JOINT BASE MYER – HENDERSON HALL

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PROGRAM PLAN FOR FORT MYER & HENDERSON HALL INSTALLATIONS FORT MYER, VIRGINIA

Prepared in accordance with:

Virginia Stormwater Management Program (VSMP) General Permit No.: VAR04
GENERAL PERMIT FOR DISCHARGES OF STORMWATER FROM SMALL MS4s

Permit Effective Dates: July 1, 2013 - June 30, 2018

VSMP REGISTRATION NUMBER VAR040068

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Final Version

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RECORD OF PLAN REVISIONS

Revision No.	Summary of Changes	Date
1	• Updated Section 2.5 to conform with Guidance Mem No. 15-2005, Chesapeake Bay TMDL Special Condition Guidance, issued by Virginia Department of Environmental Quality on 18 May 2015. • Updated Section 3.4 to address Minimum Control Measure 4 (Construction Site Stormwater Control) requirements • Updated Section 3.5 to address Minimum Control Measure 5 – (Post-Construction Stormwater Management in New Development and Development on Prior Developed Lands) requirements • Added Appendix C, Chesapeake Bay TMDL Action Plan • Updated Appendix E to include standard operating procedure for illicit discharge inspections • Added Appendix F, Stormwater Management Facility Operation and Maintenance Plan • Added Appendix G, Municipal Operations - Daily Good Housekeeping Procedures	25 June 2015
2	• Updated Section 2.5 based on updated Chesapeake Bay TMDL Action Plan update. • Added updated Chesapeake Bay TMDL Action Plan as Appendix C.	13 January 2016

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ACRONYMS

AR	Army Regulation
AST	Aboveground Storage Tank
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CFR	Code of Federal Regulations
CWA	Clean Water Act
DA	Department of the Army
DoD	Department of Defense
DPW	Directorate of Public Works
E&SC	Erosion and Sediment Control
EIR	Environmental Incident Report
EMD	Environmental Management Division
EPA	U.S. Environmental Protection Agency
FMWR	Family and Morale, Welfare, and Recreation
GIS	Geographic Information System
HUC	Hydrologic Unit Code
JBM-HH	Joint Base Myer-Henderson Hall
MDW	Military District of Washington
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
SOP	Standard Operating Procedure
SPCC	Spill Prevention, Control, and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
TOG	The Old Guard
TMDL	Total Maximum Daily Load
TMP	Transportation Motor Pool
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USAG	U.S. Army Garrison
USMC	U.S. Marine Corps
UST	Underground Storage Tank
VAC	Virginia Administrative Code
VADEQ	Virginia Department of Environmental Quality
VMF	Vehicle Maintenance Facility
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WLA	Wasteload Allocation

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1.0 GENERAL INFORMATION

1.1 Introduction

Discharges from municipal separate storm sewer systems (MS4s) in the Commonwealth of Virginia are regulated under the Virginia Stormwater Management Act, the Virginia Stormwater Management Program (VSMP) permit regulations, and the federal Clean Water Act. Stormwater discharges from Phase II (small) MS4s in Virginia are regulated under the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (General Permit) as published at 9 VAC 52-890-40. Small MS4s include storm sewer systems operated by cities, counties, towns, federal facilities such as military bases, Veteran's Affairs hospitals and research facilities, Department of Defense (DoD) facilities and parkways, and state facilities such as the Virginia Department of Transportation (VDOT), community colleges, and public universities. The previous two Phase II MS4 General Permits were administered by The Virginia Department of Conservation and Recreation (DCR). As of July 1, 2013, administration of the MS4 General Permit program was transferred to the Virginia Department of Environmental Quality (DEQ).

Under the Virginia MS4 General Permit, small MS4s must develop and implement a program to control the discharge of pollutants from their storm sewer system in a manner that protects the water quality in nearby streams, rivers, and wetlands. This program, referred to as the MS4 Program Plan, must include the following six Minimum Control Measures:

- Public education and outreach on stormwater impacts
- Public involvement and participation
- Illicit discharge detection and elimination
- Construction site stormwater runoff control
- Post-construction stormwater management in new development and redevelopment
- Pollution prevention/good housekeeping for municipal operations

This MS4 Program Plan has been prepared for Department of the Army Joint Base Myer-Henderson Hall (JBM-HH) to comply with the Virginia MS4 General Permit. This MS4 Program Plan supersedes the previous JBM-HH MS4 Program Plan (January 2013 revision) that was prepared to comply with the Virginia MS4 General Permit effective from July 9, 2008 to June 30, 2013. Best management practices (BMPs) included in the January 2013 MS4 Program Plan version will continue to be implemented until replaced by new BMPs or programs in accordance with the schedule and requirements of the Virginia VSMP Permit No.: VAR04 - General Permit for Discharges of Stormwater from Small MS4s (MS4 General Permit). A copy of the 2013 MS4 General Permit is provided as Appendix A. The Registration Statement for Coverage under the permit and letter confirmation of coverage from VADEQ are provided in Appendix B. A description of existing BMPs to be continued and new BMPs or programs to be implemented for each Minimum Control Measure are provided in Section 3 of this Plan.

1.2 Installation Description and Organization

JBM-HH is located in the Washington, D.C. Metropolitan Area and was created from the administrative reorganization of the Fort Myer Military Community (Fort Myer and Fort McNair) and the Marine Corps installation at Henderson Hall as a result of Base Realignment and

Closure (BRAC) 2005 recommendations. Fort Myer assumed installation management responsibilities and an integration of some functions and services between Fort Myer and Henderson Hall to provide more efficient support of the on-Installation and regional populations.

Fort Myer and Henderson Hall are located in Arlington, Virginia, directly across the Potomac River from Washington, D.C.; Fort McNair is located in Southwest Washington, D.C. at the confluence of the Washington Channel of the Potomac River and the Anacostia River. JBM-HH is home to the 3rd U.S. Infantry Regiment (The Old Guard) and the U.S. Marine Corps (USMC) Headquarters Battalion structured within the Marine Corps National Capital Region Command. Fort McNair is the location of the National Defense University a center for education, research, and outreach in national and international security. It is also host to the Headquarters for the Military District of Washington (MDW). JBM-HH serves as the Joint Force Headquarters-National Capital Region, and the MDW base support of operations, providing a broad level of support for missions of homeland defense, defense support to civil authorities and world-class ceremonial, musical, and special event missions. Joint Base Myer-Henderson Hall provides installation services and support to Military Members, Civilians, Retirees and their Families with a quality of life commensurate with the quality of their service. On order, JBM-HH provides Base Support to MDW/JFHQ-NCR facilitating deployment of forces for Homeland Defense and Defense Support to Civil Authorities in the NCR.

The Virginia MS4 General Permit issued to JBM-HH applies to U.S. Army Installation Fort Myer (Fort Myer) and Marine Corps Headquarters Battalion Henderson Hall (Henderson Hall), which are jointly referred to as 'the Installation' throughout this Plan. The organizational structure of the Installation is depicted on Figure 1. This Program Plan is administered by the Directorate of Public Works (DPW), Environmental Management Division (EMD). The Installation Commander is the signatory authority as defined under 9 VAC 25-870-370 for documents requiring signature in accordance with Section III.K of the MS4 General Permit. While EMD is responsible for overall coordination of permit compliance activities, other Offices, Directorates, and DPW divisions have roles in implementing and complying with the MS4 General Permit. These include:

- Directorate of Family, Morale, Welfare, and Recreation (MWR)
- Directorate of Logistics
- DPW, Engineering Division
- DPW, Operations and Maintenance Division
- Office of Public Affairs
- Third U.S. Infantry Regiment (The Old Guard)

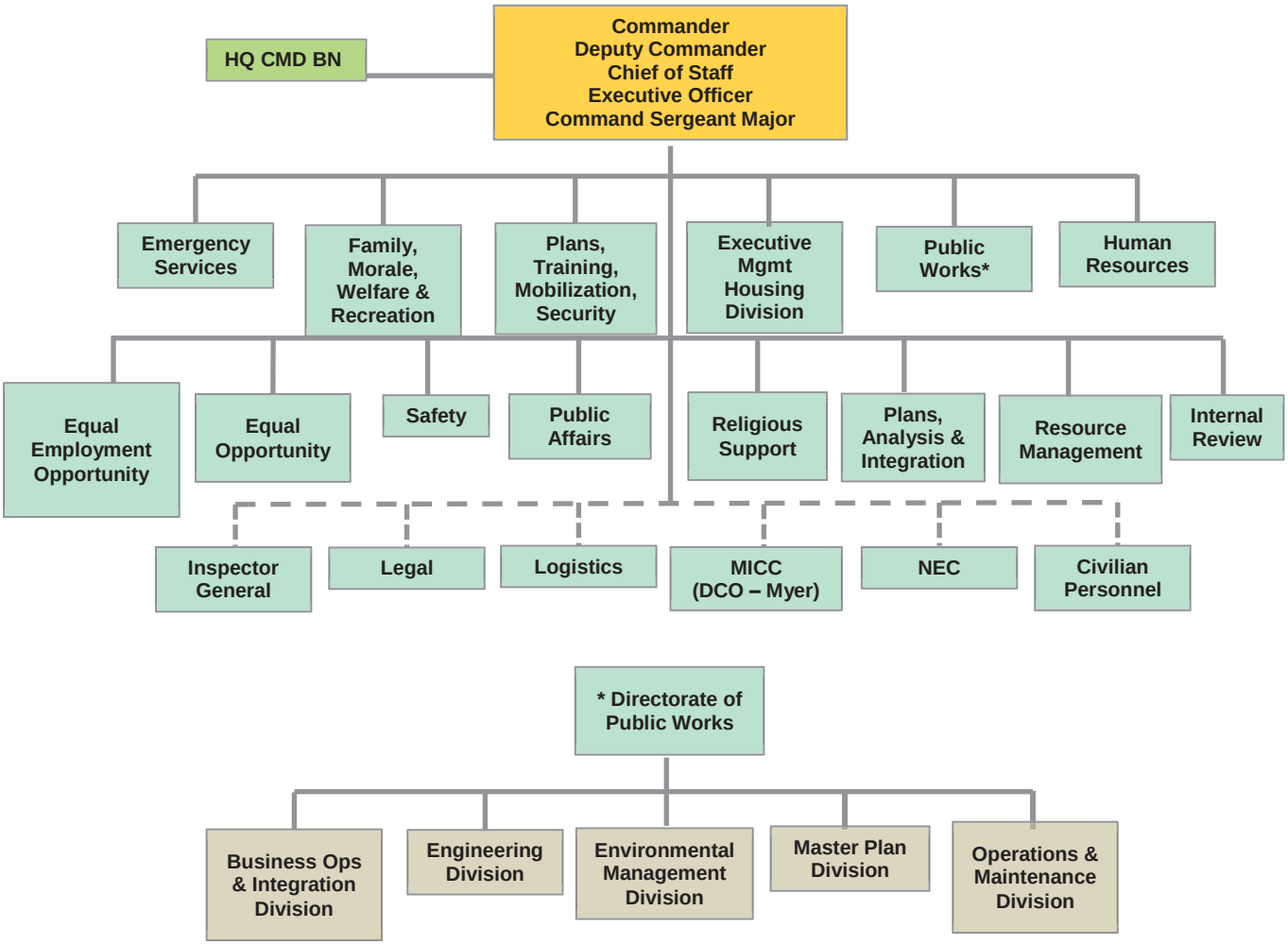

Figure 1. Installation Organizational Structure

1.3 Plan Organization and Schedule

As defined in the MS4 General Permit, the MS4 Program Plan encompasses "the completed registration statement and all approved additions, changes and modifications detailing the comprehensive program implemented by the operator under the MS4 General Permit to reduce the pollutants in the stormwater discharged from its municipal separate storm sewer system (MS4) that has been submitted and accepted by the department". A Registration Statement was submitted in March 2013 for the Installation to obtain coverage under the 2013 MS4 General Permit. This Registration Statement, provided as Appendix B, included the Installation's MS4 Program Plan that was in effect at the time of the Registration Statement submittal.

The 2013 MS4 General Permit requires the Installation to update their MS4 Program Plan in accordance with the schedule provided in the permit and, until the updates are completed and implemented, continue to implement the MS4 Program consistent with the MS4 Program Plan submitted with the Registration Statement. This updated MS4 Program Plan for JBM-HH is

organized in a manner that allows for changes and updates to the Plan over the course of the 5-year permit term to comply with the schedule presented in Table 1-1.

Section 2 of this Plan provides background information on JBM-HH's watersheds and the status of total maximum daily loads (TMDLs) that affect these watersheds. Section 3 is organized according to the six Minimum Control Measures required by the MS4 General Permit, and Section 4 summarizes the annual reporting and program evaluation requirements required under the 2013 MS4 General Permit. Specific plans, procedures, and schedules required by the permit are provided as separate appendices to the plan; these documents will be prepared in accordance with the schedule provided in Table 1-1 and amended to the MS4 Program Plan when complete.

Table 1-1. Schedule of MS4 Program Plan Updates

Program Update Requirement	Permit Reference	Schedule
Public Education Outreach Plan (Minimum Control Measure 1 – Public Education and Outreach on Stormwater Impacts)	Section II B 1	12 months after permit coverage
Illicit Discharge Procedures - (Minimum Control Measure 3 – Illicit Discharge Detection and Elimination)	Section II B 3	
Individual Residential Lot Special Criteria (Minimum Control Measure 5 – Post-Construction Stormwater Management in New Development and Development on Prior Developed Lands)	Section II B 5 c (1) (d)	
Operator-Owned Stormwater Management Inspection Procedures (Minimum Control Measure 5 – Post-Construction Stormwater Management in New Development and Development on Prior Developed Lands)	Section II B 5	
Identification of Locations Requiring SWPPPs (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 b	
Nutrient Management Plan (NMP) Locations - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 c (1) (a)	
Training Schedule and Program - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6	
Updated TMDL Action Plans (TMDLs approved before July of 2008) – (Special Conditions for Approved Total Maximum Daily Loads (TMDL) Other Than Chesapeake Bay)	Section I B	24 months after permit coverage
Chesapeake Bay TMDL Action Plan – (Special Condition for Chesapeake Bay TMDL)	Section I C	
Stormwater Management Progressive Compliance and Enforcement – (Minimum Control Measure 4 - Construction Site Stormwater Runoff Control)	Section II B 5	
Daily Good Housekeeping Procedures (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 a	

Table 1-1. Schedule of MS4 Program Plan Updates		
Program Update Requirement	**Permit Reference**	**Schedule**
Other TMDL Action Plans for applicable TMDLs approved between July 2008 and June 2013 - (Special Conditions for Approved Total Maximum Daily Loads (TMDL) Other Than Chesapeake Bay)	Section I B	36 months after permit coverage
Outfall Map Completed - (Minimum Control Measure 3 – Illicit Discharge Detection and Elimination) – Applicable to new boundaries identified as "urbanized" areas in the 2010 Decennial Census	Section II B 3 a (3)	48 months after permit coverage
SWPPP Implementation - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 b (3)	
NMP Implementation - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 c (1) (b)	60 months after permit coverage

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2.0 WATERSHEDS AND TMDLS

2.1 Installation Watersheds

The Installation occupies approximately 270 acres within Arlington County in Northern Virginia that is bordered on the north by Arlington Boulevard (Virginia Route 50), to the south by Columbia Pike (Virginia Route 244), to the west by Washington Boulevard (Virginia Route 27), and to the east by Arlington National Cemetery (ANC). The installation lies within the portion of Potomac River watershed that is identified as Middle Potomac-Anacostia-Occoquan Watershed – 4th order Hydrologic Unit Code (HUC) 02070010.

According to Virginia's 6th Order National Watershed Boundary Dataset[1], the Installation lies within 6th order Potomac River subwatershed PL24: Potomac River-Pimmit Run (see Figure 2).

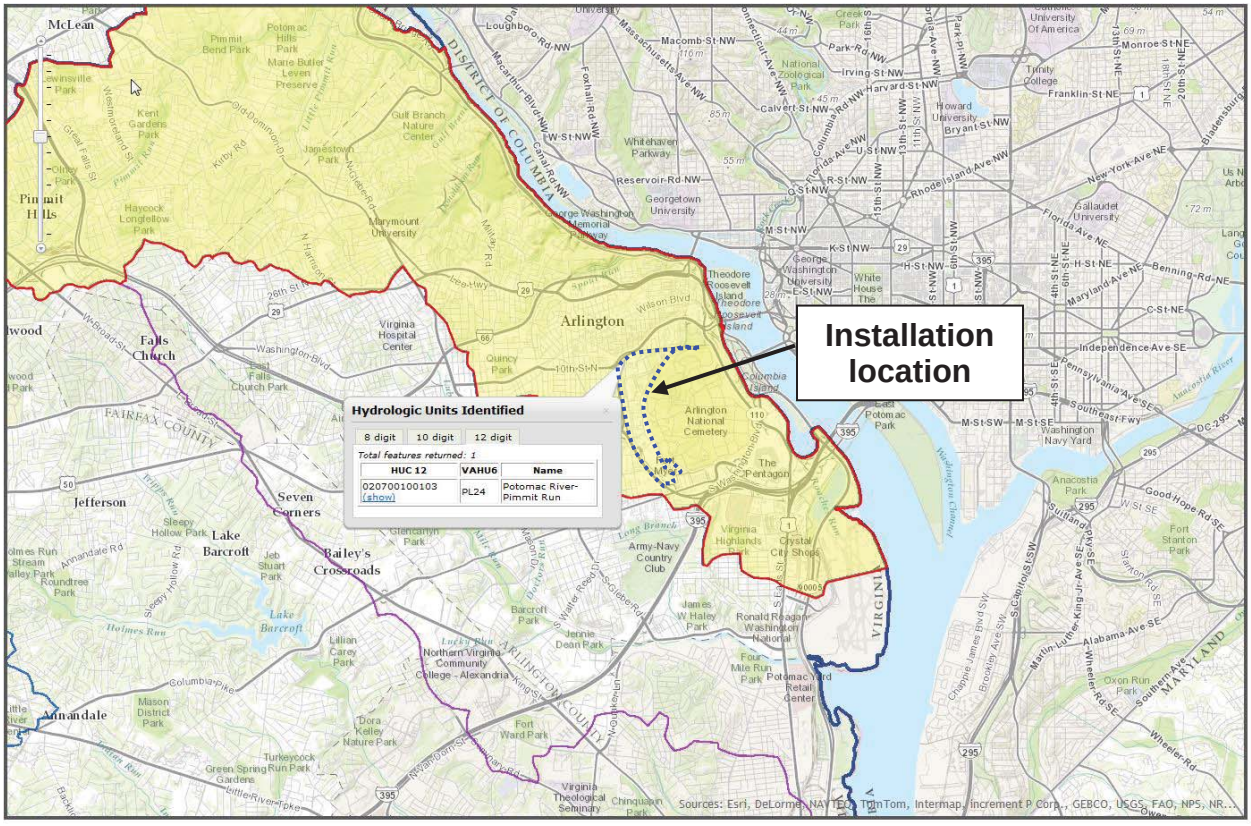

Figure 2. JBM-HH Location and Virginia 6th Order HUC Watershed Boundary[1]

1 Virginia Hydrologic Unit Explorer, Base Map Imagery, Virginia Department of Conservation and Recreation. http://dswcapps.dcr.virginia.gov/htdocs/maps/HUExplorer.htm

2.2 Stormwater Drainage Description

Stormwater discharges from the Installation are collected by stormwater drainage systems that flow either:

- East to an unnamed intermittent stream that flows through ANC and discharges to the Potomac River via Boundary Channel;
- North to Arlington County storm drains within the Rocky Run watershed (and ultimately to the Potomac River); or
- West and south to Lower Long Branch, which drains to Fourmile Run, a Potomac River tributary.

Twenty-six stormwater outfalls have been identified at the Installation.

2.3 Receiving Waters – Impairment and TMDL Status

Long Branch Creek and the non-tidal portion of Fourmile Run to which Long Branch Creek drains (about 0.8 mile south of JBM-HH) are designated as impaired for *Escherichia coli* (*E. Coli*) on Virginia's 305(b)/303(d) 2012 list of impaired waters. The portion of the Potomac River east of Arlington Cemetery that receives discharges from the Installation (State list ID DCPMS00E_02) is listed on the District of Columbia 2012 303(d) list as impaired for fecal coliform, pH, and polychlorinated biphenyls (PCBs).

TMDLs have been established for Fourmile Run to address fecal coliform impairment and for the Potomac River to address fecal coliform and polychlorinated biphenyl (PCB) impairments. Since Fourmile Run and the Potomac River are tributaries of the Chesapeake Bay, the installation is also subject to the Chesapeake Bay TMDL for nutrients and sediment.

2.4 Special Conditions for TMDLs Other Than the Chesapeake Bay TMDL

Section I.B of the MS4 General Permit contains special conditions regarding approved TMDLs other than the Chesapeake Bay TMDL. The permit requires MS4 operators to prepare and implement specific TMDL Action Plans for pollutants subject to a TMDL where the MS4 has been allocated a wasteload in an approved TMDL. The TMDL Actions Plans must identify the best management practices and other interim milestone activities to be implemented during the term of the MS4 General Permit.

In accordance with Table 1-1, MS4 Program Plans must be updated by June 30, 2015 to address any new or modified requirements established under the MS4 General Permit special condition for pollutants identified in TMDL stormwater wasteload allocations (WLAs) that were approved prior to July 9, 2008. For pollutants identified in TMDL wasteload allocations that were approved on or after July 9, 2008, the MS4 Program Plan must be updated by June 30, 2016 to include TMDL Action Plans that identify the best management practices and other interim milestone activities that will be implemented during the remaining term of the permit for pollutants identified in the TMDL stormwater WLAs.

The EPA approved a PCB TMDL for the Potomac River on October 31, 2007. Municipal stormwater discharges covered under NPDES permits are included in the TMDL stormwater WLAs, but the TMDL document states that stormwater WLAs apply only to the direct Potomac

River drainage areas for the permitted MS4s[2]. Since all of the Installation's discharges flow to Potomac River tributary streams and do not drain directly to the Potomac River, the Potomac River PCB WLA does not apply to the Installation.

A fecal coliform TMDL for Fourmile Run was approved in 2002. The WLAs for this TMDL were developed based on contributions from impervious surfaces in the study area. There are no specific stormwater WLAs assigned to MS4s individually or collectively for this TMDL. The implementation plan for this TMDL addresses wasteload contributions from the MS4s for four jurisdictions: Fairfax County, Arlington County, City of Alexandria, and the City of Falls Church. Discharges from the Installation appear to have been included with Arlington County during development of the TMDL.

There are no significant sources of fecal coliform known to be present on the Installation that contribute to stormwater pollution. Wastes associated with military dogs and horses housed at the Installation are managed in a manner that prevents direct discharges to stormwater. There are no significant resident populations of domestic or wild animals. Sanitary wastes from the installation discharge to the Arlington County sanitary sewer system and are treated by the County's Water Pollution Control Plant. A small septic field located near the Wright Gate entrance to the Installation treats waste from a single toilet facility for the Wright Gate entrance station that is used by the guards.

2.5 Special Condition for the Chesapeake Bay TMDL

Special Condition C.2.a in Section I of the MS4 permit requires permittees to develop a Chesapeake Bay TMDL Action Plan. The Plan was submitted to VADEQ and comments were received from VADEQ on 26 October 2015. The comments were addressed to VADEQ's satisfaction and the revised Final Chesapeake Bay TMDL Action Plan was submitted to VADEQ on 10 December 2015. JBM-HH is awaiting a final approval letter from VADEQ.

2 Total Maximum Daily Loads of Polychlorinated Biphenyls (PCBs) for Tidal Portions of the Potomac and Anacostia Rivers in the District of Columbia, Maryland, and Virginia. Prepared by Interstate Commission on the Potomac River Basin Rockville, Maryland, Submitted to U.S. EPA September 28, 2007 with minor revisions Oct 31, 2007.

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3.0 MINIMUM CONTROL MEASURES

Under the 2008 MS4 General Permit, the Installation was required to develop and implement BMPs for each of six Minimum Control Measures (MCMs). The 2013 MS4 General Permit contains new requirements for each of the MCMs with deadlines for implementation as outlined in Table 1-1. The BMPs included in the Installation's 2008 MS4 Program Plan (as amended throughout the 2008 permit term) must continue to be implemented for each MCM until they are updated to comply with the 2013 permit. The following sections outline the MCMs from the previous term and provide details for the updates that will be implemented in accordance with the 2013 permit.

3.1 Public Education and Outreach on Stormwater Impacts

MCM 1 of the 2013 MS4 General Permit requires operators to prepare a Public Education and Outreach Plan in accordance with the requirements in Section II.B.1 of the permit. The BMPs included in JBM-HH's 2009 MS4 Program Plan (as updated in January 2013) and the continuation plans for each are summarized in Table 3.1. The Public Education and Outreach Plan developed in accordance with the 2013 MS4 General Permit is provided as Appendix D.

Table 3-1. JBM-HH 2009 MS4 Program Plan – MCM #1 BMPs

BMP #	BMP Description	Continuation Plan
1.1	Provide information at Environmental Quality Control (EQCC) meetings about water quality and pollution prevention.	Water quality and pollution prevention will continue to be included as discussion topics at quarterly EQCC meetings.
1.2	Publish articles or advertisements in the Pentagram, a weekly publication with a circulation of over 19,000 in the national capital area military community, about seasonal practices to prevent stormwater pollution. Potential topics include fertilizer application (spring), pet cleanup practices (summer), leaf mulching and removal (fall), and use of deicing materials (winter).	EMD will continue to submit articles for publication in the Pentagram that target stormwater pollution prevention practices for base residents and employees.
1.3	Establish an environmental information page on the Joint Base Myer-Henderson Hall (JBM-HH) Website. An environmental page can be established that provides tips on pollution prevention, household hazardous waste disposal, recycling opportunities, community environmental events, reporting illegal dumping, etc.	The EMD webpage will be periodically updated with environmental information relevant to stormwater pollution prevention.
1.4	Prepare public education brochures for activities with the potential to contribute to stormwater pollution and a general stormwater pollution awareness brochure for new residents and workers.	Brochures that were previously prepared will be updated and redistributed in 2014.

3.2 Public Involvement/Participation

MCM 2 of the 2013 MS4 General Permit requires MS4 operators to engage the public in stormwater pollution prevention activities and to keep the public informed about the operator's MS4 permit compliance activities. The definition of "public" for DoD installations, including JBM-HH, is different from the definition of "public" as applied to typical municipalities that own and

operate MS4s. In the 2013 MS4 General Permit, the Virginia DEQ states that they concur with EPA's suggested interpretation of "public" for DoD facilities as "the resident and employee population within the fence line of the facility." his interpretation was used as guidance for defining the targeted public audience for the public involvement and participation activities included in this Program Plan.

3.2.1 Public Involvement

Public involvement requirements in the 2013 MS4 General Permit generally pertain to informing the public about activities related to the MS4 Program and its implementation. In accordance with the General Permit, the Installation will implement the following:

- Annually, the MS4 Program Plan will be reviewed in conjunction with the annual report and updated as needed.
- The updated MS4 program plan will be posted on the JBM-HH webpage at a minimum of once a year and within 30 days of submitting the annual report to the Virginia DEQ.
- Copies of annual reports will be posted on the JBM-HH webpage and maintained online for the duration of 2013 MS4 General Permit term.
- Prior to reapplying for coverage under a new MS4 General Permit (when the 2013 MS4 General Permit is due to expire), the proposed MS4 Program Plan that will be submitted with the application for the new permit will be posted on the JBM-HH webpage; a notice will be posted along with the draft MS4 Program Plan soliciting public comments that will contain procedures for submitting comments.

3.2.2 Public Participation

The public participation requirements of the 2013 MS4 General Permit include participating in a minimum of four local activities annually either through promotion, sponsorship, or other involvement. As stated in the permit, "the activities shall be aimed at increasing public participation to reduce stormwater pollutant loads; improve water quality; and support local restoration and clean-up projects, programs, groups, meetings, or other opportunities for public involvement."

Four activities will be planned each year for the installation to accomplish this requirement. The activities may vary from year to year based on targeted pollutant concerns, available funding, and other factors. Typical activities may include the following:

- Advertising Installation-wide spring and fall cleanup days and distributing flyers about environmentally-friendly cleanup and waste disposal options as part of the cleanup days.
- Partnering with local Arlington youth, community, and stewardship organizations such as the Boy Scouts/Girl Scouts, Casey Trees, and Master Gardeners to implement stormwater pollution prevention and related programs at JBM-HH.
- Engaging Installation residents and employees in activities such as stormwater awareness workshops in conjunction with annual Earth Day activities.
- Holding "town hall" style meetings to promote stewardship of water resources.

3.3 Illicit Discharge Detection and Elimination

There are four required components for MCM #3, Illicit Discharge Detection and Elimination, specified in the 2013 MS4 General Permit:

- Maintaining an accurate storm sewer system map and information table

- Effectively prohibiting, through ordinance or other legal mechanism, nonstormwater discharges into the storm sewer system;
- Developing, implementing, and updating, when appropriate, written procedures to detect, identify, and address unauthorized nonstormwater discharges, including illegal dumping, to the storm sewer system; and
- Promoting, publicizing, and facilitating public reporting of illicit discharges into or from the storm sewer system.

These requirements will be implemented according the schedule presented on Table 1-1. The BMPs included in the Installation's 2009 MS4 Program Plan (as updated in January 2013) for MCM #3 will continue to be implemented until the new BMPs have been implemented. The 2009 BMPs and the continuation plans for each are summarized in Table 3.2.

Table 3-2. JBM-HH 2009 MS4 Program Plan – MCM #3 BMPs

BMP #	BMP Description	Continuation Plan
3.1	Update GIS system with new storm drain system information as changes occur.	New storm drain information will be added to the GIS database.
3.2	Conduct dry weather inspections of all base outfalls to look for evidence of illicit discharges.	Dry weather inspections will be conducted annually on all of the Installation's outfalls.
3.3	Maintain database to track changes to building drains.	The GIS database will be updated with building drain information as needed.
3.4	Identify and eliminate illicit connections to storm drain. Ongoing sanitary sewer system upgrades are addressing cross connections as they are identified.	Illicit connections, if identified, will be eliminated.
3.5	Inform the JBM-HH community about hazards to human health and the environment from improper waste disposal and illegal dumping/ discharges. Information will be distributed through the sources identified in MCM #1.	Information will continue to be distributed as described for MCM #1.

Detail of the Installation's program for implementing each of the new requirements is provided below.

Storm Sewer System Map

During the previous General Permit term, known outfall locations, including interconnections to Arlington County and Arlington National Cemetery MS4s, were mapped in the Installation's geographic information system (GIS)-based database, and an Installation-wide outfall map was created. The GIS data will be updated to include the required elements specified in the 2013 MS4 General Permit. This update is required by June 30, 2017. In accordance with the General Permit, the following tasks will also be implemented:

- Maintain a copy of the current storm sewer system map and outfall information table for review upon request by the public or by the department; and
- Notify Arlington County in writing of known physical interconnections to Arlington County's MS4.

Nonstormwater Discharge Prohibition

The 2013 MS4 General Permit requires that MS4 operators "effectively prohibit, through ordinance or other legal mechanism, nonstormwater discharges into the storm sewer system to the extent allowable under federal, state, or local law, regulation, or ordinance." Since JBM-HH is a Department of the Army-operated military installation, Army Regulation 200-1, *Environmental Protection and Enhancement*, serves as the primary legal mechanism for addressing pollution prevention and surface water protection. Section 4-2.e(1)(c) of this regulation requires Army installations to "control or eliminate sources of pollutants and contaminants to protect water bodies and groundwater." Additional mechanisms in place to prevent non-stormwater discharges to the storm sewer system include developing standard operating procedures (SOPs) for industrial areas of the base that prohibit the discharge of pollutants to storm drains and providing appropriate procedures for the collection and disposal of waste materials.

Installation residents are provided with information about the collection of waste oil and household hazardous materials; dumping these materials into storm drains is not permitted. Surveillance of all Installation areas is provided 24 hour per day, 7 days per week, 365 days per year by Military Police. Incidents of illegal dumping if detected would be dealt with by the Military Police and JBM-HH Commander.

Illicit Discharge Detection and Elimination Procedures

A program for detecting and eliminating non-stormwater discharges to the Installation's storm sewer system was developed and implemented during the previous permit term. These procedures, which have been updated to conform to the requirements of the 2013 MS4 General Permit, are provided in Appendix E.

Public Reporting of Illicit Discharges

The public is encouraged to report observations of activities that could cause pollution such as spills, illegal dumping, erosion, and storm sewer problems. The JBM-HH web page contains a link to an Environmental Incident Report (EIR) form that can be used to report observations. The public can submit the form or call the EMD directly. All reports are responded to in a timely manner, and EMD performs inspections as needed to verify that corrective measures have been implemented by the responsible party.

3.4 Construction Site Stormwater Runoff Control

MCM #4 requires MS4 operators to provide adequate oversight of land-disturbing activities to control the discharge of pollutants from construction activities. The MS4 operator's oversight program must address the following elements:

- Legal authority and agreements to address discharges entering the MS4 from the following land-disturbing activities;
- Required plan approval prior to commencement of land disturbing activities;
- Sediment and erosion control plan compliance and enforcement; and
- Regulatory coordination to ensure required state permits are obtained for construction activities.

Elements of these requirements were implemented during the previous General Permit term.

Major construction activities (generally >1 acre) at JBM-HH are performed under the oversight of the U.S. Army Corps of Engineers (USACE). JBM-HH DPW and USACE require appropriate erosion and sediment controls for all construction projects: JBM-HH DPW requires construction contracts to include predetermined construction BMPs; by signing off on them, project

managers are committing that BMPs will be implemented and contractors will adhere to them. USACE requires contractors to submit an erosion and sediment control (E&SC) plan for all construction projects. These plans are reviewed by USACE and VADEQ. Copies of construction BMPs to be included in DPW's construction contracts have been distributed to the civil engineers. Construction contractors are required to obtain a VPDES stormwater construction permit from VADEQ for land disturbing activities in accordance with Commonwealth of Virginia requirements, including Title 9 of the Virginia Administrative Code (VAC), Chapter 840, *Erosion and Sediment Control Regulations* and Title 9 VAC Chapter 850, *Erosion and Sediment Control and Stormwater Management Certification Regulations*. DPW-EMD reviews construction projects to verify that stormwater permit coverage and erosion and sediment control plan approvals have been obtained and that an adequate SWPPP has been prepared. DPW-EMD also conducts biweekly inspections of construction projects to ensure compliance with permits and approvals and judge the effectiveness of installed BMPs.

If construction site discharges are determined through inspections to be a significant source of sediment or other pollutants, EMD will initiate a program with DPW and USACE to develop more stringent contractor oversight and compliance during construction activities.

3.5 Post-construction Stormwater Management in New Development and Development on Prior Developed Lands

MCM #5 includes requirements for ensuring that controls for managing post-construction stormwater runoff from new development and development on prior developed lands are designed and installed in accordance with applicable legal requirements and the controls are adequately maintained. Applicable portions of the 2013 MS4 General Permit require that the MS4 Program Plan address the following:

- A list of the applicable legal authorities such as ordinance, state and other permits, orders, specific contract language, and interjurisdictional agreements to ensure compliance with the minimum control measure in Section II related to post-construction stormwater management in new development and development on prior developed lands;
- Written policies and procedures utilized to ensure that stormwater management facilities are designed and installed in accordance with Section II.B.5.b;
- Written procedures for inspection and maintenance of operator-owned stormwater management facilities; and
- The roles and responsibilities of each of the operator's departments, divisions, or subdivisions in implementing the minimum control measure in Section II related to post-construction stormwater management in new development and development on prior developed lands.

To meet MCM 5, JBM-HH will specify design criteria in contract language for development and redevelopment projects meeting the applicability criteria in Section II.B.5.a of the permit. The design and installation of new stormwater runoff controls will be required to meet the appropriate criteria specified in Section II.B.5.b of the permit.

All existing and future stormwater runoff controls on Installation property are owned and operated by JBM-HH. There are no privately-owned stormwater management facilities that discharge to the Installation's MS4.

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Applicable Legal Authorities

Applicable legal authorities which share regulatory authority with JBM-HH with regard to post-construction stormwater management at the Installation include:

- Commonwealth of Virginia Department of Environmental Quality
- Title 9 VAC Chapter 870, Virginia Stormwater Management Program (VSMP) Regulation
- Design criteria in contract language

The Contractor is responsible for compliance with these authorities.

Final Design and Installation of Stormwater Management Facilities

DPW-EMD will inspect stormwater management facilities over the course of construction to provide ensure compliance with regulatory requirements and adherence to contractor designs. The project owner will inspect completed stormwater management facilities to verify consistency with final designs and as-builts.

Written Inspection, Operations, and Maintenance Protocols

Inspection and maintenance procedures and roles and responsibilities of the Installation's DPW and DPW-EMD for the long-term operation and maintenance of the Installation's stormwater management facilities are provided in Appendix F.

3.6 Pollution Prevention/Good Housekeeping for Municipal Operations

MCM #6 requires MS4 operators to implement the following actions to address pollution prevention from municipal operations and maintenance activities:

- Municipal facility pollution prevention and good housekeeping:
  - Identify all municipal high-priority facilities and those which have a high potential of chemicals or other materials to be discharged in stormwater
  - Develop and implement specific stormwater pollution prevention plans for all high-priority facilities
- Develop and implement written procedures designed to minimize or prevent pollutant discharges from daily operations and maintenance activities
- Develop and implement turf and landscape nutrient management plans
- Conduct employee training
- Require municipal contractors to use appropriate control measures and procedures for stormwater discharges to the MS4 system

Compliance with each of these requirements is discussed below.

Municipal Facility Pollution Prevention and Good Housekeeping

Several buildings and areas at the Installation contain operations such as vehicle maintenance and installation maintenance support that could be considered municipal-type operations. The following Installation facilities/operations are considered municipal high-priority facilities under the 2013 MS4 General Permit:

- Equipment storage and maintenance at The Old Guard maintenance shop (Building 314), the TMP heavy equipment shop (Building 325), and the bus dispatch and servicing operations (Building 330)
- Exterior storage areas around Building 306
- The DPW maintenance yard at Building 447

- The composting operation next to the boiler plant (Building 447) at the DPW maintenance yard (currently not in operation, but will be re-evaluated if the composter is put back in operation)

All of these facilities have a moderate potential for pollutants to be discharged in stormwater. The stormwater discharges from Buildings 306, 314, 325, and 330 are covered under the VPDES General Industrial Stormwater Permit. An Installation-wide SWPPP was developed and implemented to comply with the VPDES industrial permit. Each of these operations is addressed in the JBM-HH SWPPP, which specifies appropriate BMPs to prevent or reduce pollutants in runoff. This SWPPP also addresses discharges from the DPW maintenance yard at Building 447. The SWPPP is maintained by the EMD and is kept at the EMD office in Building 321. Copies of the SWPPP are kept onsite at each of the operations buildings.

The SWPPP will be reviewed and updated to incorporate 2013 MS4 General Permit requirements by the June 30, 2017 deadline specified in Table 1-1.

Daily Operations and Maintenance Activities

The 2013 MS4 General Permit requires that MS4 operators develop and implement written procedures designed to minimize or prevent pollutant discharge from: (i) daily operations such as road, street, and parking lot maintenance; (ii) equipment maintenance; and (iii) the application, storage, transport, and disposal of pesticides, herbicides, and fertilizers. The written procedures are included as Appendix G.

Turf and Landscape Management

Turf and landscaped areas at the Installation are generally limited to small maintained yards and landscaped areas surrounding residences and buildings. The only large area that may have nutrient applications is the Summerall Field. This area is about 9 acres and is used for ceremonies, parades, and other activities. The coordinates for this area are: N38.881746, E-77.081838. The need for a nutrient management plan will be evaluated, and if a plan is required it will be prepared and inserted as Appendix H.

Training Program

A computer-based stormwater pollution prevention and SPCC training program was developed in 2011 and deployed to industrial operations shops at the installation. Identified employees must take the training annually. Records of this training are maintained by EMD. The 2013 MS4 General Permit requires specific training topics for employees. Training is not required if the topic is not applicable to the operator's operations. A summary of the required training topics and their applicability to the Installation are presented in Table 3-3.

Table 3-3. 2013 MS4 General Permit Training Topics and Applicability

Training Requirement	Applicability/Status
Provide biennial training to applicable field personnel in the recognition and reporting of illicit discharges.	This topic is covered in the current SWPPP/SPCC training program; training is provided annually.
Provide biennial training to applicable employees in good housekeeping and pollution prevention practices that are to be employed during road, street, and parking lot maintenance.	This topic is somewhat covered in the current SWPPP/SPCC training program; the current SWPPP training will be expanded to specifically address road, street, and parking lot maintenance.

Table 3-3. 2013 MS4 General Permit Training Topics and Applicability	
Training Requirement	**Applicability/Status**
Provide biennial training to applicable employees in good housekeeping and pollution prevention practices that are to be employed in and around maintenance and public works facilities	This topic is covered in the current SWPPP/SPCC training program; training is provided annually.
Ensure that employees, and require that contractors, who apply pesticides and herbicides are properly trained or certified in accordance with the Virginia Pesticide Control Act (§ 3.2-3900 et seq. of the Code of Virginia)	DPW requires that all DPW personnel and landscaping contractors have appropriate certifications for pesticide and herbicide application; documentation is maintained by DPW.
Ensure that employees and contractors serving as plan reviewers, inspectors, program administrators, and construction site operators obtain the appropriate certifications as required under the Virginia Erosion and Sediment Control Law and its attendant regulations.	The construction plan/project review process will be evaluated periodically to address the requirements for plan reviewers, inspectors, and program administrators; construction site contractors must submit documentation of required certifications and information is reviewed by EMD.
Ensure that applicable employees obtain the appropriate certifications as required under the Virginia Erosion and Sediment Control Law and its attendant regulations.	EMD will periodically review the applicability of this requirement to DPW employees.
Provide biennial training to applicable employees in good housekeeping and pollution prevention practices that are to be employed in and around recreational facilities.	Not applicable to the Installation.
The appropriate emergency response employees shall have training in spill responses.	The JBM-HH Fire Department serves as emergency responders for the Installation; annual spill response training is provided for Fire Department employees.

EMD will continue to provide oversight of the employee training program elements that are applicable to the General Permit and will maintain records of training activities. The training plan for the 2014/2015 reporting cycle is to continue the existing SWPPP/SPCC training program; the training module will be reviewed and augmented as needed to address additional requirements as identified in Table 3-3.

Municipal Contractor Oversight

Under the 2013 MS4 General Permit MS4 operators “shall require that municipal contractors use appropriate control measures and procedures for stormwater discharges to the MS4 system.” Contractors employed at the Installation that might be considered “municipal contractors” are generally limited to grounds maintenance contractors. Oversight for these contractors is provided by DPW and contractors are instructed by the DPW contractor manager as to the use of appropriate control measures for preventing inappropriate discharges to the storm sewer system.

4.0 ANNUAL REPORT AND PROGRAM EVALUATION

Each year of the MS4 permit cycle, the MS4 Program will be evaluated as required by the permit. The evaluation will include the following:

- An evaluation of the appropriateness of the identified BMPs and the effectiveness of BMPs in addressing discharges into waters that are identified as impaired in the 2010 § 305(b)/303(d) Water Quality Assessment Integrated Report
- Progress towards achieving the identified measurable goals

Results of the evaluation will be summarized and included with the annual report that is submitted to VADEQ.

Annual Reports will be prepared in accordance with the permit requirements and submitted to VADEQ by October 1 of each permit year. The reports shall include:

a. Background Information.
    1) The name and state permit number of the program submitting the annual report;
    2) The annual report permit year;
    3) Modifications to any operator's department's roles and responsibilities;
    4) Number of new MS4 outfalls and associated acreage by HUC added during the permit year; and
    5) Signed certification;
b. The status of compliance with state permit conditions, an assessment of the appropriateness of the identified best management practices and progress towards achieving the identified measurable goals for each of the minimum control measures;
c. Results of information collected and analyzed, including monitoring data, if any, during the reporting period;
d. A summary of the stormwater activities the operator plans to undertake during the next reporting cycle;
e. A change in any identified best management practices or measurable goals for any of the minimum control measures including steps to be taken to address any deficiencies;
f. Notice that the operator is relying on another government entity to satisfy some of the state permit obligations (if applicable);
g. The approval status of any programs pursuant to Section II C (if appropriate), or the progress towards achieving full approval of these programs; and
h. Information required for any applicable TMDL special condition contained in Section I.

The following specific elements for each MCM will be included in the Annual Report:

- MCM #1:
    - A list of the education and outreach activities conducted during the reporting period for each high-priority water quality issue, the estimated number of people reached, and an estimated percentage of the target audience or audiences that will be reached; and
    - A list of the education and outreach activities that will be conducted during the next reporting period for each high-priority water quality issue, the estimated number of people that will be reached, and an estimated percentage of the target audience or audiences that will be reached.
- MCM #2:
    - A web link to the MS4 Program Plan and annual report

- Documentation of compliance with the public participation requirements of the permit

- MCM #3:
  - A list of any written notifications of physical interconnection given by the operator to other MS4s
  - The total number of outfalls screened during the reporting period, the screening results, and detail of any follow-up actions necessitated by the screening results
  - A summary of each investigation conducted by the operator of any suspected illicit discharge

- MCM #4:
  - Information regarding regulated land-disturbing activities including:
    1) Total number of regulated land-disturbing activities;
    2) Total number of acres disturbed;
    3) Total number of inspections conducted; and
    4) A summary of the enforcement actions taken, including the total number and type of enforcement actions taken during the reporting period.

- MCM #5
  - An electronic database or spreadsheet of all stormwater management facilities brought online during each reporting year with the appropriate Annual Report.

- MCM #6
  - A summary report on the development and implementation of the daily operational procedures;
  - A summary report on the development and implementation of the required SWPPPs;
  - A summary report on the development and implementation of the turf and landscape nutrient management plans that includes:
    (a) The total acreage of lands where turf and landscape nutrient management plans are required; and
    (b) The acreage of lands upon which turf and landscape nutrient management plans have been implemented.
  - A summary report on the required training, including a list of training events, the training date, the number of employees attending training and the objective of the training.

APPENDIX A

VIRGINIA VSMP PERMIT NO. VAR04
GENERAL PERMIT FOR DISCHARGES OF STORMWATER FROM SMALL MS4s

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9VAC25-890-40. General permit.

Any operator whose registration statement is accepted by the department will receive coverage under the following state permit and shall comply with the requirements therein and be subject to all applicable requirements of the Virginia Stormwater Management Act (Article 2.3 (§ 62.1-44.15:24 et seq.) of Chapter 3.1 of Title 62.1 of the Code of Virginia) and the Virginia Stormwater Management Program (VSMP) Regulations (9VAC25-870).

General Permit No.: VAR04

Effective Date: July 1, 2013

Expiration Date: June 30, 2018

GENERAL VPDES PERMIT FOR DISCHARGES OF STORMWATER FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS

AUTHORIZATION TO DISCHARGE UNDER THE VIRGINIA STORMWATER MANAGEMENT PROGRAM AND THE VIRGINIA STORMWATER MANAGEMENT ACT

In compliance with the provisions of the Clean Water Act, as amended and pursuant to the Virginia Stormwater Management Act and regulations adopted pursuant thereto, this state permit authorizes operators of small municipal separate storm sewer systems to discharge to surface waters within the boundaries of the Commonwealth of Virginia, except those waters specifically named in State Water Control Board regulations which prohibit such discharges.

The authorized discharge shall be in accordance with this cover page, Section I—Discharge Authorization and Special Conditions, Section II—MS4 Program and Section III—Conditions Applicable To All State Permits, as set forth herein. The operator shall utilize all legal authority provided by the laws and regulations of the Commonwealth of Virginia to control discharges to and from the MS4. This legal authority may be a combination of statute, ordinance, permit, specific contract language, order or interjurisdictional agreements.

For operators of small MS4s that are applying for initial coverage under this general permit, the schedule to develop and implement the MS4 Program Plan shall be submitted with the completed registration statement.

For operators that have previously held MS4 state permit coverage, the operator shall update the MS4 Program Plan in accordance with the following schedule. Until such time as the required updates are completed and implemented, the operator shall continue to implement the MS4 Program consistent with the MS4 Program Plan submitted with the registration statement.

Table 1: Schedule of MS4 Program Plan Updates Required in this Permit

Program Update Requirement	Permit Reference	Update Completed By
Public Education Outreach Plan (Minimum Control Measure 1 – Public Education and Outreach on Stormwater Impacts)	Section II B 1	
Illicit Discharge Procedures - (Minimum Control Measure 3 – Illicit Discharge Detection and Elimination)	Section II B 3	
Individual Residential Lot Special Criteria (Minimum Control Measure 5 – Post-Construction Stormwater	Section II B 5 c (1) (d)	

Management in New Development and Development on Prior Developed Lands)		12 months after permit coverage
Operator-Owned Stormwater Management Inspection Procedures (Minimum Control Measure 5 – Post-Construction Stormwater Management in New Development and Development on Prior Developed Lands)	Section II B 5	
Identification of Locations Requiring SWPPPs (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 b	
Nutrient Management Plan (NMP) Locations - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 c (1) (a)	
Training Schedule and Program - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6	
Updated TMDL Action Plans (TMDLs approved before July of 2008) – (Special Conditions for Approved Total Maximum Daily Loads (TMDL) Other Than Chesapeake Bay)	Section I B	24 months after permit coverage
Chesapeake Bay TMDL Action Plan – (Special Condition for Chesapeake Bay TMDL)	Section I C	
Stormwater Management Progressive Compliance and Enforcement – (Minimum Control Measure 4 - Construction Site Stormwater Runoff Control)	Section II B 5	
Daily Good Housekeeping Procedures (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 a	
Other TMDL Action Plans for applicable TMDLs approved between July 2008 and June 2013 - (Special Conditions for Approved Total Maximum Daily Loads (TMDL) Other Than Chesapeake Bay)	Section I B	36 months after permit coverage
Outfall Map Completed - (Minimum Control Measure 3 – Illicit Discharge Detection and Elimination) – Applicable to new boundaries identified as "urbanized" areas in the 2010 Decennial Census	Section II B 3 a (3)	48 months after permit coverage
SWPPP Implementation - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 b (3)	
NMP Implementation - (Minimum Control Measure 6 – Pollution Prevention/Good Housekeeping for Municipal Operations)	Section II B 6 c (1) (b)	60 months after permit coverage
*Updates should be submitted with the appropriate annual report.		

SECTION I

DISCHARGE AUTHORIZATION AND SPECIAL CONDITIONS

A. Coverage under this state permit. During the period beginning with the date of coverage under this general permit and lasting until the expiration and reissuance of this state permit, the operator is authorized to discharge in accordance with this state permit from the small municipal separate storm sewer system identified in the registration statement into surface waters within the boundaries of the Commonwealth of Virginia and consistent with 9VAC25-890-30.

B. Special conditions for approved total maximum daily loads (TMDL) other than the Chesapeake Bay TMDL. An approved TMDL may allocate an applicable wasteload to a small MS4 that identifies a pollutant or pollutants for which additional stormwater controls are necessary for the surface waters to meet water quality standards. The MS4 operator shall address the pollutants in accordance with this special condition where the MS4 has been allocated a wasteload in an approved TMDL.

1. The operator shall maintain an updated MS4 Program Plan that includes a specific TMDL Action Plan for pollutants allocated to the MS4 in approved TMDLs. TMDL Action Plans may be implemented in multiple phases over more than one state permit cycle using the adaptive iterative approach provided adequate progress to reduce the pollutant discharge in a manner consistent with the assumptions and requirements of the specific TMDL wasteload is demonstrated in accordance with subdivision 2 e of this subsection. These TMDL Actions Plans shall identify the best management practices and other interim milestone activities to be implemented during the remaining terms of this state permit.

a. In accordance with Table 1, the operator shall update the MS4 Program Plans to address any new or modified requirements established under this special condition for pollutants identified in TMDL wasteload allocations approved prior to July 9, 2008.

b. In accordance with Table 1, the operator shall update the MS4 Program Plan to incorporate approvable TMDL Action Plans that identify the best management practices and other interim milestone activities that will be implemented during the remaining term of this permit for pollutants identified in TMDL wasteload allocations approved either on or after July 9, 2008, and prior to issuance of this permit.

c. Unless specifically denied in writing by the department, TMDL Action Plans and updates developed in accordance with this section become effective and enforceable 90 days after the date received by the department.

2. The operator shall:

a. Develop and maintain a list of its legal authorities such as ordinances, state and other permits, orders, specific contract language, and interjurisdictional agreements applicable to reducing the pollutant identified in each applicable WLA;

b. Identify and maintain an updated list of all additional management practices, control techniques and system design and engineering methods, beyond those identified in Section II B, that have been implemented as part of the MS4 Program Plan that are applicable to reducing the pollutant identified in the WLA;

c. Enhance its public education and outreach and employee training programs to also promote methods to eliminate and reduce discharges of the pollutants identified in the WLA;

d. Assess all significant sources of pollutant(s) from facilities of concern owned or operated by the MS4 operator that are not covered under a separate VPDES permit and identify all municipal facilities that may be a significant source of the identified pollutant. For the purposes of this assessment, a significant source of pollutant(s) from a facility of concern means a discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL. (For example, a significant source of pollutant from a facility of concern for a bacteria TMDL would be expected to be greater at a dog park than at other recreational facilities where dogs are prohibited);

e. Develop and implement a method to assess TMDL Action Plans for their effectiveness in reducing the pollutants identified in the WLAs. The evaluation shall use any newly available information, representative and adequate water quality monitoring results, or modeling tools to estimate pollutant reductions for the pollutant or pollutants of concern from implementation of the MS4 Program Plan. Monitoring may include BMP, outfall, or in-stream monitoring, as appropriate, to estimate pollutant reductions. The operator may conduct monitoring, utilize existing data, establish partnerships, or collaborate with other MS4 operators or other third parties, as appropriate. This evaluation shall include assessment of the facilities identified in subdivision 2 d of this subsection. The methodology used for assessment shall be described in the TMDL Action Plan.

3. Analytical methods for any monitoring shall be conducted according to procedures approved under 40 CFR Part 136 or alternative methods approved by the Environmental Protection Agency (EPA). Where an approved method does not exist, the operator must use a method consistent with the TMDL.

4. The operator is encouraged to participate as a stakeholder in the development of any TMDL implementation plans applicable to their discharge. The operator may incorporate applicable best management practices identified in the TMDL implementation plan in the MS4 Program Plan or may choose to implement BMPs of equivalent design and efficiency provided that the rationale for any substituted BMP is provided and the substituted BMP is consistent with the assumptions and requirements of the TMDL WLA.

5. Annual reporting requirements.

a. The operator shall submit the required TMDL Action Plans with the appropriate annual report and in accordance with the associated schedule identified in this state permit.

b. On an annual basis, the operator shall report on the implementation of the TMDL Action Plans and associated evaluation including the results of any monitoring conducted as part of the evaluation.

6. The operator shall identify the best management practices and other steps that will be implemented during the next state permit term as part of the operator's reapplication for coverage as required under Section III M.

7. For planning purposes, the operator shall include an estimated end date for achieving the applicable wasteload allocations as part of its reapplication package due in accordance with Section III M.

C. Special condition for the Chesapeake Bay TMDL. The Commonwealth in its Phase I and Phase II Chesapeake Bay TMDL Watershed Implementation Plans (WIP) committed to a phased approach for MS4s, affording MS4 operators up to three full five-year permit cycles to implement necessary reductions. This permit is consistent with the Chesapeake Bay TMDL and the Virginia Phase I and II WIPs to meet the Level 2 (L2) scoping run for existing developed lands as it

represents an implementation of 5.0% of L2 as specified in the 2010 Phase I WIP. Conditions of future permits will be consistent with the TMDL or WIP conditions in place at the time of permit issuance.

1. Definitions. The following definitions apply to this state permit for the purpose of the special condition for discharges in the Chesapeake Bay Watershed:

"Existing sources" means pervious and impervious urban land uses served by the MS4 as of June 30, 2009.

"New sources" means pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009.

"Pollutants of concern" or "POC" means total nitrogen, total phosphorus, and total suspended solids.

"Transitional sources" means regulated land disturbing activities that are temporary in nature and discharge through the MS4.

2. Chesapeake Bay TMDL planning.

a. In accordance with Table 1, the operator shall develop and submit to the department for its review and acceptance an approvable Chesapeake Bay TMDL Action Plan. Unless specifically denied in writing by the department, this plan becomes effective and enforceable 90 days after the date received by the department. The plan shall include:

(1) A review of the current MS4 program implemented as a requirement of this state permit including a review of the existing legal authorities and the operator's ability to ensure compliance with this special condition;

(2) The identification of any new or modified legal authorities such as ordinances, state and other permits, orders, specific contract language, and interjurisdictional agreements implemented or needing to be implemented to meet the requirements of this special condition;

(3) The means and methods that will be utilized to address discharges into the MS4 from new sources;

(4) An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009, based on the 2009 progress run. The operator shall utilize the applicable versions of Tables 2 a-d in this section based on the river basin to which the MS4 discharges by multiplying the total existing acres served by the MS4 on June 30, 2009, and the 2009 Edge of Stream (EOS) loading rate:

Table 2 a: Calculation Sheet for Estimating Existing Source Loads for the James River Basin
***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen		9.39	
Regulated Urban Pervious			6.99	

Regulated Urban Impervious	Phosphorus		1.76	
Regulated Urban Pervious			0.5	
Regulated Urban Impervious	Total Suspended Solids		676.94	
Regulated Urban Pervious			101.08	

Table 2 b: Calculation Sheet for Estimating Existing Source Loads for the Potomac River Basin

***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen		16.86	
Regulated Urban Pervious			10.07	
Regulated Urban Impervious	Phosphorus		1.62	
Regulated Urban Pervious			0.41	
Regulated Urban Impervious	Total Suspended Solids		1,171.32	
Regulated Urban Pervious			175.8	

Table 2 c: Calculation Sheet for Estimating Existing Source Loads for the Rappahannock River Basin

***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen		9.38	
Regulated Urban Pervious			5.34	

Regulated Urban Impervious	Phosphorus		1.41	
Regulated Urban Pervious			0.38	
Regulated Urban Impervious	Total Suspended Solids		423.97	
Regulated Urban Pervious			56.01	

Table 2 d: Calculation Sheet for Estimating Existing Source Loads for the York River Basin

***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	2009 EOS Loading Rate (lbs/acre)	Estimated Total POC Load Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen		7.31	
Regulated Urban Pervious			7.65	
Regulated Urban Impervious	Phosphorus		1.51	
Regulated Urban Pervious			0.51	
Regulated Urban Impervious	Total Suspended Solids		456.68	
Regulated Urban Pervious			72.78	

(5) A determination of the total pollutant load reductions necessary to reduce the annual POC loads from existing sources utilizing the applicable versions of Tables 3 a-d in this section based on the river basin to which the MS4 discharges. This shall be calculated by multiplying the total existing acres served by the MS4 by the first permit cycle required reduction in loading rate. For the purposes of this determination, the operator shall utilize those existing acres identified by the 2000 U.S. Census Bureau urbanized area and served by the MS4.

Table 3 a: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the James River Basin

***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre)	Total Reduction Required First Permit Cycle (lbs)

Regulated Urban Impervious	Nitrogen		0.04	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		6.67	
Regulated Urban Pervious			0.44	

Table 3 b: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the Potomac River Basin

***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre)	Total Reduction Required First Permit Cycle (lbs)
Regulated Urban Impervious	Nitrogen		0.08	
Regulated Urban Pervious			0.03	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.001	
Regulated Urban Impervious	Total Suspended Solids		11.71	
Regulated Urban Pervious			0.77	

Table 3 c: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the Rappahannock River Basin

***Based on Chesapeake Bay Program Watershed Model Phase 5.3.2**

Subsource	Pollutant	Total Existing Acres Served by MS4 (6/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre)	Total Reduction Required First Permit Cycle (lbs)
Regulated Urban Impervious			0.04	

Regulated Urban Pervious	Nitrogen		0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		4.24	
Regulated Urban Pervious			0.25	

Table 3 d: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the York River Basin *Based on Chesapeake Bay Program Watershed Model Phase 5.3.2				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (6/30/09)**	**First Permit Cycle Required Reduction in Loading Rate (lbs/acre)**	**Total Reduction Required First Permit Cycle (lbs)**
Regulated Urban Impervious	Nitrogen		0.03	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		4.60	
Regulated Urban Pervious			0.32	

(6) The means and methods, such as management practices and retrofit programs that will be utilized to meet the required reductions included in subdivision 2 a (5) of this subsection, and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting those reductions;

(7) The means and methods to offset the increased loads from new sources initiating construction between July 1, 2009, and June 30, 2014, that disturb one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. The operator shall utilize Table 4 to develop the equivalent pollutant load for nitrogen and total suspended solids. The operator shall offset 5.0% of the calculated increased load from these new sources during the permit cycle.

(8) The means and methods to offset the increased loads from projects as grandfathered in accordance with 9VAC25-870-48, that disturb one acre or greater that begin construction after July 1, 2014, where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities. The operator shall utilize Table 4 to develop the equivalent pollutant load for nitrogen and total suspended solids.

(9) The operator shall address any modification to the TMDL or watershed implementation plan that occurs during the term of this state permit as part of its permit reapplication and not during the term of this state permit.

Table 4: Ratio of Phosphorus Loading Rate to Nitrogen and Total Suspended Solids Loading Rates for Chesapeake Bay Basins

Ratio of Phosphorus to Other POCs (Based on All Land Uses 2009 Progress Run)	Phosphorus Loading Rate (lbs/acre)	Nitrogen Loading Rate (lbs/acre)	Total Suspended Solids Loading Rate (lbs/acre)
James River Basin	1.0	5.2	420.9
Potomac River Basin	1.0	6.9	469.2
Rappahannock River Basin	1.0	6.7	320.9
York River Basin	1.0	9.5	531.6

(10) A list of future projects and associated acreage that qualify as grandfathered in accordance with 9VAC25-870-48;

(11) An estimate of the expected costs to implement the requirements of this special condition during the state permit cycle; and

(12) An opportunity for receipt and consideration of public comment regarding the draft Chesapeake Bay TMDL Action Plan.

b. As part of development of the Chesapeake Bay TMDL Action Plan, the operator may consider:

(1) Implementation of BMPs on unregulated lands provided any necessary baseline reduction is not included toward meeting the required reduction in this permit;

(2) Utilization of stream restoration projects, provided that the credit applied to the required POC load reduction is prorated based on the ratio of regulated urban acres to total drainage acres upstream of the restored area;

(3) Establishment of a memorandum of understanding (MOU) with other MS4 operators that discharge to the same or adjacent eight digit hydrologic unit within the same basin to implement BMPs collectively. The MOU shall include a mechanism for dividing the POC reductions created by BMP implementation between the cooperative MS4s;

(4) Utilization of any pollutant trading or offset program in accordance with §§ 62.1-44.19:20 through 62.1-44.19:23 of the Code of Virginia, governing trading and offsetting;

(5) A more stringent average land cover condition based on less than 16% impervious cover for new sources

initiating construction between July 1, 2009, and June 30, 2014, and all grandfathered projects where allowed by law; and

(6) Any BMPs installed after June 30, 2009, as part of a retrofit program may be applied towards meeting the required load reductions provided any necessary baseline reductions are not included.

3. Chesapeake Bay TMDL Action Plan implementation. The operator shall implement the TMDL Action Plan according to the schedule therein. Compliance with this requirement represents adequate progress for this state permit term towards achieving TMDL wasteload allocations consistent with the assumptions and requirements of the TMDL. For the purposes of this permit, the implementation of the following represents implementation to the maximum extent practicable and demonstrates adequate progress:

a. Implementation of nutrient management plans in accordance with the schedule identified in the minimum control measure in Section II related to pollution prevention/good housekeeping for municipal operations;

b. Implementation of the minimum control measure in Section II related to construction site stormwater runoff control in accordance with this state permit shall address discharges from transitional sources;

c. Implementation of the means and methods to address discharges from new sources in accordance with the minimum control measure in Section II related to post-construction stormwater management in new development and development of prior developed lands and in order to offset 5.0% of the total increase in POC loads between July 1, 2009, and June 30, 2014. Increases in the POC load from grandfathered projects initiating construction after July 1, 2014, must be offset prior to completion of the project; and

d. Implementation of means and methods sufficient to meet the required reductions of POC loads from existing sources in accordance with the Chesapeake Bay TMDL Action Plan.

4. Annual reporting requirements.

a. In accordance with Table 1, the operator shall submit the Chesapeake Bay Action Plan with the appropriate annual report.

b. Each subsequent annual report shall include a list of control measures implemented during the reporting period and the cumulative progress toward meeting the compliance targets for nitrogen, phosphorus, and total suspended solids.

c. Each subsequent annual report shall include a list of control measures, in an electronic format provided by the department, that were implemented during the reporting cycle and the estimated reduction achieved by the control. For stormwater management controls, the report shall include the information required in Section II B 5 e and shall include whether an existing stormwater management control was retrofitted, and if so, the existing stormwater management control type retrofit used.

d. Each annual report shall include a list of control measures that are expected to be implemented during the next reporting period and the expected progress toward meeting the compliance targets for nitrogen, phosphorus, and total suspended solids.

5. The operator shall include the following as part of its reapplication package due in accordance with Section III M:

a. Documentation that sufficient control measures have been implemented to meet the compliance target identified in this special condition. If temporary credits or offsets have been purchased in order to meet the compliance target, the list of temporary reductions utilized to meet the required reduction in this state permit and a schedule of implementation to ensure the permanent reduction must be provided; and

b. A draft second phase Chesapeake Bay TMDL Action Plan designed to reduce the existing pollutant load as follows:

(1) The existing pollutant of concern loads by an additional seven times the required reductions in loading rates using the applicable Table 3 for sources included in the 2000 U.S. Census Bureau urbanized areas;

(2) The existing pollutant of concerns loads by an additional eight times the required reductions in loading rates using the applicable Table 3 for expanded sources identified in the U.S. Census Bureau 2010 urbanized areas;

(3) An additional 35% reduction in new sources developed between 2009 and 2014 and for which the land use cover condition was greater than 16%; and

(4) Accounts for any modifications to the applicable loading rate provided to the operator as a result of TMDL modification.

SECTION II

MUNICIPAL SEPARATE STORM SEWER SYSTEM MANAGEMENT PROGRAM

A. The operator of a small MS4 must develop, implement, and enforce a MS4 Program designed to reduce the discharge of pollutants from the small MS4 to the maximum extent practicable (MEP), to protect water quality, to ensure compliance by the operator with water quality standards, and to satisfy the appropriate water quality requirements of the Clean Water Act and its attendant regulations. The MS4 Program must include the minimum control measures described in paragraph B of this section. Implementation of best management practices consistent with the provisions of an iterative MS4 Program required pursuant to this section constitutes compliance with the standard of reducing pollutants to the "maximum extent practicable," protects water quality in the absence of a TMDL wasteload allocation, ensures compliance by the operator with water quality standards, and satisfies the appropriate water quality requirements of the Clean Water Act and regulations in the absence of a TMDL WLA. The requirements of this section and those special conditions set out in Section I B also apply where a WLA is applicable.

B. Minimum control measures.

NOTE regarding minimum control measures for public education and outreach on stormwater impacts and public involvement/participation: "Public" is not defined in this permit. However, the department concurs with the following EPA statement, which was published in the Federal Register, Volume 64, No. 235, page 68,750 on December 8, 1999, regarding "public" and its applicability to MS4 programs: "EPA acknowledges that federal and state facilities are different from municipalities. EPA believes, however, that the minimum measures are flexible enough that they can be implemented by these facilities. As an example, DOD commentators asked about how to interpret the term "public" for military installations when implementing the public education measure. EPA agrees with the suggested interpretation of "public" for DOD facilities as "the resident and employee population within the fence line of the facility." The department recommends that nontraditional MS4 operators, such as state and federal entities and local school districts, utilize this statement as guidance

when determining their applicable "public" for compliance with this permit.

1. Public education and outreach on stormwater impacts.

a. The operator shall continue to implement the public education and outreach program as included in the registration statement until the program is updated to meet the conditions of this state permit. Operators who have not previously held MS4 permit coverage shall implement this program in accordance with the schedule provided with the completed registration statement.

b. The public education and outreach program should be designed with consideration of the following goals:

(1) Increasing target audience knowledge about the steps that can be taken to reduce stormwater pollution, placing priority on reducing impacts to impaired waters and other local water pollution concerns;

(2) Increasing target audience knowledge of hazards associated with illegal discharges and improper disposal of waste, including pertinent legal implications; and

(3) Implementing a diverse program with strategies that are targeted towards audiences most likely to have significant stormwater impacts.

c. The updated program shall be designed to:

(1) Identify, at a minimum, three high-priority water quality issues, that contribute to the discharge of stormwater (e.g., Chesapeake Bay nutrients, pet wastes and local bacteria TMDLs, high-quality receiving waters, and illicit discharges from commercial sites) and a rationale for the selection of the three high-priority water quality issues;

(2) Identify and estimate the population size of the target audience or audiences who is most likely to have significant impacts for each high-priority water quality issue;

(3) Develop relevant message or messages and associated educational and outreach materials (e.g., various media such as printed materials, billboard and mass transit advertisements, signage at select locations, radio advertisements, television advertisements, websites, and social media) for message distribution to the selected target audiences while considering the viewpoints and concerns of the target audiences including minorities, disadvantaged audiences, and minors;

(4) Provide for public participation during public education and outreach program development;

(5) Annually conduct sufficient education and outreach activities designed to reach an equivalent 20% of each high-priority issue target audience. It shall not be considered noncompliance for failure to reach 20% of the target audience. However, it shall be a compliance issue if insufficient effort is made to annually reach a minimum of 20% of the target audience; and

(6) Provide for the adjustment of target audiences and messages including educational materials and delivery mechanisms to reach target audiences in order to address any observed weaknesses or shortcomings.

d. The operator may coordinate their public education and outreach efforts with other MS4 operators; however, each operator shall be individually responsible for meeting all of its state permit requirements.

e. Prior to application for continued state permit coverage required in Section III M, the operator shall evaluate the education and outreach program for:

(1) Appropriateness of the high-priority stormwater issues;

(2) Appropriateness of the selected target audiences for each high-priority stormwater issue;

(3) Effectiveness of the message or messages being delivered; and

(4) Effectiveness of the mechanism or mechanisms of delivery employed in reaching the target audiences.

f. The MS4 Program Plan shall describe how the conditions of this permit shall be updated in accordance with Table 1.

g. The operator shall include the following information in each annual report submitted to the department during this permit term:

(1) A list of the education and outreach activities conducted during the reporting period for each high-priority water quality issue, the estimated number of people reached, and an estimated percentage of the target audience or audiences that will be reached; and

(2) A list of the education and outreach activities that will be conducted during the next reporting period for each high-priority water quality issue, the estimated number of people that will be reached, and an estimated percentage of the target audience or audiences that will be reached.

2. Public involvement/participation.

a. Public involvement.

(1) The operator shall comply with any applicable federal, state, and local public notice requirements.

(2) The operator shall:

(a) Maintain an updated MS4 Program Plan. Any required updates to the MS4 Program Plan shall be completed at a minimum of once a year and shall be updated in conjunction with the annual report. The operator shall post copies of each MS4 program plan on its webpage at a minimum of once a year and within 30 days of submittal of the annual report to the department.

(b) Post copies of each annual report on the operator's web page within 30 days of submittal to the department and retain copies of annual reports online for the duration of this state permit; and

(c) Prior to applying for coverage as required by Section III M, notify the public and provide for receipt of comment of the proposed MS4 Program Plan that will be submitted with the registration statement. As part of the reapplication, the operator shall address how it considered the comments received in the development of its MS4 Program Plan. The operator shall give public notice by a method reasonably calculated to give actual notice of the action in question to the persons potentially affected by it, including press releases or any other forum or medium to solicit public participation.

b. Public participation. The operator shall participate, through promotion, sponsorship, or other involvement, in a minimum of four local activities annually (e.g., stream cleanups; hazardous waste cleanup days; and meetings with watershed associations, environmental advisory committees, and other environmental organizations that operate within proximity to the operator's small MS4). The activities shall be aimed at increasing public participation to reduce stormwater pollutant loads; improve water quality; and support local restoration and clean-

up projects, programs, groups, meetings, or other opportunities for public involvement.

c. The MS4 Program Plan shall include written procedures for implementing this program.

d. Each annual report shall include:

(1) A web link to the MS4 Program Plan and annual report; and

(2) Documentation of compliance with the public participation requirements of this section.

3. Illicit discharge detection and elimination.

a. The operator shall maintain an accurate storm sewer system map and information table and shall update it in accordance with the schedule set out in Table 1.

(1) The storm sewer system map must show the following, at a minimum:

(a) The location of all MS4 outfalls. In cases where the outfall is located outside of the MS4 operator's legal responsibility, the operator may elect to map the known point of discharge location closest to the actual outfall. Each mapped outfall must be given a unique identifier, which must be noted on the map; and

(b) The name and location of all waters receiving discharges from the MS4 outfalls and the associated HUC.

(2) The associated information table shall include for each outfall the following:

(a) The unique identifier;

(b) The estimated MS4 acreage served;

(c) The name of the receiving surface water and indication as to whether the receiving water is listed as impaired in the Virginia 2010 303(d)/305(b) Water Quality Assessment Integrated Report; and

(d) The name of any applicable TMDL or TMDLs.

(3) Within 48 months of coverage under this state permit, the operator shall have a complete and updated storm sewer system map and information table that includes all MS4 outfalls located within the boundaries identified as "urbanized" areas in the 2010 Decennial Census and shall submit the updated information table as an appendix to the annual report.

(4) The operator shall maintain a copy of the current storm sewer system map and outfall information table for review upon request by the public or by the department.

(5) The operator shall continue to identify other points of discharge. The operator shall notify in writing the downstream MS4 of any known physical interconnection.

b. The operator shall effectively prohibit, through ordinance or other legal mechanism, nonstormwater discharges into the storm sewer system to the extent allowable under federal, state, or local law, regulation, or ordinance. Categories of nonstormwater discharges or flows (i.e., illicit discharges) identified in 9VAC25-870-400 D 2 c (3) must be addressed only if they are identified by the operator as significant contributors of pollutants to the small MS4. Flows that have been identified in writing by the department as de minimis discharges are not significant sources of pollutants to surface water and do not require a VPDES permit.

c. The operator shall develop, implement, and update, when appropriate, written procedures to detect, identify,

and address unauthorized nonstormwater discharges, including illegal dumping, to the small MS4. These procedures shall include:

(1) Written dry weather field screening methodologies to detect and eliminate illicit discharges to the MS4 that include field observations and field screening monitoring and that provide:

(a) A prioritized schedule of field screening activities determined by the operator based on such criteria as age of the infrastructure, land use, historical illegal discharges, dumping or cross connections.

(b) The minimum number of field screening activities the operator shall complete annually to be determined as follows: (i) if the total number of outfalls in the small MS4 is less than 50, all outfalls shall be screened annually or (ii) if the small MS4 has 50 or more total outfalls, a minimum of 50 outfalls shall be screened annually.

(c) Methodologies to collect the general information such as time since the last rain, the quantity of the last rain, site descriptions (e.g., conveyance type and dominant watershed land uses), estimated discharge rate (e.g., width of water surface, approximate depth of water, approximate flow velocity, and flow rate), and visual observations (e.g., order, color, clarity, floatables, deposits or stains, vegetation condition, structural condition, and biology).

(d) A time frame upon which to conduct an investigation or investigations to identify and locate the source of any observed continuous or intermittent nonstormwater discharge prioritized as follows: (i) illicit discharges suspected of being sanitary sewage or significantly contaminated must be investigated first and (ii) investigations of illicit discharges suspected of being less hazardous to human health and safety such as noncontact cooling water or wash water may be delayed until after all suspected sanitary sewage or significantly contaminated discharges have been investigated, eliminated, or identified. Discharges authorized under a separate VPDES or state permit require no further action under this permit.

(e) Methodologies to determine the source of all illicit discharges shall be conducted. If an illicit discharge is found, but within six months of the beginning of the investigation neither the source nor the same nonstormwater discharge has been identified, then the operator shall document such in accordance with Section II B 3 f. If the observed discharge is intermittent, the operator must document that a minimum of three separate investigations were made in an attempt to observe the discharge when it was flowing. If these attempts are unsuccessful, the operator shall document such in accordance with Section II B 3 f.

(f) Mechanisms to eliminate identified sources of illicit discharges including a description of the policies and procedures for when and how to use legal authorities.

(g) Methods for conducting a follow-up investigation in order to verify that the discharge has been eliminated.

(h) A mechanism to track all investigations to document: (i) the date or dates that the illicit discharge was observed and reported; (ii) the results of the investigation; (iii) any follow-up to the investigation; (iv) resolution of the investigation; and (v) the date that the investigation was closed.

d. The operator shall promote, publicize, and facilitate public reporting of illicit discharges into or from MS4s. The operator shall conduct inspections in response to complaints and follow-up inspections as needed to ensure that corrective measures have been implemented by the responsible party.

e. The MS4 Program Plan shall include all procedures developed by the operator to detect, identify, and address nonstormwater discharges to the MS4 in accordance with the schedule in Table 1. In the interim, the operator shall continue to implement the program as included as part of the registration statement until the program is updated to meet the conditions of this permit. Operators, who have not previously held MS4 permit coverage, shall implement this program in accordance with the schedule provided with the completed registration statement.

f. Annual reporting requirements. Each annual report shall include:

(1) A list of any written notifications of physical interconnection given by the operator to other MS4s;

(2) The total number of outfalls screened during the reporting period, the screening results, and detail of any follow-up actions necessitated by the screening results; and

(3) A summary of each investigation conducted by the operator of any suspected illicit discharge. The summary must include: (i) the date that the suspected discharge was observed, reported, or both; (ii) how the investigation was resolved, including any follow-up, and (iii) resolution of the investigation and the date the investigation was closed.

4. Construction site stormwater runoff control.

a. Applicable oversight requirements. The operator shall utilize its legal authority, such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements, to address discharges entering the MS4 from the following land-disturbing activities:

(1) Land-disturbing activities as defined in § 62.1-44.15:51 of the Code of Virginia that result in the disturbance of 10,000 square feet or greater;

(2) Land-disturbing activities in jurisdictions in Tidewater Virginia, as defined in § 62.1-44.15:68 of the Code of Virginia, that disturb 2,500 square feet or greater and are located in areas designated as Resource Protection Areas (RPA), Resource Management Areas (RMA) or Intensely Developed Acres (IDA), pursuant to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act;

(3) Land-disturbing activities disturbing less than the minimum land disturbance identified in subdivision (1) or (2) above for which a local ordinance requires that an erosion and sediment control plan be developed; and

(4) Land-disturbing activities on individual residential lots or sections of residential developments being developed by different property owners and where the total land disturbance of the residential development is 10,000 square feet or greater. The operator may utilize an agreement in lieu of a plan as provided in § 62.1-44.15:55 of the Code of Virginia for this category of land disturbances.

b. Required plan approval prior to commencement of the land disturbing activity. The operator shall require that land disturbance not begin until an erosion and sediment control plan or an agreement in lieu of a plan as provided in § 62.1-44.15:55 is approved by a VESCP authority in accordance with the Erosion and Sediment Control Law (§ 62.1-44.15:51 et seq. of the Code of Virginia). The plan shall be:

(1) Compliant with the minimum standards identified in 9VAC25-840-40 of the Erosion and Sediment Control

Regulations; or

(2) Compliant with department-approved annual standards and specifications. Where applicable, the plan shall be consistent with any additional or more stringent, or both, erosion and sediment control requirements established by state regulation or local ordinance.

c. Compliance and enforcement.

(1) The operator shall inspect land-disturbing activities for compliance with an approved erosion and sediment control plan or agreement in lieu of a plan in accordance with the minimum standards identified in 9VAC25-840-40 or with department-approved annual standards and specifications.

(2) The operator shall implement an inspection schedule for land-disturbing activities identified in Section II B 4 a as follows:

(a) Upon initial installation of erosion and sediment controls;

(b) At least once during every two-week period;

(c) Within 48 hours of any runoff-producing storm event; and

(d) Upon completion of the project and prior to the release of any applicable performance bonds.

Where an operator establishes an alternative inspection program as provided for in 9VAC25-840-60 B 2, the written schedule shall be implemented in lieu of Section II B 4 c (2) and the written plan shall be included in the MS4 Program Plan.

(3) Operator inspections shall be conducted by personnel who hold a certificate of competence in accordance with 9VAC25-850-40. Documentation of certification shall be made available upon request by the VESCP authority or other regulatory agency.

(4) The operator shall promote to the public a mechanism for receipt of complaints regarding regulated land-disturbing activities and shall follow up on any complaints regarding potential water quality and compliance issues.

(5) The operator shall utilize its legal authority to require compliance with the approved plan where an inspection finds that the approved plan is not being properly implemented.

(6) The operator shall utilize, as appropriate, its legal authority to require changes to an approved plan when an inspection finds that the approved plan is inadequate to effectively control soil erosion, sediment deposition, and runoff to prevent the unreasonable degradation of properties, stream channels, waters, and other natural resources.

(7) The operator shall require implementation of appropriate controls to prevent nonstormwater discharges to the MS4, such as wastewater, concrete washout, fuels and oils, and other illicit discharges identified during land-disturbing activity inspections of the MS4. The discharge of nonstormwater discharges other than those identified in 9VAC25-890-20 through the MS4 is not authorized by this state permit.

(8) The operator may develop and implement a progressive compliance and enforcement strategy provided that such strategy is included in the MS4 Program Plan and is consistent with 9VAC25-840.

d. Regulatory coordination. The operator shall implement enforceable procedures to require that large construction activities as defined in 9VAC25-870-10 and small construction activities as defined in 9VAC25-870-10, including municipal construction activities, secure necessary state permit authorizations from the department to discharge stormwater.

e. MS4 Program requirements. The operator's MS4 Program Plan shall include:

(1) A description of the legal authorities utilized to ensure compliance with the minimum control measure in Section II related to construction site stormwater runoff control such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements;

(2) Written plan review procedures and all associated documents utilized in plan review;

(3) For the MS4 operators who obtain department-approved standards and specifications, a copy of the current standards and specifications;

(4) Written inspection procedures and all associated documents utilized during inspection including the inspection schedule;

(5) Written procedures for compliance and enforcement, including a progressive compliance and enforcement strategy, where appropriate; and

(6) The roles and responsibilities of each of the operator's departments, divisions, or subdivisions in implementing the minimum control measure in Section II related to construction site stormwater runoff control. If the operator utilizes another entity to implement portions of the MS4 Program Plan, a copy of the written agreement must be retained in the MS4 Program Plan. The description of each party's roles and responsibilities, including any written agreements with third parties, shall be updated as necessary.

Reference may be made to any listed requirements in this subdivision provided the location of where the reference material can be found is included and the reference material is made available to the public upon request.

f. Reporting requirements. The operator shall track regulated land-disturbing activities and submit the following information in all annual reports:

(1) Total number of regulated land-disturbing activities;

(2) Total number of acres disturbed;

(3) Total number of inspections conducted; and

(4) A summary of the enforcement actions taken, including the total number and type of enforcement actions taken during the reporting period.

5. Post-construction stormwater management in new development and development on prior developed lands.

a. Applicable oversight requirements. The operator shall address post-construction stormwater runoff that enters the MS4 from the following land-disturbing activities:

(1) New development and development on prior developed lands that are defined as large construction activities or small construction activities in 9VAC25-870-10;

(2) New development and development on prior developed lands that disturb greater than or equal to 2,500 square feet, but less than one acre, located in a Chesapeake Bay Preservation Area designated by a local government located in Tidewater, Virginia, as defined in § 62.1-44.15:68 of the Code of Virginia; and

(3) New development and development on prior developed lands where an applicable state regulation or local ordinance has designated a more stringent regulatory size threshold than that identified in subdivision (1) or (2) above.

b. Required design criteria for stormwater runoff controls. The operator shall utilize legal authority, such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements, to require that activities identified in Section II B 5 a address stormwater runoff in such a manner that stormwater runoff controls are designed and installed:

(1) In accordance with the appropriate water quality and water quantity design criteria as required in Part II (9VAC25-870-40 et seq.) of 9VAC25-870;

(2) In accordance with any additional applicable state or local design criteria required at project initiation; and

(3) Where applicable, in accordance with any department-approved annual standards and specifications.

Upon board approval of a Virginia Stormwater Management Program authority (VSMP Authority) as defined in § 62.1-44.15:24 of the Code of Virginia and reissuance of the Virginia Stormwater Management Program (VSMP) General Permit for Discharges of Stormwater from Construction Activities, the operator shall require that stormwater management plans are approved by the appropriate VSMP Authority prior to land disturbance. In accordance with § 62.1-44.15:27 M of the Code of Virginia, VSMPs shall become effective July 1, 2014, unless otherwise specified by state law or by the board.

c. Inspection, operation, and maintenance verification of stormwater management facilities.

(1) For stormwater management facilities not owned by the MS4 operator, the following conditions apply:

(a) The operator shall require adequate long-term operation and maintenance by the owner of the stormwater management facility by requiring the owner to develop a recorded inspection schedule and maintenance agreement to the extent allowable under state or local law or other legal mechanism;

(b) The operator or his designee shall implement a schedule designed to inspect all privately owned stormwater management facilities that discharge into the MS4 at least once every five years to document that maintenance is being conducted in such a manner to ensure long-term operation in accordance with the approved designs.

(c) The operator shall utilize its legal authority for enforcement of maintenance responsibilities if maintenance is neglected by the owner. The operator may develop and implement a progressive compliance and enforcement strategy provided that the strategy is included in the MS4 Program Plan.

(d) Beginning with the issuance of this state permit, the operator may utilize strategies other than maintenance agreements such as periodic inspections, homeowner outreach and education, and other methods targeted at promoting the long-term maintenance of stormwater control measures that are designed to treat stormwater runoff solely from the individual residential lot. Within 12 months of coverage under this permit, the operator shall

develop and implement these alternative strategies and include them in the MS4 Program Plan.

(2) For stormwater management facilities owned by the MS4 operator, the following conditions apply:

(a) The operator shall provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan.

(b) The operator shall inspect these stormwater management facilities annually. The operator may choose to implement an alternative schedule to inspect these stormwater management facilities based on facility type and expected maintenance needs provided that the alternative schedule is included in the MS4 Program Plan.

(c) The operator shall conduct maintenance on its stormwater management facilities as necessary.

d. MS4 Program Plan requirements. The operator's MS4 Program Plan shall be updated in accordance with Table 1 to include:

(1) A list of the applicable legal authorities such as ordinance, state and other permits, orders, specific contract language, and interjurisdictional agreements to ensure compliance with the minimum control measure in Section II related to post-construction stormwater management in new development and development on prior developed lands;

(2) Written policies and procedures utilized to ensure that stormwater management facilities are designed and installed in accordance with Section II B 5 b;

(3) Written inspection policies and procedures utilized in conducting inspections;

(4) Written procedures for inspection, compliance and enforcement to ensure maintenance is conducted on private stormwater facilities to ensure long-term operation in accordance with approved design;

(5) Written procedures for inspection and maintenance of operator-owned stormwater management facilities;

(6) The roles and responsibilities of each of the operator's departments, divisions, or subdivisions in implementing the minimum control measure in Section II related to post-construction stormwater management in new development and development on prior developed lands. If the operator utilizes another entity to implement portions of the MS4 Program Plan, a copy of the written agreement must be retained in the MS4 Program Plan. Roles and responsibilities shall be updated as necessary.

e. Stormwater management facility tracking and reporting requirements. The operator shall maintain an updated electronic database of all known operator-owned and privately-owned stormwater management facilities that discharge into the MS4. The database shall include the following:

(1) The stormwater management facility type;

(2) A general description of the facility's location, including the address or latitude and longitude;

(3) The acres treated by the facility, including total acres, as well as the breakdown of pervious and impervious acres;

(4) The date the facility was brought online (MM/YYYY). If the date is not known, the operator shall use June 30, 2005, as the date brought online for all previously existing stormwater management facilities;

(5) The sixth order hydrologic unit code (HUC) in which the stormwater management facility is located;

(6) The name of any impaired water segments within each HUC listed in the 2010 § 305(b)/303(d) Water Quality Assessment Integrated Report to which the stormwater management facility discharges;

(7) Whether the stormwater management facility is operator-owned or privately-owned;

(8) Whether a maintenance agreement exists if the stormwater management facility is privately owned; and

(9) The date of the operator's most recent inspection of the stormwater management facility.

In addition, the operator shall annually track and report the total number of inspections completed and, when applicable, the number of enforcement actions taken to ensure long-term maintenance.

The operator shall submit an electronic database or spreadsheet of all stormwater management facilities brought online during each reporting year with the appropriate annual report. Upon such time as the department provides the operators access to a statewide web-based reporting electronic database or spreadsheet, the operator shall utilize such database to complete the pertinent reporting requirements of this state permit.

6. Pollution prevention/good housekeeping for municipal operations.

a. Operations and maintenance activities. The MS4 Program Plan submitted with the registration statement shall be implemented by the operator until updated in accordance with this state permit. In accordance with Table 1, the operator shall develop and implement written procedures designed to minimize or prevent pollutant discharge from: (i) daily operations such as road, street, and parking lot maintenance; (ii) equipment maintenance; and (iii) the application, storage, transport, and disposal of pesticides, herbicides, and fertilizers. The written procedures shall be utilized as part of the employee training. At a minimum, the written procedures shall be designed to:

(1) Prevent illicit discharges;

(2) Ensure the proper disposal of waste materials, including landscape wastes;

(3) Prevent the discharge of municipal vehicle wash water into the MS4 without authorization under a separate VPDES permit;

(4) Prevent the discharge of wastewater into the MS4 without authorization under a separate VPDES permit;

(5) Require implementation of best management practices when discharging water pumped from utility construction and maintenance activities;

(6) Minimize the pollutants in stormwater runoff from bulk storage areas (e.g., salt storage, topsoil stockpiles) through the use of best management practices;

(7) Prevent pollutant discharge into the MS4 from leaking municipal automobiles and equipment; and

(8) Ensure that the application of materials, including fertilizers and pesticides, is conducted in accordance with the manufacturer's recommendations.

b. Municipal facility pollution prevention and good housekeeping.

(1) Within 12 months of state permit coverage, the operator shall identify all municipal high-priority facilities. These high-priority facilities shall include: (i) composting facilities, (ii) equipment storage and maintenance facilities, (iii) materials storage yards, (iv) pesticide storage facilities, (v) public works yards, (vi) recycling facilities, (vii) salt storage facilities, (viii) solid waste handling and transfer facilities, and (ix) vehicle storage and

maintenance yards.

(2) Within 12 months of state permit coverage, the operator shall identify which of the municipal high-priority facilities have a high potential of discharging pollutants. Municipal high-priority facilities that have a high potential for discharging pollutants are those facilities identified in subsection (1) above that are not covered under a separate VPDES permit and which any of the following materials or activities occur and are expected to have exposure to stormwater resulting from rain, snow, snowmelt or runoff:

(a) Areas where residuals from using, storing or cleaning machinery or equipment remain and are exposed to stormwater;

(b) Materials or residuals on the ground or in stormwater inlets from spills or leaks;

(c) Material handling equipment (except adequately maintained vehicles);

(d) Materials or products that would be expected to be mobilized in stormwater runoff during loading/unloading or transporting activities (e.g., rock, salt, fill dirt);

(e) Materials or products stored outdoors (except final products intended for outside use where exposure to stormwater does not result in the discharge of pollutants);

(f) Materials or products that would be expected to be mobilized in stormwater runoff contained in open, deteriorated or leaking storage drums, barrels, tanks, and similar containers;

(g) Waste material except waste in covered, non-leaking containers (e.g., dumpsters);

(h) Application or disposal of process wastewater (unless otherwise permitted); or

(i) Particulate matter or visible deposits of residuals from roof stacks, vents or both not otherwise regulated (i.e., under an air quality control permit) and evident in the stormwater runoff.

(3) The operator shall develop and implement specific stormwater pollution prevention plans for all high-priority facilities identified in subdivision 2 of this subsection. The operator shall complete SWPPP development and implementation shall be completed within 48 months of coverage under this state permit. Facilities covered under a separate VPDES permit shall adhere to the conditions established in that permit and are excluded from this requirement.

(4) Each SWPPP shall include:

(a) A site description that includes a site map identifying all outfalls, direction of flows, existing source controls, and receiving water bodies;

(b) A discussion and checklist of potential pollutants and pollutant sources;

(c) A discussion of all potential nonstormwater discharges;

(d) Written procedures designed to reduce and prevent pollutant discharge;

(e) A description of the applicable training as required in Section II B 6 d;

(f) Procedures to conduct an annual comprehensive site compliance evaluation;

(g) An inspection and maintenance schedule for site specific source controls. The date of each inspection and

associated findings and follow-up shall be logged in each SWPPP;

(h) The contents of each SWPPP shall be evaluated and modified as necessary to accurately reflect any discharge, release, or spill from the high priority facility reported in accordance with Section III G. For each such discharge, release, or spill, the SWPPP must include the following information: date of incident; material discharged, released, or spilled; and quantity discharged, released or spilled; and

(i) A copy of each SWPPP shall be kept at each facility and shall be kept updated and utilized as part of staff training required in Section II B 6 d.

c. Turf and landscape management.

