%	3.57	0.23	0.07	0.29	90%	0.26	163.98	28.13	192.11	80%	153.69
5749	Infiltration Practices - Level 1	0.18	0.04	0.14	10/30/2017	Yes	0.67	1.41	2.08	57%	1.19	0.06	0.06	0.12	63%	0.08	46.85	24.61	71.46	95%	67.89
5744	Vegetated Open Channels	0.14	0.04	0.10	10/30/2017	Yes	0.67	1.01	1.68	55%	0.92	0.06	0.04	0.11	52%	0.06	46.85	17.58	64.43	70%	45.10
5900	Permeable Pavement - Level 1	2.05	2.05	0.00	11/8/2017	Yes	34.56	0.00	34.56	59%	20.39	3.32	0.00	3.32	59%	1.96	2,401.21	0.00	2,401.21	70%	1,680.84
5753	Bioretention - Micro Level 2	0.31	0.17	0.14	3/23/2018	Yes	2.87	1.41	4.28	90%	3.85	0.28	0.06	0.33	90%	0.30	199.12	24.61	223.74	80%	178.99

MS4 Structure ID	BMP Type	Total Drainage Area	Impervious	Pervious	ChesBay Date Installed	Credit Taken?	Loading Rate, Impervious, Nitrogen (16.86 lbs./ac./yr/)	Loading Rate, Pervious, Nitrogen (10.07 lbs./ac./yr.)	Combined Nitrogen Loading Rate (lbs./yr.)	Nitrogen Removal Rate Efficiency %	2024 Nitrogen Reduction Achieved (lbs./yr.)	Loading Rate, Impervious, Phosphorous (1.62 lbs./ac./yr.)	Loading Rate, Pervious, Phosphorous (0.41 lbs./ac./yr.)	Combined Phosphorous Loading Rate (lbs./yr.)	Phosphorous Removal Rate Efficiency %	2024 Phosphorous Reduction Achieved (lbs./yr.)3	Loading Rate, Impervious, Suspended Solids (1,171.32 lbs./ac./yr.)	Loading Rate, Pervious, Suspended Solids (175.8 lbs./ac./yr.)	Combined Suspended Solids Loading Rate (lbs./yr.)	Suspended Solids Removal Rate Efficiency %	Suspended Solids Reduction Achieved (lbs./yr.)
7591	Bioretention - Level 1	0.85	0.44	0.41	4/23/2018	Yes	7.42	4.13	11.55	64%	7.39	0.71	0.17	0.88	55%	0.48	515.38	72.08	587.46	80%	469.97
7593	Bioretention - Level 1	0.81	0.41	0.40	4/23/2018	Yes	6.91	4.03	10.94	64%	7.00	0.66	0.16	0.83	55%	0.46	480.24	70.32	550.56	80%	440.45
7590	Dry Swale - Level 2	2.24	1.39	0.85	4/23/2018	Yes	23.44	8.56	31.99	74%	23.68	2.25	0.35	2.60	76%	1.98	1,628.13	149.43	1,777.56	70%	1,244.30
7594	Infiltration Practices - Level 2	1.75	1.45	0.30	4/23/2018	Yes	24.45	3.02	27.47	92%	25.27	2.35	0.12	2.47	93%	2.30	1,698.41	52.74	1,751.15	95%	1,663.60
7595	Infiltration Practices - Level 2	2.63	1.45	1.18	4/23/2018	Yes	24.45	11.88	36.33	92%	33.42	2.35	0.48	2.83	93%	2.63	1,698.41	207.44	1,905.86	95%	1,810.57
7259	Permeable Pavement - Level 1	1.21	1.21	0.00	4/23/2018	Yes	20.40	0.00	20.40	59%	12.04	1.96	0.00	1.96	59%	1.16	1,417.30	0.00	1,417.30	70%	992.11
205	Bioretention - Level 2	0.47	0.30	0.17	4/27/2018	Yes	5.06	1.71	6.77	90%	6.09	0.49	0.07	0.56	90%	0.50	351.40	29.89	381.28	80%	305.03
161	Vegetated Open Channels	0.31	0.04	0.27	4/27/2018	Yes	0.67	2.72	3.39	55%	1.87	0.06	0.11	0.18	52%	0.09	46.85	47.47	94.32	70%	66.02
7806	Dry Extended Detention - Hydrodynamic	0.25	0.10	0.15	7/2/2018	Yes	1.69	1.51	3.20	5%	0.16	0.16	0.06	0.22	10%	0.02	117.13	26.37	143.50	10%	14.35
7807	Dry Extended Detention - Hydrodynamic	0.32	0.14	0.18	7/2/2018	Yes	2.36	1.81	4.17	5%	0.21	0.23	0.07	0.30	10%	0.03	163.98	31.64	195.63	10%	19.56
7808	Dry Extended Detention - Hydrodynamic	0.23	0.13	0.10	7/2/2018	Yes	2.19	1.01	3.20	5%	0.16	0.21	0.04	0.25	10%	0.03	152.27	17.58	169.85	10%	16.99
7584	Dry Extended Detention Ponds - Level 1	2.00	1.69	0.31	7/20/2018	Yes	28.49	3.12	31.62	10%	3.16	2.74	0.13	2.86	15%	0.43	1,979.53	54.50	2,034.03	60%	1,220.42
7803	Dry Extended Detention Ponds - Level 2	59.42	29.44	29.98	7/20/2018	Yes	496.36	301.90	798.26	24%	191.58	47.69	12.29	59.98	31%	18.60	34,483.66	5,270.48	39,754.14	60%	23,852.49
6790	Bioretention - Tree Box Filter	0.24	0.15	0.09	7/25/2018	Yes	2.53	0.91	3.44	40%	1.37	0.24	0.04	0.28	60%	0.17	175.70	15.82	191.52	80%	153.22
6815	Bioretention - Tree Box Filter	0.46	0.21	0.25	7/25/2018	Yes	3.54	2.52	6.06	40%	2.42	0.34	0.10	0.44	60%	0.27	245.98	43.95	289.93	80%	231.94
7200	Dry Extended Detention Ponds - Level 1	9.35	6.48	2.87	8/9/2018	Yes	109.25	28.90	138.15	10%	13.82	10.50	1.18	11.67	15%	1.75	7,590.15	504.55	8,094.70	60%	4,856.82
7585	Dry Extended Detention Ponds - Level 1	2.51	2.14	0.37	8/9/2018	Yes	36.08	3.73	39.81	10%	3.98	3.47	0.15	3.62	15%	0.54	2,506.62	65.05	2,571.67	60%	1,543.00
7587	Infiltration Practices - Level 1	0.83	0.14	0.68	8/9/2018	Yes	2.43	6.87	9.30	57%	5.30	0.23	0.28	0.51	63%	0.32	168.67	119.90	288.57	95%	274.14
7809	Permeable Pavement - Level 1	6.31	0.00	6.31	8/9/2018	Yes	0.00	63.54	63.54	59%	37.49	0.00	2.59	2.59	59%	1.53	0.00	1,109.30	1,109.30	70%	776.51