(1) The operator shall implement turf and landscape nutrient management plans that have been developed by a certified turf and landscape nutrient management planner in accordance with § 10.1-104.2 of the Code of Virginia on all lands owned or operated by the MS4 operator where nutrients are applied to a contiguous area greater than one acre. Implementation shall be in accordance with the following schedule:

(a) Within 12 months of state permit coverage, the operator shall identify all applicable lands where nutrients are applied to a contiguous area of more than one acre. A latitude and longitude shall be provided for each such piece of land and reported in the annual report.

(b) Within 60 months of state permit coverage, the operator shall implement turf and landscape nutrient management plans on all lands where nutrients are applied to a contiguous area of more than one acre. The following measurable outcomes are established for the implementation of turf and landscape nutrient management plans: (i) within 24 months of permit coverage, not less than 15% of all identified acres will be covered by turf and landscape nutrient management plans; (ii) within 36 months of permit coverage, not less than 40% of all identified acres will be covered by turf and landscape nutrient management plans; and (iii) within 48 months of permit coverage, not less than 75% of all identified acres will be covered by turf and landscape nutrient management plans. The operator shall not fail to meet the measurable goals for two consecutive years.

(c) MS4 operators with lands regulated under § 10.1-104.4 of the Code of Virginia shall continue to implement turf and landscape nutrient management plans in accordance with this statutory requirement.

(2) Operators shall annually track the following:

(a) The total acreage of lands where turf and landscape nutrient management plans are required; and

(b) The acreage of lands upon which turf and landscape nutrient management plans have been implemented.

(3) The operator shall not apply any deicing agent containing urea or other forms of nitrogen or phosphorus to parking lots, roadways, and sidewalks, or other paved surfaces.

d. Training. The operator shall conduct training for employees. The training requirements may be fulfilled, in total or in part, through regional training programs involving two or more MS4 localities provided; however, that each operator shall remain individually liable for its failure to comply with the training requirements in this permit. Training is not required if the topic is not applicable to the operator's operations and therefore does not have applicable personnel provided the lack of applicability is documented in the MS4 Program Plan. The operator

shall determine and document the applicable employees or positions to receive each type of training. The operator shall develop an annual written training plan including a schedule of training events that ensures implementation of the training requirements as follows:

(1) The operator shall provide biennial training to applicable field personnel in the recognition and reporting of illicit discharges.

(2) The operator shall provide biennial training to applicable employees in good housekeeping and pollution prevention practices that are to be employed during road, street, and parking lot maintenance.

(3) The operator shall provide biennial training to applicable employees in good housekeeping and pollution prevention practices that are to be employed in and around maintenance and public works facilities.

(4) The operator shall ensure that employees, and require that contractors, who apply pesticides and herbicides are properly trained or certified in accordance with the Virginia Pesticide Control Act (§ 3.2-3900 et seq. of the Code of Virginia).

(5) The operator shall ensure that employees and contractors serving as plan reviewers, inspectors, program administrators, and construction site operators obtain the appropriate certifications as required under the Virginia Erosion and Sediment Control Law and its attendant regulations.

(6) The operator shall ensure that applicable employees obtain the appropriate certifications as required under the Virginia Erosion and Sediment Control Law and its attendant regulations.

(7) The operators shall provide biennial training to applicable employees in good housekeeping and pollution prevention practices that are to be employed in and around recreational facilities.

(8) The appropriate emergency response employees shall have training in spill responses. A summary of the training or certification program provided to emergency response employees shall be included in the first annual report.

(9) The operator shall keep documentation on each training event including the training date, the number of employees attending the training, and the objective of the training event for a period of three years after each training event.

e. The operator shall require that municipal contractors use appropriate control measures and procedures for stormwater discharges to the MS4 system. Oversight procedures shall be described in the MS4 Program Plan.

f. At a minimum, the MS4 Program Plan shall contain:

(1) The written protocols being used to satisfy the daily operations and maintenance requirements;

(2) A list of all municipal high-priority facilities that identifies those facilities that have a high potential for chemicals or other materials to be discharged in stormwater and a schedule that identifies the year in which an individual SWPPP will be developed for those facilities required to have a SWPPP. Upon completion of a SWPPP, the SWPPP shall be part of the MS4 Program Plan. The MS4 Program Plan shall include the location in which the individual SWPPP is located;

(3) A list of lands where nutrients are applied to a contiguous area of more than one acre. Upon completion of a

turf and landscape nutrient management plan, the turf and landscape nutrient management plan shall be part of the MS4 Program Plan. The MS4 Program Plan shall include the location in which the individual turf and landscape nutrient management plan is located; and

(4) The annual written training plan for the next reporting cycle.

g. Annual reporting requirements.

(1) A summary report on the development and implementation of the daily operational procedures;

(2) A summary report on the development and implementation of the required SWPPPs;

(3) A summary report on the development and implementation of the turf and landscape nutrient management plans that includes:

(a) The total acreage of lands where turf and landscape nutrient management plans are required; and

(b) The acreage of lands upon which turf and landscape nutrient management plans have been implemented; and

(4) A summary report on the required training, including a list of training events, the training date, the number of employees attending training and the objective of the training.

C. If an existing program requires the implementation of one or more of the minimum control measures of Section II B, the operator, with the approval of the board, may follow that program's requirements rather than the requirements of Section II B. A program that may be considered includes, but is not limited to, a local, state or tribal program that imposes, at a minimum, the relevant requirements of Section II B.

The operator's MS4 Program Plan shall identify and fully describe any program that will be used to satisfy one or more of the minimum control measures of Section II B.

If the program the operator is using requires the approval of a third party, the program must be fully approved by the third party, or the operator must be working towards getting full approval. Documentation of the program's approval status, or the progress towards achieving full approval, must be included in the annual report required by Section II E 3. The operator remains responsible for compliance with the permit requirements if the other entity fails to implement the control measures (or component thereof).

D. The operator may rely on another entity to satisfy the state permit requirements to implement a minimum control measure if: (i) the other entity, in fact, implements the control measure; (ii) the particular control measure, or component thereof, is at least as stringent as the corresponding state permit requirement; and (iii) the other entity agrees to implement the control measure on behalf of the operator. The agreement between the parties must be documented in writing and retained by the operator with the MS4 Program Plan for the duration of this state permit.

In the annual reports that must be submitted under Section II E 3, the operator must specify that another entity is being relied on to satisfy some of the state permit requirements.

If the operator is relying on another governmental entity regulated under 9VAC25-870-380 to satisfy all of the state permit obligations, including the obligation to file periodic reports required by Section II E 3, the operator must note that fact in the registration statement, but is not required to file the periodic reports.

The operator remains responsible for compliance with the state permit requirements if the other entity fails to implement

the control measure (or component thereof).

E. Evaluation and assessment.

1. MS4 Program Evaluation. The operator must annually evaluate:

a. Program compliance;

b. The appropriateness of the identified BMPs (as part of this evaluation, the operator shall evaluate the effectiveness of BMPs in addressing discharges into waters that are identified as impaired in the 2010 § 305 (b)/303(d) Water Quality Assessment Integrated Report); and

c. Progress towards achieving the identified measurable goals.

2. Recordkeeping. The operator must keep records required by the state permit for at least three years. These records must be submitted to the department only upon specific request. The operator must make the records, including a description of the stormwater management program, available to the public at reasonable times during regular business hours.

3. Annual reports. The operator must submit an annual report for the reporting period of July 1 through June 30 to the department by the following October 1 of that year. The reports shall include:

a. Background Information.

(1) The name and state permit number of the program submitting the annual report;

(2) The annual report permit year;

(3) Modifications to any operator's department's roles and responsibilities;

(4) Number of new MS4 outfalls and associated acreage by HUC added during the permit year; and

(5) Signed certification;

b. The status of compliance with state permit conditions, an assessment of the appropriateness of the identified best management practices and progress towards achieving the identified measurable goals for each of the minimum control measures;

c. Results of information collected and analyzed, including monitoring data, if any, during the reporting period;

d. A summary of the stormwater activities the operator plans to undertake during the next reporting cycle;

e. A change in any identified best management practices or measurable goals for any of the minimum control measures including steps to be taken to address any deficiencies;

f. Notice that the operator is relying on another government entity to satisfy some of the state permit obligations (if applicable);

g. The approval status of any programs pursuant to Section II C (if appropriate), or the progress towards achieving full approval of these programs; and

h. Information required for any applicable TMDL special condition contained in Section I.

F. Program Plan modifications.

1. Program modifications requested by the operator. Modifications to the MS4 Program are expected throughout the

life of this state permit as part of the iterative process to reduce the pollutant loadings and to protect water quality. As such, modifications made in accordance with this state permit as a result of the iterative process do not require modification of this permit unless the department determines that the changes meet the criteria referenced in 9VAC25-870-630 or 9VAC25-870-650. Updates and modifications to the MS4 Program may be made during the life of this state permit in accordance with the following procedures:

a. Adding (but not eliminating or replacing) components, controls, or requirements to the MS4 Program may be made by the operator at any time. Additions shall be reported as part of the annual report.

b. Updates and modifications to specific standards and specifications, schedules, operating procedures, ordinances, manuals, checklists, and other documents routinely evaluated and modified are permitted under this state permit provided that the updates and modifications are done in a manner that (i) is consistent with the conditions of this state permit, (ii) follow any public notice and participation requirements established in this state permit, and (iii) are documented in the annual report.

c. Replacing, or eliminating without replacement, any ineffective or infeasible strategies, policies, and BMPs specifically identified in this permit with alternate strategies, policies, and BMPs may be requested at any time. Such requests must be made in writing to the department and signed in accordance with 9VAC25-870-370, and include the following:

(1) An analysis of how or why the BMPs, strategies, or policies are ineffective or infeasible, including information on whether the BMPs, strategies, or policies are cost prohibitive;

(2) Expectations regarding the effectiveness of the replacement BMPs, strategies, or policies;

(3) An analysis of how the replacement BMPs are expected to achieve the goals of the BMPs to be replaced;

(4) A schedule for implementing the replacement BMPs, strategies, and policies; and

(5) An analysis of how the replacement strategies and policies are expected to improve the operator's ability to meet the goals of the strategies and policies being replaced.

d. The operator follows the public involvement requirements identified in Section II B 2 (a).

2. MS4 Program updates requested by the department. In a manner and following procedures in accordance with the Virginia Administrative Process Act, the Virginia Stormwater Management regulations, and other applicable state law and regulations, the department may request changes to the MS4 Program to assure compliance with the statutory requirements of the Virginia Stormwater Management Act and its attendant regulations to:

a. Address impacts on receiving water quality caused by discharges from the MS4;

b. Include more stringent requirements necessary to comply with new state or federal laws or regulations; or

c. Include such other conditions necessary to comply with state or federal law or regulation.

Proposed changes requested by the department shall be made in writing and set forth the basis for and objective of the modification as well as the proposed time schedule for the operator to develop and implement the modification. The operator may propose alternative program modifications or time schedules to meet the objective of the requested modification, but any such modifications are at the discretion of the department.

SECTION III

CONDITIONS APPLICABLE TO ALL STATE PERMITS

A. Monitoring.

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

2. Monitoring shall be conducted according to procedures approved under 40 CFR Part 136 or alternative methods approved by the U.S. Environmental Protection Agency, unless other procedures have been specified in this state permit.

3. The operator shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals that will insure accuracy of measurements.

B. Records.

1. Monitoring records/reports shall include:

a. The date, exact place, and time of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) and time(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

2. The operator shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this state permit, and records of all data used to complete the registration statement for this state permit, for a period of at least three years from the date of the sample, measurement, report or request for coverage. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or regarding control standards applicable to the operator, or as requested by the board.

C. Reporting monitoring results.

1. The operator shall submit the results of the monitoring required by this state permit with the annual report unless another reporting schedule is specified elsewhere in this state permit.

2. Monitoring results shall be reported on a Discharge Monitoring Report (DMR); on forms provided, approved or specified by the department; or in any format provided the date, location, parameter, method, and result of the monitoring activity are included.

3. If the operator monitors any pollutant specifically addressed by this state permit more frequently than required by this state permit using test procedures approved under 40 CFR Part 136 or using other test procedures approved by the U.S. Environmental Protection Agency or using procedures specified in this state permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or reporting form specified by the department.

4. Calculations for all limitations that require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this state permit.

D. Duty to provide information. The operator shall furnish to the department, within a reasonable time, any information that the board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this state permit or to determine compliance with this state permit. The board may require the operator to furnish, upon request, such plans, specifications, and other pertinent information as may be necessary to determine the effect of the wastes from his discharge on the quality of surface waters, or such other information as may be necessary to accomplish the purposes of the CWA and Virginia Stormwater Management Act. The operator shall also furnish to the department upon request, copies of records required to be kept by this permit.

E. Compliance schedule reports. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this state permit shall be submitted no later than 14 days following each schedule date.

F. Unauthorized stormwater discharges. Pursuant to § 62.1-44.15:26 of the Code of Virginia, except in compliance with a state permit issued by the board, it shall be unlawful to cause a stormwater discharge from a MS4.

G. Reports of unauthorized discharges. Any operator of a small MS4 who discharges or causes or allows a discharge of sewage, industrial waste, other wastes or any noxious or deleterious substance or a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302 that occurs during a 24-hour period into or upon surface waters; or who discharges or causes or allows a discharge that may reasonably be expected to enter surface waters, shall notify the department of the discharge immediately upon discovery of the discharge, but in no case later than within 24 hours after said discovery. A written report of the unauthorized discharge shall be submitted to the department within five days of discovery of the discharge. The written report shall contain:

1. A description of the nature and location of the discharge;

2. The cause of the discharge;

3. The date on which the discharge occurred;

4. The length of time that the discharge continued;

5. The volume of the discharge;

6. If the discharge is continuing, how long it is expected to continue;

7. If the discharge is continuing, what the expected total volume of the discharge will be; and

8. Any steps planned or taken to reduce, eliminate and prevent a recurrence of the present discharge or any future discharges not authorized by this state permit.

Discharges reportable to the department under the immediate reporting requirements of other regulations are exempted from this requirement.

H. Reports of unusual or extraordinary discharges. If any unusual or extraordinary discharge including a "bypass" or "upset," as defined herein, should occur from a facility and the discharge enters or could be expected to enter surface

waters, the operator shall promptly notify, in no case later than within 24 hours, the department by telephone after the discovery of the discharge. This notification shall provide all available details of the incident, including any adverse effects on aquatic life and the known number of fish killed. The operator shall reduce the report to writing and shall submit it to the department within five days of discovery of the discharge in accordance with Section III I 2. Unusual and extraordinary discharges include but are not limited to any discharge resulting from:

1. Unusual spillage of materials resulting directly or indirectly from processing operations;

2. Breakdown of processing or accessory equipment;

3. Failure or taking out of service some or all of the facilities; and

4. Flooding or other acts of nature.

I. Reports of noncompliance. The operator shall report any noncompliance which may adversely affect surface waters or may endanger public health.

1. An oral report shall be provided within 24 hours to the department from the time the operator becomes aware of the circumstances. The following shall be included as information which shall be reported within 24 hours under this paragraph:

a. Any unanticipated bypass; and

b. Any upset which causes a discharge to surface waters.

2. A written report shall be submitted within five days and shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and

c. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

The board or its designee may waive the written report on a case-by-case basis for reports of noncompliance under Section III I if the oral report has been received within 24 hours and no adverse impact on surface waters has been reported.

3. The operator shall report all instances of noncompliance not reported under Sections III I 1 or 2, in writing, at the time the next monitoring reports are submitted. The reports shall contain the information listed in Section III I 2.

NOTE: The immediate (within 24 hours) reports required to be provided to the department in Sections III G, H and I may be made to the appropriate Regional Office Pollution Response Program as found at http://deq.virginia.gov/Programs/PollutionResponsePreparedness.aspx. Reports may be made by telephone or by fax. For reports outside normal working hours, leave a message and this shall fulfill the immediate reporting requirement. For emergencies, the Virginia Department of Emergency Services maintains a 24-hour telephone service at 1-800-468-8892.

4. Where the operator becomes aware of a failure to submit any relevant facts, or submittal of incorrect information in any report to the department, it shall promptly submit such facts or correct information.

J. Notice of planned changes.

1. The operator shall give notice to the department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The operator plans an alteration or addition to any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced:

(1) After promulgation of standards of performance under § 306 of the Clean Water Act that are applicable to such source; or

(2) After proposal of standards of performance in accordance with § 306 of the Clean Water Act that are applicable to such source, but only if the standards are promulgated in accordance with § 306 within 120 days of their proposal;

b. The operator plans alteration or addition that would significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this state permit; or

2. The operator shall give advance notice to the department of any planned changes in the permitted facility or activity; which may result in noncompliance with state permit requirements.

K. Signatory requirements.

1. Registration statement. All registration statements shall be signed as follows:

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

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

c. For a municipality, state, federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a public agency includes:

(1) The chief executive officer of the agency, or

(2) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

2. Reports, etc. All reports required by state permits, and other information requested by the board shall be signed by a person described in Section III K 1, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Section III K 1;

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

c. The written authorization is submitted to the department.

3. Changes to authorization. If an authorization under Section III K 2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Section III K 2 shall be submitted to the department prior to or together with any reports, or information to be signed by an authorized representative.

4. Certification. Any person signing a document under Sections III K 1 or 2 shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

L. Duty to comply. The operator shall comply with all conditions of this state permit. Any state permit noncompliance constitutes a violation of the Virginia Stormwater Management Act and the Clean Water Act, except that noncompliance with certain provisions of this state permit may constitute a violation of the Virginia Stormwater Management Act but not the Clean Water Act. State permit noncompliance is grounds for enforcement action; for state permit termination, revocation and reissuance, or modification; or denial of a state permit renewal application.

The operator shall comply with effluent standards or prohibitions established under § 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if this state permit has not yet been modified to incorporate the requirement.

M. Duty to reapply. If the operator wishes to continue an activity regulated by this state permit after the expiration date of this state permit, the operator shall submit a new registration statement at least 90 days before the expiration date of the existing state permit, unless permission for a later date has been granted by the board. The board shall not grant permission for registration statements to be submitted later than the expiration date of the existing state permit.

N. Effect of a state permit. This state permit does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any injury to private property or invasion of personal rights, or any infringement of federal, state or local law or regulations.

O. State law. Nothing in this state permit shall be construed to preclude the institution of any legal action under, or relieve the operator from any responsibilities, liabilities, or penalties established pursuant to any other state law or regulation

or under authority preserved by § 510 of the Clean Water Act. Except as provided in state permit conditions on "bypassing" (Section III U), and "upset" (Section III V) nothing in this state permit shall be construed to relieve the operator from civil and criminal penalties for noncompliance.

P. Oil and hazardous substance liability. Nothing in this state permit shall be construed to preclude the institution of any legal action or relieve the operator from any responsibilities, liabilities, or penalties to which the operator is or may be subject under §§ 62.1-44.34:14 through 62.1-44.34:23 of the State Water Control Law or § 311 of the Clean Water Act.

Q. Proper operation and maintenance. The operator shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed or used by the operator to achieve compliance with the conditions of this state permit. Proper operation and maintenance also includes effective plant performance, adequate funding, adequate staffing, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by the operator only when the operation is necessary to achieve compliance with the conditions of this state permit.

R. Disposal of solids or sludges. Solids, sludges or other pollutants removed in the course of treatment or management of pollutants shall be disposed of in a manner so as to prevent any pollutant from such materials from entering surface waters.

S. Duty to mitigate. The operator shall take all reasonable steps to minimize or prevent any discharge in violation of this state permit that has a reasonable likelihood of adversely affecting human health or the environment.

T. Need to halt or reduce activity not a defense. It shall not be a defense for an operator in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this state permit.

U. Bypass.

1. "Bypass," as defined in 9VAC25-870-10, means the intentional diversion of waste streams from any portion of a treatment facility. The operator may allow any bypass to occur that does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Sections III U 2 and U 3.

2. Notice.

a. Anticipated bypass. If the operator knows in advance of the need for a bypass, prior notice shall be submitted, if possible at least 10 days before the date of the bypass.

b. Unanticipated bypass. The operator shall submit notice of an unanticipated bypass as required in Section III I.

3. Prohibition of bypass.

a. Bypass is prohibited, and the board or its designee may take enforcement action against an operator for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of

untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The operator submitted notices as required under Section III U 2.

b. The board or its designee may approve an anticipated bypass, after considering its adverse effects, if the board or its designee determines that it will meet the three conditions listed above in Section III U 3 a.

V. Upset.

1. An "upset", as defined in 9VAC25-870-10, constitutes an affirmative defense to an action brought for noncompliance with technology based state permit effluent limitations if the requirements of Section III V 2 are met. A determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is not a final administrative action subject to judicial review.

2. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

3. An operator who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An upset occurred and that the operator can identify the cause(s) of the upset;

b. The permitted facility was at the time being properly operated;

c. The operator submitted notice of the upset as required in Section III I; and

d. The operator complied with any remedial measures required under Section III S.

4. In any enforcement proceeding the operator seeking to establish the occurrence of an upset has the burden of proof.

W. Inspection and entry. The operator shall allow the department as the board's designee, or an authorized representative (including an authorized contractor acting as a representative of the administrator), upon presentation of credentials and other documents as may be required by law, to:

1. Enter upon the operator's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this state permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this state permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this state permit; and

4. Sample or monitor at reasonable times, for the purposes of assuring state permit compliance or as otherwise authorized by the Clean Water Act and the Virginia Stormwater Management Act, any substances or parameters at any location.

For purposes of this subsection, the time for inspection shall be deemed reasonable during regular business hours,

and whenever the facility is discharging. Nothing contained herein shall make an inspection unreasonable during an emergency.

X. State permit actions. State permits may be modified, revoked and reissued, or terminated for cause. The filing of a request by the operator for a state permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any state permit condition.

Y. Transfer of state permits.

1. State permits are not transferable to any person except after notice to the department. Except as provided in Section III Y 2, a state permit may be transferred by the operator to a new operator only if the state permit has been modified or revoked and reissued, or a minor modification made, to identify the new operator and incorporate such other requirements as may be necessary under the Virginia Stormwater Management Act and the Clean Water Act.

2. As an alternative to transfers under Section III Y 1, this state permit may be automatically transferred to a new operator if:

a. The current operator notifies the department at least two days in advance of the proposed transfer of the title to the facility or property;

b. The notice includes a written agreement between the existing and new operators containing a specific date for transfer of state permit responsibility, coverage, and liability between them; and

c. The board does not notify the existing operator and the proposed new operator of its intent to modify or revoke and reissue the state permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Section III Y 2 b.

Z. Severability. The provisions of this state permit are severable, and if any provision of this state permit or the application of any provision of this state permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this state permit, shall not be affected thereby.

Statutory Authority

§ 62.1-44.15:28 of the Code of Virginia.

Historical Notes

Former 4VAC50-60-1240, derived from Virginia Register Volume 21, Issue 3, eff. January 29, 2005; amended, Virginia Register Volume 24, Issue 20, eff. July 9, 2008; Volume 29, Issue 4, eff. November 21, 2012; Volume 29, Issue 17, eff. July 1, 2013; amended and renumbered, Virginia Register Volume 30, Issue 2, eff. October 23, 2013.

APPENDIX B

JBM-HH 2013 GENERAL PERMIT REGISTRATION STATEMENT

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COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
TDD (804) 698-4021
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4020
1-800-592-5482

July 1, 2013

Colonel Fern O. Sumpter, Joint Base Commander
Joint Base Myer-Henderson Hall
204 Lee Avenue, Suite 107
Fort Myer, Virginia 22211-1116

RE: General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems
General Permit No. VAR040068
Joint Base Myer Henderson Hall

Dear Permittee:

Department staff has reviewed your Registration Statement and determined that the referenced Municipal Storm Sewer System (MS4) is hereby covered under the General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems. The effective date of your coverage under this general permit is July 1, 2013, or the date of this letter, whichever is later. The enclosed copy of the general permit contains the applicable reporting requirements and other conditions of coverage.

During its 2013 Legislative Session, the General Assembly passed Chapters 756 (HB2048) and 793 (SB1279) which moved several programs from the Virginia Department of Conservation and Recreation (DCR) to the Virginia Department of Environmental Quality (DEQ). As a result of this legislative change, the General Assembly transferred the administration and oversight of the General Permit for Discharges from Small Municipal Separate Storm Sewer Systems from DCR to DEQ. Please submit future permit correspondence and your annual MS4 program reports to the DEQ Northern Regional Office at the following address:

DEQ Northern Regional Office
13901 Crown Court
Woodbridge, VA 22193

The general permit will expire on June 30, 2018. The conditions of the permit require that you submit a new registration statement on or before April 1, 2018, if you wish to have continued coverage under the general permit.

If you have any questions about this letter or the general permit, please contact Mr. Bryant Thomas, Water Permits Manager, at (703) 583-3843 or Bryant.thomas@deq.virginia.gov .

Sincerely,

Melanie D. Davenport

Melanie D. Davenport, Director
Water Division

Enc. General Permit No. VAR040068

Cc. Bryant Thomas, DEQ-NRO

DEPARTMENT OF THE ARMY
JOINT BASE MYER – HENDERSON HALL
204 LEE AVENUE
FORT MYER, VIRGINIA 22211-1199

REPLY TO ATTENTION OF

March 11, 2013

Directorate of Environmental Management

Mr. Jeffrey Selengut
Department of Conservation and Recreation
900 East Main Street, 8th Floor, Pocahontas Building
Richmond, VA 23219-3558

Dear Mr. Selengut:

This submittal provides the new registration application for coverage under the VSMP General Permit for Stormwater Discharges from Small MS4s [VAR04] for Joint Base Myer-Henderson Hall (formerly U.S. Army Garrison Fort Myer), Arlington, Virginia.

For additional information or clarification of the information provided in this submittal, please contact Mr. Richard LaFreniere, Director, Directorate of Environmental Management, at (703) 696-8055, or richard.p.lafreniere2.civ@mail.mil.

Sincerely,

Fern O. Sumpter
Colonel, US Army
Commanding

Enclosure

Printed on Recycled Paper

DCR
Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL & RECREATIONAL RESOURCES

VSMP GENERAL PERMIT REGISTRATION STATEMENT FOR STORMWATER DISCHARGES FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS [VAR04]

(Please Type or Print All Information)
(The applicable fee specified in Form DCR 199-145 must additionally be submitted to the address given in that form to obtain coverage)

1. **Regulated Small MS4**

Name: Joint Base Myer-Henderson Hall

Type: ☐ City ☐ County ☐ Incorporated Town ☐ Unincorporated Town ☐ College or University
☐ Local School Board ☒ Military Installation ☐ Transport System ☐ Federal or State Facility ☐ Other

Location (County or City): Arlington County

2. **Regulated Small MS4 Operator**

Name: Department of the Army, Joint Base Myer-Henderson Hall

Address: 204 Lee Avenue, Suite 107

City: Fort Myer State: VA Zip: 22211-1116

3. **Hydrologic Unit Code(s) as identified in the most recent version of Virginia's 6th Order National Watershed Boundary Dataset currently receiving discharges or that have potential to receive discharges from the regulated small MS4:**
PL-24, Lower Potomac River; via unnamed intermittent stream that flows through Arlington Cemetery to Boundary and via a tributary of Long Branch Creek, which is a tributary of Four Mile Run.

4. **Attach a description of the estimated drainage area, in acres, served by the regulated small MS4 discharging to any impaired receiving surface waters listed in the most recent Virginia 305(b)/303(d) Water Quality Assessment Integrated Report, and a description of the land use of each such drainage area.** See Attachment 1

5. **Any TMDL waste loads allocated to the regulated small MS4 (this information may be found at http://www.deq.state.va.us/tmdl/develop.html):** No known allocations

6. **The name(s) of any regulated physically interconnected MS4s to which the regulated small MS4 discharges.**
Arlington County MS4

7. **A copy of the MS4 Program Plan that includes:** See Attachment 2

a. **A list of BMPs that the operator proposes to implement for each of the stormwater minimum control measures and their associated measurable goals pursuant to 4VAC50-60-1240, Section II B; that includes:**

i. **A list of the existing policies, ordinances, schedules, inspection forms, written procedures, and other documents necessary for BMP implementation; and**

ii. **The individual, department, division, or unit responsible for implementing the BMP;**

b. **The objective and expected results of each BMP in meeting the measurable goals of the stormwater minimum control measures;**

c. **The implementation schedule including any interim milestones for the implementation of a proposed new BMP; and**

d. The method that will be utilized to determine the effectiveness of each BMP and the program as a whole.

8. List all existing signed agreements between the operator and any applicable third parties where the operator has entered into an agreement in order to implement minimum control measures or portions of minimum control measures.

None

9. The name, address, telephone number and e-mail address of either the principal executive officer or ranking elected official as defined in 4VAC50-60-370.

Colonel Fern O. Sumpter, Joint Base Commander, Joint Base Myer-Henderson Hall
204 Lee Avenue, Suite 107, Fort Myer VA 22211-1116
(703) 696-3250 fern.o.sumpter.mil@mail.mil

10. The name, position title, address, telephone number and e-mail address of any duly authorized representative as defined in 4VAC50-60-370.

11. Certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations."

Print Name: COL Fern O. Sumpter Title: Joint Base Commander

Signature: Date: 29 Mar 13

For Department of Conservation and Recreation Use Only

Accepted/Not Accepted by: _____ Date: _____

Basin _____ Stream Class _____ Section _____ Special Standards _____

ATTACHMENT 1

2013 VSMP General Permit Registration Statement for Stormwater Discharges From Small Municipal Separate Storm Sewer Systems [Var04]

Joint Base Myer-Henderson Hall, Fort Myer, Virginia
VSMP Registration Number VAR0400068

Supplemental Information

4. Attach a description of the estimated drainage area, in acres, served by the regulated small MS4 discharging to any impaired receiving surface waters listed in the most recent Virginia 305(b)/303(d) Water Quality Assessment Integrated Report, and a description of the land use of each such drainage area.

Joint Base Myer-Henderson Hall (JBM-HH) occupies approximately 270 acres that lie west of Arlington National Cemetery within Arlington County, Virginia. The entire installation lies within the Potomac River drainage basin; the river is located approximately 0.9 miles east of the installation. Stormwater discharges from the northern portion of the installation flow either east to an unnamed intermittent stream that flows through Arlington Cemetery and discharges to the Potomac River via Boundary Channel, or north to Arlington County municipal storm drains that discharge to the Potomac River. The central and southern portions of the installation drain west and south to Arlington County storm drains that discharge to the Potomac River via Lower Long Branch Creek and Fourmile Run.

Long Branch Creek and the non-tidal portion of Fourmile Run to which Long Branch Creek drains (about 0.8 mile south of JBM-HH) are designated as impaired for *Escherichia coli* (*E. coli*) on Virginia's 305(b)/303(d) 2012 list of impaired waters. The portion of the Potomac River east of Arlington Cemetery that receives Fort Myer discharges (State list ID DCPMS00E_02) is listed on the District of Columbia 2012 303(d) list as impaired for fecal coliform, pH, and polychlorinated biphenyls (PCBs).

Categories of land use at JBM-HH include: Professional/Institutional, Residential, Community, Troop, and Industrial. The predominate land uses are community and troop with smaller areas of residential, industrial, and professional/institutional scattered throughout the installation.

ATTACHMENT 2

JBM-HH VPDES MS4 Program Plan for Permit Cycle 2008-2013
VSMP Registration Number VAR040068

MS4 Program Administration	
VDCR Requirement:	*Update the MS4 Program Plan in a time frame consistent with the reissued GeneralPermit (currently 180 days from effective date of the permit).* *1. Update the permit requirements for the Six Minimum Control Measures.* *2. Are any additional BMPs required to meet the new permit requirements?* *3. Provide a description of the BMP, responsible party schedule including interim goals, responsible party, to implement the additional BMPs that is consistent with the new permit* *4. For each existing BMP included in the MS4 Program Plan, review and complete the following:* *a. Does this BMP comply with the new General Permit or are modifications required?* *b. If no modifications are required, then BMP remains the same.* *c. If modifications are required, what modifications are required?* *d. What is my proposed schedule for implementation of the modifications?* *e. Include the proposed schedule in the Schedule and Evaluation Section.* *f. Does the BMP address the pollutant identified in a TMDL wasteload allocation?* *g. Which TMDL wasteload allocation?* *h. How does the BMP address the pollutant identified in a TMDL wasteload allocation?* *i. How can the BMP be modified to be more effective in addressing the pollutant identified in the TMDL wasteload allocation?* *j. When applicable, include a proposed schedule for BMP modification to more effectively address the TMDL wasteload allocation.*
BMP	A1. Update MS4 Program Plan
Schedule	Within 180 days of General Permit reissuance, or as specified in reissued permit.
Responsible Party	Director, Environmental Management Directorate
Measurable Goals	Complete MS4 program plan update and submit to VDCR in compliance with schedule specified in reissued permit.
Necessary Documents	MS4 Program Plan, reissued General Permit
Items Needed/Reported for the Annual Report	None. Updated MS4 Program Plan must be submitted prior to Permit Year (PY) 1 annual report

ATTACHMENT 2

JBM-HH VPDES MS4 Program Plan for Permit Cycle 2008-2013
VSMP Registration Number VAR040068

Minimum Control Measure 1: Public Education and Outreach on Stormwater Impacts				
Permit Requirements:	*Public education and outreach on stormwater impacts. Implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of stormwater discharges on water bodies and the steps that the public can take to reduce pollutants in stormwater runoff*			
BMP	1.1 - Provide information at Environmental Quality Control (EQCC) meetings about water quality and pollution prevention.	1.2 – Publish articles or advertisements in the Pentagram, a weekly publication with a circulation of over 19,000 in the national capital area military community, about seasonal practices to prevent stormwater pollution. Potential topics include fertilizer application (spring), pet cleanup practices (summer), leaf mulching and removal (fall), and use of deicing materials (winter). DEM now publishing quarterly newsletters to educate public about environmental topics.	1.3 – Establish an environmental information page on the Joint Base Myer-Henderson Hall (JBM-HH) Website. An environmental page can be established that provides tips on pollution prevention, household hazardous waste disposal, recycling opportunities, community environmental events, reporting illegal dumping, etc.	1.4 – Prepare public education brochures for activities with the potential to contribute to stormwater pollution and a general stormwater pollution awareness brochure for new residents and workers.
Objective and Expected Results	Disseminate information and JBM-HH requirements for pollution prevention to senior Installation personnel; discuss spill prevention and pollution prevention activities and requirements. Increase knowledge of JBM-HH measures to achieve water quality goals and comply with the Installation's MS4 permit.	Increase Installation personnel and tenant knowledge of storm water pollution hazards, pollution prevention measures, proper waste disposal methods, and the impact of their actions on the health of the Potomac River and Chesapeake Bay. Increase participation in installation-wide clean-up and watershed awareness activities.	Increase awareness of ways the public can reduce stormwater pollutants; empower the public with the understanding that they can make a difference individually	Increase Installation personnel, resident, and tenant knowledge of storm water pollution hazards, pollution prevention measures, proper waste disposal methods, and the impact of their actions on the health of the Potomac River and Chesapeake Bay.
Method Utilized to Determine Effectiveness	Periodic surveys; evaluating compliance with reporting and recordkeeping requirements at Installation shops; discussion participation at EQCC meetings.	Periodic surveys; number of reported pollution incidences; number of requests regarding disposal of hazardous materials/wastes; participation in installation-wide "green" activities.	Periodic surveys; determine number of hits on environmental information page; provide section on web page where individuals can share tips	Routine inspections to observe areas with pollution potential and evaluate adherence to stormwater pollution prevention best management practices.
Schedule	This BMP is being continued from the previous permit cycle. Meetings are held quarterly.	Publish articles quarterly.	Establish page by second permit year (2009).	Prepare and distribute brochures to target audiences by June 2011 (completed). Update brochures in 2013/2014 to accommodate Chesapeake Bay TMDL and new MS4 General Permit requirements and redistribute.
Responsible Party	Directorate of Environmental Management (DEM)	DEM	DEM to provide information to Webhost.	DEM
Measurable Goals	Meetings held quarterly; standing agenda item added to discuss water quality and pollution prevention issues	Articles published quarterly.	Webpage established by 2009 and updated at least semi-annually.	Brochures distributed to all target agencies/audiences. Brochures updated with TMDL requirements.
Necessary Documents	Meeting schedules, agenda item topics	Print advertisements, brochures and other information available through public sources such as the Chesapeake Bay Foundation and EPA's Nonpoint Source Outreach Toolbox.	Print advertisements, brochures and other information available through public sources such as the Chesapeake Bay Foundation and EPA's Nonpoint Source Outreach Toolbox, schedules of base-wide and local environmental activities.	Finalized 2013 Virginia MS4 General Permit and Virginia Phase 2 Watershed Implementation Plan
Items Needed/Reported for the Annual Report	Dates of meetings, summary of topics discussed, information distributed.	Dates of publication and publication topics.	Print screen of Webpage and dates of updates.	Number of brochures prepared and distributed; target audiences

ATTACHMENT 2

JBM-HH VPDES MS4 Program Plan for Permit Cycle 2008-2013
VSMP Registration Number VAR040068

Minimum Control Measure 2: Public Involvement/Participation			
Permit Requirements:	*Public involvement/participation. At a minimum, comply with applicable state, tribal, and local public notice requirements when implementing the stormwater management program*		
BMP	2.1 – Advertise post (Garrison) spring and fall cleanup days. Continue to distribute fliers about environmentally-friendly cleanup and waste disposal options.	2.2 – Distribute/advertise Environmental Incident Report (EIRs) forms/process and telephone number for Emergency Operations Center (EOC) for public to report environmental concerns and ideas.	2.3 - Partner with local Arlington County youth and community organizations to implement stormwater pollution prevention and related programs at JBM-HH.
Objective and Expected Results	Increased public involvement and participation in cleanup days; disseminate information garrison-wide	Increase public comfort in reporting (anonymous calls/reports) concerns and ideas; increase public vigilance of potential environmental concerns	Promote interaction between JBM-HH community and surrounding Arlington community; increase awareness of community's role in stormwater pollution prevention.
Method Utilized to Determine Effectiveness	Periodic surveys; interview several participants for Pentagram article; determine number of volunteers	Make report easily accessible to public; design method for tracking number of calls; number of incidents reported	Feedback and support received from JBM-HH residents for projects; additional requests from local groups to participate in installation activities and conduct projects
Schedule	This BMP is being continued from the previous permit cycle. Garrison-wide cleanups are conducted in spring and fall.	This BMP is being continued from the previous permit cycle. Availability of the reporting options will be distributed regularly to the base community through EQCC meetings, JBM-HH Website, and e-mails to DPW facility personnel.	Develop and implement one project per year.
Responsible Party	Garrison Commander	Director, DEM	DEM
Measurable Goals	Cleanups held bi-annually	Number of EIRs received and number of calls to EOC.	Number of projects implemented per year.
Necessary Documents	Operation orders (OpOrd) with cleanup and waste disposal tips/options.	EIR Form, EOC telephone number, text for email.	Contact lists for local youth and community organizations.
Items Needed/Reported for the Annual Report	Dates cleanups held.	Summary of EIRs received and number of telephone calls regarding water quality issues.	Details for projects completed each calendar year.

Minimum Control Measure 3: Illicit Discharge Detection and Elimination		
Permit Requirements:	*Develop, implement and enforce a program to detect and eliminate illicit discharges, as defined at 4VAC50-60-1200, into the small MS4. b. (1) Develop, if not already completed, a storm sewer system map, showing the location of all major outfalls and the names and location of all surface waters that receive discharges from those outfalls. (2) To the extent allowable under state, tribal or local law, effectively prohibit, through ordinance, or other regulatory mechanism, nonstormwater discharges into the storm sewer system and implement appropriate enforcement procedures and actions. (3) Develop and implement a plan to detect and address nonstormwater discharges, including illegal dumping, to the system. (4) Inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste.*	
BMP	3.1 – Update GIS system with new storm drain system information as changes occur.	3.2 – Conduct dry weather inspections of all base outfalls to look for evidence of illicit discharges.
Objective and Expected Results	Knowledge of current storm drain locations, outfall points and their connections. Provide assistance in investigating illicit discharges and determining appropriate best management practices. Retain copy of storm sewer map to be used for reporting.	Develop map of inspection priority areas for the quarter. Identify illicit connections. Identify location of potential and actual problem areas. Determine source, remove or correct illicit connections.
Method Utilized to Determine Effectiveness	Number and location of storm drains and outfalls mapped. Periodic reviews of map. Review new development plans and projects.	Number and location of outfalls screened for illicit discharge. Number and location of illicit discharges detected and eliminated. Retain copy of the priority area map for submittal. Retain copies of inspection data or checklists for reporting. Evaluate detection procedures, illicit discharger notification procedures, implementation, and procedural schedules. Ensure appropriate personnel are properly trained on dry weather inspection procedures.
Schedule	This BMP is being continued from the previous permit cycle. GIS data will be updated as needed based on construction activity.	This BMP is being continued from the previous permit cycle. Inspections are conducted quarterly.
Responsible Party	DEM/GIS contractor	DEM
Measurable Goals	New construction modifications added to GIS data.	Inspections performed quarterly
Necessary Documents	As-built construction design documentation	Checklist/form to document inspections.
Items Needed/Reported for the Annual Report	Confirmation that GIS data was updated	Dates of inspections, summary of observations.

ATTACHMENT 2

JBM-HH VPDES MS4 Program Plan for Permit Cycle 2008-2013
VSMP Registration Number VAR040068

Minimum Control Measure 3: Illicit Discharge Detection and Elimination (continued)			
BMP	3.3 – Maintain database to track changes to building drains.	3.4 – Identify and eliminate illicit connections to storm drain. Ongoing sanitary sewer system upgrades are addressing cross connections as they are identified.	3.5 – Inform the JBM-HH community about hazards to human health and the environment from improper waste disposal and illegal dumping/ discharges. Information will be distributed through the sources identified in Minimum Control Measure (MCM) 1.
Objective and Expected Results	Knowledge of changes to building drains. Review new development plans. Retain database for reporting.	Documentation of the number of illicit connections found; correction of illicit connections; review new development plans and inspect new developments for cross-connections.	Increase knowledge of proper disposal of hazardous wastes. Publicize and facilitate public reporting of illegal dumping and discharges and improper waste disposal.
Method Utilized to Determine Effectiveness	Periodic inspections of existing building drains and review of data base.	Number and location of illicit connections detected and eliminated	Number of reporting incidents received by hotline; participation in community clean-ups and other stewardship projects; attitude/behavior surveys
Schedule	This BMP is being continued from the previous permit cycle. GIS data will be updated as building drains are located and site changes are made	This BMP is being continued from the previous permit cycle. It is will be conducted under the Backflow/Cross Connection contract pending budget approval and award.	As identified in MCM 1.
Responsible Party	DPW /GIS contractor	DPW	DEM
Measurable Goals	Database updated regularly	Inspections performed by contractor	Information distributed at EQCC meetings, through Website, and in Pentagram articles.
Necessary Documents	Information to add to database as it becomes available	Checklist/form to document inspections.	Publications/information about hazards associated with illegal discharges and improper disposal of waste.
Items Needed/Reported for the Annual Report	Confirmation that database was updated	Dates of inspections, summary of observations.	Number of times and venues for information distribution.

ATTACHMENT 2

JBM-HH VPDES MS4 Program Plan for Permit Cycle 2008-2013
VSMP Registration Number VAR040068

Minimum Control Measure 4: Construction Site Stormwater Runoff Control		
Permit Requirements:	*4. Construction site stormwater runoff control.* *a. Develop, implement, and enforce a program to reduce pollutants in any stormwater runoff to the small MS4 from construction activities that result in a land disturbance of greater than or equal to one acre or equal to or greater than 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act. Additionally, reduction of stormwater discharges from construction activity disturbing less than one acre must be included in the program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more. If the board waives requirements for stormwater discharges associated with small construction activity in accordance with the definition in 4VAC50-60-10, the permittee is not required to develop, implement, and/or enforce a program to reduce pollutant discharges from such sites.* *b. The program must include the development and implementation of, at a minimum:* *(1) An ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under state, tribal, or local law;* *(2) Requirements for construction site operators to implement appropriate erosion and sediment control best management practices;* *(3) Requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality; or procedures to ensure that construction site operators have secured or will secure a VSMP construction permit;* *(4) Procedures for site plan review which incorporate consideration of potential water quality and quantity impacts and ensures compliance with the Chesapeake Bay Preservation Act as implemented in Tidewater Virginia localities;* *(5) Procedures for receipt and consideration of information submitted by the public, and* *(6) Procedures for site inspection and enforcement of control measures.* *c. Track regulated land-disturbing activities and submit the following information for the reporting period with the annual report required in Section II E 2:* *(1) Total number of regulated land-disturbing activities; and* *(2) Total disturbed acreage.*	
BMP	4.1 – Update base-wide construction stormwater pollution prevention plan (SWPPP) to address items b(2) and b(3) of MCM 4. Include a menu of appropriate BMPs that can be used by contractors to address project-specific conditions. Require contractors to return signed certification that they will implement and maintain all selected BMPs. Develop agreement with USACE that contractors under their oversight will use Fort Myer Construction SWPPP or equivalent.	4.2 – Submit erosion and sediment control (E&SC) and stormwater management (SWM) plans to Arlington County for review and comment.
Objective and Expected Results	Develop requirements for the implementation of appropriate BMPs on construction sites to control erosion, sediment and other waste. Present SWPPP for all new construction projects and at construction meetings. Provide construction site operators with menu of appropriate BMPs. Retain copy of other approved SWPPP. Retain copy of signed certification from contractors.	Ensure plans are written in compliance with federal, state, and local laws and ordinances and that they consider potential water quality and quantity impacts.
Method Utilized to Determine Effectiveness	Number of public inquiries, concerns regarding construction activities. Review and approve construction plans submitted by construction site operator before activities begin. Develop procedures for site inspection and enforcement to ensure BMPs are properly installed.	Periodic review and update of SWPPP. Number of construction projects and confirmation that Arlington County reviewed plans.
Schedule	Update SWPPP by end of PY1. Distribute SWPPP to all contractors starting PY2.	This BMP is being continued from the previous permit cycle. Plans are submitted to Arlington County as a courtesy.
Responsible Party	DEM	DPW, USACE Project Managers.
Measurable Goals	SWPPP updated by end of PY1, distributed to all contractors. Agreement in place with USACE by end of PY1.	All construction plans for regulated land-disturbing activities (generally >2,500 square feet of disturbance) submitted to Arlington County for review and comment.
Necessary Documents	Existing Construction SWPPP, EPA publication Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites, Virginia General Permit for Discharges Of Stormwater From Construction Activities. Agreement with USACE.	Approved E&SC/SWM plans.
Items Needed/Reported for the Annual Report	Confirmation that SWPPP was updated (PY1), number of copies distributed (PY2).	Number of construction projects and confirmation that Arlington County reviewed plans.

ATTACHMENT 2

JBM-HH VPDES MS4 Program Plan for Permit Cycle 2008-2013
VSMP Registration Number VAR040068

Minimum Control Measure 4: Construction Site Stormwater Runoff Control (continued)			
BMP	4.3 – Maintain tracking system for construction projects; add field for number of acres disturbed.	4.4 –DPW Engineering Division and DEM to review all construction plans and use checklist developed during previous permit cycle. Baltimore District Army Corp of Engineers (BDCOE) contractors submit erosion and sediment control (E&SC) and stormwater management (SWM) plans for review and approval.	4.5 – Develop site inspection checklist to be used for QA/QC inspections of construction sites. Checklist will include E&S and SWM controls and pollution prevention BMPs; if deficiencies are identified copy should be provided to construction operator with direction to address deficiencies. Develop agreement with USACE that they will provide same level of inspection for contractors under their oversight.
Objective and Expected Results	Provide record for reporting total number of land-disturbing activities and total disturbed acreage.	Review and submit construction plans for land-disturbing activities to Arlington County for review and comment.	Coordination with USACE on preparation of checklist and Agreement that should address noncompliance issues and enforcement actions.
Method Utilized to Determine Effectiveness	Periodic review of tracking system. Review new development plans and projects.	Number of construction projects and confirmation that Arlington County reviewed and approved plans for projects.	Checklist and confirmation of its use.
Schedule	Tracking system was in place during previous permit cycle. New field to disturbance acreage to be added before first annual report is due (2009).	This BMP is being continued from the previous permit cycle. Plans are submitted to Arlington County for review and approval.	Prepare checklist and get USACE concurrence by end of PY1.
Responsible Party	DEM	DPW Engineering Division, USACE Project Managers	DPW, DEM, USACE
Measurable Goals	Data available for annual reports.	All construction plans for regulated land-disturbing activities (generally 2,500 square feet of disturbance or greater) submitted to Arlington County for review and comment.	Checklist developed and agreement in place with USACE by end of PY1. Inspections using checklist initiated PY2.
Necessary Documents	Construction plans.	Approved E&SC/SWM plans.	New checklist. Agreement with USACE.
Items Needed/Reported for the Annual Report	Total number of regulated land-disturbing activities; and total disturbed acreage.	Number of construction projects and confirmation that Arlington County reviewed and approved plans.	Checklist, confirmation it is in use.

ATTACHMENT 2

JBM-HH VPDES MS4 Program Plan for Permit Cycle 2008-2013
VSMP Registration Number VAR040068

Minimum Control Measure 5: Post-Construction Stormwater Management in New Development and Redevelopment			
Permit Requirements:	*a. Develop, implement, and enforce a program to address stormwater runoff from new development and redevelopment projects that disturb greater than or equal to one acre or equal to or greater than 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act. The program must ensure that controls are in place that would prevent or minimize water quality impacts.* *b. (1) Develop and implement strategies which include a combination of structural and/or nonstructural best management practices (BMPs) appropriate for your community.* *(2) Use an ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under state, tribal or local law.* *(3) Ensure adequate long-term operation and maintenance by the owner of BMPs through a maintenance agreement or some other mechanism that achieves an equivalent objective.* *(4) If the MS4 discharges to the Chesapeake Bay watershed, track all permanent BMP's installed in the MS4 (structural and nonstructural), and submit the following information with the annual report required in Section II E 2:* *(a) Type of BMP installed;* *(b) Geographic location (Hydrologic Unit Code);* *(c) Waterbody the BMP is discharging into;* *(d) Number of acres treated to the nearest one-tenth acre;* *(e) Whether the BMP is inspected or maintained; and* *(f) How often the BMP is maintained (quarterly, annually, etc.).*		
BMP	5.1 – Require post-construction BMPs that comply with Virginia and Arlington County SWM requirements. Develop agreement with USACE that construction projects under their oversight will comply with Virginia and Arlington County SWM requirements.	5.2 – Develop an inventory for all permanent SWM BMPs on base (post construction BMPs at Fort Myer include aboveground and underground detention facilities and water quality structures such as sand filters and Baysavers). Include fields for all data listed under b(4) of MCM 5.	5.3 – To ensure these devices perform adequately and to track maintenance actions, develop a maintenance schedule that meets designer's/manufacturer's recommendations. Document all maintenance activities. Record maintenance actions in the tracking system for BMP 5.2.
Objective and Expected Results	Appropriate post-construction BMPs are installed as required	Complete inventory and include all information required in b(4) of MCM 5 to retain for reporting.	Obtain and review designer's/manufacturer's recommendations for maintenance. Complete maintenance activities as scheduled/recommended.
Method Utilized to Determine Effectiveness	Agreement with USACE	Review tracking system information and construction design documents for new projects.	Periodic review of maintenance schedule and protocol. Ensure necessary equipment is available and in good repair. Summary of maintenance actions.
Schedule	This is currently being done. All recent construction projects have been reviewed by Arlington County for compliance.	An inventory for construction projects that includes BMPs was maintained during the previous permit cycle; new fields will need to be added for the items in b(4). Complete inventory by end of PY1. Update continuously with new project information as it becomes available.	Develop schedule by end of PY1. Perform maintenance as recommended pending funds available.
Responsible Party	DPW, DEM, USACE	DPW, DEM, GIS, USACE	DPW, DEM
Measurable Goals	BMPs are installed for all construction projects as required.	Inventory completed and tracking system updated.	Maintenance schedule developed and maintenance performed as recommended.
Necessary Documents	Agreement with USACE.	Current tracking system information, construction design documents for new projects.	Inventory of BMPs developed for BMP 5.2.
Items Needed/Reported for the Annual Report	Confirmation that construction projects were reviewed by Arlington County.	Information requested in MCM 5 b(4).	Summary of maintenance actions.

ATTACHMENT 2

JBM-HH VPDES MS4 Program Plan for Permit Cycle 2008-2013
VSMP Registration Number VAR040068

Minimum Control Measure 6: Pollution Prevention/Good Housekeeping for Municipal Operations			
Permit Requirements:	*Develop and implement an operation and maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations. Using training materials that are available from EPA, state, tribe, or other organizations, the program must include employee training to prevent and reduce stormwater pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and stormwater system maintenance*		
BMP	6.1 – Provide training. Evaluate current training program for adequacy in addressing stormwater pollution prevention and spill response.	6.2 – Conduct inspection and cleaning of roof gutters, street gutters, and storm drainage inlets as needed.	6.3 – Update and implement SWPPPs facilities with municipal-type shop operations.
Objective and Expected Results	Enhance knowledge of ways to reduce or prevent pollution runoff. Identification and reporting of suspected discharges. Update current training program, if necessary, using EPA, state, tribal, or other available material	Develop inspection schedule and clean up as needed.	Obtain existing SWPPPs and revise as needed. Develop SWPPPs for those areas that do not have one.
Method Utilized to Determine Effectiveness	Testing; field training; training documentation including topics, names and titles/job description of personnel trained per session, and date of session	Periodic inspection of areas; review inspection records	Completed SWPPPs; site compliance evaluations.
Schedule	This BMP is being continued from the previous permit cycle. Current training will be evaluated by end of PY1 and updated by middle of PY2, if necessary	Cleanups as needed.	Complete updates by end of PY1. Fully implement within 6 months of completion. Conduct annual site compliance evaluations.
Responsible Party	DEM	DPW	DEM
Measurable Goals	Training updated if needed. All staff trained with annual refreshers provided. New staff trained within 6 months.	Records of inspections and cleaning activities (frequency, amount of debris removed, manhours, etc.)	SWPPPs updated and implemented. Annual compliance evaluations completed – no significant findings.
Necessary Documents	Current training program.	Manhour records, dates of activities, debris removed.	Existing SWPPPs. Copy of VPDES General Stormwater Permit for Industrial Activities.
Items Needed/Reported for the Annual Report	Summary of number of employees receiving training.	Inspection records and hours per activity.	Summary of SWPPP completion/ implementation and compliance evaluation results.

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APPENDIX C

CHESAPEAKE BAY TMDL ACTION PLAN

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CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD (TMDL) STUDY FOR JOINT BASE MYER- HENDERSON HALL

Prepared for: **Joint Base Myer-Henderson Hall**
Directorate of Public Works
111 Stewart Rd, Bldg 321
Fort Myer, VA 22211-1199

Prepared by: **U.S. Army Corps of Engineers, Baltimore District**
P.O. Box 1715
Baltimore, Maryland 21203-1715

June 2015

Revised December 2015

CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD (TMDL) STUDY FOR JOINT BASE MYER- HENDERSON HALL

Prepared for:

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June 2015

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EXECUTIVE SUMMARY

Introduction

United States Installation Management Command (IMCOM) tasked the United States Army Corps of Engineers (USACE) to provide technical data pertaining to Chesapeake Bay pollutant load reduction requirements for Joint Base Myer-Henderson Hall (JBM-HH), Virginia. Fort McNair, located in the District of Columbia, will be addressed in a separate opportunity assessment.

The Clean Water Act (CWA) established a basic structure for regulating pollutants in United States waters to keep them "fishable and swimmable". States are responsible for implementing these requirements through Watershed Implementation Plans (WIP), and the Environmental Protection Agency (EPA) is responsible for enforcing the regulation.

There are three pollutants identified as having the greatest impact on the Chesapeake Bay: total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS). States have identified impaired waters; and together with the EPA, developed a "pollution diet" to restore them. This pollution diet is known as a Total Maximum Daily Load (TMDL), or the amount of pollutant a waterbody can carry and still achieve its designated uses (drinking water, recreation, etc.). The Commonwealth of Virginia will utilize Municipal Storm Sewer System (MS4) permits to ensure developed lands achieve nutrient and sediment reduction requirements. This study will satisfy the MS4 Phase II General Permit, Chesapeake Bay TMDL Action Plan requirement (Section I C) and will contribute to the next scheduled MS4 progress report in October 2015.

Data Collection and Mapping

Land use, soils, stormwater infrastructure and drainage area data were collected and mapped in order to calculate baseline and current load rates for TN, TP, and TSS running off of the installation and to determine methods for reducing those pollutant loads.

Field Investigation

Existing infrastructure that is designed to treat stormwater runoff on the installation, or Best Management Practices (BMPs) were inventoried, inspected and entered into a database. The database was designed as a tracking and record keeping tool to help the installation manage their stormwater program over time. It can be used to track required pollutant reductions and to generate annual progress reports.

Establishment of Baseline Pollutant Loads

Virginia Department of Environmental Quality (DEQ) published guidance for pollutant load reduction requirements (DEQ, 2015). They used Chesapeake Bay Program (CBP) models to provide load rates for the Potomac River to be used to calculate installation-specific baseline load rates using land use data. Using 2009 land use data and the methods provided in the DEQ guidance, an estimated 3,272.40 lbs of TN, 252.05 lbs of TP and 168,742.40 lbs of TSS per year are deposited into waterways from JBM-HH.

Pollutant Load Reductions

The Phase I WIP provides a general framework for meeting Chesapeake Bay TMDL requirements. The Phase II WIP provides a more specific plan and schedule for meeting the requirements. It details

that based on the 2009 baseline conditions, 9 percent of TN loads, 16 percent of TP loads, and 20 percent of TSS loads from impervious regulated acres, and 6 percent of TN loads, 7.25 percent of TP loads and 8.75 percent TSS loads from pervious regulated acres be reduced by the end of the third permit cycle in 2027. This equates to 260.72 lbs of TN, 36.31 lbs of TP and 31,535.77 lbs of TSS that need to be reduced from JBM-HH per year by 2027. Five percent of these reductions are required to be completed by the end of the first permit cycle in 2017, and 35 percent are required to be completed by the end of the second permit cycle in 2022.

Virginia Action Plan Guidance provided a table of pollution reduction efficiencies for several types of BMPs (DEQ, 2015). Reduction efficiencies for bioswales, bioretention and permeable pavers were averaged together for each TN, TP, and TSS and applied to the baseline loads for each area of interest.

Since the 2009 baseline, some pollutant reduction has already been realized at JBM-HH. The recent demolition of a barracks building and the land's conversion from impervious surface to grass contributes to 15.07 lbs of TN, 1.61 lbs of TP, and 747.94 lbs of TSS of the required reductions. The remaining 245.65 lbs of TN, 34.70 lbs of TP, and 30,787.83 lbs of TSS may be reduced through proposed structural and non-structural BMPs. Areas in JBM-HH where BMPs can be implemented to achieve these reductions are identified in Section 6 of this report. A schedule for BMP implementation to satisfy each permit cycle requirement is included in Section 6.2. Detailed information about these areas of interest (AOIs) and BMPs are included in Appendix A.

Costs

Generalized, planning level initial construction costs for the BMPs proposed to satisfy the pollution reduction requirements were calculated using University of Maryland research on BMPs built in Maryland and Virginia counties (Hagan, 2011). This tool considered the type of BMP to be constructed and the impervious acreage it will treat. The rate for bioswale ($42,000), bioretention ($46,875) and permeable pavers ($335,412) was averaged to get one cost per impervious acre treated ($141,429).

The cost to implement BMPs to satisfy the first phase of the permit for JBM-HH is $255,986, excluding the cost of the building demolition. The cost to implement BMPs to satisfy the second phase of the permit is an additional $1.2 million. The cost to implement the third phase of the permit cycle is approximately $3.1 million. The total planning level cost estimated to implement all structural BMPs proposed to satisfy the pollution reduction requirements throughout all three phases is approximately $4.6 million.

The costs identified in this study are strictly planning level; many unknowns still exist and can only be captured during the design phase of the selected AOI. During the design phase, the type of BMP, location and results from the utility survey may change what is shown in this study within a selected AOI. Local watershed-specific permit requirements along with regional geology and soils will affect costs. In addition, the type of design/build contracting mechanism that is chosen will also affect the cost. All of these concerns are typically addressed during the design phase, which will establish final construction cost estimates.

Installation Point of Contact

Richard LaFreniere, JBM-HH DPW, Environmental Management Division 703-696-8055

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Appendix A: Factsheets

Appendix B: User's Guide for BMP Database

Appendix C: Stormwater Management Guidance for the Commonwealth of Virginia

ATTACHMENTS

Project Disc containing:

- GIS Data
- BMP Database
- Digital Report

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LIST OF ACRONYMS

Area of Interest ..... AOI
Best Management Practices ..... BMP
Chesapeake Bay Foundation ..... CBF
Chesapeake Bay Program ..... CBP
Chesapeake Bay Program Watershed Model ..... CBPWM
Clean Water Act ..... CWA
Department of Environmental Quality ..... DEQ
Digital Elevation Modeling ..... DEM
Edge of stream ..... EOS
Environmental Site Design ..... ESD
Executive Order ..... EO
Geographic Information System ..... GIS
Global Positioning System ..... GPS
Hydrologic Soil Group ..... HSG
Installation Management Command ..... IMCOM
Joint Base Myer-Henderson Hall ..... JBM-HH
Level 2 ..... L2
Light Detection and Ranging ..... LiDAR
Low Impact Development ..... LID
Municipal Storm Water Sewer System MS4
National Pollutant Discharge Elimination System ..... NPDES
Natural Resource Conservation Service ..... NRCS
North American Vertical Datum of 1988 ..... NAVD88
Pollutants of concern ..... POC
Total Maximum Daily Load ..... TMDL
Total nitrogen ..... TN
Total phosphorus ..... TP
Total suspended solids ..... TSS
United States ..... US
United States Army Corps of Engineers ..... USACE
United States Environmental Protection Agency ..... EPA
Universal Transverse Mercator ..... UTM
Virginia ..... VA
Virginia Pollution Discharge Elimination System ..... VPDES
Watershed Implementation Plans ..... WIP
Web Soil Survey ..... WSS

1 INTRODUCTION

1.1 BACKGROUND AND PURPOSE

The Clean Water Act (CWA) established a basic structure for regulating pollutants in United States (US) waters (EPA, 1972). Despite efforts to comply with these requirements, the Chesapeake Bay continues to fall short of State water quality standards and CWA goals (CBF, 2014). Additional legislation has since been developed to assure the Bay is "fishable and swimmable". The Environmental Protection Agency (EPA) established the requirements for state Watershed Implementation Plans (WIP) as part of a larger Chesapeake Bay Total Maximum Daily Load (TMDL) accountability framework.

Section 303 of the CWA requires States to: establish water quality standards based on achieving their designated uses for that water (drinking, recreation, etc…), develop lists of impaired waters that fail to meet those standards, and estimate the amount of a pollutant that the waterbody can receive and still meet those standards. The amount of a pollutant a waterbody can carry and satisfy its water quality standards is now known as a Total Maximum Daily Load (TMDL).

CWA Section 402 regulates any point sources discharging pollution into U.S. waters through the National Pollutant Discharge Elimination System (NPDES) program. Municipalities with stormwater conveyance systems are required to obtain a Municipal Storm Water Sewer System (MS4) Phase II General Permit for coverage under the NPDES program. States have chosen to use these permits to enforce the TMDL requirements.

The Chesapeake Bay Protection and Restoration Executive Order (EO) 13508 (FLCC, 2009) describes the Chesapeake Bay as a "national treasure" and intends to bring more accountability to Bay cleanup efforts. In response to the EO, EPA published guidance for Federal facilities describing how to comply with the Federal regulations implemented by the States.

In December 2010, EPA published a TMDL for all impaired segments of the Chesapeake Bay watershed in order to help the States establish load allocations. They determined that total nitrogen (TN), total phosphorus (TP) and total suspended solids (TSS) are the pollutants of concern (POC), causing the most environmental damage to the Chesapeake Bay. They then required those states within the Chesapeake Bay watershed to submit Watershed Implementation Plans (WIPs) detailing how they will achieve TMDL requirements for nitrogen, phosphorus and sediment. The Virginia Phase II WIP presented pollutant load reductions, referred to as Level 2 (L2) scoping run reductions requiring that 9 percent of TN loads, 16 percent of TP loads, and 20 percent of TSS loads from impervious regulated acres and 6 percent of TN loads, 7.25 percent of TP loads and 8.75 percent TSS loads from pervious regulated acres be reduced by the end of the third MS4 permit cycle.

United States Army Corps of Engineers (USACE) has been tasked by the Installation Management Command (IMCOM) to provide technical data pertaining to the Chesapeake Bay TMDL for Joint Base Myer-Henderson Hall (JBM-HH). The technical data collected

and/or developed during this investigation includes: existing land use; soils; Best Management Practices (BMPs) and stormwater infrastructure locations and conditions; contributing drainage area to each stormwater BMP; and baseline pollutant load computations. Table 1-1 provides additional description of the data collected.

TABLE 1-1 DATA COLLECTED

Data	Applicability
Facility Boundary	The facility boundary was the first piece of information to be collected. The facility boundary is needed to begin collecting land use, soils, BMPs, and stormwater infrastructure data.
Land Use	A land use category determines the type(s) of practices conducted on that land area. Different practices yield different types and concentrations of pollutants. For example, agricultural land is typically high in nitrogen, due to certain types of fertilizer use.
Soils	Soil characteristics impact the infiltration. For example, urban areas are typically comprised of very compacted soils, which result in higher stormwater and pollutant runoff rates.
BMPs and Drainage to BMPs	Drainage areas to BMPs were identified, so new BMPs were not proposed to treat overlapping areas.
Stormwater Infrastructure	Stormwater infrastructure data shows how the stormwater is managed within the facility. It was used to delineate BMP drainage areas.

The data collected and developed were used to conduct an opportunity assessment to determine if stormwater BMP retrofits will be favorable to reduce pollutant loads to the Chesapeake Bay. The database on the attached project disk will provide a mechanism for managing data and assisting the localities and states with implementing WIPs. Current, accurate Geographic Information System (GIS) data used to conduct this assessment will also assist JBM-HH with future stormwater BMP maintenance and compliance requirements.

This study will satisfy the MS4, Chesapeake Bay TMDL Action Plan requirement (Section I C) and will be part of the next scheduled MS4 progress report in October 2015.

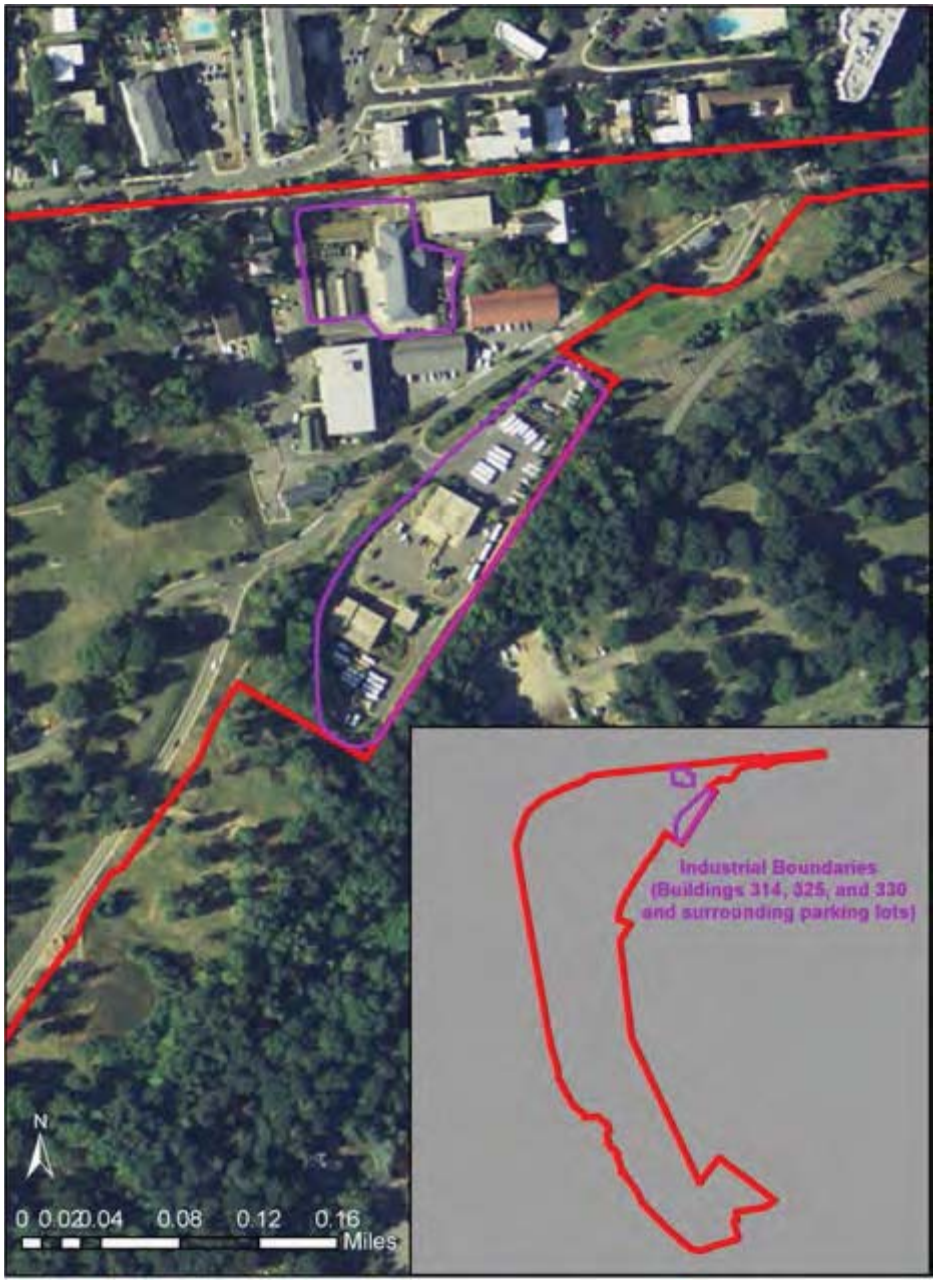
1.2 STUDY AREA

The study area for this investigation is Joint Base Myer-Henderson Hall, which occupies approximately 269 acres within Arlington County, Virginia. The Virginia MS4 General Permit for JBM-HH applies to U.S. Army Installation Fort Myer (Fort Myer) and Marine Corps Headquarters Battalion Henderson Hall (Henderson Hall), which are jointly referred to as "the installation" throughout this Plan. JBM-HH borders Arlington National Cemetery to the west, and is located in the Potomac River watershed, which is part of the Chesapeake Bay Watershed (Figure 1-1). Arlington National Cemetery, adjacent to JBM-HH, and Fort McNair, in the District of Columbia, are not included in this opportunity assessment.

Of the installation's 268.95 acres, 263.03 acres are regulated under the MS4 permit and 5.92 acres are covered by a VPDES permit for industrial discharges (VAR05). Based on Virginia Department of Environmental Quality's (DEQ) May 2015 VA TMDL Guidance (DEQ, 2015), any land regulated under a General VPDES permit for industrial discharges (shown in Figure 1-2) may be excluded from this opportunity assessment.

FIGURE 1-1 JBM-HH LOCATION MAP

FIGURE 1-2 JBM-HH INDUSTRIAL PERMIT AREAS



1.3 REPORT OUTLINE

The tasks required to complete this study and satisfy General MS4 Permit Section I.C.2.a requirements are described in the following sections of this report. Section 2 reviews the current and future MS4 program and legal authorities (I.C.2.a (1, 2)). Section 3 describes the development of GIS data layers that were used in the calculation of current baseline pollutant loads. Section 4 describes the stormwater BMP database created for JBM-HH. Section 5 describes calculation of baseline loads (I.C.2.a (4). Section 6 details the nutrient reduction requirements and a plan to meet those requirements (I.C.2.a (3, 5, 6, 7, 8, and

10). Section 7 explains the costs to complete the reduction requirements (I.C.2.a. (11). Section 8 includes conclusions from this study (I.C.2.a. (9 and 12) (Commonwealth of Virginia, 2013).

The sections of this report are to provide general information on the methodology and results of the study. Specific results for each Area of Interest (AOI) are described in factsheets located in Appendix A. Each factsheet contains five sections. Section I includes general information, including a description of its location, size and an accompanying map. Section II includes a breakdown of the existing land use, including a map identifying the land use area. Section III displays and discusses a map of existing stormwater infrastructure and proposed BMPs. The calculated baseline pollutant and reduction loads are highlighted in Section IV. Section V contains a cost assessment to construct the proposed BMPs.

TABLE 1-2 RELATING MS4 PERMIT TO THIS REPORT

General MS4 Permit Section I.C.2.a subsection	Section in this report addressing the permit requirement
1,2	Section 2
3,5,6,7,8,10	Section 7
4	Section 5
11	Section 7
9, 12	Section 8

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2 MS4 PROGRAM AND LEGAL AUTHORITIES

The provisions contained in the MS4 Permit and associated regulations will be enforced through JBM-HH policy memorandums and standardized procedures for project review and implementation. A draft Installation-wide stormwater policy was recently developed to address the Installation's compliance with the Virginia MS4 permit, the Virginia general industrial stormwater permit, and other stormwater regulations. The policy outlines proper protocols for minimizing stormwater pollution during activities that directly and indirectly impact stormwater. The policy is currently under review. Anticipate full implementation in calendar year 2016.

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3 DATA COLLECTION AND MAPPING

GIS was used to create, analyze and plan all geographically related information. These data were created as shapefiles, which can be used to accurately measure the spatial area needed to perform land use and load reduction calculations. Each data set is in Universal Transverse Mercator (UTM) Zone 18 North American Vertical Datum of 1988 (NAVD88) horizontal coordinate system.

3.1 LAND USE

Accurate land use data is essential for baseline and reduction load calculations. Considerable effort was made to collect and develop the most accurate data and categorize it in two different ways for multiple uses. Virginia TMDL Guidance classification was necessary for Action Plan calculations; Chesapeake Bay Program (CBP) classifications will be used for model runs.

Land use polygons were attributed with land uses relevant to Virginia Guidance calculations (i.e. regulated urban impervious and regulated urban pervious). The polygons were also attributed using the same categories of land cover as those used by the CBP and their watershed model (construction, forest, hay, hay with nutrients, high intensity impervious urban, high intensity pervious urban, low intensity impervious urban, high intensity pervious urban, unfertilized grass, and water) (see Table 3-1 Land Use).

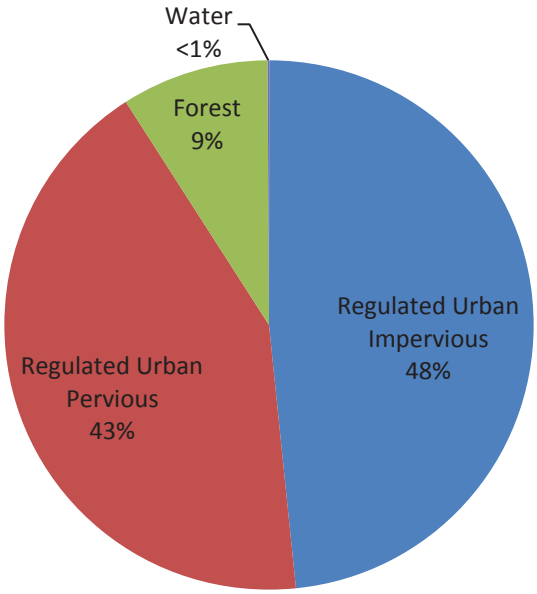
EPA required each state to submit guidance for how to achieve the goals set forth in the WIP. Virginia Department of Environmental Quality provided draft guidance to USACE in 2013, which provided instructions to permittees for estimating pollutant source loads as of June 30, 2009 (DEQ, 2015). Before guidance was released setting 2009 as the baseline year, land use layers were developed using the most up to date information at the time (2013 aerial imagery). In response to that draft guidance, existing land use was digitized using the 2009 aerial imagery. As a result, land use layers were developed for both 2009 and 2013 conditions and will be provided in the attached project disk. The digitized imagery was used to calculate baseline load rates and the baseline load rates were then used to establish L2 reductions (see Section 5-1).

TABLE 3-1 LAND USE CLASSIFICATIONS

VA Land Use	CBP Land Use	General Description
Regulated Urban Impervious	High Intensity Impervious Urban/ Low Intensity Impervious urban	building, road, parking
Regulated Urban Pervious	High Intensity Pervious Urban/ Low Intensity Pervious urban	beach, gravel, lawn, shrubs
N/A	construction	bare earth
N/A	forest	forest, wetland
N/A	hay	row crops, not fertilized
N/A	hay with nutrients	row crops, fertilized
N/A	unfertilized grass	brush
N/A	water	water

Forty-eight percent of JBM-HH's 263.03 acres, excluding the 5.92 acres in industrial areas, is categorized as regulated urban impervious urban land cover (127.27 acres). This includes building rooftops, parking areas, sidewalks, and recreational courts. An estimated 43 percent (111.88 acres) is categorized as regulated urban pervious land cover, or beach, gravel, lawn, or shrubs. Forest comprises 9 percent of the land (23.66 acres). Another 0.22 acres of the installation's total area is comprised of water, which accounts for less than 1 percent of the installations total area (Figure 3-1 Land Use Summary for JBM-HH).

FIGURE 3-1 LAND USE SUMMARY FOR JBM-HH



3.2 SOILS

Soil type was used to determine preliminary BMP site locations for planning purposes. Reduction efficiency and cost effectiveness are generally maximized when BMPs are implemented in A and B soils, and B soils make up 97 percent of the installation (260.05 acres). It is more expensive and fewer nutrients are reduced when BMPs are built in C and D soils, which are not present on the installation. The remaining three percent of the installation (8.9 acres) was not surveyed. Soils data were obtained from the Natural Resource Conservation Service (NRCS) Web Soil Survey (WSS) (USDA NCRS, 2013). The county-wide soils layer obtained from the WSS was clipped to the installation boundary to create a shapefile specific for JBM-HH (Figure 3-2 Soil Type Map). The shapefiles are attributed with soil type and Hydrologic Soil Group (HSG).

FIGURE 3-2 SOIL TYPE MAP

TABLE 3-2 SOIL GROUP DISTRIBUTION

HSG	Total Area (AC)	Percentage of Installation Area
B	260.05	97%
N/A	8.9	3%

3.3 DRAINAGE AREAS

Since as-built and stormwater management plans were not available for planning; drainage areas were delineated using Light Detection and Ranging (LiDAR) data, Digital Elevation Modeling (DEM), topographic contours and 2009 aerials. BMPs were delineated to include all stormwater conveyed to them through existing infrastructure. These areas were portrayed as polygons in GIS (Figure 3-3 JBM-HH BMP Drainage Areas). Once these individual watersheds were identified, these areas were excluded from consideration for new BMP treatment opportunities. Drainage areas to BMPs recommended to meet TMDL requirements were also delineated. These drainage areas are referred to as Areas of Interest (AOIs), and are shown in the fact sheets in Appendix A.

3.4 STORMWATER INFRASTRUCTURE

The stormwater layers used for this investigation were provided by the installation. Separate shapefiles were created for stormwater lines and BMPs. All GIS data created for this project and analyses are included on the attached project disk.

FIGURE 3-3 JBM-HH BMP DRAINAGE AREAS

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4 FIELD INVESTIGATION

A field assessment was performed in August 2011 to confirm land use and installation boundaries, and to inventory and assess stormwater BMPs. Project members traveled to JBM-HH and coordinated with installation points of contact to locate BMP facilities and inspect structural features.

4.1 STORMWATER BMP INVENTORY AND INSPECTION

Several pieces of data were compiled for each stormwater BMP. A field team documented the type of BMP installed (i.e. ponds, infiltration, filtration, manufactured/underground), and the geographic location, using Global Positioning System (GPS) technology. A visual assessment of the condition of the BMP was performed and documented using The Virginia Stormwater Management Handbook (DCR, 1999). Digital photographs were also taken to document the location and condition of each BMP at the time of the inventory and assessment.

The end product of the stormwater BMP inventory and inspections is the BMP database, which is discussed in Section 3.2. Based upon the results of the field inspection, an overall rating was assigned to each BMP. A description of the ratings is provided in Table 4-1 Stormwater BMP Rating Description. These ratings will assist the installation in prioritizing maintenance and improvement activities for each facility.

TABLE 4-1 STORMWATER BMP RATING DESCRIPTION

Rating	Description
A	The BMP is functioning as designed with no problem conditions identified. No signs of impending deterioration.
B	Minor problems are observed, however BMP is functioning as designed with no problem conditions in critical parameters.
C	Minor problems are observed, however BMP is functioning as designed with no problem conditions in critical parameters, but BMP performance is being compromised.
D	Major problems are observed and BMP is not functioning as designed with problem conditions in several critical parameters. Conditions have compromised the BMP performance.
E	Major problems are observed and BMP is not functioning as designed with problem conditions in several critical parameters. Conditions have compromised the BMP performance. BMP shows signs of impending failure.

All stormwater BMPs were assigned a Permanent ID that includes an abbreviation for the type of stormwater BMP (i.e. "P" for pond or "I" infiltration), and then an identification number.

Twelve stormwater BMPs were identified within the study area. All were inventoried by the USACE field crew in 2011 (Table 4-2 BMP Inventory Results), and ratings were assigned based on their conditions (Table 4-3 BMP Inspection Rating Results). The location and type of BMPs are recorded for the inventoried BMPs.

TABLE 4-2 BMP INVENTORY RESULTS

BMP type	Number
Filtration	3
Infiltration	1
Manufactured	3
Miscellaneous	1
Ponds	4

TABLE 4-3 BMP INSPECTION RATING RESULTS

Rating	Number
A	8
B	4
C	0
D	0
E	0

4.2 STORMWATER BMP DATABASE

The data collected from the field assessments was used to create the BMP Database. The BMP database serves as a tracking and record keeping tool, and can also be used to determine the pollutant reductions provided by implementing various BMPs. The BMP Database can be used to create a map of all BMP locations within the installation, by exporting a GIS shapefile. The database is in Microsoft Access format, with forms containing all the inspection results and a digital photograph of each BMP. Should the installation implement any additional stormwater BMPs, the database can be expanded so installation staff can use it to manage their stormwater program over time. A brief user's guide for the BMP Database is located in Appendix B.

Additionally, all historical BMPs have been reported to DEQ.

5 ESTABLISHMENT OF BASELINE POLLUTANT LOADS

Knowledge of baseline (existing) loading conditions for TN, TP and TSS is needed to guide the facilities in their management and implementation of stormwater BMPs to meet the overall Chesapeake Bay TMDL pollution reduction requirements. The Chesapeake Bay Program Watershed Model (CBPWM) is at a macro-scale and typically does not have the level of detail in land use and installation boundary data as was collected in this study. Therefore, independent calculations of baseline pollutant loads, using the best data available, is needed to better understand the actual baseline pollutant contribution from these facilities and what level of improvements, if any, are needed to meet overall Chesapeake Bay TMDL goals.

5.1 METHODOLOGY

Tables provided in the Virginia TMDL Guidance were used to calculate pollutant load rates from JBM-HH (DEQ, 2014). This approach uses tables with established "Edge of Stream" (EOS) loading rates for pervious and impervious land uses in each of the four regional river basins within the Chesapeake Bay watershed – James River, Potomac River, Rappahannock River, and York River. The total existing acreage for each site is then input into the appropriate table and multiplied by the 2009 EOS loading rate to determine the estimated baseline loads.

5.2 RESULTS

JBM-HH falls within the Potomac River watershed. Baseline load rates from the 2009 CBPWM; acres served by JBM-HH's MS4 permit, which excludes the 5.92 acres on JBM-HH within industrial permit areas; and the estimated pollutant loads for JBM-HH based on the 2009 progress run rates are shown in Table 5-1.

TABLE 5-1 BASELINE CALCULATIONS FOR JBM-HH

	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Rate (lbs/acre)	Estimated Total POC Load (lbs) Based on 2009 Progress Run
Regulated Urban Impervious	Nitrogen	127.27	16.86	2,145.77
Regulated Urban Pervious		111.88	10.07	1,126.63
Regulated Urban Impervious	Phosphorus	127.27	1.62	206.18
Regulated Urban Pervious		111.88	0.41	45.87
Regulated Urban Impervious	Suspended Solids	127.27	1,171.32	149,073.90
Regulated Urban Pervious		111.88	175.80	19,668.50

Table 2-b: Calculation Sheet for Estimating Existing Source Loads for the Potomac River (Based on Chesapeake Bay Program Watershed Model Phase 5.3.2) (DEQ, 2015)

6 POLLUTANT LOAD REDUCTIONS

L2 scoping run reductions, presented in the Phase II WIP and enforced through the MS4 permit equate to a reduction of 9 percent of TN loads, 16 percent of TP loads, and 20 percent of TSS loads from impervious regulated acres, and 6 percent of TN loads, 7.25 percent of TP loads and 8.75 percent TSS loads beyond 2009 progress loads for pervious regulated acreage by the end of the third permit cycle. Virginia (VA) TMDL Guidance provides flexibility in the implementation of specific management technologies employed to meet the required reductions, while stipulating standards and/or objectives. MS4 operators will be able to adjust the levels of reduction between pervious and impervious land uses within their service area, provided the total load reduction for each pollutant is met.

Best Management Practices accepted as methods of reducing pollutant loads for TMDL requirements include: street sweeping, urban stream restoration, shoreline restoration, land use change, structural BMPs, urban nutrient management, and nutrient trade. Street Sweeping is credited based on lane miles swept per year. Permittees may receive credit for urban stream restoration, based on linear footage of restoration completed. Shoreline restoration efficiencies are in review by CBP. The methodology under review is based on linear footage of shoreline restored and was used to calculate reductions in this report (Drescher, 2014). Conversion of land use from impervious to pervious or forest land may also receive POC reductions credits based on the acreage changed and type of change. Urban nutrient management plans developed for unregulated, public land smaller than one acre where nutrients are applied may be considered for credit, but have not yet been developed at JBM-HH. Permittees may also offset pollutant loads trading non-point source nutrients in accordance with Virginia Code (DEQ, 2015).

TABLE 6-1 POLLUTION REDUCTION REQUIREMENTS

Pollutant	Regulated Acreage % Load Reduction Target	
	Impervious	Pervious
TN	9%	6%
TP	16%	7.25%
TSS	20%	8.75%

Table 6-2 shows the "Calculation Sheet for Determining Total POC Reductions Required during the Permit Cycle for the Potomac River Basin" provided in the VA TMDL Guidance completed with total existing acres served by JBM-HH's MS4 permit for regulated urban impervious and pervious land uses and the resulting reduction required by applying the reduction loading rate provided in the fourth column (DEQ, 2015).

TABLE 6-2 FIRST PERMIT CYCLE REDUCTIONS

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)	Total Reduction Required First Permit Cycle (lbs/yr)
Regulated Urban Impervious	Nitrogen	127.27	0.08	10.18
Regulated Urban Pervious		111.88	0.03	3.36
Regulated Urban Impervious	Phosphorus	127.27	0.01	1.27
Regulated Urban Pervious		111.88	0.001	0.11
Regulated Urban Impervious	Total Suspended Solids	127.27	11.71	1,490.33
Regulated Urban Pervious		111.88	0.77	86.15

Table 3 b: Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the Potomac River Basin (*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

2009 progress run estimated pollutant loads were applied to the load reduction targets to calculate pollutant load reductions required for each of the three permit cycles at JBM-HH, shown in Table 6-3 .

TABLE 6-3 POLLUTANT REDUCTIONS REQUIRED FOR JBM-HH, BY PERMIT CYCLE

Pollutant	First Permit Cycle Reductions (lbs) 5% by 2018	Second Permit Cycle Reductions (lbs) 35% by 2023	Third Permit Cycle Reductions (lbs) 100% by 2028
TN	13.54	94.78	270.80
TP	1.38	9.66	27.60
TSS	1,576.48	11,035.36	31,529.60

6.1 STRUCTURAL BMPS

Areas of Interest (AOIs) were identified by studying the digitized land use maps for concentrated areas of urban impervious and pervious land uses, which are untreated and within the regulated MS4 area. Those areas that have existing stormwater infrastructure were given higher priority, as that infrastructure makes it easier and less expensive to convey the water running off of that area to a BMP, as long as there is adjacent land available to accommodate a BMP. Certain soil types require less work to build BMPs, so soil type was considered for BMP site recommendations as well. Choosing specific BMP types and sizing requires extensive

engineering design analysis, which is appropriate for the design phase of a project and too detailed for this planning study.

VA TMDL Guidance provided a table of CBP BMP load reduction efficiencies, which were used to calculate BMP pollutant removal rates. Soil, site conditions and high pollutant removal rates narrowed structural BMP choices recommended for JBM-HH to bioretention, permeable pavement and swales. These BMP types and efficiencies are shown in Table 6-4. Green roofs are another favorable BMP choice; however, there are limited opportunities for this type of BMP at JBM-HH, so it was not considered a recommended practice. A green roof is recommended for AOI 6a, but this was considered a special circumstance.

TABLE 6-4 CHESAPEAKE BAY PROGRAM BMPS AND EFFICIENCIES

Chesapeake Bay Program BMPs, Established Efficiencies			
	TN	TP	TSS
Bioretention A/B soils, no underdrain	80%	85%	90%
Bioswale	70%	75%	80%
Permeable Pavement w/ Sand, Veg. A/B soils, no underdrain	80%	80%	85%

Load reductions estimated for each proposed AOI and the percentage of the total reduction requirements are shown in Table 6-5. Details for each of the AOIs can be found in Appendix A.

There are three BMPs currently in the design phase within AOI 6 and AOI 7 – one green roof and one parking lot with permeable pavers in AOI 6, and one bioswale in AOI 7. In order to accurately represent the ongoing efforts in the implementation schedule, AOI 6 and AOI 7 have each been split into two subsections. AOI 6a (0.36 acres) and AOI 7a (0.34 acres) will represent the drainage areas for the BMPs currently in design, and AOI 6b and AOI 7b will represent the remaining areas within the AOIs, as there are additional opportunities in those areas.

Table 6-5 Load Reductions for each AOI

AOI	BMP TYPE	Baseline Load (lb/yr)			Proposed BMP Reduction (lb/yr)			Percent of Total Goal		
		N	P	TSS	N	P	TSS	N	P	TSS
1	Bioretention	82.88	7.87	5,673.89	66.30	6.69	5,160.50	25%	18%	16%
	BioSwale	82.88	7.87	5,673.89	58.02	5.90	4,539.11	22%	16%	14%
	Perm Pavers	82.88	7.87	5,673.89	66.30	6.30	4,822.81	25%	17%	15%
2	Bioretention	80.73	6.57	4,487.54	64.58	5.59	4,038.79	25%	15%	13%
	BioSwale	80.73	6.57	4,487.54	56.51	4.93	3,590.03	22%	14%	11%
	Perm Pavers	80.73	6.57	4,487.54	64.58	5.26	3,814.41	25%	15%	12%
3	Bioretention	178.18	13.92	9,372.31	142.54	11.83	8,435.10	55%	33%	27%
	BioSwale	178.18	13.92	9,372.31	124.73	10.44	7,497.85	48%	29%	24%
	Perm Pavers	178.18	13.92	9,372.31	142.54	11.14	7,966.46	55%	31%	25%
4	Bioretention	210.63	17.58	12,140.05	168.50	14.94	10,926.05	65%	41%	35%
	BioSwale	210.63	17.58	12,140.05	147.44	13.19	9,712.04	57%	36%	31%
	Perm Pavers	210.63	17.58	12,140.05	168.50	14.06	10,319.04	65%	39%	33%
5	Bioretention	113.74	8.52	5,633.90	91.0	7.24	5,070.51	35%	20%	16%
	BioSwale	113.74	8.52	5,633.90	79.62	6.39	4,507.12	31%	18%	14%
	Perm Pavers	113.74	8.52	5,633.90	91.0	6.82	4,788.82	35%	19%	15%
6a	Bioretention	6.07	0.58	421.68	4.86	0.50	379.51	2%	1%	1%
	BioSwale	6.07	0.58	421.68	4.25	0.45	337.34	2%	1%	1%
	Perm Pavers	6.07	0.58	421.68	4.86	0.46	358.43	2%	1%	1%
6b	Bioretention	31.81	2.42	1,607.75	25.45	2.06	1,446.98	10%	6%	5%
	BioSwale	31.81	2.42	1,607.75	22.27	1.82	1,286.2	9%	5%	4%
	Perm Pavers	31.81	2.42	1,607.75	25.45	1.94	1,366.59	10%	5%	4%
7a	Bioretention	5.12	0.44	308.65	4.10	0.37	277.79	2%	1%	1%
	BioSwale	5.12	0.44	308.65	3.58	0.33	246.92	1%	1%	1%
	Perm Pavers	5.12	0.44	308.65	4.10	0.35	262.35	2%	1%	1%
7b	Bioretention	35.35	2.73	1,827.38	28.28	2.32	1,644.64	11%	6%	5%
	BioSwale	35.35	2.73	1,827.38	24.75	2.05	1,461.9	9%	6%	5%
	Perm Pavers	35.35	2.73	1,827.38	28.28	2.18	1,553.27	11%	6%	5%

6.2 ALTERNATIVE CREDITS

In addition to structural BMPs, permittees may receive credit for land use change, urban nutrient management, nutrient trading and urban stream restoration. Any conversion of land use from urban impervious to pervious or to forest can receive credit for pollutant removal, as explained in the VA TMDL Guidance (DEQ, 2015). Urban nutrient management plans developed for unregulated, public land smaller than one acre where nutrients are applied may be considered for credit. Permittees may offset pollutant loads trading non-point source nutrients in accordance with Virginia Code. Permittees may also receive credit for urban stream restoration, based on the reduction of nutrients entering streams as a result of the restoration.

6.3 LAND USE CREDITS

Building 406, a former barracks building, was demolished in 2014 and the land was converted from impervious surface to grass. The resulting pollutant reductions are shown in Table 6-5.

TABLE 6-6 BUILDING CONVERSION POLLUTANT REDUCTION AT JBM-HH

	Impervious Acres Converted (ac)	Pollution Reduction Rate for Conversion to Grass (lbs/ac/yr)	Reduction for Conversion (lb/yr)	Percent of Total Goal
TN	1.20	12.56	15.07	6%
TP	1.20	1.34	1.61	4%
TSS	1.20	623.28	747.94	2%

FIGURE 6-1 BUILDING DEMOLITION SITE MAP

6.4 STREET SWEEPING

JBM-HH already has a street sweeping program in place; however, the sweeper being used does not meet the criteria to qualify for alternative credits for this practice. Should JBM-HH purchase the equipment that would meet the qualifications, then credits could be given for the street sweeping program.

Based on the area already being swept by JBM-HH, the Qualifying Lanes Method detailed in the VA TMDL Guidance was used to estimate what the pollutant reductions would be if a vacuum-assisted or regenerative air sweeper was purchased.

JBM-HH currently only sweeps the main roads on the installation, which make up approximately 11 acres. Assuming that 15% of these roads are swept on a monthly basis, 19.8 acres per year would be swept in the aggregate. The VA TMDL Guidance provides a pre-sweeping annual nutrient load of 15.4 lbs/impervious acre/yr for TN and 2 lbs/impervious acre/yr of TP. No annual nutrient loads were provided for TSS, so Potomac River impervious surface baseline load rates were used. The pickup factors for this type of sweeper are 0.05 lbs per year of TN, 0.06 lbs per year of TP and 0.25 lbs per year of TSS. Impervious acres swept per year were multiplied by the pre-sweeping annual nutrient load rates (where provided), then by the pickup factors supplied in the guidance to get the reductions per year shown in Table 6-7 (DEQ, 2015).

TABLE 6-7 STREET SWEEPING REDUCTIONS

	TN	TP	TSS
Regenerative/Vacuum Street Sweeping of ~ 20 acres per year	15.25	2.38	5,798.04

6.5 IMPLEMENTATION SCHEDULE

VA TMDL Guidance provides a timeline for when these pollutant load reductions must be implemented, as described in Table 6-3.

In addition to the pollution reduction credits attributed to the 2014 building demolition and land use conversion, seven AOIs are recommended to treat the stormwater and runoff at JBM-HH. These AOIs are listed in priority order in Table 6-8.

The building demolition and land conversion, along with the implementation of BMPs proposed in AOI 6a, 7a, and 6b will satisfy the first permit cycle requirements. The required 5% is almost met with just the land conversion and planned BMPs in AOI 6a and 7a, so only a small portion of AOI 6b would need to be addressed by 2018 to meet the 5% requirement. Implementation of BMPs in AOIs 7b and 3 will satisfy the second permit cycle requirements. Implementation of BMPs in AOIs 2, 1, 5, and 4 will satisfy the remainder of the L2 reductions required by 2028.

If the required equipment is purchased, the street sweeping program described above in Section 6.4 could be used in place of AOIs 1, 2, or 5 to meet the required reductions by 2028.

TABLE 6-8 PROPOSED AOIS IN PRIORITY ORDER

	BMP Pollution Reduction (lb/yr)			Cumulative Percent of Total Goal		
AOI	TN	TP	TSS	TN	TP	TSS
Bldg Demo/Land Conversion	15.07	1.61	747.94	6%	4%	2%
6a	4.16	0.40	316.26	8%	5%	3%
7a	3.93	0.35	262.35	10%	6%	4%
6b	24.39	1.93	1,366.59	19%	11%	8%
7b	27.10	2.18	1,553.27	29%	17%	13%
3	137.20	11.14	7,966.46	82%	48%	38%
2	62.16	5.26	3,814.41	106%	62%	50%
1	63.54	6.30	4,822.81	130%	79%	65%
5	87.58	6.82	4,788.82	164%	98%	80%
4	162.19	14.06	10,319.04	226%	137%	113%

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7 COSTS

Virginia TMDL Guidance does not provide a tool for estimating BMP costs. Generalized, planning-level construction costs are provided for the proposed BMPs using the *Costs of Stormwater Management Practices in Maryland*. This table was developed using data from Virginia as well as Maryland, and based on impervious acre treated by the BMP (Hagan, 2011).

The same BMPs were used for both cost estimating and pollutant load reductions. The rate for bioswale ($42,000), bioretention ($46,875) and permeable pavers ($335,412) was averaged to get one cost per impervious acre treated ($141,429), as shown in Table 7-1.

At the project planning level, relative cost information is useful for a broad comparison of relative financial commitments required to site, design, and construct each BMP. Costs estimated for each AOI are listed in Table 7-2.

TABLE 7-1 BMP COST

	Pre-Construction	Construction Cost	Total Initial Costs
Bioretention (New - Suburban)	$9,375	$37,500	$46,875
Bioswale (New)	$12,000	$30,000	$42,000
Permeable Pavement w/ Sand, Veg. (New)	$30,492	$304,920	$335,412
Average			$141,429

(Hagan, 2011)

TABLE 7-2 BMP CONSTRUCTION COSTS FOR PROPOSED AOIS

AOI	Impervious Acres Treated	New Suburban Cost
1	4.82	$ 681,688
2	3.51	$ 496,416
3	7.14	$ 1,009,803
4	9.65	$ 1,364,790
5	4.16	$ 588,345
6a	0.36	$ 50,914
6b	1.20	$ 169,715
7a	0.25	$ 35,357
7b	1.38	$ 195,172

Several variables to be explored in later phases of the study can greatly affect the cost to implement a BMP, such as utility placement, regional specific permits, unexploded ordinance surveys, type of contract, acquisition strategy, and real property. With further investigation, these areas of interest can be prioritized based on the cost of logistics to construct the BMPs and divert stormwater to them.

Planning level, order-of-magnitude initial construction costs for the seven AOIs total approximately $4.6 million (Hagan, 2011). These seven AOIs, in addition to the building demolition/land use conversion that took place in 2014, will exceed the L2 reduction requirements through 2028.

8 CONCLUSIONS

The purpose of this study is to provide technical data pertaining to the Chesapeake Bay TMDL Action Plan for JBM-HH. This was executed by locating, inventorying, and assessing the condition of existing stormwater BMPs, quantifying source loads for TN, TP, and TSS within the installation boundary and identifying opportunities to reduce pollutant loads to the Chesapeake Bay.

The results of this investigation conclude that approximately 3,272.40 lbs of TN, 252.05 lbs of TP and 168,742.40 lbs of TSS are loaded into waterways from JBM-HH per year, based on 2009 land use data. JBM-HH must reduce their nutrient loads by 260.72 lbs of TN, 36.31 lbs of TP and 31,535.77 lbs of TSS by the end of the third MS4 permit cycle in 2028.

Seven areas where new stormwater BMPs may be implemented to meet those reduction requirements have been identified. The cost to implement the proposed structural BMPs proposed to meet these requirements is approximately $4.6 million.

JBM-HH will release the Action Plan information to the public on or around 1 August 2015. It will be available for comment for 30 days, and will be accessible by phone or email request. The "public," as defined by JBM-HH's MS4 Program Plan is "the resident and employee population within the fence line of the facility" (JBM-HH, 2013). Therefore, the Action Plan will only be released via installation media outlets, including the weekly newspaper, the Pentagram, and the installation Facebook page.

A BMP database was created to store and organize data collected from the BMP inventory conducted as a part of this study; it also provides the installation with a tool to track L2 reduction progress and generate annual progress reports.

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APPENDIX A

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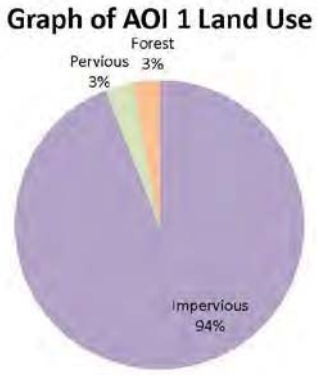
I. Location and General Information

AOI 1

N 0 237.5 475 950 Feet

JBM-HH Area of Interest 1 is located along Forrest Circle. It is on the northwestern side of the installation and consists of approximately eight buildings, and a parking area.

N 0 140 280 560 Feet



JBM-HH Area of Interest 1 consists of:
4.82 acres of impervious surface,
0.16 acres of pervious surface, and
0.15 acres of forest.

N

0 255 510 1,020 Feet

Stormwater BMPs from Table 6-4 were applied to the above AOI.

The baseline load rates below were calculated using 2009 EOS Rates Provided in the Virginia TMDL Guidance and applied to land use delineated by USACE using 2009 aerials.

Baseline Loads (lb/yr)		
TN	TP	TSS
82.88	7.87	5,673.89

The pollution reductions below were calculated by applying CBP reduction efficiency rates to baseline loads shown above. The table shows how many pounds of N, P, and SS will be reduced by the proposed BMPs in AOI 1.

Proposed BMP Reduction (lb/yr)			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	66.30	6.69	5,106.50
Bioswale	58.02	5.90	4,539.11
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	66.30	6.30	4,822.81

The Table below shows the portion of the total L2 Reduction Goals required by 2028 that treatment of AOI 1 will satisfy.

Percent of Total Goal			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	25%	18%	16%
Bioswale	22%	16%	14%
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	25%	17%	15%

Initial planning level construction costs were calculated using the "Cost of Stormwater Management Practices in Maryland" table. This tool is based on impervious acreage in AOI 1 (4.82 acres).

These estimates include capital, labor, material and overhead costs, but not land or maintenance costs.

Several variables to be explored in later phases of the study can greatly affect the cost to implement a BMP, such as utility placement, regional specific permits, unexploded ordinance surveys, type of contract, acquisition strategy, and real property.

Impervious Acres	New Suburban Cost
4.82	$681,688

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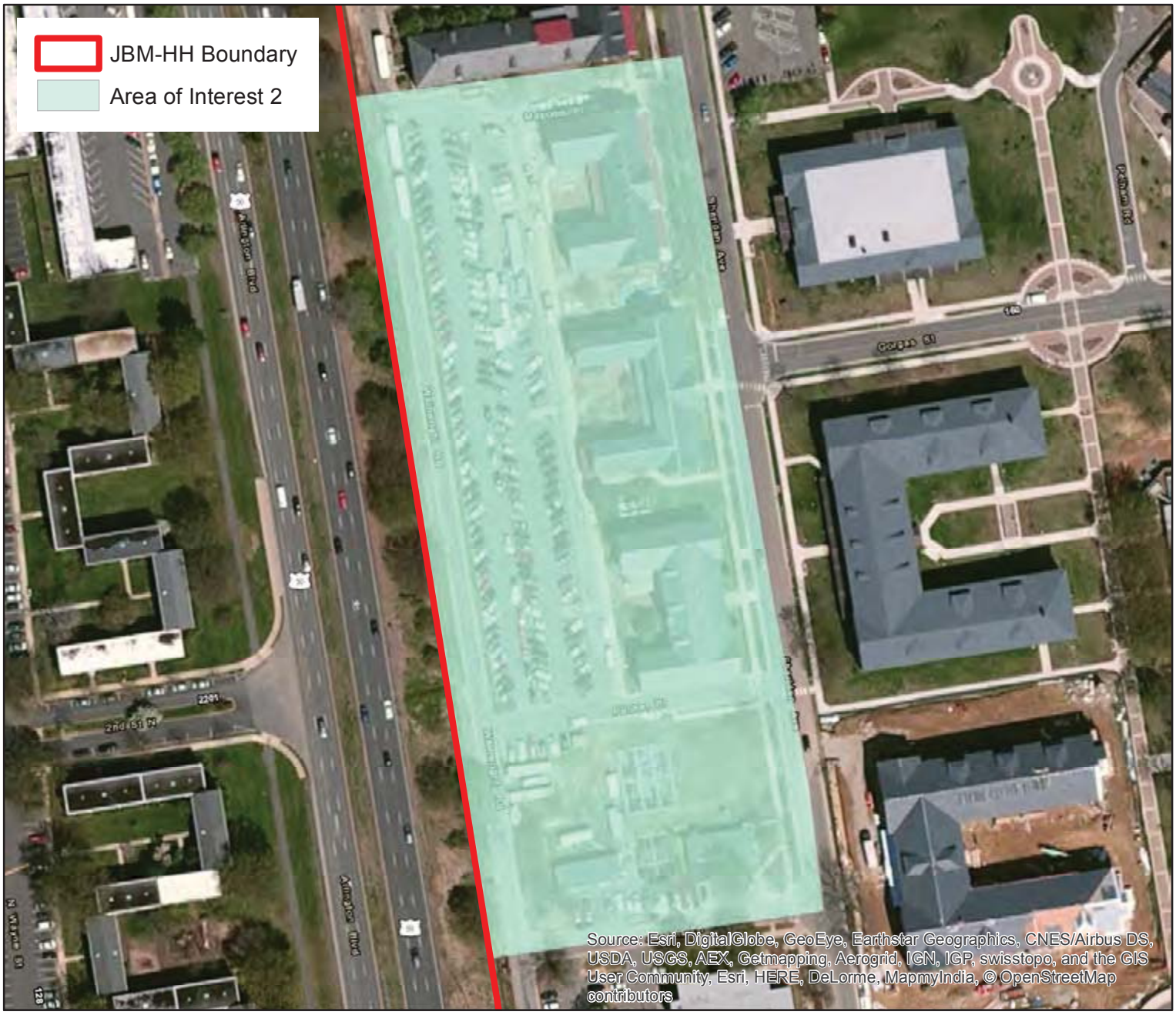
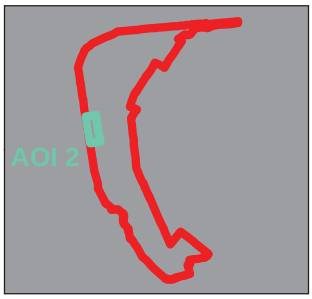
I. Location and General Information

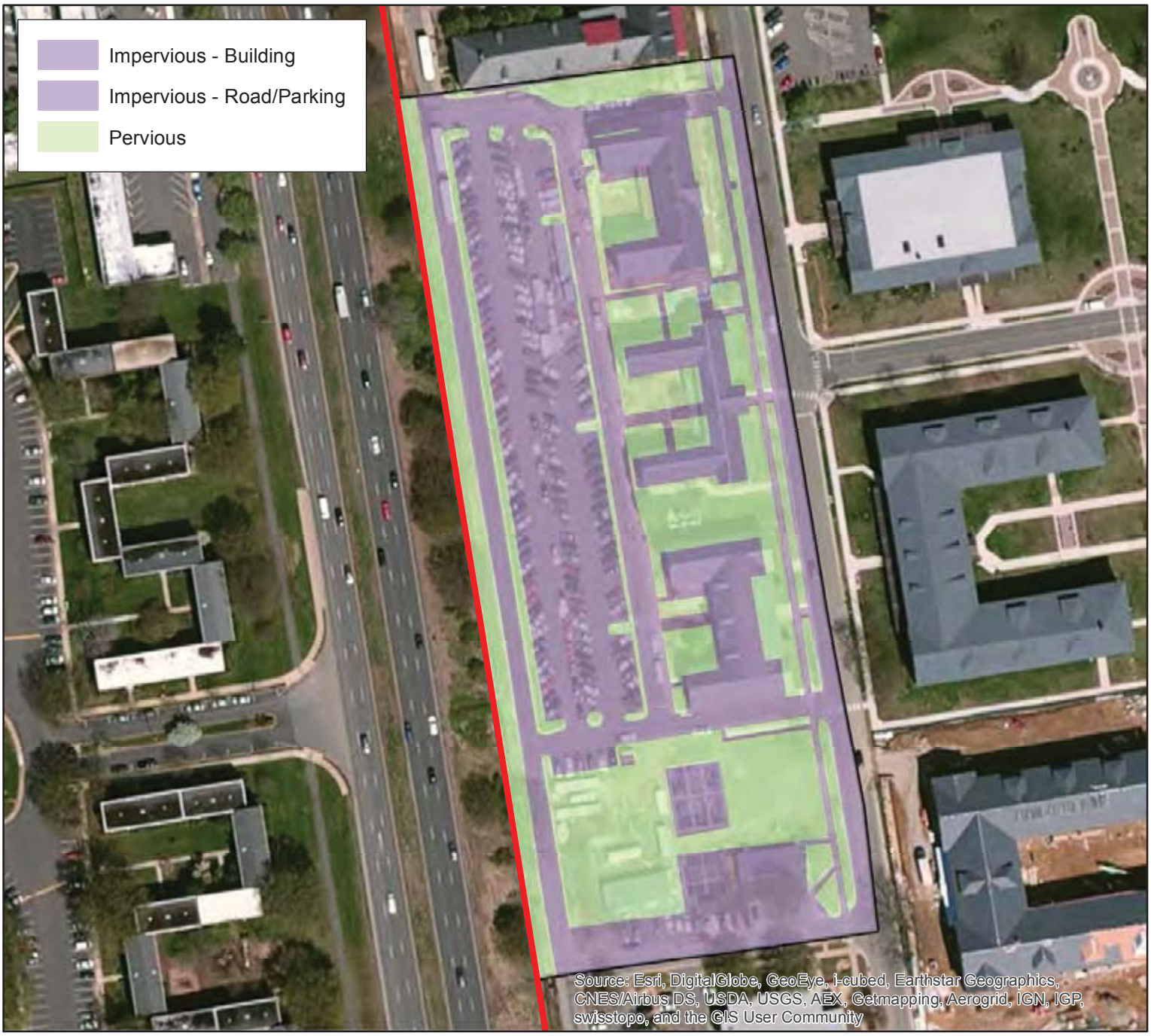
AOI 2



N 0 185 370 740 Feet

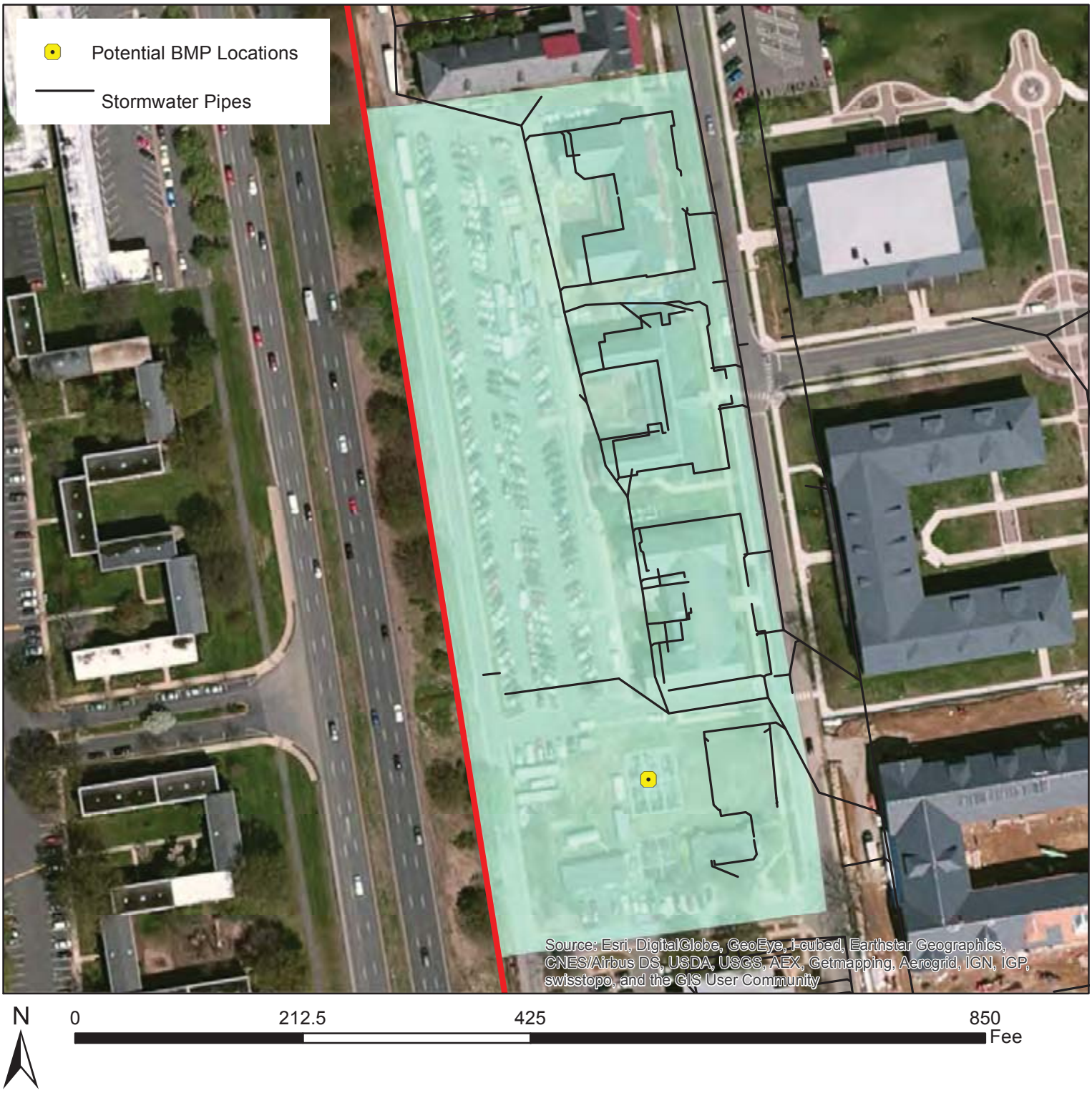
JBM-HH Area of Interest 2 is located along Sheridan Avenue between Macomb Place and Pitcher Place. It is on the western edge of the installation and consists of approximately three buildings and a parking area.





N 0 115 230 460 Feet

JBM-HH Area of Interest 2 consists of:
3.51 acres of impervious surface and
2.14 acres of pervious surface.



Stormwater BMPs from Table 6-4 were applied to the above AOI.

The baseline load rates below were calculated using 2009 EOS Rates Provided in the Virginia TMDL Guidance and applied to land use delineated by USACE using 2009 aerials.

Baseline Loads (lb/yr)		
TN	TP	TSS
80.73	6.57	4,487.54

The pollution reductions below were calculated by applying CBP reduction efficiency rates to baseline loads shown above. The table shows how many pounds of N, P, and SS will be reduced by the proposed BMPs in AOI 2.

Proposed BMP Reduction (lb/yr)			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	64.58	5.59	4,038.79
Bioswale	56.51	4.93	3,590.03
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	64.58	5.26	3,814.41

The Table below shows the portion of the total L2 Reduction Goals required by 2028 that treatment of AOI 2 will satisfy.

Percent of Total Goal			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	25%	15%	13%
Bioswale	22%	14%	11%
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	25%	15%	12%

Initial planning level construction costs were calculated using the "Cost of Stormwater Management Practices in Maryland" table. This tool is based on impervious acreage in AOI 2 (3.51 acres).

These estimates include capital, labor, material and overhead costs, but not land or maintenance costs.

Several variables to be explored in later phases of the study can greatly affect the cost to implement a BMP, such as utility placement, regional specific permits, unexploded ordinance surveys, type of contract, acquisition strategy, and real property.

Impervious Acres	New Suburban Cost
3.51	$496,416

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I. Location and General Information

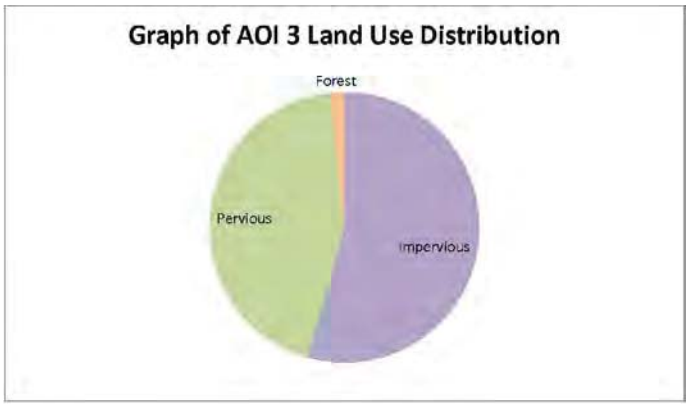
AOI 3

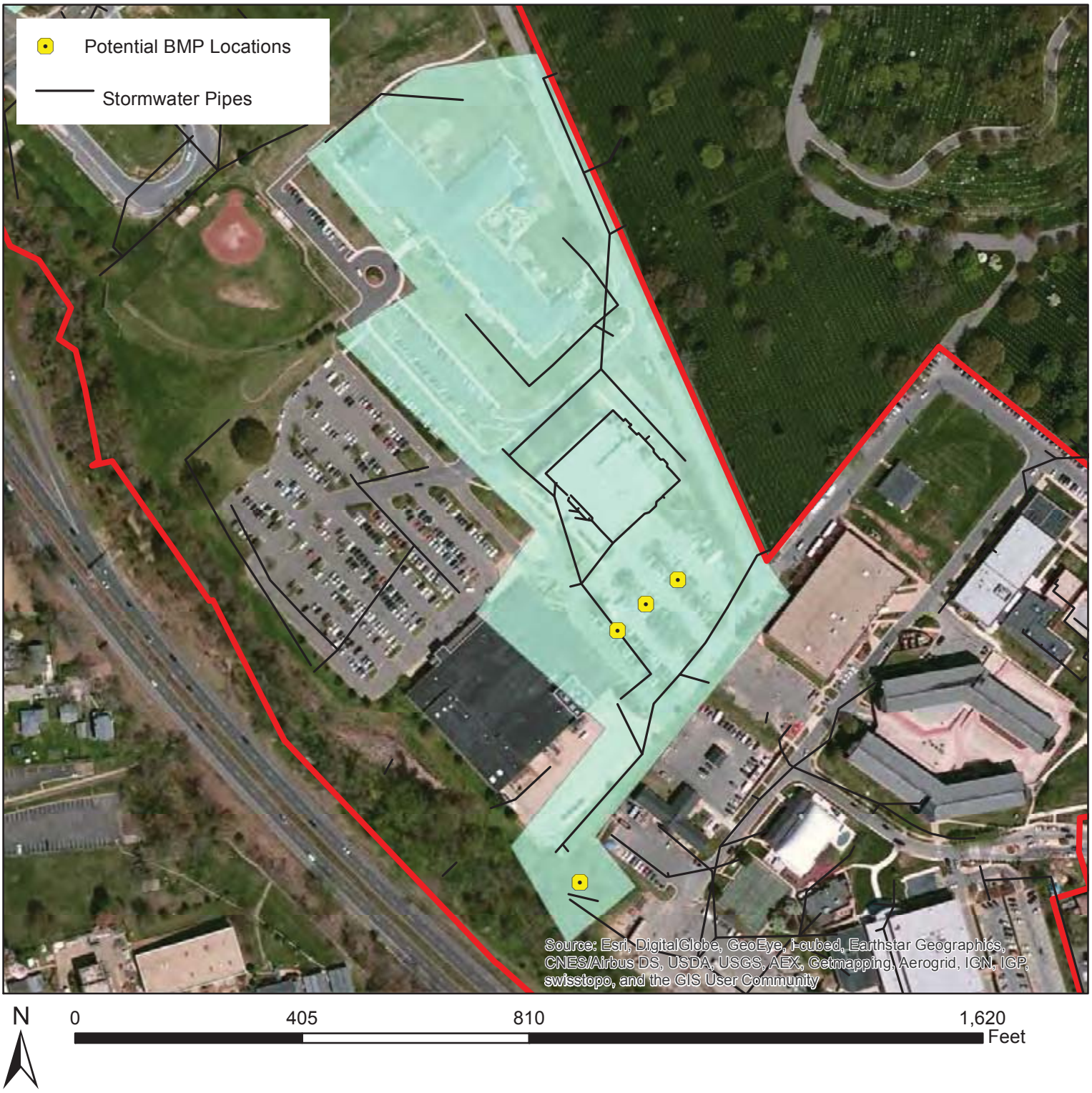
N 0 355 710 1,420 Feet

JBM-HH Area of Interest 3 is located along Carpenter Road and continues down between the Commissary and Northeast Road. It is on the eastern edge of the installation and consists of approximately two buildings and several parking areas.

N 0 225 450 900 Feet

JBM-HH Area of Interest 3 consists of:
7.14 acres of impervious surface,
5.74 acres of pervious surface, and
0.22 acres of forest.





Stormwater BMPs from Table 6-4 were applied to the above AOI.

The baseline load rates below were calculated using 2009 EOS Rates Provided in the Virginia TMDL Guidance and applied to land use delineated by USACE using 2009 aerials.

Baseline Loads (lb/yr)		
TN	TP	TSS
178.18	13.92	9,372.31

The pollution reductions below were calculated by applying CBP reduction efficiency rates to baseline loads shown above. The table shows how many pounds of N, P, and SS will be reduced by the proposed BMPs in AOI 3.

Proposed BMP Reduction (lb/yr)			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	142.54	11.83	8,435.10
Bioswale	124.73	10.44	7,497.85
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	142.54	11.14	7,966.46

The Table below shows the portion of the total L2 Reduction Goals required by 2028 that treatment of AOI 3 will satisfy.

Percent of Total Goal			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	55%	33%	27%
Bioswale	48%	29%	24%
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	55%	31%	25%

Initial planning level construction costs were calculated using the "Cost of Stormwater Management Practices in Maryland" table. This tool is based on impervious acreage in AOI 3 (7.14 acres).

These estimates include capital, labor, material and overhead costs, but not land or maintenance costs.

Several variables to be explored in later phases of the study can greatly affect the cost to implement a BMP, such as utility placement, regional specific permits, unexploded ordinance surveys, type of contract, acquisition strategy, and real property.

Impervious Acres	New Suburban Cost
7.14	$1,009,803

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I. Location and General Information

AOI 4

N 0 412.5 825 1,650 Feet

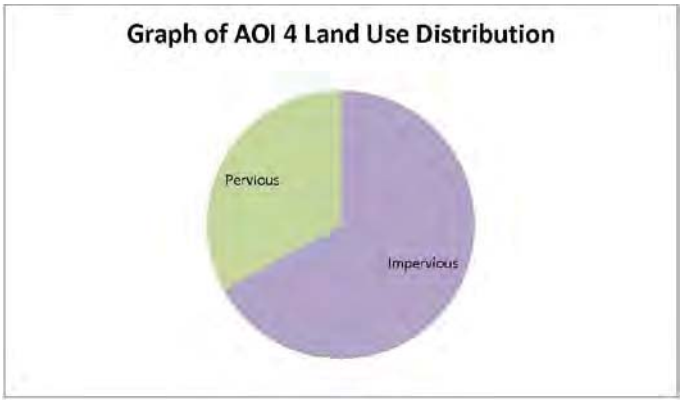
JBM-HH Area of Interest 4 is located between McNair Road and the eastern edge of the facility. It runs past the recreation center and south to include the chapel and PX. The AOI consists of approximately three buildings and several parking areas.

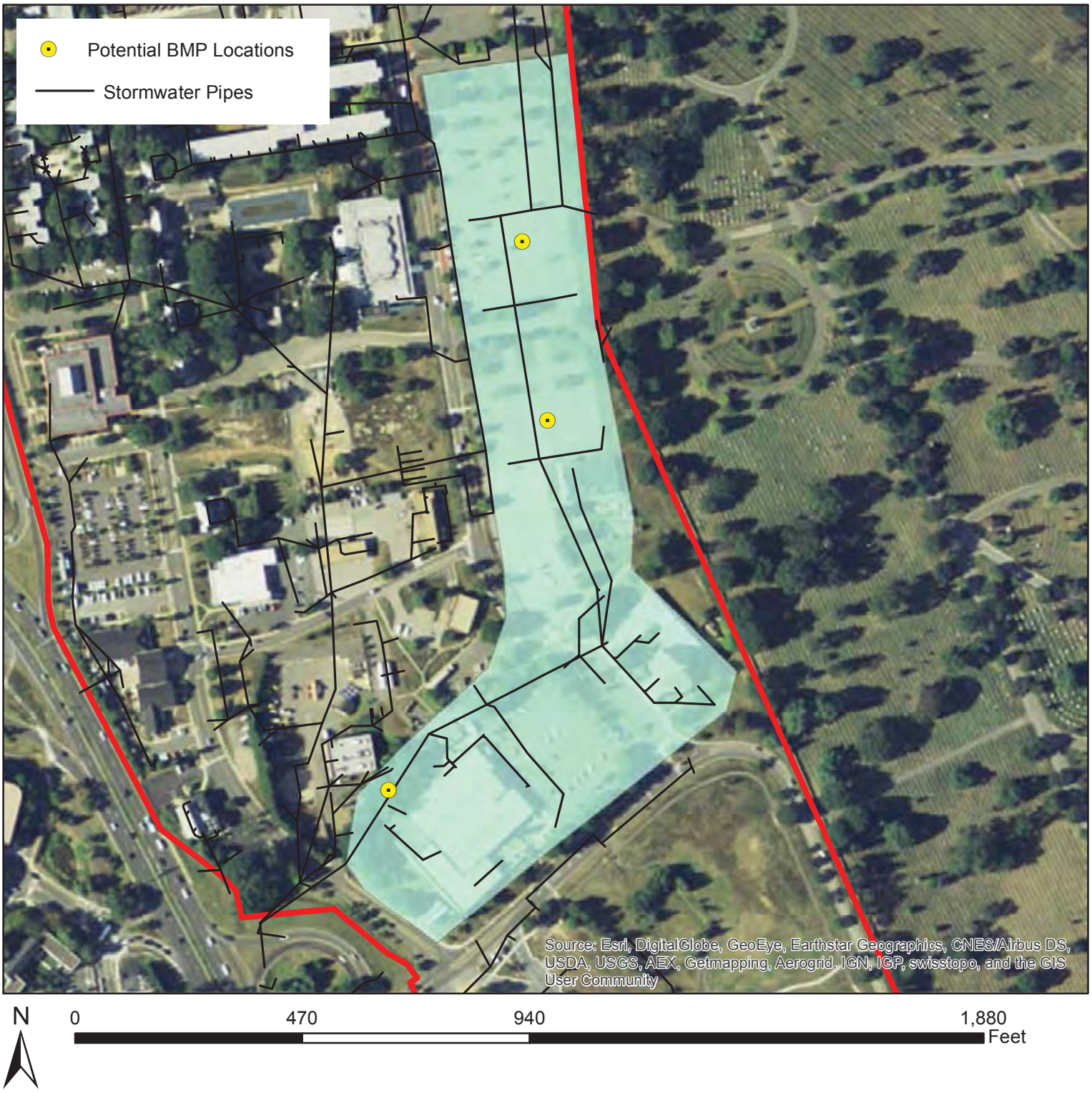
Impervious - Building
Impervious - Road/Parking
Pervious

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

N 0 260 520 1,040 Feet

JBM-HH Area of Interest 4 consists of:
9.65 acres of impervious surface and
4.76 acres of pervious surface.





Stormwater BMPs from Table 6-4 were applied to the above AOI.

The baseline load rates below were calculated using 2009 EOS Rates Provided in the Virginia TMDL Guidance and applied to land use delineated by USACE using 2009 aerials.

Baseline Loads (lb/yr)		
TN	TP	TSS
210.63	17.58	12,140.05

The pollution reductions below were calculated by applying CBP reduction efficiency rates to baseline loads shown above. The table shows how many pounds of N, P, and SS will be reduced by the proposed BMPs in AOI 4.

Proposed BMP Reduction (lb/yr)			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	168.50	14.94	10,926.05
Bioswale	147.44	13.19	9,712.04
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	168.50	14.06	10,319.04

The Table below shows the portion of the total L2 Reduction Goals required by 2028 that treatment of AOI 4 will satisfy.

Percent of Total Goal			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	65%	41%	35%
Bioswale	57%	36%	31%
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	65%	39%	33%

Initial planning level construction costs were calculated using the "Cost of Stormwater Management Practices in Maryland" table. This tool is based on impervious acreage in AOI 4 (9.65 acres).

These estimates include capital, labor, material and overhead costs, but not land or maintenance costs.

Several variables to be explored in later phases of the study can greatly affect the cost to implement a BMP, such as utility placement, regional specific permits, unexploded ordinance surveys, type of contract, acquisition strategy, and real property.

Impervious Acres	New Suburban Cost
9.65	$1,364,790

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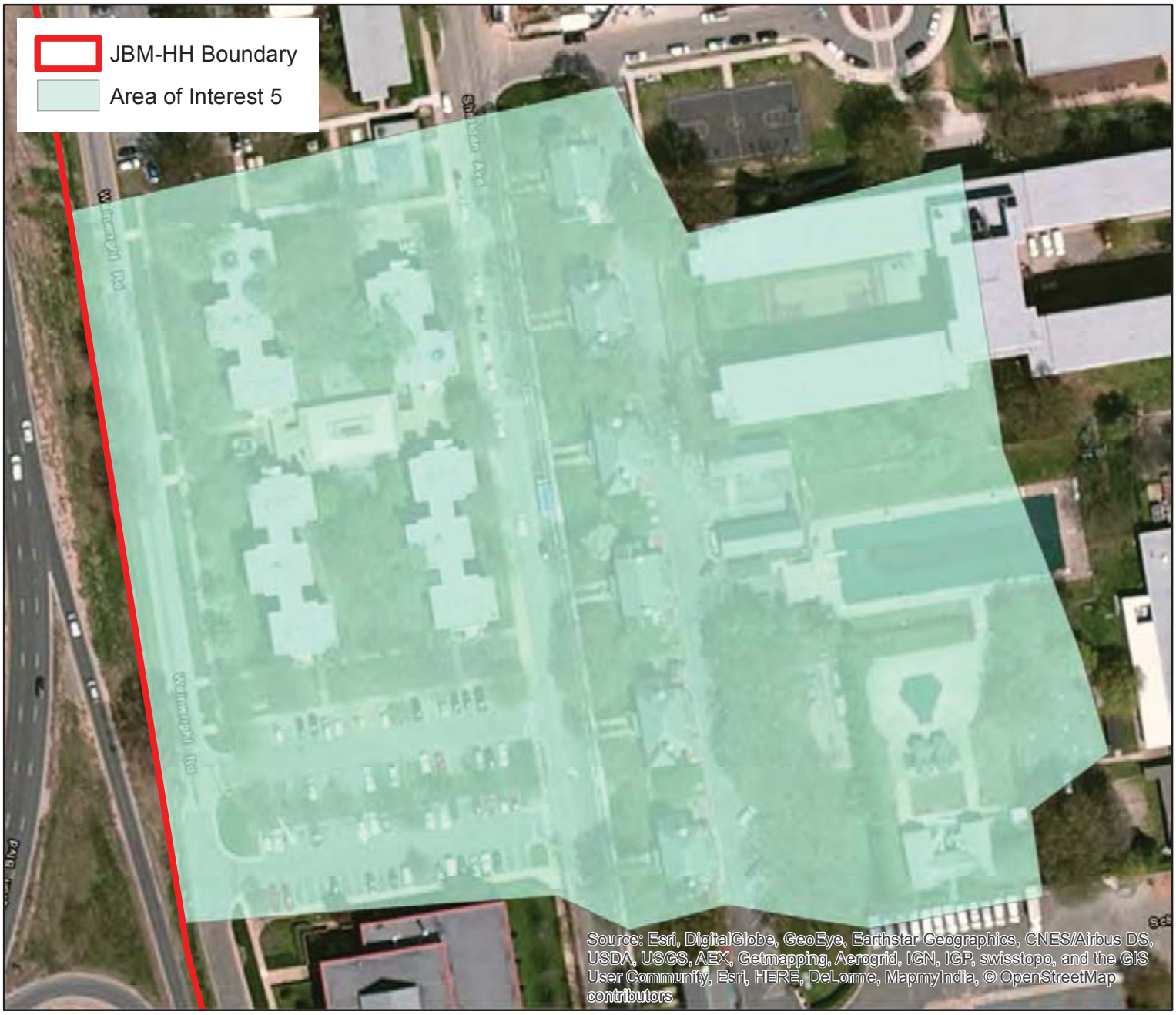
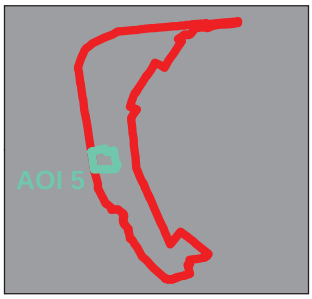
I. Location and General Information AOI 5



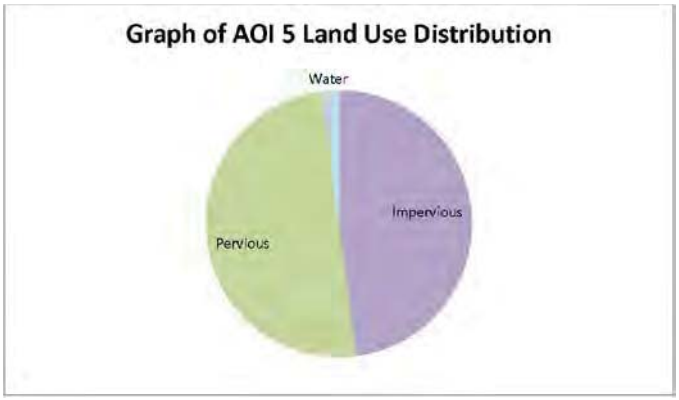
N 0 150 300 600 Feet

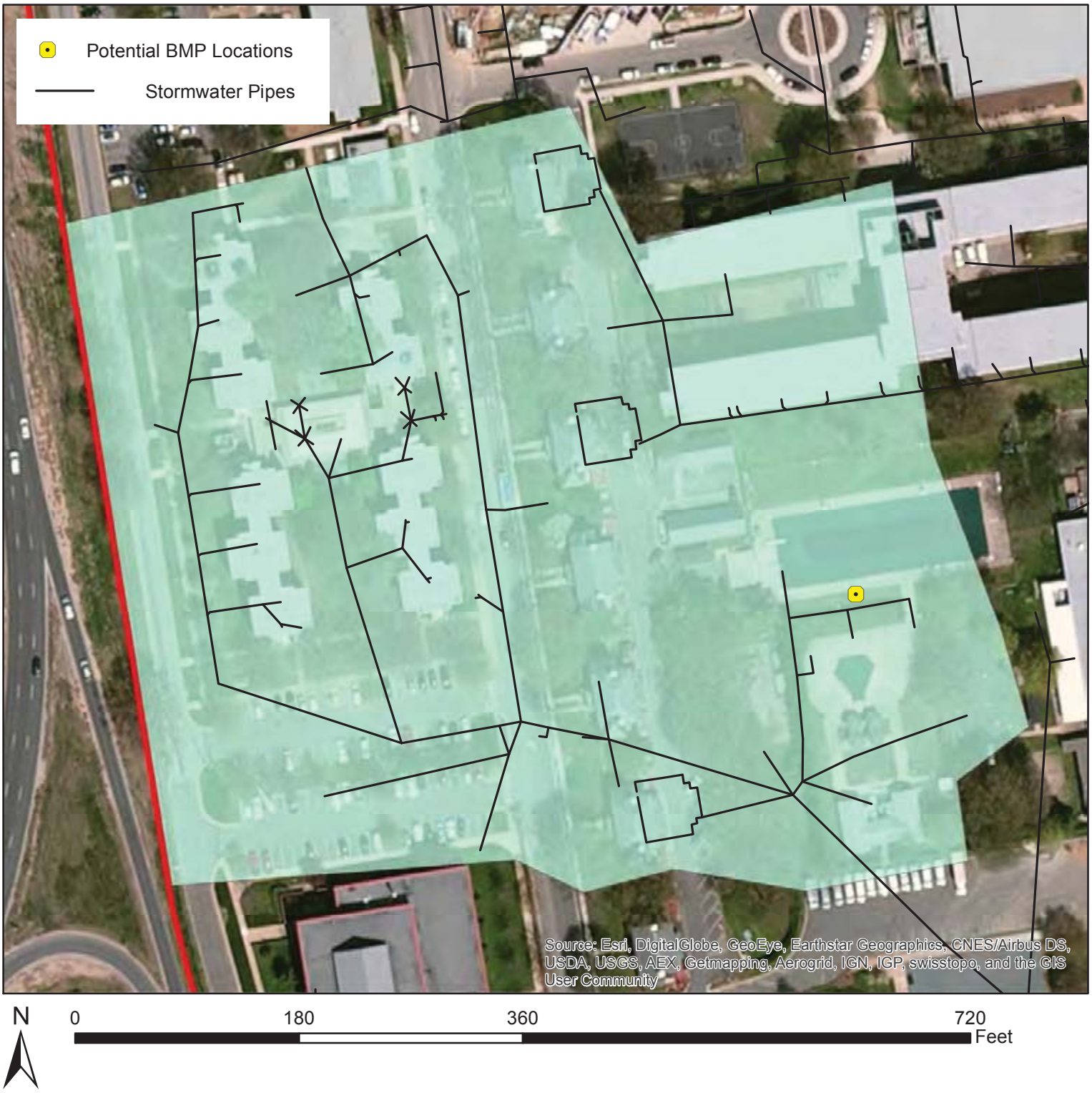


JBM-HH Area of Interest 5 is located along Sheridan Avenue on the western edge of the facility. It runs between Pitcher Place and Abrams Lane, and covers part of the recreation center grounds. The AOI consists of approximately ten buildings and several roads and lawn areas.

N 0 120 240 480 Feet

JBM-HH Area of Interest 5 consists of:
4.16 acres of impervious surface,
4.33 acres of pervious surface, and
0.19 acres of water.





Stormwater BMPs from Table 6-4 were applied to the above AOI.

The baseline load rates below were calculated using 2009 EOS Rates Provided in the Virginia TMDL Guidance and applied to land use delineated by USACE using 2009 aerials.

Baseline Loads (lb/yr)		
TN	TP	TSS
113.74	8.52	5,633.90

The pollution reductions below were calculated by applying CBP reduction efficiency rates to baseline loads shown above. The table shows how many pounds of N, P, and SS will be reduced by the proposed BMPs in AOI 5.

Proposed BMP Reduction (lb/yr)			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	91.0	7.24	5,070.51
Bioswale	79.62	6.39	4,507.12
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	91.0	6.82	4,788.82

The Table below shows the portion of the total L2 Reduction Goals required by 2028 that treatment of AOI 5 will satisfy.

Percent of Total Goal			
BMP TYPE	TN	TP	TSS
Bioretention A/B Soils, no underdrain	35%	20%	16%
Bioswale	31%	18%	14%
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	35%	19%	15%

Initial planning level construction costs were calculated using the "Cost of Stormwater Management Practices in Maryland" table. This tool is based on impervious acreage in AOI 5 (4.16 acres).

These estimates include capital, labor, material and overhead costs, but not land or maintenance costs.

Several variables to be explored in later phases of the study can greatly affect the cost to implement a BMP, such as utility placement, regional specific permits, unexploded ordinance surveys, type of contract, acquisition strategy, and real property.

Impervious Acres	New Suburban Cost
4.16	$588,345

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I. Location and General Information

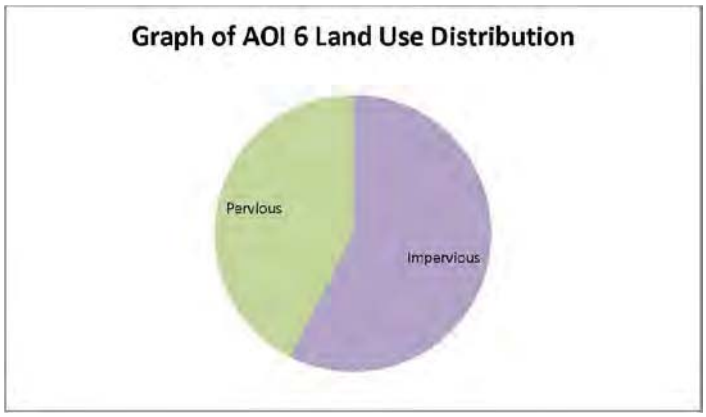
AOI 6

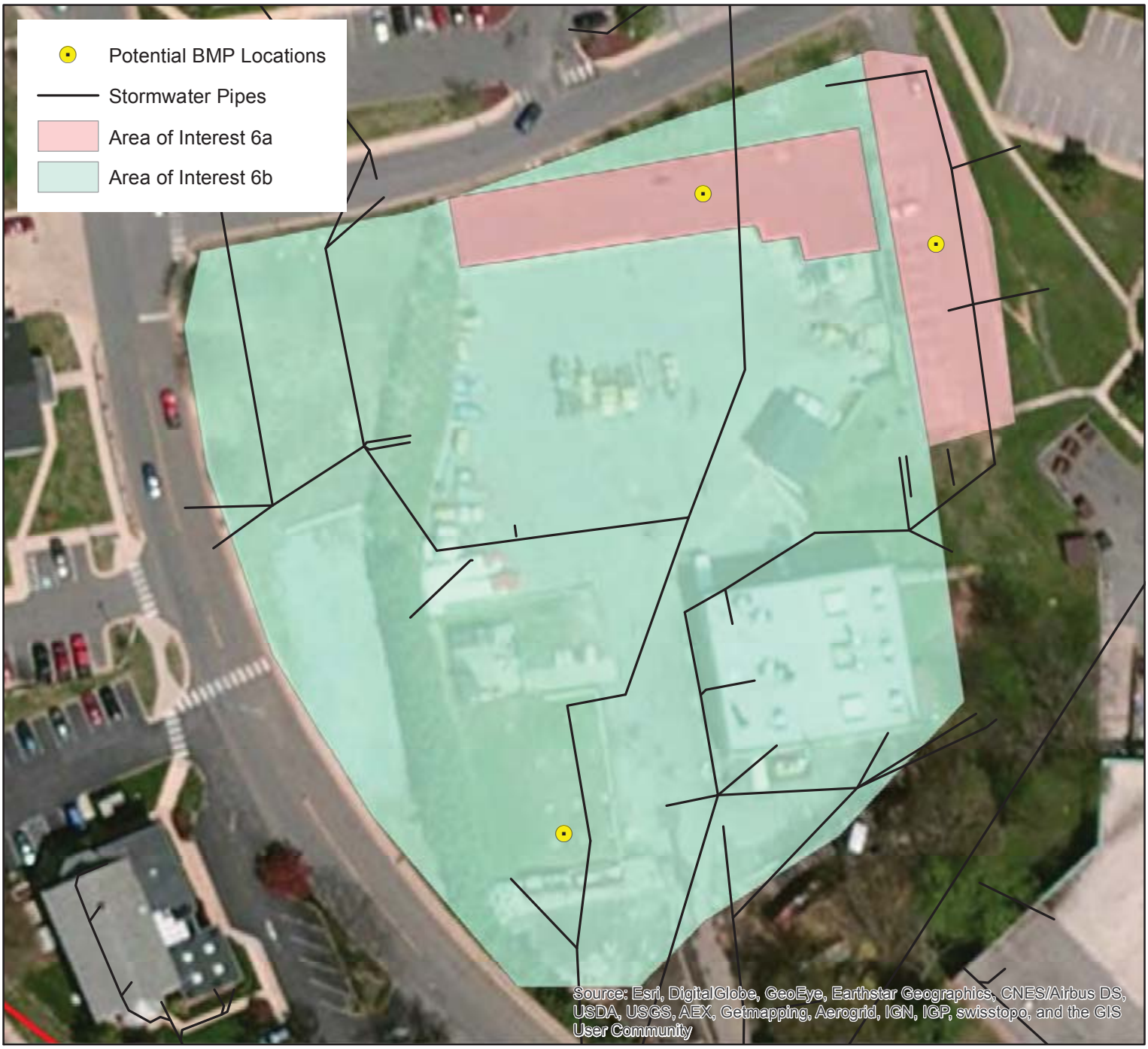
N 0 105 210 420 Feet

JBM-HH Area of Interest 6 is located at the corner of Sheridan Avenue and Pershing Drive. It contains one small building, a parking lot, and several grassy areas just northwest of the PX.This AOI has been split into two - 6a and 6b - to address that part of the AOI is currently in the design phase for a BMP and that the other part could be used for future BMP implementation.

N 0 60 120 240 Feet

JBM-HH Area of Interest 6 consists of:
1.56 acres of impervious surface (0.36 acres in 6a and 1.20 acres in 6b) and
1.15 acres of pervious surface (entirely in 6b).





N

0 112.5 225 450 Feet

Three opportunities for BMP placement are presented for AOI 6. AOI 6a contains two proposed BMPs - a green roof on the building along the northern edge of the AOI and permeable pavers on the parking lot to the east of that building - that are currently in the design process. They will treat approximately 0.36 acres. A bioretention is proposed in a grassy area close to the southern edge of the AOI to treat the remaining runoff and stormwater from the buildings and parking lot. This bioretention and its treated areas make up AOI 6b.

The baseline load rates below were calculated using 2009 EOS Rates Provided in the Virginia TMDL Guidance and applied to land use delineated by USACE using 2009 aerials.

	Baseline Loads (lb/yr)		
AOI AREA	**TN**	**TP**	**TSS**
AOI 6a	6.07	0.58	421.68
AOI 6b	31.81	2.42	1607.75

The pollution reductions below were calculated by applying CBP reduction efficiency rates to baseline loads shown above. The table shows how many pounds of N, P, and SS will be reduced by the proposed BMPs in AOI 6a and AOI 6b.

Proposed BMP Reduction (lb/yr)			
AOI AREA/BMP TYPE	TN	TP	TSS
AOI 6a/ Bioretention A/B Soils, no underdrain	4.86	0.50	379.51
AOI 6b/ Bioretention A/B Soils, no underdrain	25.45	2.06	1,446.98
AOI 6a/Bioswale	4.25	0.45	337.34
AOI 6b/Bioswale	22.27	1.82	1,286.2
AOI 6a/Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	4.86	0.46	358.43
AOI 6a/Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	25.45	1.94	1,366.59

The Table below shows the portion of the total L2 Reduction Goals required by 2028 that treatment of AOI 6a and AOI 6b will satisfy.

Percent of Total Goal			
AOI AREA/BMP TYPE	TN	TP	TSS
AOI 6a/ Bioretention A/B Soils, no underdrain	2%	1%	1%
AOI 6b/ Bioretention A/B Soils, no underdrain	10%	6%	5%
AOI 6a/Bioswale	2%	1%	1%
AOI 6b/Bioswale	9%	5%	4%
AOI 6a/Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	2%	1%	1%
AOI 6a/Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	10%	5%	4%

Initial planning level construction costs were calculated using the "Cost of Stormwater Management Practices in Maryland" table. This tool is based on impervious acreage in AOI 6 - 0.36 acres in AOI 6a, and 1.20 acres in AOI 6b.

These estimates include capital, labor, material and overhead costs, but not land or maintenance costs.

Several variables to be explored in later phases of the study can greatly affect the cost to implement a BMP, such as utility placement, regional specific permits, unexploded ordinance surveys, type of contract, acquisition strategy, and real property.

	Impervious Acres	New Suburban Cost
AOI 6a	0.36	$50,914
AOI 6b	1.20	$169,715

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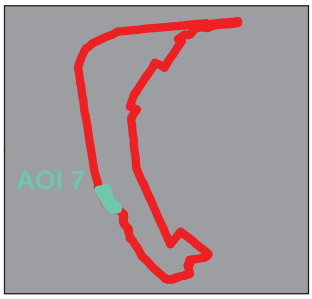
I. Location and General Information

AOI 7

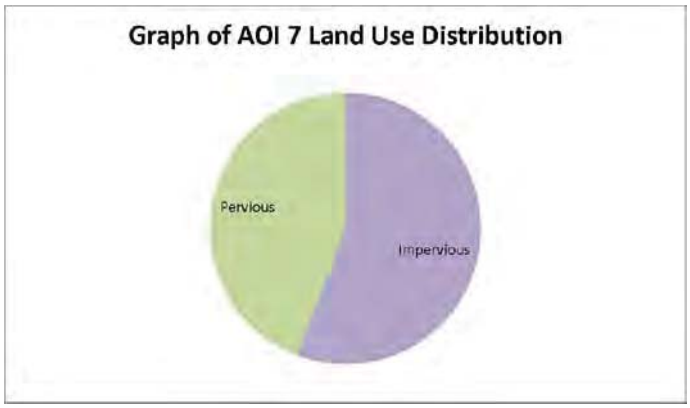
N 0 155 310 620 Feet

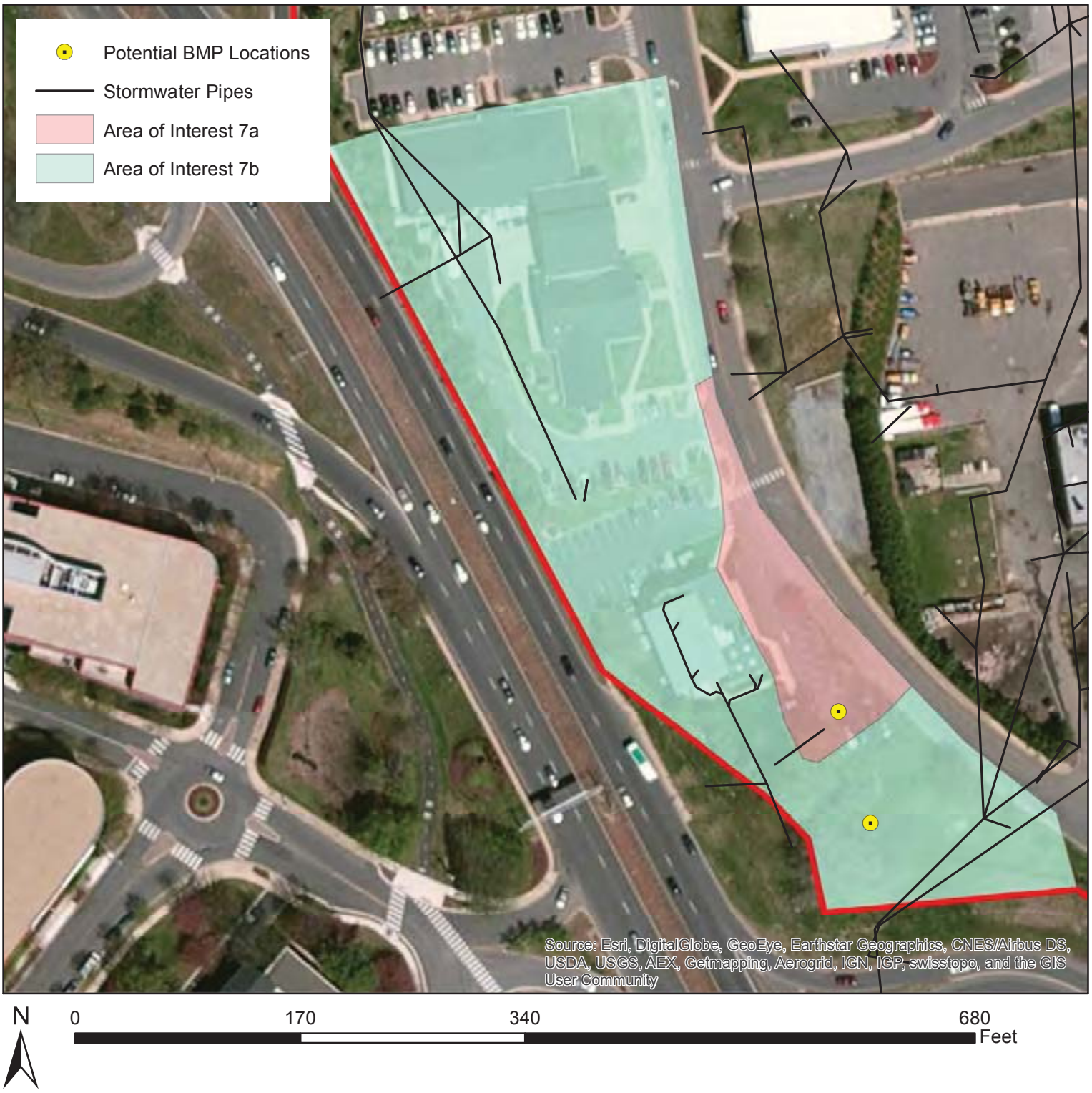


JBM-HH Area of Interest 7 is located between the southwestern edge of the facility and Sheridan Avenue, from Pershing Drive to the ramp from Hatfield gate onto Washington Boulevard. It contains three buildings, a parking lot, and several grassy areas. This AOI has been split into two - 7a and 7b - to address that part of the AOI is currently in the design phase for a BMP and that the other part could be used for future BMP implementation.

N 0 100 200 400 Feet

JBM-HH Area of Interest 7 consists of:
1.63 acres of impervious surface (0.25 acres in 7a and 1.38 acres in 7b) and
1.29 acres of pervious surface (0.09 acres in 7a and 1.20 acres in 7b).





Two opportunities for BMP placement are presented for AOI 7. A small bioswale - which makes up AOI 7a - is proposed, and is currently in the design process, to treat a 0.34 acre area of mostly road and parking lot to the east of the southernmost building in the AOI. A bioretention - AOI 7b - is proposed to treat the remaining runoff and stormwater from the buildings and parking lot to the north. The BMP would be located in a depression in the southern end of the AOI.

The baseline load rates below were calculated using 2009 EOS Rates Provided in the Virginia TMDL Guidance and applied to land use delineated by USACE using 2009 aerials.

	Baseline Loads (lb/yr)		
AOI AREA	**TN**	**TP**	**TSS**
AOI 7a	5.12	0.44	308.65
AOI 7b	35.35	2.73	1827.38

The pollution reductions below were calculated by applying CBP reduction efficiency rates to baseline loads shown above. The table shows how many pounds of N, P, and SS will be reduced by the proposed BMPs in AOI 7a and AOI 7b.

Proposed BMP Reduction (lb/yr)			
AOI AREA/BMP TYPE	TN	TP	TSS
AOI 7a/ Bioretention A/B Soils, no underdrain	4.10	0.37	277.79
AOI 7b/ Bioretention A/B Soils, no underdrain	28.28	2.32	1,644.64
AOI 7a/Bioswale	3.58	0..33	246.92
AOI 7b/Bioswale	24.75	2.05	1,461.9
AOI 7a/Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	4.10	0.35	262.35
AOI 7a/Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	28.28	2.18	1,553.27

The Table below shows the portion of the total L2 Reduction Goals required by 2028 that treatment of AOI 7a and AOI 7b will satisfy.

Percent of Total Goal			
AOI AREA/BMP TYPE	TN	TP	TSS
AOI 7a/ Bioretention A/B Soils, no underdrain	2%	1%	1%
AOI 7b/ Bioretention A/B Soils, no underdrain	11%	6%	5%
AOI 7a/Bioswale	1%	1%	1%
AOI 7b/Bioswale	9%	6%	5%
AOI 7a/Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	2%	1%	1%
AOI 7a/Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	11%	6%	5%

Initial planning level construction costs were calculated using the "Cost of Stormwater Management Practices in Maryland" table. This tool is based on impervious acreage in AOI 7 - 0.25 acres in AOI 7a, and 1.38 acres in AOI 7b.

These estimates include capital, labor, material and overhead costs, but not land or maintenance costs.

Several variables to be explored in later phases of the study can greatly affect the cost to implement a BMP, such as utility placement, regional specific permits, unexploded ordinance surveys, type of contract, acquisition strategy, and real property.

	Impervious Acres	New Suburban Cost
AOI 7a	0.25	$35,357
AOI 7b	1.38	$195,172

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APPENDIX B

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Stormwater BMP Database User Guide

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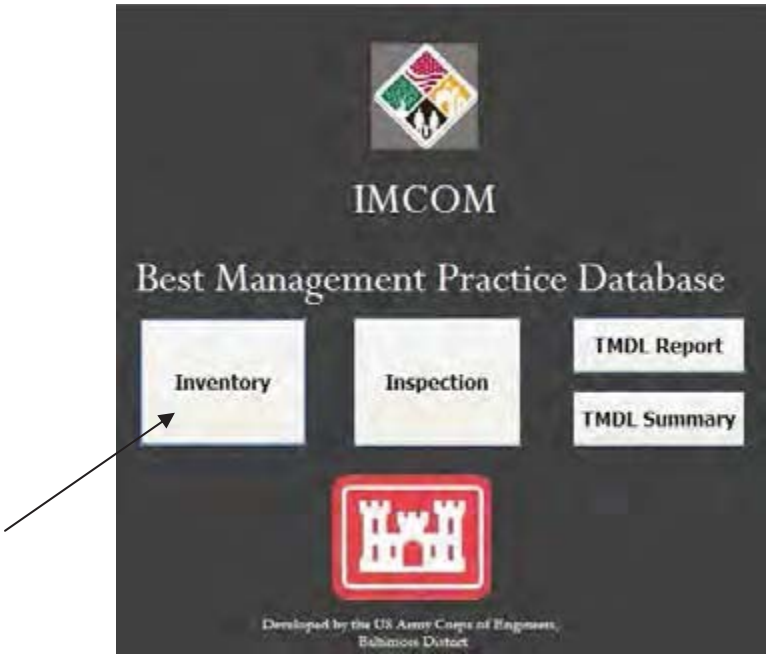
Inventory Database

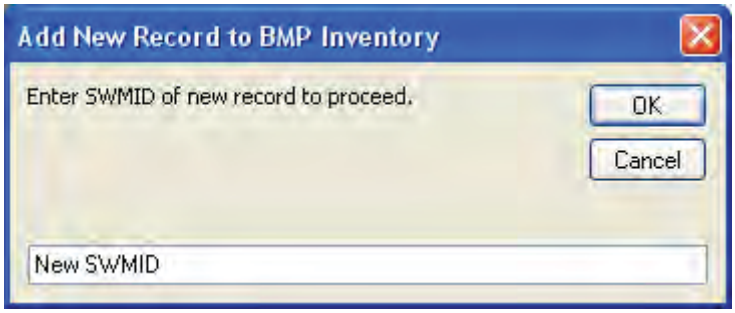
Upon opening the database users will come to a switchboard:



Users must first enter data into the Inventory Database before entering data into the Inspection Database. Clicking the "Inventory" button will take you to the Inventory Database:

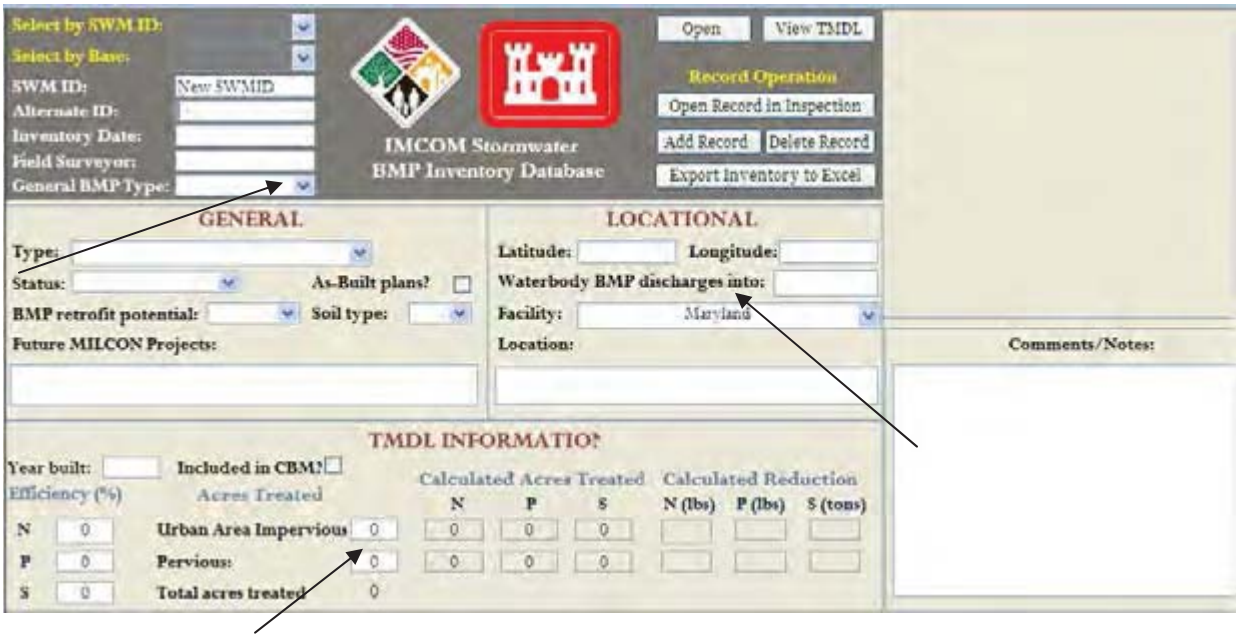
Click the "Add Record" button.

Clicking the “Add Record” button will bring up this prompt:



Enter the SWMID of your new record.

A new record will be created and the SWMID will be populated. Enter information in the form, starting with the textboxes located at the top left (Alternate ID, Inventory Date, etc.). Your selection for “General BMP Type” will determine what fields must be populated in the area, so be sure this field is accurately filled out.

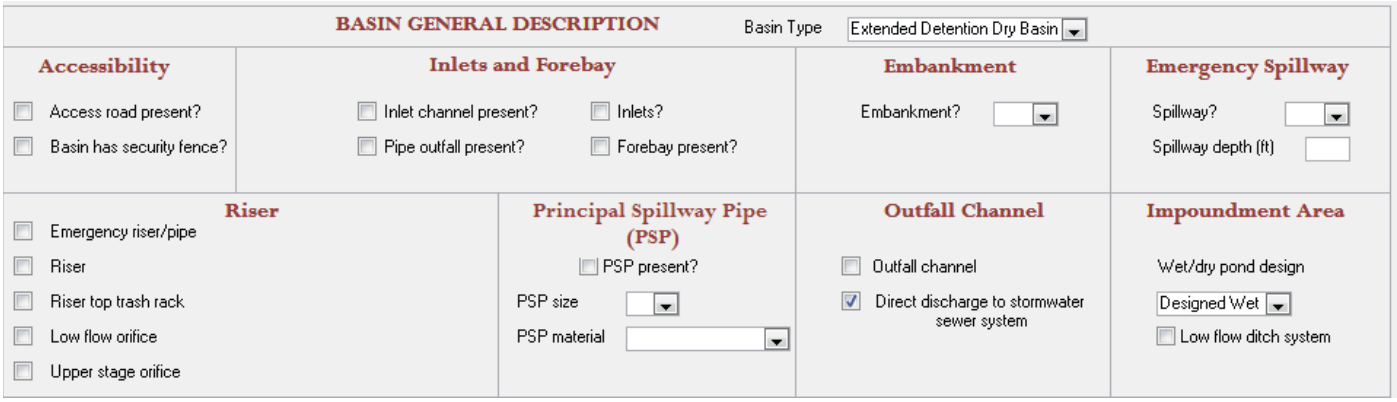


It is also important to correctly input the locational section of the inventory sheet with the GPS position coordinates, the watershed discharged into, and the location.

Finally, the TMDL information is inputted by entering the acres impervious and pervious covered by the specific BMP.

Basin specific fields

If the selection for General BMP Type is “Basin” then a “BASIN GENERAL DESCRIPTION” area will become visible at the bottom of the form:

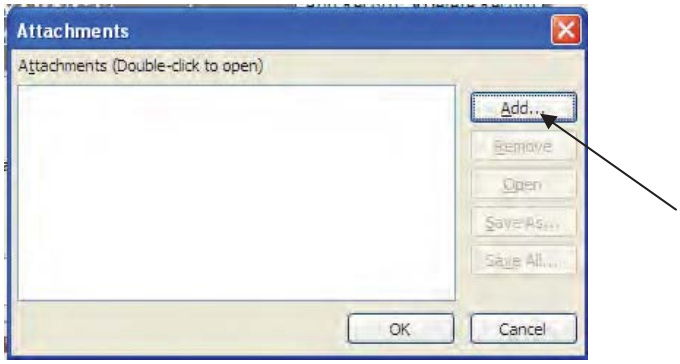


This must be completed before proceeding to the Inspection Database, as the data entered here will impact the structure of the Inspection Form.

Adding Photographs

To add photographs to the selected record, simply click on the empty box in the top right hand corner of the inventory page.

This opens the photograph management box. To add a photo click on the add button on the top right of the box and select the photo from the appropriate file.



Inspections Database

Inspection information can be entered for records already in the Inventory Database using this form. Data entered in the Inventory Form will be visible in the Inspection Form

The tabs that are visible will be based on the "General BMP Type" selected in the Inspections Database. If "Basin" is selected then the tabs will be for basins, if "Filtration" is selected, the tabs will be for filtration, and so on.

Steps to adding a new inspection

A record must first be entered in the Inventory Form before an inspection can be entered. Do the following to add a new inspection:

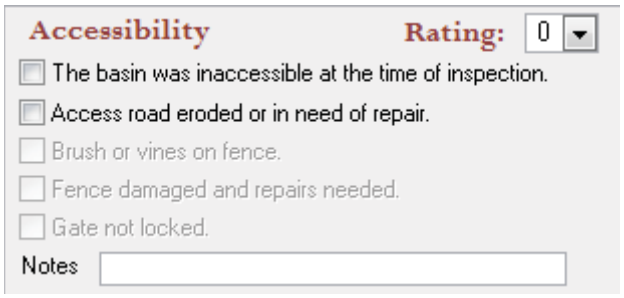
Navigate to the SWM ID you wish to update. If you are not already viewing the SWM ID you wish to update, use the "Select by SWM ID" tool in the upper left hand corner to select the appropriate SWM ID.

Click the "Open Record in Inspection" button

Doing this will add a new inspection for the current SWM ID.

Once the SWM ID has been entered the user may begin filling out all the fields in the form, it is important to enter the date of the inspection as this will differentiate the inspection from other records for the same SWM ID. Information from the Inventory Form is imported to the Inspection Form and viewable (but not editable). Information gathered in the Inventory Form will determine whether certain fields are active in the Inspection Form. For instance, take a case where the box is checked next to "Access road present?" under "Accessibility" in the Inventory Form for a "Basin" BMP type:

If this is the case, then in the Inventory Form the checkbox for "Access road eroded or in need of repair" will be active. Had "Access road present?" not been checked in the Inventory Form the "Access road eroded or in need of repair" checkbox would be shown as greyed out, similar to the 3 checkboxes at the bottom of this figure:

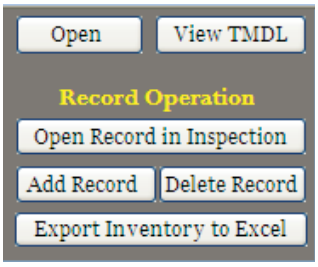


Tools

There are several tools that have been created to make the database easier to use.

Inventory Form Tools

This set of tools is in the upper right corner of the Inventory Form:



Open Record in Inspection– This will open up the inspection form with a filter set for the inventory record you are currently in. You will only see the inspections for that particular record after opening the form. There must be an existing inventory for this work correctly.

Delete Record – Deletes the current BMP from the inventory.

Add Record – Use this to add a new BMP to the inventory.

Inspection Form Tools

This set of tools is in the upper left area of the Inspection Form:

View Record in Inventory Form – Opens current inspection record in the Inventory Form. Use this to update any inventory information related to that particular BMP.

Add New Inspection – This should be used whenever you are adding a new inspection to a location that has had a previous inspection entered into the database. This will add a new inspection for the SWM ID you are currently viewing. To change SWM ID's use the "Select by SWM ID" in the upper right hand corner (described below).

Delete Inspection – This deletes the current inspection.

Open Report – Use this button to open a report with all inventory and inspection information for the current SWM ID.

Exit Database – Closes the database.

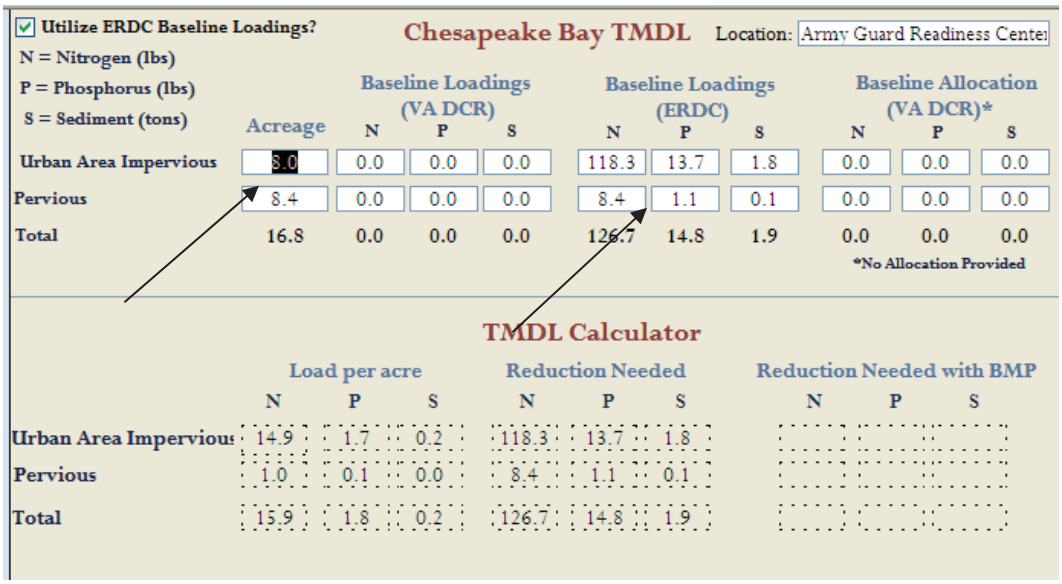
Select by SWM ID dropdown tool

One tool that is in both the Inventory Database and the Inspection Database is the "Select by SWM ID" dropdown box:

This tool is found in the upper left hand corner and has a yellow font. Selecting an SWM ID from the dropdown menu will filter the form so that only records for that SWM ID are shown. In the Inventory Form it will simply take you to the SWM ID as there is only one record per SWM ID.

TMDL Information

The TMDL information can be found in the left shutter bar under the forms group. Double clicking the form labeled TMDL brings up the screen shown below.

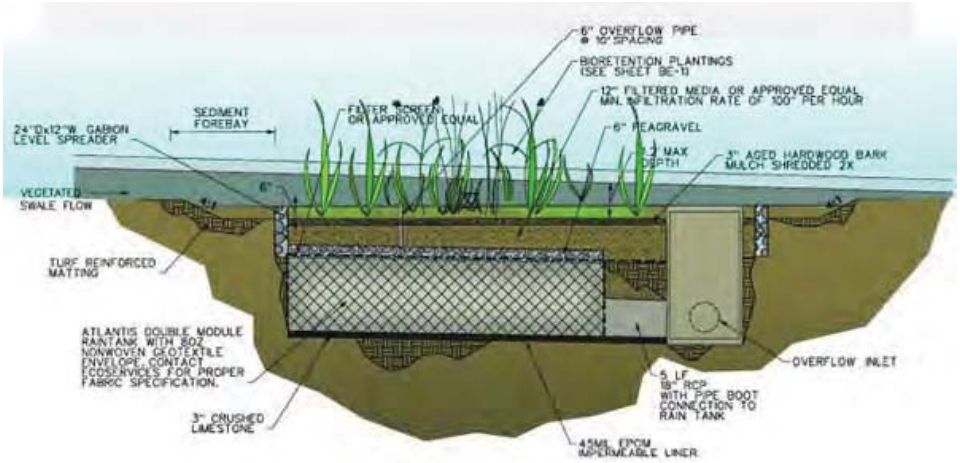


The acreage and the baseline loading information for the site are entered into the indicated boxes. The calculations are then computed based on this information. The site for which the TMDL information is being used for is located in the upper right hand corner.

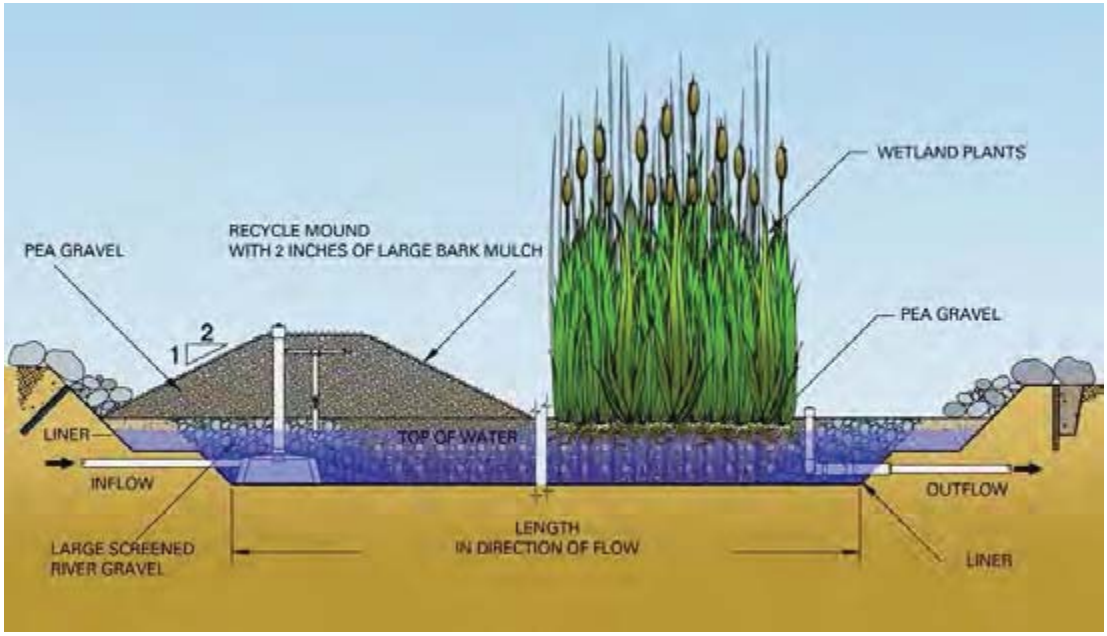
BMP Definition List

Filtration:

Bioretention: Bioretention is a flat-bottomed, shallow landscaped depression or basin used to collect and hold stormwater runoff, allowing pollutants to settle and filter out as the water infiltrates into the ground or to an underdrain, depending on soil conditions. Stormwater runoff enters the basin, where it temporarily ponds within the shallow depression and subsequently filters down through the various layers in the bioretention area.



Constructed Wetlands: Constructed wetlands are shallow marsh systems planted with emergent vegetation to treat stormwater runoff.



Filter Strips: Filter strips, or vegetated filter strips, are densely vegetated strips of gently sloping area that receives runoff from an adjacent impervious area as sheet flow. This filter strip slows the velocity of the runoff and allows for removal of sediment and other pollutants as the runoff flows through the filter strip.

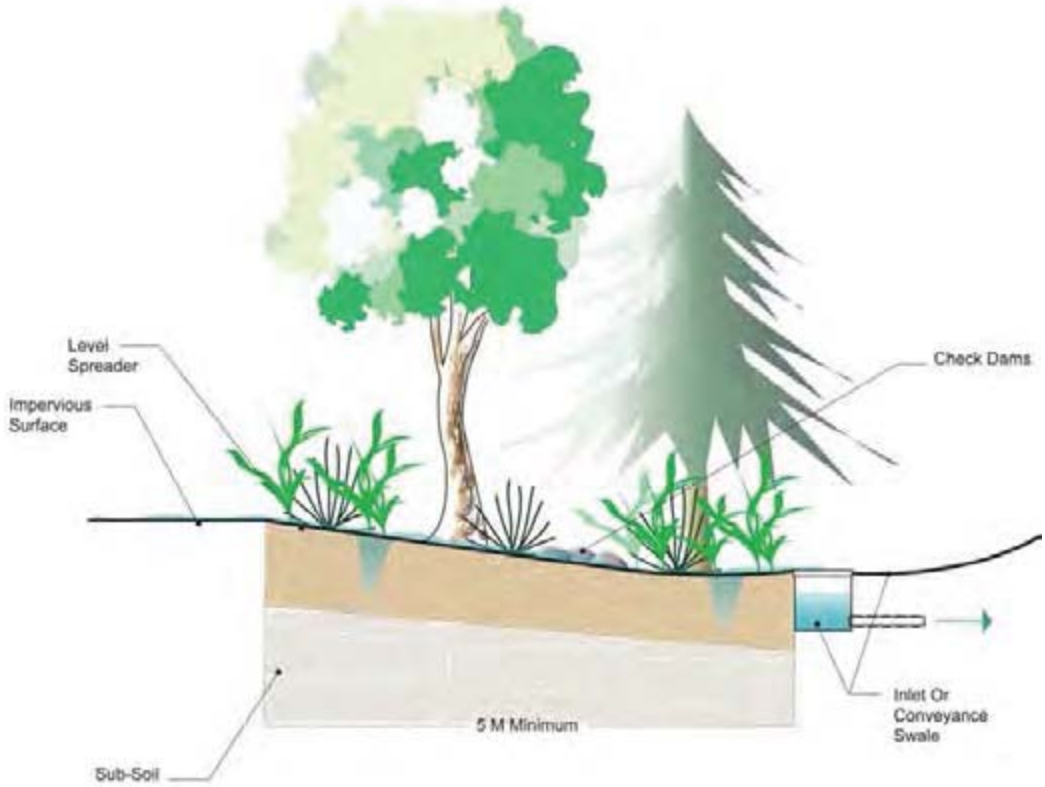
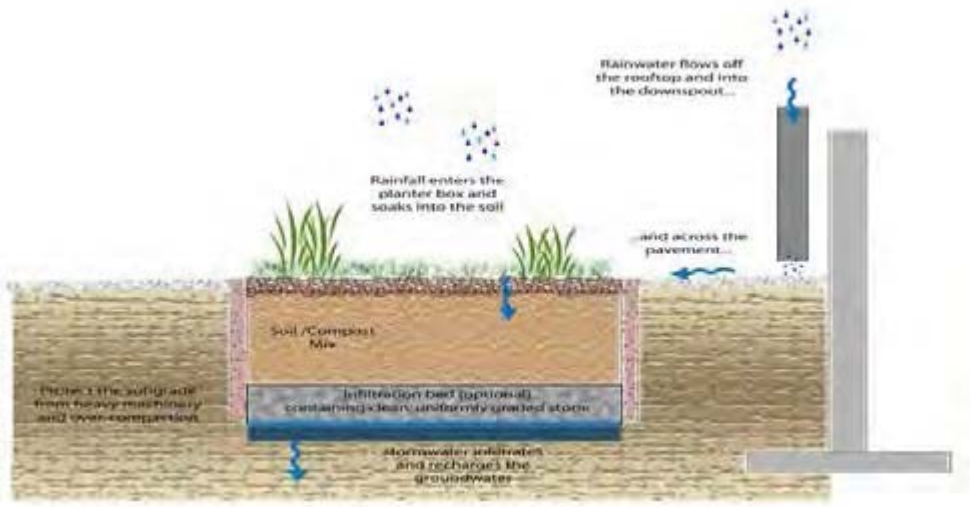


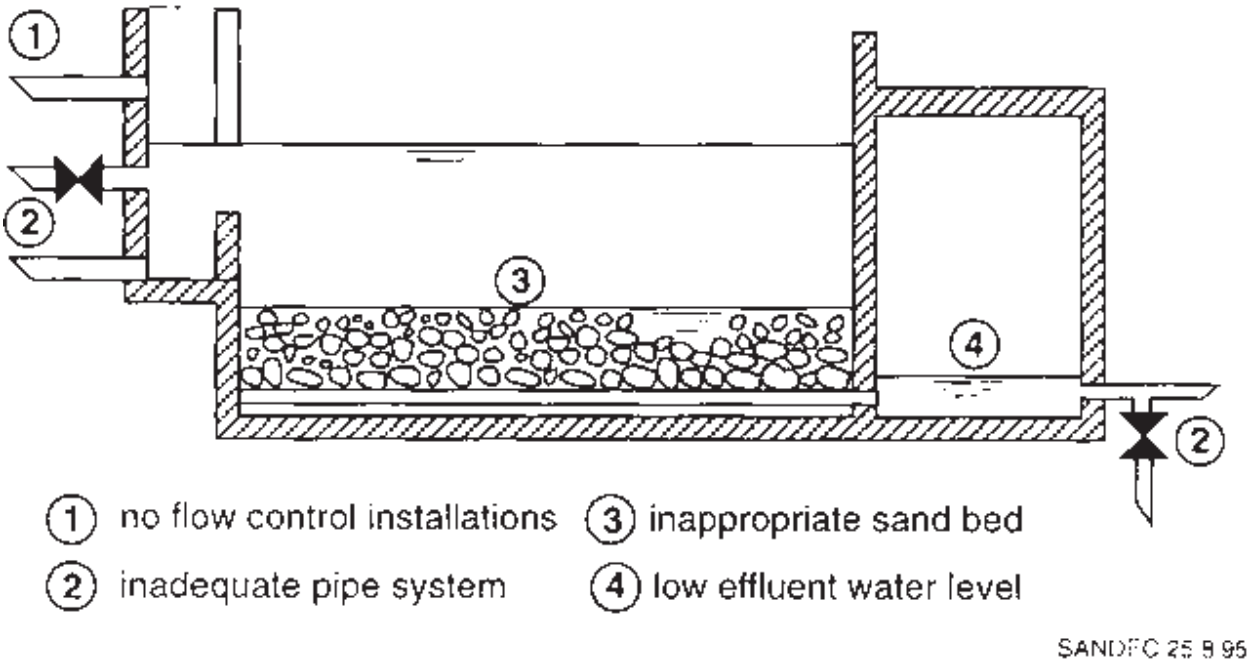
Figure 2-10
Vegetated Filter Strip
(Source: Landmark Design Group)

Green Alley: A green alley is an alley in which water is allowed to infiltrate into the soils through permeable pavement or infiltration basins, instead of being directed into a sewer system.

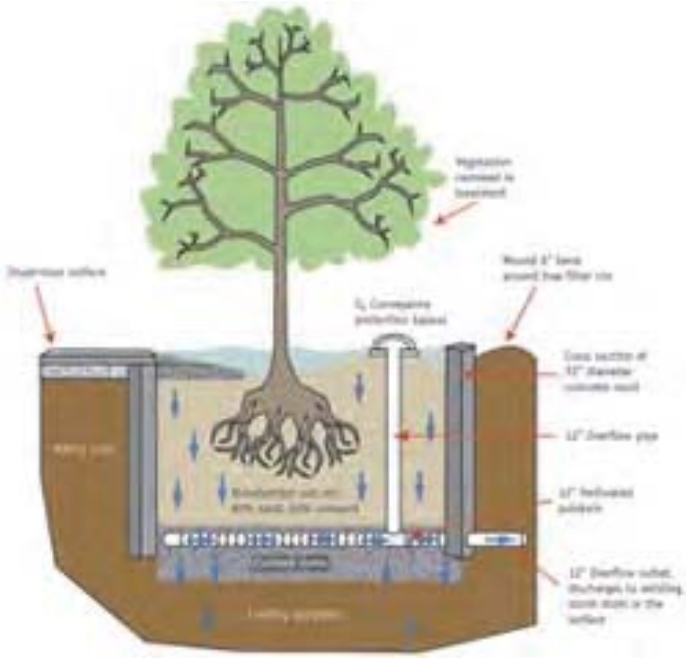
Planter Box: A planter box is a constructed box with vegetation designed to receive runoff from rooftops and filtrates the stormwater runoff.



Sand Filter: A sand filter is a device used to filter stormwater through a layer of sand to an underdrain system that conveys the stormwater to a detention facility or discharge point.



Tree Box Filter: A tree box filter is another type of bioretention filter in which stormwater runoff is directed to a box underneath a tree where the water is treated by vegetation and soil before entering an underdrain system.



Vegetated Buffer: Vegetated buffers are areas of natural or established vegetation maintained to protect water quality. Buffer zones slow stormwater runoff, provide an area where runoff can permeate the soil, contribute to ground water recharge, and filter sediment.