7802	Dry Extended Detention Ponds - Level 1	1.64	1.28	0.36	10/11/2018	Yes	21.58	3.63	25.21	10%	2.52	2.07	0.15	2.22	15%	0.33	1,499.29	63.29	1,562.58	60%	937.55
7801	Dry Swale - Level 1	0.56	0.56	0.00	10/11/2018	Yes	9.44	0.00	9.44	55%	5.19	0.91	0.00	0.91	52%	0.47	655.94	0.00	655.94	70%	459.16
7832	Bioretention - Micro Level 2	0.18	0.14	0.04	7/9/2019	Yes	2.36	0.40	2.76	90%	2.49	0.23	0.02	0.24	90%	0.22	163.98	7.03	171.02	80%	136.81
7833	Bioretention - Micro Level 2	0.12	0.09	0.03	7/9/2019	Yes	1.52	0.30	1.82	90%	1.64	0.15	0.01	0.16	90%	0.14	105.42	5.27	110.69	80%	88.55
6829	Bioretention - Micro Level 1	0.30	0.10	0.20	7/25/2019	Yes	1.69	2.01	3.70	64%	2.37	0.16	0.08	0.24	55%	0.13	117.13	35.16	152.29	80%	121.83
6895	Bioretention - Micro Level 1	0.63	0.20	0.43	7/25/2019	Yes	3.37	4.33	7.70	64%	4.93	0.32	0.18	0.50	55%	0.28	234.26	75.59	309.86	80%	247.89
7220	Bioretention - Micro Level 1	0.63	0.31	0.32	7/25/2019	Yes	5.23	3.22	8.45	64%	5.41	0.50	0.13	0.63	55%	0.35	363.11	56.26	419.37	80%	335.49
7269	Bioretention - Micro Level 1	0.33	0.11	0.22	7/25/2019	Yes	1.85	2.22	4.07	64%	2.60	0.18	0.09	0.27	55%	0.15	128.85	38.68	167.52	80%	134.02
7268	Bioretention - Tree Box Filter	0.23	0.12	0.11	7/25/2019	Yes	2.02	1.11	3.13	40%	1.25	0.19	0.05	0.24	60%	0.14	140.56	19.34	159.90	80%	127.92
7211	Dry Extended Detention - UDS	3.57	2.02	1.55	7/25/2019	Yes	34.06	15.61	49.67	5%	2.48	3.27	0.64	3.91	10%	0.39	2,366.07	272.49	2,638.56	10%	263.86
7862	Dry Extended Detention Ponds - Level 1	1.30	0.62	0.68	11/18/2019	Yes	10.45	6.85	17.30	10%	1.73	1.00	0.28	1.28	15%	0.19	726.22	119.54	845.76	60%	507.46
7860	Infiltration Practices - Level 1	2.94	1.78	1.16	11/18/2019	Yes	30.01	11.68	41.69	57%	23.76	2.88	0.48	3.36	63%	2.12	2,084.95	203.93	2,288.88	95%	2,174.43
7861	Infiltration Practices - Level 1	6.24	2.58	3.66	11/18/2019	Yes	43.50	36.86	80.36	57%	45.80	4.18	1.50	5.68	63%	3.58	3,022.01	643.43	3,665.43	95%	3,482.16
8001	Filtering Practices - Proprietary	1.12	1.12	0.00	10/13/2020	Yes	18.88	0.00	18.88	40%	7.55	1.81	0.00	1.81	60%	1.09	1,311.88	0.00	1,311.88	80%	1,049.50
8002	Bioretention - Level 1	0.40	0.27	0.13	10/27/2020	Yes	4.55	1.31	5.86	64%	3.75	0.44	0.05	0.49	55%	0.27	316.26	22.85	339.11	80%	271.29
9019	Infiltration Practices - Level 1	0.90	0.71	0.19	12/1/2020	Yes	11.97	1.91	13.88	57%	7.91	1.15	0.08	1.23	63%	0.77	831.64	33.40	865.04	95%	821.79
9021	Infiltration Practices - Level 1	1.37	0.43	0.94	12/1/2020	Yes	7.25	9.47	16.72	57%	9.53	0.70	0.39	1.08	63%	0.68	503.67	165.25	668.92	95%	635.47
9023	Infiltration Practices - Level 1	1.42	1.19	0.23	12/1/2020	Yes	20.06	2.32	22.38	57%	12.76	1.93	0.09	2.02	63%	1.27	1,393.87	40.43	1,434.30	95%	1,362.59
9024	Infiltration Practices - Level 1	1.94	1.13	0.81	12/1/2020	Yes	19.05	8.16	27.21	57%	15.51	1.83	0.33	2.16	63%	1.36	1,323.59	142.40	1,465.99	95%	1,392.69
9025	Infiltration Practices - Level 1	2.26	1.27	0.99	12/1/2020	Yes	21.41	9.97	31.38	57%	17.89	2.06	0.41	2.46	63%	1.55	1,487.58	174.04	1,661.62	95%	1,578.54
9026	Infiltration Practices - Level 1	2.75	1.89	0.86	12/1/2020	Yes	31.87	8.66	40.53	57%	23.10	3.06	0.35	3.41	63%	2.15	2,213.79	151.19	2,364.98	95%	2,246.73
9027	Infiltration Practices - Level 1	2.89	1.79	1.10	12/1/2020	Yes	30.18	11.08	41.26	57%	23.52	2.90	0.45	3.35	63%	2.11	2,096.66	193.38	2,290.04	95%	2,175.54
9028	Infiltration Practices - Level 1	3.27	2.03	1.24	12/1/2020	Yes	34.23	12.49	46.71	57%	26.63	3.29	0.51	3.80	63%	2.39	2,377.78	217.99	2,595.77	95%	2,465.98
9029	Infiltration Practices - Level 1	5.27	3.39	1.88	12/1/2020	Yes	57.16	18.93	76.09	57%	43.37	5.49	0.77	6.26	63%	3.95	3,970.77	330.50	4,301.28	95%	4,086.21
9018	Permeable Pavement - Level 1	0.65	0.65	0.00	12/1/2020	Yes	10.96	0.00	10.96	59%	6.47	1.05	0.00	1.05	59%	0.62	761.36	0.00	761.36	70%	532.95
8009	Bioretention - Level 2	0.35	0.22	0.13	5/20/2021	Yes	3.71	1.26	4.97	90%	4.47	0.36	0.05	0.41	90%	0.37	257.69	21.98	279.67	80%	223.73
8010	Bioretention - Level 2	0.43	0.29	0.14	5/20/2021	Yes	4.87	1.45	6.32	90%	5.69	0.47	0.06	0.53	90%	0.47	338.51	25.32	363.83	80%	291.06
7871	Bioretention - Level 2	0.73	0.39	0.34	8/13/2021	Yes	6.58	3.42	10.00	90%	9.00	0.63	0.14	0.77	90%	0.69	456.81	59.77	516.59	80%	413.27
7872	Bioretention - Level 2	0.86	0.53	0.33	8/13/2021	Yes	8.94	3.32	12.26	90%	11.03	0.86	0.14	0.99	90%	0.89	620.80	58.01	678.81	80%	543.05
7884	Dry Swale - Level 1	0.29	0.12	0.17	5/4/2022	Yes	2.02	1.71	3.74	55%	2.05	0.19	0.07	0.26	52%	0.14	140.56	29.89	170.44	70%	119.31