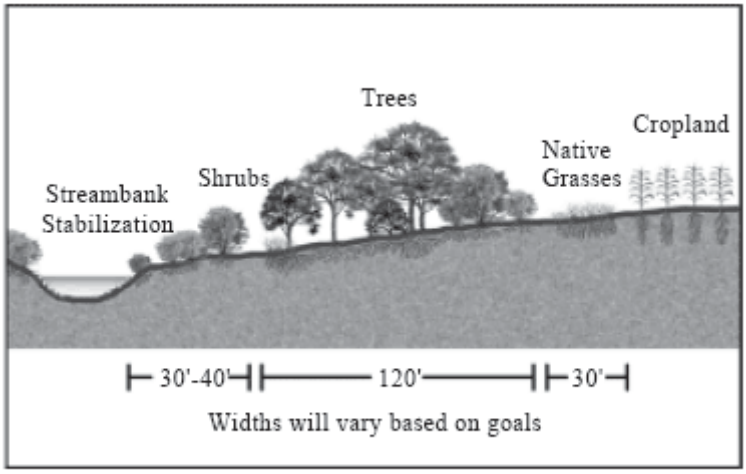
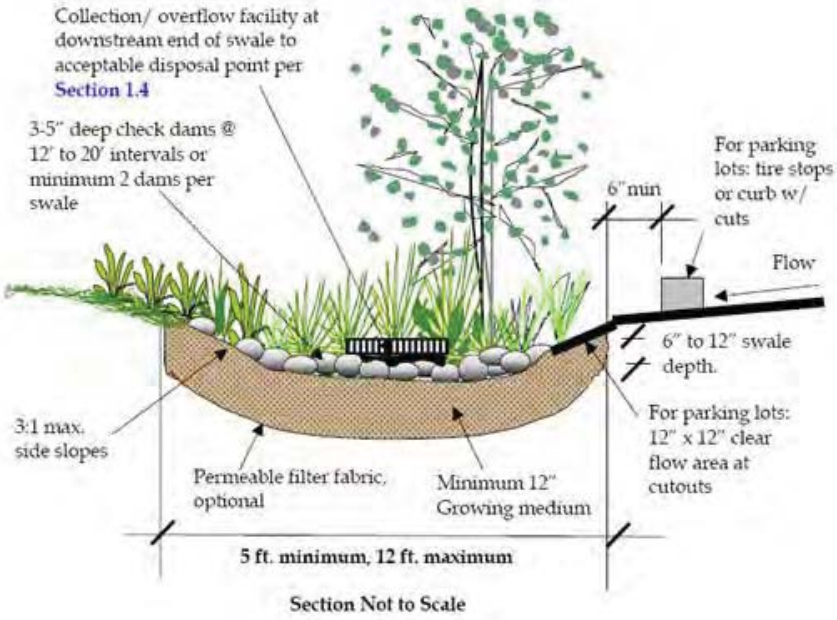


Figure 1. Cross section of an alternative buffer design.

Vegetated Roof: Vegetated (or green) roofs are made up of a layer of vegetation installed on top of a conventional flat or slightly sloped roof that absorbs rainwater in the soil media to be transpired by vegetation or discharged to another BMP or stormwater system.

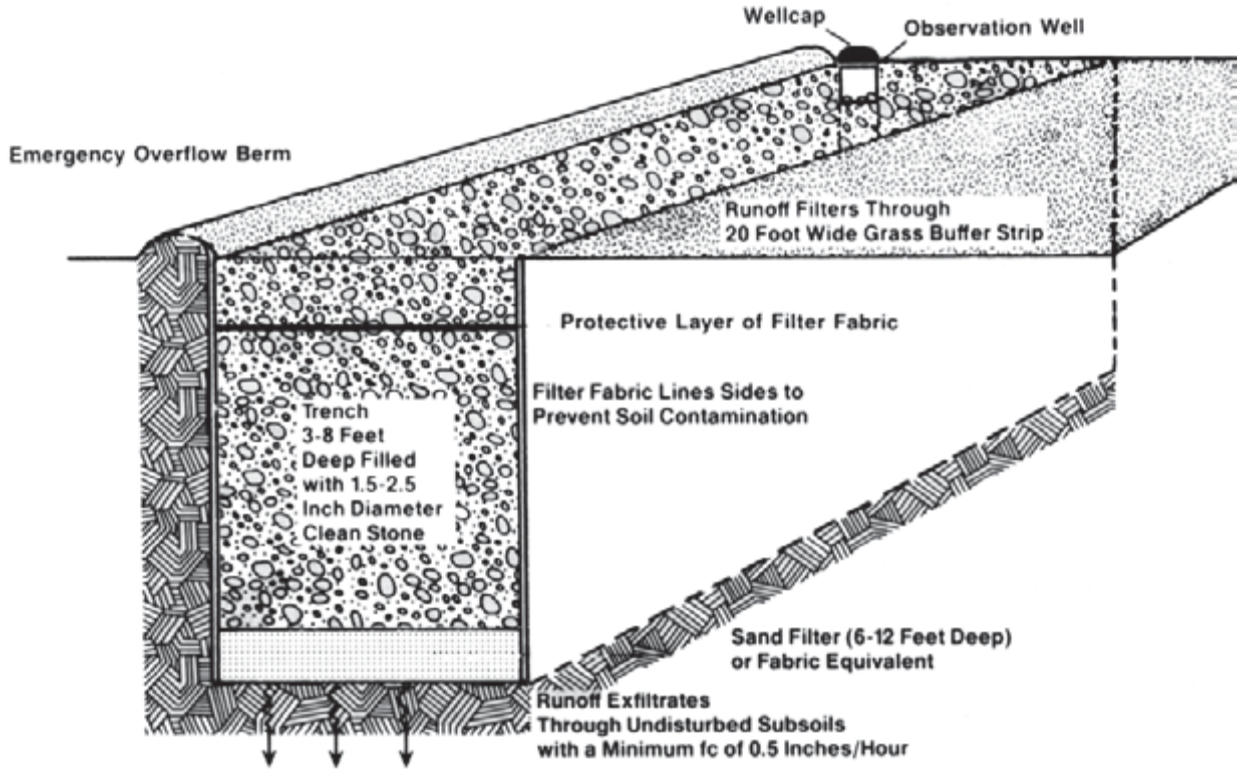
Vegetated Swales: Vegetated swales are gently sloping depressions planted with dense vegetation or grass that treat stormwater runoff from rooftops, streets, and parking lots. As the runoff flows along the length of the swale, the vegetation slows and filters it and allows it to infiltrate into the ground.



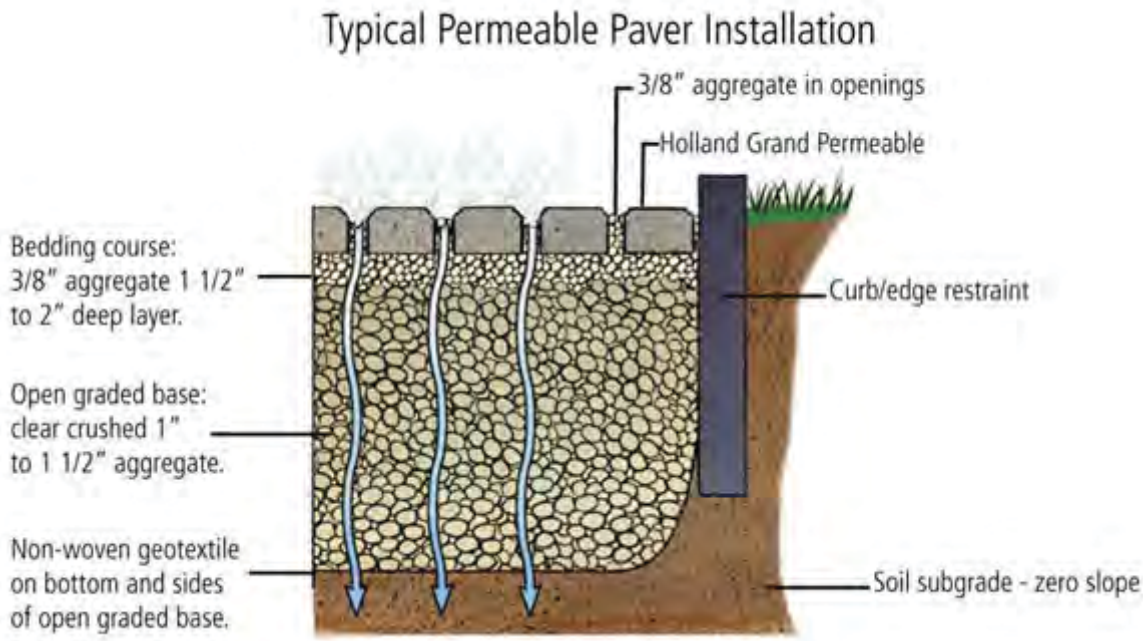
Infiltration:

Infiltration Basin: An infiltration basin is either a natural or constructed shallow surface impoundments that often include a flat, density vegetated floor situated over naturally permeable soils.

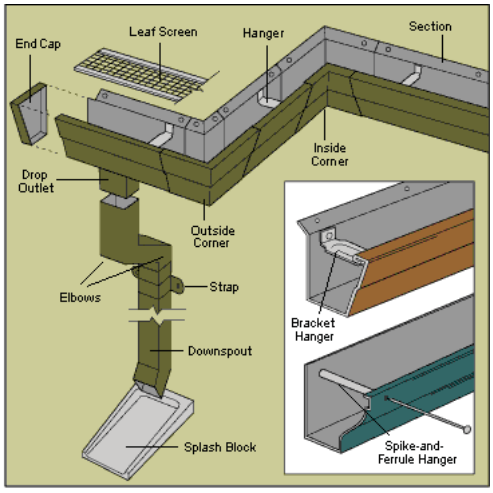
Infiltration Trench: Infiltration trenches are shallow excavations that are lined with filter fabric and filled with stone to create underground reservoirs for stormwater runoff.



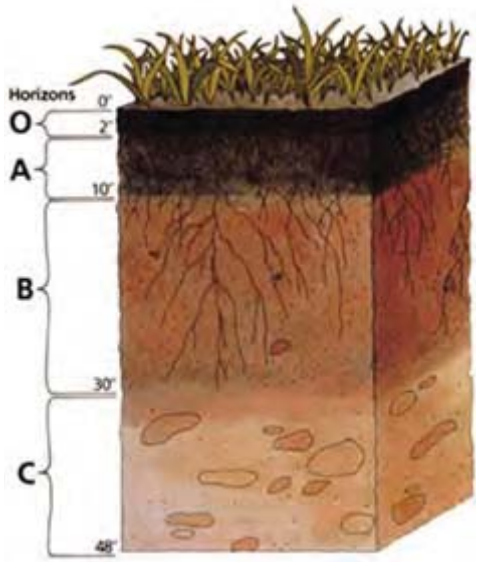
Permeable Pavers: Permeable pavers are similar to conventional pavement, but have pores or voids that allow stormwater runoff to filter through the pavement surface into an underlying stone reservoir.



Roof Downspout System: Downspout dispersion BMPs are splashblocks or gravel-filled trenches that serve to spread roof runoff over vegetated pervious areas.

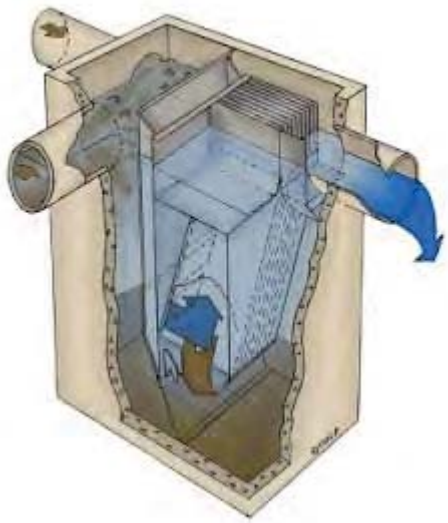


Soil Amendments: A soil amendment is a material added to a soil to improve its water retention, permeability, reduce erosion, and degrade pollutants.

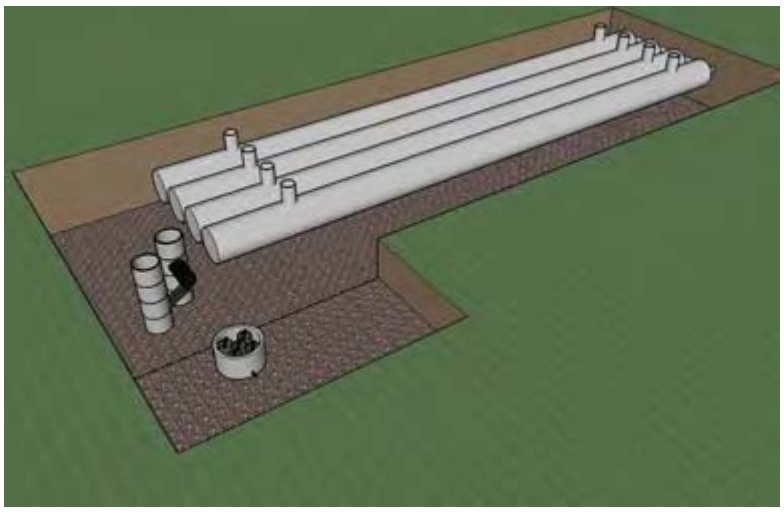


Manufactured:

Proprietary: Proprietary Stormwater BMPS are manufactured systems that use proprietary settling, filtration, absorption/adsorption, vortex principles, vegetation, and other processes to regulate stormwater management.



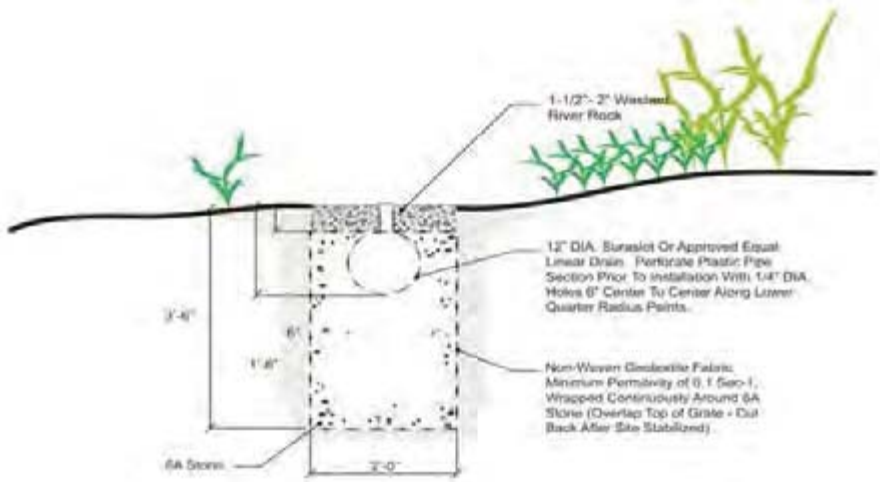
Pipe Detention: Pipe detention systems are underground pipe systems used for storing stormwater runoff.



Parking Lot Storage: A parking lot storage unit is a specialized detention basin used primarily to reduce the peak discharge of stormwater from the surrounding area.

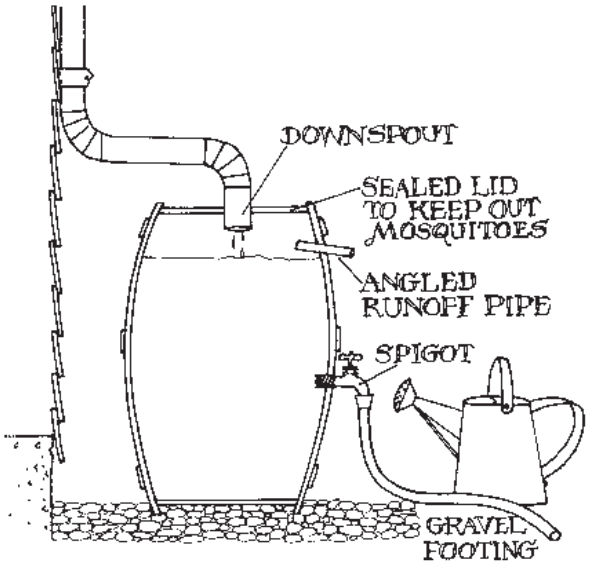
Miscellaneous:

Level Spreader: A level spreader is an erosion control measure that is designed to mitigate the impact of high-velocity stormwater surface runoff, and can also serve to increase infiltration and reduce water pollution.



Check Dam: Check dams are small, temporary structures built across a swale or a channel with the primary purpose of reducing erosion and sediment level in flowing stormwater.

Stormwater Reuse (Rainbarrel): Stormwater reuse involves the collection and storage of rainwater for future use from rooftops or parking lots.



Basin:

Acting as Sediment Basin: A sediment basin is a temporary pond built to capture eroded or disturbed sediment as it is washed away by stormwater.

Dry Basin: A dry basin is a detention pond used next to rivers, streams, or lakes to prevent from flooding by storing water for a limited period of time. They are called dry ponds because no permanent pool of water exists.

Extended Detention Dry Basin: An extended detention dry basin is a dry basin that is designed to retain excess storm water for an extended period of time.

Wet Basin: A wet basin is a detention pond that is designed as an artificial lake with vegetation around the perimeter that is used for water quality improvement, groundwater recharge, flood protection, or aesthetic improvement.

Storm water BMP Retrofitting

Problems	***Solutions***
Basin walls/ structural components eroding.	1. Re-grade the basin to slow flow 2. Plant native vegetation to slow flow. 3. Line walls with geo synthetics or other erosion control systems (i.e. gabion walls) to protect from erosion.
Pollutants are not being treated properly.	1. Re-grade the basin and add native vegetation to slow flow and increase retention/ filtration time. Deep root systems help storm water percolate to the ground (decreasing surface flow) 2. Install weir plate onto outlet structure openings to hold shallow water. 3. Create a sediment fore-bay designed to allow sediment and pollutants to settle out before entering main pond area. 4. Remove concrete low - flow channels to slow water movement and allow for more infiltration.

Too much storm-water entering the basin.	1. Expand water basin size (excavation) 2. Increase size of outfall structure 3. Plant native vegetation (deep root system allows for water to percolate through soil faster). 4. Add adjacent storm water structure 5. Grass swale inlets to pre-treat and infiltrate water. 6. Create rain gardens/ retention basins in pervious zones (i.e. middle of parking lots) to collect and re-route water to main basin.

Database Storage and Installation

The BMP database should be placed in a single centralized location. Ideally, the database will be stored on a server, rather than on a local computer's hard drive. Users should take care to make sure that multiple versions of the database do not exist. If a user must work on the database off of the network the following steps should be taken:

- Download the database to the computer that will be used offline.
- Verify that no users will be editing the database during the time that the user is working offline with the database.
- Upon finishing the offline editing, copy the database back to the server, overwriting the current database stored on the server.
    - Prior to overwriting the database the user may wish to copy the database into a backup folder. This may not be necessary if data is automatically backed up by the network administrators.

Photo Storage

Access databases are limited to a maximum storage size of 2 gigabytes (GB). The attachment field, which is where the photos and other documents can be stored, is the field most likely to impact the size of the database. In instances where it is likely that the total size of the database will exceed 2 GB the following steps should be taken to separate the photos from the database itself.

- Set up a location on a centralized server where the photos will be stored.
- Apply a standardized process for naming photos, for example the names for all photos for a BMP with SWMID ABC12 begin with ABC12.
- Create a field within the database and corresponding field within the forms that will hyperlink to the photos on the servers.

APPENDIX C

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COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER DIVISION

Subject: Guidance Memo No. 15-2005

To: Regional Directors

From: Melanie D. Davenport, Director Melanie D. Davenport

Date: May 18, 2015

Copies: James Golden, Fred Cunningham, Allan Brockenbrough, Regional Water Permit Managers

Summary: This guidance document provides staff and permittees in the Chesapeake Bay Watershed with background information and procedures to meet the Chesapeake Bay TMDL Special Condition requirements in the 2013-2018 General Permit for Discharges of Stormwater from Small (Phase II) MS4s, the reissued Phase I MS4 permits, and any Individual Phase II permits that are issued. This document may also be used as a reference to meet the Chesapeake Bay TMDL load allocation for unregulated urban entities as well as local TMDL waste load allocations for nutrients and sediment. This document replaces Guidance Memo No. 14-2012.

Electronic Copy: An electronic copy of this guidance document is available in PDF format through DEQ's MS4 website.

Contact Information: Please contact Jaime Bauer, Office of VPDES permits, at (804) 698-4416 or Jaime.Bauer@deq.virginia.gov or with any questions regarding the application of this guidance.

Disclaimer:
This document is provided as guidance and, as such, sets forth standard operating procedures for the agency. However, it does not mandate or prohibit any particular action not otherwise required or prohibited by law or regulation. If alternative proposals are made, such proposals will be reviewed and accepted or denied based on their technical adequacy and compliance with appropriate laws and regulations.

Chesapeake Bay TMDL Action Plan Guidance Revision Change Summary
5/18/2015

Corrections/Updates:
Corrections and updates are made throughout the document where applicable:

- Typos corrected as identified
- Broken links fixed as identified
- Permit citations corrected as identified
- Corrected error in Loading Rate Tables to lbs/ac/yr throughout the document
- Corrected alphabetizing error in definitions
- Corrected definitions to match the VSMP regulations
- Incorporated link for reporting spreadsheet
- Removed "or 8" from the title of Example II.2. The aggregate method may not be used for Special Condition 8.
- The urban stream restoration appendix has been updated to reflect the changes that resulted from the revised Expert Panel Report. The link has been changed to the most recent report.

Additional Clarifying Language:

- Clarifying text added concerning Special Conditions 3, 7, and 8
    - Text added to flow chart in Appendix III concerning Special Condition 3
- Clarifying text added concerning the appropriate loading rates that should be used to determine the additional reductions required under Special Condition 7 and Special Condition 8
- Clarifying text added to explain credit for redevelopment, oversized BMPs, and more stringent development requirements
- Emphasized section concerning calculations for SLAF Grant not impacting permit compliance
- Text added concerning the treatment of lands in transition
- Clarifying text concerning the downward modification procedure was added. Downward modification is only allowable if the Bay Program efficiencies were used.

Substantive Changes:

Loading Rate Tables (Part II.2):

It has been brought to the Department's attention that there is an issue with insufficient significant figures in *Tables 3a-d* that may result in calculated required reduction values that are not 5% of the L2 scoping run reductions. The full reduction requirement values have been included in the guidance and permittees are encouraged to use those corrected values. However, permittees may submit calculations using either set of values for this permit term.

Credit Guarantees (multiple changes made throughout the document):

This section has been updated to reflect a change for credit guarantees from "construction initiated" to "have had, at a minimum, funds approved as part of an adopted Capital Improvement Plan, or an equivalent funding plan for state and federal facilities." Additional clarifying language concerning this change has been added throughout the document.

Crediting BMP Restoration (multiple changes made throughout the document):

The previous version of the guidance stated that permittees could not receive credit for BMP Restoration projects, which are permitted under the Bay Program's *Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects*. The Department has revisited this aspect of the guidance and has determined it is appropriate to allow permittees to receive credit for BMP Restoration. However, permittees may only receive incremental credit for improvements to water quality BMPs or impoundments installed prior to 2006, regardless of whether they have been previously reported to the Department or the Bay Program. This decision is in keeping with a forthcoming Bay Program FAQ document. If the Bay Program revises their approach to this issue, the Department will revisit the applicable sections of the guidance.

Forested Lands (& Ag Lands) (multiple changes made throughout the document)*:*

The previous version of the guidance stated that permittees could exclude forested lands from their system and service area delineation. However, the document also stated permittees could not receive credit for BMPs that treated these excluded lands. Upon further review, the Department has determined permittees may receive credit for these lands, but it is not appropriate to use the loading rates provided in the permit table. In the revised guidance the Department has provided loading rates for forested lands by basin. Permittees may use these values to calculate reductions for BMPs that drain forested lands. Between the March, 2015 draft revision and the final revised guidance the size threshold for "forest" has also been reduced to better match the resolution of the Bay Program Model. It has also been clarified that the minimum size and density requirement do not apply to the Forest Buffer BMP.

Similarly, permittees may receive credit for any agricultural lands draining to a BMP, but it is not appropriate to use the loading rates in the permit for these lands. Given the variability of agricultural lands, a loading rates table has not been included in the guidance. For these BMPs permittees should contact the Department for appropriate loading rates.

The stream restoration section of the guidance has also been revised to reflect these changes. There is no baseline for forested acres or agricultural lands, so permittees may receive full credit for the proportion of forested acres that drain to the BMP. The discussion of Stream Restoration in the appendix and the example has been revised to reflect this change. The stream restoration calculation spreadsheets have also been updated.

Oversized BMP calculations for TN and TSS (Appendix V.E)*:*

In the March 2015 draft revision language was incorporated in to the guidance concerning the method for calculating TN and TSS reductions from oversized BMPs. However, that language did not sufficiently explain the approach the Department recommends for these calculations. That language has been revised and an Appendix (*Appendix V.E*) has been added to the document concerning this subject.

Crediting Pre-July, 1 2009 BMPs (multiple changes made throughout the document)*:*

In the initial guidance, permittees could receive credit for "BMPs installed prior to July 1, 2009 that have not previously been reported to the Department , the structure **must** have been installed as a dedicated stormwater treatment facility (i.e. recreational ponds will **not** receive credit." Upon further review, this section appeared to conflict with "Appendix V.D, Existing BMP Efficiency Modification" as well as the Bay Program's Expert Panel Report.

In the draft revised guidance that was circulated in March 2015 the guidance was revised to indicate that the credit that could be claimed for a BMP installed prior to July 1, 2009 was based on the date the BMP was installed. For BMPs installed:

1. **On or after Jan 1, 2006 and prior to June 30, 2009:** Permittees may receive full credit for BMPs installed between these dates is they were not previously reported to the Department and if the permittee provided a full historical accounting, to the maximum extent practical, of BMPs in their jurisdiction. The Department had records from 11 permittees, which were listed in the revised document.
2. **Prior to Jan 1, 2006:** Permittees may receive incremental credit from any enhancements, conversions, or restoration projects performed on BMPs or Impoundments that were in place prior to Jan 1, 2006. These structures are otherwise implicit in the model and the baseline loading rates through the water quality calibration.

Based on the comments were received and continued discussion with the Bay Program and EPA, the Department has determined that overall this method is appropriate. However, the Department acknowledges that the reported BMP data we have is limited and incomplete and, as such, the reference to the 11 permittees that was included in the draft revision has been removed from the final guidance. *All* permittees may receive credit for any stormwater quality BMPs installed between Jan 1, 2006 and June 30, 2009 within the MS4 service area if the permittee provides a full historical accounting, to the maximum extent practical, of BMPs in their jurisdiction. This crediting method is in line with EPA's expectations and a forthcoming FAQ document from the Bay Program. If the Bay Program or EPA shifts their position on this issue, we will review whether this method remains appropriate.

The Permittee should see Part IV.2 of the guidance for more information on this subject. Changes have also been made to "Appendix V.D, Existing BMP Efficiency Modification" and a new "Appendix VI – Credit for BMPs installed prior to July 1, 2009" has been added to the document and includes a flow chart for additional clarity.

Action Plan Expectations (multiple changes made throughout the document)*:*

Text has been added to Part VI concerning the Department's expectations for the level of detail that will be included in the Action Plan, although this is discussed throughout this section. For Special Condition 3 some text was added that reflects other changes throughout the document concerning the projects that are subject to special condition 3.

Text has also been added to Part VI.5 concerning the Department's expectation for the level of detail we need for BMPs that are implemented to meet Special Condition 6.

Bay Program Retrofit Equations (Appendix V.B)*:*

There have been two changes made to the guidance concerning the Bay Program Retrofit Equations. One is an update: The Bay Program updated the curves in the Expert Panel Report. These have been incorporated in to the guidance along with the old curves. At this time and for this permit cycle the Department will accept calculations using either set of curves.

The other is a correction: We received comments indicating that it is not appropriate to use the RRM spreadsheet as a shortcut for estimating the Runoff Storage for use in the curve equation. This is correct. Upon further review the Department concurs with the comments that use of the RRM spreadsheet for this purpose results in the Runoff Storage being double counted.

Street Sweeping (Appendix V.G):

In the March 2015 draft the street sweeping “efficiency” was removed from the Appendix V.C.1 table and a separate Appendix was added for street sweeping that better reflected the most recent Bay Program guidance on this subject. Based on the comments we received, this section was edited after the draft revision and the qualifying conditions to receive credit for this BMP were removed. Permittees may receive credit for reductions from street sweeping regardless of the number of times per year the streets are swept.

Chesapeake Bay TMDL Action Plan Guidance Change Table
5/18/15

SECTION	Change Date	Page #	Subject	Change
Throughout	3/19/2015	-	Correction	Corrected errors in loading tables. Removal should be in lbs/ac/yr, not lbs/ac.
Throughout	3/19/2015	-	Correction	Typos corrected where identified
PART I - BACKGROUND	3/19/2015	1	Correction	Corrected Alphabetizing Error in Definitions
PART I - BACKGROUND	5/12/2015	1	Correction	Definition corrected/added to match VSMP regulations
PART I.2, Purpose	3/19/2015	2	Clarification	Added additional language to this section concerning required new source reductions
PART II - REQUIRED REDUCTIONS	3/19/2015	3	New Sources	Added additional language discussing the differences between Special Condition 3, 7, and 8
PART II.1, Scope of Reductions Required	3/19/2015	4	Clarification	Added text clarifying the appropriate loading rates to use to calculate additional reductions from new sources
PART II.1, Scope of Reductions Required	5/12/2015	4	Clarification	Added text clarifying when reductions need to be made to meet Special Condition 8
PART II.2, Size and Extent	3/19/2015	5	Clarification	Added additional lands that can be subtracted from the service area - Concrete Products Facilities, NMMP, Ag Lands, Wetlands, Open Waters
PART II.2, Size and Extent	3/19/2015	5	Forested Lands	Edited footnote - removed text about not crediting forested land draining to a BMP. Added footnote about density and acre requirement to meet the definition of "forested."
PART II.2, Permit Tables	3/19/2015	6	Clarification	Clarified permit tables are the reductions for existing sources
PART II.2, Permit Tables	3/19/2015	6	Clarification	Clarified in footnote that once construction is completed on sites that are in transition as of June 30, 2009, those lands should be considered new sources subject to Special Condition 3.
PART II.2, Permit Tables	5/12/2015	7	Permit Tables	Clarification concerning Tables 3a-d loading rates
PART III - Eligible BMPs	3/19/2015	8	Credit Guarantees	Changed credit guarantee from "BMPs that are completed or under construction" to "funds approved as part of an adopted Capital Improvement (or equivalent) Plan."
PART III - ELIGIBLE BMPs	3/19/2015	8	Clarification	Bolded section concerning grants awarded under prior efficiencies
PART III.1, Calculating Credits	3/19/2015	9	Forested Lands	Edited text throughout section to reflect change to crediting for forested lands.
PART III.1, Calculating Credits	3/19/2015	9	Forested Lands	Added forested loading rate table and text concerning loading rates for Ag lands.

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PART III.1, Calculating Credits	3/19/2015	9	Forested Lands	Added text stating that permittees may only receive credit for forested land use conversion of 30m x 30m or greater. Added text to clarify this does not apply to the Forest Buffer BMP.
PART III.2, Calculation Credits, Unregulated	3/19/2015	9	Forested Lands	Added text to clarify there is no baseline for forested lands, ag lands
PART III.3	3/19/2015	11	Clarification	Clarifying text added that explains how permittees may receive credit for BMPs that were primarily installed to meet VSMP requirements
Part III.4	3/19/2015	11	Crediting Pre-09 BMPs	Added text concerning credit for BMPs initially installed prior to June 30, 2009. This is discussed in greater depth in Part IV.2 and Appendix VI
PART IV.1	3/19/2015	12	Correction	Added link for reporting spreadsheet
PART IV.2, Historical Data	3/19/2015	12	Crediting Pre-09 BMPs	Added text clarifing the necessary steps permittees must take to receive credit for BMPs installed prior to July 1, 2009.
PART V	5/12/2015	13	Clarification	Added text clarifing BMP eligibility for credit guarantees
PART VI	3/19/2015	14	Correction	Removed "5%" from the discussion of reductions required this permit cycle. Reductions required under Special Condition 8 were not captured in this statement.
PART VI.3	3/19/2015	15	Correction	Corrected citation
PART VI.3	3/19/2015	15	New Sources	Added clarifying text concerning the Department's expectation for meeting Special Condition 3.
PART VI.5	3/19/2015	16	Action Plan Expectations	Added clarifying text concerning the Department's expectation for meeting Special Condition 5.
Appendix II	5/12/2015	27	Clarification	Added text to footnote clarifying reductions do not need to be made beyond the 16% average land cover condition
Appendix II, Example II.1	3/19/2015	37	Clarification	Added text clarifying the appropriate loading rates to use to calculate additional reductions from new sources
Appendix II, Example II.2	3/19/2015	38	Correction	Removed "or 8" from the title of the section. Aggregate Accounting method cannot be used for Special Condition 8.
Appendix II, Example II.2	3/19/2015	38	Clarification	Added text clarifying the appropriate loading rates to use to calculate additional reductions from new sources

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Appendix III	3/19/2015	41	Clarification	Added citations for Special Condition 3 where appropriate
Appendix IV	5/12/2015	42	Correction	Corrected citation
Appendix V.B	3/19/2015	48	Retrofit Curves	Retrofit Curves have been updated by the Bay Program. The updated curves and equations have been incorporated in to the guidance. Permittees may use either set of curves for this permit term.
Appendix V.B	3/19/2015	48	Retrofit Curves	Clarified that RRM sppreadsheet may not be used to estimate the RS value for use in the curve equation
Appendix V.B	3/19/2015	48	Clarification	Text added to clarify the retrofit curves/equations cannot be used for dry ponds or extended dentention ponds
Appendix V.D	3/19/2015	57	BMP Restoration	Changed text to incorporate BMP restoration as an option in accordance with the Bay Program's Expert Panel Report.
Appendix V.D, Existing BMP Modification	3/19/2015	58	Clarification	Downward Modification. Permittees may only use downward modification w/ Bay Program Established Efficiencies
Appendix V.D, Existing BMP Modification	3/19/2015	58	BMP Restoration	Removed text stating the credit would not be available for BMP restoration
Appendix V.D, Existing BMP Modification	3/19/2015	59	Credit for Pre-09 BMPs	Edited example to reflect elimination of design era consideration
Appendix V.D, Example V.D.2	5/12/2015	60	Correction	Error in example corrected
Appendix V.E	5/12/2015	61	Oversized BMPs	Appendix added to clarify the calculation method that should be used for oversized BMPs
Appendix V.G	3/19/2015	64	Street Sweeping	Separate appendix for street sweeping added
Appendix V.H	3/19/2015	65	Land Use Change	Additional land uses that should be considered pervious added
Appendix V.J	3/19/2015	69	Urban Stream Restoration	Updated section to reflect expert panel report that was released after the guidance was finalized
Appendix V.J	3/19/2015	69	Urban Stream Restoration	Section edited throughout to reflect change that permittees may receive credit for forested lands
Appendix V.J	5/12/2015	71	Urban Stream Restoration	Added language to clarify how the baseline for unregulated lands impacts the credit available for stream restoration projects
Appendix V.L	3/19/2015	75	Clarification	Language added to clarify that all redevelopment projects are eligible for credit, regardless of the initial land use cover condition
Appendix VI	3/19/2015	76	Crediting Pre-09 BMPs	Added Appendix explaining how permittees may receive credit for BMPs install prior to July 1, 2009

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PART I - BACKGROUND

1. Definitions – For purposes of this guidance document, the following definitions shall apply:

Best Management Practices ("BMPs") – Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices, including both structural and nonstructural practices, to prevent or reduce the pollution of surface waters and groundwater systems

Existing Sources – Pervious and impervious urban land uses served by the MS4 as of June 30, 2009

Impervious Cover – A surface composed of material that significantly impedes or prevents natural infiltration of water into soil

Municipal Separate Storm Sewer - A conveyance or system of conveyances otherwise known as a municipal separate storm sewer system, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains:

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

Municipal Separate Storm Sewer System ("MS4") – All separate storm sewers that are defined as "large" or "medium" or "small" municipal separate storm sewer systems or designated under 9VAC25-870-380 A 1.

New Sources – Pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009

Pollutants of Concern ("POC") – Total nitrogen ("TN"), total phosphorous ("TP"), and total suspended solids ("TSS")

Prior Developed Lands ("Redevelopment") – Land that has been previously utilized for residential, commercial, industrial, institutional, recreation, transportation, or utility facilities or structures, and that will have the impervious areas associated with those uses altered during a land-disturbing activity

Regulated Land – Regulated land refers to the conveyances and drainage area served by the permittee's MS4. 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.

For terms not defined above, please refer to the 9VAC25-890-1 or 9VAC25-870-10 of the Virginia Administrative Code.

2. Purpose

In the Phase I and Phase II Chesapeake Bay TMDL Watershed Implementation Plan ("WIP") for the Chesapeake Bay Total Maximum Daily Load ("TMDL"), the Commonwealth committed to a phased approach to reducing nutrients and suspended solids discharging from Municipal Separate Storm Sewer Systems ("MS4"). The Special Condition for the Chesapeake Bay TMDL ("Special Condition") in the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (VAR04), effective July 1, 2013, and the eleven Phase I individual MS4 permits, as they are reissued, requires MS4 operators to develop a Chesapeake Bay TMDL Action Plan ("Action Plan") and submit it to the Virginia Department of Environmental Quality ("Department").

The Action Plan should provide a review of the current MS4 program, which demonstrates the permittee's ability to ensure compliance with the Special Condition and include the means and methods the permittee will use to meet 5.0% of the Level 2 (L2) scoping run reduction for existing development by the end of the first permit cycle as well as any reductions that may be required for new sources **initiating construction** between July 1, 2009 and June 30, 2014 and grandfathered projects that **initiate construction** after July 1, 2014. Level 2 implementation equates to an average reduction of 9.0% of nitrogen loads, 16% of phosphorus loads, and 20% of sediment loads from impervious regulated acres and 6.0% of nitrogen loads, 7.25% of phosphorus loads and 8.75% sediment loads from pervious regulated acres beyond 2009 progress loads and beyond urban nutrient management reductions for pervious regulated acres.

The purpose of this guidance is to provide staff and permittees with methods for meeting the requirements of the Special Condition for the Chesapeake Bay TMDL and the WIP, with particular attention to the development of the Action Plan. It is intended to create consistency in reporting to the Department, as well as ensure that compliance and program evaluations are handled uniformly throughout the Commonwealth. This guidance is specific to the first reissuance of the Phase I MS4 permits since approval of the Chesapeake Bay TMDL and the 2013-2018 General Permit for Discharges of Stormwater from Small MS4s ("GP"). **If there are inconsistencies between the requirements described in this guidance document and the requirements in a permittee's individual permit, the individual permit is the controlling document. If additional guidance is needed concerning any inconsistencies, the permittee should contact the Department.**

The GP requires permittees to update their MS4 Program Plans to include the Action Plan no later than 24 months after permit coverage is initiated. Action Plans must be submitted with the Annual Report for the reporting period of July 1, 2014 through June 30, 2015 to the Department by October 1, 2015. Permittees regulated by a VPDES individual permit are required to modify their MS4 Program Plans to include the Action Plan and submit it to the Department in accordance with the schedule listed in the individual permit. The Action Plan becomes an enforceable part of the MS4 Program Plan unless specifically denied in writing by the Department within the time frame specified by the permit. Permittees may modify the Action Plans during the permit cycle to include new opportunities for reductions or address projects that are deemed infeasible. Any updates should be submitted to the Department in accordance with the Program Plan Modification section of the permit (GP Section II.F.1).

For reference, the Special Condition as found in 9VAC25-890-40.C of the General Permit is provided in *Appendix I* of this guidance document.

PART II – REQUIRED REDUCTIONS

The permittee's Action Plan should provide the Department with the means and methods that will be implemented to meet the POC reductions required by the end of the first permit cycle. To develop this plan, the permittee will first need to determine the reductions required for each POC. This section identifies the scope of those reductions based on the Special Condition requirements and indicates the steps permittees should follow when delineating the extent of their MS4 system.

NOTE: As discussed below, existing sources ("pervious or impervious land uses served by the MS4 as of June 30, 2009") are subject to GP Section I.C.2.a.(6). New Sources ("pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009") are subject to GP Section I.C.2.a.(3). There are no additional reductions required for projects subject to GP Section I.C.2.a.(3), but the permit requires that permittees address the "means and methods that will be utilized to address discharges into the MS4 from new sources." Please see *Part VI* of the guidance for additional information concerning the Department's expectations for meeting GP Section I.C.2.a.(3). Additionally, if projects meet the requirements for GP Section I.C.2.a.(7) or GP Section I.C.2.a.(8) additional reductions are required. For a more detailed description of when additional reductions are necessary under Special Condition 7 and Special Condition 8, see *Appendix II*.

Please see *Appendix III* for additional clarification about which permit requirement applies to a given project.

1. Scope of Reductions Required by the Permit

Existing Development (GP Section I.C.2.a.(6))
The permit requires permittees to reduce 5.0% of the L2 Scoping Run POC reductions required for existing sources as of June 30, 2009. During the first permit cycle, Phase II permittees do not need to account for the expanded urbanized areas that were identified as a result of the 2010 US Census. However, permittees should begin to plan for those areas and will need to include them in the updated draft Action Plan that must accompany the application for reissuance of the permit. The full 40% POC reductions for those "expanded areas" are required by the end of the second permit cycle.

For newly designated Phase II permittees that were required to obtain a permit as a result of the 2010 Census, all regulated lands should be treated as "expanded areas." That means those permittees are not required to implement any BMPs during the first permit cycle. However, the full 40% POC reductions must be met on all regulated lands by the end of the second permit cycle.

New Sources with an Impervious Land Cover Condition Greater than 16% for the design of post-development stormwater management facilities (*GP Section I.C.2.a.(7))*
If a "new source," where construction was initiated between July 1, 2009 and June 30, 2014, meets an average impervious land cover condition of 16% or less for the design of post development stormwater management facilities no additional offsets are required under the Special Condition beyond those required for existing conditions (GP Section I.C.2.a.(6)). If the permittee has adopted an average impervious land cover condition that is greater than 16% or has a "fee-in-lieu of" or similar program that has allowed projects to be built at an average land cover condition greater than 16% for the design of post development stormwater management facilities, those projects may be subject to additional reductions under Special Condition Requirement 7 (GP Section I.C.2.a.(7)) if they disturb one acre or greater. For a more detailed description of when additional reductions are necessary under Special Condition 7, see *Appendix II*.

For accounting consistency, and in accordance with the permit language, permittees that adopted an established land cover condition greater than 16% should use the simple method to determine the excess TP that needs to be offset for projects subject to Special Condition 7. Table 4 in the permit should be used to determine the equivalent required load reductions necessary for TN and TSS. The loading rates from *Tables 2a-d* and *Tables 3a-d may not* be used for site by site calculations to determine the reductions required under Special Condition 7. An example of how these calculations should be performed on a site by site basis is provided in *Appendix II, Example II.1*.

Permittees that adopted a "fee-in-lieu of" or similar program may have sites throughout their service area with variable final land cover conditions that may or may not have been offset through the implementation of BMPs. The Department acknowledges that it may represent a substantial burden to these permittees to determine reductions from these projects on a site by site basis. To simplify the accounting process, an aggregate accounting approach may be used. Aggregate accounting may be done by tracking the land use change on all regulated land between July 1, 2009 and June 30, 2014 to determine the increased loads that were not treated and must be addressed under Special Condition 7. To use the loading rates in Table 3a-d for this purpose, the aggregate approach must be applied to a permittee's entire service area. Permittees should note that using an aggregate approach may capture lands beyond those that fall under this requirement (i.e. lands less than an acre, lands that have an average impervious land use cover less than 16%).

The permittee should choose the most appropriate approach taking into consideration the (1) amount of development that must be accounted for throughout the regulated area, (2) the resources required to perform these calculations on a site by site basis, and (3) the quality of development records available to the permittee.

Grandfathered Projects with an Impervious Land Cover Condition Greater than 16% for the design of post-development stormwater management facilities (*GP Section I.C.2.a.(8))*
The permit also requires permittees to offset any increase in POC from grandfathered projects (as defined in 9VAC 25-870-48) that disturb one acre or greater and have an impervious land cover condition greater than 16% for the design of post-development stormwater management facilities. Those increases should be offset prior to the completion of the grandfathered projects in accordance with GP Section I.C.3.c. Since the increased loads must be entirely offset prior to completion of the project, these projects must be accounted for on a site by site basis. Permittees should use the simple method, in conjunction with permit *Table 4*, to calculate the additional load reductions required under Special Condition 8. The loading rates from permit *Tables 2a-d* and *Tables 3a-d* should not be used to calculate the load reductions required on a site by site basis. For a more detailed description of when additional reductions are required under Special Condition Requirement 8 (GP Section I.C.2.a.(8)), see *Appendix II*.

NOTE: Permittees are not required to offset increased POC from grandfathered sources until construction on those sites is completed and are not required to plan for those reductions until construction is initiated. Therefore, to meet Special Condition 8, permittees should address the offset of any grandfathered projects initiated between July 1, 2014 and Action Plan submission as part of the first Action Plan. Permittees should address reductions for grandfathered projects that initiate construction after the initial Action Plan submission in the Chesapeake Bay TMDL Action Plan section of future annual reports submitted for the reporting period in which the grandfathered construction began. Permittees will still need to develop a list of future projects and associated acreage in accordance with Special Condition 10. That list should serve as an estimate of the projects the permittee anticipates will need to be addressed to meet Special Condition 8.

2. Calculating Reductions for this Permit Cycle

Permittees should use the appropriate basin values provided in the permit to estimate the pollutant source loads as of June 30, 2009 and calculate the pollutant reductions necessary to meet the permit requirements. In order to estimate these reductions, as well as calculate how the required reductions will be met, permittees will first need to estimate:

1. The size and extent of their regulated MS4 system as of June 30, 2009; and
2. The total regulated acres of urban pervious and urban impervious surface served by the MS4 as of June 30, 2009.

If there is incomplete data concerning either the extent of the MS4 system or the number of pervious and impervious acres served, permittees should use their best professional judgment to make the best estimates possible. Diagrams have been included in *Appendix IV* to illustrate some of the potential delineation issues discussed in this section.

Size and Extent of the MS4

When estimating the size of the MS4 system, the permittee should not include in its service area the conveyances and drainage area that are regulated by a separate MS4 permit. For permittees that have interconnected systems, MOUs should be considered as a method to clearly differentiate which operator is responsible for which part of the system. For this permit cycle, permittees may also exclude from their regulated urban impervious and regulated urban pervious cover calculations:

1. Land regulated under any General VPDES permit that addresses industrial stormwater, including the General VPDES Permit for Stormwater Associated with Industrial Activity (VAR05), the General VPDES Permit for Concrete Products Facilities (VAG11), and the Nonmetallic Mineral Processing General Permit (VAR84);
2. Lands regulated under an individual VPDES permit for industrial stormwater discharges;
3. Forested Lands[1];
4. Agricultural Lands;
5. Wetlands; and,
6. Open Waters.

Permittees should clearly document the areas within their jurisdiction that are not included in their regulated acres so the Department is able to verify an appropriate methodology was used. Permittees are encouraged to provide maps depicting the MS4 boundaries, lands served by the MS4, and any lands that the permittee has excluded as allowed above.

For Phase II permittees, the Census designated urbanized areas and jurisdictional boundaries may be used as a conservative estimate of the area the MS4 serves. It is expected that this data will be refined as the permittee completes the mapping exercise required in Section II B.3.a.(3) of the General Permit. Again, any expanded areas that resulted from the 2010 U.S. Census are not required to be included in the first permit cycle reductions, and Phase II permittees that were identified and designated as a result of the 2010 Census are not required to implement BMPs until the second permit cycle. By the end of the next permit cycle these permittees are expected to achieve the full 40% of the L2 scoping run reductions for existing sources in the expanded areas and should plan accordingly. Where data is unavailable or

[1] For the purpose of service area delineation and the land use change BMP "forested" lands must meet the tree density requirements described in Appendix V.H, be undeveloped, and be a minimum of 30m x 30m (900 m^2) contiguous. This minimum threshold is based on the resolution of the Bay Program Model. These minimum requirements do not apply to the forest buffer BMP.

boundaries are unclear, the permittee will need to exercise its best professional judgment in determining the boundaries and service area of its MS4.

Mapping Tools

To estimate the regulated urban impervious and regulated urban pervious acres served by the MS4 as of June 30, 2009 the Department strongly encourages permittees to use the best GIS resources available. 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. Permittees should include a summary of the methodology that was used to estimate the regulated urban impervious acres and regulated urban pervious acres as part of their Action Plan so the Department is able to verify an appropriate method was used.

Base aerial imagery is available to permittees through the Virginia Base Mapping Program, which is administered by the Virginia Geographic Information Network (VGIN). These images can be viewed free of charge using the VEGIS viewer at: http://www.deq.virginia.gov/mapper_ext/default.aspx?service=public/wimby or through VGIN's website. Permittees may use the "Most Recent Imagery" map available through the Virginia GIS Clearinghouse at: http://vgin.maps.arcgis.com/home/ to estimate the amount of pervious and impervious surface in their MS4. This map is a composite of two images that can be accessed separately through this webpage: http://gismaps.vita.virginia.gov/arcgis/rest/services. For Action Plan development permittees may use the "VBMP2009" and "VBMP2011" links. "VBMP2009" contains information for the eastern half of the state, while "VBMP2011" is the most applicable map of the western half of the state. This imagery is provided at 1'X1' resolution, which is the image and analytical resolution the Department recommends permittees use.

Permit Tables – Reductions for Existing Conditions

Once the regulated urban pervious acres and regulated urban impervious acres are estimated, the permittee can calculate the existing source loads for the pollutants of concern. If a permittee has lands that were under construction as of June 30, 2009 the Department recommends the permittee use the pre-construction land use as the baseline.[2] If a permittee's MS4 system discharges to multiple river basins, the permittee will need to calculate pollutant loads and load reductions for each basin to which the MS4 discharges. The first set of tables (*Tables 2a-d*) in the Special Condition provides an estimate of the total pollutant loads entering the applicable river basin based on the June 30, 2009 progress run. Using these values, permittees can determine the reductions required during this permit cycle.

NOTE: It has been brought to the Department's attention that the "first permit cycle required reduction loading rates" presented in the *Tables 3a-d* may result in lbs/yr POC required reduction values that are not 5% of the LT reductions due to an issue with insufficient significant figures. If permittees submit Action Plans that meet reductions requirements calculated using the values in *Tables 3a-d* of the permit that will be acceptable. However, permittees are encouraged, if possible, to use the following, more accurate, values instead:

[2] Once construction is completed, these lands should be considered "new sources" subject to GP Section I.C.2.a.(3)

James River Basin

Subsource	Pollutant	Current Table Loading Rate	Corrected Loading Rate
Regulated Urban Impervious	Nitrogen	.04	.042255
Regulated Urban Pervious		.02	.02097
Regulated Urban Impervious	Phosphorous	.01	.01408
Regulated Urban Pervious		.002	.0018125
Regulated Urban Impervious	Total Suspended Solids	6.67	6.7694
Regulated Urban Pervious		.44	.442225

Potomac River Basin

Subsource	Pollutant	Current Loading Rate	Corrected Loading Rate
Regulated Urban Impervious	Nitrogen	.08	.07587
Regulated Urban Pervious		.03	.03021
Regulated Urban Impervious	Phosphorous	.01	.01296
Regulated Urban Pervious		.001	.00148625
Regulated Urban Impervious	Total Suspended Solids	11.71	11.7132
Regulated Urban Pervious		.77	.769125

Rappahannock River Basin

Subsource	Pollutant	Current Loading Rate	Corrected Loading Rate
Regulated Urban Impervious	Nitrogen	.04	.04221
Regulated Urban Pervious		.02	.01602
Regulated Urban Impervious	Phosphorous	.01	.01128
Regulated Urban Pervious		.002	.0013775
Regulated Urban Impervious	Total Suspended Solids	4.24	4.2397
Regulated Urban Pervious		.25	.24504375

York River Basin

Subsource	Pollutant	Current Loading Rate	Corrected Loading Rate
Regulated Urban Impervious	Nitrogen	.03	.032895
Regulated Urban Pervious		.02	.02295
Regulated Urban Impervious	Phosphorous	.01	.01208
Regulated Urban Pervious		.002	.00184875
Regulated Urban Impervious	Total Suspended Solids	4.60	4.5668
Regulated Urban Pervious		.32	.3184125

Only one set of values should be used for the loading rate calculations and the loading rates that are used should be identified in the Action Plan. For reporting, permittees should round the calculated pounds of reductions required during the first permit cycle to the nearest hundredth.

PART III – ELIGIBLE BMPS AND CREDIT OPPORTUNITIES[3]

To meet the reduction requirements for this permit cycle, permittees should implement BMPs that are in the Virginia Stormwater BMP Clearinghouse (*Appendix V.A*) or have been approved by the Chesapeake Bay Program ("Bay Program") (*Appendices V.B-V.K)*. As BMPs are approved by the Bay Program during the permit cycle, they may also be used to meet the implementation requirements of this permit. Permittees are encouraged to work with the Department throughout Action Plan development, including submitting draft plans for review.

The means and methods provided to the Department must show that, based on the information available at the time the Action Plan is submitted, the BMPs implemented by the permittee will meet the reductions required by the Special Condition for the Chesapeake Bay TMDL for this permit cycle. Implementation of the BMPs in the permittee's approved Action Plan will demonstrate compliance with the reduction requirements for this permit cycle regardless of efficiency changes that may occur after the Action Plan is submitted. After the Action Plan is submitted any changes in established efficiencies will not be retroactively applied to projects approved to meet reductions for this permit cycle. The same credit guarantee will apply to any BMP included in the second Action Plan that has had, at a minimum, funds approved as part of an adopted Capital Improvement Plan, or an equivalent funding plan for state and federal facilities, at the time the application for permit reissuance is submitted. Likewise, if the BMPs included in the initial Action Plan result in reductions beyond the required 5% those reductions will also be guaranteed at the efficiencies available at the time the Action Plan is submitted. For instance, if a permittee's initial Action Plan includes BMPs that result in a 7% reduction in TN and those BMPs are implemented, the permittee will need to reduce an additional 33% TN during the next permit cycle, not an additional 35%, to meet the reduction requirements for the second permit cycle.

Permittees should submit supporting documentation with the application for permit reissuance and the subsequent Action Plan that lists the projects that have not been implemented, but have met this financing requirement. If funds have not been approved for a BMP prior to submission of the second Action Plan, the permittee will need to recalculate reductions from those BMPs based on the most up to date efficiencies. For planning purposes, when multiple reduction efficiencies are available through Bay Program BMPs, expert panel reports, or other sources, the permittee is encouraged to use the most conservative efficiency values

Permittees should also note that projects may require local, state, or federal permits such as the General Permit for Discharges of Stormwater from Construction Activities or Virginia Water Protection Permits and this should be taken into account as BMPs are selected. **NOTE: If a permittee has been awarded a grant for reductions based on efficiencies that are revised prior to submittal of the Action Plan, the award will not be revoked or altered due to these circumstances. However, to meet the Special Condition, permittees will need to recalculate the reductions from those BMPs based on the most up-to-date efficiencies at the time the Action Plan is submitted. The Department's review of nutrient and sediment reductions included in the Action Plan is independent of the review of any previous grant applications for a given BMP.**

[3] This guidance focuses solely on urban BMPs. If there are other types of land that are within a permittee's service area and/or that drain to the permittee's system, the permittee should refer to the Bay Program's guidance for applicable BMPs to reduce pollutant loads. The application of these BMPs for credit will be reviewed on a case by case basis.

1. Calculating Credits

Estimating the pollutant reductions provided by a BMP is primarily a two-step process. First, the permittee should calculate the pollutant load draining to the BMP. Second, the reductions created by a BMP should be applied to that calculated load (for most structural BMPs this will be a percent efficiency). The result is the POC load reduced. Depending on the BMP installed this procedure may vary slightly. More detailed information concerning how to perform calculations for accepted BMPs can be found in *Appendix V*. **Permittees should submit their BMP data with their Annual Report using the spreadsheet provided on DEQ's website.**

Permittees should not use the loading rates in Tables 2a-d of the permit to calculate the pollutant loads draining to a BMP if those loads are from (1) forested lands or (2) agricultural lands. If a permittee has identified forested or agricultural acres that drain to a BMP, the permittee may receive credit for load reductions from those lands, regardless of whether or not they have been included in the initial service area delineation. However, it is not appropriate to use the loading rates found in the permit tables for these land uses. For forested lands, permittees should use the following loading rates:

Table III.1 - Forested loading rates by basin:

River Basin	TN (lbs/ac/yr)	TP (lbs/ac/yr)	TSS (lbs/ac/yr)
James	2.36	0.13	77.38
Potomac	5.29	0.13	79.91
Rappahannock	4.03	0.13	57.35
York	2.13	0.07	27.61

Due to the variability of agricultural lands, it is not appropriate to use a single set of loading rates for pollutants loads from these lands. If permittees have or plan to install BMPs that receive drainage from agricultural lands, the Department should be contacted for the appropriate loading rates.

Permittees may receive credit for:

1. *Structural BMPs* –To calculate the credits generated by structural BMPs, the permittees may use, as applicable, (1) the efficiencies in the Virginia Stormwater BMP Clearinghouse (*Appendix V.A*), (2) the retrofit performance curves provided by the Bay Program (*Appendix V.B*), or (3) the approved or interim Bay Program efficiencies (*Appendix V.C*). Permittees may also receive credit for BMP Enhancements, Conversions, and/or Restoration (*Appendix V.D*) or BMPs that were installed to meet development requirements, but exceed those requirements and any applicable state standards (*Appendix V.E)*. The impact of treatment trains should also be considered by permittees (*Appendix V.F*).
2. *Land Use Change* – To calculate the credits generated by a land use change, permittees should use the conversion factors presented in *Appendix V.H*. Conversions to forested land will only be credited at areas greater than 30m x 30m (900m^2). In addition to the Land Use Change Credit, permittees may receive an efficiency credit for Forest Buffers which is explained in greater detail in *Appendix V.I*.
3. *Urban Stream Restoration* – There are five methodologies permittees may use to calculate reductions from Urban Stream Restoration (*Appendix V.J)*. In accordance with GP Section I.C.2.b.(1) any BMPs implemented on unregulated lands must exceed baseline reductions. In accordance with GP Section I.C.2.b, the credit for stream restoration projects must be adjusted to account for the baseline reduction required on the unregulated land draining to the restored stream.

4. *Urban Nutrient Management ("UNM")* – Permittees may receive credit for UNM plans that are developed for unregulated land, public lands one contiguous acre or less[4], and/or privately owned lands that are not golf courses where nutrients are applied. The recommended method for calculating reductions for Urban Nutrient Management is described in *Appendix V.K*.
5. *Nutrient Trading* – Permittees may utilize the DEQ nutrient trading or offset program in accordance with § 62.1-44.19:21.A of the Code of Virginia, governing trading and offsetting. Regulations concerning certification of non-point source nutrient trading along with additional guidance are forthcoming.
6. *Redevelopment* – Permittees may receive credit for redevelopment projects if the calculated pollutant load for the land cover condition prior to redevelopment is reduced (*Appendix V.L*). **NOTE:** Additional nutrient reductions beyond the VSMP requirements are also potentially creditable through the DEQ nutrient trading program; however, the MS4 permittee and land owner may not both take credit for the reductions. Reduction calculations for individual BMPs implemented on redeveloped land should be performed in the same manner as BMPs applied to existing development. Permittees may use the approved site development plans to determine the POC reductions from these projects.

Permittees may submit alternate POC reduction methods, which the Department will review on a case by case basis. The Department has developed guidance for the approval of Manufactured Treatment Devices ("MTD") that permittees may find useful. This guidance can be found on DEQ's website at: http://www.deq.virginia.gov/Portals/0/DEQ/Water/Guidance/142009.pdf. Currently, the MTD approval process only certifies a practice's TP reductions. Permittees should use the Bay Program curves and/or efficiencies to calculate reductions for TN and TSS if there is an analogous BMP. If there is not an analogous Bay Program BMP for an approved MTD, the Department will consider TN and TSS credits for those BMPs on a case-by-case basis.

2. Calculating Credits for BMPs Implemented on Unregulated Lands[5]

In accordance with GP Section I.C.2.b.(1) permittees may receive credit for BMPs implemented on unregulated land provided any necessary baseline is met first. Depending on the BMP type, baseline means:

1. *Baseline for Structural BMPs* **–** The baseline for structural BMPs is intended to be consistent with the nutrient trading regulations. In accordance with §62.1-44.19:21 of the Code of Virginia, baseline for urban practices from new development shall be in compliance with post-construction nutrient loading requirements of the Virginia Stormwater Management Program regulations, which has been set at 0.45 lbs TP/acre/year for practices installed between July 1, 2009 and June 30, 2014 and 0.41 lbs TP/acre/year for projects installed after July 1, 2014. Any POC reductions beyond these values may contribute to the reductions required by the Special Condition. Associated TN and TSS load reductions for BMPs implemented to treat unregulated land should be calculated on a BMP by BMP basis.
2. *Baseline for Stream Restoration* **–** Permittees may receive full credit for the proportion of regulated urban land that drains to a stream restoration project and an adjusted credit for the proportion of unregulated urban land that drains to the stream restoration project. There is no

[4] Permittees may not receive credit for UNM plans developed on "lands owned or operated by the MS4 operator where nutrients are applied to a contiguous area of more than one acre" because those plans are an existing permit requirement (GP Section II.B.6.c) and are assumed reductions in the WIP.
[5] If the BMP was funded by a 319 nonpoint source grant, it may be contrary to the funding award to seek credit towards required reductions under the Special Condition.

baseline that must be met for any forested or agricultural lands that drain to the project. The credit for unregulated land must account for baseline reductions required by the TMDL and WIP. The method permittees should use to calculate baseline for these practices is provided in *Appendix V.J*.

3. *Baseline for Urban Nutrient Management* **–** Baseline for urban nutrient management is based on the commitments the Commonwealth made in the WIP, which calls for Nutrient Management Plans ("NMP"s) on 48% of urban pervious lands. If permittees develop NMPs for either public or privately owned lands (except golf courses) that fall outside of the regulated MS4 service area, the permittee may take credit for the lbs/TN and lbs/TP addressed in the plan minus the 48% required by the WIP. See *Appendix V.K* for additional information.

3. BMPs Installed to meet Development or Redevelopment Requirements

In general, permittees may not receive credit towards the reductions that are required under GP Section I.C.2.a.(6) or may be required under GP Section I.C.2.a.(7) and/or GP Section I.C.2.a.(8) for BMPs installed after July 1, 2009 that were implemented to meet the minimum VSMP technical criteria phosphorous removal requirement (9VAC25-870 Part II B or Part II C) for new development or other minimum regulatory requirements. However, permittees may receive credit for these BMPs under the following circumstances:

1. *Redevelopment* **–** As is mentioned throughout this document permittees may receive credit for pollutant *reductions* as the result of a redevelopment project, regardless of the initial land cover condition of the site. This applies to any redevelopment project completed after July 1, 2009.
2. *Stricter Development Requirements* **–** Permittees may have enacted development requirements that were stricter than the state standards, such as adopted an average land cover condition less than 16% for the design of post-development stormwater management facilities or required the implementation of stormwater management facilities for projects that disturb less than an acre. Any BMPs installed to meet these stricter standards after July 1, 2009 (or any BMP capacity that exceeds the state standards and/or average land cover condition) may be counted towards the reductions required under Special Condition 6, 7, and/or 8. **NOTE:** Permittees subject to the Chesapeake Bay Preservation Act may not receive credit for BMPs installed to meet those requirements. It is assumed that these BMPs will be installed as a method for maintaining baseline conditions and do not result in an additional load reduction.
3. *Oversized BMPs* **–** If an oversized BMP is installed and the excess capacity has not been utilized to offset additional development, permittees may use that capacity to meet the POC reductions required under the TMDL. If permittees choose to use the remaining BMP capacity to meet their TMDL requirements that capacity cannot be used to meet other regulatory requirements for future development. Please see *Appendix V.E* for additional information concerning the appropriate methods that should be used to calculate reductions from these BMPs.

4. Credit for BMPs and Impoundments Initially Installed Prior to July 1, 2009

The Department has revised the crediting procedure for BMPs and impoundments that were initially installed prior to July 1, 2009. This was done to ensure that the guidance is internally consistent, as well as to improve consistency with the Bay Program's *Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects* and simplify the crediting process. Please see *Part IV.2* and *Appendix VI* for additional information on this subject.

PART IV – REPORTING CONTROL MEASURES

1. Implementation for this Permit Cycle

For all BMPs that are implemented to meet the Special Condition requirements, **the permittee should report BMP information in accordance with Section I.C.4 of the General Permit using the spreadsheet developed by the Department**. When submitting this information with the appropriate Annual Report, permittees should designate which BMPs were employed to meet the Chesapeake Bay TMDL POC load reductions.

The method permittees use to estimate the acres treated by each BMP depends on the retrofit. *Appendix VII* provides guidelines for how the acres treated should be considered for each BMP type. In addition to the information required in Section I.C.4 of the General Permit, the permittees should submit calculation information (i.e. the method that is used) for the BMPs that are planned and implemented. This will ensure that the Department can verify the permittee will meet the POC reductions required by the permit.

2. Historical Data

The Department strongly encourages permittees to submit historical data for water quality BMPs installed prior to June 30, 2013.[6] This historical information should include water quality BMPs implemented throughout the permittee's jurisdiction, not just those BMPs implemented in the permittee's regulated service area. If this historical data is provided to the Department by September 1, 2015[7] using the spreadsheet provided on DEQ's MS4 website, permittees will receive full credit for BMPs that were:

1. initially installed on or after January 1, 2006 and prior to July 1, 2009, and;
2. constructed to address water quality within the permittee's regulated service area.

To receive credit for previously unreported BMPs installed on or after January 1, 2006 and prior to July 1, 2009, permittees will need to include the following in their Action Plan:

1. An affirmative statement that a complete list, to the maximum extent practicable, of historical BMPs was or will be submitted to the Department by September 1, 2015. Permittees may submit this data as part of the "Historical Data Clean-Up" effort that is currently ongoing.
2. Appropriate calculations for the BMPs that the permittee is claiming for credit towards its required POC load reductions.

Eligible unreported BMPs must be submitted for credit as part of the permittee's first Chesapeake Bay TMDL Action Plan. Permittees will not receive credit for previously unreported BMPs that are submitted as a component of the second phase and/or third phase Chesapeake Bay TMDL Action Plan.

[6] A more accurate accounting of the permittee's historical BMPs will allow the Bay Program to better refine its load allocations for Virginia in the next phase of the Bay Program Model. If the Department does not receive data from permittees about existing BMPs, no data will be reported to the Bay Program on behalf of that MS4. This may have a direct impact on the permittee's pollutant reduction requirements in subsequent permits.

[7] The Department must receive historical BMPs by this date for inclusion in the Phase 6 Chesapeake Bay Model.

PART V – APPLICATION FOR PERMIT REISSUANCE REQUIREMENTS

As part of the application for permit reissuance, the permittee will need to estimate the POC reductions that will be required for the next permit cycle in accordance with Section I.C.5.b of the General Permit. With the exception of those BMPs that meet the credit guarantee requirements in Part III of this guidance, calculations for BMPs proposed as part of the draft second phase Chesapeake Bay TMDL Action Plan should be developed using the most recently approved BMP efficiencies and crediting protocols available at the time of draft plan submission.

The purpose of the requirements in Section I.C.5.b is to ensure the full 40% reductions are achieved for existing development, expanded Urban Areas designated in the 2010 Census, and new sources developed between 2009 and 2014 for which the land cover condition was greater than 16% impervious for the design of post-development stormwater management facilities.

PART VI – CHESAPEAKE BAY TMDL ACTION PLAN ELEMENTS

This section describes the required and suggested elements that should be included in the Chesapeake Bay TMDL Action Plan to ensure it is approvable. Providing this information as described in this guidance document should ensure consistency in reporting as well as the Action Plan review process. The Action Plan should allow the Department to verify that the permittee will be able to meet the requirements for the Special Condition for the Chesapeake Bay by the end of the first permit cycle.

The Action Plan should include sufficient supporting material to show that the permittee has:

1. Calculated the full scope of offsets for existing development and new sources that are required to be made by the end of the first permit cycle (See *Part II*, *Appendix II*, and *Appendix III*); and,
2. Determined the methods that will be used to meet the reductions required by the end of the first permit cycle (See *Part III* and *Appendix V*)

In addition to this, the permit requires that the Action Plan also include:

1. A review of the current MS4 permit authority and implementation capabilities,
2. Existing, new, and modified legal authorities necessary to meet required reductions;
3. An estimate of future grandfathered projects and their acreage;
4. Expected costs for implementing the Action Plan; and,
5. A public comment process and period.

The references in this section refer to the General Permit requirements which can be found in *Appendix I*. The majority of requirements in the Phase I Permits' Special Condition are the same as those in the General Permit. Note that the Phase I Individual Permits include a more extensive "Public Comments" requirement (section 10.a and 10.b below).

For existing Phase II permittees, the Action Plans must be completed no later than 24 months after permit coverage and submitted to the Department with the appropriate Annual Report. For permittees covered by the GP, the submitted Action Plan becomes effective and enforceable 90 days after the date received by the Department unless specifically denied in writing by the Department in accordance with Section I.C.2.a of the General Permit. Permittees covered by individual permits must follow the schedule in their permit. Permittees with individual permits must receive an affirmative response from the Department before their Action Plans become enforceable.

Permit Requirements

1. Current program and existing legal authority (*General Permit Section I.C.2.a.(1)*)
A review of the current MS4 program implemented as a requirement of this state permit including a review of the existing legal authorities and the operator's ability to ensure compliance with this special condition;

Permittees should include by reference the components of their current MS4 program, or other relevant legal authorities, that will be used to meet the Special Condition. This should include a list of the relevant existing legal authorities (i.e. ordinances, permits, orders, contracts, inter-jurisdictional agreements, and/or other enforceable mechanisms).

2. New or modified legal authority (*General Permit Section I.C.2.a.(2)*)
The identification of any new or modified legal authorities such as ordinances, state and other permits, orders, specific contract language, and interjurisdictional agreements implemented or needing to be implemented to meet the requirements of this special condition;

New or modified legal authorities that were or will be developed to comply with the Special Condition should be listed. The list should include either (1) why the legal authority was or will be developed or (2) why the existing legal authority needs to be modified. If no new legal authorities are required for permit compliance that should be stated in the Action Plan.

3. Means and methods to address discharges from new sources *(General Permit Section I.C.2.a.(3)*)
The means and methods that will be utilized to address discharges into the MS4 from new sources;

"New Sources" means pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009. This Special Condition requirement applies to all new sources that require post-development stormwater runoff control, as described in GP Section II.B.5.a.

If the new source disturbs one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities, the permittee should see *Part VI.6*, *Part VI.7,* and *Appendix II* of this guidance. Additional offsets may be necessary. If the new source does not utilize an average impervious land cover condition greater than 16% for the design of post development stormwater management facilities no additional offsets are required under the Special Condition beyond those for existing development. Similarly, if a new source disturbs less than 1 acre, no additional offsets are required under the Special Condition beyond those for existing development.

The permittee may fulfill this requirement with a short narrative describing the programmatic tools the permittee uses to address new sources, such as adherence to the VSMP regulations for the implementation of post-development stormwater management facilities or a description of more stringent local requirements if applicable.

4. Estimated existing source loads and calculated total pollutant of concern (POC) required reductions *(General Permit Section I.C.2.a.(4) and (General Permit Section I.C.2.a.(5)*)
An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009, based on the 2009 progress run. The operator shall utilize the applicable [Table/Tables] in this section based on the river basin to which the MS4 discharges by multiplying the total existing acres served by the MS4 on June 30, 2009, and the 2009 Edge of Stream (EOS) loading rate;

A determination of the total pollutant load reductions necessary to reduce the annual POC loads from existing sources utilizing the applicable [Table/Tables] in this section based on the river basin to which the MS4 discharges. This shall be calculated by multiplying the total existing acres served by the MS4 by the first permit cycle required reduction in loading rate. For the purposes of this determination, the operator shall utilize those existing acres identified by the 2000 U.S. Census Bureau urbanized area and served by the MS4.[8]

[8] This last sentence applies to Phase II MS4s only.

The POC loads and required reductions should be calculated using the tools described in this guidance document. The permittee should, at a minimum, provide a summary describing how pervious and impervious surface for the MS4 was estimated (e.g. the GIS resources that were used). The Department will need this information to verify that the method used is acceptable. Please see *Part II.2* for additional guidance concerning the delineation of these areas.

Completed calculation tables (either the values in Table3a-d of the permit or the corrected values in *Part II* of this document) should be submitted.

5. **Means and methods to meet the required reductions and schedule** *(General Permit Section I.C.2.a.(6)*)

The means and methods, such as management practices and retrofit programs that will be utilized to meet the required reductions included in subdivision 2 a (5) of this subsection, and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting those reductions;

This section should list the management practices and retrofit programs (including improvements from redevelopment) that have or will be implemented between July 1, 2009 and the end of the first permit cycle to achieve the 5.0% reductions required for existing development. The permittee should support its plan with calculations that show how the reductions will be met. Any credit trading that is used to meet reductions should also be described.

Permittees are encouraged to submit this information in an electronic spreadsheet with a summary page that serves as a ledger showing:

- the total reductions required;
- each practice that will be implemented;
- the approximate location of the project, and;
- the load that will be reduced by each project.

Permittees should **not** submit full plans and specs for individual BMPs as part of the Action Plan. However, plans and specs should be available to the Department upon request as they are developed.

The schedule should include estimates of when new management practices will be initiated, when BMP construction will begin, and when BMP installation is expected to be completed. These estimates can be provided as the annual benchmarks required by the permit. For BMPs that have already been implemented at the time the Action Plan is submitted, the permittee should indicate when they were installed.

6. **Means and methods to offset increased loads from new sources initiating construction between July 1, 2009 and June 30, 2014** *(General Permit Section I.C.2.a.(7)*)

The means and methods to offset the increased loads from new sources initiating construction between July 1, 2009, and June 30, 2014, that disturb one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. The operator shall utilize the [applicable table] in this section to develop the equivalent pollutant load for nitrogen and total suspended solids. The operator shall offset 5.0% of the calculated increased load from these new sources during the permit cycle.

Permittees may account for these additional offsets on a site by site basis, but the Department recommends taking an aggregate approach to demonstrate compliance with this Special Condition requirement. At a minimum permittees should provide (1) the total additional POC loads created by "new sources" and (2) the 5.0% of those loads permittees must offset by the end of this permit cycle. The BMPs that will be implemented to address them should also be included. See *Appendix II* of this guidance for more information.

7. Means and methods to offset increased loads from grandfathered projects that begin construction after July 1, 2014 (*General Permit Section I.C.2.a.(8)*)

The means and methods to offset the increased loads from projects as grandfathered in accordance with 9VAC25-870-48, that disturb one acre or greater that begin construction after July 1, 2014, where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities. The operator shall utilize Table 4 in this section to develop the equivalent pollutant load for nitrogen and total suspended solids.

Increases in the POC load from grandfathered projects **initiating** construction after July 1, 2014, must be offset prior to completion of the project, in accordance with GP Section I.C.3.c. Permittees should include an estimate of the number of acres impacted by grandfathered projects, which will be used to estimate the pollutant loadings created by these projects. This estimate can be provided as an aggregate. The best available data should be used, but where data is unavailable permittees should use their best professional judgment. The strategies that will be used to address this type of development, including any nutrient trading, should also be included in the Action Plan.

8. A list of future projects, and associated acreage that qualify as grandfathered (*General Permit Section I.C.2.a.(10)*)

A list of future projects and associated acreage that qualify as grandfathered in accordance with 9VAC25-870-48

To fulfill this requirement, permittees should list projects that have been approved or have an obligation of locality, state, or federal funding prior to July 1, 2012, but have not received coverage under the General Permit for Discharges of Stormwater from Construction Activities prior to July 1, 2014. This permit requirement applies solely to new development, not redevelopment projects.

9. An estimate of the expected cost to implement the necessary reductions (*General Permit Section I.C.2.a.(11)*)

An estimate of the expected costs to implement the requirements of this special condition during the state permit cycle;

This estimate should cover the expected cost to the permittee. Permittees should have a strategy in place to achieve the (1) 5.0% reductions for the existing sources, (2) 5.0% reductions for the new sources that disturb one acre or greater and have an average impervious land cover condition greater than 16% for the design of post-development stormwater management facilities, and (3) any offsets for grandfathered projects that disturb one acre or greater and have an average impervious land cover condition greater than 16% for the design of post-development stormwater management facilities for this permit cycle. Permittees should also begin to plan for the full reductions that will be required by the end of three permit cycles. Permittees are encouraged to be as detailed as possible as this information will be reviewed by the state when it reevaluates the amount of funding that will be available to aid localities with their programs.

10.a Public comments on draft Action Plan (GENERAL PERMIT REQUIREMENTS)
(General Permit Section I.C.2.a.(12))
An opportunity for receipt and consideration of public comment regarding the draft Chesapeake Bay TMDL Action Plan.

The public comment process and period should be described, including how the process was advertised to the public.

10.b Public comments on draft Action Plan (PHASE I PERMIT REQUIREMENTS)
An opportunity for receipt and consideration of public comment on the draft Chesapeake Bay TMDL Action Plan; and, a list of all comments received as a result of public comment and any modifications made to the draft Chesapeake Bay TMDL Action Plan as a result of the public comments.

The public comment process and period should be described, including how the process was advertised to the public**.** The list should include comments received and the permittee's response to public comments.

APPENDIX I

Special condition for the Chesapeake Bay TMDL from the General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems

C. Special condition for the Chesapeake Bay TMDL. The Commonwealth in its Phase I and Phase II Chesapeake Bay TMDL Watershed Implementation Plans (WIP) committed to a phased approach for MS4s, affording MS4 operators up to three full five-year permit cycles to implement necessary reductions. This permit is consistent with the Chesapeake Bay TMDL and the Virginia Phase I and II WIPs to meet the Level 2 (L2) scoping run for existing developed lands as it represents an implementation of 5.0% of L2 as specified in the 2010 Phase I WIP. Conditions of future permits will be consistent with the TMDL or WIP conditions in place at the time of permit issuance.

1. Definitions. The following definitions apply to this state permit for the purpose of the special condition for discharges in the Chesapeake Bay Watershed:
"Existing sources" means pervious and impervious urban land uses served by the MS4 as of June 30, 2009.
"New sources" means pervious and impervious urban land uses served by the MS4 developed or redeveloped on or after July 1, 2009.
"Pollutants of concern" or "POC" means total nitrogen, total phosphorous, and total suspended solids.
"Transitional sources" means regulated land disturbing activities that are temporary in nature and discharge through the MS4.
2. Chesapeake Bay TMDL planning.
a. In accordance with Table 1[9] in this section, the operator shall develop and submit to the department for its review and acceptance an approvable Chesapeake Bay TMDL Action Plan. Unless specifically denied in writing by the department, this plan becomes effective and enforceable 90 days after the date received by the department. The plan shall include:
(1) A review of the current MS4 program implemented as a requirement of this state permit including a review of the existing legal authorities and the operator's ability to ensure compliance with this special condition;
(2) The identification of any new modified legal authorities such as ordinances, state and other permits, orders, specific contract language, and interjurisdictional agreements implemented or needing to be implemented to meet the requirements of this special condition;
(3) The means and methods that will be utilized to address discharges into the MS4 from new sources;
(4) An estimate of the annual POC loads discharged from the existing sources as of June 30, 2009, based on the 2009 progress run. The operator shall utilize the applicable versions of Tables 2 a-d in the section based on the river basin to which the MS4 discharges by multiplying the total existing acres served by the MS4 on June 30, 2009, and the 2009 Edge of Stream (EOS) loading rate:

[9] See the General Permit for Table 1

Table 2 a: Calculation Sheet for Estimating Existing Source Loads for the James River Basin (* Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre/yr)	Estimated Total POC Load Based on 2009 Progress Run (lbs/yr)
Regulated Urban Impervious	Nitrogen		9.39	
Regulated Urban Pervious			6.99	
Regulated Urban Impervious	Phosphorus		1.76	
Regulated Urban Pervious			0.5	
Regulated Urban Impervious	Total Suspended Solids		676.94	
Regulated Urban Pervious			101.08	

Table 2 b: Calculation Sheet for Estimating Existing Source Loads for the Potomac River Basin (* Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre/yr)	Estimated Total POC Load Based on 2009 Progress Run (lbs/yr)
Regulated Urban Impervious	Nitrogen		16.86	
Regulated Urban Pervious			10.07	
Regulated Urban Impervious	Phosphorus		1.62	
Regulated Urban Pervious			0.41	
Regulated Urban Impervious	Total Suspended Solids		1,171.32	
Regulated Urban Pervious			175.8	

Table 2 c: Calculation Sheet for Estimating Existing Source Loads for the Rappahannock River Basin (* Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre/yr)	Estimated Total POC Load Based on 2009 Progress Run (lbs/yr)
Regulated Urban Impervious	Nitrogen		9.38	
Regulated Urban Pervious			5.34	
Regulated Urban Impervious	Phosphorus		1.41	
Regulated Urban Pervious			0.38	
Regulated Urban Impervious	Total Suspended Solids		423.97	
Regulated Urban Pervious			56.01	

Table 2 d: Calculation Sheet for Estimating Existing Source Loads for the York River Basin (* Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre/yr)	Estimated Total POC Load Based on 2009 Progress Run (lbs/yr)
Regulated Urban Impervious	Nitrogen		7.31	
Regulated Urban Pervious			7.65	
Regulated Urban Impervious	Phosphorus		1.51	
Regulated Urban Pervious			0.51	
Regulated Urban Impervious	Total Suspended Solids		456.68	
Regulated Urban Pervious			72.28	

(5) A determination of the total pollutant load reductions necessary to reduce the annual POC loads from existing sources utilizing the applicable versions of Tables 3 a-d in this section based on the river basin to which the MS4 discharges. This shall be calculated by multiplying the total existing acres served by the MS4 by the first permit cycle required reduction in loading rate. For the purposes of this determination, the operator shall utilize those existing acres identified by the 2000 U.S. Census Bureau urbanized area and served by the MS4.

Table 3 a: Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the James River Basin (*Based On Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)	Total Reduction Required First Permit Cycle (lbs/yr)[10]
Regulated Urban Impervious	Nitrogen		0.04	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		6.67	
Regulated Urban Pervious			0.44	

[10] Tables 3a-d replicated in this Appendix are consistent with the tables that appear in the permit. Permittees should note that the Total Reduction's required in the permit represent lbs/yr.

Table 3 b: Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the Potomac River Basin
(*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)	Total Reduction Required First Permit Cycle (lbs/yr)[8]
Regulated Urban Impervious	Nitrogen		0.08	
Regulated Urban Pervious			0.03	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.001	
Regulated Urban Impervious	Total Suspended Solids		11.71	
Regulated Urban Pervious			0.77	

Table 3 c: Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the Rappahannock River Basin
(*Based On Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)	Total Reduction Required First Permit Cycle (lbs/yr)[8]
Regulated Urban Impervious	Nitrogen		0.04	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		4.24	
Regulated Urban Pervious			0.25	

Table 3 d: Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the York River Basin
(*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)	Total Reduction Required First Permit Cycle (lbs/yr)[8]
Regulated Urban Impervious	Nitrogen		0.03	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		4.60	
Regulated Urban Pervious			0.32	

(6) The means and methods, such as management practices and retrofit programs that will be utilized to meet the required reductions included in subdivision 2 a (5) of this subsection, and a schedule to achieve those reductions. The schedule should include annual benchmarks to demonstrate the ongoing progress in meeting those reductions;
(7) The means and methods to offset the increased loads from new sources initiating construction between July 1, 2009, and June 30, 2014, that disturb one acre or greater as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. The operator shall utilize Table 4 in this section to develop the equivalent pollutant load for nitrogen and total suspended solids. The operator shall offset 5.0% of the calculated increased load from these new sources during the permit cycle.
(8) The means and methods to offset the increased loads from projects as grandfathered in accordance with 9VAC25-870-48, that disturb one acre or greater that begin construction after July 1, 2014, where the project utilizes an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities. The operator shall utilize Table 4 in this section to develop the equivalent pollutant load for nitrogen and total suspended solids.
(9) The operator shall address any modification to the TMDL or watershed implementation plan that occurs during the term of this state permit as part of its permit reapplication and not during the term of this state permit

Table 4: Ratio of Phosphorous Loading Rate to Nitrogen and Total Suspended Solids Loading Rates for Chesapeake Bay Basins

Ratio of Phosphorous to Other POCs (Based on All Land Uses 2009 Progress Run)	Phosphorous Loading Rate (lbs/acre)	Nitrogen Loading Rate (lbs/acre)	Total Suspended Solids Loading Rate (lbs/acre)
James River Basin	1.0	5.2	420.9
Potomac River Basin	1.0	6.9	469.2
Rappahannock River Basin	1.0	6.7	320.9
York River Basin	1.0	9.5	531.6

(10) A list of future projects and associated acreage that qualify as grandfathered in accordance with 9VAC25-870-48;

(11) An estimate of the expected costs to implement the requirements of this special condition during the state permit cycle; and

(12) An opportunity for receipt and consideration of public comment regarding the draft Chesapeake Bay TMDL Action Plan.

b. As part of development of the Chesapeake Bay TMDL Action Plan, the operator may consider:

(1) Implementation of BMPs on unregulated lands provided any necessary baseline reduction is not included toward meeting the required reduction in this permit;

(2) Utilization of stream restoration projects, provided that the credit applied to the required POC load reduction is prorated based on the ratio of regulated urban acres to total drainage acres upstream of restored area;

(3) Establishment of a memorandum of understanding (MOU) with other MS4 operators that discharge to the same of adjacent eight digit hydrologic unit within the same basin to implement BMPs collectively. The MOU shall include a mechanism for dividing the POC reductions created by BMP implementation between the cooperative MS4s;

(4) Utilization of any pollutant trading or offset program in accordance with 10.1-603.15:1 et seq. of the Code of Virginia, governing trading and offsetting;

(5) A more stringent average land cover condition based on less than 16% impervious cover for new sources initiating construction between July 1, 2009, and June 30, 2014, and all grandfathered projects where allowed by law; and

(6) Any BMPs installed after June 30, 2009, as part of a retrofit program may be applied towards meeting the required load reductions provided any necessary baseline reductions are not included.

3. Chesapeake Bay TMDL Action Plan implementation. The operator shall implement the TMDL Action Plan according to the schedule therein. Compliance with this requirement represents adequate progress for this state permit term towards achieving TMDL waste load allocation consistent with the assumptions and requirement of the TMDL. For the purposes of this permit, the implementation of the following represents implementation to the maximum extent practicable and demonstrated adequate progress:

a. Implementation of nutrient management plans in accordance with the schedule identified in the minimum control measure in Section II related to pollution prevention/good housekeeping for municipal operations;

b. Implementation of the minimum control measure in Section II related to construction site stormwater runoff control in accordance with this state permit shall address discharges from transitional sources;

c. Implementation of the means and methods to address discharges from new sources in accordance with the minimum control measure in Section II related to post-construction stormwater management in new development and development of prior developed lands and in order to offset 5.0% of the total increase in POC loads from grandfathered projects initiating construction after July 1, 2014, must be offset prior to completion of the project; and

d. Implementation of means and methods sufficient to meet the required reductions of POC loads from existing sources in accordance with the Chesapeake Bay TMDL Action Plan.

APPENDIX II – MEETING SPECIAL CONDITION REQUIREMENT 7 AND/OR 8

Special Condition Requirements 7 (GP Section I.C.2.a.(7)) and 8 (GP Section I.C.2.a.(8)) apply to permittees that (1) adopted an average impervious land cover condition greater than 16% for the design of post-development stormwater management facilities under the Chesapeake Bay Preservation Act or (2) have allowed projects to be built with an impervious land cover condition greater than 16% for the design of post-development stormwater management facilities through a "fee-in-lieu of" or similar program. The reductions required under these sections of the Special Condition are to offset *increased* loads from new sources and must be made *in addition* to those required for existing conditions as of June 30, 2009 (GP Section I.C.2.a.(6)).

For projects that initiate construction between July 1, 2009 and June 30, 2014 subject to Special Condition Requirement 7 (GP Section I.C.2.a.(7)), permittees must offset 5.0% of the **increased** POC loads from those projects by the end of the permit cycle. For projects that are grandfathered in accordance with 9VAC25-870-48 and initiate construction or after July 1, 2014 subject to Special Condition Requirement 8 (GP Section I.C.2.a.(8)), permittees must offset the entire increased load prior to completion of the project.

These projects are subject to Technical Criteria II C under the VSMP regulations. If permittees use the technology-based criteria under 9VAC25-870-96.C, no additional reductions are required under the Special Condition beyond those for the existing conditions as of June 30, 2009 under General Permit Section I.C.2.a.(6). This is because the technology based criteria assumes as average land cover condition of 16% for the design of post-development stormwater management facilities.

Permittees using the performance-based criteria under 9VAC25-870-96.B may have projects that require additional reductions under General Permit Section I.C.2.a.(7) or I.C.2.a.(8). The VSMP regulations organize the "performance-based criteria" into "four applicable land development situations." For clarity, this Appendix uses the same "situation" framework to explain when additional reductions are required for "new sources" under the Special Condition.

This Appendix is organized by "situation." Under each "situation" header the following information is provided:

1. Each "situation," as is described in 9VAC-25-870-96.B of the VSMP regulations,
2. The VSMP requirements for each performance-based criteria "situation," and;
3. An example diagram and the reduction requirements for each "situation" beyond those required under Section I.C.2.a.(6) of the general permit for each of the following project types:
    a. Redevelopment with an Average Impervious Land Cover Condition of 16% or Less
    b. Redevelopment with an Average Impervious Land Cover Condition Greater than 16%
    c. New Development with an Average Impervious Land Cover Condition of 16% or Less
    d. New Development with an Average Impervious Land Cover Condition Greater than 16%

NOTE: In some of these "situations" meeting the VSMP requirements will result in POC reductions. If that is the case, permittees may take credit for those reductions on prior developed lands and apply those credits to their 2009 baseline reductions under Special Condition Requirement 6 (GP Section I.C.2.a.(6)). Where applicable, these instances are indicated throughout this section. They are also addressed in *Appendix V.L*.

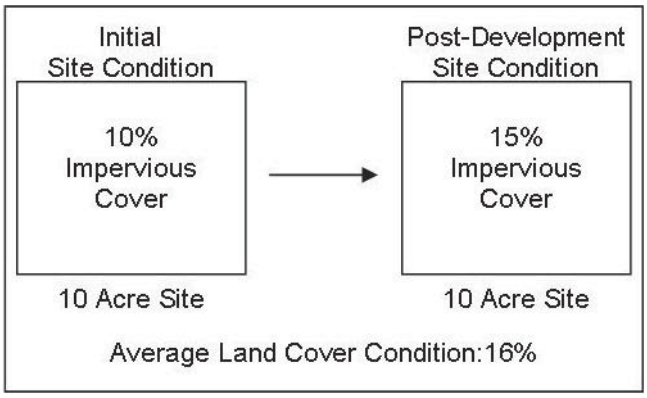
SITUATION 1

Land disturbing activities where the existing percent impervious cover is less than or equal to the average land cover condition and the proposed improvements will create a total percent impervious cover which is less than the average land cover condition.

VSMP Requirement: No reduction in the after disturbance pollutant discharge is required.

Special Condition Requirements*:*

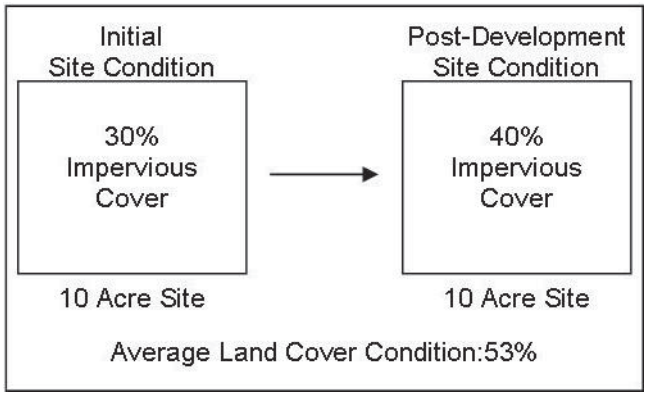
(a) *Redevelopment with an Average Impervious Land Cover Condition of 16% or Less:*



Special Condition Requirement 7: No additional reductions are required for this project type and situation because the average land cover condition is less than 16%.

Special Condition Requirement 8: No additional reductions are required for this project type and situation because the average land cover condition is less than 16%.

(b) *Redevelopment with an Average Impervious Land Cover Condition Greater than 16%:*

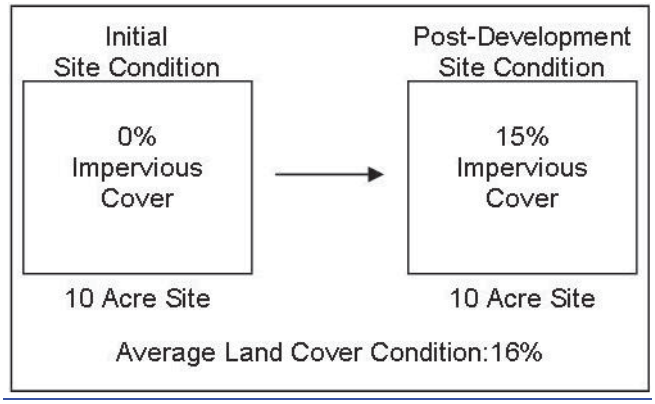


Special Condition Requirement 7: If construction on the project was initiated between July 1, 2009 and June 30, 2014 the permittee must create reductions *in addition* to those required

by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). In this instance, the permittee must offset 5.0% of the incremental[11] increased load from the impervious cover change.

Special Condition Requirement 8: If the project is grandfathered in accordance with 9VAC25-870-48 and initiated or initiates construction after July 1, 2014 the permittee must create reductions *in addition* to those required by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). In this instance, the permittee must offset the entire incremental increased load from the impervious cover change prior to completion of the project.

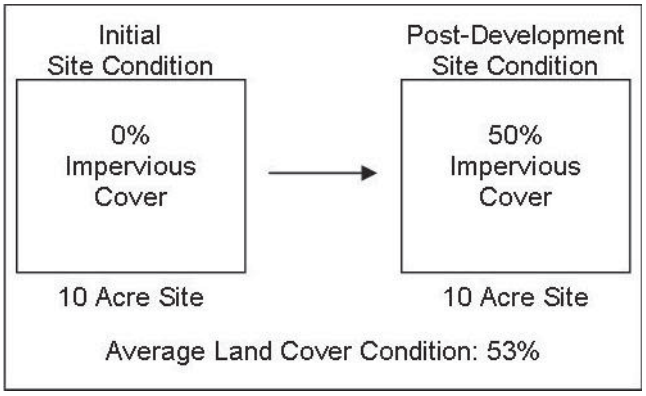
(c) *New Development with an Average Impervious Land Cover Condition of 16% or Less:*



Special Condition Requirement 7: No additional reductions are required for this project type and situation because the average land cover condition is less than 16%.

Special Condition Requirement 8: No additional reductions are required for this project type and situation because the average land cover condition is less than 16%.

(d) *New Development with an Average Impervious Land Cover Condition Greater than 16%*



Special Condition Requirement 7: If construction on the project was initiated between July 1, 2009 and June 30, 2014 the permittee must create reductions *in addition* to those required

[11] Throughout this section incremental refers to the difference between the site's initial impervious cover and the post-development impervious cover. However, permittees do not have to make reductions beyond the 16% average land cover condition or .45lbs TP/ac/yr.

by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). In this instance, the permittee must offset 5.0% of the incremental increased load from the impervious cover change, down to the average land cover condition (50% impervious cover load – 16% impervious cover load).

Special Condition Requirement 8: If the project is grandfathered in accordance with 9VAC25-870-48 and initiated or initiates construction after July 1, 2014 the permittee must create reductions *in addition* to those required by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). In this instance, the permittee must offset the entire incremental increased load from the impervious cover change, down to the average land cover condition (50% Impervious Cover – 16% Impervious Cover) prior to completion of the project.

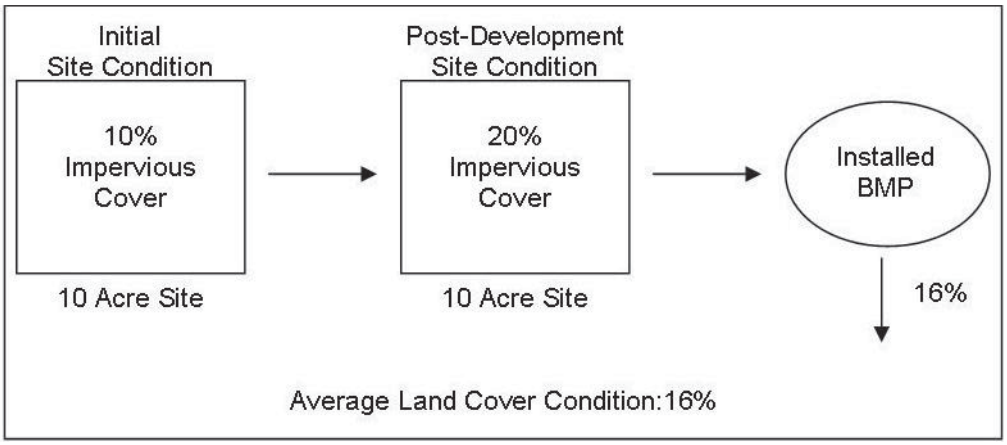
SITUATION 2

Land disturbing activities where the existing percent impervious cover is less than or equal to the average land cover condition and the proposed improvements will create a total percent impervious cover which is greater than the average land cover condition.

VSMP Requirement: The pollutant discharge after disturbance shall not exceed the existing pollutant discharge based on the average land cover condition. If the post-development impervious land cover condition exceeds the average land cover condition, BMPs must be installed on site to offset those increased loads using the techniques described in the Virginia Stormwater Management Handbook, which can be found on DEQ's website.

Special Condition Requirement:

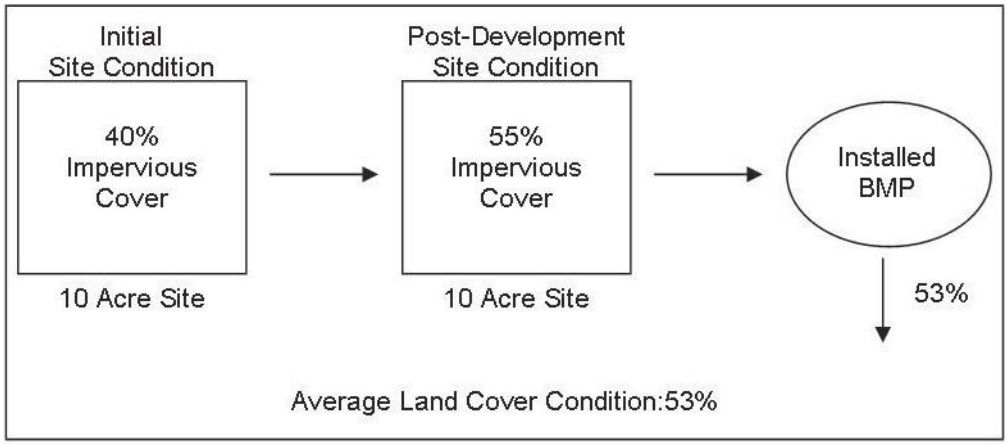
(a) *Redevelopment with an Average Impervious Land Cover Condition of 16% or Less:*



Special Condition Requirement 7: No additional reductions beyond those provided by the "Installed BMP" are necessary because the load draining from the site is equivalent to the load draining from a site with a 16% land cover condition.

Special Condition Requirement 8: No additional reductions beyond those provided by the "Installed BMP" are necessary because the load draining from the site is equivalent to the load draining from a site with a 16% land cover condition.

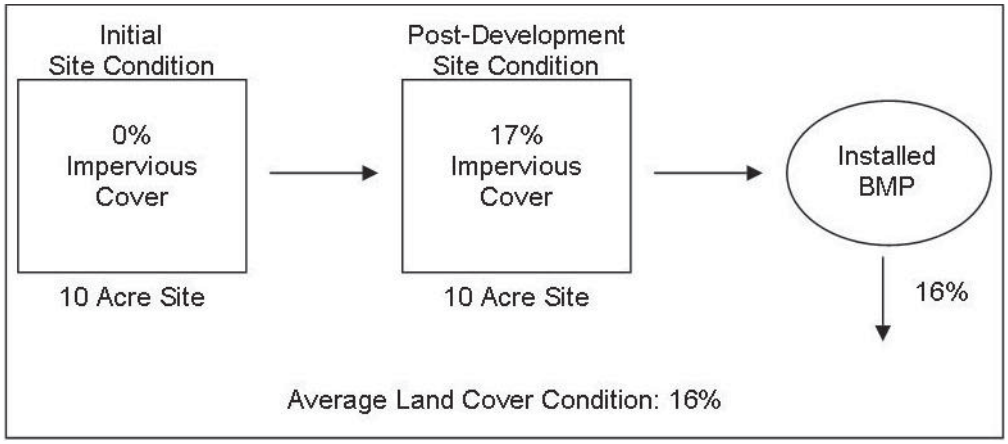
(b) *Redevelopment with an Average Impervious Land Cover Condition Greater than 16%*



Special Condition Requirement 7: If construction on the project was initiated between July 1, 2009 and June 30, 2014 the permittee must create reductions *in addition* to those required by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). The "Installed BMP" meets the VSMP requirements, since it offsets the additional load to the Average Land Cover Condition. To meet Special Condition Requirement 7 the permittee must determine the remaining incremental load increase from the redevelopment project (53% impervious cover load – 40% impervious cover load). By the end of the first permit cycle, the permittee must offset 5.0% of that load.

Special Condition Requirement 8: If the project is grandfathered in accordance with 9VAC25-870-48 and initiated or initiates construction after July 1, 2014 the permittee must create reductions *in addition* to those required by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). The "Installed BMP" meets the VSMP requirements, since it offsets the additional load to the Average Land Cover Condition. To meet Special Condition Requirement 8 the permittee must determine the remaining incremental load increase from the redevelopment project (53% impervious cover load – 40% impervious cover load). The permittee must offset the entire load prior to completion of the project.

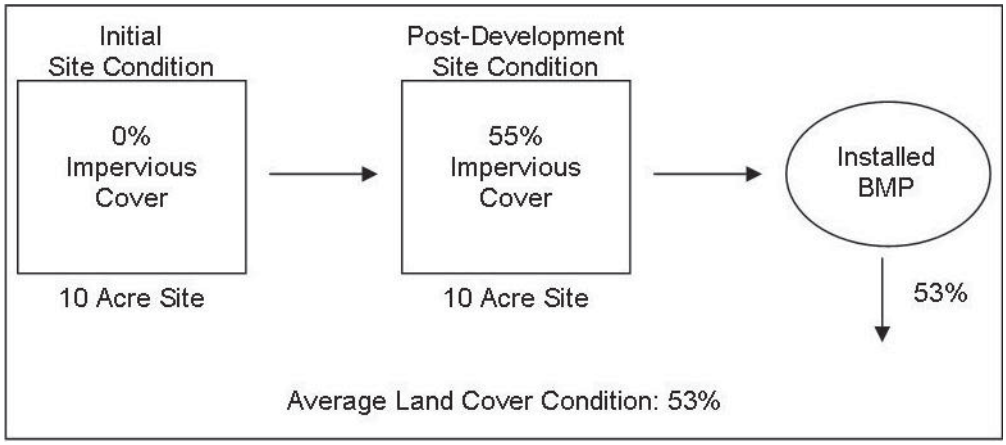
(c) *New Development with an Average Impervious Land Cover Condition of 16% or Less*



Special Condition Requirement 7: No additional reductions beyond those provided by the "Installed BMP" are necessary because the load draining from the site is equivalent to the load draining from a site with a 16% land cover condition.

Special Condition Requirement 8: No additional reductions beyond those provided by the "Installed BMP" are necessary because the load draining from the site is equivalent to the load draining from a site with a 16% land cover condition.

(d) *New Development with an Average Impervious Land Cover Condition Greater than 16%*



Special Condition Requirement 7: If construction on the project was initiated between July 1, 2009 and June 30, 2014 the permittee must create reductions *in addition* to those required by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). The "Installed BMP" meets the VSMP requirements, since it offsets the additional load to the Average Land Cover Condition. To meet Special Condition Requirement 7 the permittee must determine the remaining incremental load increase from the redevelopment project, down to the 16% Average Land Cover Condition (53% impervious cover load – 16% impervious cover load). By the end of the first permit cycle, the permittee must offset 5.0% of that load.

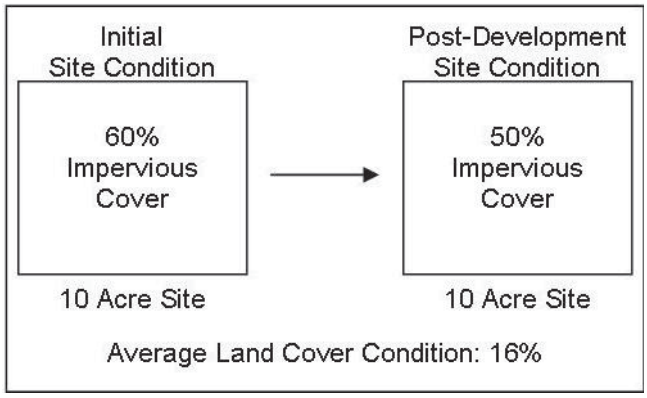
Special Condition Requirement 8: If the project is grandfathered in accordance with 9VAC25-870-48 and initiated or initiates construction after July 1, 2014 the permittee must create reductions *in addition* to those required by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). The "Installed BMP" meets the VSMP requirements, since it offsets the additional load to the Average Land Cover Condition. To meet Special Condition Requirement 8 the permittee must determine the remaining incremental load increase from the redevelopment project (53% impervious cover load – 16% impervious cover load). The permittee must offset the entire incremental load prior to completion of the project.

SITUATION 3
Land disturbing activities where the existing percent impervious cover is greater than the average land cover condition.

VSMP Requirement: The pollutant discharge after development shall not exceed 1) the pollutant discharge based on existing conditions less 10%; or 2) the pollutant discharge based on the average land cover condition, whichever is greater.

Special Condition Requirement:

(a) *Redevelopment with an Average Impervious Land Cover Condition of 16% or Less*

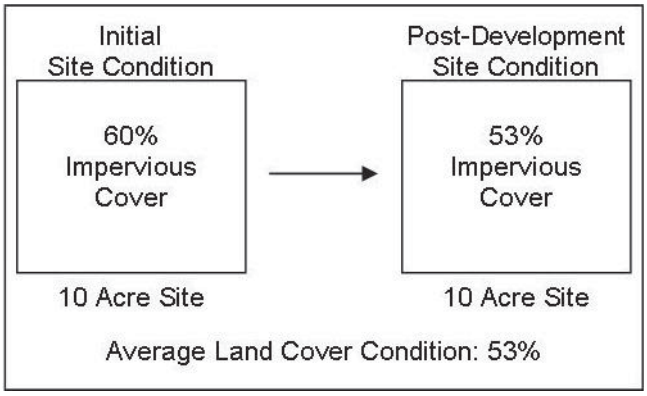


Special Condition Requirement 7: No additional reductions are required because there has not been an *increase* in the load draining from the site.

Special Condition Requirement 8: No additional reductions are required because there has not been an *increase* in the load draining from the site.

NOTE: The permittee may take credit for the 10% reductions and apply it to the existing source reductions required by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). See *Appendix V.L* for additional information concerning credits for redevelopment.

(b) *Redevelopment with an Average Impervious Land Cover Condition Greater than 16%*



Special Condition Requirement 7: No additional reductions are required because there was *no increase* in loads from the post developed site.

Special Condition Requirement 8: No additional reductions are required because there was *no increase* in loads from the post developed site.

NOTE: The permittee may take credit for the 7.0% reductions and apply it to the existing source reduction required by Special Condition Requirement 6 (GP Section I.C.2.a.(6)). See *Appendix V.L* for additional information concerning credits for redevelopment.

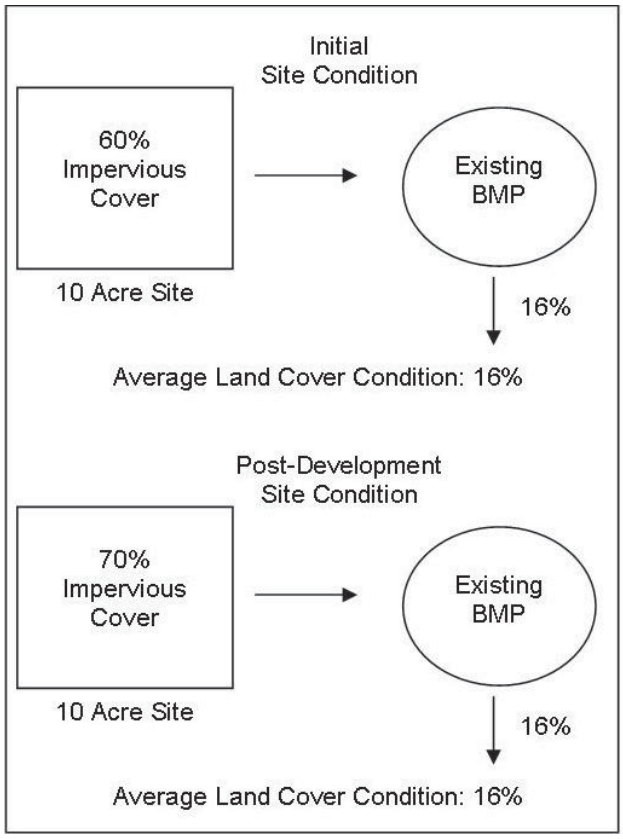
(c) *New Development with an Average Impervious Land Cover Condition of 16% or Less*
This situation does not apply to new development.

(d) *New Development with an Average Impervious Land Cover Condition Greater than 16%*
This situation does not apply to new development.

SITUATION 4
Land disturbing activities where the existing percent impervious cover is served by an existing stormwater management BMP(s) that addresses water quality.

VSMP Requirement: The pollutant discharge after disturbance shall not exceed the existing pollutant discharge based on the existing percent impervious cover while served by the existing BMP. The existing BMP shall be shown to have been designed and constructed in accordance with proper design standards and specifications, and to be in proper functioning condition.

Special Condition Requirement:



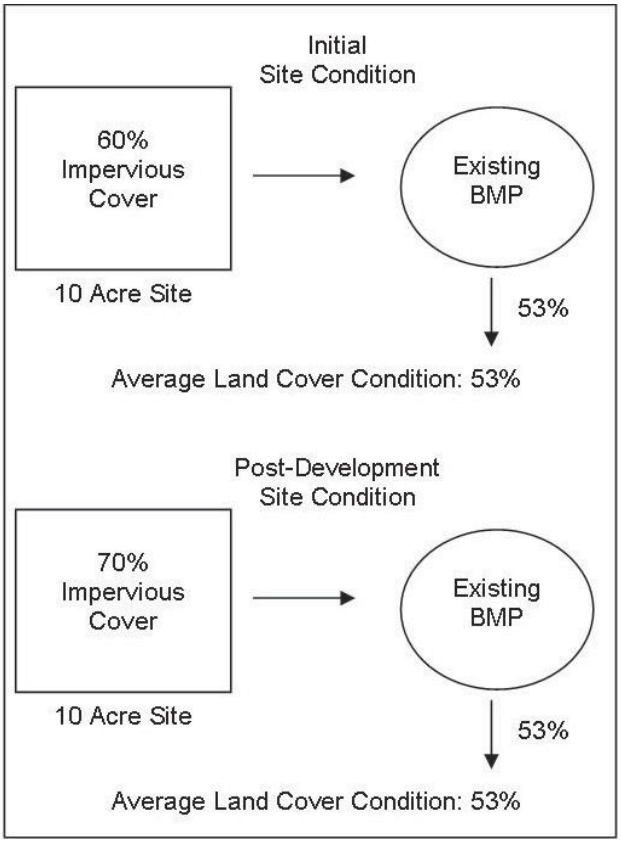
The site drains to an existing stormwater BMP before discharging to an impaired water body. The pollutant load discharged to the receiving stream from the regional BMP is less than or equal to load from a site with an average land cover condition of 16 percent. If the BMP is overdesigned for the current site, it may be possible for redevelopment to result in an increase in impervious cover on the site, but not result in an increased load reaching the stream. If that is the case, additional reductions do not need to be made.

(a) *Redevelopment with an Average Impervious Land Cover Condition of 16% or Less*

Special Condition Requirement 7: No additional reductions are required because the load draining from the BMP to the receiving water body does not increase.

Special Condition Requirement 8: No additional reductions are required because the load draining from the BMP to the receiving water body does not increase.

(b) *Redevelopment with an Average Impervious Land Cover Condition Greater than 16%*



The site drains to an existing stormwater BMP before discharging to an impaired water body. The pollutant load discharged to the receiving stream from the regional BMP is less than or equal to load from a site with an average land cover condition of 53 percent. If the BMP is overdesigned for the current site, it may be possible for redevelopment to result in an increase in impervious cover on the site, but not result in an increased load reaching the stream. If that is the case, additional reductions do not need to be made.

Special Condition Requirement 7: No additional reductions are required because the load draining from the BMP to the receiving water body does not increase.

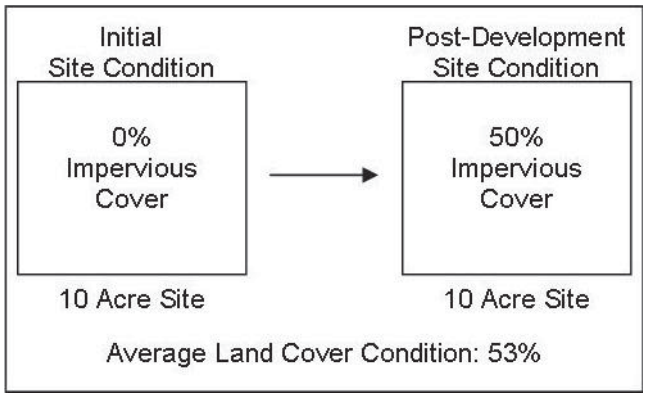
Special Condition Requirement 8: No additional reductions are required because the load draining from the BMP to the receiving water body does not increase.

(c) *New Development with an Average Impervious Land Cover Condition of 16% or Less*
This situation does not apply to new development.

(d) *New Development with an Average Impervious Land Cover Condition Greater than 16%*
This situation does not apply to New Development.

EXAMPLE II.1 – Site Specific Calculation to Meet Special Condition Requirement 7 or 8

A permittee in the James River Basin that adopted an average land cover condition of 53% under the Chesapeake Bay Preservation Act needs to calculate the additional reductions required under Special Condition Requirement 7 (GP Section I.C.2.a.(7)) for a 10 acre new development project where construction was initiated between July 1, 2009 and June 30, 2014. Once completed, the project will have an average land cover condition of 50%, which is less than the locality's adopted average land cover condition.



Step 1: Site Condition as of June 30, 2009 Calculation

The permittee must incorporate the site conditions as of June 30, 2009 into the acreage calculation under Special Condition Requirement 6 (GP Section I.C.2.a.(6)). Once the "existing condition" required reductions are determined using the tables they do not need to be recalculated. In this example, all 10 acres of the pre-development site are pervious regulated acres (there are no forested acres on site).

Step 2: Identifying Additional Reductions under Special Condition 7 or 8

Next the permittee must determine if the project is subject to additional reduction requirements. Referencing Appendix II.1 of this guidance document, the permittee identifies that this project falls under Situation 1.(d). In accordance with Special Condition Requirement 7 (GP Section I.C.2.a.(7)) the permittee must offset 5.0% of the *increased* load from the impervious cover change down to the statewide average land cover condition of 16% by the end of this permit cycle *in addition* to the reductions required under GP Section I.C.2.a.(6).

Step 3: Calculating Additional Required Reductions

The post-development 50% impervious land cover condition has an associated total phosphorous loading of 1.14 lbs TP/ac/yr (calculated using the Simple Method). To calculate the additional offsets that will be necessary for the site the permittee should subtract the phosphorous loading associated with a 16% average impervious land cover condition (0.45 lbs TP/ac/yr) from the load calculated using the simple method for the higher average land cover condition:

1.14 lbs TP/ac/yr - 0.45 lbs TP/ac/yr = 0.69 lbs TP/ac/yr

By the end of the first permit cycle, the permittee must offset 5.0% of this increased load:

0.69 lbs TP/ac/yr * .05 = 0.0345 lbs TP/ac/yr

Since the project is a 10 acre site, the total pounds that must be offset for this site for this permit cycle is:

10 acre site * 0.0345 lbs/ac/yr = 0.345 lbs TP/yr

The permittee must offset 0.345 lbs TP/yr for this site by the end of the permit term. By the end of the next permit term the permittee will need to offset an additional 35% of the increased load from this project and it is expected that by the end of the third permit cycle the increased loading from the site will be fully offset.

To calculate the TN loading rate reduction required by the end of this MS4 permit cycle and TSS loading rate reduction required by the end of this MS4 permit cycle, the permittee will need to use the ratio table provided in the permit. For the James River Basin, the POC ratios are those shown in GP Section I.C.2, *Table 4*, an excerpt of which is provided below (*Table II.1*):

Table II.1 – Ratio of Phosphorous Loading Rate to Nitrogen and Total Suspended Solids Loading Rates for the James River Basin[12]

Ratio of Phosphorous to Other POCs (Based on All Land Uses 2009 Progress Run)	Phosphorous Loading Rate (lbs/ac)	Nitrogen Loading Rate (lbs/ac)	Total Suspended Solids Loading Rate (lbs/ac)
James River Basin	1.0	5.2	420.9

To calculate the additional reductions required for TN for this project the permittee first needs to use the conversion table to calculate the lbs TN/ac/yr that must be reduced as a result of 50% impervious land cover condition:

$$.0345 \text{ lbs TP/ac/yr} * \frac{5.2 \text{ lbs TN/ac}}{1.0 \text{ lbs TP/ac}} = 0.179 \text{ lbs TN/ac/yr}$$

The permittee should then calculate the TN offsets that must be made for this 10 acre project:

$$0.179 \text{ lbs TN/ac/yr} * 10 \text{ acres} = 1.79 \text{ lbs TN/yr}$$

Similar calculations must be performed to determine the offsets for total suspended solids loading rate. Again, the permittee first needs to use the conversion table provided in the permit to determine the lbs TSS/ac/yr that must be reduced as a result of 50% impervious land cover condition.

$$0.0345 \text{ lbs TP/ac/yr} * \frac{420.9 \text{ lbs TSS/ac}}{1.0 \text{ lbs TP/ac}} = 14.521 \text{ lbs TSS/ac/yr}$$

The permittee should then calculate the TSS offsets that must be made for this 10 acre project:

$$14.5211 \text{ lbs TSS/ac/yr} * 10 \text{ acres} = 145.21 \text{ lbs TSS/yr}$$

[12] Table values for the James River Basin can be found in the General Permit or *Appendix I* of this document.

For this project, by the end of the first permit cycle, the permittee must offset an additional 0.345 lbs TP/yr, 1.79 lbs TN/yr, and 145.21 lbs TSS/yr. By the end of the next permit term the permittee will need to offset an additional 35% of the increased load from this project and it is expected that by the end of the third permit cycle the increased loading from the site will be fully offset.

NOTE: Permittees may report the impact of offsets required under Special Condition 7 and/or 8 to the Department in aggregate. However, the data and calculations performed to determine these numbers should be kept on hand.

EXAMPLE II.2[13] – Aggregate Accounting for Special Condition Requirement 7

A permittee in the James River Basin had a fee-in-lieu of program in place through July 1, 2012. Due to the variability in the average land cover condition of projects built under this program, the permittee has decided to take an aggregate approach to addressing Special Condition 7. The permittee has 1000 acres of regulated land throughout its service area, which was 50% impervious and 50% pervious as of June 30, 2009. To estimate the POC reductions required under Special Condition Requirement 7, the permittee first needs to calculate the total POC loads as of June 30, 2009. The permittee should use the "2009 EOS Loading Rate" from Table 2a in the permit for this calculation:

Table II.2 – POC Loads as of June 30, 2009 (Pre-Development)

Subsource	Pollutant	Total Existing Acres Served by MS4 as of 06/30/09	2009 EOS Loading Rate (lbs/acre/yr)	Estimated Total POC Load as of 06/30/09 (lbs/yr)
Regulated Urban Impervious	Nitrogen	*500*	9.39	*4695*
Regulated Urban Pervious		*500*	6.99	*3495*
Regulated Urban Impervious	Phosphorus	*500*	1.76	*880*
Regulated Urban Pervious		*500*	0.5	*250*
Regulated Urban Impervious	Total Suspended Solids	*500*	676.94	*338,470*
Regulated Urban Pervious		*500*	101.08	*50,540*

As of July 1, 2014 the permittee determines using GIS resources that, as a result of "new sources," the proportion of regulated urban pervious acres to regulated urban impervious acres has changed. The permittee should determine the "post-development" loading rates as a result of the land use change. Again, the "2009 EOS Loading Rate" from Table 2a should be used for this calculation:

[13] **NOTE**: This aggregate method captures all changes in regulated urban impervious and regulated urban pervious loads. Permittees may submit alternative aggregate accounting strategies, but they must ensure that the submitted method captures all additional reductions required under Special Condition Requirement 7 (GP Section I.C.2.a.(7)).

Table II.3 - Post-Development Conditions July 1, 2014

Subsource	Pollutant	Total Existing Acres Served by MS4 (07/01/14)	2009 EOS Loading Rate (lbs/acre/yr)	Estimated Total POC Load as of 07/01/14 (lbs/yr)
Regulated Urban Impervious	Nitrogen	*600*	9.39	*5634*
Regulated Urban Pervious		*400*	6.99	*2796*
Regulated Urban Impervious	Phosphorus	*600*	1.76	*1056*
Regulated Urban Pervious		*400*	0.5	*200*
Regulated Urban Impervious	Total Suspended Solids	*600*	676.94	*406,164*
Regulated Urban Pervious		*400*	101.08	*40,432*

The permittee should then calculate the difference between the post-development and pre-development land cover condition to estimate the Total Load Change (Regulated Urban Impervious Load Change + Regulated Urban Pervious Load Change).

Table II.4 – Total Load Change from "New Sources" between June 30, 2009 and July 1, 2014

Subsource	Pollutant	Estimated Total POC Load as of 07/01/14 (lbs/yr)	Estimated Total POC Load as of 06/30/09 (lbs/yr)	Load Change (lbs/yr)	Total Load Change (lbs/yr)
Regulated Urban Impervious	Nitrogen	*5634*	*4695*	939	
Regulated Urban Pervious		*2796*	*3495*	-699	240
Regulated Urban Impervious	Phosphorus	*1056*	*880*	176	
Regulated Urban Pervious		*200*	*250*	-50	126
Regulated Urban Impervious	Total Suspended Solids	*406,164*	*338,470*	67,694	
Regulated Urban Pervious		*40,432*	*50,540*	-10,108	57,586

The permittee should also take into account BMPs that were installed on site during the development or redevelopment process to meet other VSMP requirements. The POC loads treated by those BMPs should be subtracted from the Total Load Change.

Table II.5 – Net Load Change (Total Load Change – Reductions from implemented BMPs)

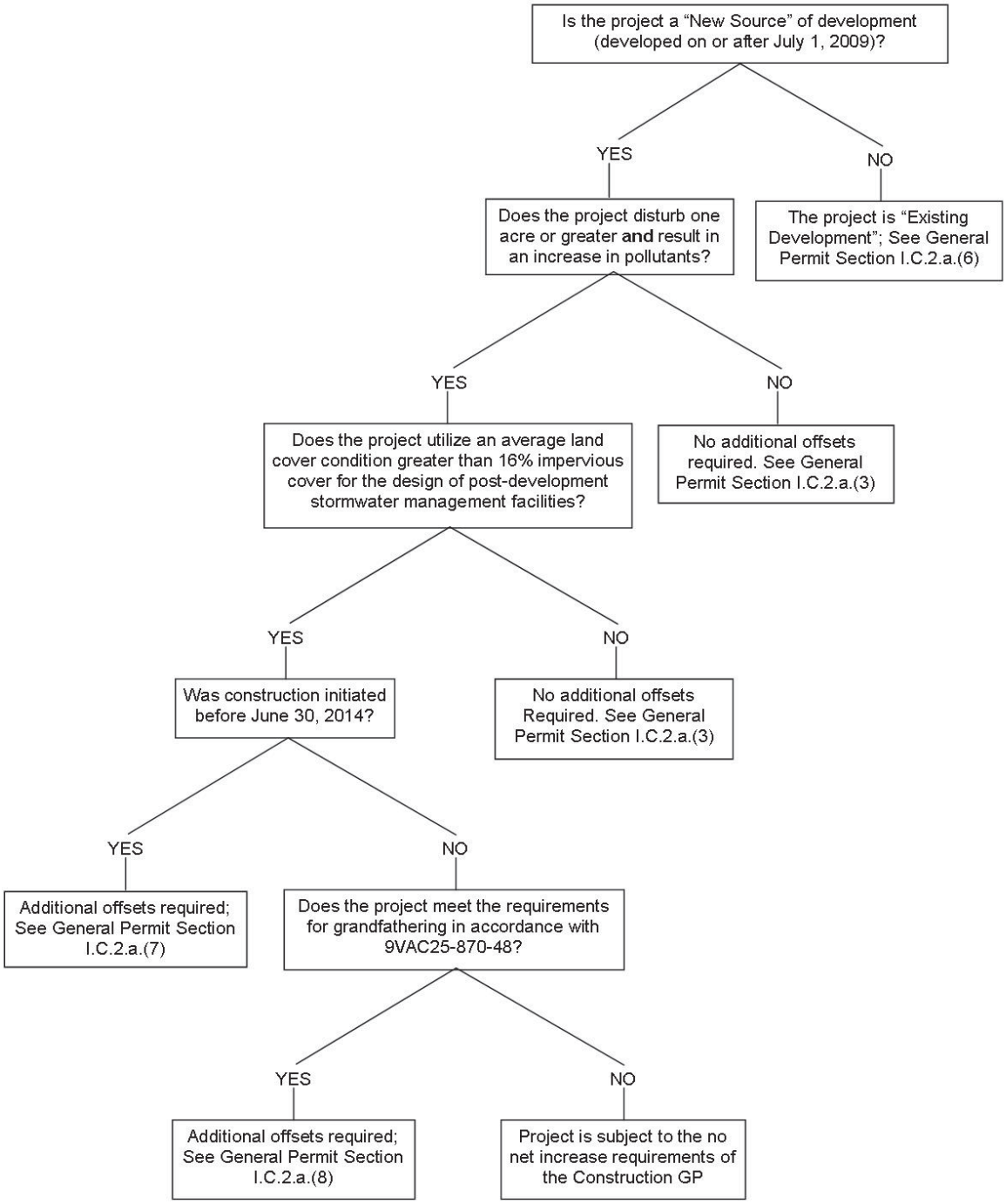
Pollutant	Total Load Change (lbs/yr)	Reductions from on-site BMPs (lbs/yr)	Net Load Change (lbs/yr)
Nitrogen	240	100	140
Phosphorus	126	25	101
Total Suspended Solids	57,586	20,000	37,586

The final column of Table II.5 represents the additional load from New Sources between June 30, 2009 and July 1, 2014 that must be offset. By the end of the first permit cycle, the permittee will need to offset 5.0% of the calculated "Net Load Change."

Pollutant	Net Load Change (lbs/yr)	Required Reduction during first permit cycle	Additional Reductions Required by the end of the first permit cycle (lbs/yr)
Nitrogen	140	0.05	7
Phosphorous	101	0.05	5.05
Total Suspended Solids	37,586	0.05	1879.3

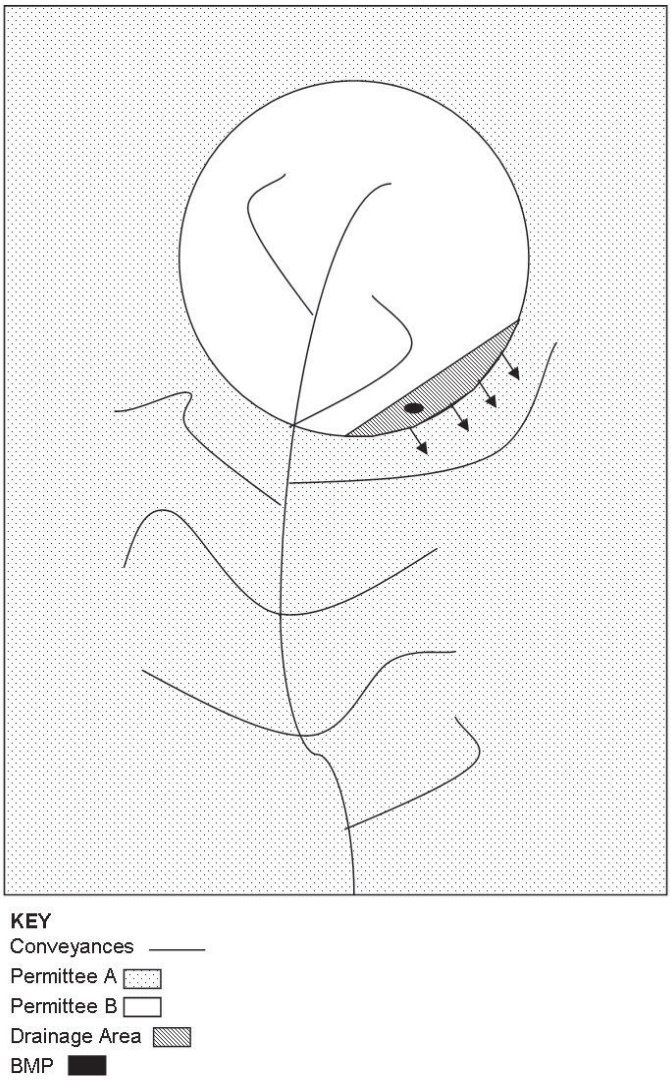
Although this was not the case in this example, if the total load change for any pollutant represents a reduction, the permittee may take credit for the difference and apply it towards the reduction requirements for existing sources.

APPENDIX III – PERMIT POC LOAD REDUCTION FLOW CHART



APPENDIX IV – MS4 BOUNDARY DIAGRAMS

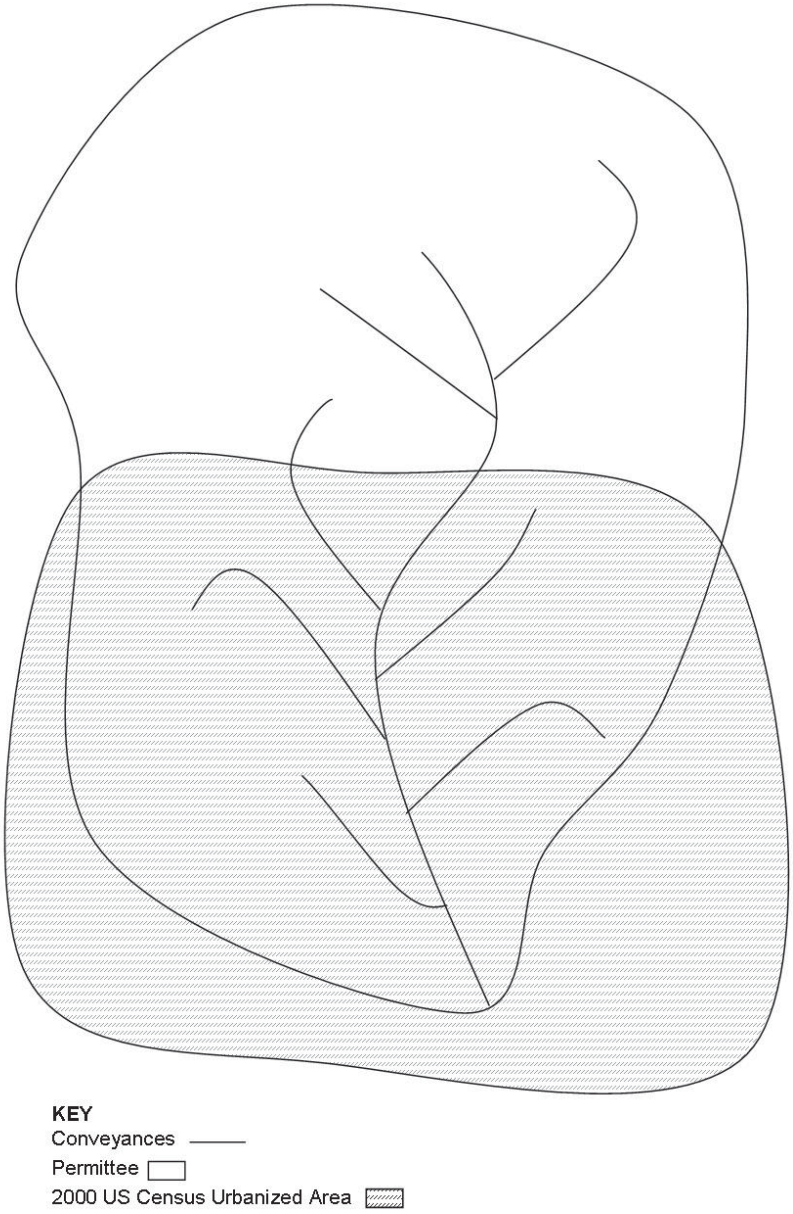
EXAMPLE IV.1 – OVERLAPPING DRAINAGE AREAS



In accordance with GP Section I.C.2.a.(5) permittees must determine the existing acres *served* by the MS4. The system's service area includes those acres that drain to the permittee's system. Permittee B is located within Permittee A's land area and both permittees are located entirely within a Census Designated Urbanized Area. A portion of Permittee B's land area drains, through sheetflow, to Permittee A's system. Although the shaded drainage area is located within Permittee B's jurisdiction, Permittee A is responsible for the POC loads draining from that land. Alternatives to this approach will be considered as long as all lands are accounted for in reduction calculations.

However, if Permittee B installs a BMP within the shaded Drainage Area, they will receive credit for reductions from the BMP. Regardless, it is highly recommended that permittees work together to reduce POC loads in these instances.

EXAMPLE IV.2 – JURISDICTION EXTENDS BEYOND URBANIZED AREA



A portion of the Phase II permittee's system falls outside of the 2000 US Census Urbanized Area. The Phase II permittee is not responsible for any land area draining to the portion of their system that falls outside the Urbanized Area.

APPENDIX V – CALCULATION METHODOLOGIES

Appendix V.A – Structural BMPs, Methodology I – Virginia Stormwater Clearinghouse BMPs

Appendix V.B – Structural BMPs, Methodology II – Bay Program Retrofit Curves

Appendix V.C – Structural BMPs, Methodology III – Bay Program Established Efficiencies

Appendix V.D – BMP Enhancement, Conversion, and Restoration

Appendix V.E – BMPs installed to Meet Development and Redevelopment Requirements

Appendix V.F – BMP Treatment Trains

Appendix V.G – Street Sweeping

Appendix V.H – Land Use Changes

Appendix V.I – Forest Buffers

Appendix V.J – Urban Stream Restoration

Appendix V.K – Urban Nutrient Management

Appendix V.L – Development on Prior Developed Lands (Redevelopment)

APPENDIX V.A – Virginia Stormwater Clearinghouse BMPs[14]

To be eligible for these efficiencies, the BMP must meet all the design requirements that are listed in the Virginia Stormwater BMP Clearinghouse's technical specification for that BMP, not just the one inch requirement for runoff depth treated. There are no established efficiencies for TSS in the Virginia Stormwater BMP Clearinghouse. To calculate the TSS reductions, permittees should use the retrofit curves developed by the Bay Program or the Bay Program Established Efficiencies. The methodology for using the retrofit curves is detailed in *Appendix V.B*. For additional information about the Virginia Stormwater BMP Clearinghouse requirements, permittees should see the BMP design standards and specs, which can be found at http://vwrrc.vt.edu/swc/StandardsSpecs.html.

Table V.A.1 - Virginia Stormwater BMP Clearinghouse BMPs, Established Efficiencies

Practice Number	Practice	TN	TP
1	Rooftop Disconnection[15]	25% or 50%[1]	25% or 50%[1]
2	Sheetflow to Vegetated Filter or Conserved Open Space 1	25% or 50%[1]	25% or 50%[1]
	Sheetflow to Vegetated Filter or Conserved Open Space 2	50% or 75%[1]	50% or 75%[1]
3	Grass Channel	28%	23%
5	Vegetated Roof 1	45%	45%
	Vegetated Roof 2	60%	60%
6	Rainwater Harvesting[15]	Up to 90%	Up to 90%
7	Permeable Pavement 1	59%	59%
	Permeable Pavement 2	81%	81%
8	Infiltration 1	57%	63%
	Infiltration 2	92%	93%
9	Bioretention 1	64%	55%
	Bioretention 2	90%	90%
	Urban Bioretention	64%	55%
10	Dry Swale 1	55%	52%
	Dry Swale 2	74%	76%
11	Wet Swale 1	25%	20%
	Wet Swale 2	35%	40%
12	Filtering Practice 1	30%	60%
	Filtering Practice 2	45%	65%
13	Constructed Wetland 1	25%	50%
	Constructed Wetland 2	55%	75%
14	Wet Pond 1	30% (20%)[2]	50% (45%)[2]
	Wet Pond 2	40% (30%)[2]	75% (65%)[2]
15	Extended Detention Pond 1	10%	15%
	Extended Detention Pond 2	24%	31%

[1]Lower rate is for HSG soils C and D; higher rate is for HSG soils A and B
[2]Lower nutrient removal in parentheses apply to wet ponds in coastal plain terrain

[14] These efficiencies are up to date as of the publication of this guidance. The most up to date list of approved BMPs and their efficiencies can be found on the Virginia Stormwater BMP Clearinghouse website. If there is a discrepancy between this table and the website, the efficiencies on the website supersede those listed in this table. The TN efficiencies may be found in the bodies of the individual BMP reports.

[15] **NOTE:** There are no Bay Program equivalent efficiency BMPs for Rooftop Disconnection and Rainwater Harvesting. Permittees must use the VA Stormwater Clearinghouse technical criteria and efficiencies to receive credit for these practices.

EXAMPLE V.A.1

A small Phase II MS4 with 1000 acres of regulated urban impervious surface and 1000 acres of regulated urban pervious surface is located in the James River Basin. The permittee is planning to implement a constructed wetland that will treat a 50 acre site that is 40% impervious surface and 60% pervious surface.

Prior to considering this project, the permittee has filled out Tables 2a and 3a in their permit, which are incorporated into this example for reference. The permittee will use the loading rates in Table 2a to determine the loads draining to the proposed BMP.

Calculation Sheet for Estimating Existing Source Loads for the James River Basin (*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre/yr)[1]	Estimated Total POC Load Based on 2009 Progress Run (lbs/yr)
Regulated Urban Impervious	Nitrogen	*1000*	9.39	*9390*
Regulated Urban Pervious		*1000*	6.99	*6990*
Regulated Urban Impervious	Phosphorus	*1000*	1.76	*1760*
Regulated Urban Pervious		*1000*	0.5	*500*
Regulated Urban Impervious	Total Suspended Solids	*1000*	676.94	*676,940*
Regulated Urban Pervious		*1000*	101.08	*101,080*

[1]This loading rate can be found in Table 2 a of the General Permit

The second table(s) in the permit must be used to calculate the required reduction for the first permit cycle. This calculation will provide the necessary reductions for the first permit cycle in pounds:

Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the James River Basin (*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)[1]	Total Reduction Required First Permit Cycle (lbs/yr)
Regulated Urban Impervious	Nitrogen	*1000*	0.04	*40*
Regulated Urban Pervious		*1000*	0.02	*20*
Regulated Urban Impervious	Phosphorus	*1000*	0.01	*10*
Regulated Urban Pervious		*1000*	0.002	*2*
Regulated Urban Impervious	Total Suspended Solids	*1000*	6.67	*6670*
Regulated Urban Pervious		*1000*	0.44	*440*

[1]This loading rate can be found in Table 3 a in the General Permit

Based on the calculations in the table, the permittee must achieve reductions of 60 lbs TN, 12 lbs TP, and 7110 lbs TSS within the first permit cycle. Although this table divides the loads by regulated impervious and regulated pervious, the BMP's efficiencies are applied to the entire POC load, not just the load from the impervious acres. The MS4 intends to offset a portion of this load by installing a constructed wetland to treat a 50 acre site that is 40% impervious (20 acres) and 60% pervious (30 acres).

The BMP being installed meets all the design requirements for the Virginia Stormwater BMP Clearinghouse "Constructed Wetland #1," which has a TN reduction efficiency of 25% and a TP reduction efficiency of 50% (*Table V.A 1*). The BMP's efficiency can be translated into pounds by first calculating the site's POC loading without the BMP. Recall that the BMP is being installed to treat land that is 20 acres impervious and 30 acres pervious surface. The acres should be multiplied by the 2009 EOS loading rate for the appropriate basin (*Appendix I, Table 2a)*. For TN:

$$20\ acres * 9.39\ lbs\ TN/ac/yr = 187.8\ lbs\ TN/yr$$

and for pervious surface:

$$30\ acres * 6.99\ lbs\ TN/ac/yr = 209.7\ lbs\ TN/yr$$

These calculated TN loads should be multiplied by the TN efficiency for a constructed wetland as provided in *Table V.A.1*.

$$187.8\ lbs\ TN/yr * 0.25 = 46.95\ lbs\ TN/yr$$

$$209.7\ lbs\ TN/yr * 0.25 = 52.43\ lbs\ TN/yr$$

Therefore, the total nitrogen reduction from the constructed wetland is:

$$46.95\ lbs\ TN/yr + 52.43\ lbs\ TN/yr = 99.38\ lbs\ TN/yr$$

With the installation of this BMP, the permittee has reduced its annual load of nitrogen by 99.38 lbs. With this BMP the permittee has met the reduction requirements for the first permit cycle for nitrogen. The reductions that are achieved for TP can be calculated using the same methodology. To calculate the reductions for TSS, see *Appendix V.B* or *Appendix V.C.*

APPENDIX V.B – Chesapeake Bay Program, Retrofit Curves/Equations

This credit calculation method should be used when a BMP cannot meet the Virginia Stormwater BMP Clearinghouse criteria. The *Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects* (October 2012) provided "Retrofit Curves" as an acceptable method for determining BMP efficiency. An FAQ published by the Bay Program in May 2013 indicated that the log curves in the October report be superseded by 5th order polynomial equations. The Expert Panel report curves were updated to reflect this change in January 2015. These equations may not provide the same efficiencies as the retrofit curves previously incorporated into this section of the guidance document. However, for this permit cycle, permittees may use either the current or former set of curves for BMP efficiency calculations. As part of the Action Plan, the permittee should clearly identify which set of curves were used for the efficiency calculations. To use the updated retrofit equations or curves, the permittee must first estimate the runoff depth treated per impervious acre by the BMP. This can be done using the following equation:

$$RD = \frac{(RS)(12)}{IA}$$

Where

RD = Runoff Depth Treated (inches)
RS = Runoff Storage (acre-feet)
IA = Impervious Acres (acres)

Runoff Depth or Runoff Storage can be estimated by the engineer who designed the BMP. **NOTE:** The previous version of this guidance document stated that permittees could use the Runoff Reduction Method Spreadsheet to estimate a BMP's Runoff Storage for use in this equation. However, upon further review, it was determined that using the "Runoff Reduction" cell is not an appropriate method, as it results in the "runoff storage" being counted twice

BMPs are categorized as either a Runoff Reduction (RR) Practice or a Stormwater Treatment (ST) Practice (*Table V.B.1)*. Once the runoff depth treated ("X") and BMP type are defined, the user will be able to estimate the total removal percentage using the retrofit curves or equations. **NOTE: The Bay Program retrofit equations and/or curves CANNOT be used for dry ponds or extended detention ponds. Permittees may use either the Bay Program Established Efficiencies or the VA Clearinghouse efficiencies to determine reductions from these practices.**

Table V.B.1 - BMP Characterization for Nutrient Curves

Runoff Reduction Practices (RR)	Stormwater Treatment Practices (ST)
Site Design/Non-Structural Practices	Constructed Practices
Landscape Restoration/Reforestation	Constructed Wetlands
Riparian Buffer Restoration	Filtering Practices (aka Constructed Filters, Sand Filters, Stormwater Filtering Systems)
Rooftop Disconnection (aka Simple Disconnection to Amended Soils, to a Conservation Area, to a Pervious Area, Non-Rooftop Disconnection)	Proprietary Practices (aka Manufactured BMPs)
Sheetflow to Filter/Open Space* (aka Sheetflow to Conservation Area, Vegetated Filter Strip)	Wet Ponds (aka Retention Basin)
All Environmental Site Design BMPS	Wet Swale
Constructed Practices	
Bioretention or Rain Garden (Standard or Enhanced)	
Dry Swale	
Expanded Tree Pits	
Grass Channels (w/ Soil Amendments, aka Bio-swale, Vegetated Swale)	
Green Roof (aka Vegetated Roof)	
Green Streets	
Infiltration (aka Infiltration Basin, Infiltration Bed, Infiltration Trench, Dry Well/Seepage Pit, Landscape Infiltration)	
Permeable Pavement (aka Porous Pavement)	
Rainwater Harvesting (aka Capture and Re-use)	
*May include a berm or a level spreader	

More information concerning the retrofit equation calculations can be found in the Bay Program's:

- *Frequently Asked Questions (FAQ) for Recently Approved Urban BMPs*, May 2013 at: http://www.chesapeakebay.net/channel_files/19172/attach_f--draft_faq_document__template.pdf and more information concerning the retrofit curves can be found in the Bay Program's:
- *Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects*, January 2015, at: http://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2012/10/Final-CBP-Approved-Expert-Panel-Report-on-Stormwater-Retrofits-long_012015.pdf

The retrofit equations and curves are provided below:

Table V.B.2 – Retrofit Equations

TN	RR	$y = 0.0308\mathbf{x}^5 - 0.2562\mathbf{x}^4 + 0.8634\mathbf{x}^3 - 1.5285\mathbf{x}^2 + 1.501\mathbf{x} - 0.013$
	ST	$y = 0.0152\mathbf{x}^5 - 0.131\mathbf{x}^4 + 0.4581\mathbf{x}^3 - 0.8418\mathbf{x}^2 + 0.8536\mathbf{x} - 0.0046$
TP	RR	$y = 0.0304\mathbf{x}^5 - 0.2619\mathbf{x}^4 + 0.9161\mathbf{x}^3 - 1.6837\mathbf{x}^2 + 1.7072\mathbf{x} - 0.0091$
	ST	$y = 0.0239\mathbf{x}^5 - 0.2058\mathbf{x}^4 + 0.7198\mathbf{x}^3 - 1.3229\mathbf{x}^2 + 1.3414\mathbf{x} - 0.0072$
TSS	RR	$y = 0.0326\mathbf{x}^5 - 0.2806\mathbf{x}^4 + 0.9816\mathbf{x}^3 - 1.8039\mathbf{x}^2 + 1.8292\mathbf{x} - 0.0098$
	ST	$y = 0.0304\mathbf{x}^5 - 0.2619\mathbf{x}^4 + 0.9161\mathbf{x}^3 - 1.6837\mathbf{x}^2 + 1.7072\mathbf{x} - 0.0091$

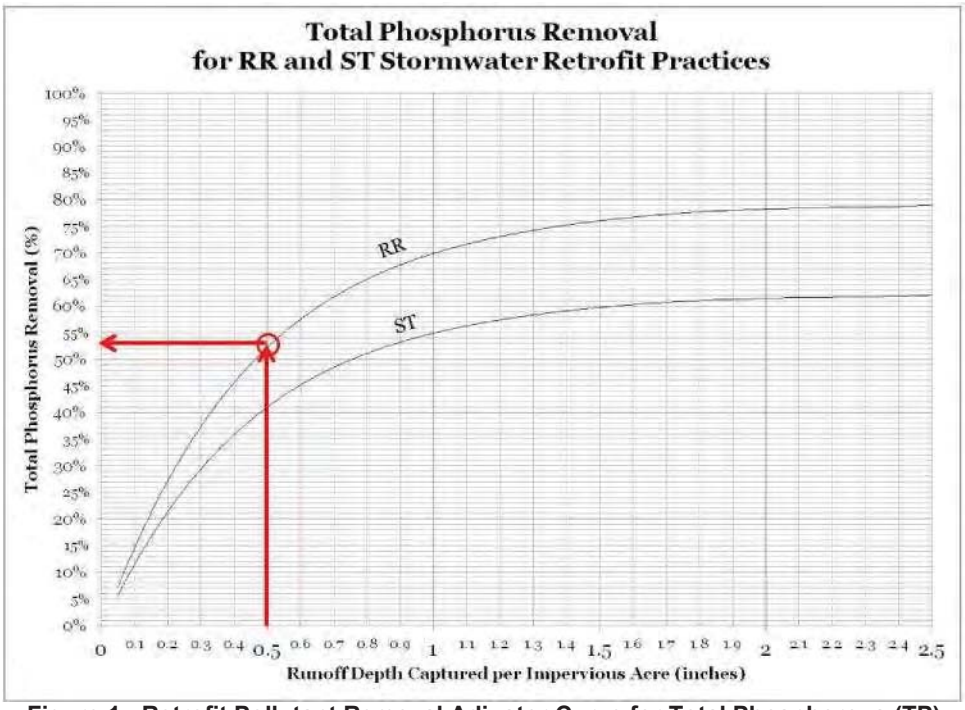


Figure 1 - Retrofit Pollutant Removal Adjustor Curve for Total Phosphorous (TP)

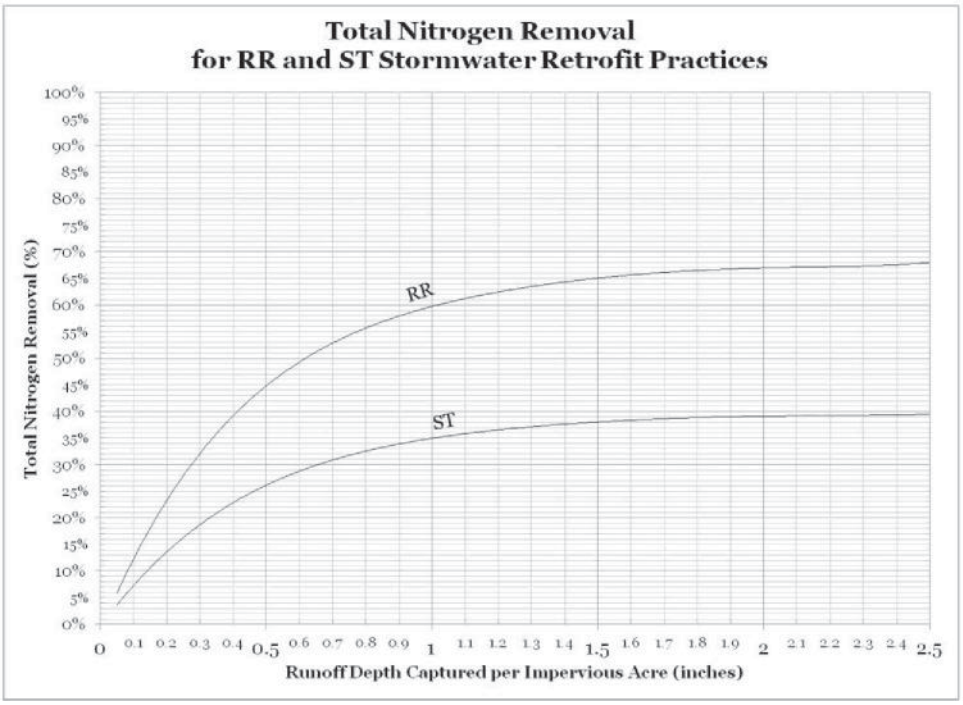


Figure 2 - Retrofit Pollutant Removal Adjustor Curve for Total Nitrogen (TN)

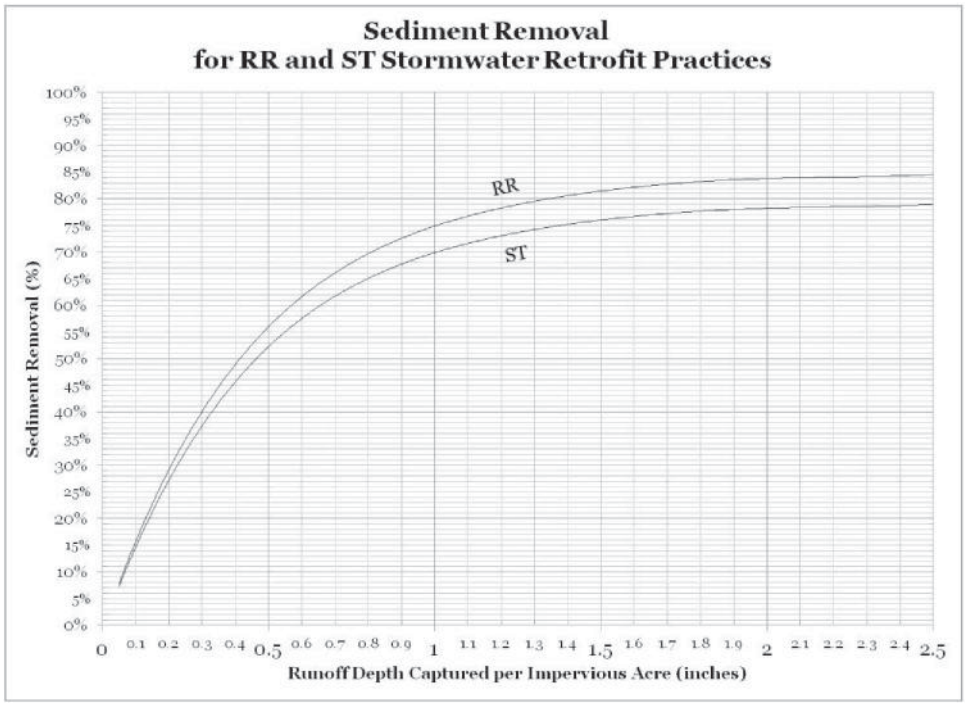


Figure 3 - Retrofit Pollutant Removal Adjustor Curve for Total Sediment (Suspended Solids)

EXAMPLE V.B.1

A small Phase II MS4 with 1000 acres of regulated urban impervious surface and 1000 acres of regulated urban pervious surface is located in the James River Basin. A constructed wetland is planned to treat a 50 acre site that is 40% impervious surface and 60% pervious surface.

Prior to considering this project, the permittee has filled out Tables 2a and 3a in their permit, which are incorporated into this example for reference. The permittee will use the loading rates in Table 2a to determine the loads draining to the proposed BMP.

Calculation Sheet for Estimating Existing Source Loads for the James River Basin (*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre/yr)[1]	Estimated Total POC Load Based on 2009 Progress Run (lbs/yr)
Regulated Urban Impervious	Nitrogen	*1000*	9.39	*9390*
Regulated Urban Pervious		*1000*	6.99	*6990*
Regulated Urban Impervious	Phosphorus	*1000*	1.76	*1760*
Regulated Urban Pervious		*1000*	0.5	*500*
Regulated Urban Impervious	Total Suspended Solids	*1000*	676.94	*676,940*
Regulated Urban Pervious		*1000*	101.08	*101,080*

[1]This loading rate can be found in 9VAC25-890-40 Section I.C Table 2-a of the General Permit

The second table(s) in the permit must be used to calculate the required reduction for the first permit cycle. This calculation will provide the necessary reductions for the first permit cycle in pounds:

Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the James River Basin (*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)[1]	Total Reduction Required First Permit Cycle (lbs/yr)
Regulated Urban Impervious	Nitrogen	*1000*	0.04	*40*
Regulated Urban Pervious		*1000*	0.02	*20*
Regulated Urban Impervious	Phosphorus	*1000*	0.01	*10*
Regulated Urban Pervious		*1000*	0.002	*2*
Regulated Urban Impervious	Total Suspended Solids	*1000*	6.67	*6670*
Regulated Urban Pervious		*1000*	0.44	*440*

[1]This loading rate can be found in 9VAC25-890-40 Section I.C Table 3-a in the General Permit

Based on the calculations in the table, the permittee must achieve reductions of 60 lbs TN, 12 lbs TP, and 7110 lbs TSS within the first permit cycle. Although this table divides the loads by regulated urban impervious acres and regulated urban pervious acres, the BMP's efficiencies are applied to the entire POC load, not just the load from the impervious acres. The MS4 intends to offset a portion of this load by installing a constructed wetland to treat a 50 acre site that is 40% impervious (20 acres) and 60% pervious (30 acres).

A constructed wetland is an efficiency BMP. As recommended in the guidance, the permittee intends to use the retrofit curves to calculate the percent removal accomplished by the BMP. To do this, the permittee needs to estimate (1) the BMP's runoff storage in acre-feet and (2) the number of impervious acres draining to the BMP. The design engineer determines that the runoff storage of the BMP is 1.25 acre-feet. The runoff depth can be estimated using the "Runoff Depth Treated" equation:

$$\frac{(1.25\ acre - feet)(12)}{20\ acres} = 0.75\ in$$

The runoff depth treated by the constructed wetland is 0.75 inch. From there, the retrofit curves can be used to estimate the removal efficiencies for TP, TN, and TSS. Based on *Table V.B.1* the permittee determines that constructed wetlands are a stormwater treatment (ST) BMP. Using the curves in *Figures 1, 2, and 3,* the permittee estimates that the removal rates are:

TN	TP	TSS
30%	47%	60%

The BMP's efficiency can be translated into pounds by first calculating the site's POC loading without the BMP. Recall that the BMP is being installed to treat land that is 20 acres impervious and 30 acres pervious surface. The acres should be multiplied by the 2009 EOS loading rate for the appropriate basin (*Appendix I, Table 2a)*. For TN:

$$20\ acres * 9.39\ lbs\ TN/ac/yr = 187.8\ lbs\ TN/yr$$

and for pervious surface:

$$30\ acres * 6.99\ lbs\ TN/ac/yr = 209.7\ lbs\ TN/yr$$

These values should be multiplied by the BMP's efficiency for TN that was calculated above.

$$187.8\ lbs\ TN/yr * 0.30 = 56.34\ lbs\ TN/yr$$

$$209.7\ lbs\ TN/yr * 0.30 = 62.91\ lbs\ TN/yr$$

Therefore, the TN reduction from the constructed wetland is:

$$56.34\ lbs\ TN/yr + 62.91\ lbs\ TN/yr = 119.25\ lbs\ TN/yr$$

With the installation of this BMP, the permittee has reduced its annual load of nitrogen by 119.25 lbs. With this BMP the permittee has met the reduction requirements for the first permit cycle for nitrogen. The reductions that are achieved for the other POC can be calculated using the same procedure.

APPENDIX V.C - Chesapeake Bay Program, Established Efficiencies

As an alternative to using the Bay Program Curves, permittees may use the Bay Program's established efficiencies for BMPs. Again, these efficiencies may be used for BMPs that do not meet the Virginia Stormwater BMP Clearinghouse design specifications.

Table V.C.1 – Chesapeake Bay Program BMPs, Established Efficiencies

Chesapeake Bay Program BMPs	TN	TP	TSS
Wet Ponds and Wetlands	20%	45%	60%
Dry Detention Ponds and Hydrodynamic Structures	5%	10%	10%
Dry Extended Detention Ponds	20%	20%	60%
Infiltration Practices w/o Sand, Veg.	80%	85%	95%
Infiltration Practices w/ Sand, Veg.	85%	85%	95%
Filtering Practices	40%	60%	80%
Bioretention C/D soils, underdrain	25%	45%	55%
Bioretention A/B soils, underdrain	70%	75%	80%
Bioretention A/B soils, no underdrain	80%	85%	90%
Vegetated Open Channels C/D soils, no underdrain	10%	10%	50%
Vegetated Open Channels A/B soils, no underdrain	45%	45%	70%
Bioswale	70%	75%	80%
Permeable Pavement w/o Sand, Veg. C/D soils, underdrain	10%	20%	55%
Permeable Pavement w/o Sand, Veg. A/B soils, underdrain	45%	50%	70%
Permeable Pavement w/o Sand, Veg. A/B soils, no underdrain	75%	80%	85%
Permeable Pavement w/Sand, Veg. C/D soils, underdrain	20%	20%	55%
Permeable Pavement w/Sand, Veg. A/B soils, underdrain	50%	50%	70%
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	80%	80%	85%

BMP efficiencies for wetland restoration vary depending on hydrogeomorphic region as listed below in *Table V.C.2*. To use this table the permittee will need to determine which region their MS4 is in and use the appropriate efficiency. If the permittee is unsure which Hydrogeomorphic Region it is located in, resources are available through the USGS at http://chesapeake.usgs.gov/data.html.

Table V.C.2 – Chesapeake Bay Program BMPs, Established Efficiencies Regionally Impacted

Chesapeake Bay Program Hydrogeomorphic Region affected efficiencies				
BMPs	Region	TN	TP	TSS
Wetland Restoration	Appalachian Plateau Siliciclastic Non-Tidal	7.0%	12%	4.0%
Wetland Restoration	Coastal Plain Dissected Uplands Non-Tidal; Coastal Plain Dissected Uplands Tidal; Coastal Plain Lowlands Tidal; Coastal Plain Uplands Tidal; Coastal Plain Lowlands Non-Tidal; Coastal Plain Uplands Non-Tidal	25%	50%	15%
Wetland Restoration	Blue Ridge Non-Tidal; Mesozoic Lowlands Non-Tidal; Valley and Ridge Carbonate Non-Tidal; Piedmont Crystalline Non-Tidal; Piedmont Carbonate Non-Tidal; Valley and Ridge Siliciclastic Non-Tidal	14%	26%	8.0%

EXAMPLE V.C.1

A small Phase II MS4 with 1000 acres of regulated urban impervious surface and 1000 acres of regulated urban pervious surface is located in the James River Basin. A bioswale is planned to treat a 5 acre site that is 40% impervious surface and 60% pervious surface.

Prior to considering this project, the permittee has filled out Tables 2a and 3a in their permit, which are incorporated into this example for reference. The permittee will use the loading rates in Table 2a to determine the loads draining to the proposed BMP.

Calculation Sheet for Estimating Existing Source Loads for the James River Basin (*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	2009 EOS Loading Rate (lbs/acre/yr)[1]	Estimated Total POC Load Based on 2009 Progress Run (lbs/yr)
Regulated Urban Impervious	Nitrogen	*1000*	9.39	*9390*
Regulated Urban Pervious		*1000*	6.99	*6990*
Regulated Urban Impervious	Phosphorus	*1000*	1.76	*1760*
Regulated Urban Pervious		*1000*	0.5	*500*
Regulated Urban Impervious	Total Suspended Solids	*1000*	676.94	*676,940*
Regulated Urban Pervious		*1000*	101.08	*101,080*

[1]This loading rate can be found in 9VAC25-890-40 Section I.C Table 2-a of the General Permit

The second table(s) in the permit must be used to calculate the required reduction for the first permit cycle. This calculation will provide the necessary reductions for the first permit cycle in pounds:

Calculation Sheet for Determining Total POC Reductions Required During the Permit Cycle for the James River Basin (*Based on Chesapeake Bay Program Watershed Model Phase 5.3.2)

Subsource	Pollutant	Total Existing Acres Served by MS4 (06/30/09)	First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)[1]	Total Reduction Required First Permit Cycle (lbs/yr)
Regulated Urban Impervious	Nitrogen	*1000*	0.04	*40*
Regulated Urban Pervious		*1000*	0.02	*20*
Regulated Urban Impervious	Phosphorus	*1000*	0.01	*10*
Regulated Urban Pervious		*1000*	0.002	*2*
Regulated Urban Impervious	Total Suspended Solids	*1000*	6.67	*6670*
Regulated Urban Pervious		*1000*	0.44	*440*

[1]This loading rate can be found in 9VAC25-890-40 Section I.C Table 3-a of the General Permit

Based on the calculations in the table, the permittee must achieve reductions of 60 lbs TN, 12 lbs TP, and 7110 lbs TSS within the first permit cycle. Although this table divides the loads by regulated urban impervious acres and regulated urban pervious acres, the BMP's efficiencies are applied to the entire POC load, not just the load from the impervious acres. The MS4 intends to offset a portion of this load by installing a bioswale to treat a 5 acre site that is 40% impervious (2 acres) and 60% pervious (3 acres).

The BMP's efficiency can be translated into pounds by first calculating what the site's POC loading would be without the BMP. Recall that the BMP is being installed to treat land that is 2 acres impervious and 3 acres pervious surface. The acres should be multiplied by the 2009 EOS loading rate for the appropriate basin (*Appendix I, Table 2a)*. For TN:

$$2\ acres * 9.39\ lbs\ TN/ac/yr = 18.78\ lbs\ TN/yr$$

and for pervious surface:

$$3\ acres * 6.99\ lbs\ TN/ac/yr = 20.97\ lbs\ TN/yr$$

These values should be multiplied by the BMP's efficiency for TN that was calculated above.

$$18.78\ lbs\ TN/yr * 0.70 = 13.15\ lbs\ TN/yr$$

$$20.97\ lbs\ TN/yr * 0.70 = 14.68\ lbs\ TN/yr$$

Therefore, the total nitrogen reduction from the bioswale is:

$$13.15\ lbs\ TN/yr + 14.68\ lbs\ TN/yr = 27.83\ lbs\ TN/yr$$

With the installation of this BMP, the permittee has reduced its annual load of nitrogen by 27.83 lbs. The permittee will need to implement additional BMPs to reduce the remaining 32.17 lbs of nitrogen. The reductions that are achieved for the other POC can be calculated using the same procedure.

APPENDIX V.D – BMP Enhancement, Conversion, and Restoration[16]

The credit permittees will receive for BMP Enhancement, Conversion, and/or Restoration should be calculated using an incremental rate (enhanced BMP efficiency minus existing BMP efficiency). The permittee should apply the difference between the existing BMPs efficiency and the enhanced or converted BMP's efficiency to the load that is draining to the BMP to calculate the POC reduction that will be credited.

To receive credit for BMP restoration, the project must meet the criteria for a "major restoration." Please see the *Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects* to determine if a project qualifies as a major restoration. The report may be found at*:* *http://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2012/10/Final-CBP-Approved-Expert-Panel-Report-on-Stormwater-Retrofits-long_012015.pdf*.

EXAMPLE V.D.1

The same small MS4 is planning to convert a Dry Extended Detention Pond to a Wet Pond. A 10 acre site that is 50% impervious (5 acres) and 50% pervious (5 acres) drains to the existing Pond and the planned upgrades will not alter the BMP's drainage area. Using the same method that was used in *Example V.A.1* and *Example V.B.1* the permittee calculates that the loads draining to the pond are:

for impervious surface:

$$5\ acres * \ 9.39\ lbs\ TN/ac/yr = \ 46.95\ lbs\ TN/yr$$

and for pervious surface:

$$5\ acres * \ 6.99\ lbs\ TN/ac/yr = \ 34.95\ lbs\ TN/yr$$

To calculate the credits for this conversion, the permittee first needs to estimate the removal efficiency of the existing Dry Extended Detention pond. The initial pond was not built to meet VA Stormwater BMP Clearinghouse standards, so the permittee chooses to use the accepted Bay Program Efficiencies as its starting point. For Dry Extended Detention Ponds the accepted Bay Program removal efficiencies are:

TN	TP	TSS
20%	20%	60%

Next the permittee must estimate the efficiency of the Wet Pond that will result from the conversion. For this the permittee elects to use the Bay Program Curves since, as the result of design constraints, the newly converted pond cannot meet all of the Clearinghouse standards for that BMP type. Using the same process described in *Appendix V.B* the permittee estimates the new Wet Pond will have a runoff depth treated of one inch. Since Wet Ponds are a ST practice, the permittee uses the provided curves[17] to estimate that the pollutant removal rates are:

TN	TP	TSS
33%	52%	66%

[16] When enhancing, converting, or restoring existing BMPs and/or impoundments, any existing water quantity criteria should be maintained to avoid potential flooding or additional stream erosion downstream of the BMP.
[17] This example and all other examples in this guidance use the previous (logarithmic) set of Bay Program Curves

To determine the credits, the permittee must subtract the efficiencies from the existing Dry Pond from the efficiencies for the new Wet Pond.

For TN

$$33\% - 20\% = 13\%$$

So for the nitrogen loads draining to the new Wet Pond the permittee will receive credit for reductions of 13 percent.

$$46.95\ lbs\ TN/yr\ *\ 0.13\ =\ 6.104\ lbs\ TN/yr$$

$$34.95\ lbs\ TN/yr *\ 0.13 =\ 4.544\ lbs\ TN/yr$$

The conversion results in a total increased reduction of 10.65 lbs TN/yr. The interim efficiencies and pollutant reductions can be calculated using the same method for the other POC.

Existing BMP Efficiency Modification

If the BMP being enhanced, converted, or restored is missing major design elements or is substantially undersized the permittee may modify the "existing BMP efficiency" that is used to calculate the incremental rate. **NOTE**: Permittees may only use this modification method if the Bay Program Established Efficiencies are used to determine the initial BMP's efficiency prior to an enhancement, conversion, or restoration project. The VA BMP Clearinghouse efficiencies may only be used if all design elements are present. Likewise, the Bay Program curves should not require additional modification to account for missing design elements. Instead any deficiencies should be captured in a reduced initial runoff storage value for the practice. Permittees will need to exercise their best professional judgment if applying an efficiency modification to an existing BMP. To receive credit for this type of modification, permittees should submit the appropriate supporting documentation to the Department for approval. All documentation supporting that modification should also be made available to the Department for verification upon request.

A Visual Inspection Checklist can be used for any design deficiencies that inhibit the full performance of a BMP when calculating credit for an enhancement, conversion, or restoration. Permittees should document how their modification decisions were made so that the Department may verify that the modification applied was appropriate. Supporting documentation, such as a visual inspection checklist and modification tables should be submitted to the Department in support of modifications. In all cases, best professional judgment should be used.

Permittees may apply a downward modification of up to 10% for each design criteria that is missing or each aspect of the practice that is undersized. The total modification should not exceed 50 percent.

EXAMPLE V.D.2

In reviewing the previous BMP conversion, the permittee determines through a field review that the initial dry pond is eligible for an efficiency modification. BMPs should be modified based on any specific deficiencies present.

For instance, elements specific to dry ponds or dry extended detention ponds that permittees might consider for a modification include:

Missing Design Criteria
For each missing design criterion, the permittee should apply an additional downward modification of 10% to the BMP's initial removal efficiency. Missing Design Criteria for a Dry Pond may include:

- *Absence of a sediment forebay*
- *Absence of a micro pool or other form of protection at the riser outlet*
- *Short circuiting due to the initial inlet placement (note: short circuiting can qualify for an efficiency modification only if it is the result of the initial BMP design. If short circuiting is the result of sediment accumulation it should not be considered for an efficiency modification)*

and

Undersized Practice
Permittees may modify the efficiency of the BMP downward by 10% if some aspect of the BMPs original design is undersized. For a dry pond this may include:

- *Small Drainage Area – if the drainage area is 5 acres or less AND the drainage orifice is greater than 3 inches (pre 1999 BMPs only) OR if the Dry Pond has less than a minimum 12 hour draw down time*
- *If the minimum volume of the pond is less than 2 * WQv (where WQv is .5 inches * the area of the impervious cover draining to the pond).*

For the dry pond in question, the permittee determines it was constructed in 1994, is missing a sediment forebay and has no riser outlet protection. The permittee summarizes this information in a spreadsheet for submission to the Department:

Sample Modification Table/Spreadsheet

BMP Type	BMP Location	Modification Type	Downward Modification Applied (%)
Dry Pond	(*Lat, Long*)	Missing Sediment Forebay	10
		No Riser Outlet Protection	10
		Total	20

Based on the review of the BMP, the permittee would be able to apply a 20% downward modification to the initial efficiency of the Dry Extended Detention Pond being enhanced or converted. So instead of the initial practice having efficiencies of 20%, 20%, and 60% for TN, TP, and TSS (*Table V.C.1)* the permittee would calculate the efficiencies 20% downward for initial efficiencies of 16%, 16% and 48 percent. These downward modified efficiencies are then used to calculate the incremental efficiencies applied to their POC loads.

So instead of the calculation shown in *Example V.D.1* to calculate the POC reductions for BMP enhancement from an existing dry extended detention pond to a Wet Pond, the permittee would perform the following calculation to estimate the increased POC reductions from the conversion:

$$33\% - 16\% = 17\%$$

This efficiency is then applied to the calculated load

$$46.95\ \ lbs\ TN/yr\ *\ 0.17\ =\ 7.98\ lbs\ TN/yr$$

$$34.95\ lbs\ TN/yr *\ 0.17 =\ 5.94 lbs\ TN/yr$$

$$7.98\ lbs\ TN/yr + 5.94\ lbs\ TN/yr = 13.92\ lbs\ TN/yr$$

The conversion, with an appropriate modification applied to the existing BMP, results in a total load reduction of 13.92 lbs TN/yr

APPENDIX V.E – BMPs installed to Meet Development and Redevelopment Requirements

Permittees will receive full credit for any POC reductions that result from redevelopment projects. For oversized BMPs and stricter development requirements permittees may receive credit for the difference between the BMP's reductions and the reductions required under the VSMP regulations or other applicable state standards. Under the VSMP regulations, TP serves as an indicator pollutant for TN and TSS and permittees must account for the associated reductions required for those POCs prior to taking credit for reductions that exceed the VSMP requirements.

Permittees may use the conversion factors in Table 4 to account for load reductions that occur as the result of direct reductions in impervious cover. To estimate the credit for TN and TSS from an oversized BMP, the permittee should calculate the proportion of the implemented BMP's total reduction that is available for credit towards the TMDL for TP. The permittee may take credit for the same proportion of the BMP's total reductions for TN and TSS. The following example provides the calculation method permittees should follow to determine reductions from oversized BMPs.

EXAMPLE V.E.1

A permittee in the James River Basin has a new development project that disturbs 10 acres. The site's post-construction average land cover condition is 20%, which has an associated TP load of .52 lbs TP/ac/yr. To meet the VSMP requirements, the permittee needs to install a BMP that reduces the average site load to .45 lbs TP/ac/yr. The permittee decides to install a Wet Pond 1 to treat this site.

Step 1: Determine the proportion of the installed BMP's total TP reductions that may be applied towards the TMDL reduction requirements:

The total TP load for the post-development site is 5.2 lbs TP/yr (.52 lbs TP/ac/yr * 10 acres) and the permittee needs to reduce that site load to 4.5 lbs TP/yr (.45 lbs TP/ac/yr * 10 acres). The total reduction required on the site to meet the VSMP regulations is:

5.2 lbs TP/yr – 4.5 lbs TP/yr = .7 lbs TP/yr reduction required

The Wet Pond 1 the permittee installs has a 50% efficiency for TP in the VA BMP Clearinghouse. The permittee multiples the total site load for TP by the BMP's efficiency and determines that the total reduction the BMP provides for TP is:

5.2 lbs TP/yr * .5 = 2.6 lbs TP/yr

The permittee may take credit for the difference between the BMP's total reductions and the reductions that are required on site to meet the VSMP regulatory requirements. For TP, the permittee may take credit for:

2.6 lbs TP/yr – 0.7 lbs TP/yr = 1.9 lbs TP/yr

Likewise, the permittee may take credit for the same *proportion* of the BMP's total reductions for each POC. The proportion that is available for credit may be determined by dividing the creditable reduction for TP by the BMPs total reduction for TP:

(1.9 lbs TP/yr) / (2.6 lbs TP/yr) = .73

Step 2: Determine the total site loads for TN and TSS:

The total associated site loads for TN and TSS should be calculated using *Table 4* in the permit:

TN: 5.2 lbs TP/yr * 5.2 lbs TN/lb TP = 27.04 lbs TN/yr

TSS: 5.2 lbs TP/yr * 420.9 lbs TSS/lb TP = 2188.68 lbs TSS/yr

Step 3: Determine the total BMP reductions for TN and TSS:

For TN, the permittee should use the VA BMP Clearinghouse efficiency for a Wet Pond 1, which is 30%:

TN: 27.04 * .30 = 8.112 lbs TN/yr

For TSS, the permittee may use either the Bay Program Established Efficiencies or the Bay Program Curves. In this example, the permittee decides to use the Bay Program Established Efficiency, which is 60% for a Wet Pond:

TSS: 2188.68 lbs TSS/yr * .6 = 1313.21 lbs TSS/yr

Step 4: Determine the credit the permittee may receive towards the TMDL reduction requirements for TN and TSS:

The permittee may take credit for the same proportion of the total pollutant load determined in **Step 1** for TN and TSS**:**

TN: 8.112 lbs TN/yr * .73 = 5.92 lbs TN/yr

TSS: 1313.21 lbs TSS/yr * .73 = 958.64 lbs TSS/yr

The permittee may take credit for 1.9 lbs TP/yr, 5.92 lbs TN/yr, and 958.64 lbs TSS/yr towards its TMDL requirements for this oversized BMP.

APPENDIX V.F – Treatment Trains

Although BMPs should be reported to the Department individually, the permittee may receive credit for BMPs that are implemented as part of a treatment train. For treatment trains composed of BMPs from the Virginia Stormwater BMP Clearinghouse the Runoff Reduction Method Spreadsheet can be used to account for the impact of the treatment train. If the retrofit curves are used, the permittee will need to use their best professional judgment to identify the predominant BMP that will be credited. If BMPs with Bay Program approved efficiencies are used, the permittee may calculate the reduced POC loading rate to each BMP in the treatment train to estimate the appropriate reductions for each step.

APPENDIX V.G – Street Sweeping

In the initial publication of this guidance document a street sweeping efficiency was provided in Table V.C.1. Upon further review, it was determined that a single efficiency is not an appropriate method for calculating reductions from this practice. Instead permittees should follow one of the suggested Bay Program methods: the "mass loading approach" or "qualifying street lanes method." Calculation procedures for both methods are provided below:

Mass Loading Approach

1. Determine pounds of material collected
2. Convert to pounds of material to dry weight using a factor of .7 lbs dry weight/lbs material
3. Multiply by the following factors for each POC to determine the reductions from street sweeping:

TN lbs/yr	TP lbs/yr	TSS lbs/yr
.0025	.001	.3

Qualifying Street Lanes Method

1. Determine the lane miles swept
2. Convert to total impervious acres by multiplying the miles swept by the lane width swept (10 ft) and dividing that figure by 43,560. If both side of the street are swept, then use a lane width of 20 feet.
3. Multiply the impervious acres by the pre-sweeping annual nutrient load for TP (2 lbs/impervious acre/yr) and TN (15.4 lbs/impervious acre/yr):
4. Multiply the pre-sweep baseline load by the pickup factors depending on the technology used to determine the reductions from street sweeping:

Technology	TN lbs/yr	TP lbs/yr	TSS lbs/yr
Mechanical	.04	.04	.10
Regenerative/Vacuum	.05	.06	.25

For additional information regarding these calculation procedures, please see:

- March 3, 2011 memo Re: Street Sweeping/BMP Era Recommendations: http://www.chesapeakebay.net/channel_files/13238/bmp_memo_to_wg_for_street_and_era.pdf
- Section 5.3.8 of the Chesapeake Stormwater Network's *Technical Bulletin 9:* http://chesapeakestormwater.net/wp-content/uploads/downloads/2012/03/TB-9-Nutrient-Accounting-FINAL-DRAFT.pdf

Permittees will receive full credit for the POC pounds reduced through their street sweeping program as calculated using either the "mass loading approach" or the "qualifying street lanes method." Permittees do not need to meet the minimum requirement of sweeping 26 times per year to receive credit for this practice.

Regardless of the method that is used to calculate credits for street sweeping, permittees should note that **street sweeping will be credited annually**. If permittees commit to a level of pollutant removal to achieve their 5% reductions and fall short of meeting those pollutant reductions additional reductions will need to be made in those years. Permittees may wish to be conservative in their estimates of the amount of pollutants that will be reduced by street sweeping annually to avoid shortfalls in the future.

APPENDIX V.H – Land Use Change

Permittees may receive credit for land use change conversions based on the number of acres converted. Conversion efficiencies for land use change are dependent on basin and are listed in Table V.H.1. Permittees may receive credit for converting:

1. Impervious to Forest – Permittees may receive credit for converting any Impervious Surface to Forest. To receive credit for the "Forest" land use, permittees should meet the tree density per acre described in the Virginia Department of Forestry's Land Use Tax Assessment Standards (*Table V.H.2*), which can also be found on the Virginia Department of Forestry's website: http://www.dof.virginia.gov/land/usetax/assessment-standards.htm.
2. Impervious to Grass – Permittees may receive credit for converting any Impervious Surface to Grass. To qualify for this credit the "Grass" must be unmanaged (i.e. no nutrient application).
3. Impervious to Pervious – Permittees may receive credit for converting any Impervious Surface to a Pervious Surface other than Forest and/or Grass. Pervious surfaces might include: lawns, unimpacted gravel, railroad embankments/side slopes, etc. If a permittee is unsure if a surface is considered "pervious," the Department should be contacted for further guidance.
4. Pervious to Forest – Permittees may receive credit for converting any Pervious Surface, including unmanaged Grass, to Forest.
5. Pervious to Grass – Permittees may receive credit for converting any Pervious Surface, other than Forest, to unmanaged Grass.

Table V.H.1 – Land Use Change Conversion Efficiency Table

Basin	Land Use from	Conversion	Edge of Stream Reductions TN(lbs/ac/year)	Edge of Stream Reductions TP(lbs/ac/year)	Edge of Stream Reductions TSS(lbs/ac/year)
James	Impervious	Forest	7.31	2.07	875.11
James	Impervious	Grass	6.87	1.55	486.31
James	Impervious	Pervious	2.29	1.60	817.29
James	Pervious	Forest	5.03	0.48	57.82
James	Pervious	Grass	4.58	0.00	0.00
Potomac	Impervious	Forest	13.91	1.80	1252.01
Potomac	Impervious	Grass	12.56	1.34	623.28
Potomac	Impervious	Pervious	6.75	1.42	1119.05
Potomac	Pervious	Forest	7.16	0.38	132.96
Potomac	Pervious	Grass	5.81	0.00	0.00
Rappahannock	Impervious	Forest	11.51	2.26	866.31
Rappahannock	Impervious	Grass	10.04	1.67	206.99
Rappahannock	Impervious	Pervious	4.19	1.74	793.13
Rappahannock	Pervious	Forest	7.32	0.53	73.18
Rappahannock	Pervious	Grass	5.85	0.00	0.00
York	Impervious	Forest	6.83	1.49	749.05
York	Impervious	Grass	6.06	1.17	430.00
York	Impervious	Pervious	1.65	1.10	670.75
York	Pervious	Forest	5.18	0.40	78.30
York	Pervious	Grass	4.41	0.08	0.00

Table V.H.2 - Minimum Number of Trees Required Per Acre to Determine 30 Square Feet of Tree Basal Area of 40% Stocking For Classification as Forest Land

D.B.H.[1] Range	D.B.H. in 2" Classes	Basal Area Per Tree	Per Acre	Per 1/5 Acre	Per 1/10 Acre
up to 2.9"	Seedlings		400	80	40
3.0-4.9"	4	0.0873	400	80	40
5.0-6.9"	6	0.1964	153	31	15
7.0-8.9"	8	0.3491	86	17	9
9.0-10.9"	10	0.5454	55	11	6
11.0-12.9"	12	0.7854	38	8	4
13.0-14.9"	14	1.0690	28	6	3
15.0" +	16+	1.3963	21	4	2

[1] DBH refers to the tree diameter measured at 4.5 feet above the ground.

EXAMPLE V.H.1

A locality in the Potomac River Basin is converting 1.5 acres of contiguous land from impervious surface to forest. The trees being planted all fall between 1 and 2 inches in diameter at breast height (4.5 feet from ground level), so the permittee must plant at least 400 trees per acre or at least 600 trees on the site to qualify for the land use conversion. To calculate the credit the permittee will receive, the appropriate values from *Table V.H.1* should be used.

For TN:

$$1.5\ acres\ converted * 13.91\ lbs\ TN/ac/yr = 20.87\ lbs\ TN/yr$$

For TP:

$$1.5\ acres\ converted * 1.80\ lbs\ TP/ac/yr = 2.7\ lbs\ TP/yr$$

For TSS:

$$1.5\ acres\ converted * 1252.01\ lbs\ TSS/ac/yr = 1{,}878.02\ lbs\ TSS/yr$$

Through the land use conversion the permittee has offset 20.87 lbs TN/yr, 2.7 lbs TP/yr, and 1,878.02 lbs TSS/yr.

APPENDIX V.I – Forest Buffers

Forest Buffers can be credited as both a land use change and efficiency BMP. The land use change component should be credited in accordance with the applicable section of *Table V.H.1* in *Appendix V.H*. The efficiency is applied at up to a 2-to-1 ratio for upland acres that drain to the buffer as sheetflow (i.e. if a one acre buffer is installed, but only 1.5 upland acres drains to the buffer as sheetflow, the permittee may only receive the efficiency credit for 1.5 acres). The following established efficiencies for TP, TN, and TSS should be used (*Table V.I.1*):

Table V.I.1 - Efficiencies for Forest Buffers Applied to Two Upland Acres per Acre of Buffer

Practice	TN	TP	TSS
Forest Buffer	25%	50%	50%

EXAMPLE V.I.1

A permittee in the Potomac River basin has identified an area of regulated land adjacent to a stream as a candidate site for a forest buffer. The site has 311.14 linear feet of stream that can be buffered with an average width of 35 feet for a total of a 0.25 acre forest buffer. The land the forest buffer will be implemented on and the land draining to the buffer is all urban pervious.