7900	Bioretention - Level 2	1.51	0.58	0.93	6/20/2022	Yes	9.78	9.37	19.14	90%	17.23	0.94	0.38	1.32	90%	1.19	679.37	163.49	842.86	80%	674.29
7901	Bioretention - Level 2	0.71	0.36	0.35	6/20/2022	Yes	6.07	3.52	9.59	90%	8.63	0.58	0.14	0.73	90%	0.65	421.68	61.53	483.21	80%	386.56
9030	Dry Extended Detention - Hydrodynamic	0.24	0.24	0.00	9/9/2022	Yes	4.05	0.00	4.05	5%	0.20	0.39	0.00	0.39	10%	0.04	281.12	0.00	281.12	10%	28.11
9031	Dry Extended Detention - UDS	0.24	0.24	0.00	9/9/2022	Yes	4.05	0.00	4.05	5%	0.20	0.39	0.00	0.39	10%	0.04	281.12	0.00	281.12	10%	28.11
9032	Bioretention - Level 1	0.49	0.25	0.24	10/17/2022	Yes	4.22	2.42	6.63	64%	4.24	0.41	0.10	0.50	55%	0.28	292.83	42.19	335.02	80%	268.02
9033	Filtering Practices - Proprietary	0.69	0.45	0.24	10/17/2022	Yes	7.59	2.42	10.00	40%	4.00	0.73	0.10	0.83	60%	0.50	527.09	42.19	569.29	80%	455.43
9034	Filtering Practices - Proprietary	0.38	0.25	0.13	10/17/2022	Yes	4.22	1.31	5.52	40%	2.21	0.41	0.05	0.46	60%	0.27	292.83	22.85	315.68	80%	252.55
9035	Filtering Practices - Proprietary	0.37	0.17	0.20	10/17/2022	Yes	2.87	2.01	4.88	40%	1.95	0.28	0.08	0.36	60%	0.21	199.12	35.16	234.28	80%	187.43
9036	Filtering Practices - Proprietary	0.36	0.16	0.20	10/17/2022	Yes	2.70	2.01	4.71	40%	1.88	0.26	0.08	0.34	60%	0.20	187.41	35.16	222.57	80%	178.06
9037	Bioretention - Level 1	0.17	0.07	0.10	5/2/2023	Yes	1.18	1.01	2.19	64%	1.40	0.11	0.04	0.15	55%	0.08	81.99	17.58	99.57	80%	79.66
9044	Bioretention - Level 1	2.01	1.79	0.22	5/16/2023	Yes	30.18	2.22	32.39	64%	20.73	2.90	0.09	2.99	55%	1.64	2,096.66	38.68	2,135.34	80%	1,708.27
9045	Bioretention - Level 1	2.19	1.86	0.33	5/16/2023	Yes	31.36	3.32	34.68	64%	22.20	3.01	0.14	3.15	55%	1.73	2,178.66	58.01	2,236.67	80%	1,789.34
9039	Dry Extended Detention - Hydrodynamic	1.83	1.79	0.04	5/16/2023	Yes	30.18	0.40	30.58	5%	1.53	2.90	0.02	2.92	10%	0.29	2,096.66	7.03	2,103.69	10%	210.37
9040	Dry Extended Detention - Hydrodynamic	0.50	0.50	0.00	5/16/2023	Yes	8.43	0.00	8.43	5%	0.42	0.81	0.00	0.81	10%	0.08	585.66	0.00	585.66	10%	58.57
9041	Dry Extended Detention - Hydrodynamic	1.52	1.36	0.16	5/16/2023	Yes	22.93	1.61	24.54	5%	1.23	2.20	0.07	2.27	10%	0.23	1,593.00	28.13	1,621.12	10%	162.11
9042	Dry Extended Detention - UDS	1.83	1.79	0.04	5/16/2023	Yes	30.18	0.40	30.58	5%	1.53	2.90	0.02	2.92	10%	0.29	2,096.66	7.03	2,103.69	10%	210.37
9043	Dry Extended Detention - UDS	2.02	1.86	0.16	5/16/2023	Yes	31.36	1.61	32.97	5%	1.65	3.01	0.07	3.08	10%	0.31	2,178.66	28.13	2,206.78	10%	220.68
9038	Dry Swale - Level 1	0.39	0.11	0.28	5/16/2023	Yes	1.85	2.82	4.67	55%	2.57	0.18	0.11	0.29	52%	0.15	128.85	49.22	178.07	70%	124.65
9046	Bioretention - Micro Level 2	0.12	0.05	0.07	5/30/2023	Yes	0.84	0.70	1.55	90%	1.39	0.08	0.03	0.11	90%	0.10	58.57	12.31	70.87	80%	56.70
9047	Bioretention - Level 1	0.23	0.11	0.12	6/13/2023	Yes	1.85	1.21	3.06	64%	1.96	0.18	0.05	0.23	55%	0.13	128.85	21.10	149.94	80%	119.95
9048	Bioretention - Level 1	0.19	0.08	0.11	6/13/2023	Yes	1.35	1.11	2.46	64%	1.57	0.13	0.05	0.17	55%	0.10	93.71	19.34	113.04	80%	90.43
9049	Bioretention - Level 1	0.40	0.26	0.14	6/13/2023	Yes	4.38	1.41	5.79	64%	3.71	0.42	0.06	0.48	55%	0.26	304.54	24.61	329.16	80%	263.32
9050	Bioretention - Level 1	0.68	0.28	0.40	6/13/2023	Yes	4.72	4.03	8.75	64%	5.60	0.45	0.16	0.62	55%	0.34	327.97	70.32	398.29	80%	318.63
9051	Bioretention - Level 1	0.60	0.22	0.38	6/13/2023	Yes	3.71	3.83	7.54	64%	4.82	0.36	0.16	0.51	55%	0.28	257.69	66.80	324.49	80%	259.60
9052	Bioretention - Level 1	1.04	0.27	0.77	6/13/2023	Yes	4.55	7.75	12.31	64%	7.88	0.44	0.32	0.75	55%	0.41	316.26	135.37	451.62	80%	361.30

MS4 Structure ID	BMP Type	Total Drainage Area	Impervious	Pervious	ChesBay Date Installed	Credit Taken?	Loading Rate, Impervious, Nitrogen (16.86 lbs./ac./yr/)	Loading Rate, Pervious, Nitrogen (10.07 lbs./ac./yr.)	Combined Nitrogen Loading Rate (lbs./yr.)	Nitrogen Removal Rate Efficiency %	2024 Nitrogen Reduction Achieved (lbs./yr.)	Loading Rate, Impervious, Phosphorous (1.62 lbs./ac./yr.)	Loading Rate, Pervious, Phosphorous (0.41 lbs./ac./yr.)	Combined Phosphorous Loading Rate (lbs./yr.)	Phosphorous Removal Rate Efficiency %	2024 Phosphorous Reduction Achieved (lbs./yr.)3	Loading Rate, Impervious, Suspended Solids (1,171.32 lbs./ac./yr.)	Loading Rate, Pervious, Suspended Solids (175.8 lbs./ac./yr.)	Combined Suspended Solids Loading Rate (lbs./yr.)	Suspended Solids Removal Rate Efficiency %	Suspended Solids Reduction Achieved (lbs./yr.)