Calculating the nutrient reductions provided by this BMP is a two part process. The first step is to calculate the reductions that result from the land use conversion. The permittee is converting pervious surface to forest, so using *Table V.H.1* in *Appendix V.H*, the permittee can identify the appropriate conversion factor, which is 7.16 lbs/acre for nitrogen. The permittee should multiply this value by the acres changed to calculate the land use change reduction for the site:

$$7.16\ lbs\ TN/ac/yr * \ 0.25\ acres = 1.79\ lbs\ TN/yr$$

In addition to the land use change credit, the permittee will also receive an efficiency credit for this BMP. Again, the permittee should calculate the loading rate for the land draining to the BMP. Upland acres are treated by forest buffers at a ratio of 2:1, so there are:

$$0.25\ acres\ converted * 2 = \ 0.5\ upland\ acres\ treated$$

The permittee verifies that there are at least 0.5 upland acres draining to the buffer as sheetflow, so the permittee may take the full efficiency credit for this forest buffer.

The permittee should multiply the number of upland acres treated by the appropriate loading rate from Section I.C.2.a.(4) in the MS4 permit, in this case *Table 2b* for the Potomac watershed. As noted above, all the land draining to the BMP is urban pervious so for TN the loading rate for all acres draining to the buffer is 10.07 lbs. To estimate the loading rate after the BMP is applied, the permittee should multiply the initial loading rate by the BMPs efficiency, which is 25% (*Table V.I.1*):

$$10.07\ lbs\ TN/ac/yr * \ 0.25 = 2.52\ lbs\ TN/ac/yr$$

The permittee should multiply the upland acres treated by this modified loading rate to calculate the pounds of nitrogen reduced:

$$2.52\ lbs\ TN/ac/yr * \ 0.5\ acres = 1.26\ lbs\ TN/yr$$

This result should be added to the result from the land use conversion for a total reduction of:

$$1.79\ lbs\ TN/yr + 1.26\ lbs\ TN/yr = 3.05\ \ lbs\ TN/yr$$

With the installation of the forest buffer, this permittee has reduced its annual load of TN by 3.05 lbs/yr. The same procedure can be followed to calculate the reductions for TP and TSS.

APPENDIX V.J – Urban Stream Restoration

For urban stream restoration projects that have been installed on or after January 1, 2006 and those that cannot conform to any of the four protocols for stream restoration, permittees should use the interim approved removal rates developed by the Bay Program to calculate credits. These efficiencies can be found in *Table V.J.1*.

Table V.J.1 – Urban Stream Restoration Interim Approved Removal Rates

BMPs	How Credited	TN	TP	TSS
Stream Restoration	Mass reduction/length (lbs/linear ft)	0.075	0.068	444.88/15.13*

*The value that should be used to calculate reductions for sediment is dependent on the project's location. Projects located outside the coastal plain should use 44.88 lbs TSS/linear ft. Projects located within the coastal zone should use 15.13 lbs TSS/linear ft.

In addition to the removal rates, there are four established protocols for urban stream restoration that a permittee may use to calculate reductions from urban stream restoration projects. However, the Department strongly recommends that permittees use the interim approved removal rates to calculate reductions for stream restoration projects during Action Plan development because the Stream Restoration Protocols are still actively under review and revision.

The four protocols are:

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

These protocols, and the interim removal rates, may be applied to 0-5th order streams that meet the basic qualifying conditions described in the Expert Panel Report. Credit cannot be received for improvements to stream sections that are tidally influenced. The first three protocols require direct measurements to estimate pollutant reductions. Pollutant reductions for the fourth option can be calculated using the curves provided by the Bay Program for the other runoff reduction BMPs. Full requirements for each type of stream restoration and how they are credited in the Bay Program are described in greater detail in the following report:

> *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects*, September 2014, which can be found at: http://www.chesapeakebay.net/documents/Stream_Panel_Report_Final_08282014_Appendices_A_G.pdf

Once the reductions from an Urban Stream Restoration project are calculated using one of the accepted methodologies, the credit a permittee may receive must be adjusted to account for the baseline required for the proportion of unregulated land that drains to the restored stream section. Permittees do not need to account for any BMPs installed upstream of a stream restoration project when calculating the reduction from the project **NOTE**: In the initial version of this guidance document permittees also had to account for the amount of forested lands draining to a stream restoration project, and subtract from the total reductions the proportion of the upstream area that receives drainage from forested land. This has been revised. Regardless of whether these lands are incorporated into the initial reductions calculated using the tables, permittees do not have to reduce the credit received from a stream restoration project based on the proportion of forested acres draining to the project.

NOTE: Stream Restoration projects included in the Action Plan must include clear documentation of the degraded nature of the stream prior to restoration. Permittees should incorporate verification activities into their stream restoration projects, such as periodic visual inspections, to ensure the project does not degrade.

EXAMPLE V.J.1

To meet its TMDL reduction requirements, a Phase II permittee in the James River basin has decided to implement a stream restoration project. In accordance with the GP, the permittee may receive credit for the implementation of BMPs on unregulated lands provided any necessary baseline reduction is accounted for (Section I.C.2.b.(1)). For stream restoration projects that receive drainage from both regulated and unregulated lands, permittees may take full credit for the loads draining from regulated lands and an adjusted credit for loads draining off unregulated lands that accounts for baseline reductions (Section I.C.2.b.(2)). Permittees may receive full credit for the proportion of unregulated forested acres or agricultural lands draining to the project because there is no baseline requirement for those lands.

Step 1: Calculate the POC Reductions from the Proposed Stream Restoration Project:

The permittee uses the default rate (*Table V.J.1*) to calculate the stream restoration project's POC reductions. The permittee is restoring a 1,000 linear foot stream reach. The calculated reductions for this project are:

TN	TP	TSS
75 lbs/yr	68 lbs/yr	44,880 lbs/yr

Step 2: Characterize the Acres Draining to the Proposed Stream Restoration Project:

To quantify the stream restoration project reductions that can be credited toward meeting the TMDL, the permittee must first characterize the acres that drain to the project. The permittee estimates the regulated urban impervious and urban pervious acres, unregulated urban impervious and urban pervious acres, and forested acres draining to the stream length that will be restored:

	Urban Impervious Acres	Urban Pervious Acres	Total Urban Acres	Forested Acres	
Regulated Land[1]	9.08	6.37	15.45	1.90	
Unregulated Land	.21	1.64	1.85	7.36	Total
		Total	17.3	9.26	26.56

[1]Regulated Land means acres that drain to any MS4 system.

Using this information, ratios of regulated, unregulated, and forested acres to total acres can be calculated:

15.45 acres regulated land/26.56 total acres = 0.58 regulated acreage ratio

1.85 unregulated acres/26.56 total acres = 0.07 unregulated acreage ratio

9.26 forested acres/26.56 total acres = 0.35 forested acres

Step 3: Calculate the Total Reductions for Regulated and Unregulated Urban Lands

Permittees may receive credit for stream restoration projects from:

1. **Regulated Urban Acres**: permittees may receive the full reduction credit for the proportion of the project that receives drainage from regulated acres
2. **Unregulated Urban Acres**: permittees may receive an adjusted reduction credit for the proportion of the project that receives drainage from unregulated acres. **NOTE:** If the baseline requirement for unregulated land exceeds the credit produced on unregulated urban acres, permittees may not receive credit for the proportion of the project that receives drainage from unregulated acres. However, this will not impact the credit received for the proportion of the project that receives drainage from regulated urban acres or forested or agricultural acres.
3. **Forested or Agricultural Acres**: permittees may receive full credit for the proportion of the project that receives drainage from unregulated forested or agricultural lands, as there is no baseline requirement for these lands.

So, to calculate the TSS credits it may receive for this stream restoration project, the permittee should multiply the total project TSS reduction calculated in *Step 1* (45,974 lbs TSS/yr) by the ratios calculated in *Step 2*:

For regulated acres: 44,880 lbs TSS * 0.58 = 26,030.4 lbs TSS

For unregulated urban acres: 44,880 lbs TSS * 0.07 = 3,141.6 lbs TSS

For forested acres: 44,880 lbs TSS * 0.35 = 15,708 lbs TSS

Step 4: Account for the Total Baseline Reductions on Unregulated Land

The load reduction calculated for unregulated acres must be adjusted to account for the baseline reduction required on unregulated land. This calculation is based on the loading rates found in Tables 3a-d of the permit. The impervious and pervious load reductions that must be achieved in the first permit cycle (5.0% of the total required reductions) are multiplied by 20 to estimate the entire baseline reductions needed to comply with the Chesapeake Bay TMDL by the end of the third MS4 permit cycle. For TSS the permittee calculates that the baseline loading rate for its project in the James River Basin (Table 3a) for urban impervious acres is:

6.67 lbs TSS/ac/yr * 20 = 133.40 lbs TSS/ac/yr

and for urban pervious acres is:

0.44 lbs TSS/ac/yr * 20 = 8.80 lbs TSS/ac/yr

The total required baseline reduction can be calculated by multiplying these loading rates by the unregulated urban acres draining to the stream restoration project.

For urban impervious acres this is:

133.40 lbs TSS/ac/yr * 0.21 Unregulated Urban Impervious Acres = 28.01 lbs TSS/yr

and for urban pervious acres this is:

8.80 lbs TSS/ac/yr * 1.64 Unregulated Urban Pervious Acres = 14.43 lbs TSS/yr

for a total baseline reduction of:

28.01 lbs TSS/yr + 14.43 lbs TSS/yr = 42.44 lbs TSS/yr

The permittee *may not* take credit for 42.44 lbs TSS reduction from the unregulated lands draining to the stream restoration project. The permittee should subtract this value from the TSS credit for unregulated acres that was calculated in *Step 3*:

3,141.6 lbs TSS/yr – 42.44 lbs TSS/yr = 3,099.16 lbs TSS/yr

The permittee may take credit for 3,099.16 lbs TSS/yr for the proportion of unregulated land draining to the stream restoration project. Again, if this value is negative the permittee may not receive credit for the proportion of unregulated urban acres draining to the stream restoration project. The total credit for the project will be limited to the credit calculated for regulated urban acres and forested or agricultural acres.

Step 6: Calculate Total Reductions from Regulated and Unregulated (Non-Forested) Acres, Accounting for Required Baseline Reductions:

To calculate the credit towards meeting the reductions required under the TMDL the permittee should receive for this stream restoration project, the adjusted credit for unregulated acres calculated in *Step 5* should be added to the credit the permittee receives for the proportion of regulated acres draining to the restored stream calculated in *Step 3*:

26,030.4 lbs TSS/yr + 3,099.16 lbs TSS/yr +15,708 lbs TSS/yr = 44,837.56 lbs TSS/yr

The permittee should receive credit for reducing 44,837.56 lbs TSS/yr through this stream restoration project. The calculations for TN and TP can be done using the same process.

APPENDIX V.K – Urban Nutrient Management

Permittees are required under the "Turf and Landscape Management" section of the permit (GP Section II.B.6.c) to develop NMPs on "all lands owned or operated by the MS4 operator where nutrients are applied to a contiguous area greater than one acre." Permittees cannot receive credit towards the TMDL reduction requirements for the development of NMPs that are required by Virginia statute or regulation. However, permittees may receive credit for NMPs that are developed for lands outside the MS4 service area[18], public lands within the MS4 service area that are one contiguous acre or less, or privately owned lands where nutrients are applied that are not golf courses. Urban Nutrient Management plans can be applied and reported in partial acres. If any BMPs are installed downstream of land where a credited urban nutrient management plan has been applied, permittees will need to account for the reduced pollutant load going to that BMP. The efficiency accepted for nutrient management is based on the risk level for the site. Where the risk level is unknown, permittees should use the blended efficiency (*Table V.K.1*).

TABLE V.K.1 – Urban Nutrient Management Removal Rate

Site Risk Level	TN	TP
High	20%	10%
Low	6%	3%
Unknown (Blended)	9%	4.5%

The removal rate represents a percent reduction of pervious load based on the number of acres the UNM plan covers. The load that is reduced should be calculated based on the loading rates in permit Tables 2a-d. How risk for the site is estimated is discussed in greater detail in the following report:

- *Recommendation of the Expert Panel to Define Removal Rates for Urban Nutrient Management,* March 2013, which can be found at: http://www.chesapeakebay.net/documents/Final_CBP_Approved_Expert_Panel_Report_on_Urban_Nutrient_Management--short.pdf

EXAMPLE V.K.1 – Nutrient Management on Unregulated Land

A permittee in the York River Basin develops an NMP for 5 acres of privately owned turf fields that are located outside of their regulated MS4 service area. Since the NMP is for unregulated land, the permittee will receive an adjusted credit for the NMP after the baseline reductions are subtracted from the total expected NMP reductions.

To calculate the reductions from the NMP that will be credited towards the TMDL reduction requirements the permittee should first calculate the POC reductions from the NMP based on the *Recommendation of the Expert Panel to Define Removal Rates for Urban Nutrient Management*. The permittee references Table 2d in the permit to calculate the POC loads for the 5 acre project:

5 acres * 7.65 lbs TN/ac/yr = 38.25 lbs TN/yr

5 acres * 0.51 lbs TP/ac/yr = 2.55 = lbs TP/yr

The risk level for the 5 acres is unknown, so the permittee uses the blended efficiency to calculate the reductions from the NMP:

38.25 lbs TN/yr * 0.09 = 3.44 lbs TN/yr

[18] If the BMP was funded by a 319 nonpoint source grant, it may be contrary to the funding award to seek credit towards required reductions under the Special Condition.

2.55 lbs TP/yr * 0.045 = 0.11 lbs TP/yr

In accordance with Section I.C.2.b.(1), the permittee must account for baseline reductions on unregulated land prior to taking credit for any BMP reductions. For NMPs, baseline is the 48% reduction on all urban pervious lands that is assumed under the WIP. The permittee may receive credit for the remaining 52% of the project's reductions:

3.44 lbs TN/yr * .52 = 1.79 lbs TN/yr

.11 lbs TP/yr * .52 = 0.06 lbs TP/yr

For developing a NMP for 5 acres of privately owned turf fields outside of the permittee's MS4 service area, the permittee may take credit for reductions of 1.79 lbs TN/yr and 0.06 lbs TP/yr.

APPENDIX V.L – Development on Prior Developed Lands (Redevelopment)

Permittees may receive credit for redevelopment projects if the pre-development pollutant load is reduced, regardless of the initial land use condition. Under VSMP regulations (9VAC25-870), development projects may be subject to either Technical Criteria II B or Technical Criteria II C:

Projects Subject to Technical Criteria II B:

Under VSMP regulations, those projects subject to Technical Criteria II B permittees are (1) required to reduce phosphorous by 20% for land-disturbing activities disturbing greater than or equal to one acre that result in no net increase in impervious cover from the predevelopment condition or (2) reduce phosphorous by 10% for land-disturbing activities disturbing less than one acre that result in no net increase in impervious cover from the predevelopment condition. Permittees may take credit for these reductions. Permittees may also take credit for any Nitrogen and/or Sediment reductions that are created by the BMPs that are implemented to meet these requirements.

Projects Subject to Technical Criteria II C:

Technical Criteria II C applies to those projects that initiate construction prior to July 1, 2014 or are grandfathered in accordance with 9VAC-25-870-48. For these projects, permittees may use either the (1) performance-based criteria or the (2) technology- based criteria:

(1) Performance Based Criteria – Reductions may be credited to the permittee if the phosphorous load is reduced through development of prior developed lands (See Appendix II – Situation 3).
(2) Technology Based Criteria – If this approach is used, no additional reductions are required under the Special Condition beyond those for existing development under Special Condition requirement 6 (GP Section I.C.2.a.(6)).

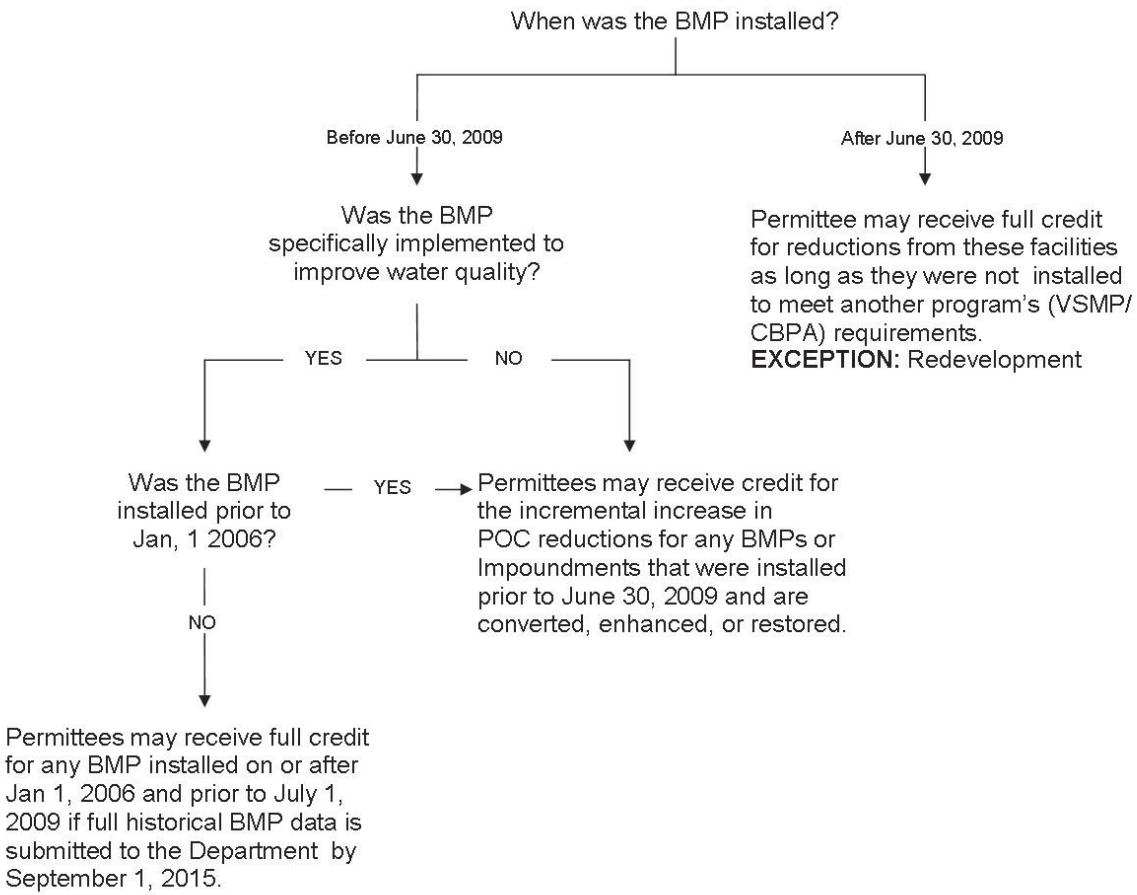
APPENDIX VI – Credit for BMPs installed prior to July 1, 2009

For all BMPs or impoundments that were installed prior to July 1, 2009 permittees may receive credit for any incremental increase in treatment that is the result of an enhancement, conversion, or restoration project. Restoration projects must meet the minimum requirements that are listed in the *Expert Panel to Define Removal Rates for Urban Stormwater Retrofits* report to be eligible for credit. Permittees may not receive full credit for BMPs that were installed prior to January 1, 2006, regardless of whether or not they were previously reported to the Department.

Permittees may receive full credit for BMPs that were initially installed on or after January 1, 2006 and prior to July 1, 2009 within the regulated MS4 service area, if a full account of BMPs throughout the permittee's jurisdiction is submitted to the Department as part of the "Historical Data Clean-Up" effort. **Historical BMP data should be submitted to the Department by September 1, 2015**. Please see Part IV.2 of this document for additional information on receiving credit for these BMPs.

A flowchart showing the credit permittees may receive for BMPs installed prior to July 1, 2009 is included below.

Credit for BMPs installed prior to July 1, 2009



APPENDIX VII – REPORTING ELEMENTS

Table VI.1 – Reporting Elements for Individual BMPs

Virginia Stormwater BMP Clearinghouse BMP	
Practice	Reporting Elements
Rooftop Disconnection	Impervious acres disconnected
Sheetflow to Vegetated Filter or Conserved Open Space 1 & 2	area in acres treated
Grass Channel	area in acres treated by grass channel
Vegetated Roof 1 & 2	area in acres treated by vegetated roof
Rainwater Harvesting	volume of rainwater captured
Permeable Pavement 1	area in acres treated by permeable pavement and upgradient area draining to pavement, so long as it does not exceed a ratio of 2:1
Permeable Pavement 2	area in acres treated by permeable pavement
Infiltration 1 & 2	area in acres treated by infiltration practices
Bioretention 1 & 2, Urban Bioretention	area in acres treated by bioretention practices
Dry Swale 1 & 2	area in acres treated by dry swale
Wet Swale 1 & 2	area in acres treated by wet swale
Filtering Practice 1 & 2	area in acres treated by filtration practices
Constructed Wetland 1 & 2	area in acres treated by constructed wetlands
Wet Pond 1 & 2	area in acres treated by Wet Ponds
Extended Detention Pond 1 & 2	area in acres treated by Extended Detention Ponds
Chesapeake Bay Program BMPs	
Wet Ponds and Wetlands	area in acres treated by Wet Ponds or wetlands
Dry Detention Ponds and Hydrodynamic Structures	area in acres treated by Dry Detention Ponds or Hydrodynamic Structures
Dry Extended Detention Ponds	area in acres treated by Dry Extended Detention Ponds
Infiltration Practices w/o Sand, Veg.	area in acres treated by infiltration practices
Infiltration Practices w/ Sand, Veg.	area in acres treated by infiltration practices
Filtering Practices	area in acres treated by filtration practices
Bioretention C/D soils, underdrain	area in acres treated by bioretention practices
Bioretention A/B soils, underdrain	area in acres treated by bioretention practices
Bioretention A/B soils, no underdrain	area in acres treated by bioretention practices
Vegetated Open Channels C/D soils, no underdrain	area in acres treated by vegetated Open Channels C/D soils, no underdrain
Vegetated Open Channels A/B soils, no underdrain	area in acres treated by vegetated Open Channels A/B soils, no underdrain
Bioswale	area in acres treated by bioswale
Permeable Pavement w/o Sand, Veg. C/D soils, underdrain	area in acres of permeable pavement w/o Sand, Veg. C/D soils, underdrain
Permeable Pavement w/o Sand, Veg. A/B soils, underdrain	area in acres of permeable pavement w/o Sand, Veg. A/B soils, underdrain
Permeable Pavement w/o Sand, Veg. A/B soils, no underdrain	area in acres of permeable pavement w/o Sand, Veg. A/B soils, no underdrain
Permeable Pavement w/Sand, Veg. C/D soils, underdrain	area in acres of permeable pavement w/Sand, Veg. C/D soils, underdrain
Permeable Pavement w/Sand, Veg. A/B soils, underdrain	area in acres of permeable pavement w/Sand, Veg. A/B soils, underdrain
Permeable Pavement w/Sand, Veg. A/B soils, no underdrain	area in acres of permeable pavement w/Sand, Veg. A/B soils, no underdrain

Performance Standard Curve ST or RR, Establishment Retrofit Curve ST or RR, Enhancement Retrofit Curve ST or RR, Restoration Retrofit Curve Pre-restoration condition ST or RR, Restoration Retrofit Curve Post restoration condition ST or RR	total area of runoff collection, impervious area within the total, inches of runoff captured
Wetland Restoration	area in acres of restored wetlands
Stream Restoration	linear feet of stream restoration
Land Use Change BMPs	
Impervious Urban Surface Reduction	area in acres of reduced impervious surface
Forest Buffers	area in acres converted to riparian forest
Grass Buffers	area in acres converted to riparian grasses or herbaceous plants
Tree Planting	area in acres converted to forest

General Permit No.: VAR04

Effective Date: ~~July 9, 2008~~ July 1, 2013

Expiration Date: ~~July 8, 2013~~ June 30, 2018

GENERAL PERMIT FOR DISCHARGES OF STORMWATER FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS

AUTHORIZATION TO DISCHARGE UNDER THE VIRGINIA STORMWATER MANAGEMENT PROGRAM AND THE VIRGINIA STORMWATER MANAGEMENT ACT

In compliance with the provisions of the Clean Water Act, as amended and pursuant to the Virginia Stormwater Management Act and regulations adopted pursuant thereto, this permit authorizes operators of small municipal separate storm sewer systems to discharge to surface waters within the boundaries of the Commonwealth of Virginia, except those waters specifically named in State Water Control Board and Virginia Soil and Water Conservation Board regulations ~~or policies~~ which prohibit such discharges.

The authorized discharge shall be in accordance with this cover page, Section I—Discharge Authorization and Special Conditions, Section II—MS4 Program and Section III—Conditions Applicable To All VSMP Permits, as set forth herein. The operator shall utilize all legal authority provided by the laws and regulations of the Commonwealth of Virginia to control discharges to and from the MS4. This legal authority may be a combination of statute, ordinance, permit, specific contract language, order or interjurisdictional agreements.

For operators who have previously held MS4 state permit coverage, the operator shall update the MS4 Program Plan in accordance with the following schedule. Until such time as the required updates are completed and implemented, the operator shall continue to implement the MS4 Program consistent with the MS4 Program Plan submitted with the registration statement.

For operators of small MS4s that are applying for initial coverage under this general permit, the schedule to develop and implement the MS4 Program Plan shall be submitted with the completed registration statement.

Table 1: Schedule of MS4 Program Plan Updates Required in this Permit

Program Update Requirement	Permit Reference	Update Completed By
Updated TMDL Action Plans (TMDLs approved before July of 2008)	Section I B	24 months after permit coverage
Other TMDL Action Plans for applicable TMDLs approved between July 2008 and June 2013	Section I B	36 months after permit coverage
TMDL Action Plans for applicable TMDLs approved after June of 2013	Section I	36 months after notification by the department of their approval
Chesapeake Bay TMDL Action Plan	Section I C	24 months after permit coverage
Public Education Outreach Plan	Section II B	12 months after permit coverage
Outfall Map Completed	Section II B	48 months after permit coverage
Illicit Discharge Procedures	Section II B	12 months after permit coverage
Single Family SWM Special Criteria	Section II B	12 months after permit coverage
Stormwater Management Progressive Compliance and Enforcement	Section II B	24 months after permit coverage
Operator-Owned Stormwater Management Inspection Procedures	Section II B	12 months after permit coverage
Daily Good Housekeeping Procedures	Section II B	24 months after permit coverage
SWPPP Locations	Section II B	12 months after permit coverage
SWPPP Implementation	Section II B	60 months after permit coverage with internal goals
Nutrient Management Plan (NMP) Locations	Section II B	12 months after permit coverage
NMP Implementation	Section II B	60 months after permit coverage
Training Schedule and Program	Section II B	12 months after permit coverage

SECTION I
DISCHARGE AUTHORIZATION AND SPECIAL CONDITIONS

A. Coverage under this permit. During the period beginning with the date of coverage under this general permit and lasting until the expiration and reissuance of this permit, the operator is authorized to discharge in accordance with this permit from the small municipal separate storm sewer system identified in the registration statement into surface waters.

~~B. Special conditions. A total maximum daily load (TMDL) approved by the State Water Control Board may include a wasteload allocation to the regulated small MS4 that identifies the pollutant for which stormwater controls are necessary for the surface waters to meet water quality standards. The pollutant identified in a wasteload allocation as of the effective date of this permit must be addressed through the measurable goals of the MS4 Program Plan. A wasteload allocation does not establish that the operator of a regulated small MS4 is in or out of compliance with the conditions of this permit.~~

~~1. The operator shall update its MS4 Program Plan to include measurable goals, schedules, and strategies to ensure MS4 Program consistency with the assumptions of the TMDL WLA within 18 months of permit coverage; or, within 18 months of the effective date of any reopening of this permit to include wasteloads allocated to the regulated small MS4 after issuance of permit coverage.~~

~~2. The measurable goals, schedules, strategies, and other best management practices (BMPs), required in an updated MS4 Program Plan to assure MS4 Program consistency with an approved TMDL for the pollutant identified in a WLA are, at a minimum:~~

~~a. The operator shall develop a list of its current ordinances and legal authorities, BMPs, policies, plans, procedures and contracts implemented as part of the MS4 Program that are applicable to reducing the pollutant identified in a WLA.~~

~~b. The operator shall evaluate existing ordinances and legal authorities, BMPs, policies, plans, procedures and contracts of the existing MS4 Program to determine the effectiveness of the MS4 Program in addressing reductions of the pollutant identified in the WLA. The evaluation shall identify any weakness or limitation in the MS4 Program to reduce the pollutant identified in the WLA in a manner consistent with the TMDL.~~

~~c. The operator shall develop a schedule to implement procedures and strategies that address the MS4 Program weaknesses such as timetables to update existing ordinances and legal authorities within two years, BMPs, policies, plans, procedures and contracts to ensure consistency with the assumptions of the TMDL WLA. When possible, source elimination shall be prioritized over load reduction.~~

~~d. The operator shall implement the schedule established in Section I B 2 c.~~

~~3. The operator shall integrate an awareness campaign into its existing public education and outreach program that promotes methods to eliminate and reduce discharges of the pollutant identified in the WLA. This may include additional employee training regarding the sources and methods to eliminate and minimize the discharge of the pollutant identified in the WLA.~~

~~4. The operator is encouraged to participate as a stakeholder in the development of any implementation plans developed to address the TMDL and shall incorporate applicable best management practices identified in the TMDL implementation plan in their MS4 Program Plan. The operator may choose to implement BMPs of equivalent design and efficiency instead of those identified in the TMDL implementation plan, provided that the rationale for any substituted BMP is provided and the substituted BMP is consistent with the TMDL and the WLA.~~

~~5. The operator shall develop and implement outfall reconnaissance procedures to identify potential sources of the pollutant identified in the WLA from anthropogenic activities. The operator shall conduct reconnaissance in accordance with the following:~~

~~a. Should the operator have 250 or more total outfalls discharging to the surface water identified in the WLA, the operator shall perform reconnaissance on a minimum of 250 outfalls for each WLA assigned at least once during the five year permit period and shall perform reconnaissance on a minimum of 35 outfalls per year.~~

~~b. Should the operator have less than 250 total outfalls discharging to an identified surface water, the operator shall perform reconnaissance on all outfalls during the five year permit period and shall annually conduct reconnaissance on a minimum of 15% of its known MS4 outfalls discharging to the surface water for which the WLA has been assigned.~~

~~The department recommends that the operator review the publication entitled "Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments," EPA cooperative agreement number X-82907801-0, for guidance in implementing its outfall reconnaissance procedures. The operator shall implement procedures designed to reduce the discharge of the pollutant in a manner consistent with the TMDL. Physically interconnected MS4s may coordinate outfall reconnaissance to meet the requirements of this subdivision.~~

~~6. The operator shall evaluate all properties owned or operated by the MS4 operator that are not covered under a separate VPDES permit for potential sources of the pollutant identified in the WLA. Within three years of the~~

~~required date for updating the MS4 Program Plan, the operator shall conduct a site review and characterize the runoff for those properties where it determines that the pollutant identified in the WLA is currently stored, or has been transferred, transported or historically disposed of in a manner that would expose it to precipitation in accordance with the following schedule:~~

~~a. As a part of the site review, the operator shall collect a total of two samples from a representative outfall for each identified municipal property. One sample shall be taken during each of the following six month periods: October through March, and April through September.~~

~~b. All collected samples shall be grab samples and collected within the first 30 minutes of a runoff producing event that is greater than 0.1 inches in magnitude and that occurs at least 72 hours from the previous measurable (greater than 0.1 inch rainfall) storm event. The required 72 hour storm event interval is waived where the preceding measurable storm event did not result in a measurable discharge from the property. The required 72 hour storm event interval may also be waived where the operator documents that less than a 72-hour interval is representative for local storm events during the season when sampling is being conducted. Analytical methods shall be conducted according to procedures approved under 40 CFR Part 136 or alternative methods approved by the Environmental Protection Agency (EPA). Where an approved 40 CFR Part 136 method does not exist, the operator must use a method consistent with the TMDL.~~

~~c. For properties where there is found to be a discharge of the pollutant identified in the WLA, the operator shall develop and implement a schedule to minimize the discharge of the pollutant identified in the WLA in a manner consistent with the approved TMDL.~~

~~7. The operator shall conduct an annual characterization that estimates the volume of stormwater discharged, in cubic feet, and the quantity of pollutant identified in the WLA, in a unit consistent with the WLA, discharged by the regulated small MS4.~~

~~8. As part of the annual evaluation, the operator shall update the MS4 Program Plan to include any new information regarding the TMDL in order to ensure consistency with the TMDL.~~

~~9. Along with reporting requirements in Section II E, the operator shall include the following with each annual report:~~

~~a. Copies of any updates to the MS4 Program Plan completed during the reporting cycle and any new information regarding the TMDL in order to evaluate its ability to assure the consistency of its discharge with the assumptions of the TMDL WLA.~~

~~b. The estimate of the volume of stormwater discharged, in cubic feet, and the quantity of pollutant identified in the WLA, in a unit consistent with the WLA discharged by the regulated small MS4 for each WLA.~~

B. Special conditions for approved total maximum daily loads (TMDL) other than the Chesapeake Bay TMDL. An approved TMDL may allocate an applicable wasteload to a small MS4 that identifies a pollutant or pollutants for which additional stormwater controls are necessary for the surface waters to meet water quality standards. The MS4 operator shall address the pollutants in accordance with this special condition where the MS4 has been allocated a wasteload in an approved TMDL.

1. The operator shall maintain an updated MS4 Program Plan that includes a specific TMDL Action Plan for pollutants allocated to the MS4 in approved TMDLs. TMDL Action Plans may be implemented in multiple phases over more than one state permit cycle using the adaptive iterative approach provided adequate progress is demonstrated. These TMDL Actions Plans shall identify the best management practices and other implementation steps to be implemented during the remaining terms of this state permit.

a. In accordance with Table 1 in this section, the operator shall update the MS4 Program Plans to address any new or modified requirements established under this special condition for pollutants identified in TMDL wasteload allocations approved prior to July 8, 2008.

b. In accordance with Table 1 in this section, the operator shall update the MS4 Program Plan to incorporate Action Plans that identify the best management practices and other implementation steps that will be implemented during the remaining term of this permit for pollutants identified in TMDL wasteload allocations approved either on or after July 8, 2008, and prior to issuance of this permit.

c. In accordance with Table 1 in this section, the operator shall update the MS4 Program Plan with TMDL Action Plans that identify the best management practices and other steps that will be implemented during the remaining term of this state permit for pollutants identified in TMDL wasteload allocations approved after issuance of this permit for impairment listed on the 2012 § 303(d)/305(b) list and for which a TMDL schedule identifies its development as occurring during this state permit cycle.

2. The operator shall:

a. Develop and maintain a list of its legal authorities such as ordinances, state and other permits, orders, specific contract language, and interjurisdictional agreements applicable to reducing the pollutant identified in a WLA;

b. Identify and maintain an updated list of all additional management practices, control techniques and system design and engineering methods, beyond those identified in Section II B, that have been implemented as part of the MS4 Program Plan that are applicable to reducing the pollutant identified in the WLA;

c. Enhance the public education and outreach and employee training programs to also promote methods to eliminate and reduce discharges of the pollutants identified in the WLA;

d. Assess all facilities of concern owned or operated by the MS4 operator that are not covered under a separate VPDES permit and identify all municipal facilities that may be a significant source of the identified pollutant. For the purpose of this assessment, significant source is identified as facilities of concern where the pollutant discharge is expected to be greater than that average expected existing discharge for the land use identified in the TMDL. For example, the discharge of bacteria would be expected to be greater at a dog park than at other recreational facilities where dogs are prohibited.

e. Develop and implement a method to assess TMDL Action Plans for their effectiveness in reducing the pollutants identified in the WLAs. The evaluation shall use any newly available information, water quality monitoring results, or modeling tools to estimate pollutant reductions for the pollutant or pollutants of concern from implementation of the MS4 Program Plan. Monitoring may include BMP, outfall, or in-stream monitoring, as appropriate, to estimate pollutant reductions. The operator may conduct monitoring, utilize existing data, establish partnerships, or collaborate with other MS4 operators or other third parties, as appropriate. This evaluation shall include assessment of the facilities identified in subdivision 2 d of this subection. The methodology used for assessment shall be described in the TMDL Action Plan.

3. Analytical methods for any monitoring shall be conducted according to procedures approved under 40 CFR Part 136 or alternative methods approved by the Environmental Protection Agency (EPA). Where an approved 40 CFR Part 136 method does not exist, the operator must use a method consistent with the TMDL.

4. The operator is encouraged to participate as a stakeholder in the development of any TMDL implementation plans applicable to their discharge. The operator may incorporate applicable best management practices identified in the TMDL implementation plan in the MS4 Program Plan or may choose to implement BMPs of equivalent design and efficiency provided that the rationale for any substituted BMP is provided and the substituted BMP is consistent with the assumptions and requirements of the TMDL WLA.

5. Annual reporting requirements.

a. The operator shall submit the required TMDL Action Plans with the appropriate annual report associated schedule identified in this state permit.

b. The operator shall report on the implementation of the TMDL Action Plans and associated evaluation including the results of any monitoring conducted as part of the evaluation.

6. The operator shall identify the best management practices and other steps that will be implemented during the next state permit term as part of the operator's reapplication for coverage as required under Section III M.

C. Special condition for the Chesapeake Bay TMDL.

1. Definitions. The following definitions apply to this state permit for the purpose of the special condition for discharges in the Chesapeake Bay Watershed:

"Existing sources" means pervious and impervious urban land uses serviced by the MS4 as of June 30, 2009.

"New sources" means pervious and impervious urban land uses served by the MS4 developed on or after July 1, 2009.

"Transitional sources" means regulated land disturbing activities that are temporary in nature and discharge through the MS4.

"Pollutants of concern" or "POC" means total nitrogen, total phosphorus, and total suspended solids.

2. Chesapeake Bay TMDL planning.

a. In accordance with Table 1 in this section, the operator shall develop and submit a phased Chesapeake Bay TMDL Action Plan that includes:

(1) A review of the baseline program implemented as a requirement of this state permit including a review of the existing legal authorities;

(2) The identification of any new or modified legal authorities such as ordinances, state and other permits, orders, contracts and interjurisdictional agreements implemented or needing to be implemented to meet the requirements of this special condition;

(3) The means and methods that will be utilized to address discharges into the MS4 from new sources;

(4) An estimate of the annual POC loads discharged from the existing sources as of June 30, 2008, based on the 2009 progress run. The operator shall utilize the appropriate version of Table 2 in this section based on the river basin to which the MS4 discharges by multiplying the total existing acres served by the MS4 on June 30, 2009, and the 2009 EOS loading rate:

Table 2 a: Calculation Sheet for Estimating Existing Source Loads for the James River Basin				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (6/30/09)**	**2009 EOS Loading Rate (lbs/ac)**	**Estimated Total POC Load Based on 2009 Progress Run**
Regulated Urban Impervious	Nitrogen		9.39	
Regulated Urban Pervious			6.99	
Regulated Urban Impervious	Phosphorus		1.76	
Regulated Urban Pervious			0.5	
Regulated Urban Impervious	Total Suspended Solids		676.94	
Regulated Urban Pervious			101.08	

Table 2 b: Calculation Sheet for Estimating Existing Source Loads for the Potomac River Basin				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (6/30/09)**	**2009 EOS Loading Rate (lbs/ac)**	**Estimated Total POC Load Based on 2009 Progress Run**
Regulated Urban Impervious	Nitrogen		16.86	
Regulated Urban Pervious			10.07	
Regulated Urban Impervious	Phosphorus		1.62	
Regulated Urban Pervious			0.41	
Regulated Urban Impervious Regulated Urban Pervious	Total Suspended Solids		1,171.32 175.8	

Table 2 c: Calculation Sheet for Estimating Existing Source Loads for the Rappahannock River Basin				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (6/30/09)**	**2009 EOS Loading Rate (lbs/ac)**	**Estimated Total POC Load Based on 2009 Progress Run**
Regulated Urban Impervious	Nitrogen		9.38	
Regulated Urban Pervious			5.34	
Regulated Urban Impervious Regulated Urban Pervious	Phosphorus		1.41 0.38	

Regulated Urban Impervious	Total Suspended Solids		423.97	
Regulated Urban Pervious			56.01	

Table 2 d: Calculation Sheet for Estimating Existing Source Loads for the York River Basin				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (6/30/09)**	**2009 EOS Loading Rate (lbs/ac)**	**Estimated Total POC Load Based on 2009 Progress Run**
Regulated Urban Impervious	Nitrogen		7.31	
Regulated Urban Pervious			7.65	
Regulated Urban Impervious	Phosphorus		1.51	
Regulated Urban Pervious			0.51	
Regulated Urban Impervious	Total Suspended Solids		456.68	
Regulated Urban Pervious			72.78	

(5) An estimate of the total reductions necessary to reduce the annual POC loads from existing sources to the L2 implementation level utilizing the appropriate version of Table 3 in this section based on the river basin to which the MS4 discharges. This shall be calculated by multiplying the total existing acres service by the MS4 during the first state permit cycle required reduction in loading rate. Existing sources located in any portion of an expanded urbanized area or new urbanized area identified as part of an urbanized area by the 2010 U.S. Census shall not be included in the total acreage in determining the 5.0% reduction requirement in this state permit.

Table 3 a: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the James River Basin				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (7/1/09)**	**First Permit Cycle Requiring Reduction in Loading Rate (lbs/ac)**	**Total Reduction Required First Permit Cycle (lbs)**
Regulated Urban Impervious	Nitrogen		0.04	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		6.67	
Regulated Urban Pervious			0.44	

Table 3 b: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the Potomac River Basin				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (7/1/09)**	**First Permit Cycle Requiring Reduction in Loading Rate (lbs/ac)**	**Total Reduction Required First Permit Cycle (lbs)**
Regulated Urban Impervious	Nitrogen		0.08	
Regulated Urban Pervious			0.03	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.001	
Regulated Urban Impervious	Total Suspended Solids		11.71	
Regulated Urban Pervious			0.77	

Table 3 c: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the Rappahannock River Basin				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (7/1/09)**	**First Permit Cycle Requiring Reduction in Loading Rate (lbs/ac)**	**Total Reduction Required First Permit Cycle (lbs)**
Regulated Urban Impervious	Nitrogen		0.04	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		4.24	
Regulated Urban Pervious			0.25	

Table 3 d: Calculation Sheet for Determining Total POC Reductions Required During this Permit Cycle for the York River Basin				
Subsource	**Pollutant**	**Total Existing Acres Served by MS4 (7/1/09)**	**First Permit Cycle Requiring Reduction in Loading Rate**	**Total Reduction Required First Permit Cycle (lbs)**

			(lbs/ac)	
Regulated Urban Impervious	Nitrogen		0.03	
Regulated Urban Pervious			0.02	
Regulated Urban Impervious	Phosphorus		0.01	
Regulated Urban Pervious			0.002	
Regulated Urban Impervious	Total Suspended Solids		4.60	
Regulated Urban Pervious			0.32	

(6) The means and methods that will be utilized to implement sufficient reductions from existing sources equal to 5.0% of the estimated total reductions necessary. The methodology may incorporate reductions documented through the implementation of this state permit;

(7) The means and methods to offset the increased loads from new sources initiating construction between July 1, 2009, and June 30, 2014, that disturb greater than one acre as a result of the utilization of an average land cover condition greater than 16% impervious cover for the design of post-development stormwater management facilities. The operator shall utilize Table 4 in this section to develop the equivalent pollutant load for nitrogen and total suspended solids. The operator shall offset 5.0% of the calculated increased load from these new sources during the permit cycle.

(8) The means and methods to offset the increased loads from grandfathered projects that disturb greater than one acre that begin construction after July 1, 2014, where the project utilized an average land cover condition greater than 16% impervious cover in the design of post-development stormwater management facilities. The operator shall utilize Table 4 in this section to develop the equivalent pollutant load for nitrogen and total suspended solids.

(9) The operator shall address any modification to the TMDL or watershed implementation plan that occurs during the term of this state permit as part of its permit reapplication and not during the term of this state permit.

Table 4: Ratio of Phosphorus Loading Rate to Nitrogen and Total Suspended Solids Loading Rates for Chesapeake Bay Basins

Ratio of Phosphorus to Other POCs (Based on All Land Uses 2009 Progress Run)	Phosphorus Loading Rate (lbs/ac)	Nitrogen Loading Rate (lbs/ac)	Total Suspended Solids Loading Rate (lbs/ac)
James River Basin	1.0	5.2	420.9
Potomac River Basin	1.0	6.9	469.2
Rappahannock River Basin	1.0	6.7	320.9
York River Basin	1.0	9.5	531.6

(10) A list of future projects and associated acreage that qualify as grandfathered in accordance with 4VAC50-60-48;

(11) An estimate of the expected costs to implement the requirements of this special condition during the state permit cycle; and

(12) An opportunity for receipt and consideration of public comment regarding the draft Chesapeake Bay TMDL Action Plan.

b. As part of development of the Chesapeake Bay TMDL Action Plan, the operator may consider:

(1) Placement of BMPs on unregulated lands. Reductions may only be credited towards the required reductions after any required unregulated land baseline pollutant reductions are met for treated acres;

(2) Utilization of stream restoration projects;

(3) Establishment of a memorandum of understanding (MOU) with other MS4 operators that discharge to the same or adjacent eight digit hydrologic unit to implement BMPs collectively. The MOU shall include a mechanism for dividing the POC reductions created by BMP implementation between the cooperative MS4s;

(4) Utilization of any pollutant trading or offset program in accordance with §§ 10.1-603.15:1 and 10.1-603.8:1 of the Code of Virginia, governing trading and offsetting; and

(5) A more stringent average land cover condition based on less than 16% impervious cover for new sources initiating construction between July 1, 2009, and June 30, 2014, and all grandfathered projects where allowed by law.

3. Chesapeake Bay TMDL Action Plan implementation. The operator shall implement the TMDL Action Plan to the maximum extent practicable and demonstrate adequate progress for this state permit term towards the long-term compliance targets for TMDL wasteload allocations. For the purposes of this permit, the implementation of the following represents implementation to the maximum extent practicable and demonstrates adequate progress:

a. Implementation of nutrient management plans in accordance with the schedule identified in the minimum control measure in Section II related to pollution prevention/good housekeeping for municipal operations;

b. Implementation of the minimum control measure in Section II related to construction site stormwater runoff control in accordance with this state permit shall address discharges from transitional sources;

c. Implementation of the means and methods to address discharges from new sources in accordance with the minimum control measure in Section II related to post-construction stormwater management in new development and development of prior developed lands and in order to offset 5.0% of the total increase in POC loads between July 1, 2009, and June 30, 2014. Increases in the POC load from grandfathered projects initiating construction after July 1, 2014, must be offset prior to completion of the project; and

d. Implementation of means and methods sufficient to meet 5.0% of the total required reductions of POC loads from existing sources in accordance with the Chesapeake Bay TMDL Action Plan.

4. Annual reporting requirements.

a. In accordance with Table 1 in this section, the operator shall submit the Chesapeake Bay Action Plan.

b. Each subsequent annual report shall included a list of control measures implemented during the reporting period and the cumulative progress toward meeting the compliance targets for total nitrogen, phosphorus, and total suspended soils.

c. Each subsequent annual report shall include a list of control measures in an electronic format provided by the department that were implemented during the reporting cycle and the estimated reduction achieved by the control. For stormwater management controls, the report shall include the information required in Section II B 5 e and shall include whether an existing stormwater management control was retrofitted, and if so, the existing stormwater management control type retrofit used.

d. Each annual report shall include a list of control measures that are expected to be implemented during the next reporting period and the expected progress toward meeting the compliance targets for total nitrogen, phosphorus, and total suspended solids.

5. The operator shall include the following as part of its reapplication package due in accordance with Section III M:

a. Documentation that sufficient control measures have been implemented to meet the compliance target identified in this special condition. If temporary credits or offsets have been purchased in order to meet the compliance target, the list of temporary reductions utilized to meet the 5.0% reduction in this state permit and a schedule of implementation to ensure a permanent 5.0% reduction must be provided; and

b. A draft second phase Chesapeake Bay TMDL Action Plan designed to reduce the existing pollutant load by an additional 35% (or a total of 40% if more than a 5.0% reduction is achieved during the first phase) as determined using Table 3 in this section unless alternative calculations have been provided by the Commonwealth.

SECTION II
MUNICIPAL SEPARATE STORM SEWER SYSTEM MANAGEMENT PROGRAM

A. The operator of a ~~regulated~~ small MS4 must develop, implement, and enforce a MS4 Program designed to reduce the discharge of pollutants from the ~~regulated~~ small MS4 to the maximum extent practicable (MEP), to protect water quality, to ensure compliance by the operator with water quality standards, and to satisfy the appropriate water quality requirements of the Clean Water Act and regulations. The MS4 Program must include the minimum control measures described in paragraph B of this section. Implementation of best management practices consistent with the provisions of an iterative MS4 Program required pursuant to this section constitutes compliance with the standard of reducing pollutants to the "maximum extent practicable", protects water quality in the absence of a TMDL wasteload allocation, ensures compliance by the operator with water quality

standards, and satisfies the appropriate water quality requirements of the Clean Water Act and regulations in the absence of a TMDL WLA. The requirements of this section and those special conditions set out in Section I B also apply where a WLA is applicable.

~~No later than January 9, 2009, the operator shall review its existing MS4 Program Plan and submit a schedule to develop and implement programs to meet the conditions established by this permit. For operators of regulated small MS4s that are applying for initial coverage under this general permit, the schedule to develop and implement the MS4 Program Plan shall be submitted with the completed registration statement.~~

B. Minimum control measures.

1. Public education and outreach on stormwater impacts. ~~Implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of stormwater discharges on water bodies and the steps that the public can take to reduce pollutants in stormwater runoff. The department recommends that the operator review the Environmental Protection Agency (EPA) publication entitled "Getting in Step: A Guide for Conducting Watershed Outreach Campaigns," publication number EPA 841-B-03-002, for guidance in developing a public education program.~~

~~The operator shall identify, schedule, implement, evaluate and modify, as necessary, BMPs to meet the following public education and outreach measurable goals:~~

~~a. Increased individual and household knowledge about the steps that they can take to reduce stormwater pollution, placing priority on reducing impacts to impaired waters and other local water pollution concerns;~~

~~b. Increased public employee, business, and general public knowledge of hazards associated with illegal discharges and improper disposal of waste, including pertinent legal implications;~~

~~c. Increased individual and group involvement in local water quality improvement initiatives including the promotion of local restoration and clean up projects, programs, groups, meetings and other opportunities for public involvement;~~

~~d. Diverse strategies to target audiences specific to the area serviced by the regulated small MS4;~~

~~e. Improved outreach program to address viewpoints and concerns of target audiences, with a recommended focus on minorities, disadvantaged audiences and minors; and~~

~~f. Targeted strategies towards local groups of commercial, industrial, and institutional entities likely to have significant stormwater impacts.~~

a. The operator shall continue to implement the public education and outreach program as included in the registration statement until the program is updated to meet the conditions of this state permit. Operators who have not previously held MS4 permit coverage shall implement this program in accordance with the schedule in Table 1 of this section.

b. The public education and outreach program should be designed with consideration of the following goals:

(1) Increasing target audience knowledge about the steps that can be taken to reduce stormwater pollution, placing priority on reducing impacts to impaired waters and other local water pollution concerns;

(2) Increasing target audience knowledge of hazards associated with illegal discharges and improper disposal of waste, including pertinent legal implications; and

(3) Implementing a diverse program with strategies that are targeted towards audiences most likely to have significant stormwater impacts.

c. The updated program shall be designed to:

(1) Identify, at a minimum, three high-priority water quality issues, contributed to by the discharge of stormwater (e.g., Chesapeake Bay nutrients, pet wastes and local bacteria TMDLs, high-quality receiving waters, and illicit discharges from commercial sites) and a rationale for the selection of the three high-priority water quality issues;

(2) Identify and estimate the population size of the target audience or audiences who is most likely to have significant impacts for each high-priority water quality issue;

(3) Develop relevant message or messages and associated educational and outreach materials (e.g., various media such as printed materials, billboard and mass transit advertisements, signage at select locations, radio advertisements, television advertisements, websites, and social media) for message distribution to the selected target audiences while considering the viewpoints and concerns of the target audiences including minorities, disadvantaged audiences, and minors;

(4) Provide for public participation during public education and outreach program development;

(5) Annually conduct sufficient education and outreach activities designed to reach an equivalent 20% of each high-priority issue target audience. It shall not be considered noncompliance for failure to reach 20% of the target audience. However, it shall be a compliance issue if insufficient effort is made to annually reach a minimum of 20% of the target audience; and

(6) Provide for the adjustment of target audiences and messages including educational materials and delivery mechanisms to reach target audiences in order to address any observed weaknesses or shortcomings as necessary.

d. The operator may coordinate their public education and outreach efforts with other MS4 operations;

however, each operator shall be individually responsible for meeting all of its state permit requirements.

e. Prior to application for continued state permit coverage required in Section III M, the operator shall evaluate the education and outreach program for:

(1) Appropriateness of the high-priority stormwater issues;

(2) Appropriateness of the selected target audiences for each high-priority stormwater issue;

(3) Effectiveness of the message or messages being delivered; and

(4) Effectiveness of the mechanism or mechanisms of delivery employed in reaching the target audiences.

f. The MS4 Program Plan shall describe how the conditions of this permit shall be updated in accordance with Table 1 in this section.

g. The operator shall include in the annual report the following:

(1) A list of the education and outreach activities conducted during the reporting period for each high-priority water quality issue, the estimated number of people reached, and an estimated percentage of the target audience or audiences that will be reached; and

(2) A list of the education and outreach activities that will be conducted during the next reporting period for each high-priority water quality issue, the estimated number of people that will be reached, and an estimated percentage of the target audience or audiences that will be reached.

2. Public involvement/participation.

~~The operator shall comply with applicable state, tribal, and local public notice requirements and identify, schedule, implement, evaluate and modify, as necessary, BMPs to meet the following public involvement/participation measurable goals:~~

~~a. Promote the availability of the operator's MS4 Program Plan and any modifications for public review and comment. Public notice shall be given by any method reasonably calculated to give actual notice of the action in question to the persons potentially affected by it, including press releases or any other forum or medium to elicit public participation. Provide access to or copies of the MS4 Program Plan or any modifications upon request of interested parties in compliance with all applicable freedom of information regulations;~~

~~b. Provide access to or copies of the annual report upon request of interested parties in compliance with all applicable freedom of information regulations; and~~

~~c. Participate, through promotion, sponsorship, or other involvement, in local activities aimed at increasing public participation to reduce stormwater pollutant loads and improve water quality.~~

a. Public involvement.

(1) The operator shall comply with any applicable federal, state, and local public notice requirements.

(2) The operator shall:

(a) Maintain an updated MS4 Program Plan on the operator's web page. Updates to the MS4 Program Plan shall be completed a minimum of once a year and should be updated in conjunction with the annual report.

(b) Post copies of each annual report on the operator's web page within 30 days of submittal to the department and retain copies of annual reports online for the duration of this state permit; and

(c) Prior to reapplying for coverage as required by Section III M, notify the public and provide for receipt of comment of the proposed MS4 Program Plan that will be submitted with the registration statement. As part of the reapplication, the operator shall address how the received comments were considered in the development of the MS4 Program Plan. Public notice shall be given by a method reasonably calculated to give actual notice of the action in question to the persons potentially affected by it, including press releases or any other forum or medium to solicit public participation.

b. Public participation. The operator shall participate, through promotion, sponsorship, or other involvement, in a minimum of four local activities annually. The activities shall be aimed at increasing public participation to reduce stormwater pollutant loads; improve water quality; and support local restoration and clean-up projects, programs, groups, meetings, or other opportunities for public involvement.

c. The MS4 Program Plan shall include written procedures for implementing this program.

d. Each annual report shall include:

(1) A web link to the MS4 Program Plan and annual report; and

(2) Documentation of compliance with the public participation requirements of this section.

3. Illicit discharge detection and elimination. ~~The MS4 Program shall:~~

~~a. Develop, implement and enforce a program to detect and eliminate illicit discharges, as defined at 4VAC50-60-10, into the regulated small MS4. The department recommends that the operator review the publication entitled "Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments," Environmental Protection Agency (EPA) cooperative agreement number X-82907801-0, for guidance in implementing and evaluating its illicit discharge detection and elimination program;~~

~~b. Develop, if not already completed, and maintain, an updated storm sewer system map, showing the location~~

~~of all known outfalls of the regulated small MS4 including those physically interconnected to a regulated MS4, the associated surface waters and HUCs, and the names and locations of all impaired surface waters that receive discharges from those outfalls. The operator shall also estimate the acreage within the regulated small MS4 discharging to each HUC and impaired water;~~

~~c. To the extent allowable under state, tribal or local law or other regulatory mechanism, effectively prohibit, through ordinance, or other regulatory mechanism, nonstormwater discharges into the storm sewer system and implement appropriate enforcement procedures and actions;~~

~~The following categories of nonstormwater discharges or flows (i.e., illicit discharges) must be addressed only if they are identified by the operator, the State Water Control Board, or by the board as significant contributors of pollutants to the regulated small MS4: water line flushing, landscape irrigation, diverted stream flows, rising ground waters, uncontaminated ground water infiltration, uncontaminated pumped ground water, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, springs, water from crawl space pumps, footing drains, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, dechlorinated swimming pool discharges, street wash water, discharges or flows from fire fighting activities, and flows that have been identified in writing by the Department of Environmental Quality as de minimis discharges that are not significant sources of pollutants to state waters and not requiring a VPDES permit;~~

~~d. Develop and implement procedures to detect and address nonstormwater discharges, including illegal dumping, to the regulated small MS4;~~

~~e. Prevent or minimize to the maximum extent practicable, the discharge of hazardous substances or oil in the stormwater discharge(s) from the regulated small MS4. In addition, the MS4 Program must be reviewed to identify measures to prevent the recurrence of such releases and to respond to such releases, and the program must be modified where appropriate. This permit does not relieve the operator or the responsible part(ies) of any reporting requirements of 40 CFR Part 110 (2001), 40 CFR Part 117 (2001) and 40 CFR Part 302 (2001) or § 62.1-44.34:19 of the Code of Virginia;~~

~~f. Track the number of illicit discharges identified, provide narrative on how they were controlled or eliminated, and submit the information in accordance with Section II E 3; and~~

~~g. Notify, in writing, any downstream regulated MS4 to which the small regulated MS4 is physically interconnected of the small regulated MS4's connection to that system.~~

a. The operator shall maintain an accurate storm sewer system map and information table and shall update it in accordance with the schedule set out in Table 1 of this section.

(1) The storm sewer system map must show the following, at a minimum:

(a) The location of all MS4 outfalls. In cases where the outfall is located outside of the MS4 operator's legal responsibility, the operator may elect to map the known point of discharge location closest to the actual outfall. Each mapped outfall must be given a unique identifier, which must be noted on the map; and

(b) The name and location of all waters receiving discharges from the MS4 outfalls and the associated HUC.

(2) At a minimum, the associated information table shall include for each outfall the following:

(a) The unique identifier;

(b) The estimated MS4 acreage served;

(c) The name of the receiving surface water and indication as to whether the receiving water is listed as impaired on the Virginia 2012 303(d)/305(b) list; and

(d) The name of any applicable TMDL or TMDLs.

(3) Within 48 months of coverage under this state permit, the operator shall have a complete and updated storm sewer system map and information table that includes all MS4 outfalls located within the boundaries identified as "urbanized" areas in the 2010 Decennial Census and shall submit the updated information table as an appendix to the annual report.

(4) The operator shall maintain a copy of the current storm sewer system map and outfall information table for review upon request by the public or by the department.

(5) The operator shall continue to identify other points of discharge. The operator shall notify in writing the downstream MS4 of any known physical interconnection.

b. The operator shall effectively prohibit, through ordinance or other legal mechanism, nonstormwater discharges into the storm sewer system to the extent allowable under federal, state, or local law or regulation. Categories of nonstormwater discharges or flows (i.e., illicit discharges) identified in 4VAC50-60-400 D 2 c (3) must be addressed only if they are identified by the operator, the State Water Control Board, or by the board as significant contributors of pollutants to the small MS4. Flows that have been identified in writing by the Department of Environmental Quality as de minimis discharges are not significant sources of pollutants to surface water and do not require a VPDES permit.

c. The operator shall develop and implement written procedures to detect, identify, and address nonstormwater

discharges, including illegal dumping, to the small MS4. These procedures shall include:

(1) Written dry weather field screening methodologies to detect and eliminate illicit discharges to the MS4 that include field observations and field screening monitoring and that provide:

(a) A prioritized schedule of field screening activities determined by the operator based on such things as age of the infrastructure, land use, historical illegal discharges, dumping or cross connections.

(b) The minimum number of field screening activities the operator shall complete annually to be determined as follows: (i) if the total number of outfalls in the small MS4 is less than 50, all outfalls shall be screened annually or (ii) if the small MS4 has 50 or more total outfalls, a minimum of 50 outfalls shall be screened annually.

(c) Methodologies to collect the general information such as time since the last rain, the quantity of the last rain, site descriptions (e.g., conveyance type and dominant watershed land uses), estimated discharge rate (e.g., width of water surface, approximate depth of water, approximate flow velocity, and flow rate), and visual observations (e.g., order, color, clarity, floatables, deposits or stains, vegetation condition, structural condition, and biology;

(d) A time frame upon which to conduct an investigation or investigations to identify and locate the source of any observed continuous or intermittent nonstormwater discharge prioritized as follows: (i) illicit discharges suspected of being sanitary sewage or significantly contaminated must be investigated first and (ii) investigations of illicit discharges suspected of being less hazardous to human health and safety such as noncontact cooling water or wash water may be delayed until after all suspected sanitary sewage or significantly contaminated discharges have been investigated, eliminated, or identified. Discharges authorized under a separate VDPES or state permit are natural flow and require no further action.

(e) Methodologies to determine the source of all illicit discharges shall be conducted. If an illicit discharge is found, but within six months of the beginning of the investigation neither the source nor the same nonstormwater discharge has been identified, then the operator shall document such in accordance with Section II B 3 f. If the observed discharge is intermittent, the operator must document that a minimum of three separate investigations were made in an attempt to observe the discharge when it was flowing. If these attempts are unsuccessful, the operator shall document such in accordance with Section II B 3 f.

(f) Mechanisms to eliminate identified sources of illicit discharges including a description of the policies and procedures for when and how to use legal authorities;

(g) Methods for conducting a follow-up investigation in order to verify that the discharge has been eliminated.

(h) A mechanism to track all investigations to document at a minimum: (i) the date or dates that the illicit discharge was observed and reported; (ii) the results of the investigation; (iii) any follow-up of the investigation; (iv) resolution of the investigation; and (v) the date that the investigation was closed.

d. The operator shall eliminate or minimize to the maximum extent practicable, the discharge of hazardous substance or oil in the stormwater discharge or discharges from the small MS4. In addition, the MS4 Program Plan must be reviewed to identify measures to prevent the recurrence of such releases, and respond to such releases, and must be modified where appropriate.

e. The operator shall promote, publicize, and facilitate public reporting of illicit discharges into or from MS4s. The operator shall conduct inspections in response to complaints and follow-up inspections as needed to ensure that corrective measures have been implemented by the responsible party.

f. The MS4 Program Plan shall include all procedures developed by the operator to detect, identify, and address nonstormwater discharges to the MS4 in accordance with the schedule in Table 1 in this section. In the interim, the operator shall continue to implement the program as included as part of the registration statement until the program is updated to meet the conditions of this permit. Operators, who have not previously held MS4 permit coverage, shall implement this program in accordance with the schedule provided in Table 1 in this section.

g. Annual reporting requirements. Each annual report shall include:

(1) A list of any written notifications of physical interconnection given by the operator to other MS4s;

(2) The total number of outfalls screened during the reporting period, the screening results, and detail of any follow-up necessary based on screening results; and

(3) A summary of each investigation conducted by the operator of any suspected illicit discharge. The summary must include: (i) the date that the suspect discharge was observed or reported or both; (ii) how the investigation was resolved, including any follow-up, and (iii) resolution of the investigation and the date the investigation was closed.

4. Construction site stormwater runoff control.

~~a. The operator shall develop, implement, and enforce procedures to reduce pollutants in any stormwater runoff to the regulated small MS4 from construction activities that result in a land disturbance of greater than or equal~~

~~to one acre or equal to or greater than 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act. Additionally, reduction of stormwater discharges from construction activity disturbing less than one acre must be included in the program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more.~~

~~The procedures must include the development and implementation of, at a minimum:~~

~~(1) An ordinance or other mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance with the Erosion and Sediment Control Law and attendant regulations, to the extent allowable under state, tribal, or local law. Such ordinances and other mechanisms shall be updated as necessary;~~

~~(2) Requirements for construction site owners and operators to implement appropriate erosion and sediment control best management practices as part of an erosion and sediment control plan that is consistent with the Erosion and Sediment Control Law and attendant regulations and other applicable requirements of state, tribal, or local law. Where determined appropriate by the operator, the operator shall encourage the use of structural and nonstructural design techniques to create a design that has the goal of maintaining or replicating predevelopment runoff characteristics and site hydrology;~~

~~(3) Requirements for construction site owners and operators to secure authorization to discharge stormwater from construction activities under a VSMP permit for construction activities that result in a land disturbance of greater than or equal to one acre or equal to or greater than 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act. Additionally, stormwater discharges from construction activity disturbing less than one acre must secure authorization to discharge under a VSMP permit if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more;~~

~~(4) Procedures for receipt and consideration of information submitted by the public; and~~

~~(5) Procedures for site inspection and enforcement of control measures.~~

~~b. The operator shall ensure that plan reviewers, inspectors, program administrators and construction site owners and operators obtain the appropriate certifications as required under the Erosion and Sediment Control Law;~~

~~c. The operator shall track regulated land-disturbing activities and submit the following information in accordance with Section II E 3:~~

~~(1) Total number of regulated land-disturbing activities; and~~

~~(2) Total disturbed acreage.~~

a. Applicable oversight requirements. The operator shall utilize its legal authority, such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements, to address discharges entering the MS4 from the following land-disturbing activities:

(1) Land-disturbing activities as defined in § 10.1-560 of the Code of Virginia that result in the disturbance of 10,000 square feet or greater;

(2) Land-disturbing activities in Tidewater jurisdictions, as defined in § 10.1-2101 of the Code of Virginia, that disturb 2,500 square feet or greater and are located in areas designated as Resource Protection Areas (RPA), Resource Management Areas (RMA) or Intensely Developed Acres (IDA), pursuant to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act;

(3) Land-disturbing activities disturbing less than the minimum land disturbance identified in subdivision (1) or (2) above for which a local ordinance requires that an erosion and sediment control plan be developed; and

(4) Land-disturbing activities on individual residential lots or sections of residential developments being developed by different property owners and where the total land disturbance of the residential development is 10,000 square feet or greater. The operator may utilize an agreement in lieu of a plan as provided in § 10.1-563 of the Code of Virginia for these land disturbances.

b. Required plan approval prior to commencement of the land disturbing activity. The operator shall require that land disturbance not begin until an erosion and sediment control plan or an agreement in lieu of a plan as provided in § 10.1-563 is approved by a VESCP authority in accordance with the Erosion and Sediment Control Act (§ 10.1-560 et seq.). The plan shall be:

(1) Compliant with the minimum standards identified in 4VAC-50-30-40 of the Erosion and Sediment Control Regulations; or

(2) Compliant with department-approved annual standards and specifications. Where applicable, the plan shall be consistent with any additional or more stringent, or both, erosion and sediment control requirements established by state regulation or local ordinance.

c. Compliance and enforcement.

(1) The operator shall inspect land-disturbing activities for compliance with an approved erosion and sediment

control plan or agreement in lieu of a plan in accordance with the minimum standards identified in 4VAC50-30-40 or with board-approved standards and specifications.

(2) The operator shall implement an inspection schedule for land-disturbing activities identified in Section II B 4 a as follows:

(a) Upon initial installation of erosion and sediment controls;

(b) At least once during every two-week period;

(c) Within 48 hours of any runoff-producing storm event; and

(d) Upon completion of the project and prior to the release of any applicable performance bonds.

Where an operator establishes an alternative inspection program as provided for in 4VAC50-30-60 B 2, the written schedule shall be implemented in lieu of Section II B 4 c (2) and the written plan shall be included in the MS4 Program Plan.

(3) Operator inspections shall be conducted by personnel who hold an appropriate certificate of competence in accordance with 4VAC-50-50-40. Documentation of certification shall be made available upon request by the VESCP authority or other regulatory agency.

(4) The operator shall promote to the public a mechanism for receipt of complaints regarding regulated land-disturbing activities and shall follow up on any complaints regarding potential water quality and compliance issues.

(5) The operator shall utilize, as appropriate, its legal authority to require compliance with the approved plan where an inspection finds that the approved plan is not being properly implemented.

(6) The operator shall utilize, as appropriate, its legal authority to require changes to an approved plan when a inspection finds that the approved plan is inadequate to effectively control soil erosion, sediment deposition, and runoff to prevent the unreasonable degradation of properties, stream channels, waters, and other natural resources.

(7) The operator shall required implementation of appropriate controls to prevent nonstormwater discharges to the MS4, such as wastewater, concrete washout, fuels and oils, and other illicit discharges identified during land-disturbing activity inspections of the MS4. The discharge of nonstormwater discharges other than those identified in 4VAC50-60-1220 through the MS4 is not authorized in this state permit.

(8) The operator may develop and implement a progressive compliance and enforcement strategy provided that such strategy is included in the MS4 Program Plan.

d. Regulatory coordination. The operator shall implement enforceable procedures to require that large construction activities as defined in 4VAC50-60-10 and small construction activities as defined in 4VAC50-60-10, including municipal construction activities, secure necessary state permit authorizations from the department to discharge stormwater.

e. MS4 Program requirements. The operator's MS4 Program Plan shall include:

(1) A description of the legal authorities utilized to ensure compliance with the minimum control measure in Section II related to construction site stormwater runoff control such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements;

(2) Written plan review procedures and all associated documents utilized in plan review;

(3) For the MS4 operators who obtain department-approved standards and specifications, a copy of the current standards and specifications;

(4) Written inspection procedures and all associated documents utilized in plan review including the inspection schedule;

(5) Written procedures for compliance and enforcement, including a progressive compliance and enforcement strategy, where appropriate; and

(6) The roles and responsibilities of each of the operator's departments, divisions, or subdivisions in implementing the minimum control measure in Section II related to construction site stormwater runoff control. If the operator utilizes another entity to implement portions of the MS4 Program Plan, a copy of the written agreement must be retained in the MS4 Program Plan. The description of the roles and responsibilities, including any written agreements with third parties, shall be updated as necessary.

Reference may be made to any listed requirements in this subdivision provided the location of where to find the reference material can be found is included and the reference material is made available to the public upon request.

f. Reporting requirements. The operator shall track regulated land-disturbing activities and submit the following information in all annual reports:

(1) Total number of regulated land-disturbing activities;

(2) Total disturbed acreage;

(3) Total number of inspections performed; and

(4) A summary of the enforcement actions taken.

5. Post-construction stormwater management in new development and development on prior developed lands ~~redevelopment~~.

~~a. The operator shall develop, implement, and enforce procedures to address stormwater runoff to the regulated~~

~~small MS4 from new development and redevelopment projects that disturb greater than or equal to one acre or equal to or greater than 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into the regulated small MS4. The procedures must ensure that controls are in place that would prevent or minimize water quality and quantity impacts in accordance with this section.~~

~~b. The operator shall:~~

~~(1) Develop and implement strategies which include a combination of structural and/or nonstructural best management practices (BMPs) appropriate for the operator's community. Where determined appropriate by the operator, the operator shall encourage the use of structural and nonstructural design techniques to create a design that has the goal of maintaining or replicating predevelopment runoff characteristics and site hydrology;~~

~~(2) Use an ordinance, regulation, or other mechanism to address post-construction runoff from new development and redevelopment projects to ensure compliance with the Virginia Stormwater Management Act (§ 10.1-603.1 et seq. of the Code of Virginia) and attendant regulations, and to the extent allowable under state, tribal or local law. Such ordinances and other mechanisms shall be updated as necessary;~~

~~(3) Require construction site owners and operators to secure authorization to discharge stormwater from construction activities under a VSMP permit for new development and redevelopment projects that result in a land disturbance of greater than or equal to one acre or equal to or greater than 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and Management Regulations adopted pursuant to the Chesapeake Bay Preservation Act. Additionally, stormwater discharges from construction activity disturbing less than one acre must secure authorization to discharge under a VSMP permit if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more;~~

~~(4) Require adequate long-term operation and maintenance by the owner of structural stormwater management facilities through requiring the owner to develop a recorded inspection schedule and maintenance agreement to the extent allowable under state, tribal or local law or other legal mechanism. The operator shall additionally develop, through the maintenance agreement or other method, a mechanism for enforcement of maintenance responsibilities by the operator if they are neglected by the owner;~~

~~(5) Conduct site inspection and enforcement measures consistent with the Virginia Stormwater Management Act and attendant regulations; and~~

~~(6) Track all known permanent stormwater management facilities that discharge to the regulated small MS4 and submit the following information in accordance with Section II E 3:~~

~~(a) Type of structural stormwater management facility installed as defined in the Virginia Stormwater Management Handbook;~~

~~(b) Geographic location (HUC);~~

~~(c) Where applicable, the impaired surface water that the stormwater management facility is discharging into; and~~

~~(d) Number of acres treated.~~

a. Applicable oversight requirements. The operator shall address post-construction stormwater runoff that enters the MS4 from the following land-disturbing activities:

(1) New development and development on prior developed lands that are defined as large construction activities or small construction activities in 4VAC50-60-10;

(2) New development and development on prior developed lands that disturb greater than or equal to 2,500 square feet, but less than one acre, located in a Chesapeake Bay Preservation Area designated by a local government located in Tidewater, Virginia; and

(3) New development and development on prior developed lands where an applicable state regulation or local ordinance has designated a more stringent regulatory size threshold than that identified in subdivision (1) or (2) above.

b. Required design criteria for stormwater runoff controls. The operator shall utilize appropriate legal authority, such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements, to require that activities identified in Section II B 5 a address stormwater runoff in such a manner that stormwater runoff controls are designed and installed:

(1) In accordance with the appropriate water quality and water quantity design criteria as required in Part II (4VAC50-60-40 et seq.) of 4VAC50-60;

(2) In accordance with any additional applicable state or local design criteria required at project initiation; and

(3) Where applicable, in accordance with any department-approved annual standards and specifications.

Upon board approval of a Virginia Stormwater Management Program authority (VSMP authority) as defined in § 10.1-603.2 of the Code of Virginia and reissuance of the Virginia Stormwater Management

Program (VSMP) General Permit for Discharges of Stormwater from Construction Activities, the operator shall require that stormwater management plans are approved by the appropriate VSMP authority prior to land disturbance. The expected implementation date of this requirement is July 1, 2014; as per § 10.1-603.3 M of the Code of Virginia, VSMPS shall become effective July 1, 2014, unless otherwise specified by the board.

c. Inspection, operation, and maintenance verification of stormwater management facilities.

(1) For stormwater management facilities not owned by the MS4 operator, the following conditions apply:

(a) The operator shall require adequate long-term operation and maintenance by the owner of the stormwater management facility by requiring the owner to develop a recorded inspection schedule and maintenance agreement to the extent allowable under state or local law or other legal mechanism;

(b) The operator shall implement a schedule designed to inspect all privately owned stormwater management facilities that discharge into the MS4 at least once every five years to document that maintenance is being conducted in such a manner to ensure long-term operation in accordance with the approved designs.

(c) The operator shall utilize its legal authority for enforcement of maintenance responsibilities by the operator if maintenance is neglected by the owner. The operator may develop and implement a progressive compliance and enforcement strategy provided that the strategy is included in the MS4 Program Plan.

(d) Beginning with the issuance of this state permit, the operator may utilize strategies other than maintenance agreements such as periodic inspections, homeowner outreach and education, and other methods targeted at promoting the long-term maintenance of stormwater control measures that are designed to treat stormwater runoff solely from the individual residential lot. Within 12 month of coverage under this permit, the operator shall develop and implement these alternative strategies.

(2) For stormwater management facilities owned by the MS4 operator, the following conditions apply:

(a) The operator shall provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan.

(b) The operator shall inspect these stormwater management facilities annually. The operator may choose to implement an alternative schedule to inspect these stormwater management facilities based on facility type and expected maintenance needs provided that the alternative schedule is included in the MS4 Program Plan.

(c) The operator shall conduct maintenance on its stormwater management facilities as necessary.

d. MS4 Program Plan requirements. The operator's MS4 Program Plan shall be updated in accordance with Table 1 in this section to include:

(1) A list of the applicable legal authorities such as ordinance, state and other permits, orders, specific contract language, and interjurisdictional agreements to ensure compliance with the minimum control measure in Section II related to post-construction stormwater management in new development and development on prior developed lands;

(2) Written policies and procedures utilized to ensure that stormwater management facilities are designed and installed in accordance with Section II B 5 b;

(3) Written inspection policies and procedures utilized in conducting inspections;

(4) Written procedures for inspection, compliance and enforcement to ensure maintenance is conducted on private stormwater facilities to ensure long-term operation in accordance with approved design;

(5) Written procedures for inspection and maintenance of operator-owned stormwater management facilities;

(6) The roles and responsibilities of each of the operator's departments, divisions, or subdivisions in implementing the minimum control measure in Section II related to post-construction stormwater management in new development and development on prior developed lands. If the operator utilizes another entity to implement portions of the MS4 Program Plan, a copy of the written agreement must be retained in the MS4 Program Plan. Roles and responsibilities shall be updated as necessary.

e. Stormwater management facility tracking and reporting requirements. The operator shall maintain an updated electronic database of all known operator-owned and privately-owned stormwater management facilities that discharge into the MS4. The database shall include the following:

(1) The stormwater management facility type;

(2) A general description of the facility's location, including the address or latitude and longitude;

(3) The acres treated by the facility, including total acres, as well as the breakdown of pervious and impervious acres;

(4) The date the facility was brought online (MMYYYY). If the date is not known, the operator shall use June 2005 as the date brought online for all previously existing stormwater management facilities;

(5) The sixth order hydrologic unit code (HUC) in which the stormwater management facility is located;

(6) The name of any impaired water segments within each HUC listed on the 2012 § 305(b)/303(d) Water

Quality Assessment Integrate Report to which the stormwater management facility discharges;

(7) Whether the stormwater management facility is operator-owned or privately-owned;

(8) Whether a maintenance agreement exists if the stormwater management facility is privately owned; and

(9) The date of the last inspection.

In addition, the operator shall annually track and report the total number of inspections completed and, when applicable, the number of enforcement actions taken to ensure long-term maintenance.

An electronic database or spreadsheet of all stormwater management facilities brought online during each reporting year shall be submitted with the appropriate annual report. Upon such time as the department provides the operators access to a statewide web-based reporting database, the operator shall utilize such database to complete the pertinent reporting requirements of this state permit.

6. Pollution prevention/good housekeeping for municipal operations. ~~Develop and implement an operation and maintenance program consistent with the MS4 Program Plan that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations. Using training materials including those available from EPA, state, tribe, or other organizations, the program shall include employee training to prevent and reduce stormwater pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and MS4 maintenance. The operator is encouraged to review the Environmental Protection Agency's (EPA's) National Menu of Stormwater Best Management Practices for ideas and strategies to incorporate into its program. The menu can be accessed at http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm.~~

~~The operator shall identify, implement, evaluate and modify, as necessary, BMPs to meet the following pollution prevention/good housekeeping for municipal operations measurable goals:~~

~~a. Operation and maintenance programs including activities, schedules, and inspection procedures shall include provisions and controls to reduce pollutant discharges into the regulated small MS4 and receiving surface waters;~~

~~b. Illicit discharges shall be eliminated from storage yards, fleet or maintenance shops, outdoor storage areas, rest areas, waste transfer stations, and other municipal facilities;~~

~~c. Waste materials shall be disposed of properly;~~

~~d. Materials that are soluble or erodible shall be protected from exposure to precipitation;~~

~~e. Materials, including but not limited to fertilizers and pesticides, that have the potential to pollute receiving surface waters shall be applied according to manufacturer's recommendations; and~~

~~f. For state agencies with lands where nutrients are applied, nutrient management plans shall be developed and implemented in accordance with the requirements of § 10.1-104.4 of the Code of Virginia.~~

a. Operations and maintenance activities. The MS4 Program Plan submitted with the registration statement shall be implemented by the operator until updated in accordance with this state permit. In accordance with Table 1 in this section, the operator shall develop and implement written procedures designed to minimize or prevent pollutant discharge from: (i) daily operations such as road, street, and parking lot maintenance; (ii) equipment maintenance; and (iii) the application, storage, transport, and disposal of pesticides, herbicides, and fertilizers. The written procedures shall be utilized, as appropriate, as part of the employee training. At a minimum, the written procedures shall be designed to:

(1) Prevent illicit discharges;

(2) Ensure the proper disposal of water materials, including landscape wastes;

(3) Prevent the discharge of municipal vehicle wash water into the MS4 without authorization under a separate VPDES permit;

(4) Prevent the discharge of wastewater into the MS4 without authorization under a separate VDPES permit;

(5) Require implementation of best management practices when discharging water pumped from utility construction and maintenance activities;

(6) Minimize the pollutants in stormwater runoff from bulk storage areas (e.g., salt storage, topsoil stockpiles) through the use of best management practices;

(7) Prevent pollutant discharge into the MS4 from leaking municipal automobiles and equipment; and

(8) Ensure that the application of materials, including fertilizers and pesticides, is conducted in accordance with the manufacturer's recommendations.

b. Municipal facility pollution prevention and good housekeeping.

(1) Within 12 months of state permit coverage, the operator shall identify all municipal high-priority facilities. These high-priority facilities shall include (i) composting facilities, (ii) equipment storage and maintenance facilities, (iii) materials storage yards, (iv) pesticide storage facilities, (v) public works yards, (vi) recycling facilities, (vii) salt storage facilities, (viii) solid waste handling and transfer facilities, and (viii) vehicle storage and maintenance yards.

(2) With 12 months of state permit coverage, the operator shall identify which of the municipal high-priority facilities have a high potential of chemicals or other materials to be discharged in stormwater.

(3) The operator shall develop and implement specific stormwater pollution prevention plans for all high-priority facilities identified as having a high potential for the discharge of chemicals and other materials in stormwater. SWPPP development and implementation shall be completed within four years of coverage under this state permit. Facilities covered under a separate VDPES permit shall adhere to the conditions established in that permit and are excluded from this requirement.

(4) Each SWPPP shall include:

(a) A site description that includes a site map identifying all outfalls, direction of flows, existing source controls, and receiving water bodies;

(b) A discussion and checklist of potential pollutants and pollutant sources;

(c) A discussion of all potential nonstormwater discharges;

(d) Written procedures designed to reduce and prevent pollutant discharge;

(e) A description of the applicable training as required in Section II B 6 c;

(f) Procedures to conduct an annual comprehensive site compliance evaluation;

(g) An inspection and maintenance schedule for site specific source controls. The date of each inspection and associated findings and follow-up shall be logged in each SWPPP;

(h) The contents of each SWPPP shall be evaluated and modified as necessary as the result of any release or spill from the high priority facility reported in accordance with Section III G. The date of the release, material spilled and the amount of the release must be listed in each SWPPP; and

(i) A copy of each SWPPP shall be kept at each facility and shall be kept updated and utilized as part of staff training required in Section II B 6 d.

c. Nutrient management.

(1) The operator shall implement nutrient management plans that have been developed by a certified nutrient management planner in accordance with § 10.1-104.2 of the Code of Virginia on all lands owned or operated by the MS4 operator where nutrients are applied to a contiguous area greater than one acre. Implementation shall be in accordance with the following schedule:

(a) Within 12 months of state permit coverage, the operator shall identify all applicable lands where nutrients are applied to a contiguous area of more than one acre. A latitude and longitude shall be provided for each such piece of land and reported in the annual report.

(b) Within 60 months of state permit coverage, the operator shall implement nutrient management plans on all lands where nutrients are applied to a contiguous area of more than one acre. The following measurable goals are established for the implementation of nutrient management plans: (i) within 24 months of permit coverage, not less than 15% of all identified acres will be covered by nutrient management plans; (ii) within 36 months of permit coverage, not less than 40% of all identified acres will be covered by nutrient management plans; and (iii) within 48 months of permit coverage, not less than 75% of all identified acres will be covered by nutrient management plans. The operator shall not fail to meet the measurable goals for two consecutive years.

(c) MS4 operators with lands regulated under § 10.1-104.4 of the Code of Virginia shall continue to implement nutrient management plans in accordance with this statutory requirement.

(2) Operators shall annually track the following:

(a) The total acreage of lands where nutrient management plans are required; and

(b) The acreage of lands upon which nutrient management plans have been implemented.

(3) The operator shall not apply any deicing agent containing urea or other forms of nitrogen or phosphorus to parking lots, roadways, and sidewalks, or other paved surfaces.

d. Training. The operator shall conduct training for employees. The training requirements may be fulfilled, in total or in part, through regional training programs involving two or more MS4 localities provided; however, that each operator shall remain individually liable for its failure to comply with the training requirements in this permit. Training is not required if the topic is not applicable to the operator's operations and therefore does not have applicable relevant personnel provided the lack of applicability is documented in the MS4 Program Plan. The operator shall determine the relevant employees to receive training. The operator shall develop an annual written training plan including a schedule of training events that ensures implementation of the training requirements as follows:

(1) The operator shall provide biennial training to relevant field personnel in the recognition and reporting of illicit discharges.

(2) The operator shall provide biennial training to relevant employees in good housekeeping and pollution prevention practices that are to be employed during road, street, and parking lot maintenance.

(3) The operator shall provide biennial training to relevant employees in good housekeeping and pollution

prevention practices that are to be employed in and around maintenance and public works facilities.

(4) The operator shall ensure that employees, and require that contractors, applying pesticides and herbicides are properly trained or certified in accordance with the Virginian Pesticide Control Act (§ 3.1-249.27 et seq. of the Code of Virginia).

(5) The operator shall ensure that employees and contractors employed as plan reviewers, inspectors, program administrators, and construction site operators obtain the appropriate certifications as required under the Virginia Erosion and Sediment Control Law and its attendant regulations.

(6) The operator shall ensure that the relevant employees obtain the appropriate certifications as required under the Virginia Erosion and Sediment Control Law and its attendant regulations.

(7) The operators shall provide biennial training to appropriate employees in good housekeeping and pollution prevention practices that are to be employed in and around recreational facilities.

(8) The appropriate emergency response employees shall have training in spill responses. A summary of the training or certification program provided to emergency response employees shall be included in the first annual report.

(9) The operator shall keep documentation on each training event including the training date, the number of employees attending the training, and the objective of the training event for a period of three years after each training event.

e. The operator shall require that municipal contractors use appropriate control measures and procedures for stormwater discharges to the MS4 system. Oversight procedures shall be described in the MS4 Program Plan.

f. In accordance with the schedule of development in Table 1 of this section, the MS4 Program Plan shall contain:

(1) The written protocols being used to satisfy the daily operations and maintenance requirements;

(2) A list of all municipal high-priority facilities that denotes those facilities that have a high potential of chemicals or other materials to be discharged in stormwater and a schedule that identifies the year in which an individual SWPPP will be developed for those facilities required to have SWPPP. Upon completion of a SWPPP, the SWPPP shall be part of the MS4 Program Plan. The MS4 Program Plan shall include the location in which the individual SWPPP is located;

(3) A list of lands where nutrients are applied to a contiguous area of more than one acre. Upon completion of a nutrient management plan, the nutrient management plan shall be part of the MS4 Program Plan. The MS4 Program Plan shall include the location in which the individual nutrient management plan is located; and

(4) The annual written training plan for the next reporting cycle.

g. Reporting requirements.

(1) A summary report on the development and implementation of the daily operational procedures;

(2) A summary report on the development and implementation of the required SWPPPs;

(3) A summary report on the development and implementation of the nutrient management plans that includes:

(a) The total acreage of lands where nutrient management plans are required; and

(b) The acreage of lands upon which nutrient management plans have been implemented; and

(4) A summary report on the required training, including a list of training events, the training date, the number of employees attending training and the objective of the training.

C. If an existing program requires the implementation of one or more of the minimum control measures of Section II B, the operator, with the approval of the board, may follow that program's requirements rather than the requirements of Section II B. A program that may be considered includes, but is not limited to, a local, state or tribal program that imposes, at a minimum, the relevant requirements of Section II B.

The operator's MS4 Program Plan shall identify and fully describe any program that will be used to satisfy one or more of the minimum control measures of Section II B.

If the program the operator is using requires the approval of a third party, the program must be fully approved by the third party, or the operator must be working towards getting full approval. Documentation of the program's approval status, or the progress towards achieving full approval, must be included in the annual report required by Section II E 3. The operator remains responsible for compliance with the permit requirements if the other entity fails to implement the control measures (or component thereof.)

D. The operator may rely on another entity to satisfy the VSMP permit ~~obligations~~ requirements to implement a minimum control measure if: (i) the other entity, in fact, implements the control measure; (ii) the particular control measure, or component thereof, is at least as stringent as the corresponding VSMP permit requirement; and (iii) the other entity agrees to implement the control measure on behalf of the operator. The agreement between the parties must be documented in writing and retained by the operator with the MS4 Program Plan for the duration of this permit.

In the annual reports that must be submitted under Section II E 3, the operator must specify that another entity is being

relied on to satisfy some of the permit ~~obligations~~ requirements.

If the operator is relying on another governmental entity regulated under 4VAC50-60-380 to satisfy all of the permit obligations, including the obligation to file periodic reports required by Section II E 3, the operator must note that fact in the registration statement, but is not required to file the periodic reports.

The operator remains responsible for compliance with the permit ~~obligations~~ requirements if the other entity fails to implement the control measure (or component thereof).

E. Evaluation and assessment.

1. MS4 Program Evaluation. The operator must annually evaluate:

~~a. The operator must annually evaluate:~~

~~(1)~~ a. Program compliance;

~~(2)~~ b. The appropriateness of the identified BMPs (as part of this evaluation, the operator shall evaluate the effectiveness of BMPs in addressing discharges into waters that are identified as impaired in the ~~2006~~ 2012 § 305(b)/303(d) Water Quality Assessment Integrated Report); and

~~(3)~~ c. Progress towards achieving the identified measurable goals.

~~b. The operator must evaluate its MS4 Program once during the permit cycle using the "Municipal Stormwater Program Evaluation Guidance," Environmental Protection Agency EPA-833-R-07-003. Such information shall be utilized when reapplying for permit coverage. Results of this evaluation shall be kept on file and made available during audits and inspections.~~

2. Recordkeeping. The operator must keep records required by the NPDES permit for at least three years. These records must be submitted to the ~~NPDES permitting authority~~ department only upon specific request. The operator must make the records, including a description of the stormwater management program, available to the public at reasonable times during regular business hours.

3. Annual reports. The operator must submit an annual report for the reporting period of July 1 through June 30 to the department by the following October 1. The reports shall include:

a. Background Information.

(1) The name and permit number of the program submitting the annual report;

(2) The annual report permit year;

(3) Modifications to any operator's department's roles and responsibilities;

(4) Number of new MS4 outfalls and associated acreage by HUC added during the permit year; and

(5) Signed certification.

b. The status of compliance with permit conditions, an assessment of the appropriateness of the identified best management practices and progress towards achieving the identified measurable goals for each of the minimum control measures;

c. Results of information collected and analyzed, including monitoring data, if any, during the reporting period;

d. A summary of the stormwater activities the operator plans to undertake during the next reporting cycle;

e. A change in any identified best management practices or measurable goals for any of the minimum control measures including steps to be taken to address any deficiencies;

f. Notice that the operator is relying on another government entity to satisfy some of the permit obligations (if applicable);

g. The approval status of any programs pursuant to Section II C (if appropriate), or the progress towards achieving full approval of these programs; and

h. Information required ~~pursuant to Section I B 9;~~ for any applicable TMDL special condition.

~~i . The number of illicit discharges identified and the narrative on how they were controlled or eliminated pursuant to Section II B 3 f;~~

~~j. Regulated land disturbing activities data tracked under Section II 4 c;~~

~~k. All known permanent stormwater management facility data tracked under Section II B 5 b (6) submitted in a database format to be prescribed by the department. Upon filing of this list, subsequent reports shall only include those new stormwater management facilities that have been brought online;~~

~~l. A list of any new or terminated signed agreements between the operator and any applicable third parties where the operator has entered into an agreement in order to implement minimum control measures or portions of minimum control measures; and~~

~~m. Copies of any written comments received during a public comment period regarding the MS4 Program Plan or any modifications.~~

F. Program Plan modifications. ~~The board may require modifications to the MS4 Program Plan as needed to address adverse impacts on receiving surface water quality caused, or contributed to, by discharges from the regulated small MS4. Modifications required by the board shall be made in writing and set forth the time schedule to develop and implement the modification. The operator may propose alternative program modifications and time schedules to meet the objective of the required modification. The board retains the authority to require any modifications it determines are necessary.~~

1. Modifications requested by the operator. Modifications to the MS4 Program are expected throughout the life of this state permit as part of the iterative process to reduce the pollutant loadings and to protect water quality. As such, modifications made in accordance with this state permit as a result of the iterative process do not require modification of this permit unless the department determines that the changes met the criteria referenced in 4VAC50-60-630 or 4VAC50-60-650. Updates and modifications to the MS4 Program may be made during the life of this state permit in accordance with the following procedures:

a. Adding (but not eliminating or replacing) components, controls, or requirements to the MS4 Program may be made by the operator at any time. Additions shall be reported as part of the annual report.

b. Updates and modifications to specific standards and specifications, schedules, operating procedures, ordinances, manuals, checklists, and other documents routinely evaluated and modified are permitted under this state permit provided that the updates and modifications are done in a manner that (i) is consistent with the conditions of this state permit, (ii) follow any public notice and participation requirements established in this state permit, and (iii) are documented in the annual report.

c. Replacing, or eliminating without replacement, any ineffective or infeasible strategies, policies, and BMPs specifically identified in this permit with alternate strategies, policies, and BMPs may be requested at any time. Such requests must include the following:

(1) An analysis of how or why the BMPs, strategies, or policies are ineffective or infeasible, including cost prohibitive;

(2) Expectations on the effectiveness of the replacement BMPs, strategies, or policies;

(3) An analysis of how the replacement BMPs are expected to achieve the goals of the BMP's to be replaced;

(4) A schedule for implementing the replacement BMPs, strategies, and policies;

(5) An analysis of how the replacement strategies and policies are expected to improve the operator's ability to meet the goals of the strategies and policies being replaced; and

(6) Requests or notifications must be made in writing to the department and signed in accordance with 4VAC-50-60-370.

d. The operator follows the public involvement requirements identified in Section II B 2 (a).

2. MS4 Program updates requested by the department. In a manner and following procedures in accordance with the Virginia Administrative Process Act, the Virginia Stormwater Management regulations, and other applicable state law and regulations, the department may request changes to the MS4 Program to assure compliance with the statutory requirements of the Virginia Stormwater Management Act and its attendant regulations to:

a. Address impacts on receiving water quality caused by discharges from the MS4;

b. Include more stringent requirements necessary to comply with new state or federal laws or regulations; or

c. Include such other conditions necessary to comply with state or federal law or regulation.

Proposed changes requested by the department shall be made in writing and set forth the basis for and objective of the modification as well as the proposed time schedule for the operator to develop and implement the modification. The operator may propose alternative program modifications or time schedules to meet the objective of the requested modification, but any such modifications are at the discretion of the department.

SECTION III
CONDITIONS APPLICABLE TO ALL VSMP PERMITS

A. Monitoring.

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

2. Monitoring shall be conducted according to procedures approved under 40 CFR Part 136 (2001) or alternative methods approved by the U.S. Environmental Protection Agency, unless other procedures have been specified in this permit.

3. The operator shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals that will insure accuracy of measurements.

B. Records.

1. Monitoring records/reports shall include:

a. The date, exact place, and time of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) and time(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

2. The operator shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the registration statement for this permit, for a period of at least three years from the date of the sample,

measurement, report or request for coverage. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or regarding control standards applicable to the operator, or as requested by the board.

C. Reporting monitoring results.

1. The operator shall submit the results of the monitoring required by this permit with the annual report unless another reporting schedule is specified elsewhere in this permit.

2. Monitoring results shall be reported on a Discharge Monitoring Report (DMR); on forms provided, approved or specified by the department; or in any format provided the date, location, parameter, method, and result of the monitoring activity are included.

3. If the operator monitors any pollutant specifically addressed by this permit more frequently than required by this permit using test procedures approved under 40 CFR Part 136 (2001) or using other test procedures approved by the U.S. Environmental Protection Agency or using procedures specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or reporting form specified by the department.

4. Calculations for all limitations that require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

D. Duty to provide information. The operator shall furnish to the department, within a reasonable time, any information that the board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The board may require the operator to furnish, upon request, such plans, specifications, and other pertinent information as may be necessary to determine the effect of the wastes from his discharge on the quality of surface waters, or such other information as may be necessary to accomplish the purposes of the CWA and Virginia Stormwater Management Act. The operator shall also furnish to the department upon request, copies of records required to be kept by this permit.

E. Compliance schedule reports. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Unauthorized stormwater discharges. Pursuant to § 10.1-603.2:2 A of the Code of Virginia, except in compliance with a permit issued by the board, it shall be unlawful to cause a stormwater discharge from a MS4.

G. Reports of unauthorized discharges. Any operator of a ~~regulated~~ small MS4 who discharges or causes or allows a discharge of sewage, industrial waste, other wastes or any noxious or deleterious substance or a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110 (2002), 40 CFR Part 117 (2002) or 40 CFR Part 302 (2002) that occurs during a 24-hour period into or upon surface waters; or who discharges or causes or allows a discharge that may reasonably be expected to enter surface waters, shall notify the Department of Environmental Quality of the discharge immediately upon discovery of the discharge, but in no case later than within 24 hours after said discovery. A written report of the unauthorized discharge shall be submitted to the Department of Environmental Quality and the Department of Conservation and Recreation, within five days of discovery of the discharge. The written report shall contain:

1. A description of the nature and location of the discharge;

2. The cause of the discharge;

3. The date on which the discharge occurred;

4. The length of time that the discharge continued;

5. The volume of the discharge;

6. If the discharge is continuing, how long it is expected to continue;

7. If the discharge is continuing, what the expected total volume of the discharge will be; and

8. Any steps planned or taken to reduce, eliminate and prevent a recurrence of the present discharge or any future discharges not authorized by this permit.

Discharges reportable to the Department of Environmental Quality and the Department of Conservation and Recreation under the immediate reporting requirements of other regulations are exempted from this requirement.

H. Reports of unusual or extraordinary discharges. If any unusual or extraordinary discharge including a " bypass " or " upset," as defined herein, should occur from a facility and the discharge enters or could be expected to enter surface waters, the operator shall promptly notify, in no case later than within 24 hours, the Department of Environmental Quality and the Department of Conservation and Recreation by telephone after the discovery of the discharge. This notification shall provide all available details of the incident, including any adverse affects on aquatic life and the known number of fish killed. The operator shall reduce the report to writing and shall submit it to the Department of Environmental Quality and the Department of Conservation and Recreation within five days of discovery of the discharge in accordance with Section III I 2. Unusual and extraordinary discharges include but are not limited to any discharge resulting from:

1. Unusual spillage of materials resulting directly or indirectly from processing operations;

2. Breakdown of processing or accessory equipment;

3. Failure or taking out of service some or all of the facilities; and

4. Flooding or other acts of nature.

I. Reports of noncompliance. The operator shall report any noncompliance which may adversely affect surface waters or may endanger public health.

1. An oral report shall be provided within 24 hours to the Department of Environmental Quality and the Department of Conservation and Recreation from the time the operator becomes aware of the circumstances. The following shall be included as information which shall be reported within 24 hours under this paragraph:

a. Any unanticipated bypass; and

b. Any upset which causes a discharge to surface waters.

2. A written report shall be submitted within five days and shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and

c. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

The board or its designee may waive the written report on a case-by-case basis for reports of noncompliance under Section III I if the oral report has been received within 24 hours and no adverse impact on surface waters has been reported.

3. The operator shall report all instances of noncompliance not reported under Sections III I 1 or 2, in writing, at the time the next monitoring reports are submitted. The reports shall contain the information listed in Section III I 2.

NOTE: The immediate (within 24 hours) reports required to be provided to the Department of Environmental Quality in Sections III G, H and I may be made to the appropriate Department of Environmental Quality's Regional Office Pollution Response Program as found at http://www.deq.virginia.gov/prep/homepage.html#. Reports may be made by telephone or by fax. For reports outside normal working hours, leave a message and this shall fulfill the immediate reporting requirement. For emergencies, the Virginia Department of Emergency Services maintains a 24-hour telephone service at 1-800-468-8892.

4. Where the operator becomes aware of a failure to submit any relevant facts, or submittal of incorrect information in any report to the department or the Department of Environmental Quality, it shall promptly submit such facts or correct information.

J. Notice of planned changes.

1. The operator shall give notice to the department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The operator plans an alteration or addition to any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced:

(1) After promulgation of standards of performance under § 306 of the Clean Water Act that are applicable to such source; or

(2) After proposal of standards of performance in accordance with § 306 of the Clean Water Act that are applicable to such source, but only if the standards are promulgated in accordance with § 306 within 120 days of their proposal;

b. The operator plans alteration or addition that would significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this permit; or

2. The operator shall give advance notice to the department of any planned changes in the permitted facility or activity; which may result in noncompliance with permit requirements.

K. Signatory requirements.

1. Registration statement. All registration statements shall be signed as follows:

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

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

c. For a municipality, state, federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a public agency includes:

(1) The chief executive officer of the agency, or

(2) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

2. Reports, etc. All reports required by permits, and other information requested by the board shall be signed by a person described in Section III K 1, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Section III K 1;

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

c. The written authorization is submitted to the department.

3. Changes to authorization. If an authorization under Section III K 2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Section III K 2 shall be submitted to the department prior to or together with any reports, or information to be signed by an authorized representative.

4. Certification. Any person signing a document under Sections III K 1 or 2 shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

L. Duty to comply. The operator shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Virginia Stormwater Management Act and the Clean Water Act, except that noncompliance with certain provisions of this permit may constitute a violation of the Virginia Stormwater Management Act but not the Clean Water Act. Permit noncompliance is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

The operator shall comply with effluent standards or prohibitions established under § 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if this permit has not yet been modified to incorporate the requirement.

M. Duty to reapply. If the operator wishes to continue an activity regulated by this permit after the expiration date of this permit, the operator shall submit a new registration statement at least 90 days before the expiration date of the existing permit, unless permission for a later date has been granted by the board. The board shall not grant permission for registration statements to be submitted later than the expiration date of the existing permit.

N. Effect of a permit. This permit does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any injury to private property or invasion of personal rights, or any infringement of federal, state or local law or regulations.

O. State law. Nothing in this permit shall be construed to preclude the institution of any legal action under, or relieve the operator from any responsibilities, liabilities, or penalties established pursuant to any other state law or regulation or under authority preserved by § 510 of the Clean Water Act. Except as provided in permit conditions on "bypassing" (Section III U), and "upset" (Section III V) nothing in this permit shall be construed to relieve the operator from civil and criminal penalties for noncompliance.

P. Oil and hazardous substance liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the operator from any responsibilities, liabilities, or penalties to which the operator is or may be subject under §§ 62.1-44.34:14 through 62.1-44.34:23 of the State Water Control Law or § 311 of the Clean Water Act.

Q. Proper operation and maintenance. The operator shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances), which are installed or used by the operator to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes effective plant performance, adequate funding, adequate staffing, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by the operator only when the operation is necessary to achieve compliance with the conditions of this permit.

R. Disposal of solids or sludges. Solids, sludges or other pollutants removed in the course of treatment or management of pollutants shall be disposed of in a manner so as to prevent any pollutant from such materials from entering surface waters.

S. Duty to mitigate. The operator shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

T. Need to halt or reduce activity not a defense. It shall not be a defense for an operator in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

U. Bypass.

1. "Bypass," as defined in 4VAC50-60-10, means the intentional diversion of waste streams from any portion of a treatment facility. The operator may allow any bypass to occur that does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Sections III U 2 and U 3.

2. Notice.

a. Anticipated bypass. If the operator knows in advance of the need for a bypass, prior notice shall be submitted, if possible at least 10 days before the date of the bypass.

b. Unanticipated bypass. The operator shall submit notice of an unanticipated bypass as required in Section III I.

3. Prohibition of bypass.

a. Bypass is prohibited, and the board or its designee may take enforcement action against an operator for bypass, unless:

(1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and

(3) The operator submitted notices as required under Section III U 2.

b. The board or its designee may approve an anticipated bypass, after considering its adverse effects, if the board or its designee determines that it will meet the three conditions listed above in Section III U 3 a.

V. Upset.

1. An upset, as defined in 4VAC50-60-10, constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of Section III V 2 are met. A determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is not a final administrative action subject to judicial review.

2. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

3. An operator who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

a. An upset occurred and that the operator can identify the cause(s) of the upset;

b. The permitted facility was at the time being properly operated;

c. The operator submitted notice of the upset as required in Section III I; and

d. The operator complied with any remedial measures required under Section III S.

4. In any enforcement proceeding the operator seeking to establish the occurrence of an upset has the burden of proof.

W. Inspection and entry. The operator shall allow the department as the board's designee, or an authorized representative (including an authorized contractor acting as a representative of the administrator), upon presentation of credentials and other documents as may be required by law, to:

1. Enter upon the operator's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act and the Virginia Stormwater Management Act, any substances or parameters at any location.

For purposes of this subsection, the time for inspection shall be deemed reasonable during regular business hours, and whenever the facility is discharging. Nothing contained herein shall make an inspection unreasonable during an emergency.

X. Permit actions. Permits may be modified, revoked and reissued, or terminated for cause. The filing of a request by the operator for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

Y. Transfer of permits.

1. Permits are not transferable to any person except after notice to the department. Except as provided in Section III Y 2, a permit may be transferred by the operator to a new

owner or operator only if the permit has been modified or revoked and reissued, or a minor modification made, to identify the new operator and incorporate such other requirements as may be necessary under the Virginia Stormwater Management Act and the Clean Water Act.

2. As an alternative to transfers under Section III Y 1, this permit may be automatically transferred to a new operator if:

a. The current operator notifies the department at least two days in advance of the proposed transfer of the title to the facility or property;

b. The notice includes a written agreement between the existing and new operators containing a specific date for transfer of permit responsibility, coverage, and liability between them; and

c. The board does not notify the existing operator and the proposed new operator of its intent to modify or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Section III Y 2 b.

Z. Severability. The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

NOTICE: The following forms used in administering the regulation were filed by the agency. The forms are not being published; however, online users of this issue of the Virginia Register of Regulations may click on the name to access a form. The forms are also available from the agency contact or may be viewed at the Office of the Registrar of Regulations, General Assembly Building, 2nd Floor, Richmond, Virginia 23219.

FORMS (4VAC50-60)

Application Form 1-General Information, Consolidated Permits Program, EPA Form 3510-1, DCR 199-149 (August 1990).

~~Department of Conservation and Recreation Permit Fee Form, DCR 199-145 (10/09).~~

Department of Conservation and Recreation MS4 Operator Permit Fee Form, DCR 199-145 (10/09) (09/12).

VSMP General Permit for Discharges of Stormwater from Construction Activities (VAR10) - Registration Statement, DCR 199-146 (03/09).

VSMP General Permit Notice of Termination - Construction Activity Stormwater Discharges (VAR10), DCR 199-147 (03/09).

VSMP General Permit for Discharges of Stormwater from Construction Activities (VAR10) - Transfer Agreement, DCR199-191 (03/09).

~~VSMP General Permit Registration Statement for Stormwater Discharges From Small Municipal Separate Storm Sewer Systems (VAR04), DCR 199-148 (07/08).~~

VSMP General Permit Registration Statement for Stormwater Discharges From Small Municipal Separate Storm Sewer Systems (VAR04) and Instructions, DCR 199-148 (09/12).

DOCUMENTS INCORPORATED BY REFERENCE (4VAC50-60)

~~Illicit Discharge Detection and Elimination — A Guidance Manual for Program Development and Technical Assessments, EPA Cooperative Agreement X-82907801-0, October 2004, by Center for Watershed Protection and Robert Pitt, University of Alabama, available on the Internet at http://cfpub.epa.gov/npdes/stormwater/idde.cfm.~~

~~Getting in Step — A Guide for Conducting Watershed Outreach Campaigns, EPA 841-B-03-002, December 2003, U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, available on the Internet at http://www.epa.gov/owow/watershed/outreach/documents/getnstep.pdf, or may be ordered from National Service Center for Environmental Publications, telephone 1-800-490-9198.~~

~~Municipal Stormwater Program Evaluation Guidance, EPA-833-R-07-003, January 2007 (field test version), U.S. Environmental Protection Agency, Office of Wastewater Management, available on the Internet at http://cfpub.epa.gov/npdes/docs.cfm?program_id=6&view=allprog&sort=name#ms4_guidance, or may be ordered from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, telephone 1-800-553-6847 or (703) 605-6000.~~

Virginia Runoff Reduction Method: Instructions & Documentation, March 28, 2011.

VA.R. Doc. No. R12-3136; Filed October 16, 2012, 3:43 p.m.

◆ ◆

TITLE 6. CRIMINAL JUSTICE AND CORRECTIONS

CRIMINAL JUSTICE SERVICES BOARD

Fast-Track Regulation

Title of Regulation: **6VAC20-30. Rules Relating to Compulsory In-Service Training Standards for Law-Enforcement Officers, Jailors or Custodial Officers, Courtroom Security Officers, Process Server Officers and Officers of the Department of Corrections, Division of Operations (amending 6VAC20-30-80).**

Statutory Authority: § 9.1-102 of the Code of Virginia.

Public Hearing Information: No public hearings are scheduled.

APPENDIX D

PUBLIC EDUCATION AND OUTREACH PLAN

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JOINT BASE MYER – HENDERSON HALL
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PROGRAM PLAN

APPENDIX D

PUBLIC EDUCATION AND OUTREACH PLAN

FOR
FORT MYER & HENDERSON HALL INSTALLATIONS
FORT MYER, VIRGINIA

Prepared by:
JBM-HH Directorate of Public Works, Environmental Management Division

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1.0 INTRODUCTION

Minimum Control Measure (MCM) 2 of the 2013 Virginia municipal separate storm sewer systems (MS4) General Permit requires MS4 operators to engage the public in stormwater pollution prevention activities and to keep the public informed about the operator's MS4 permit compliance activities. The definition of "public" for Department of Defense (DoD) installations, including Joint Base Myer-Henderson Hall (JBM-HH), is different from the definition of public as it applies to typical municipalities that own and operate MS4s. In the 2013 MS4 General Permit, the Virginia Department of Environmental Quality (VADEQ) states that they concur with the US Environmental Protection Agency's (EPA's) suggested interpretation of "public" for DoD facilities as "the resident and employee population within the fence line of the facility[1]." This interpretation was used as guidance for defining the targeted public audience for the public involvement and participation activities included in this Public Education and Outreach Plan.

1.1 Plan Goals

The primary goals of the JBM-HH public education and outreach program are consistent with goals presented in Section II.B.1.b of the MS4 General Permit:

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

2.0 INSTALLATION CHARACTERISTICS

JBM-HH is located in the Washington, D.C. metropolitan area and was created from the administrative reorganization of the Fort Myer Military Community (Fort Myer and Fort McNair) and the U.S. Marine Corps (USMC) Headquarters Battalion Henderson Hall (Henderson Hall) as a result of Base Area Realignment and Closure (BRAC) 2005 recommendations. Fort Myer and Henderson Hall are located in Arlington, Virginia, directly across the Potomac River from Washington, D.C.; Fort McNair is located in Southwest Washington, D.C. at the confluence of the Washington Channel of the Potomac River and the Anacostia River.

The Virginia MS4 General Permit issued to JBM-HH applies to U.S. Army Installation Fort Myer (Fort Myer) and the USMC installation at Henderson Hall (Henderson Hall), which are jointly referred to as 'the Installation' in this Plan. The Installation is home to the 3rd U.S. Infantry Regiment (The Old Guard) and the USMC Headquarters Battalion structured within the Marine Corps National Capital Region Command. Joint Base Myer-Henderson Hall provides installation services and support to military members, civilians, retirees, and their families with a quality of life commensurate with the quality of their service. This Public Education and Outreach Plan primarily addresses the resident and employee populations of the Installation. The transient populations that use the services available at the Installation are addressed when applicable.

[1] 9VAC25-890-40, Section II B

The land area served by the Installation's MS4 encompasses approximately 270 acres. Stormwater from all areas of the Installation discharges to the Installation's MS4, which is interconnected with the MS4s for Arlington County and Arlington National Cemetery (ANC). There are no natural surface water bodies present within the fence line of the Installation. A portion of a Lower Long Branch tributary runs in an enclosed culvert along the southern boundary of the Installation.

2.1 Water Quality Issues

Stormwater from the Installation discharges via MS4s for Arlington County and ANC to Potomac River tributaries – including Four Mile Run – and ultimately to the Chesapeake Bay. Impairments that have been identified for these water bodies include bacteria, nutrients (nitrogen and phosphorus), polychlorinated biphenyls (PCBs), pH, and sediment. The Installation was evaluated to identify if these or other pollutants may need to be targeted for public education and outreach. The primary activities at the Installation include the following:

- Administrative offices for various Army and USMC operations
- Housing for active-duty military personnel in single-family, duplex, and dormitory-style housing
- Healthcare, childcare, recreation, dining, retail (military exchange stores, commissary, automobile fueling, etc.) and other support service facilities for active-duty and retired military personnel
- Stabling and care of horses used for funeral services at ANC
- Housing and fueling of buses for military bands, ceremonial regiments, and other groups
- Ceremonial activities including funeral services at two chapels
- Training and kennel facilities for military dogs
- Military vehicle (including buses) maintenance and housing
- Installation operation and maintenance activities

Routine inspections of the Installation's industrial areas and stormwater discharge monitoring are required by JBM-HH's Virginia Pollutant Discharge Elimination System (VPDES) Industrial Stormwater permit. Information obtained from inspections and monitoring as well as a review of the Installation's activities was used to identify high-priority water quality issues to be addressed with public education and outreach efforts. The following summarizes the evaluation results with regard to the pollutants identified in local water quality impairments and other potential pollutants:

- **Bacteria:** No significant sources of bacteria were identified for the Installation. The resident pet population is minimal, and wastes from the dog kennels and horse stables are strictly managed to minimize pollution potential. There is one septic system that serves a single toilet facility for a guard station at the Wright Gate. No sanitary sewer cross connections were identified during a recent comprehensive cross-connection survey. Waste management associated with dining facilities at the Installation has a minor potential to contribute bacteria to stormwater discharges.
- **Nutrients (specifically nitrogen and phosphorus):** Grounds maintenance for all areas of the Installation is the responsibility of the Directorate of Public Works (DPW). There are no individual resident-maintained landscape areas. Fertilizer application is the responsibility of DPW and will be addressed in accordance with the nutrient management requirements for MCM #6 of the MS4 General Permit. Another potential nutrient source is discharges from roadways and parking lots.

- **PCBs:** There are no known sources of PCBs at the Installation. Transformers are owned and operated by the local utility, Dominion Virginia Power. PCB-containing transformer oils were reportedly replaced years ago.
- **pH:** There are no known activities at the Installation that could significantly affect the pH of stormwater discharges.
- **Sediment**: Potential sources of sediment discharges identified at the Installation include erosional areas, construction activities, and roadways/parking lots.
- **Other pollutants**: Oil and grease, hydrocarbons, and related pollutants have the potential to be discharged to stormwater from the following activities: vehicle fueling; vehicle maintenance, storage, and parking; and dining facility waste management. Trash and litter from resident, non-resident and employee populations has been observed throughout the Installation.

Based on the above evaluation results, three high-priority water quality issues identified for the Installation to be addressed in public education and outreach efforts include:

- **Oil and grease, hydrocarbons and related pollutants** associated with vehicle maintenance and fueling operations as well as leaks from personal vehicles;
- **Sediment** discharges from erosional areas, construction sites, road maintenance and other sources; addressing sediments from roadways and parking lots will also help reduce nutrient discharges from these sources; and
- **Trash and litter** from employees, residents, and non-residents.

2.2 Target Audiences

The potential target audiences for public education and outreach efforts include the populations that live and work at the Installation; military family members, retirees and spouses that use the services provided at the Installation; and visitors for funeral services and ceremonies. The estimated population numbers for each of these audiences were derived from a recent transportation study[2] as follows:

- **Active Duty Military Population**: assigned: 2,395; attached: 5,900
- **Civilian Workforce**: 1,730
- **Surge Ceremonial Guard**: 4 funerals/day; guard arrives in buses from all services
- **Visitors for Funeral Services**: guests arrive in cars for each ceremony; numbers vary according to type of funeral; low: 15 vehicles; high: 400 vehicles (high level services).
- **Military Family Members, Retirees, and Spouses accessing services:** 112,000
- **Military Visitors MCX/PX**: 4,961 customer/ week; average 243,935 customers per year.
- **Fort Myer Officer's Club**: (recorded uses for 1 October 2011 to 30 September 2012):
    - Catered Events - 72,700 customers;
    - Dining: 56,260 customers;
    - Swimming Pool Memberships: 40,500 customers, Memorial to Labor Day.

The target audiences most likely to have impacts related to each of the high-priority water quality issues identified for the Installation are summarized in Table 2-1.

[2] 2013 Transportation Management Program Update, Joint Base Myer-Henderson Hall; Final Version Prepared by the Division of Master Planning, Directorate of Public Works; January 2014

Table 2-1: High-Priority Water Quality Issue Target Audiences and Populations	
Water Quality Issue	**Target Audiences/ Approximate Population**
Oil and grease, hydrocarbons, and related pollutants	Civilian workforce/ 1,730 Active duty military population/8,300
Sediment	Civilian workforce with relevant duties that could impact sediment discharges/100-500
Trash and Litter	Civilian workforce/ 1,730 Active duty military population/8,300 Military Family Members, Retirees, spouses accessing services/112,000

3.0 PUBLIC EDUCATION AND OUTREACH PLANNING

3.1 Outreach Efforts Implemented Previously

A number of public education and outreach efforts or best management practices (BMPs) were initiated for the Installation during previous MS4 General Permit terms by the DPW Environmental Management Division (EMD). Most of these efforts will be continued until the new outreach and education methods described in this Plan are fully implemented. In some cases, the existing BMPs will be adapted and included in the new program. A list of the BMPs included in JBM-HH's 2009 MS4 Program Plan (as updated in January 2013) and the continuation plans for each are summarized in Table 3-1.

Table 3-1. JBM-HH 2009 MS4 Program Plan – MCM #1 BMPs		
BMP #	**BMP Description**	**Continuation Plan**
1.1	Provide information at Environmental Quality Control (EQCC) meetings about water quality and pollution prevention.	Water quality and pollution prevention will continue to be included as discussion topics at quarterly EQCC meetings.
1.2	Publish articles or advertisements in the Pentagram, a weekly publication with a circulation of over 19,000 in the national capital area military community, about seasonal practices to prevent stormwater pollution. Potential topics include fertilizer application (spring), pet cleanup practices (summer), leaf mulching and removal (fall), and use of deicing materials (winter).	EMD will continue to submit articles for publication in the Pentagram that target stormwater pollution prevention practices for base residents and employees.
1.3	Establish an environmental information page on the JBM-HH website that provides tips on pollution prevention, household hazardous waste disposal, recycling opportunities, community environmental events, reporting illegal dumping, etc.	The JBM-HH EMD webpage will be periodically updated with environmental information relevant to stormwater pollution prevention.
1.4	Prepare public education brochures for activities with the potential to contribute to stormwater pollution and a general stormwater pollution awareness brochure for new residents and workers.	Brochures that were previously prepared will be updated and redistributed in 2014.

3.2 Outreach Actions and Methods

The nature of the Installation as a small military base with a large transient population provides a challenge for distributing messages to the Installation's "public". The following methods were deemed feasible for use:

- Printed materials such as brochures, articles in Installation-wide publications, and handouts
- Signage at select locations
- Posting information on the JBM-HH website
- Social media: postings messages on the JBM-HH Facebook Page
- Employee training programs

These methods were selected as the best means to reach an equivalent 20% of each high-priority issue target audience. Table 3-2 presents the relevant messages for public education and outreach efforts and associated educational and outreach materials to be employed for each.

Table 3-2. Public Education and Outreach Messages and Distribution Methods

Pollutant	Messages	Audiences	Distribution Methods
Oil and grease, hydrocarbons, and related pollutants	• Take care of your vehicle - poorly maintained vehicles pollute waterways • Don't overfill fuel tanks • Clean up spills – don't let oils get into storm drains • Use good housekeeping BMPs in work areas to prevent leaks and spills • Properly manage food service waste oil and grease	• Residents • Employees, residents, and non-residents that use fueling facilities • DPW, Fire Department, maintenance shop employees • Food service employees	• Signs • Brochures and Pentagram articles • Employee training • Website and Facebook postings
Sediment	• Sediment pollutes waterways and harms aquatic life • Monitor and maintain sediment controls on construction sites • Don't over-apply deicing sand mix • Maintain roads and parking lots • Do not wash vehicles and equipment in areas that drain to storm drains – have all washwater drain to sanitary system • Report sediment discharges to EMD	• DPW • Construction project managers • Residents and employees	• Brochures and Pentagram articles • Employee training • Website and Facebook postings
Trash and Litter	• Don't litter – what you drop on the ground ends up in storm drains and all drains lead to waterways • Cigarette butts are litter too • Properly dispose of trash and wastes • Recycle as much as you can • Keep dumpsters covered	• Employees • Residents • Non-residents using Installation services	• Signs • Brochures and Pentagram articles • Employee training • Website and Facebook postings

The outreach methods and messages and their success at reaching the target audiences will be evaluated annually. If weaknesses are identified, the methods and messages will be adjusted as needed to better achieve the program goals.

3.3 Public Participation

The DPW EMD is responsible for development and implementation of the Installation's Public Education and Outreach program. Past efforts to generate public participation have not resulted in significant public input. This is likely due in part to the transient nature of most of the Installation's population, which is unlikely to feel connected to the environmental resources of the surrounding areas. Greater efforts will be put forth during this permit term to generate interest in environmental protection and solicit input that can be used to modify the messages and methods for public education and outreach efforts. The distribution methods identified in Section 3.2 will be used to engage the public and solicit input.

4.0 ANNUAL REPORT AND PROGRAM EVALUATION

As required by the MS4 General Permit, the following information will be included in each annual report submitted to the VADEQ:

- A list of the education and outreach activities conducted during the reporting period for each high-priority water quality issue, the estimated number of people reached, and an estimated percentage of the target audience or audiences that will be reached; and
- A list of the education and outreach activities that will be conducted during the next reporting period for each high-priority water quality issue, the estimated number of people that will be reached, and an estimated percentage of the target audience or audiences that will be reached.

APPENDIX E

ILLICIT DISCHARGE DETECTION PROCEDURES

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Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Illicit Discharge Inspections*			
Owner: DPW EMD Stormwater Program Manager	Approved By: Chair, DPW EMD Date: April 2015	Last revised: April 2015	Review Date: April 2015

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for conducting illicit discharge inspections, which is a component of Minimum Control Measure 1: Illicit Discharge Detection and Elimination (IDDE) required under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (9VAC25-890-40 et. seq.). JBM-HH has obtained coverage under this permit (issued as Permit No. VAR040068) for discharges from the municipal separate storm sewer system (MS4) that serves the Fort Myer and Henderson Hall Installations (collectively referred to as the Installation in this SOP). This SOP applies to the Fort Myer and Henderson Hall MS4. The SOP does not apply to Fort McNair.

In accordance with Section II.B.3.c of the General Permit, a program to detect and eliminate illicit discharges, as defined at 9VAC25-870-10, into the regulated small MS4 must be developed and implemented. IDDE programs are designed to prevent contamination of ground and surface water supplies by monitoring, inspection and removal of unauthorized non-stormwater discharges. Information regarding the complete IDDE program for the Installation is contained in the *JBM-HH Municipal Separate Storm Sewer System (MS4) Program Plan for Fort Myer & Henderson Hall Installations*. Additional guidance for conducting the illicit discharge inspections can be found in the publication entitled "*Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*," funded by the Environmental Protection Agency (EPA) cooperative agreement number X-82907801-0 (http://water.epa.gov/polwaste/npdes/stormwater/upload/idde_manualwithappendices.pdf).

ABBREVIATIONS AND DEFINITIONS

1.1 Abbreviations

a. BMP – Best Management Practice
b. DPW – Directorate of Public Works
c. EMD – Environmental Management Division
d. EPA – Environmental Protection Agency
e. HUC – Hydrologic Unit Code
f. IDDE – Illicit Discharge Detection and Elimination
g. mL – milliliter
h. MS4 – Municipal Separate Storm Sewer System
i. ORI – Outfall Reconnaissance Inventory
j. PPE – Personal Protective Equipment
k. SOP – Standard Operating Procedure
l. TMDL – Total Maximum Daily Load
m. VPDES – Virginia Pollutant Discharge Elimination System
n. VSMP – Virginia Stormwater Management Program
o. WLA – Wasteload Allocation

1.2 Definitions

a. *Illicit Discharge* - any discharge to the municipal separate storm sewer system that is not composed entirely of stormwater, except for discharges allowed under a VPDES permit or discharges resulting from firefighting operations.

b. *Measurable Storm Event* – a precipitation event that results in a total measured precipitation accumulation equal to, or greater than, one-tenth (0.1) inch of rainfall and that produces runoff that discharges to the storm sewer system.

2.0 OPERATIONAL PROCEDURES

2.1 Non-Stormwater (Illicit) Discharge Inspections

a. Inspection Requirements

1. There are 24 outfalls that have been identified for the Installation that must be inspected annually.
2. Inspections must be performed during a period when no precipitation or snow melt is occurring and at least 72 hours from the previous measurable storm event.

b. Inspection Locations

1. Refer to Figure 1 for outfall locations.
2. A field survey of the Installation's 24 outfalls identified in Figure 1 has been conducted. A unique identification number has been assigned to each outfall.

The basic characteristics and a photograph of each outfall have been collected and collated into an Outfall Monitoring Guide (Attachment 1).

c. Inspection Procedures

1. Conduct field screening of outfalls and record observations on an Outfall Reconnaissance Inventory (ORI)/Sample Collection Field Sheet (Attachment 2). The observations should include the following:

    i. Record general information in Section 1 (*Background Data*) of the ORI form.

    ii. Observe the conditions surrounding the outfall and determine if flow is present; record presence of flow and the outfall's physical characteristics in Section 2 (*Outfall Description*) of the ORI form.

    iii. If flow or standing water is present, collect a sample using a plastic dipper, telescoping dipper, or swing sampler, as appropriate. Look for the following *physical indicators for flowing outfalls* and record observations in Section 4 of the ORI form:

    - Odor
    - Color
    - Turbidity
    - Floatables (does not include trash)

    iv. Look for the following p*hysical indicators for flowing and non-flowing outfalls* and record observations in Section 5 of the ORI form:

    - Outfall Damage
    - Deposits/Stains
    - Abnormal Vegetation
    - Poor Pool Quality
    - Pipe Benthic Growth (such as algae or other organic matter)

    v. Based on the physical indicators that are observed (such as flow, staining, and deposits), determine the likelihood of illicit discharge and record in Section 6 (*Overall Outfall Characterization)* of the ORI form using the following classifications:

    - Unlikely illicit discharge
    - Potential illicit discharge (presence of 2 or more indicators)
    - Suspect illicit discharge (1 or more indicators with severity of 3)
    - Obvious illicit discharge

    vi. Note any non-illicit discharge concerns (e.g., trash, maintenance repairs, etc.) and record in Section 8 of the ORI form.

2. At flowing outfalls, trace the source of the flow by working back up the storm sewer system via manholes and inlets. Attempt to trace the source while outfalls are actively flowing, but no later than one week after the initial illicit discharge is observed.
    i. Investigate illicit discharges suspected of being sanitary sewage or significantly contaminated first.
    ii. Investigations of illicit discharges suspected of being less hazardous to human health and safety may be delayed until they have been investigated, eliminated, or identified.
    iii. No further action is required for discharges authorized under a separate VPDES permit.

2.2 Inspection Supplies

a. Inspection equipment
    - ORI Forms (see Attachment 2)
    - Tool for removing manhole covers
    - Plastic dipper
    - Telescoping dipper
    - Swing sampler with clean *1,000 milliliter (mL) plastic sampling container
b. Personal Protective Equipment (PPE)
    - Work gloves
    - Steel-toed boots

2.3 Safety Considerations

a. Always wear steel-toed boots to protect feet from possible crushing injuries while handling the manhole covers.
b. Use proper lifting techniques when removing manhole covers to prevent back injury.
c. Use extreme caution when working over open manhole structure; no part of your body should enter the plane created by the manhole opening as this would constitute confined space entry.
d. DO NOT enter manhole or outfall structures under any conditions.

2.4 Post Inspection Notifications and Actions

a. If outfall inspections identify illicit discharges, follow-up investigations should be conducted to identify their source(s). Investigations must be documented in a tracking system including:
   - The date(s) that the illicit discharge was observed and reported
   - The results of the investigation
   - Any follow-up to the investigation
   - Resolution of the investigation
   - The date that the investigation was closed

b. Once the source of an illicit discharge (if any) is detected, necessary measures must be taken to fix or eliminate the discharge. EMD will notify the DPW with operational control over the source of the discharge and discuss corrective actions. EMD will verify through follow-up investigations that illicit discharges have been eliminated.

c. Update GIS system and JBM-HH Stormwater Outfall Monitoring Guide (Attachment 1) annually with new storm sewer system/outfall information as changes occur.

3.0 RECORDKEEPING AND REPORTING REQUIREMENTS

3.1 Recordkeeping Requirements

a. Complete the ORI form (Attachment 2) for each outfall. These forms shall be maintained in the EMD files.

3.2 Reporting Requirements

a. None.

4.0 RESPONSIBILITIES

4.1 EMD

a. EMD is responsible for all of the inspection procedures described in the SOP.

5.0 FIGURES

Figure 1: Outfall Monitoring Location Map

6.0 ATTACHMENTS

Attachment 1: JBM-HH Stormwater Outfall Monitoring Guide

Attachment 2: Outfall Reconnaissance Inventory/Sample Collection Field Sheet

Figure 1

Fort Myer and Henderson Hall Outfall Monitoring Location Map

Attachment 1

JBM-HH Stormwater Outfall Monitoring Guide

Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide					
Outfall No.	**Drainage Area**	**Monitoring Point Description**	**Land Use**	**Notes**	**Photograph**
001	POT – CEM/PENT	24-inch RCP w/headwall Structure #1838	Marshall Dr., N. Meade St., canopy for Wright Gate. Suspect that foundation drainage for apartment buildings at NW corner of Marshall Dr. and N. Meade St. is discharged to outfall No industrial activities	Long-handled dipper required to collect monitoring samples.	
002	POT – CEM/PENT	4' x 4' drop inlet structure Structure #1887 Suspect that 6-inch PVC pipe entering structure on W side is from septic field.	Marshall Dr., VCP roof drainage, Bldg 305 yard area. No industrial activities	Stormwater will have to be inspected visually from grate; not accessible for sample collection. Flashlight needed for inspection. 2 pipes coming into structure	
003	POT – CEM/PENT	Manhole structure off NE corner of parking area that is N of Bldg 325. 30-inch RCP Structure #1869	Equipment storage yard, equipment parking area, Marshall Dr., yard and parking areas for Bldgs 306, 312, 313, 318, and others Industrial activities **Outfall covered under VPDES Industrial General Permit**	Will need J-hook or crow bar to remove manhole cover and cable sampler or long-handled dipper to collect samples (invert is ~12-feet deep). Key needed for fence enclosure	
004 **Not Monit-ored**	POT – CEM/PENT	24-inch RCP Structure #1858	Former drainage areas have been re-routed to partial underground detention basin. Remaining pipe drainage is from naturally-occurring sources Industrial activities	Located on E of retaining wall for Bldg 325 access road. Pipe is damaged and broken upstream of outfall	

Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide					
Outfall No.	**Drainage Area**	**Monitoring Point Description**	**Land Use**	**Notes**	**Photograph**
005	POT – CEM/PENT	24-inch RCP w/headwall Structure #1833	Bldg 330 fueling station (TMP), bus parking; outfall for stormwater basin that receives discharges from fueling station OWS. Industrial activities **Outfall covered under VPDES Industrial General Permit**	Located on E side of retaining wall that is E of Bldg 330 fueling station.	
006 **Not Monit-ored**	POT – CEM/PENT	30-inch RCP w/headwall Structure #2739 **Property transferred to ANC; outfall destroyed during Millennium burial site construction.**	Originally received drainage from open grassy space, Lee Ave., Hospital Ln., residence structures on Lee Ave., and Summerall Field. All drainage apparently re-routed to Millennium underground stormwater basin. No industrial activities	Located east of McNair Rd., ~ 900 ft S of bunkers and SW of picnic shelter. Discharge quantity should be evaluated to determine if outfall should be eliminated from monitoring program.	
006a **Not Monit-ored**	POT – CEM/PENT	Drainage ditch flowing into channel downstream of outfall 006. **Property transferred to ANC; outfall destroyed during Millennium burial site construction.**	Grassy areas and tree-lined ditch north of Post Chapel (Bldg. 335) No industrial activities	Located adjacent to Outfall 006	
007	POT – CEM/PENT	Drainage ditch outlet for Post Chapel parking lot.	Parking lot drainage from Post Chapel parking and roof drainage. No industrial activities	NE corner of Post Chapel rear parking lot.	

Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide					
Outfall No.	**Drainage Area**	**Monitoring Point Description**	**Land Use**	**Notes**	**Photograph**
008	FMR- LLB	Henderson Hall outfall; ~28-inch RCP	Henderson Hall – roadway and parking areas around Buildings 26 (MCX) and 31 No industrial activities	Located outside of HH fence; will need to be accessed from Columbia Pike to Rte 27 access ramp.	
009	FMR- LLB	Parking lot stormwater flood basin emergency bypass Outfall is 36” RCP adjacent to 72” concrete box culvert that carries Long Branch. Outfall is outside of fence line. Observation point is new inlet/manhole structure installed 2010 during MCX reconstruction. Structure has twin 24” CMP entering on N side and single 32” RCP entering from W side	Henderson Hall; mixed use buildings, paved parking and roadway areas, and grassy yard areas Some industrial activities (material storage)	~~Monitoring point is inlet structure in parking lot stormwater basin~~. Original outlet removed during MCX reconstruction; new overflow structure installed with same final discharge location	
010	FMR- LLB	Stormwater inlet at end of concrete flume	Henderson Hall; parking and storage areas around Building 12. Includes discharges from material storage areas and access areas for hazwaste storage building No industrial activities	Basin outfalls to Long Branch in area where stream is enclosed in piping. Will need J-hook to remove inlet grate and long handled dipper to collect monitoring samples.	

Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide					
Outfall No.	**Drainage Area**	**Monitoring Point Description**	**Land Use**	**Notes**	**Photograph**
011	FMR- LLB	30-inch RCP Structure # TBD	Parking and roadway areas around Bldgs 523 and 525, drainage along Carpenter Rd., No industrial activities	Steep grassy slope leading to outfall	
012	FMR- LLB	Outlet for stormwater basin W of Bldg 523. 48-inch RCP Structure # TBD	Parking lots and roadway areas surrounding Bldg 523 No industrial activities	Monitoring point is outlet structure for SWM basin. Key needed to open gate to fence around basin. Gate is on south end of basin. Steep grassy slope leading to outfall.	
013	FMR- LLB	18-inch RCP w/headwall Structure # 637 (previous survey #)	Grassy areas and some roadway drainage around Hatfield Gate vehicle inspection station. No industrial activities	Located ~150 feet W of SW corner of vehicle inspection loop	
014	FMR- LLB	18-inch RCP Structure # TBD	Roadway drainage around Hatfield Gate vehicle inspection station. No industrial activities	Located W of exit for vehicle inspection loop onto Carpenter Rd.	

Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide					
Outfall No.	**Drainage Area**	**Monitoring Point Description**	**Land Use**	**Notes**	**Photograph**
015	FMR- LLB	60-inch RCP Structure #7717	Boiler plant area (Bldg 447), loading area for heating oil USTs at Boiler Plant, Public Works storage yard, 90-Day HazWaste storage area, parking, roadways, and roof drainage from many buildings (404-406, 439, 441, 451-453, 469, etc.) Industrial activities	Located in grassy area ~200 ft S on Bldg 468 and across Sheridan Ave. from Boiler Plant entrance. Will need J-hook to remove inlet grate and cable sampler to collect monitoring samples. May need to be observed through open grate.	
016	FMR- LLB	36-inch RCP Structure #7876	Parking, roadways, and roof drainage from many buildings 59, 400, 450, 480, 482. No industrial activities	Only accessible monitoring point is inlet in loading dock area for Bldg 450 (Post Exchange). Deep manhole (~12 ft). Will need J-hook to remove inlet grate and cable sampler to collect monitoring samples.	
017, 017a	FMR- LLB	017 – 18-inch RCP Structure #7715-A 017a – 12-inch RCP Structure #7716-A	015 – Runoff from parking areas, roadways and roof drains around Bldgs 414 and 415 015a – Parking on south end of Bldg 415 No industrial activities	Located off SW corner of parking lot that is south of Bldg 415. Both pipes are more than half full of sediment.	
018	POT- RR	15-inch RCP Structure #6826	Drainage from Forrest Cir. roadway areas around Bldg 238 No industrial activities	W of SW corner of Bldg 238 at end of concrete ditch near horse paddock gate. Pipe is inside inlet structure. Long-handled dipper needed.	

Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide					
Outfall No.	**Drainage Area**	**Monitoring Point Description**	**Land Use**	**Notes**	**Photograph**
019	POT- RR	18-inch RCP Structure #6818 Pipe invert is 12.8-feet deep	Drainage from areas around Bldgs 233 and 236. Outfall receives drainage from horse stables	W of Bldg 233 on W side of Forrest Cir., down the slope ~30 ft. Will need J-hook to remove manhole cover and cable sampler or long-handled dipper to collect samples.	
020	POT- RR	15-inch RCP Structure #6808	Vehicle wash bay, Auto Craft Shop, horse paddock area, horse stables, roadway drainage. Industrial activities	Monitoring point is inlet W of Bldg 227 by wash bays. J-hook needed to remove inlet cover and long handled dipper required to collect sample. Pipe invert is ~7-feet deep	
021	POT- RR	30-inch RCP Structure # TBD	Roadway, parking, and lawn areas surrounding Building 205; inlets in lawn area west of Building 273 (dog kennel) Outfall receives drainage from area surrounding dog kennels	Outfall for Bldg 205 SWM basin, located N of Bldg 205 and NW of Bldg 272 beyond fenceline.	
022	POT- RR	12-inch terracotta DS from Structure #1777	Drainage from Washington Ave. and grassy lawn areas E and NE of Bldg 01. No industrial activities	Access is off-base, W of intersection of 12th St. and N. Rolfe St. on hillside NE of Bldg 01	

Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide					
Outfall No.	**Drainage Area**	**Monitoring Point Description**	**Land Use**	**Notes**	**Photograph**
023	POT – CEM/PENT	15-inch RCP Manhole on east side of Carpenter Road, across from southeast corner of parking garage	Drainage from Henderson Hall including parking garage, roadways, parking lots, and roof drainage from Building 27 No industrial activities	Monitoring point is manhole for 15-inch RCP that runs along Carpenter Road; outfall is to Arlington County MS4	
024	POT – CEM/PENT	15-inch RCP Manhole located in outdoor patio on east side of theater	Drainage from Henderson Hall including roadways, parking lots, and roof drainage from Buildings 29 and 30, Theater, parking garage, and Physical Fitness Center No industrial activities	Monitoring point is manhole for 15-inch RCP south of Building 29; outfall is to Arlington County MS4	
025	FMR- LLB	24-inch RCP Manhole in grassy area southwest of Hatfield Gate, just inside fence	Drainage from roadway areas along Carpenter Road	Monitoring point is manhole in grassy area southwest of Hatfield Gate, just inside fence. Pipe discharges to Lower Long Branch on east side of headwall for 2nd St. So. culvert	

Attachment 2

Outfall Reconnaissance Inventory/Sample Collection Field Sheet

OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

Subwatershed:		Outfall ID:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.): Last 24 hours:	Last 48 hours:	
Latitutde:	Longitude:	GPS Unit:	GPS LMK #:
Camera:		Photo #s:	

Land Use in Drainage Area (Check all that apply):

- ☐ Industrial
- ☐ Ultra-Urban Residential
- ☐ Suburban Residential
- ☐ Commercial
- ☐ Open Space
- ☐ Institutional
- Other: _____
- Known Industries: _____

Notes (e.g.., origin of outfall, if known):

Section 2: Outfall Description

LOCATION	MATERIAL	SHAPE		DIMENSIONS (IN.)	SUBMERGED
☐ **Closed Pipe**	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: _____	☐ Circular ☐ Eliptical ☐ Box ☐ Other: _____	☐ Single ☐ Double ☐ Triple ☐ Other: _____	Diameter/Dimensions: _____	In Water: ☐ No ☐ Partially ☐ Fully With Sediment: ☐ No ☐ Partially ☐ Fully
☐ **Open drainage**	☐ Concrete ☐ Earthen ☐ rip-rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____		Depth: _____ Top Width: _____ Bottom Width: _____	
☐ **In-Stream**	**(applicable when collecting samples)**				
Flow Present?	☐ Yes	☐ No	***If No, Skip to Section 5***		
Flow Description (If present)	☐ Trickle	☐ Moderate	☐ Substantial		

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS				
PARAMETER		**RESULT**	**UNIT**	**EQUIPMENT**
☐Flow #1	Volume		Liter	Bottle
	Time to fill		Sec	
☐Flow #2	Flow depth		In	Tape measure
	Flow width	_____' _____"	Ft, In	Tape measure
	Measured length	_____' _____"	Ft, In	Tape measure
	Time of travel		S	Stop watch
Temperature			°F	Thermometer
pH			pH Units	Test strip/Probe
Ammonia			mg/L	Test strip

Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in outfall flow
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	
Abnormal Vegetation	☐	☐ Excessive ☐ Inhibited	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

Section 6: Overall Outfall Characterization

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

Section 7: Data Collection

1.	Sample for the lab?	☐ Yes	☐ No			
2.	If yes, collected from:	☐ Flow	☐ Pool			
3.	Intermittent flow trap set?	☐ Yes	☐ No	If Yes, type:	☐ OBM	☐ Caulk dam

Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)? _____

_____

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APPENDIX F

STORMWATER MANAGEMENT FACILITY INSPECTION PROCEDURES

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JOINT BASE MYER – HENDERSON HALL
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PROGRAM PLAN

APPENDIX F

STORMWATER MANAGEMENT FACILITY OPERATION AND MAINTENANCE PLAN

FOR
FORT MYER & HENDERSON HALL INSTALLATIONS
FORT MYER, VIRGINIA
AND
FORT MCNAIR, WASHINGTON, DC

Prepared by:
JBM-HH Directorate of Public Works, Environmental Management Division

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Wet Ponds

Detention Structures

Bioretention Areas

Filterra® Stormwater Bioretention Filtration Systems

BaySaver Technologies© BaySeparator™ System

StormFilter® Systems

Oil-Water Separators

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1.0 INTRODUCTION

JBM-HH owns and operates a municipal separate storm sewer system (MS4) that serves U.S. Army Installation Fort Myer (Fort Myer) and the USMC installation at Henderson Hall (Henderson Hall), which are jointly referred to as 'the Installation' in this Plan. Discharges from Installation's MS4 are covered under the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (General Permit). Minimum Control Measure (MCM) 5 of General Permit requires MS4 operators to prepare and implement a plan for inspecting and maintaining stormwater management facilities. A stormwater management facility is defined in 9VAC25-870-10 as "a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow."

This document presents the operation of maintenance plan for the Installation's stormwater management facilities. Written inspection, operations, and maintenance protocols to provide for long-term operation and maintenance of stormwater maintenance facilities discharging to JBM-HH's MS4 system are contained in this plan. The Installation has a variety of stormwater management facilities to treat runoff before it is discharged to the MS4 system.

Although not covered under the Virginia General Permit, Fort McNair in Washington, DC is part of the JBM-HH command. To provide a comprehensive and consistent management plan for all of the stormwater facilities in the JBM-HH command, the Fort McNair stormwater management facilities have been included in this plan.

2.0 INSTALLATION CHARACTERISTICS

JBM-HH is located in the Washington, D.C. metropolitan area and was created from the administrative reorganization of the Fort Myer Military Community (Fort Myer and Fort McNair) and the U.S. Marine Corps (USMC) Headquarters Battalion Henderson Hall (Henderson Hall) as a result of Base Area Realignment and Closure (BRAC) 2005 recommendations. Fort Myer and Henderson Hall are located in Arlington, Virginia, directly across the Potomac River from Washington, D.C.; Fort McNair is located in Southwest Washington, D.C. at the confluence of the Washington Channel of the Potomac River and the Anacostia River.

The Installation is home to the 3rd U.S. Infantry Regiment (The Old Guard) and the USMC Headquarters Battalion structured within the Marine Corps National Capital Region Command. Joint Base Myer-Henderson Hall provides installation services and support to military members, civilians, retirees, and their families with a quality of life commensurate with the quality of their service.

The land area served by the Installation's MS4 encompasses approximately 270 acres. Stormwater from all areas of the Installation discharges to the Installation's MS4, which is interconnected with the MS4s for Arlington County and Arlington National Cemetery (ANC). There are no natural surface water bodies present within the fence line of the Installation. A portion of a Lower Long Branch tributary runs in an enclosed culvert along the southern boundary of the Installation. Stormwater management facilities, including aboveground detention basins and bioretention areas, underground retention vaults, sand filters and oil/water

separators, Filterra filtration systems, and rain gardens, currently treat runoff from approximately 100 acres of the Installation[1].

Fort McNair has 7 BaySaver® proprietary storm water treatment devices, and several stormwater detention and bioretention areas.

3.0 JBM-HH-OWNED STORMWATER MANAGEMENT FACILITIES

Stormwater management facilities owned by JBM-HH are inspected and maintained by DPW, with support from EMD. EMD has developed standard operating procedures (SOPs) for each type of stormwater management facility at JBM-HH. The SOPs for the following stormwater management facilities are included as Appendix A:

Table 1. Stormwater Management Facilities at Fort Myer and Henderson Hall.

Stormwater Management Facility Type	Location
Sand Filter	B314 vehicle maintenance facility
	B419 barracks
Detention Structures	Henderson Hall underground pipe detention
	B205 partial underground dry extended detention basin
	B325 partial underground dry extended detention basin
	B314 underground detention/infiltration basin
	Millennium underground detention basin
	B419 and 421 underground detention basin
	Radnor Heights Substation underground detention vault
Wet Ponds	B330 Fueling Station Pond
	Long Branch Detention Basin (west of B523)
Bioretention Areas	Wright Gate vehicle inspection station bioretention
	Radnor Heights Substation
	Memorial Chapel rain gardens
Filterra® Systems	Hatfield Gate vehicle inspection loop
	Radnor Heights Substation
StormFilter® Stormwater Treatment Device	Radnor Heights Substation
Oil-Water Separator	B330 fueling station

[1] The acreage of land treated by stormwater management facilities is currently being calculated by the US Army Corps of Engineers. Final acreage will be updated when available.

Table 2. Stormwater Management Facilities at Fort McNair.	
Stormwater Management Facility Type	**Location**
BaySaver Technologies® BaySeparator™ Stormwater Filtration System	B64 parking lot and roadways (4 units)
	B62 entrance area (1 unit)
	B28/3rd Avenue (1 unit)
Detention Structures	Between 4th Avenue and 5th Avenue, south of residences
	3rd Avenue extended detention
Bioretention Areas	Northeast of B69
	Southeast of B62

Additional SOPs will be developed as new stormwater management facilities are installed.

3.1 Inspections

Inspections of stormwater management facilities must take place at least twice annually. Inspections shall be documented on the form provided by EMD. A separate form should be completed per inspection for each stormwater management facility. Copies of completed inspection forms should be submitted to EMD. Refer to the SOPs contained in Appendix A for specific inspection schedules and inspection and maintenance forms.

3.2 Maintenance

Maintenance of stormwater management facilities shall be performed as necessary and to the manufacturer's or designer's specifications, as appropriate. Maintenance activities must be documented on the form provided by EMD. Refer to the SOPs contained in Appendix A for specific maintenance requirements and maintenance forms.

Large-scale maintenance involving land-disturbing activities must be permitted by the appropriate regulatory authorities and approved by EMD.

3.3 Duties and Responsibilities

Inspections and maintenance are the responsibility of DPW. DPW shall document all inspection and maintenance activities at each stormwater management facility on forms provided by the EMD. Completed forms shall be submitted to EMD within seven days of the date on which the inspection or maintenance activities were performed. EMD will maintain all inspection and maintenance records as they are provided by DPW.

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Appendix A

Stormwater Management Facility Inspection and Maintenance Standard Operating Procedures

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Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Sand Filters*			
Owner: EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD Date: April 2015	Last revised: April 2015	Review Date: April 2015

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for performing inspections and maintenance of sand filters located at Buildings 314 and 419. Written inspection and maintenance procedures for stormwater management facilities, including sand filters, are a component of Minimum Control Measure (MCM) 5: Post-construction stormwater management in new development and development on prior developed lands. This MCM is required under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (9VAC25-890-40 et. seq.). JBM-HH has obtained coverage under this permit (issued as Permit No. VAR040068) for discharges from the municipal separate storm sewer system (MS4) that serves the Fort Myer and Henderson Hall Installations (collectively referred to as “the Installation” in this SOP).

In accordance with Section II.B.5.c.2 of the General Permit, the Installation must provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan. This and other SOPs specifically developed for the stormwater management facilities present onsite serve as written guidance to Installation staff on how to properly inspect and maintain Installation-owned stormwater management facilities.

Sand filters are multi-chambered vaults used to hold stormwater and gradually filter out particulates. In the first chamber, also referred to as the sedimentation chamber, stormwater enters slowly, and large particles settle to the bottom. Stormwater continues to the next chamber, which contains sand to filter smaller particles as stormwater passes through. Filtered stormwater may be discharged directly from this chamber, or it may be stored in a third chamber and discharged gradually.

Sand filters may be constructed with two or more vaults. As the number of vaults in sand filters increase, so do the levels of filtration. Sand filters are especially useful in areas prone to generating contaminated stormwater runoff, such as the TOG Maintenance Facility. Though called sand filters, they may contain organic media filters instead of sand.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. DPW – Directorate of Public Works
b. EMD – Environmental Management Division
c. MS4 – Municipal Separate Storm Sewer System
d. PPE – Personal Protective Equipment
e. SOP – Standard Operating Procedure

2.2 Definitions

a. *Sand filter* – an underground chambered treatment system using a combination of gravel, sand, and filter fabrics to filter particulates from stormwater runoff.

b. *Stormwater Management Facility* - a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

3.0 OPERATIONAL PROCEDURES

3.1 Inspections

a. Inspection Requirements

1. Sand filters at the Installation must be inspected at least three times annually:
    i. One inspection must be performed during a period when no precipitation or snow melt is occurring and at least 72 hours from the previous measurable storm event.
    ii. The second inspection must be performed during a period of active precipitation.
    iii. The third inspection must be performed within 24 hours of a storm that exceeds 0.5” of rainfall.

b. Inspection Locations

1. Refer to Figure 1 for locations of sand filters at the Installation.

c. Inspection Procedures

1. Conduct visual field screening of sand filters and record observations on an Inspection and Maintenance Record (Attachment 1). The observations should include the following:
    i. Cracks, spalling, or other signs of deterioration in the concrete above the sand filter
    ii. Visible damage or obstructions in inlets, outlets, and overflow spillway
    iii. Excessive erosion in areas draining to the sand filter
    iv. Detectable odors
    v. Observations of the chambers:
        1. Presence of standing water in chambers 72+ hours after rain
        2. Filter chamber is clean of sediment; sediment in sedimentation chamber is no more than 6-inches tall
        3. Filter bed is level and free of trash and debris
        4. Visible damage or deterioration of structural components
    vi. Trash and debris in control openings
2. Based on the physical inspection, determine if maintenance activities are required.
    i. Submit a Work Request (Form 4283) with photos to DPW detailing inspection observations and solutions.
    ii. Work that requires entering sand filter chambers must be performed by a qualified contractor.

d. Inspection Supplies

1. Inspection equipment
    - Inspection and Maintenance Record (see Attachment 1)
    - Camera
2. Personal Protective Equipment (PPE)
    - Work gloves
    - Steel-toed boots

3.2 Typical Required Maintenance

a. Maintenance is only required on an as-needed basis, determined through regular inspection of sand filters.

Sand Filters	
Inspection Finding	**Maintenance Required**
Cracks, spalling, or other signs of deterioration in the concrete above the sand filter	Fill cracks in concrete to prevent further damage.
Visible damage to inlets, outlets, and overflow spillway	Repair inlets, outlets, and overflow devices to ensure their functionality.
Excessive erosion in areas draining to the sand filter	Replant and/or re-mulch eroded areas to limit the amount of sediment being conveyed to the sand filter.
Detectable odors	Repair chambers to keep them sealed.
Standing water observed in chambers 72+ hours after rain	Contact contractor to remove water, replace filter media, and remove blockages.
Filter chamber and sedimentation chamber contain excess sediment	Contact contractor to remove excess sediment.
Filter bed is uneven and/or contains debris	Contact contractor to replace filter media and remove trash and debris.
Visible damage or deterioration of structural components	Contact contractor to initiate repairs.
Trash and debris in control opening	Remove trash and debris.

b. Underground sand filters should be cleaned and pumped out annually by a contractor.
c. Record all maintenance activities on an Inspection and Maintenance Record (Attachment 1)

3.3 Safety Considerations

a. Always wear steel-toed boots to protect feet from possible crushing injuries while handling the sand filter covers.
b. Use proper lifting techniques when removing sand filter covers to prevent back injury.
c. Use extreme caution when working over open sand filter chambers; no part of your body should enter the plane created by the opening, as this would constitute confined space entry.
d. DO NOT enter sand filter chambers under any conditions.

4.0 RECORDKEEPING AND REPORTING REQUIREMENTS

4.1 Recordkeeping Requirements

a. Complete the Inspection and Maintenance Record (Attachment 1) for each inspection and maintenance activity. DPW shall maintain these forms and their associated Work Requests.

4.2 Reporting Requirements

a. DPW shall provide EMD with written records of inspection and maintenance activities within seven days of the date the activity was performed.

5.0 RESPONSIBILITIES

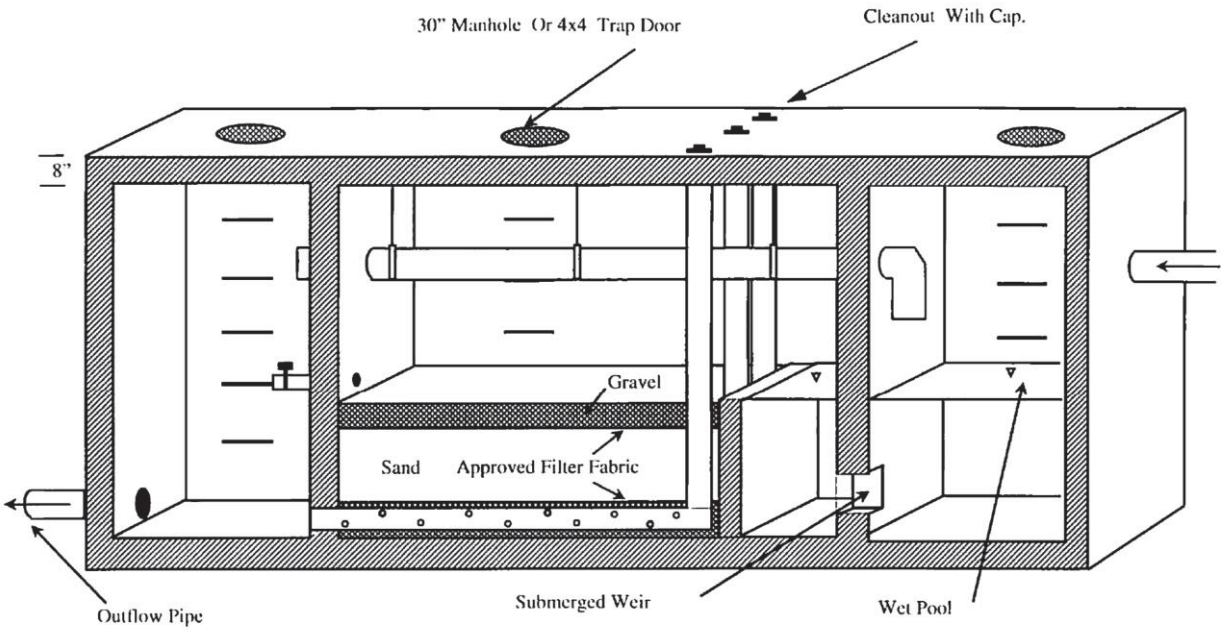
5.1 DPW

a. DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

b. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

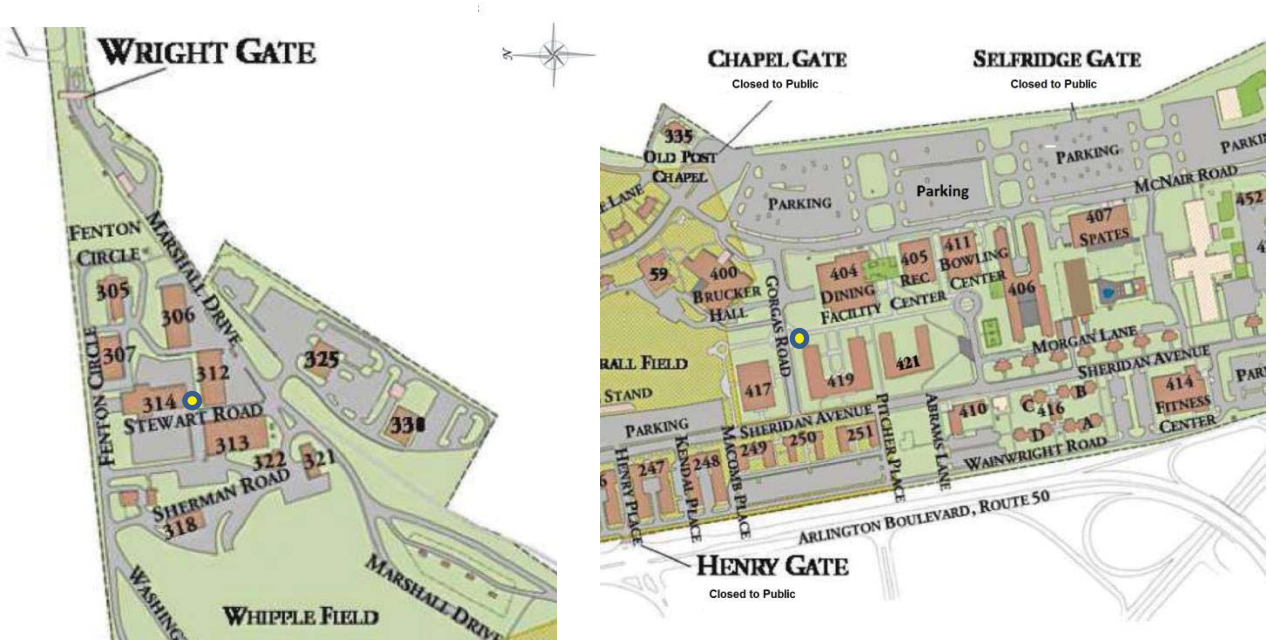
6.0 FIGURES



Section A-A (3D)
NTS

Source: District of Columbia, 2001

Figure 1: Typical Sand Filter Diagram



Sand Filter Location

Figure 2: Sand Filter Location Map

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

Attachment 1

Inspection and Maintenance Record

ATTACHMENT 1 – SAND FILTER INSPECTION AND MAINTENANCE RECORD

Sand Filter Location:_____ Structure No. _____

Technician(s): _____ Date:_____

Date of last storm/total rainfall: _____ Current weather: _____

Y	N	Observation	Maintenance Performed/ Maintenance Required
		Are cracks, spalling, or other signs of deterioration in the concrete above the sand filter present?	
		Is there evidence of erosion in areas draining to the sand filter?	
		Are there any odors coming from the vault?	
		Is standing water present inside vault chambers 72+ hours after rain?	
		Are vault chambers full of sediment or debris?	
		Is the filter bed uneven?	
		Is there a petroleum odor or sheen?	
		Is there visible damage or deterioration of structural components, including vault walls, pipes, or manhole covers?	
		Has maintenance on the detention vault been performed in the last year?	

Other notes (use back if necessary):

Follow-up inspection required?
___ Y ___ N

Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Wet Ponds*			
Owner: EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD Date: April 2015	Last revised: April 2015	Review Date: April 2015

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for performing inspections and maintenance of wet ponds. Written inspection and maintenance procedures for stormwater management facilities, such as wet ponds, are a component of Minimum Control Measure (MCM) 5: Post-construction stormwater management in new development and development on prior developed lands. This MCM is required under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (9VAC25-890-40 et. seq.). JBM-HH has obtained coverage under this permit (issued as Permit No. VAR040068) for discharges from the municipal separate storm sewer system (MS4) that serves the Fort Myer and Henderson Hall Installations (collectively referred to as "the Installation" in this SOP).

In accordance with Section II.B.5.c.2 of the General Permit, the Installation must provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan. This and other SOPs specifically developed for the stormwater management facilities present onsite serve as written guidance to Installation staff on how to properly inspect and maintain Installation-owned stormwater management facilities.

Wet ponds are designed to store stormwater from significant rainfall events. Stormwater from large storms flows into wet ponds via the Installation's stormwater drainage system, where it infiltrates the soil or evaporates slowly, leaving behind pollutants and particulates. Besides infiltrating, stormwater is discharged from the pond through overflow structures, which allow excess flows to discharge during heavy storms when stormwater enters basins faster than it can be evaporated or infiltrated.

In addition to functioning as a stormwater management device, wet ponds may provide aesthetic value and wildlife habitat.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. DPW – Directorate of Public Works
b. EMD – Environmental Management Division
c. MS4 – Municipal Separate Storm Sewer System
d. PPE – Personal Protective Equipment
e. SOP – Standard Operating Procedure

2.2 Definitions

a. *Wet pond* – a permanently wet basin designed to store stormwater. Stormwater residence time in wet ponds is long, allowing stormwater to infiltrate or evaporate; overflow structures discharge stormwater in significant rain events to nearby storm sewers and outfalls. Wet ponds are also known as retention basins.

b. *Stormwater Management Facility* - a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

3.0 OPERATIONAL PROCEDURES

3.1 Inspections

a. Inspection Requirements

1. Wet ponds at the Installation must be inspected three times annually.
   i. One inspection must be performed during a period when no precipitation or snow melt is occurring and at least 72 hours from the previous measurable storm event.
   ii. The second inspection must be performed during a period of active precipitation.
   iii. The third inspection must be performed within 24 hours of a storm that exceeds 0.5” of rainfall.

b. Inspection Locations

1. Refer to Figure 1 for locations of wet ponds at the Installation.

c. Inspection Procedures

1. Conduct field screening of wet ponds and record observations on an Inspection and Maintenance Record (Attachment 1). Observations of wet ponds should include the following:
    i. Excessive algae, vegetation growth or undesirable invasive vegetation species (e.g. cattails and phragmites) within or around the perimeter of the permanent pool
    ii. Woody vegetation growing on the upstream or downstream face of the pond embankment, within 25 feet of the outlet control structure, and at inlet and outlet channels
    iii. Visible damage or obstructions in inlets, outlets, and riser structure/overflow spillway (e.g. leaks, clogs, or corrosion) including riprap protection at inlets and outlets
    iv. Erosion in areas draining to the wet pond and/or along sloped sides of the wet pond
    v. Structural damage to the wet pond or its components, including damage due to animal burrows, and cracks or sinkholes on the dam embankment
    vi. Sediment accumulation
    vii. Signs of petroleum contamination
    viii. Overgrowth and weeds on side slopes and dam embankment
    ix. Trash and debris.
2. Based on the physical inspection, determine if maintenance activities are required.
    i. Submit a Work Request (Form 4283) with photos to DPW detailing inspection observations and work description.

d. Inspection Supplies

1. Inspection equipment
    - Inspection and Maintenance Record (see Attachment 1)
    - Camera
2. Personal Protective Equipment (PPE)
    - Work gloves
    - Work boots

3.2 Typical Required Maintenance

a. Maintenance is only required on an as-needed basis, determined through regular inspection of wet ponds.

Wet Ponds	
Inspection Finding	**Maintenance Required**
Excessive algae, vegetation growth, or undesirable invasive vegetation	Remove excessive vegetation; if excessive algae growth is present, review fertilizer application practices in upstream areas.
Woody vegetation growing on the upstream or downstream face of the pond's embankment, within 25 feet of the outlet control structure, and at inlet and outlet channels	Remove woody vegetation
Visible damage or obstructions in inlets, outlets, riser structure/overflow spillway including riprap protection at inlets and outlets	Remove obstructions and repair damage to restore function.
Erosion in areas draining to the wet pond and/or along sloped sides of wet pond	Repair and replant eroded areas.
Structural damage to the wet pond or its components, including damage from animal burrows , and cracks or sinkholes on the dam embankment	Make repairs to return wet pond to original design.
Sediment accumulation	Excavate excess sediment to return wet pond to original design.
Signs of petroleum contamination	Trace the source of contamination and implement controls to prevent future contamination.
Overgrowth and weeds on side slopes and dam embankment	Mow grassy areas and remove weeds.
Trash and debris present in wet pond.	Perform more regular trash pickup.

b. Record all maintenance activities on an Inspection and Maintenance Record (Attachment 1)

3.3 Safety Considerations

a. Always wear work boots that provide ankle support. Wet ponds have sloped sides, which may be difficult to walk on. Wet, slippery vegetation may also be present.

4.0 RECORDKEEPING AND REPORTING REQUIREMENTS

4.1 Recordkeeping Requirements

a. Complete the Inspection and Maintenance Record (Attachment 1) for each inspection and maintenance activity. DPW shall maintain these forms and their associated Work Requests.

4.2 Reporting Requirements

a. DPW shall provide EMD with written records of inspection and maintenance activities within seven days of the date the activity was performed.

5.0 RESPONSIBILITIES

5.1 DPW

a. DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

b. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES

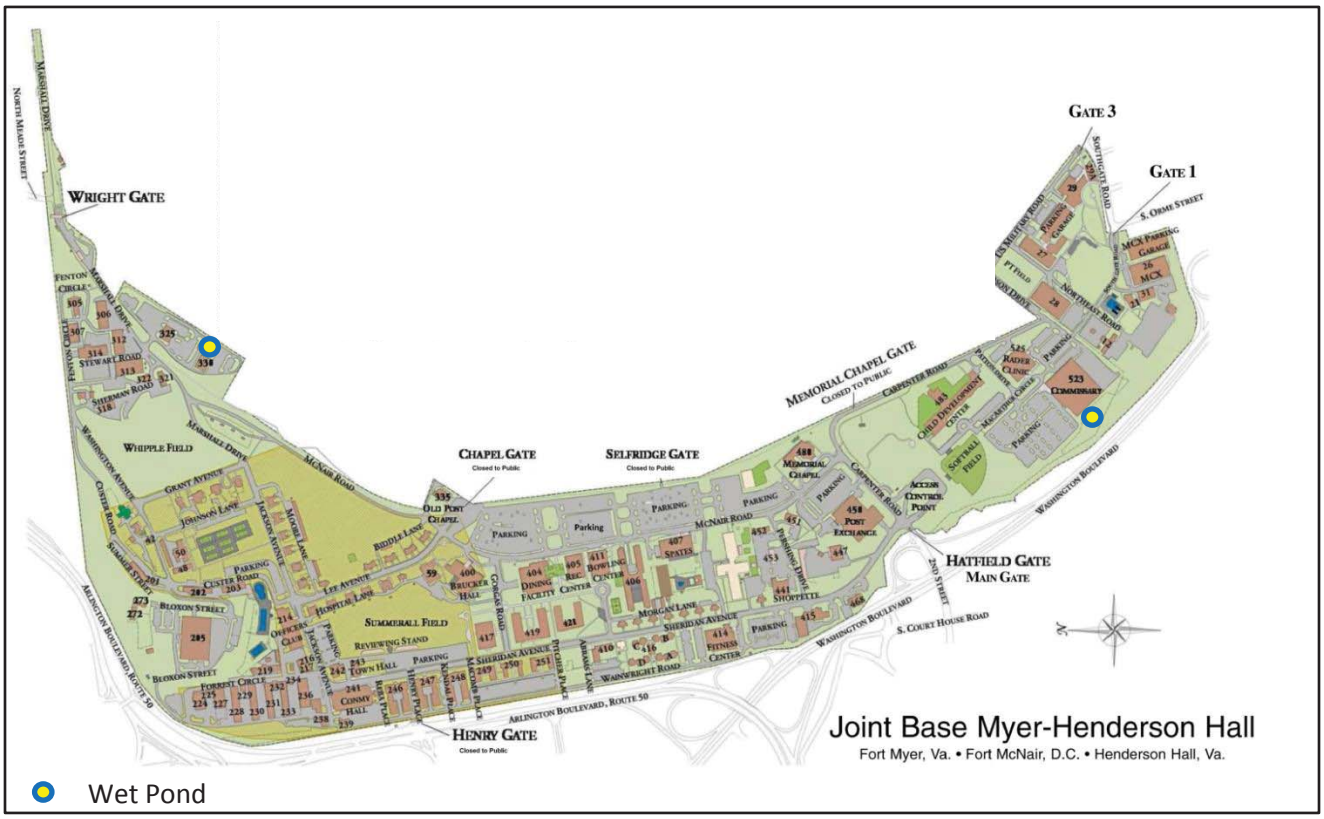


Figure 1: Wet Pond Location Map

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

Attachment 1

Inspection and Maintenance Record

ATTACHMENT 1 – WET POND INSPECTION AND MAINTENANCE RECORD

Wet Pond Location:_____ Structure No. _____

Technician(s): _____ Date:_____

Date of last storm/total rainfall: _____ Current weather: _____

Y	N	Observation	Maintenance Performed/ Maintenance Required
		Is there excessive algae, vegetation growth or undesirable invasive vegetation?	
		Is there woody vegetation growing on the upstream or downstream face of the pond embankment, within 25 feet of the outlet control structure, and at inlet and outlet channels?	
		Is there visible damage or obstructions in inlets, outlets, and riser structure/overflow spillway, or riprap protection?	
		Is there evidence of erosion in areas draining to the wet pond?	
		Is there evidence of erosion along sloped sides of the wet pond?	
		Is there any sign of structural damage to the wet pond or its components (including animal burrows and cracks or sinkholes on the dam embankment)?	
		Is there excessive sediment accumulation in the wet pond?	
		Is there a petroleum odor or sheen?	
		Is there overgrown vegetation on side slopes and embankment?	
		Are trash and debris present in the wet pond?	

Other notes (use back if necessary):

Follow-up inspection required?
___ Y ___ N

Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Detention Structures*			
Owner: EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD Date: April 2015	Last revised: April 2015	Review Date: April 2015

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for performing inspections and maintenance of stormwater detention structures, including underground detention vaults. Written inspection and maintenance procedures for stormwater management facilities, such as detention structures, are a component of Minimum Control Measure (MCM) 5: Post-construction stormwater management in new development and development on prior developed lands. This MCM is required under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (9VAC25-890-40 et. seq.). JBM-HH has obtained coverage under this permit (issued as Permit No. VAR040068) for discharges from the municipal separate storm sewer system (MS4) that serves the Fort Myer and Henderson Hall Installations (collectively referred to as “the Installation” in this SOP).

In accordance with Section II.B.5.c.2 of the General Permit, the Installation must provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan. This and other SOPs specifically developed for the stormwater management facilities present onsite serve as written guidance to Installation staff on how to properly inspect and maintain Installation-owned stormwater management facilities.

Although not subject to the Virginia General permit, this SOP applies also to detention structures at Fort McNair.

Detention structures are designed to store stormwater from significant rainfall events and remain dry for the majority of the time. Detention structures exist at JBM-HH in the form of dry detention basins and underground detention vaults. Stormwater from large storms is stored in detention basins and discharged slowly, reducing discharge volume at peak

discharge, and helping to reduce erosion at outfalls and along the banks of receiving streams.

Stormwater entering dry detention basins undergo some pretreatment in the form of filtration through vegetation and infiltration through vegetation and underlying soils. Underground detention vaults may include a pretreatment system prior to storage, or they may be installed downstream of a pretreatment system; some underground detention structures may allow for infiltration to underlying soils.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. DPW – Directorate of Public Works
b. EMD – Environmental Management Division
c. MS4 – Municipal Separate Storm Sewer System
d. PPE – Personal Protective Equipment
e. SOP – Standard Operating Procedure

2.2 Definitions

a. *Detention Structure* – a dry basin or underground chamber system designed to store stormwater from significant storms and release stormwater slowly to prevent flooding and erosion. Detention structures also allow pollutants to settle out of the stormwater before it is discharged.

b. *Stormwater Management Facility* - a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

3.0 OPERATIONAL PROCEDURES

3.1 Inspections

a. Inspection Requirements

1. Detention structures at the Installation must be inspected three times annually.
    i. One inspection must be performed during a period when no precipitation or snow melt is occurring and at least 72 hours from the previous measurable storm event.
    ii. The second inspection must be performed during a period of active precipitation.
    iii. The third inspection must be performed within 24 hours of a storm that exceeds 0.5” of rainfall.

b. Inspection Locations

1. Refer to Figures 1-2 for locations of detention structures at the Installation.

c. Inspection Procedures

1. Conduct field screening of detention structures and record observations on an Inspection and Maintenance Record (Attachment 1). Only visual inspections should be performed of underground detention vaults.

2. Observations of detention basins should include the following:

   i. The presence of ponded water 72+ hours after rain
   ii. Excessive vegetation growth or undesirable invasive vegetation species
   iii. Woody vegetation growing on the upstream or downstream face of the pond embankment, within 25 feet of the outlet control structure, and at inlet and outlet channels
   iv. Visible damage or obstructions in inlets, outlets, and riser structure/overflow spillway (e.g. leaks, clogs, or corrosion)
   v. Erosion in areas draining to the detention basin and/or along sloped sides of detention basins
   vi. Structural damage to the detention basin or its components, including damage due to animal burrows and cracks or sinkholes on the dam embankment
   vii. Signs of petroleum contamination
   viii. Overgrowth and weeds
   ix. Trash and debris.

3. Observations of underground detention vaults should include the following:

   i. Erosion in areas draining to the detention vault
   ii. Maintenance access is free of obstructions; manholes can be opened
   iii. The presence of standing water in chambers 72+ hours after rain
   iv. Trash, debris, or excess sediment in vault chambers
   v. Inlet and outlet flow control devices free of obstructions/accumulations and functioning properly (e.g. leaks, clogs, or corrosion)
   vi. Visible damage or deterioration of chambers and structural components
   vii. Signs of petroleum contamination

4. Based on the physical inspection, determine if maintenance activities are required.

i. Submit a Work Request (Form 4283) with photos to DPW detailing inspection observations and solutions.

ii. Work that requires entering detention vault chambers must be performed by a qualified contractor.

d. Inspection Supplies

1. Inspection equipment
   - Inspection and Maintenance Record (see Attachment 1)
   - Camera
2. Personal Protective Equipment (PPE)
   - Work gloves
   - Steel-toed boots

3.2 Typical Required Maintenance

a. Maintenance is only required on an as-needed basis, determined through regular inspection of detention structures.

Detention Basins	
Inspection Finding	**Maintenance Required**
The presence of ponded water 72+ hours after rain	Remove blockages to infiltration or discharge. Check for accumulated sediment and debris.
Excessive vegetation growth or undesirable invasive vegetation	Remove excessive vegetation.
Woody vegetation growing on the upstream or downstream face of the pond's embankment, within 25 feet of the outlet control structure, and at inlet and outlet channels	Remove woody vegetation
Visible damage or obstructions in inlets, outlets, and riser structure/overflow spillway, including riprap protection at inlets and outlets	Remove obstructions and repair damage to restore function.
Erosion in areas draining to the detention basin and/or along sloped sides of detention basins	Re pair and replant areas.
Structural damage to the detention basin or its components, including damage from animal burrows and cracks or sinkholes on the dam embankment	Make repairs to return detention basin to original design.

Detention Basins	
Inspection Finding	**Maintenance Required**
Signs of petroleum contamination	Trace the source of contamination and implement controls to prevent future contamination.
Overgrowth and weeds	Mow grassy areas and remove weeds.
Trash and debris.	Perform more regular trash pickup.

Underground Detention Vaults	
Inspection Finding	**Maintenance Required**
Erosion observed in areas draining to the detention vault	Replant and/or re-mulch eroded areas.
Maintenance access is obstructed; access manholes are locked	Ensure that maintenance access points are not blocked and that manholes are not paved over or locked.
Standing water in vault chambers 72+ hours after rain	Contact contractor to remove blockages to discharge and check for accumulated sediment and debris in vault chambers.
Trash, debris, or excess sediment in vault chambers	Contact contractor to remove trash, debris, and accumulated sediment in vault chambers. Perform more regular trash pickup to prevent trash from entering vault chambers.
Visible damage or obstructions in inlet and outlet flow control devices	Contact contractor to remove obstructions and repair damage to restore function.
Visible damage or deterioration of chambers and structural components	Contact contractor to repair damage and restore vault to original function.
Signs of petroleum contamination	Trace the source of contamination and implement controls to prevent future contamination.

b. Underground detention vaults should be cleaned and pumped out a contractor whenever inspections indicate sediment, trash, and debris accumulation.
c. Record all maintenance activities on an Inspection and Maintenance Record (Attachment 1)

3.3 Safety Considerations

a. Always wear steel-toed boots to protect feet from possible crushing injuries while handling the manhole covers for detention vaults.
b. Use proper lifting techniques when removing manhole covers to prevent back injury.
c. Use extreme caution when working over detention vault chambers; no part of your body should enter the plane created by the opening, as this would constitute confined space entry.

d. DO NOT enter detention vault chambers under any conditions; vaults are confined spaces and may only be entered by properly trained and certified personnel.

e. When working around detention basins, always wear work boots that provide ankle support. Detention basins have sloped sides, which may be difficult to walk on.

4.0 RECORDKEEPING AND REPORTING REQUIREMENTS

4.1 Recordkeeping Requirements

a. Complete the Inspection and Maintenance Record (Attachment 1) for each inspection and maintenance activity. DPW shall maintain these forms and their associated Work Requests.

4.2 Reporting Requirements

a. DPW shall provide EMD with written records of inspection and maintenance activities within seven days of the date the activity was performed.

5.0 RESPONSIBILITIES

5.1 DPW

a. DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

b. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES

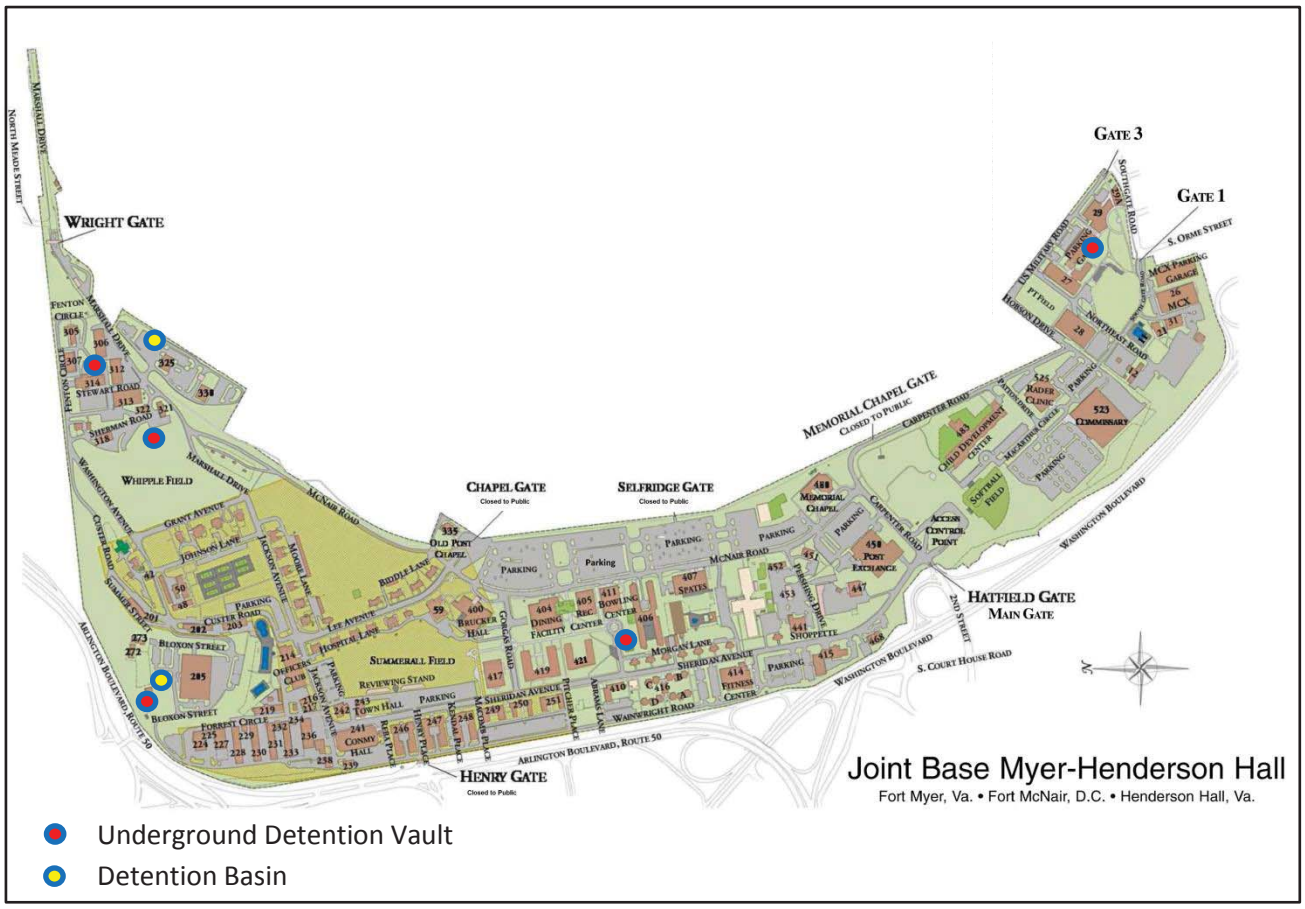


Figure 1: Detention Structure Locations Map – Fort Myer and Henderson Hall

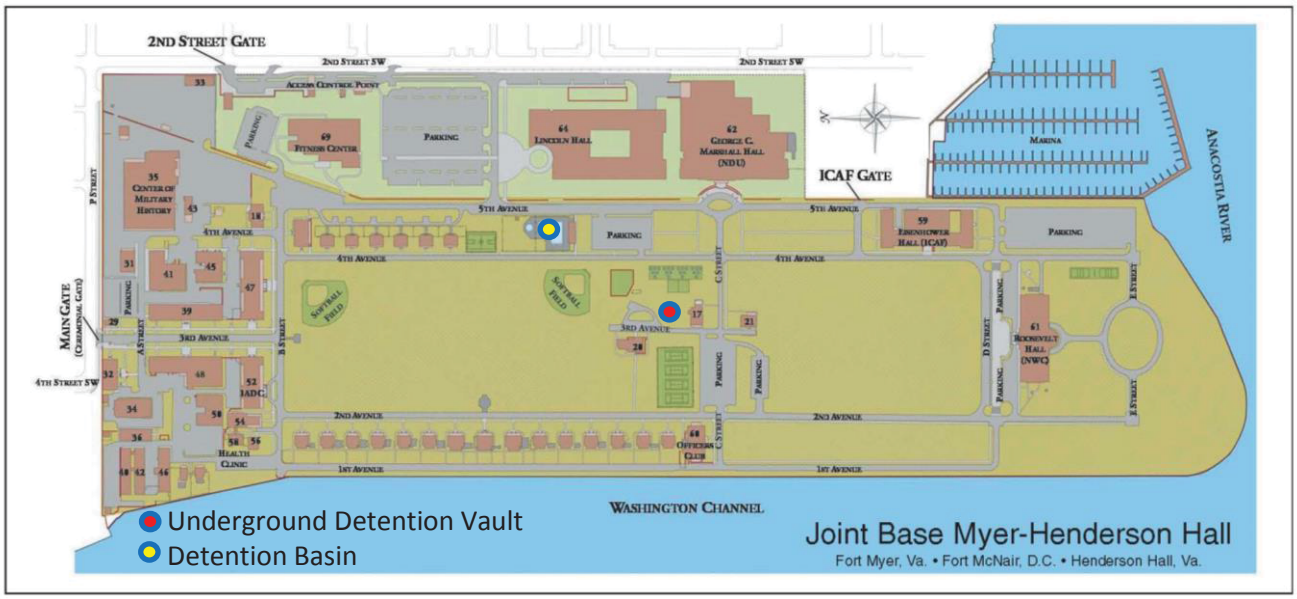


Figure 2: Detention Structure Locations Map – Fort McNair

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

Attachment 1

Inspection and Maintenance Record

ATTACHMENT 1 – DETENTION BASIN INSPECTION AND MAINTENANCE RECORD

Detention Basin Location:_____ Structure No. _____

Technician(s): _____ Date:_____

Date of last storm/total rainfall: _____ Current weather: _____

Y	N	Observation	Maintenance Performed/ Maintenance Required
		Is ponded water present 72+ hours after rain?	
		Is there excessive vegetation growth or undesirable invasive vegetation?	
		Is there woody vegetation growing on the upstream or downstream face of the pond embankment, within 25 feet of the outlet control structure, and at inlet and outlet channels?	
		Is there visible damage or obstructions in inlet, outlets, and riser structure/overflow spillway, or riprap protection??	
		Is there evidence of erosion in areas draining to the detention basin?	
		Is there evidence of erosion along sloped sides of the detention basin?	
		Is there any sign of structural damage to the detention basin or its components (including animal burrows and cracks or sinkholes on the dam embankment)?	
		Is there a petroleum odor or sheen?	
		Is the detention basin overgrown?	
		Are trash and debris present?	