9053	Filtering Practices - Proprietary	0.22	0.07	0.15	6/13/2023	Yes	1.18	1.51	2.69	40%	1.08	0.11	0.06	0.17	60%	0.10	81.99	26.37	108.36	80%	86.69
9054	Filtering Practices - Proprietary	0.44	0.15	0.29	6/13/2023	Yes	2.53	2.92	5.45	40%	2.18	0.24	0.12	0.36	60%	0.22	175.70	50.98	226.68	80%	181.34
9055	Filtering Practices - Proprietary	0.12	0.12	0.00	6/13/2023	Yes	2.02	0.00	2.02	40%	0.81	0.19	0.00	0.19	60%	0.12	140.56	0.00	140.56	80%	112.45
9056	Filtering Practices - Proprietary	0.21	0.08	0.13	6/13/2023	Yes	1.35	1.31	2.66	40%	1.06	0.13	0.05	0.18	60%	0.11	93.71	22.85	116.56	80%	93.25
9057	Filtering Practices - Proprietary	0.38	0.21	0.17	6/13/2023	Yes	3.54	1.71	5.25	40%	2.10	0.34	0.07	0.41	60%	0.25	245.98	29.89	275.86	80%	220.69
9058	Filtering Practices - Proprietary	0.09	0.09	0.00	6/13/2023	Yes	1.52	0.00	1.52	40%	0.61	0.15	0.00	0.15	60%	0.09	105.42	0.00	105.42	80%	84.34
9059	Filtering Practices - Proprietary	0.24	0.15	0.09	6/13/2023	Yes	2.53	0.91	3.44	40%	1.37	0.24	0.04	0.28	60%	0.17	175.70	15.82	191.52	80%	153.22
9060	Filtering Practices - Proprietary	0.66	0.35	0.31	6/13/2023	Yes	5.90	3.12	9.02	40%	3.61	0.57	0.13	0.69	60%	0.42	409.96	54.50	464.46	80%	371.57
9061	Filtering Practices - Proprietary	0.44	0.15	0.29	6/13/2023	Yes	2.53	2.92	5.45	40%	2.18	0.24	0.12	0.36	60%	0.22	175.70	50.98	226.68	80%	181.34
9062	Filtering Practices - Proprietary	0.24	0.17	0.07	6/13/2023	Yes	2.87	0.70	3.57	40%	1.43	0.28	0.03	0.30	60%	0.18	199.12	12.31	211.43	80%	169.14
9063	Filtering Practices - Proprietary	0.41	0.08	0.33	6/13/2023	Yes	1.35	3.32	4.67	40%	1.87	0.13	0.14	0.26	60%	0.16	93.71	58.01	151.72	80%	121.38
9064	Filtering Practices - Proprietary	0.42	0.10	0.32	6/13/2023	Yes	1.69	3.22	4.91	40%	1.96	0.16	0.13	0.29	60%	0.18	117.13	56.26	173.39	80%	138.71
9065	Filtering Practices - Proprietary	0.20	0.10	0.10	6/13/2023	Yes	1.69	1.01	2.69	40%	1.08	0.16	0.04	0.20	60%	0.12	117.13	17.58	134.71	80%	107.77
9066	Filtering Practices - Proprietary	0.44	0.32	0.13	6/13/2023	Yes	5.40	1.31	6.70	40%	2.68	0.52	0.05	0.57	60%	0.34	374.82	22.85	397.68	80%	318.14
9067	Filtering Practices - Proprietary	0.39	0.13	0.26	6/13/2023	Yes	2.19	2.62	4.81	40%	1.92	0.21	0.11	0.32	60%	0.19	152.27	45.71	197.98	80%	158.38
9068	Filtering Practices - Proprietary	0.31	0.17	0.14	6/13/2023	Yes	2.87	1.41	4.28	40%	1.71	0.28	0.06	0.33	60%	0.20	199.12	24.61	223.74	80%	178.99
956	Bioretention - Level 1	2.38	0.29	2.09	1/1/2006	No	4.89	21.05	25.94	0%	0.00	0.47	0.86	1.33	0%	0.00	339.68	367.42	707.10	0%	0.00
2230	Bioretention - Level 1	2.84	1.37	1.47	1/1/2006	No	23.10	14.80	37.90	0%	0.00	2.22	0.60	2.82	0%	0.00	1,604.71	258.43	1,863.13	0%	0.00
5465	Bioretention - Level 1	3.07	0.58	2.49	1/1/2006	No	9.78	25.07	34.85	0%	0.00	0.94	1.02	1.96	0%	0.00	679.37	437.74	1,117.11	0%	0.00
7247	Bioretention - Level 1	0.50	0.21	0.29	1/1/2006	No	3.54	2.92	6.46	0%	0.00	0.34	0.12	0.46	0%	0.00	245.98	50.98	296.96	0%	0.00
7248	Bioretention - Level 1	0.41	0.17	0.24	1/1/2006	No	2.87	2.42	5.28	0%	0.00	0.28	0.10	0.37	0%	0.00	199.12	42.19	241.32	0%	0.00
930	Bioretention - Micro Level 1	1.35	0.16	1.19	1/1/2006	No	2.70	11.98	14.68	0%	0.00	0.26	0.49	0.75	0%	0.00	187.41	209.20	396.61	0%	0.00
1779	Bioretention - Micro Level 1	1.56	1.00	0.56	1/1/2006	No	16.86	5.64	22.50	0%	0.00	1.62	0.23	1.85	0%	0.00	1,171.62	98.40	1,270.02	0%	0.00
2535	Bioretention - Micro Level 1	1.17	0.83	0.34	1/1/2006	No	13.99	3.42	17.42	0%	0.00	1.34	0.14	1.48	0%	0.00	972.20	59.77	1,031.97	0%	0.00
3022	Bioretention - Micro Level 1	1.46	0.83	0.63	1/1/2006	No	13.99	6.34	20.34	0%	0.00	1.34	0.26	1.60	0%	0.00	972.20	110.75	1,082.95	0%	0.00
3028	Bioretention - Micro Level 1	1.33	0.65	0.68	1/1/2006	No	10.96	6.85	17.81	0%	0.00	1.05	0.28	1.33	0%	0.00	761.36	119.54	880.90	0%	0.00
3036	Bioretention - Micro Level 1	0.39	0.22	0.17	1/1/2006	No	3.71	1.71	5.42	0%	0.00	0.36	0.07	0.43	0%	0.00	257.69	29.89	287.58	0%	0.00
3038	Bioretention - Micro Level 1	3.10	2.08	1.02	1/1/2006	No	35.07	10.27	45.34	0%	0.00	3.37	0.42	3.79	0%	0.00	2,436.35	179.32	2,615.66	0%	0.00
3044	Bioretention - Micro Level 1	1.96	0.68	1.28	1/1/2006	No	11.46	12.89	24.35	0%	0.00	1.10	0.52	1.63	0%	0.00	796.50	225.02	1,021.52	0%	0.00
3054	Bioretention - Micro Level 1	0.88	0.41	0.47	1/1/2006	No	6.91	4.73	11.65	0%	0.00	0.66	0.19	0.86	0%	0.00	480.24	82.63	562.87	0%	0.00
3058	Bioretention - Micro Level 1	0.83	0.43	0.40	1/1/2006	No	7.25	4.03	11.28	0%	0.00	0.70	0.16	0.86	0%	0.00	503.67	70.32	573.99	0%	0.00
3082	Bioretention - Micro Level 1	1.30	0.53	0.77	1/1/2006	No	8.94	7.75	16.69	0%	0.00	0.86	0.32	1.17	0%	0.00	620.80	135.37	756.17	0%	0.00
3087	Bioretention - Micro Level 1	1.32	0.60	0.72	1/1/2006	No	10.12	7.25	17.37	0%	0.00	0.97	0.30	1.27	0%	0.00	702.79	126.58	829.37	0%	0.00
3089	Bioretention - Micro Level 1	2.36	0.98	1.38	1/1/2006	No	16.52	13.90	30.42	0%	0.00	1.59	0.57	2.15	0%	0.00	1,147.89	242.60	1,390.50	0%	0.00
3091	Bioretention - Micro Level 1	2.47	0.97	1.50	1/1/2006	No	16.35	15.11	31.46	0%	0.00	1.57	0.62	2.19	0%	0.00	1,136.18	263.70	1,399.88	0%	0.00
7262	Bioretention - Micro Level 1	0.79	0.24	0.55	1/1/2006	No	4.05	5.54	9.58	0%	0.00	0.39	0.23	0.61	0%	0.00	281.12	96.69	377.81	0%	0.00
7263	Bioretention - Micro Level 1	0.71	0.27	0.44	1/1/2006	No	4.55	4.43	8.98	0%	0.00	0.44	0.18	0.62	0%	0.00	316.26	77.35	393.61	0%	0.00
7264	Bioretention - Micro Level 1	0.47	0.16	0.31	1/1/2006	No	2.70	3.12	5.82	0%	0.00	0.26	0.13	0.39	0%	0.00	187.41	54.50	241.91	0%	0.00
7265	Bioretention - Micro Level 1	0.57	0.27	0.30	1/1/2006	No	4.55	3.02	7.57	0%	0.00	0.44	0.12	0.56	0%	0.00	316.26	52.74	369.00	0%	0.00
2548	Bioretention - Micro Level 2	1.03	0.57	0.46	1/1/2006	No	9.61	4.63	14.24	0%	0.00	0.92	0.19	1.11	0%	0.00	667.65	80.87	748.52	0%	0.00
97	Bioretention - Tree Box Filter	0.19	0.11	0.08	1/1/2006	No	1.80	0.85	2.65	0%	0.00	0.17	0.03	0.21	0%	0.00	125.33	14.77	140.10	0%	0.00
3039	Bioretention - Tree Box Filter	0.26	0.23	0.03	1/1/2006	No	3.88	0.30	4.18	0%	0.00	0.37	0.01	0.38	0%	0.00	269.40	5.27	274.68	0%	0.00
3105	Bioretention - Tree Box Filter	0.11	0.09	0.02	1/1/2006	No	1.52	0.20	1.72	0%	0.00	0.15	0.01	0.15	0%	0.00	105.42	3.52	108.93	0%	0.00
5381	Constructed Wetland - Level 1	25.94	9.40	16.54	1/1/2006	No	158.52	166.54	325.06	0%	0.00	15.23	6.78	22.01	0%	0.00	11,012.75	2,907.38	13,920.13	0%	0.00
5454	Constructed Wetland - Level 1	10.21	3.57	6.64	1/1/2006	No	60.19	66.86	127.06	0%	0.00	5.78	2.72	8.51	0%	0.00	4,181.61	1,167.31	5,348.92	0%	0.00
1083	Dry Extended Detention - Hydrodynamic	3.56	2.15	1.41	1/1/2006	No	36.25	14.20	50.45	0%	0.00	3.48	0.58	4.06	0%	0.00	2,518.34	247.88	2,766.22	0%	0.00
1100	Dry Extended Detention - Hydrodynamic	5.81	1.61	4.20	1/1/2006	No	27.14	42.29	69.44	0%	0.00	2.61	1.72	4.33	0%	0.00	1,885.83	738.36	2,624.19	0%	0.00
1118	Dry Extended Detention - Hydrodynamic	1.58	0.68	0.90	1/1/2006	No	11.46	9.06	20.53	0%	0.00	1.10	0.37	1.47	0%	0.00	796.50	158.22	954.72	0%	0.00
3709	Dry Extended Detention - Hydrodynamic	5.29	1.74	3.55	1/1/2006	No	29.34	35.75	65.08	0%	0.00	2.82	1.46	4.27	0%	0.00	2,038.10	624.09	2,662.19	0%	0.00
3766	Dry Extended Detention - Hydrodynamic	1.15	0.67	0.48	1/1/2006	No	11.30	4.81	16.11	0%	0.00	1.09	0.20	1.28	0%	0.00	784.78	84.03	868.82	0%	0.00
3871	Dry Extended Detention - Hydrodynamic	0.30	0.03	0.27	1/1/2006	No	0.49	2.73	3.22	0%	0.00	0.05	0.11	0.16	0%	0.00	33.97	47.64	81.61	0%	0.00
4225	Dry Extended Detention - Hydrodynamic	2.57	0.38	2.19	1/1/2006	No	6.38	22.07	28.45	0%	0.00	0.61	0.90	1.51	0%	0.00	443.34	385.27	828.61	0%	0.00
4230	Dry Extended Detention - Hydrodynamic	2.49	1.19	1.30	1/1/2006	No	20.06	13.09	33.15	0%	0.00	1.93	0.53	2.46	0%	0.00	1,393.87	228.54	1,622.41	0%	0.00
4244	Dry Extended Detention - Hydrodynamic	1.50	0.91	0.59	1/1/2006	No	15.34	5.94	21.28	0%	0.00	1.47	0.24	1.72	0%	0.00	1,065.90	103.72	1,169.62	0%	0.00
69	Dry Extended Detention - UDS	2.36	1.77	0.59	1/1/2006	No	29.84	5.94	35.78	0%	0.00	2.87	0.24	3.11	0%	0.00	2,073.24	103.72	2,176.96	0%	0.00
93	Dry Extended Detention - UDS	0.71	0.39	0.32	1/1/2006	No	6.58	3.22	9.80	0%	0.00	0.63	0.13	0.76	0%	0.00	456.81	56.26	513.07	0%	0.00
132	Dry Extended Detention - UDS	2.85	1.57	1.28	1/1/2006	No	26.47	12.89	39.36	0%	0.00	2.54	0.52	3.07	0%	0.00	1,838.97	225.02	2,064.00	0%	0.00
139	Dry Extended Detention - UDS	1.92	0.88	1.04	1/1/2006	No	14.84	10.47	25.31	0%	0.00	1.43	0.43	1.85	0%	0.00	1,030.76	182.83	1,213.59	0%	0.00
294	Dry Extended Detention - UDS	5.00	1.98	3.02	1/1/2006	No	33.38	30.41	63.79	0%	0.00	3.21	1.24	4.45	0%	0.00	2,319.21	530.92	2,850.13	0%	0.00
331	Dry Extended Detention - UDS	2.51	1.21	1.30	1/1/2006	No	20.40	13.09	33.49	0%	0.00	1.96	0.53	2.49	0%	0.00	1,417.30	228.54	1,645.84	0%	0.00
347	Dry Extended Detention - UDS	3.40	3.40	0.00	1/1/2006	No	57.32	0.00	57.32	0%	0.00	5.51	0.00	5.51	0%	0.00	3,982.49	0.00	3,982.49	0%	0.00
357	Dry Extended Detention - UDS	0.12	0.06	0.06	1/1/2006	No	1.01	0.60	1.62	0%	0.00	0.10	0.02	0.12	0%	0.00	70.28	10.55	80.83	0%	0.00
391	Dry Extended Detention - UDS	2.68	0.69	1.99	1/1/2006	No	11.63	20.04	31.67	0%	0.00	1.12	0.82	1.93	0%	0.00	808.21	349.84	1,158.05	0%	0.00
408	Dry Extended Detention - UDS	5.66	2.31	3.35	1/1/2006	No	38.95	33.73	72.68	0%	0.00	3.74	1.37	5.12	0%	0.00	2,705.75	588.93	3,294.68	0%	0.00
1006	Dry Extended Detention - UDS	2.44	1.13	1.31	1/1/2006	No	19.05	13.19	32.24	0%	0.00	1.83	0.54	2.37	0%	0.00	1,323.59	230.30	1,553.89	0%	0.00
1018	Dry Extended Detention - UDS	1.27	0.57	0.70	1/1/2006	No	9.61	7.05	16.66	0%	0.00	0.92	0.29	1.21	0%	0.00	667.65	123.06	790.71	0%	0.00
1116	Dry Extended Detention - UDS	10.90	4.44	6.46	1/1/2006	No	74.86	65.05	139.91	0%	0.00	7.19	2.65	9.84	0%	0.00	5,200.66	1,135.67	6,336.33	0%	0.00
2236	Dry Extended Detention - UDS	5.45	3.43	2.02	1/1/2006	No	57.83	20.34	78.17	0%	0.00	5.56	0.83	6.38	0%	0.00	4,017.63	355.12	4,372.74	0%	0.00
2265	Dry Extended Detention - UDS	10.90	7.71	3.19	1/1/2006	No	129.99	32.12	162.11	0%	0.00	12.49	1.31	13.80	0%	0.00	9,030.88	560.80	9,591.68	0%	0.00
2266	Dry Extended Detention - UDS	10.20	7.71	2.49	1/1/2006	No	129.99	25.07	155.06	0%	0.00	12.49	1.02	13.51	0%	0.00	9,030.88	437.74	9,468.62	0%	0.00
2347	Dry Extended Detention - UDS	13.90	7.88	6.02	1/1/2006	No	132.86	60.62	193.48	0%	0.00	12.77	2.47	15.23	0%	0.00	9,230.00	1,058.32	10,288.32	0%	0.00
2423	Dry Extended Detention - UDS	14.00	7.54	6.46	1/1/2006	No	127.12	65.05	192.18	0%	0.00	12.21	2.65	14.86	0%	0.00	8,831.75	1,135.67	9,967.42	0%	0.00
3107	Dry Extended Detention - UDS	1.22	0.98	0.24	1/1/2006	No	16.52	2.42	18.94	0%	0.00	1.59	0.10	1.69	0%	0.00	1,147.89	42.19	1,190.09	0%	0.00
3446	Dry Extended Detention - UDS	21.59	12.28	9.31	1/1/2006	No	207.04	93.75	300.79	0%	0.00	19.89	3.82	23.71	0%	0.00	14,383.81	1,636.70	16,020.51	0%	0.00

MS4 Structure ID	BMP Type	Total Drainage Area	Impervious	Pervious	ChesBay Date Installed	Credit Taken?	Loading Rate, Impervious, Nitrogen (16.86 lbs./ac./yr/)	Loading Rate, Pervious, Nitrogen (10.07 lbs./ac./yr.)	Combined Nitrogen Loading Rate (lbs./yr.)	Nitrogen Removal Rate Efficiency %	2024 Nitrogen Reduction Achieved (lbs./yr.)	Loading Rate, Impervious, Phosphorous (1.62 lbs./ac./yr.)	Loading Rate, Pervious, Phosphorous (0.41 lbs./ac./yr.)	Combined Phosphorous Loading Rate (lbs./yr.)	Phosphorous Removal Rate Efficiency %	2024 Phosphorous Reduction Achieved (lbs./yr.)3	Loading Rate, Impervious, Suspended Solids (1,171.32 lbs./ac./yr.)	Loading Rate, Pervious, Suspended Solids (175.8 lbs./ac./yr.)	Combined Suspended Solids Loading Rate (lbs./yr.)	Suspended Solids Removal Rate Efficiency %	Suspended Solids Reduction Achieved (lbs./yr.)
3683	Dry Extended Detention - UDS	4.53	3.22	1.31	1/1/2006	No	54.29	13.19	67.48	0%	0.00	5.22	0.54	5.75	0%	0.00	3,771.65	230.30	4,001.95	0%	0.00
3707	Dry Extended Detention - UDS	5.69	2.03	3.66	1/1/2006	No	34.23	36.86	71.08	0%	0.00	3.29	1.50	4.79	0%	0.00	2,377.78	643.43	3,021.21	0%	0.00
5185	Dry Extended Detention - UDS	3.66	2.93	0.73	1/1/2006	No	49.40	7.35	56.75	0%	0.00	4.75	0.30	5.05	0%	0.00	3,431.97	128.33	3,560.30	0%	0.00
7256	Dry Extended Detention - UDS	8.23	6.58	1.65	1/1/2006	No	110.94	16.62	127.55	0%	0.00	10.66	0.68	11.34	0%	0.00	7,707.29	290.07	7,997.36	0%	0.00
160	Dry Extended Detention Ponds - Level 1	12.10	6.05	6.05	1/1/2006	No	101.99	60.92	162.91	0%	0.00	9.80	2.48	12.28	0%	0.00	7,085.90	1,063.50	8,149.40	0%	0.00
534	Dry Extended Detention Ponds - Level 1	11.30	5.82	5.48	1/1/2006	No	98.13	55.18	153.31	0%	0.00	9.43	2.25	11.68	0%	0.00	6,817.08	963.38	7,780.47	0%	0.00
937	Dry Extended Detention Ponds - Level 1	3.54	0.76	2.78	1/1/2006	No	12.81	27.99	40.81	0%	0.00	1.23	1.14	2.37	0%	0.00	890.20	488.72	1,378.93	0%	0.00
1266	Dry Extended Detention Ponds - Level 1	14.40	6.34	8.06	1/1/2006	No	106.89	81.16	188.06	0%	0.00	10.27	3.30	13.58	0%	0.00	7,426.17	1,416.95	8,843.12	0%	0.00
1373	Dry Extended Detention Ponds - Level 1	8.96	3.02	5.94	1/1/2006	No	50.92	59.82	110.73	0%	0.00	4.89	2.44	7.33	0%	0.00	3,537.39	1,044.25	4,581.64	0%	0.00
1392	Dry Extended Detention Ponds - Level 1	2.62	1.32	1.30	1/1/2006	No	22.26	13.09	35.35	0%	0.00	2.14	0.53	2.67	0%	0.00	1,546.14	228.54	1,774.68	0%	0.00
1947	Dry Extended Detention Ponds - Level 1	8.40	1.96	6.44	1/1/2006	No	32.96	64.86	97.82	0%	0.00	3.17	2.64	5.81	0%	0.00	2,290.13	1,132.30	3,422.43	0%	0.00
1962	Dry Extended Detention Ponds - Level 1	8.01	1.84	6.17	1/1/2006	No	30.99	62.13	93.12	0%	0.00	2.98	2.53	5.51	0%	0.00	2,153.08	1,084.66	3,237.74	0%	0.00
2492	Dry Extended Detention Ponds - Level 1	5.71	1.68	4.03	1/1/2006	No	28.32	40.58	68.91	0%	0.00	2.72	1.65	4.37	0%	0.00	1,967.82	708.47	2,676.29	0%	0.00
2831	Dry Extended Detention Ponds - Level 1	42.20	18.58	23.62	1/1/2006	No	313.26	237.85	551.11	0%	0.00	30.10	9.68	39.78	0%	0.00	21,763.13	4,152.40	25,915.52	0%	0.00
2926	Dry Extended Detention Ponds - Level 1	23.50	9.29	14.21	1/1/2006	No	156.63	143.09	299.72	0%	0.00	15.05	5.83	20.88	0%	0.00	10,881.56	2,498.12	13,379.68	0%	0.00
3354	Dry Extended Detention Ponds - Level 1	16.20	11.52	4.68	1/1/2006	No	194.23	47.13	241.35	0%	0.00	18.66	1.92	20.58	0%	0.00	13,493.61	822.74	14,316.35	0%	0.00
3525	Dry Extended Detention Ponds - Level 1	6.62	1.19	5.43	1/1/2006	No	20.06	54.68	74.74	0%	0.00	1.93	2.23	4.15	0%	0.00	1,393.87	954.59	2,348.46	0%	0.00
3751	Dry Extended Detention Ponds - Level 1	2.50	0.06	2.44	1/1/2006	No	1.01	24.57	25.58	0%	0.00	0.10	1.00	1.10	0%	0.00	70.28	428.95	499.23	0%	0.00
3778	Dry Extended Detention Ponds - Level 1	17.20	10.37	6.83	1/1/2006	No	174.84	68.78	243.62	0%	0.00	16.80	2.80	19.60	0%	0.00	12,146.59	1,200.71	13,347.30	0%	0.00
3828	Dry Extended Detention Ponds - Level 1	11.20	7.54	3.66	1/1/2006	No	127.12	36.86	163.98	0%	0.00	12.21	1.50	13.72	0%	0.00	8,831.75	643.43	9,475.18	0%	0.00
3832	Dry Extended Detention Ponds - Level 1	4.56	2.93	1.63	1/1/2006	No	49.40	16.41	65.81	0%	0.00	4.75	0.67	5.41	0%	0.00	3,431.97	286.55	3,718.52	0%	0.00
4061	Dry Extended Detention Ponds - Level 1	10.50	7.02	3.48	1/1/2006	No	118.36	35.04	153.40	0%	0.00	11.37	1.43	12.80	0%	0.00	8,222.67	611.78	8,834.45	0%	0.00
4064	Dry Extended Detention Ponds - Level 1	13.30	8.57	4.73	1/1/2006	No	144.49	47.63	192.12	0%	0.00	13.88	1.94	15.82	0%	0.00	10,038.21	831.53	10,869.75	0%	0.00
5223	Dry Extended Detention Ponds - Level 1	14.90	9.66	5.24	1/1/2006	No	162.87	52.77	215.63	0%	0.00	15.65	2.15	17.80	0%	0.00	11,314.95	921.19	12,236.14	0%	0.00
5340	Dry Extended Detention Ponds - Level 1	8.81	3.13	5.68	1/1/2006	No	52.77	57.20	109.97	0%	0.00	5.07	2.33	7.40	0%	0.00	3,666.23	998.54	4,664.78	0%	0.00
5375	Dry Extended Detention Ponds - Level 1	1.28	0.24	1.04	1/1/2006	No	4.05	10.47	14.52	0%	0.00	0.39	0.43	0.82	0%	0.00	281.12	182.83	463.95	0%	0.00
5645	Dry Extended Detention Ponds - Level 1	9.13	3.24	5.89	1/1/2006	No	54.63	59.31	113.94	0%	0.00	5.25	2.41	7.66	0%	0.00	3,795.08	1,035.46	4,830.54	0%	0.00
6048	Dry Extended Detention Ponds - Level 1	9.03	3.17	5.86	1/1/2006	No	53.45	59.01	112.46	0%	0.00	5.14	2.40	7.54	0%	0.00	3,713.08	1,030.19	4,743.27	0%	0.00
203	Dry Extended Detention Ponds - Level 2	1.96	0.98	0.98	1/1/2006	No	16.53	9.87	26.40	0%	0.00	1.59	0.40	1.99	0%	0.00	1,148.48	172.37	1,320.85	0%	0.00
797	Dry Extended Detention Ponds - Level 2	5.33	1.61	3.72	1/1/2006	No	27.14	37.46	64.61	0%	0.00	2.61	1.53	4.13	0%	0.00	1,885.83	653.98	2,539.80	0%	0.00
832	Dry Extended Detention Ponds - Level 2	4.79	1.44	3.35	1/1/2006	No	24.28	33.73	58.01	0%	0.00	2.33	1.37	3.71	0%	0.00	1,686.70	588.93	2,275.63	0%	0.00
933	Dry Extended Detention Ponds - Level 2	2.63	1.49	1.14	1/1/2006	No	25.12	11.48	36.60	0%	0.00	2.41	0.47	2.88	0%	0.00	1,745.27	200.41	1,945.68	0%	0.00
1040	Dry Extended Detention Ponds - Level 2	4.96	1.55	3.41	1/1/2006	No	26.13	34.34	60.47	0%	0.00	2.51	1.40	3.91	0%	0.00	1,815.55	599.48	2,415.02	0%	0.00
1528	Dry Extended Detention Ponds - Level 2	22.04	16.95	5.09	1/1/2006	No	285.78	51.26	337.03	0%	0.00	27.46	2.09	29.55	0%	0.00	19,853.87	894.82	20,748.70	0%	0.00
2735	Dry Extended Detention Ponds - Level 2	2.44	1.78	0.66	1/1/2006	No	30.01	6.65	36.66	0%	0.00	2.88	0.27	3.15	0%	0.00	2,084.95	116.03	2,200.98	0%	0.00
38	Filtering Practices - Proprietary	0.11	0.11	0.00	1/1/2006	No	1.85	0.00	1.85	0%	0.00	0.18	0.00	0.18	0%	0.00	128.85	0.00	128.85	0%	0.00
42	Filtering Practices - Proprietary	0.11	0.10	0.01	1/1/2006	No	1.69	0.10	1.79	0%	0.00	0.16	0.00	0.17	0%	0.00	117.13	1.76	118.89	0%	0.00
47	Filtering Practices - Proprietary	6.35	2.89	3.46	1/1/2006	No	48.73	34.84	83.57	0%	0.00	4.68	1.42	6.10	0%	0.00	3,385.11	608.27	3,993.38	0%	0.00
72	Filtering Practices - Proprietary	2.88	1.66	1.22	1/1/2006	No	27.99	12.29	40.27	0%	0.00	2.69	0.50	3.19	0%	0.00	1,944.39	214.48	2,158.87	0%	0.00
103	Filtering Practices - Proprietary	2.85	1.57	1.28	1/1/2006	No	26.47	12.89	39.36	0%	0.00	2.54	0.52	3.07	0%	0.00	1,838.97	225.02	2,064.00	0%	0.00
298	Filtering Practices - Proprietary	4.23	1.67	2.56	1/1/2006	No	28.16	25.78	53.94	0%	0.00	2.71	1.05	3.76	0%	0.00	1,956.10	450.05	2,406.15	0%	0.00
325	Filtering Practices - Proprietary	0.31	0.18	0.13	1/1/2006	No	3.03	1.31	4.34	0%	0.00	0.29	0.05	0.34	0%	0.00	210.84	22.85	233.69	0%	0.00
335	Filtering Practices - Proprietary	1.75	0.93	0.82	1/1/2006	No	15.68	8.26	23.94	0%	0.00	1.51	0.34	1.84	0%	0.00	1,089.33	144.16	1,233.48	0%	0.00
364	Filtering Practices - Proprietary	1.44	0.37	1.07	1/1/2006	No	6.24	10.77	17.01	0%	0.00	0.60	0.44	1.04	0%	0.00	433.39	188.11	621.49	0%	0.00
374	Filtering Practices - Proprietary	0.27	0.05	0.22	1/1/2006	No	0.84	2.22	3.06	0%	0.00	0.08	0.09	0.17	0%	0.00	58.57	38.68	97.24	0%	0.00
396	Filtering Practices - Proprietary	0.59	0.29	0.30	1/1/2006	No	4.89	3.02	7.91	0%	0.00	0.47	0.12	0.59	0%	0.00	339.68	52.74	392.42	0%	0.00
415	Filtering Practices - Proprietary	4.59	1.83	2.76	1/1/2006	No	30.85	27.79	58.65	0%	0.00	2.96	1.13	4.10	0%	0.00	2,143.52	485.21	2,628.72	0%	0.00
2140	Infiltration Practices - Level 1	6.34	3.91	2.43	1/1/2006	No	65.92	24.47	90.39	0%	0.00	6.33	1.00	7.33	0%	0.00	4,579.86	427.19	5,007.06	0%	0.00
4324	Infiltration Practices - Level 1	8.50	4.03	4.47	1/1/2006	No	67.95	45.01	112.96	0%	0.00	6.53	1.83	8.36	0%	0.00	4,720.42	785.83	5,506.25	0%	0.00
360	Infiltration Practices - UDI1	3.90	1.41	2.49	1/1/2006	No	23.77	25.07	48.85	0%	0.00	2.28	1.02	3.31	0%	0.00	1,651.56	437.74	2,089.30	0%	0.00
397	Infiltration Practices - UDI1	9.10	5.42	3.68	1/1/2006	No	91.38	37.06	128.44	0%	0.00	8.78	1.51	10.29	0%	0.00	6,348.55	646.94	6,995.50	0%	0.00
625	Infiltration Practices - UDI1	9.48	4.64	4.84	1/1/2006	No	78.23	48.74	126.97	0%	0.00	7.52	1.98	9.50	0%	0.00	5,434.92	850.87	6,285.80	0%	0.00
4008	Vegetated Open Channels	0.23	0.08	0.15	1/1/2006	No	1.35	1.51	2.86	0%	0.00	0.13	0.06	0.19	0%	0.00	93.71	26.37	120.08	0%	0.00
4279	Wet Pond - Level 1	59.60	50.66	8.94	1/1/2006	No	854.13	90.03	944.15	0%	0.00	82.07	3.67	85.73	0%	0.00	59,339.07	1,571.65	60,910.72	0%	0.00
5443	Wet Pond - Level 1	2.83	0.47	2.36	1/1/2006	No	7.92	23.77	31.69	0%	0.00	0.76	0.97	1.73	0%	0.00	550.52	414.89	965.41	0%	0.00
5584	Wet Pond - Level 1	30.90	3.96	26.94	1/1/2006	No	66.77	271.29	338.05	0%	0.00	6.42	11.05	17.46	0%	0.00	4,638.43	4,736.05	9,374.48	0%	0.00
4155	Wet Pond - Level 2	28.70	17.20	11.50	1/1/2006	No	289.99	115.81	405.80	0%	0.00	27.86	4.72	32.58	0%	0.00	20,146.70	2,021.70	22,168.40	0%	0.00
5778	Cisterns & Rain Barrels	2.32	2.32	0.00	6/30/2011	No	39.12	0.00	39.12	0%	0.00	3.76	0.00	3.76	0%	0.00	2,717.46	0.00	2,717.46	0%	0.00
7246	Green Roofs - Extensive	0.14	0.00	0.14	6/30/2011	No	0.00	1.41	1.41	0%	0.00	0.00	0.06	0.06	0%	0.00	0.00	24.61	24.61	0%	0.00
6198	Cisterns & Rain Barrels	1.17	0.82	0.35	6/30/2012	No	13.83	3.52	17.35	0%	0.00	1.33	0.14	1.47	0%	0.00	960.48	61.53	1,022.01	0%	0.00
6711	Cisterns & Rain Barrels	1.00	0.56	0.44	6/30/2012	No	9.44	4.43	13.87	0%	0.00	0.91	0.18	1.09	0%	0.00	655.94	77.35	733.29	0%	0.00
7020	Cisterns & Rain Barrels	2.18	2.18	0.00	6/30/2012	No	36.75	0.00	36.75	0%	0.00	3.53	0.00	3.53	0%	0.00	2,553.48	0.00	2,553.48	0%	0.00
7242	Green Roofs - Extensive	0.21	0.21	0.00	6/30/2012	No	3.54	0.00	3.54	0%	0.00	0.34	0.00	0.34	0%	0.00	245.98	0.00	245.98	0%	0.00
7243	Green Roofs - Extensive	0.02	0.02	0.00	6/30/2012	No	0.34	0.00	0.34	0%	0.00	0.03	0.00	0.03	0%	0.00	23.43	0.00	23.43	0%	0.00
7244	Green Roofs - Extensive	0.16	0.16	0.00	6/30/2012	No	2.70	0.00	2.70	0%	0.00	0.26	0.00	0.26	0%	0.00	187.41	0.00	187.41	0%	0.00
7245	Green Roofs - Extensive	0.16	0.16	0.00	6/30/2012	No	2.70	0.00	2.70	0%	0.00	0.26	0.00	0.26	0%	0.00	187.41	0.00	187.41	0%	0.00
6647	Green Roofs - Intensive	0.69	0.69	0.00	6/30/2012	No	11.63	0.00	11.63	0%	0.00	1.12	0.00	1.12	0%	0.00	808.21	0.00	808.21	0%	0.00
7592	Cisterns & Rain Barrels	0.85	0.00	0.85	4/23/2018	No	0.00	8.56	8.56	0%	0.00	0.00	0.35	0.35	0%	0.00	0.00	149.43	149.43	0%	0.00

MS4 Structure ID	BMP Type	Total Drainage Area	Impervious	Pervious	ChesBay Date Installed	Credit Taken?	Loading Rate, Impervious, Nitrogen (16.86 lbs./ac./yr/)	Loading Rate, Pervious, Nitrogen (10.07 lbs./ac./yr.)	Combined Nitrogen Loading Rate (lbs./yr.)	Nitrogen Removal Rate Efficiency %	2024 Nitrogen Reduction Achieved (lbs./yr.)	Loading Rate, Impervious, Phosphorous (1.62 lbs./ac./yr.)	Loading Rate, Pervious, Phosphorous (0.41 lbs./ac./yr.)	Combined Phosphorous Loading Rate (lbs./yr.)	Phosphorous Removal Rate Efficiency %	2024 Phosphorous Reduction Achieved (lbs./yr.)3	Loading Rate, Impervious, Suspended Solids (1,171.32 lbs./ac./yr.)	Loading Rate, Pervious, Suspended Solids (175.8 lbs./ac./yr.)	Combined Suspended Solids Loading Rate (lbs./yr.)	Suspended Solids Removal Rate Efficiency %	Suspended Solids Reduction Achieved (lbs./yr.)
7804	Filter Strip - Compost Amendment	0.95	0.80	0.15	7/2/2018	No	13.49	1.51	15.00	0%	0.00	1.30	0.06	1.36	0%	0.00	937.06	26.37	963.43	0%	0.00
7805	Filter Strip - Compost Amendment	0.34	0.29	0.05	7/2/2018	No	4.89	0.50	5.39	0%	0.00	0.47	0.02	0.49	0%	0.00	339.68	8.79	348.47	0%	0.00
8000	Cisterns & Rain Barrels	1.12	1.12	0.00	10/13/2020	No	18.88	0.00	18.88	0%	0.00	1.81	0.00	1.81	0%	0.00	1,311.88	0.00	1,311.88	0%	0.00
9020	Filter Strip - Compost Amendment	2.93	0.00	2.93	12/1/2020	No	0.00	29.51	29.51	0%	0.00	0.00	1.20	1.20	0%	0.00	0.00	515.09	515.09	0%	0.00
Total						**369**					**2,970**					**255**					**286,791**