Other notes (use back if necessary):

Follow-up inspection required?
___ Y ___ N

ATTACHMENT 1 – UNDERGROUND DETENTION VAULT INSPECTION AND MAINTENANCE RECORD

Detention Basin Location:_____ Structure No. _____
Technician(s): _____ Date:_____

Y	N	Observation	Maintenance Performed/ Maintenance Required
		Is there evidence of erosion in areas draining to the detention basin?	
		Are access manholes unlocked and unobstructed?	
		Is standing water present inside vault chambers 72+ hours after rain?	
		Are trash and debris present inside vault chambers?	
		Is there visible damage or obstructions in inlet and outlet control, and overflow spillway?	
		Is there any sign of structural damage to the detention basin or its components?	
		Is there a petroleum odor or sheen?	
		Has maintenance on the detention vault been performed in the last year?	

Other notes (use back if necessary):

Follow-up inspection required?
___ Y ___ N

Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Bioretention Areas*			
Owner: EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD Date: April 2015	Last revised: April 2015	Review Date: April 2015

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for performing inspections and maintenance of bioretention areas, including rain gardens. Written inspection and maintenance procedures for stormwater management facilities, including bioretention areas and rain gardens, are a component of Minimum Control Measure (MCM) 5: Post-construction stormwater management in new development and development on prior developed lands. This MCM is required under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (9VAC25-890-40 et. seq.). JBM-HH has obtained coverage under this permit (issued as Permit No. VAR040068) for discharges from the municipal separate storm sewer system (MS4) that serves the Fort Myer and Henderson Hall Installations (collectively referred to as “the Installation” in this SOP).

In accordance with Section II.B.5.c.2 of the General Permit, the Installation must provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan. This and other SOPs specifically developed for the stormwater management facilities present onsite serve as written guidance to Installation staff on how to properly inspect and maintain Installation-owned stormwater management facilities. Although not subject to the Virginia General Permit, this SOP applies also to bioretention areas at Fort McNair.

Bioretention areas are generally shallow vegetated basins specifically designed to collect and filter stormwater. Stormwater runoff flows from paved areas to a graded bioretention area, where it drains through a filter bed containing layers of mulch, sand, soil, or other media that is planted with plants and shrubs. As the runoff infiltrates the soil in the ponding area, dissolved or suspended pollutants are filtered out through adsorportion, sedimentation,

volatilization, or through microbial activity and uptake by plants. Filtered stormwater that is not taken up by plants evaporates or contributes to recharging aquifers.

During storms, bioretention areas' design allows for stormwater storage and infiltration over time. Bioretention areas are often connected to an overflow structure, such as perforated under-drains, to convey excess stormwater to the storm sewer system.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. DPW – Directorate of Public Works
b. EMD – Environmental Management Division
c. MS4 – Municipal Separate Storm Sewer System
d. PPE – Personal Protective Equipment
e. SOP – Standard Operating Procedure

2.2 Definitions

a. *Bioretention area* – a landscaped treatment area using a combination of soils and plants to filter pollutants from stormwater runoff. See Figure 1 for illustration.

b. *Stormwater Management Facility* - a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

3.0 OPERATIONAL PROCEDURES

3.1 Inspections

a. Inspection Requirements

1. Bioretention areas at the Installation must be inspected three times annually.
    i. One inspection must be performed during a period when no precipitation or snow melt is occurring and at least 72 hours from the previous measurable storm event.
    ii. The second inspection must be performed during a period of active precipitation.
    iii. The third inspection must be performed within 48 hours of a storm that exceeds 0.5" of rainfall.

b. Inspection Locations

1. Refer to Figures 2-3 for locations of bioretention areas at the Installation.

c. Inspection Procedures

1. Conduct field screening of bioretention areas and record observations on an Inspection and Maintenance Record (Attachment 1). The observations should include the following:
    i. The presence of ponded water
    ii. Visible damage to plants, or indicators of poor health
    iii. Erosion along sloped sides or at outlet (if equipped with outlet)
    iv. Sediment build-up around inlets or obstructed inlets
    v. Structural damage to the bioretention area or its components
    vi. Signs of petroleum contamination
    vii. Overgrowth and weeds
    viii. Trash and debris.
2. Based on the physical inspection, determine if maintenance activities are required.
    i. Submit a Work Request (Form 4283) with photos to DPW detailing inspection observations and solutions.

d. Inspection Supplies

1. Inspection equipment
    - Inspection and Maintenance Record (see Attachment 1)
    - Camera
2. Personal Protective Equipment (PPE)
    - Work gloves
    - Steel-toed boots

3.2 Typical Required Maintenance

a. Maintenance is only required on an as-needed basis, determined through regular inspection of bioretention areas.

Bioretention Areas	
Inspection Finding	**Maintenance Required**
The presence of ponded water 72+ hours after rain	Remove blockages to infiltration. Check for accumulated sediment and debris.
Visible damage to plants, or indicators of poor health	Remove any dead or diseased vegetation; replant vegetation that is not salvageable. Remulch areas annually.
Erosion along sloped sides or at outlet (if present)	Replant and/or re-mulch eroded areas. Erosion at outlet could indicate that water is passing through too quickly and not infiltrating
Sediment build-up or other obstructions around inlet areas	Remove excess sediment and clear obstructions.

Bioretention Areas	
Inspection Finding	**Maintenance Required**
Structural damage to the bioretention area or its components	Make repairs to return bioretention area to original design.
Signs of petroleum contamination	Trace the source of contamination and implement controls to prevent future contamination.
Overgrowth and weeds	Mow grassy areas and remove weeds.
Trash and debris.	Perform more regular trash pickup.

b. Record all maintenance activities on an Inspection and Maintenance Record (Attachment 1)

3.3 Safety Considerations

a. Always wear work boots that provide ankle support. Bioretention areas have sloped sides and often contain rocks and different types of ground cover, creating an uneven walking surface.

4.0 RECORDKEEPING AND REPORTING REQUIREMENTS

4.1 Recordkeeping Requirements

a. Complete the Inspection and Maintenance Record (Attachment 1) for each inspection and maintenance activity. DPW shall maintain these forms and their associated Work Requests.

4.2 Reporting Requirements

a. DPW shall provide EMD with written records of inspection and maintenance activities within seven days of the date the activity was performed.

5.0 RESPONSIBILITIES

5.1 DPW

a. DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

b. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES

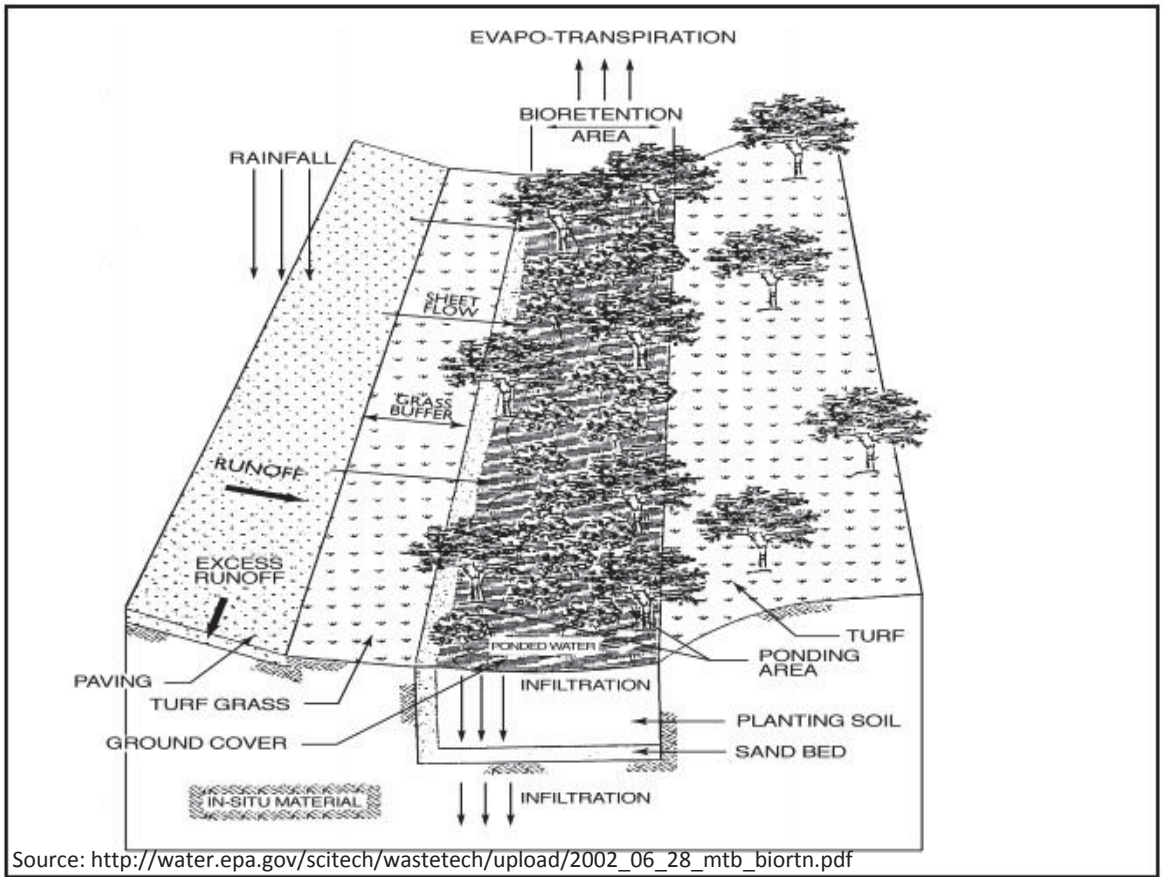


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Figure 1: Bioretention Area Diagram

Figure 2: Bioretention Area Locations Map – Fort Myer

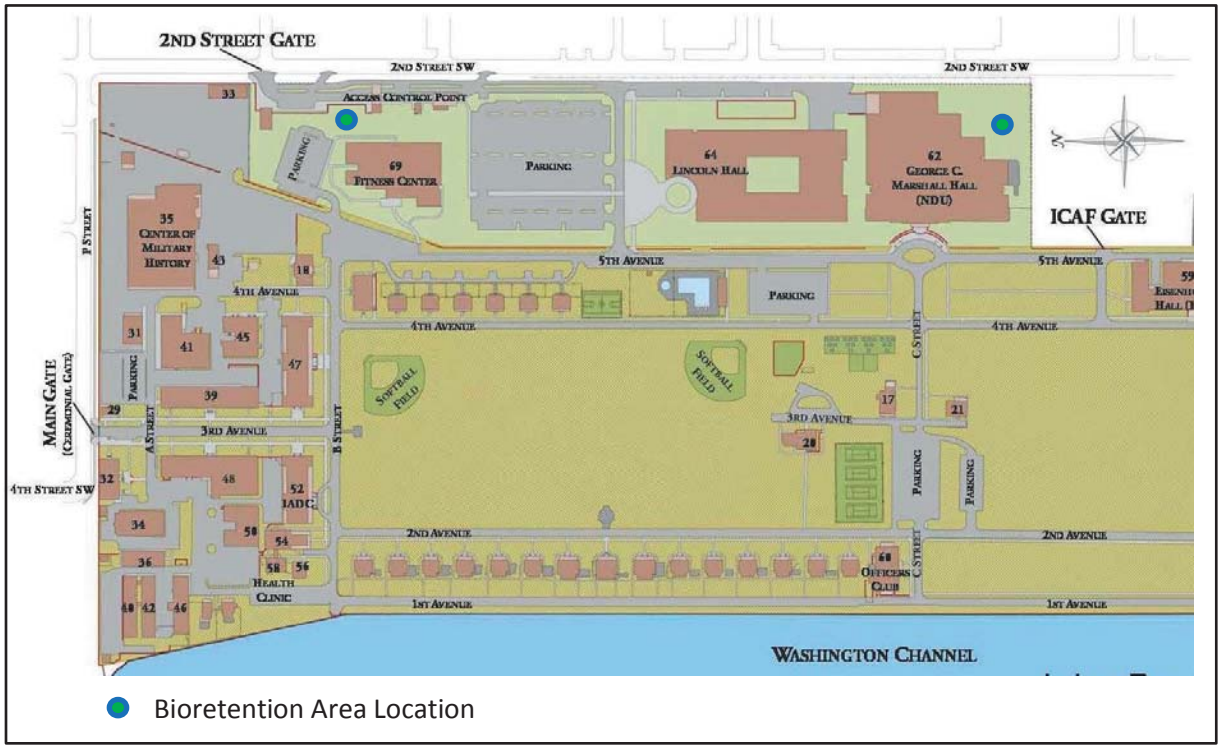

Figure 3: Bioretention Area Locations Map – Fort McNair

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

Attachment 1

Inspection and Maintenance Record

ATTACHMENT 1 – BIORETENTION AREA INSPECTION AND MAINTENANCE RECORD

Bioretention Area Location:_____ Structure No. _____

Technician(s): _____ Date:_____

Date of last storm/total rainfall: _____ Current weather: _____

Y	N	Observation	Maintenance Performed/ Maintenance Required
		Is ponded water present 72+ hours after rain?	
		Are there dead plants or are there visible damage/disease to plants, or indicators of poor plant health?	
		Is a sufficient layer of mulch present? (If included in bioretention area design)	
		Is there evidence of erosion along sloped sides or outlet (if present) of the bioretention area?	
		Is there excessive sediment accumulation in the bioretention area?	
		Is there any sign of structural damage to the bioretention area or its components (including animal burrows)?	
		Is there a petroleum odor or sheen?	
		Are retention area inlets free of obstructions/deposits and can stormwater freely enter structure?	
		Is the bioretention area overgrown?	
		Are trash and debris present?	

Other notes (use back if necessary):

Follow-up inspection required?
___ Y ___ N

Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Filterra® Stormwater Bioretention Filtration Systems*			
Owner: EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD Date: April 2015	Last revised: April 2015	Review Date: April 2015

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for performing inspections and maintenance of Filterra® stormwater bioretention filtration systems. Written inspection and maintenance procedures for stormwater management facilities, such Filterra® systems, are a component of Minimum Control Measure (MCM) 5: Post-construction stormwater management in new development and development on prior developed lands. This MCM is required under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (9VAC25-890-40 et. seq.). JBM-HH has obtained coverage under this permit (issued as Permit No. VAR040068) for discharges from the municipal separate storm sewer system (MS4) that serves the Fort Myer and Henderson Hall Installations (collectively referred to as “the Installation” in this SOP).

In accordance with Section II.B.5.c.2 of the General Permit, the Installation must provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan. This and other SOPs specifically developed for the stormwater management facilities present onsite serve as written guidance to Installation staff on how to properly inspect and maintain Installation-owned stormwater management facilities.

The Filterra® stormwater bioretention filtration system is a manufactured bioretention stormwater best management practice (BMP) that filters stormwater runoff from impervious surfaces (roadways, parking lots, and rooftops). The Filterra® system consists of a concrete container filled with an engineered soil filter media, a mulch layer, an under-drain system and a tree, shrub, or other plant selection. Runoff drains directly from the impervious surface, through the filter media, and then out of the container through the under-drain and is discharged to the Installation’s MS4 system. Refer to Figures 1 and 2 for a diagram and

photograph of a Filterra® system and Figures 3 and 4 for the locations of Filterra® systems at the Installation.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. DPW – Directorate of Public Works
b. EMD – Environmental Management Division
c. MS4 – Municipal Separate Storm Sewer System
d. PPE – Personal Protective Equipment
e. SOP – Standard Operating Procedure

2.2 Definitions

a. *Filterra® Stormwater Bioretention Filtration System* – a stormwater treatment system that uses a combination of filters, soils, and plants to filter pollutants from stormwater runoff.

b. *Stormwater Management Facility* - a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

3.0 OPERATIONAL PROCEDURES

3.1 Inspections and Maintenance

a. Annually, each Filterra unit shall be inspected and maintenance performed as required to maintain the function of the system.

1. Annual inspection shall be performed in accordance with the Filterra® Operation and Maintenance Manual (provided as Attachment 1) and shall be documented on the inspection form provided as Attachment 2.
2. At a minimum, annual maintenance will include:
   - i. Inspection of the Filterra® including the filter media and surrounding area
   - ii. Removal of debris, trash, and silt from the filter surface
   - iii. Replacement of the surface mulch layer. Complete replacement of the soil media is generally required only as part of a spill clean-up.
   - iv. Plant health evaluation and pruning or replacement as necessary. If the vegetation is in dead or in poor health, it will require replacement. Consult Attachment 3 for a list of appropriate plants to be used with the Filterra® system.
   - v. Appropriate disposal of all refuse items

vi. Cleaning the area immediately surrounding each Filterra® system.

3. If maintenance requires DPW assistance, Submit a Work Request (Form 4283) with photos to DPW detailing inspection observations and solutions.

3.2 Inspection Supplies:

a. Inspection/Maintenance Record (see Attachment 2)
b. Camera
c. Personal Protective Equipment (PPE)
    1. Work gloves
    2. Steel-toed boots

3.3 Irrigation

a. During periods of prolonged drought during the normal growing season (April 1 through October 31), plants in the Filterra® boxes shall be irrigated weekly or as necessary to prevent drought-related damage.

4.0 RECORDKEEPING AND REPORTING REQUIREMENTS

4.1 Recordkeeping Requirements

a. Complete the Inspection/Maintenance Record (Attachment 1) for each inspection and maintenance activity. DPW shall maintain these forms and their associated Work Requests.

4.2 Reporting Requirements

a. DPW shall provide EMD with written records of inspection and maintenance activities within seven days of the date the activity was performed.

5.0 RESPONSIBILITIES

5.1 DPW

a. DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

b. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

a. DPW is responsible for providing irrigation as described in Section 3.2.

6.0 Figures

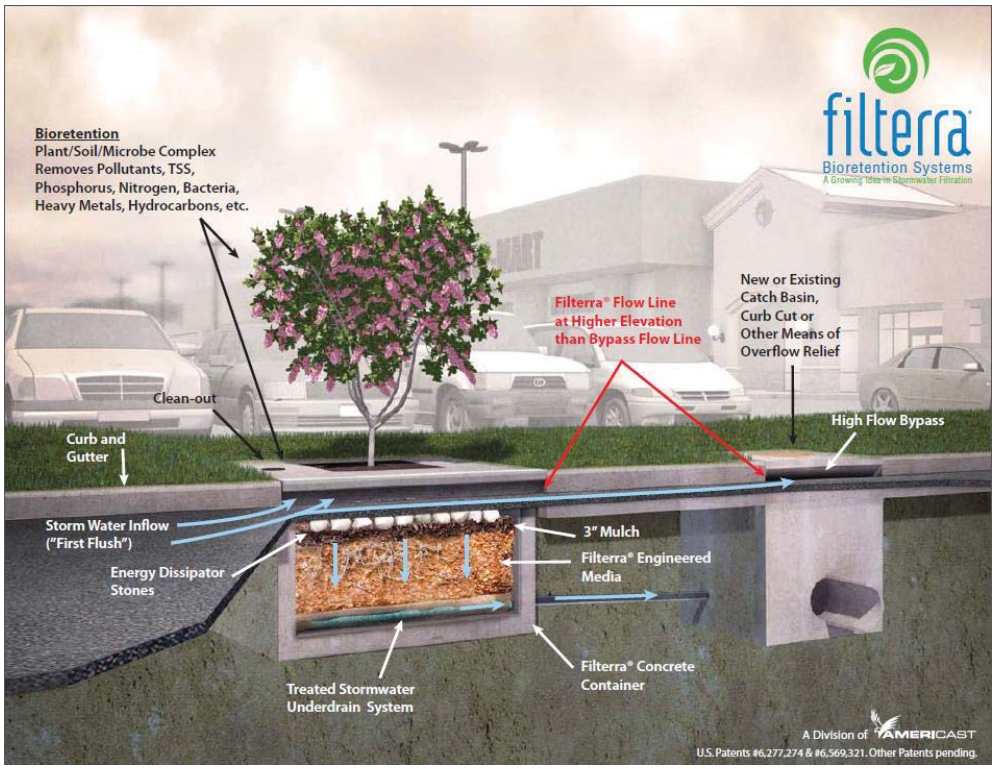

Figure 1: Typical Filterra® Unit

Figure 2: JBM-HH Filterra® Unit installed at Hatfield Gate.

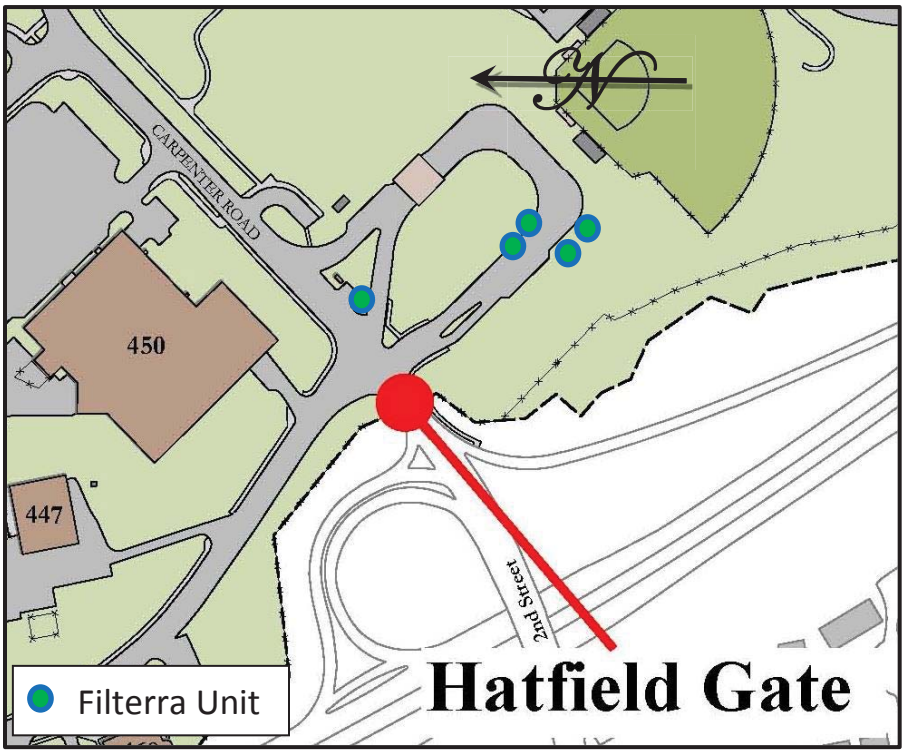

Figure 3: Installation Filterra® location map – Hatfield Gate

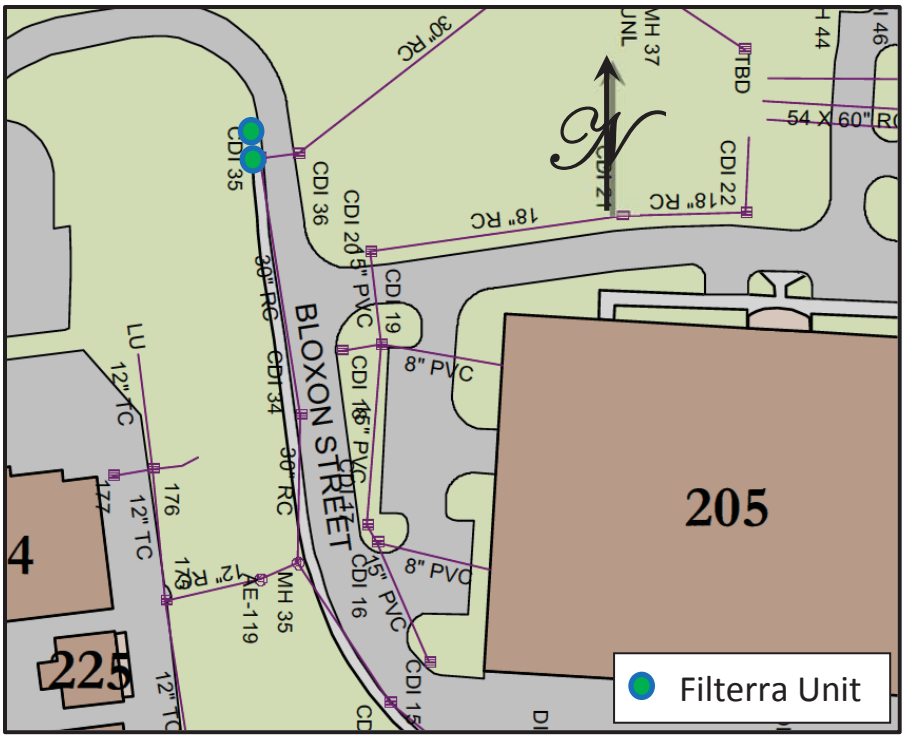

Figure 4: Installation Filterra® location map – Radnor Heights Substation

6.0 Attachments

Attachment 1: Filterra® Operation & Maintenance Manual

Attachment 2: Inspection and Maintenance Record

Attachment 3: Filterra® Plant List for Hardy Zone 7

Attachment 1

Filterra Operation & Maintenance Manual

Operation & Maintenance (OM) Manual v01

filterra®
Bioretention Systems
A Growing Idea in Stormwater Filtration.

A Division of:

AMERICAST

Filterra® Stormwater Bioretention Filtration System

toll free: **(866) 349 3458** | fax: **(804) 798 8400** | maintenance@filterra.com | filterra.com

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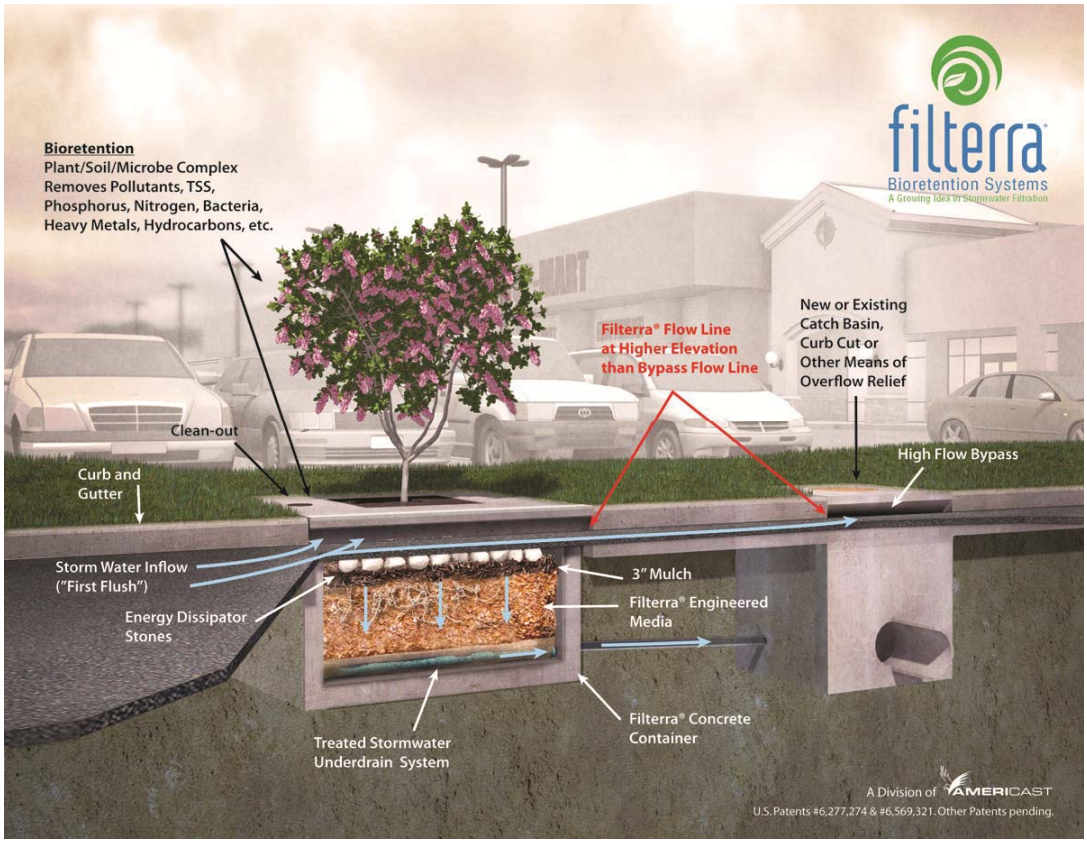
General Description

The following general specifications describe the general operations and maintenance requirements for the Americast stormwater bioretention filtration system, the Filterra®. The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, pre-constructed drop-in place unit designed for applications in the urban landscape to treat contaminated runoff.



Stormwater flows through a specially designed filter media mixture contained in a landscaped concrete container. The mixture immobilizes pollutants which are then decomposed, volatilized and incorporated into the biomass of the Filterra® system's micro/macro fauna and flora. Stormwater runoff flows through the media and into an underdrain system at the bottom of the container, where the treated water is discharged. Higher flows bypass the Filterra® to a downstream inlet or outfall.

Maintenance is a simple, inexpensive and safe operation that does not require confined space access, pumping or vacuum equipment or specialized tools. Properly trained landscape personnel can effectively maintain Filterra® Stormwater systems by following instructions in this manual.

Basic Operations

Filterra® is a bioretention system in a concrete box. Contaminated stormwater runoff enters the filter box through the curb inlet spreading over the 3-inch layer of mulch on the surface of the filter media. As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the soil media where the finer particles are removed and other chemical reactions take place to immobilize and capture pollutants in the soil media. The cleansed water passes into an underdrain and flows to a pipe system or other appropriate discharge point. Once the pollutants are in the soil, the bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a very complex variety of biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

Design and Installation

Each project presents different scopes for the use of Filterra® systems. To ensure the safe and specified function of the stormwater BMP, Americast reviews each application before supply. Information and help may be provided to the design engineer during the planning process. Correct Filterra® box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at filterra.com.

Maintenance

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement.

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the expected lifespan of your Filterra media.
- Avoid more costly media replacement.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the Filterra® is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the throat. This may include trash, silt and leaves etc. which will be contained within the void below the top grate and above the mulch layer. Too much silt may inhibit the Filterra's® flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Americast includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as the unit installed, curb and gutter and transitions in place and activation (by Supplier) when mulch and plant are added and temporary throat protection removed.

Activation cannot be carried out until the site is **fully** stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing).

Exclusion of Services

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra® system.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra® (where the cleaned runoff drains to, such as drop-inlet) and block off the throat of the Filterra®. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra® and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra®
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.).

Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each unit size. Mulch should be a double shredded, hardwood variety; do not use colored or dyed mulch. Some visits may require additional Filterra® engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft2)	Volume @ 3" (ft3)	# of 2 ft3 Mulch Bags
4	4	16	4	2
6	4	24	6	3
8	4	32	8	4
6	6	36	9	5
8	6	48	12	6
10	6	60	15	8
12	6	72	18	9
13	7	91	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

1. Inspection of Filterra® and surrounding area

- Record individual unit **before** maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Damage to Box Structure	yes | no
Damage to Grate	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra® box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
# of Buckets Removed	

3. Removal of debris, trash and mulch

- After removal of mulch and debris, measure distance from the top of the Filterra® engineered media soil to the bottom of the top slab. If this distance is greater than 12”, add Filterra® media (not top soil or other) to recharge to a 9” distance.

Record on Maintenance Report the following:

Distance to Bottom of Top Slab (inches)
# of Buckets of Media Added

4. Mulch replacement

- Please see mulch specifications.
- Add double shredded mulch evenly across the entire unit to a depth of 3”.
- Ensure correct repositioning of erosion control stones by the Filterra® inlet to allow for entry of trash during a storm event.
- Replace Filterra® grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant’s health and replace if dead.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	(feet)
Width at Widest Point	(feet)
Health	alive | dead
Damage to Plant	yes | no
Plant Replaced	yes | no

6. Clean area around Filterra®

- Clean area around unit and remove all refuse to be disposed of appropriately.

7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Americast during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check For	Conditions That Should Exist	Actions
Inlet	Excessive sediment or trash accumulation	Accumulated sediments or trash impair free flow of water into Filterra	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	“Ponding” of water on mulch cover.	“Ponding” in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks	Cracks wider than ½ inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.
Maintenance is ideally to be performed twice annually.				

Filterra® Project Maintenance Order

Project

Address

Directions

Project Owner

Company	
Contact Name	
Telephone #	
Owner Notified of Mtce on (date)	

Filterra Units on this Order _____

Total Units on this Project _____

Date of Maintenance	
Arrival Time	
Departure Time	
# of Workers	
Notes on Project	

Maintenance Supervisor _____

12/14/04

Filterra® Structure Maintenance Report

Project		**Structure Number**	
Plant Type		**Structure Size**	
Date		**GPS**	
		Pre Mtce Photo #	

Initial Observations

Standing Water	Y	N	Damage to Grate	Y	N
IF Yes, STOP NOW & call 804-798-6068			Is Bypass Clear	Y	N
			Notes		
Damage to Box Structure	Y	N			
If YES to any observation take close up photo					

Waste

Silt / Clay	Y	N	Buckets Removed (# of)	
Cups/Bags	Y	N	Notes	
Leaves	Y	N		
Other				

Media

Distance to Bottom of Top Slab (in.)		Notes
Buckets of Media Added (# of)		

Mulch

Netting Replaced	Y	N	Bags of Mulch Added (# of)	
Stones Replaced	Y	N	Notes	

Plant	#1	(#2)		#1	(#2)
Height above Grate (feet)			Plant Replaced	Y / N	Y / N
Width at Widest Point (feet)			Notes		
Health	Alive/Dead	Alive/Dead			
Damage to Plant	Y / N	Y / N			
If YES to plant damage take close up photo					

Other Notes

(use back if necessary)

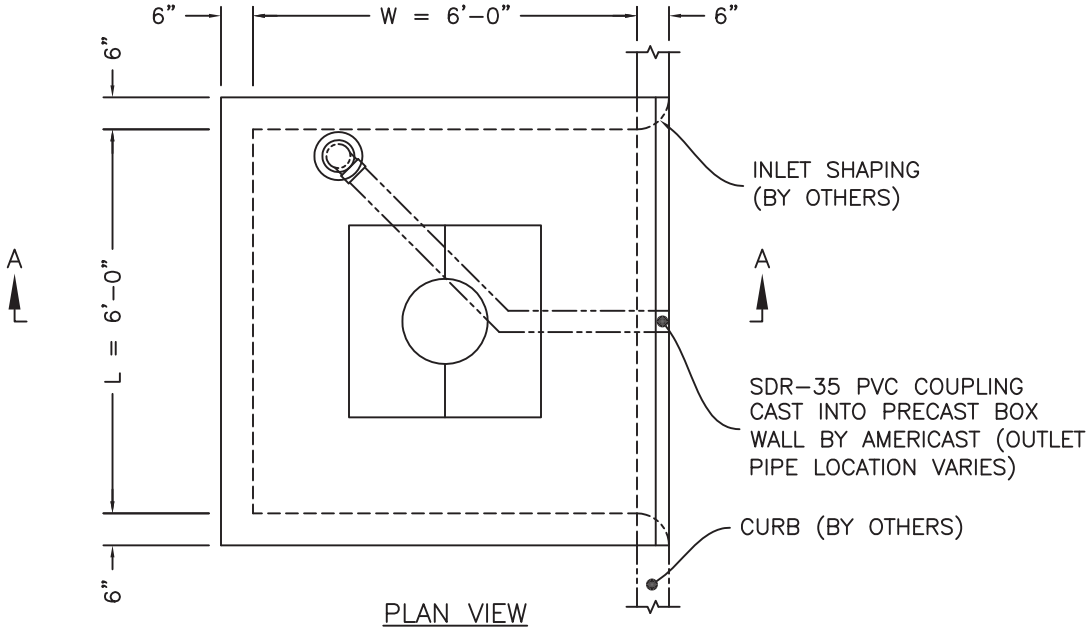
Filterra® Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

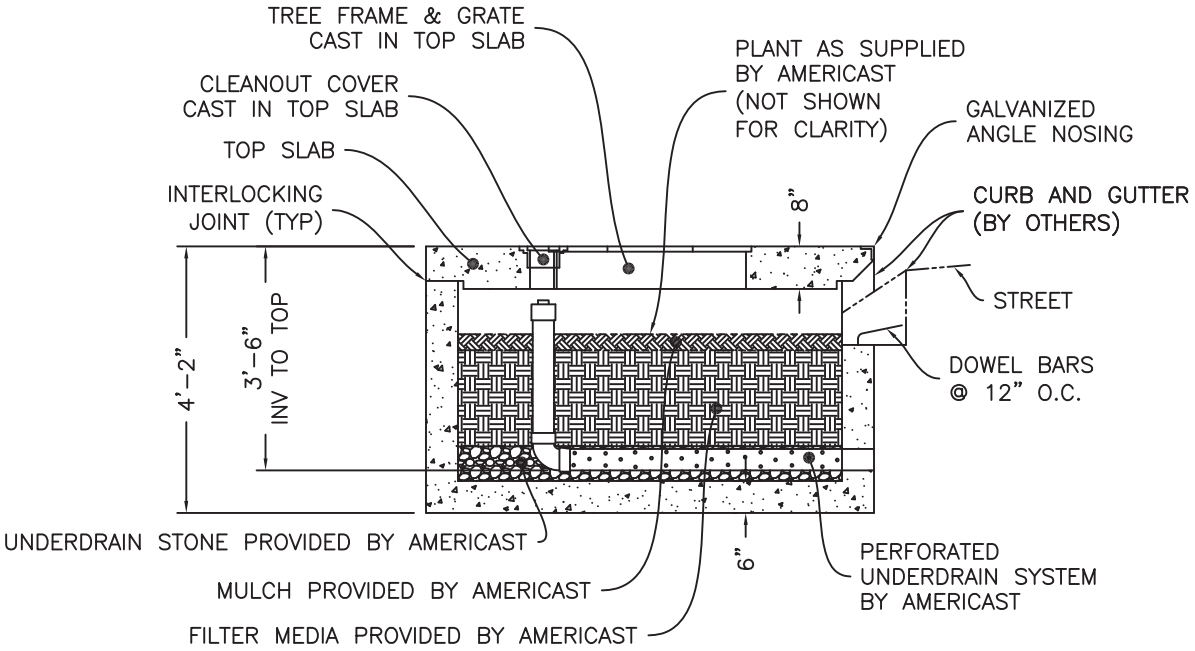
Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.



PLAN VIEW



SECTION A–A

DESIGNATION	L	W	TREE GRATE QTY & SIZE	OUTLET PIPE
6 x 6	6'–0"	6'–0"	(1) 3x3	4" SDR–35 PVC

** SIZES SHOWN ARE FOR THE MID ATLANTIC AND MAY VARY ACROSS THE COUNTRY
PLEASE CONTACT FILTERRA FOR A LIST OF SIZES WITHIN YOUR REGION

AMERICAST®

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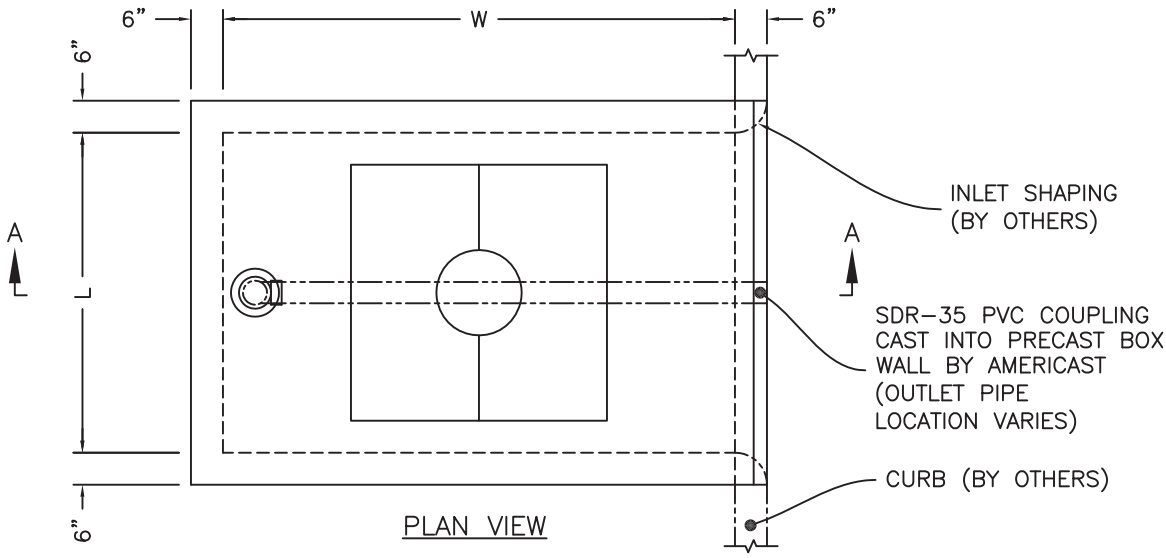
DATE: 03–04–14 DWG: FTST–2

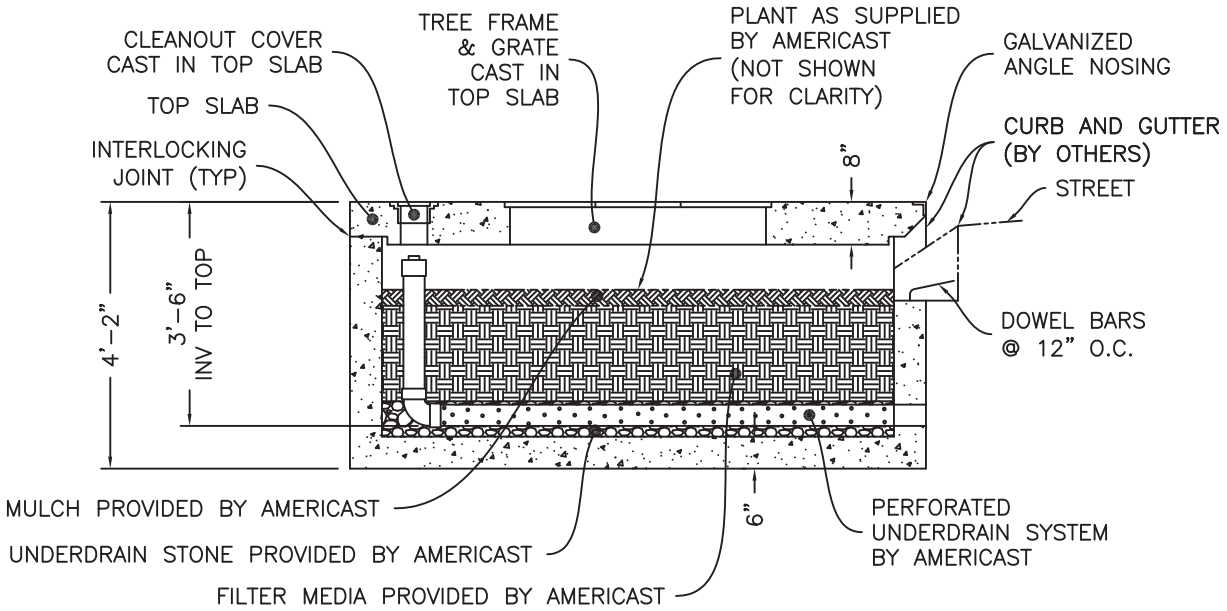
PRECAST FILTERRA® UNIT
STANDARD CONFIGURATION

filterra®

US PAT 6,277,274
6,569,321 AND
7,625,485



PLAN VIEW



SECTION A–A

DESIGNATION	L	W	TREE GRATE QTY & SIZE	OUTLET PIPE
4 x 6	4’–0”	6’–0”	(1) 3x3	4” SDR–35 PVC
4 x 8	4’–0”	8’–0”	(1) 3x3	4” SDR–35 PVC
4 x 12	4’–0”	12’–0”	(2) 3x3	4” SDR–35 PVC
6 x 8	6’–0”	8’–0”	(1) 4x4	4” SDR–35 PVC
6 x 10	6’–0”	10’–0”	(1) 4x4	6” SDR–35 PVC
6 x 12	6’–0”	12’–0”	(2) 4x4	6” SDR–35 PVC
7 x 13	7’–0”	13’–0”	(2) 4x4	6” SDR–35 PVC

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PRECAST FILTERRA® UNIT
NARROW LENGTH CONFIGURATION

filterra®

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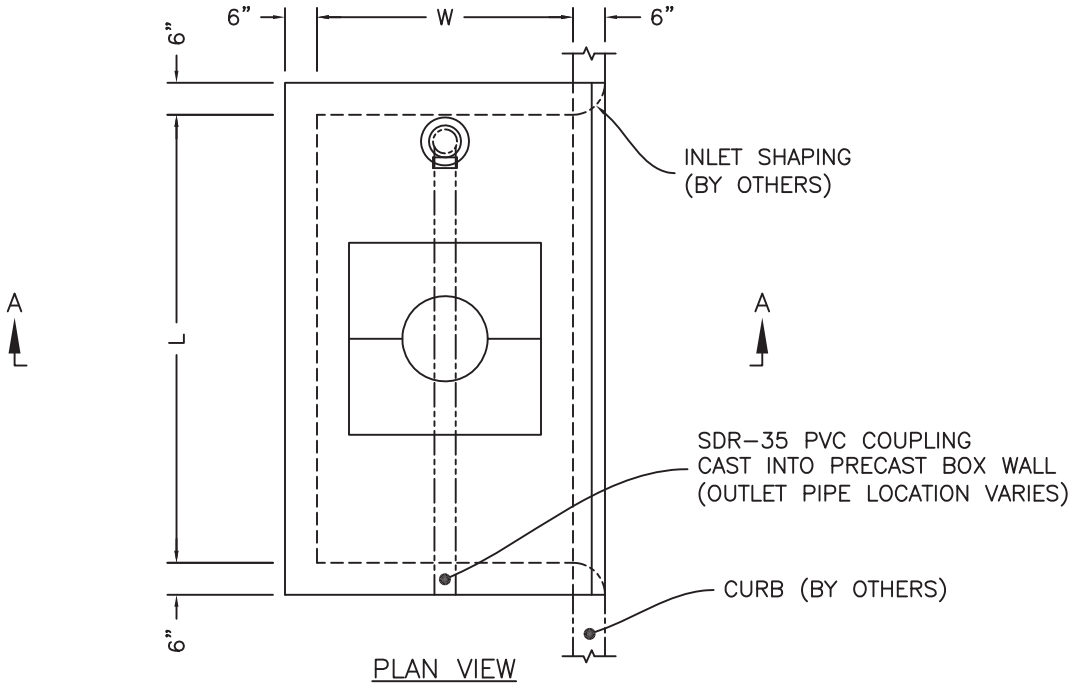
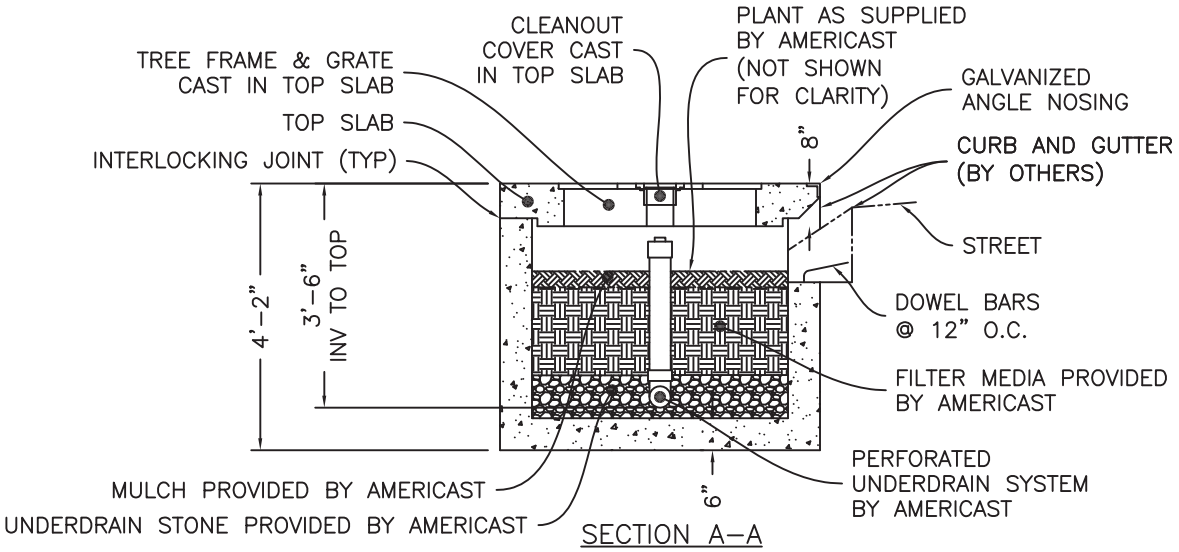
6,569,321 AND
7,625,485





DESIGNATION	L	W	TREE GRATE QTY & SIZE	OUTLET PIPE
6 x 4	6'–0"	4'–0"	(1) 3x3	4" SDR–35 PVC
8 x 4	8'–0"	4'–0"	(1) 3x3	4" SDR–35 PVC
8 x 6	8'–0"	6'–0"	(1) 4x4	4" SDR–35 PVC
10 x 6	10'–0"	6'–0"	(1) 4x4	6" SDR–35 PVC
12 x 4	12'–0"	4'–0"	(2) 3x3	4" SDR–35 PVC
12 x 6	12'–0"	6'–0"	(2) 4x4	6" SDR–35 PVC
13 x 7	13'–0"	7'–0"	(2) 4x4	6" SDR–35 PVC

** SIZES SHOWN ARE FOR THE MID ATLANTIC AND MAY VARY ACROSS THE COUNTRY
PLEASE CONTACT FILTERRA FOR A LIST OF SIZES WITHIN YOUR REGION

AMERICAST®

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PRECAST FILTERRA® UNIT
NARROW WIDTH CONFIGURATION

filterra®

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Attachment 2

Inspection and Maintenance Record

ATTACHMENT 2 – INSPECTION AND MAINTENANCE RECORD

Filterra Unit Location:_____ Structure No. _____

Plant Type:_____

Technician(s): _____ Date:_____

Date of last storm/total rainfall: _____ Current weather:_____

Initial Observations

Standing Water	Y	N	Damage to Grate	Y	N
IF Yes, STOP NOW & call 804-798-6068			Is Bypass Clear	Y	N
			Notes		
Damage to Box Structure	Y	N			
If YES to any observation take close up photo					

Waste

Silt / Clay	Y	N	Buckets Removed (# of)	_____
Cups/Bags	Y	N	Notes	
Leaves	Y	N		
Other	_____			

Media

Distance to Bottom of Top Slab (in.)	_____	Notes
Buckets of Media Added (# of)	_____	

Mulch

Netting Replaced	Y	N	Bags of Mulch Added (# of)	_____
Stones Replaced	Y	N	Notes	

Plant

	#1	(#2)		#1	(#2)
Height above Grate (feet)	_____	_____	Plant Replaced	Y / N	Y / N
Width at Widest Point (feet)	_____	_____	Notes		
Health	Alive/Dead	Alive/Dead			
Damage to Plant	Y / N	Y / N			
If YES to plant damage take close up photo					

Other Notes

(use back if necessary)

Attachment 3

Filterra® Plant List for Hardy Zone 7

Filterra® Plants for Hardy Zone 7

Common Name *Latin Name*	Sun	Hardy Range	Height	Spread
Plant Type: Deciduous small trees and shrubs				
Beautyberry, American *Callicarpa americana*	Partial Shade or Partial Sun to Full Sun	7A – 10B	4’ – 8’	6’ – 7’
Buttonbush *Cephalanthus occidentalis*	Partial Shade or Partial Sun to Full Sun	4A – 10A	4’ – 6’	6’ – 10’
Cherry, Purpleleaf Sand *Prunus x cistena*	Full Sun	5B – 8A	6’ – 8’	6’ – 10’
Chokeberry, Black *Aronia melanocarpa*	Full Shade to Full Sun	3B – 8B	3’ – 6’	4’ – 6’
Chokeberry, Red *Aronia arbutifolia*	Partial Shade or Partial Sun to Full Sun	4B – 9A	6’ – 10’	4’ – 6’
Crabapple, Sargent *Malus sargentii*	Full Sun	4A – 8A	6’ – 8’	10’ – 12’
Crape Myrtle *Lagarstroemia indica*	Full Sun	7A – 9A	6’ – 25’	15’ – 25’
Dogwood, Chinese *Cornus kousa*	Partial Shade or Partial Sun to Full Sun	4B – 8A	15’ – 25’	20’ – 30’
Dogwood, Cornelian Cherry *Cornus mas*	Partial Shade or Partial Sun to Full Sun	4B – 8A	15’ – 20’	15’ – 20’

Common Name ***Latin Name***	**Sun**	**Hardy Range**	**Height**	**Spread**
Dogwood, Graystem *Cornus racemosa*	Full Shade to Full Sun	5A – 8B	10’ – 15’	10 – 15’
Dogwood, Red Osier *Cornus stolonifera ‘Baileyi’*	Partial Shade or Partial Sun to Full Sun	3A – 7A	8’ – 10’	8’ – 10’
Dogwood, Silky *Cornus amomum*	Full Shade to Full Sun	4B – 8A	8’ – 10’	8’ – 15’
Elderberry, American *Sambucus canadensis*	Full Sun	4A – 9B	10’ – 15’	6’ – 10’
Euonymus, Winged *Euonymus alatus ‘compactus’*	Partial Shade or Partial Sun to Full Sun	5A – 8B	8’ – 10’	6’ – 10’
Franklin Tree *Franklinia alatamaha*	Partial Shade or Partial Sun to Full Sun	5A – 8A	15’ – 25’	10’ – 15’
Fringe Tree, Chinese *Chionanthus retusus*	Full Shade to Full Sun	5B – 9A	15’ – 25’	10’ – 15’
Fringe Tree, White *Chionanthus virginicus*	Full Shade to Full Sun	4A – 9A	15’ – 25’	10’ – 15’
Hawthorn, Cockspur *Crataegus crus-galli*	Full Sun	4A – 7A	15’ – 25’	15’ – 25’
Hawthorn, Washington *Crataegus phaenopyrum*	Full Sun	4A – 8A	15’ – 25’	15’ – 25’

Common Name ***Latin Name***	**Sun**	**Hardy Range**	**Height**	**Spread**
Holly, Possum Haw Ilex decidua	Full Shade to Full Sun	5A – 9A	15’ – 20’	15’ – 25’
Holly, Winterberry *Ilex verticillata*	Partial Shade or Partial Sun to Full Sun	3B – 9A	6’ – 10’	8’ – 15’
Hydrangea, Wild *Hydrangea arborescens*	Partial Shade or Partial Sun to Full Sun	4A – 9A	3’ – 5’	3’ – 6’
Lilac, Dwarf *Syringa meyeri*	Full Sun	3B – 8A	5’ – 8’	8’ – 10’
Lilac, Japanese Tree *Syringa reticulata*	Full Sun	3A – 7A	15’ – 25’	10’ – 15’
Magnolia, Ann *Magnolia x ‘Ann’*	Partial Shade or Partial Sun to Full Sun	3B – 7A	10’ – 12’	10’ – 12’
Magnolia, Galaxy *Magnolia ‘Galaxy’*	Partial Shade or Partial Sun to Full Sun	5A – 8B	15’ – 20’	15’ – 25’
Magnolia, Saucer *Magnolia x soulangiana*	Partial Shade or Partial Sun to Full Sun	5A – 9A	15’ – 25’	15’ – 25’
Magnolia, Star *Magnolia stellata*	Partial Shade or Partial Sun to Full Sun	4A – 8B	10’ – 20’	10’ – 15’
Maple, Amur *Acer ginnala*	Full Shade to Full Sun	3A – 8A	15’ – 25’	15’ – 25’

Common Name ***Latin Name***	**Sun**	**Hardy Range**	**Height**	**Spread**
Northern Bayberry *Myrica pensylvanica*	Partial Shade or Partial Sun to Full Sun	3A – 7A	10’ – 15’	6’ – 10’
Plum, Cherry *Prunus cerasifera*	Full Sun	5B – 8A	15’ – 25’	15’ – 25’
Redbud, Eastern *Cercis canadensis*	Partial Shade or Partial Sun to Full Sun	4B – 9A	15’ – 25’	15’ – 25’
Redbud, Western *Cercis occidentalis*	Partial Shade to Full Sun	5A – 9A	8’ – 20’	10+’
Rose-of-Sharon *Hibiscus syriacus*	Partial Shade or Partial Sun to Full Sun	5B – 9A	10’ – 15’	6’ – 10’
Serviceberry *Amelanchier x grandiflora*	Partial Shade or Partial Sun to Full Sun	4A – 7A	15’ – 25’	15’ – 25’
Smoketree *Cotinus coggygria*	Full Sun	5A – 8A	10’ – 15’	15’ – 25’
Summersweet *Clethra alnifolia*	Full Shade to Full Sun	4A – 8B	3’ – 8’	3’ – 6’
Sweetshrub *Calycanthus floridus*	Full Shade to Full Sun	5B – 10A	6’ – 10’	6’ – 12’
Sweetspire, Virginia *Itea virginica*	Partial Shade or Partial Sun to Full Sun	5A – 9A	4’ – 6’	6’ – 10’

Common Name *Latin Name*	Sun	Hardy Range	Height	Spread
Viburnum, American Cranberrybush *Viburnum trilobum*	Partial Shade or Partial Sun to Full Sun	2A – 7B	8’ – 12’	8’ – 15’
Viburnum, Arrowwood *Viburnum dentatum*	Full Shade to Full Sun	2B – 8B	5’ – 15’	5’ – 12’
Viburnum, Blackhaw *Viburnum prunifolium*	Full Shade to Full Sun	3B – 9A	12’ – 15’	15’ – 20’
Viburnum, European Cranberry *Viburnum opulus*	Partial Shade to Full Sun	3B – 8A	8’ – 12’	10’-15’
Virburnum, Nannyberry *Viburnum lentago*	Full Shade to Full Sun	3A– 7A	15’ – 25’	15’ – 25’
Witch Hazel *Hamamelis virginiana*	Full Shade to Full Sun	3B – 8B	15’ – 25’	15’ – 25’
Plant Type: Evergreen small trees and shrubs				
Anise *Illicium parviflorum*	Full Shade to Full Sun	6A – 10A	15’ – 20’	10’ – 15’
Camellia, Japanese *Camellia japonica*	Partial Shade or Partial Sun to Full Sun	7A – 9A	10’ – 15’	6’ – 10’
Heavenly Bamboo *Nandina domestica*	Partial Shade or Partial Sun to Full Sun	6B – 9B	6’ – 10’	1’ – 3’
Holly, Chinese *Ilex cornuta*	Partial Shade or Partial Sun to Full Sun	7A – 9A	15’ – 25’	15’ – 25’

Common Name ***Latin Name***	**Sun**	**Hardy Range**	**Height**	**Spread**
Holly, Foster's *Ilex x attenuata 'Fosteri'*	Partial Shade or Partial Sun to Full Sun	6A - 9A	20' – 25'	6' – 10'
Holly, Inkberry *Ilex glabra*	Partial Shade or Partial Sun to Full Sun	5A – 10A	6' – 10'	6' – 10'
Holly, Japanese *Ilex crenata*	Partial Shade or Partial Sun to Full Sun	6A – 9A	6' – 10'	6' – 10'
Holly, Nellie Stevens *Ilex x*	Partial Shade or Partial Sun to Full Sun	6A – 9A	15' – 25'	6' – 10'
Holly, San Jose *Ilex x aquipernyi*	Full Shade to Full Sun	5B – 9A	15' – 20'	10' – 15'
Holly, Yaupon *Ilex vomitoria*	Full Shade to Full Sun	7A – 10A	15' – 18'	10' – 15'
Japanese Privet *Ligustrum japonicum*	Partial Shade to Full Sun	7B – 10B	12' – 18'	15' – 25'
Wax Myrtle, Pacific *Myrica californica*	Partial Shade to Full Sun	7B – 11	15' – 25'	15' – 25'
Wax Myrtle, Southern *Myrica cerifera*	Partial Shade or Partial Sun to Full Sun	7B – 11	15' – 25'	15' – 25'

The Filterra® standard sized box accommodates a 5 to 15 gallon root zone. Larger trees will require deeper boxes. Modified custom boxes can be manufactured at an additional cost.

The species listed are drought tolerant and have applicability to bioretention due to shallow root zones.

This list is subject to availability and we reserve the right to make appropriate substitutions when necessary.
For species not listed, please contact for suitability.

Each Filterra® unit must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
This may be achieved through a piped system, gutter flow or through the tree grate.
In common with all plants, each Filterra plant will require more frequent watering during the establishment period

Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *BaySaver Technologies© BaySeparator™ System*			
Owner: EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD Date: April 2015	Last revised: April 2015	Review Date: April 2015

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for performing inspections and maintenance of BaySaver Technologies© BaySeparator™ stormwater filtration systems at Fort McNair in Washington, DC. These systems were installed at Fort McNair to treat stormwater runoff from roadway and parking areas and help Fort McNair prevent stormwater pollution and maintain compliance with the Clean Water Act. To ensure the BaySeparator™ systems function as designed and achieve maximum pollutant removal, they must be regularly inspected and maintained.

SOPs specifically developed for the stormwater management facilities present at the JBM-HH installations serve as written guidance to JBM-HH staff on how to properly inspect and maintain JBM-HH-owned stormwater management facilities.

The BaySaver Technologies© BaySeparator™ stormwater filtration system is a stormwater best management practice (BMP) that filters stormwater runoff from impervious surfaces (roadways, parking lots, and rooftops). The BaySeparator™ system consists of a Primary Manhole and Storage Manhole connected by a BaySeparator™ unit. Runoff enters the Primary Manhole, and flows over a weir to enter the BaySeparator™ unit to the storage manhole. Coarse sediment settles to the bottom of the Primary Manhole; after passing through the BaySeparator™ unit, floatable debris, grease, and oils float to the top of the Storage Manhole, while fine sediment settle to the bottom. The separated flow then flows back through the BaySeparator™ unit and into the outfall to the DC MS4. Refer to Figure 1 for a diagram of a BaySeparator™ stormwater filtration system and Figure 2 for the locations of BaySeparator™ stormwater filtration systems at Fort McNair. The manufacturer's Technical and Design Manual is included as Attachment 1.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. DPW – Directorate of Public Works
b. EMD – Environmental Management Division
c. MS4 – Municipal Separate Storm Sewer System
d. PPE – Personal Protective Equipment
e. SOP – Standard Operating Procedure

2.2 Definitions

a. BaySaver Technologies© BaySeparator™ Stormwater Filtration System – a stormwater treatment system that uses a series of manholes to facilitate sedimentation and flotation to remove pollutants from stormwater runoff.

b. *Stormwater Management Facility* - a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release, or the velocity of flow.

3.0 OPERATIONAL PROCEDURES

3.1 Inspections and Maintenance

a. Each BaySeparator™ System shall be inspected annually.

1. Inspect the surrounding drainage area for evidence of cracks in pavement or excess trash and sediment.
2. Remove manhole covers to visually inspect each BaySeparator™ System manhole. Measure the depth of the sediment in each manhole using a measuring stick. The BaySeparator™ System requires maintenance if:
   - There is evidence of a chemical spill;
   - There is a significant amount of oil in the manhole; or
   - The depth of accumulated sediment exceeds two feet.
3. Inspections shall be documented on the inspection form provided as Attachment 2.

b. Maintenance of BaySeparator™ Systems involves cleaning out the Storage Manhole and Primary Manhole.

1. Storage Manhole: Use a vacuum truck or other similar equipment to remove all water, debris, oils, and sediment.

2. Storage Manhole: Use a high pressure hose to clean the manhole of all the remaining sediment and debris. Then, use the vacuum truck to remove the rinse water.
3. Primary Manhole: Use a submersible pump to pump the bulk of the water from the Primary Manhole into the clean Storage Manhole. Stop pumping when the water surface falls to one foot above the accumulated sediments.
4. Primary Manhole: Use a vacuum truck or other similar equipment to remove all remaining water, debris, and sediment.
5. Primary Manhole: Use a high pressure hose to clean the manhole of all the remaining sediment and debris. Then, use the vacuum truck to remove the rinse water.
6. Both Manholes: On sites with a high water table or other conditions which may cause flotation, it is necessary to fill the manholes with clean water after maintenance
7. Replace the two manhole covers.
8. Dispose of the accumulated water, oils, sediment, and trash at an approved facility in accordance with applicable regulations.

   Note: analytical testing may be required to determine appropriate disposal options. Contact EMD for assistance with disposal.

3.2 Inspection Supplies:

a. Inspection/Maintenance Record (see Attachment 2)
b. Camera
c. Measuring stick
d. Personal Protective Equipment (PPE)
   1. Work gloves
   2. Steel-toed boots

3.3 Safety Considerations

a. Always wear steel-toed boots to protect feet from possible crushing injuries while handling the manhole covers.
b. Use proper lifting techniques when removing sand filter covers to prevent back injury.
c. Use extreme caution when working over open manholes; no part of your body should enter the plane created by the opening, as this would constitute confined space entry.
d. DO NOT enter manholes under any conditions. Inspections and maintenance do not require confined space entry. Vacuum truck hoses will be used for all maintenance activities within manholes.

4.0 RECORDKEEPING AND REPORTING REQUIREMENTS

4.1 Recordkeeping Requirements

a. Complete the Inspection/Maintenance Record (Attachment 2) for each inspection and maintenance activity. DPW shall maintain these forms and their associated Work Requests.

4.2 Reporting Requirements

a. DPW shall provide EMD with written records of inspection and maintenance activities within seven days of the date the activity was performed.

5.0 RESPONSIBILITIES

5.1 DPW

a. DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

a. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 Figures

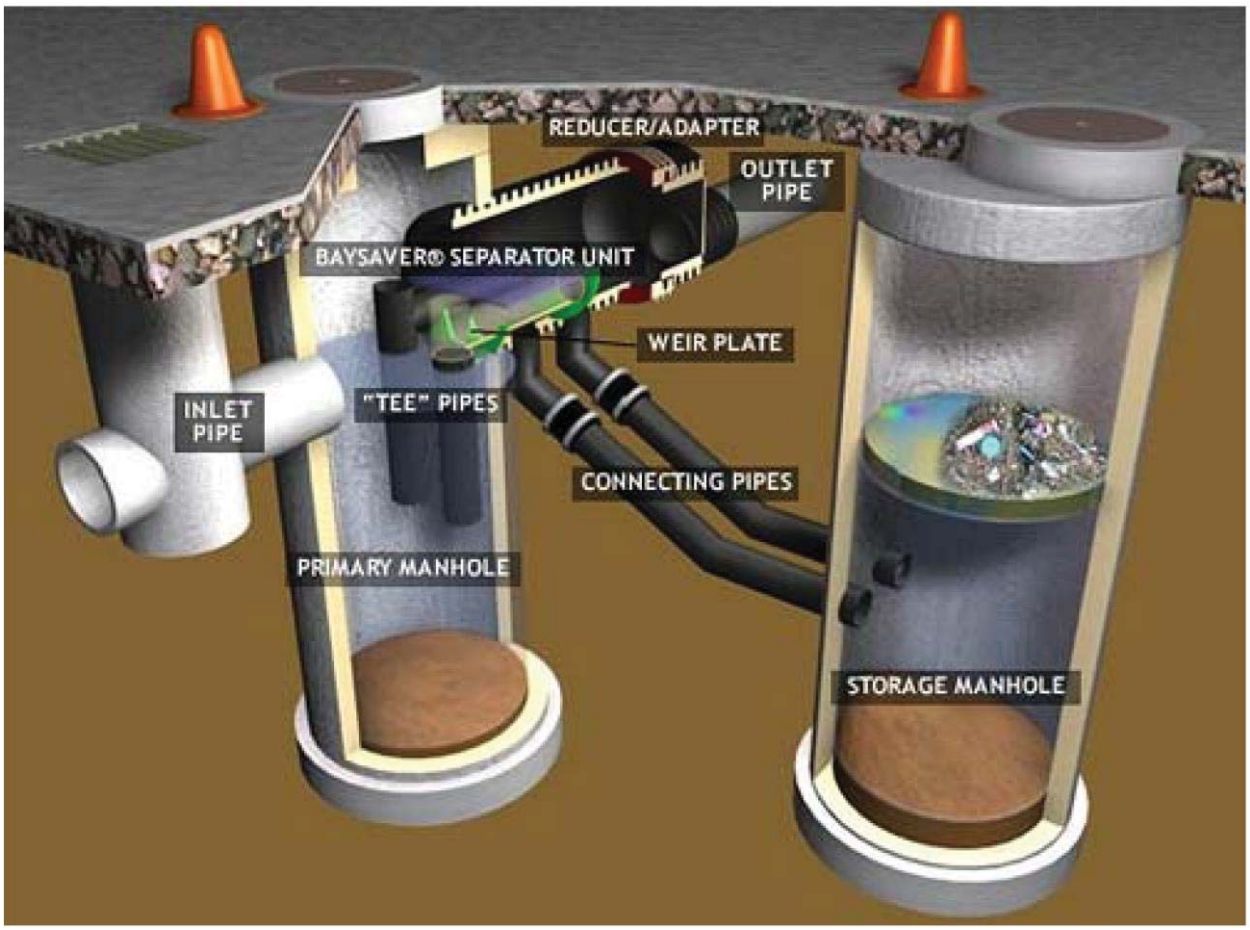


Figure 1: Typical BaySeparator™ Stormwater Filtration System

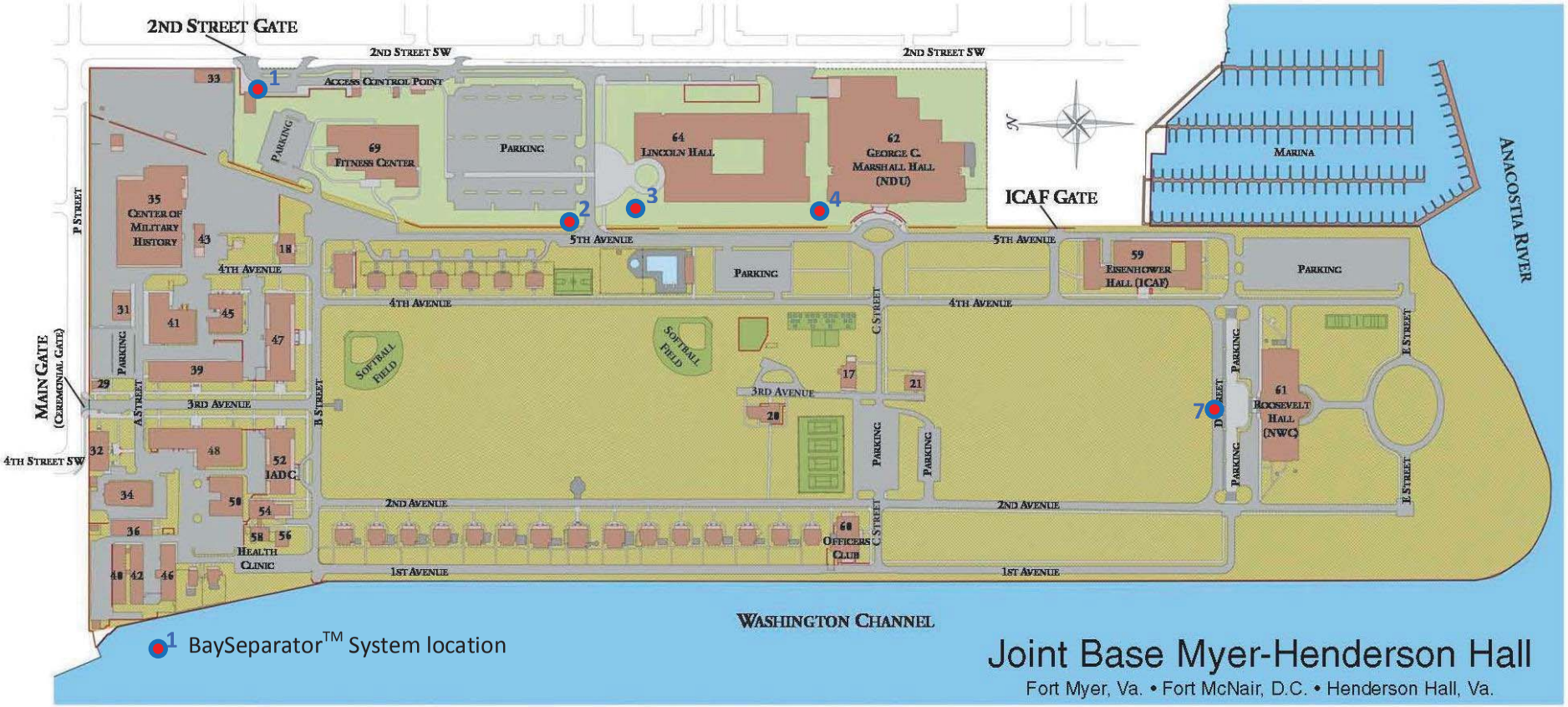


Figure 2: BaySeparator™ Stormwater Filtration System location map – Fort McNair

7.0 Attachments

Attachment 1: BaySeparator™ Stormwater Filtration System Technical and Design Manual

Attachment 2: Inspection and Maintenance Record

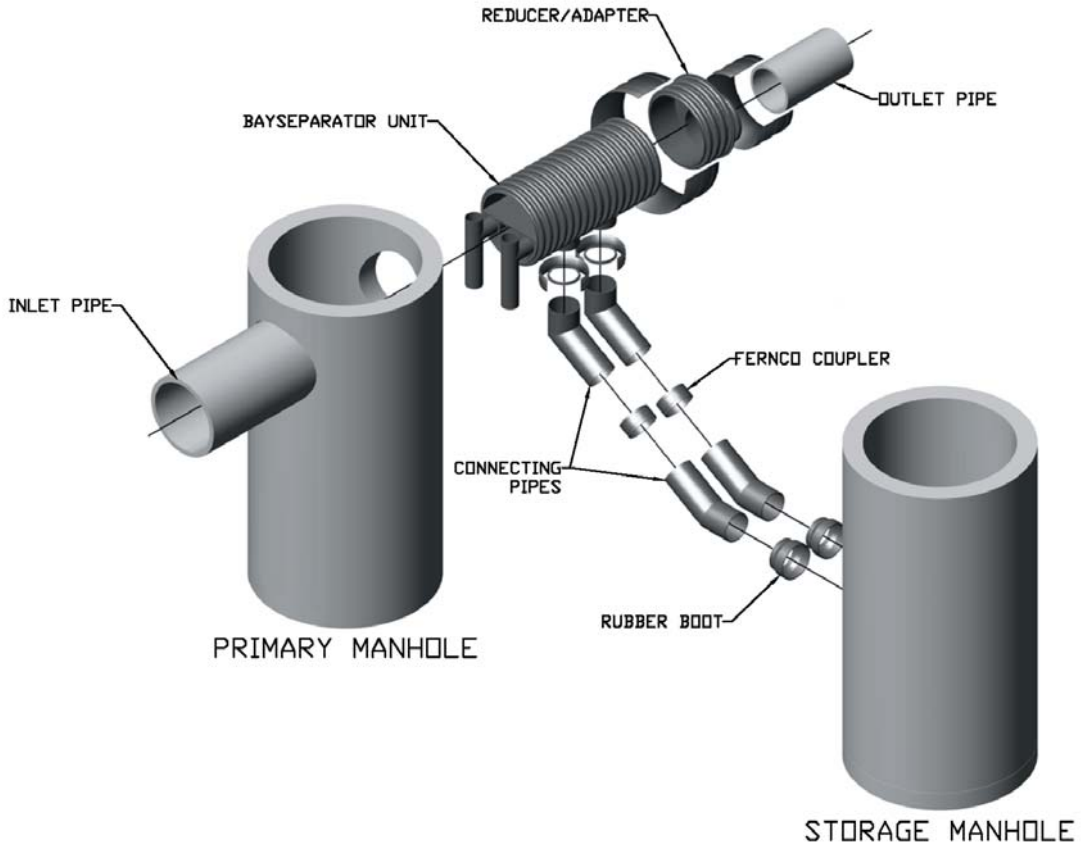
Attachment 1

BaySeparator™ Stormwater Filtration System Technical and Design Manual

BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions

BaySeparator™

Technical and Design Manual



www.BaySaver.com

BAYSEPARATOR™ SYSTEM

Technical and Design Manual

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1302 Rising Ridge Road, Unit One
Mount Airy, Maryland 21771
Phone 301-829-6470 • Fax 301-829-3747

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Chapter

1

Introduction

Since 1997, BaySaver Technologies™ has been protecting lakes, streams, and waterways from environmental problems. One of BaySaver Technologies' most innovative products to control non-point source pollution has been the BaySaver® Separation System[1]. The system has been installed in over 1,500 locations in commercial, industrial, and residential applications worldwide, and has been used in projects as varied as parking lots, gas stations, service stations, maintenance facilities, and highways. This separator has also been used as a pretreatment for other types of stormwater technologies such as filters, ponds, infiltration systems, etc.

During the summer and fall of 2004, BaySaver Technologies, Inc. contracted the University of Minnesota's Saint Anthony Falls Laboratory (SAFL) to perform an independent investigation and performance characterization of a full scale BaySaver® Separation System. After 18 months of intensive testing some relatively minor, albeit important, potential changes were identified in the standard BaySaver Separation System. These product improvement features were then incorporated in the optimized BaySeparator™ product line. The BaySeparator™ line of products has essentially the same design and appearance as its predecessor.

This manual provides an introduction to the BaySeparator™ line of products and the technical details that will help you meet your stormwater pollution control requirements both now and in the future.

The BaySeparator™ was designed based upon the philosophy of the 3E's: Efficiency, Ease of Maintenance, and Economy. Through extensive laboratory testing and mathematical modeling we have developed a separator that delivers predictable, reliable, and scalable performance based on third party full scale testing.

The BaySeparator™ System makes complying with stormwater treatment regulations nationwide convenient and cost effective. The BaySeparator™ system is a high performance separator yet, its unique and simple design keeps it highly affordable, easy to specify, install, and maintain. The BaySeparator™ is customizable to special project site conditions as either a standalone or a pretreatment unit, and is ideal for use in retrofit situations. The BaySeparator™ has minimal footprint requirements when compared to other types of Best Management Practices (BMPs).

The BaySeparator™ system begins operating as soon as runoff enters the system. During a storm event, flow enters a Primary Manhole for initial separation. The flow is then conveyed to an offline Storage Manhole where oils, fine suspended solids, and floatables are collected. Since the

[1] The BaySaver® Separation System is manufactured in Mount Airy, Maryland, by BaySaver Technologies, Inc., and is protected by U.S. patent 5,746,911, several patents pending, and international patents. Any infringement on these patents will be prosecuted to the fullest extent of the law. For detailed information on specifying, purchasing, or installing a BaySaver® Separation System, please contact BaySaver Technologies, Inc. or an authorized representative directly.

water flow is regulated into the secondary manhole, resuspension is eliminated during higher flows. In addition, the system's chambers are fully accessible for inspection and maintenance from the surface without entry to the system, resulting in more efficient maintenance and lower costs.

BaySaver Technologies, Inc. is committed to providing stormwater treatment solutions and excellent customer service. If you have any questions about the information in this manual, please contact BaySaver Technologies at 1-800-229-7283 (1-800-BaySaver) or by e-mail at TechQuestions@BaySaver.com.

Chapter

2

Principles of Operation

Hydrodynamic Separators

Hydrodynamic separators rely on density differences and gravity to remove suspended solids and floatables (hydrocarbons, floating debris, etc.) from stormwater runoff. The BaySeparator™ system splits water between two different manholes for optimal removal efficiency, responding to changes in the influent flow rate. Pollutants are trapped in the two manholes until they are removed by routine maintenance.

Mechanisms of Removal

The BaySeparator™ system removes pollutants from the stormwater stream through one of two mechanisms: sedimentation or flotation. Engineers have relied on these two mechanisms in water and wastewater treatment for years. The BaySeparator™ system applies these time tested principles to stormwater treatment in a configuration that prevents contaminant release or resuspension during high flow rates.

Sedimentation is the gravity-driven process by which solids suspended in water fall downward. Sedimentation is driven by the difference in density between the solid particles and the water surrounding it, and the size of the settling particles. Because they have more mass, larger particles settle faster than smaller ones. The effectiveness of sedimentation depends on the size of the settling particles and the length of time the particles are allowed to settle.

Flotation works the same way as sedimentation, but in the opposite direction. Floatable pollutants like free oils and debris rise to the surface and are trapped in the storage manhole.

BaySeparator™ systems and other types of similar BMPs are typically sized to provide a given annual aggregate removal efficiency. While hydrodynamic separators perform better at low flow rates than they do at high flows, low flows are far more frequent than high flows. When designed to achieve a specified annual aggregate removal efficiency, the BaySeparator™ system operates at a high removal efficiency during the frequent, low intensity storms. Because the majority of the sediment load from a site is contained in these more frequent storms, a BaySeparator™ system designed in this way can remove 80% or more of the annual sediment load from a given site. The BaySeparator™ can also be configured as a pretreatment BMP to filters, ponds, and other types of BMPs as part of a treatment train.

Overview of the Standard BaySeparator™ System

The system is comprised of three main components: the BaySeparator™ unit, the Primary Manhole, and the Storage Manhole. Figure 2.1 displays a simple schematic of the BaySeparator™ system. Influent flow containing pollutants enters the system by first passing through the Primary Manhole. In this structure, coarse sediment settles while the flow passes over a weir into the BaySeparator™ Unit and is routed to the Storage Manhole. The influent flow, at this point, still contains pollutants of concern, such as fine sediments, oil, grease, floating trash, and other debris. Once in the Storage Manhole floatable trash, oils, and grease float to the surface, while fine sediments settle out and the influent separated flow returns to the outfall of the system back through the Separator Unit.

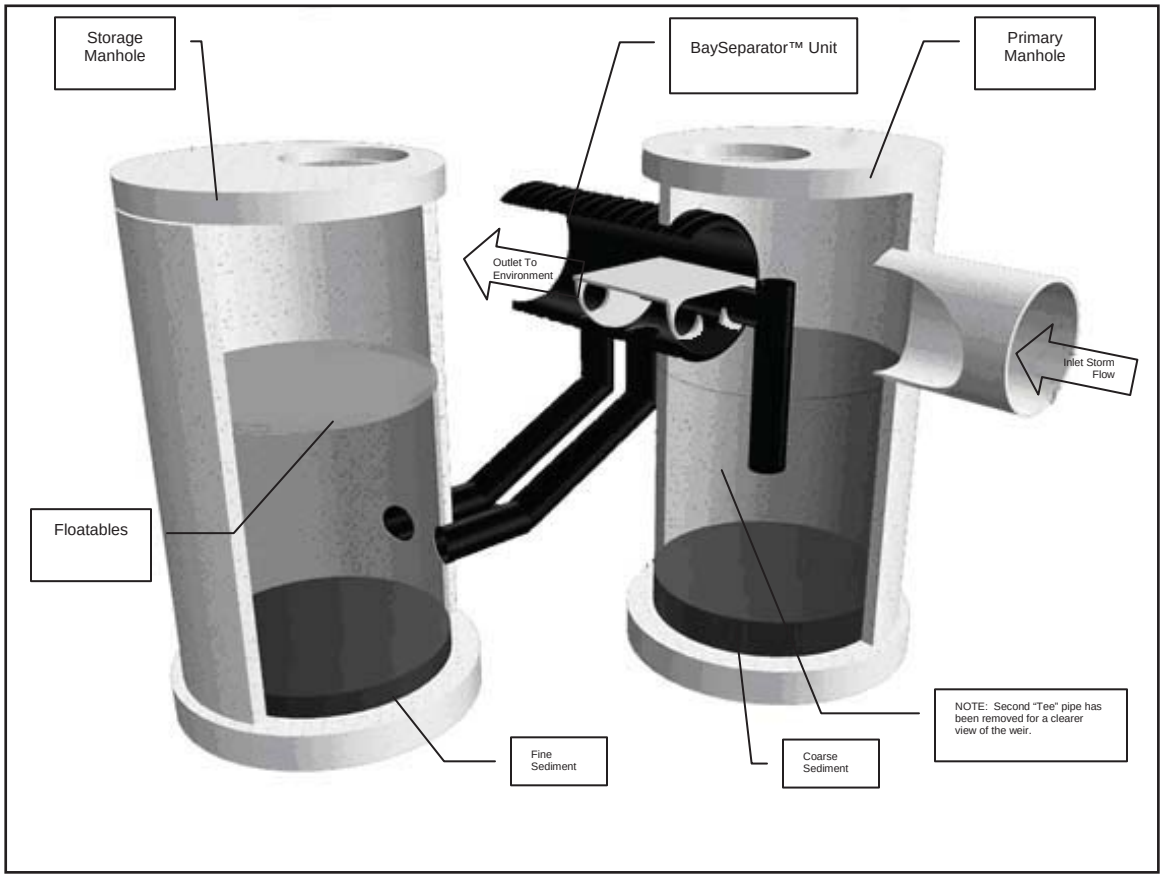


Figure 2.1: The BaySeparator™ System

As the rate of flow increases through the system, the BaySeparator™ unit acts as a dynamic control to route the influent flow through the most effective flow path for treatment. For example, under low flow conditions the entire influent flow is treated as described above. Under moderate flows and up to the maximum treatment flow, water is continuously treated through both the Primary and Storage Manholes, with a portion of these flows diverted through the T-pipes and the remainder flowing into the Separator Unit and then to the Storage Manhole. This flow path allows for full treatment of floatable pollutants, while still treating sediments under moderate flow conditions. During maximum flow conditions, most of the influent flow passes over the bypass plate and will not be treated.

Single Structure BaySeparator™ Systems

For some applications, site conditions or applicable regulations may require a single structure hydrodynamic separator. For these projects, BaySaver Technologies can provide the BaySeparator™ SV, a BaySeparator™ system contained in a single precast concrete vault. The BaySeparator™ SV is a self-contained, single structure BMP that operates on the same principles and in the same manner as the standard BaySeparator™ systems.

The BaySeparator™ SV is contained in a precast concrete vault. The vault is divided into two separate chambers: a primary chamber and a storage chamber, which duplicate the functions of the precast manholes. These two chambers provide a location for sedimentation and flotation to occur, and storage capacity for the collected pollutants. Fine sediments and floatable pollutants are stored off-line, isolated from high flows that may enter the system during extreme events, and the accumulated pollutants are retained in the two chambers until they are removed by routine maintenance.

Internal flow controls divert influent water to achieve the best possible treatment efficiency in response to the influent flow rate. These controls are constructed of HDPE, PVC, or stainless steel, and include a surface skimming pipe that conveys influent water from the surface of the primary chamber to the middle of the storage chamber; a return pipe that delivers treated water from the storage chamber to the system outfall; a baffle in the primary chamber that prevents design flows from passing directly to the system outlet; and a weir at the system outfall that allows flows up to the maximum treatment rate to pass through the system without inundating the storage chamber and resuspending the pollutants collected there. These flow controls also allow extreme flows to pass through the system unimpeded, thus minimizing the risk of resuspending collected pollutants.

The BaySeparator™ SV is also available with built-in flow splitter design (BaySeparator™ SV-FS). This configuration delivers treated effluent to a detention system or another water quality device via a low flow while also diverting treated secondary flow to the low flow outlet as well. This outlet also allows high intensity runoff to bypass the system through a separate overflow outlet pipe. The two effluent streams can be directed to separate outfalls, or combined downstream and directed to a single outfall. Engineering details for the BaySeparator™ SV-FS system can be found in Appendix B.

BaySaver Technologies, Inc. also manufactures an additional single structure system, BaySeparator™ TT. The BaySeparator™ TT is constructed within a precast concrete vault. The system comprises a modified BaySeparator™ SV-FS system and a third chamber that is used as the housing structure for a BayFilter™ system. This third chamber also accommodates an attachment of an underground storage system that retains the water quality volume on site.

The BaySeparator™ TT units were designed specifically to meet the specifications imposed by the Maryland Stormwater Design Manual and the Montgomery County Department of Permitting Services. For more information on the applicability of the BaySeparator™ TT-4 or TT-7, please contact BaySaver Technologies directly at 800.229.7283 (800-BAYSAVE)

BaySeparator™ System Operation

Low Flows

During low flows, the BaySeparator™ System treats all the runoff through both manholes. This occurs during small storms and the beginning of more intense storms.

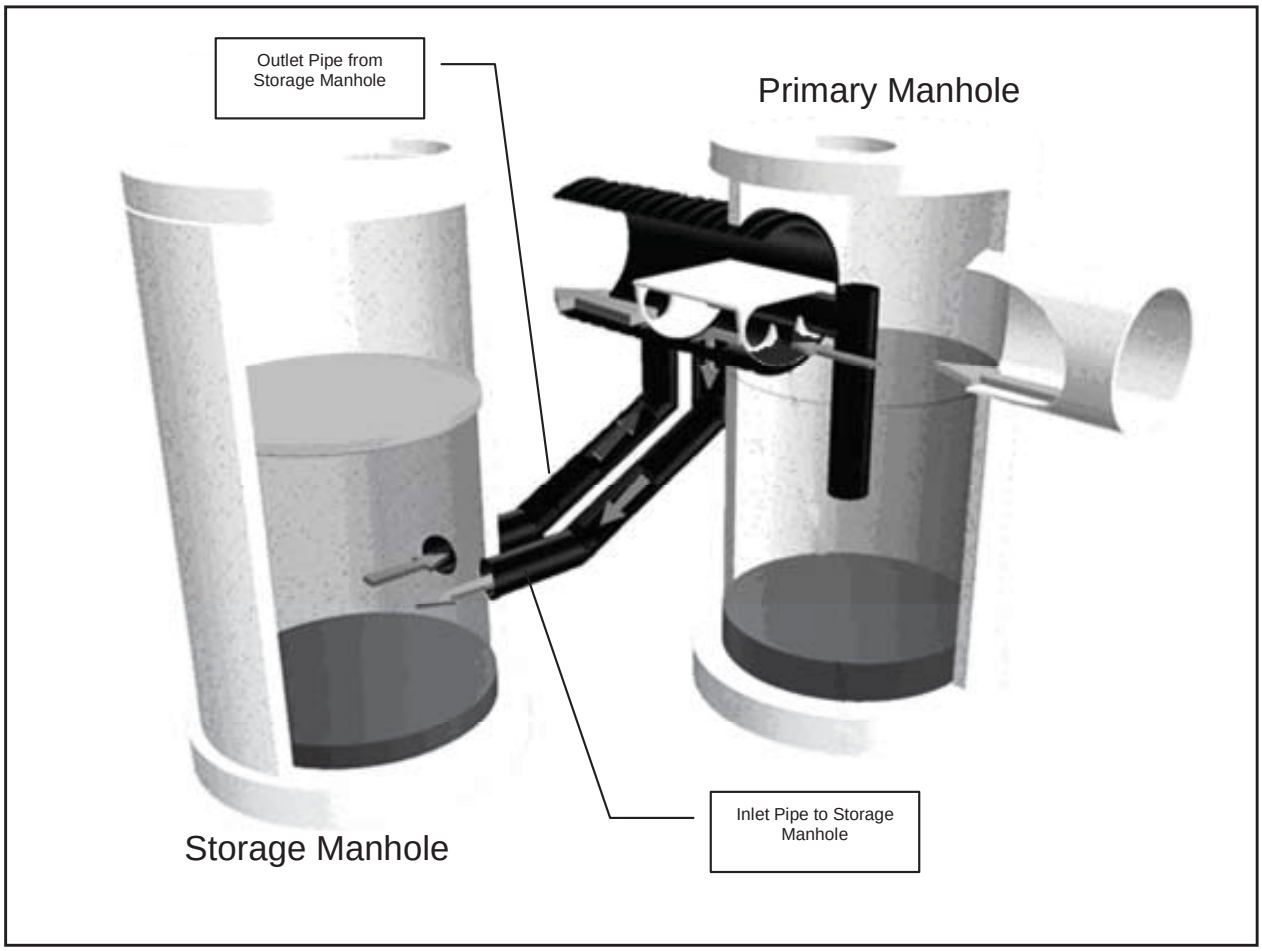


Figure 2.2: Low Flow Operation

Note: Only one "T" pipe is shown in this drawing.

As shown in Figure 2.2, water enters the BaySeparator™ system's Primary Manhole through the inlet pipe shown on the right side of the figure. Coarse sediments (gravel and sand) immediately fall to the floor of the Primary Manhole. The influent water, carrying floatables and finer sediments, flows through the separator and is conveyed into the Storage Manhole (on the left), where it enters the structure below the water surface. When water enters the Storage Manhole from the submerged inlet pipe, oils and other floatables rise to the surface, while sediments settle to the floor. These contaminants remain trapped offline and are not resuspended during larger flows. The influent water displaces clean water from the center of the column, which is forced back up the return pipe to the system outfall. In this way, all of the water that reaches the system outfall has been treated in both the Primary and Storage manholes.

Maximum Treatment Flow

During larger storms, flow rates continue to increase. During these events, the BaySeparator™ unit continues to divert surface flows (containing the majority of suspended sediments, as well as the oils and other floatables) from the Primary Manhole to the Storage Manhole as described above (Figure 2.3).

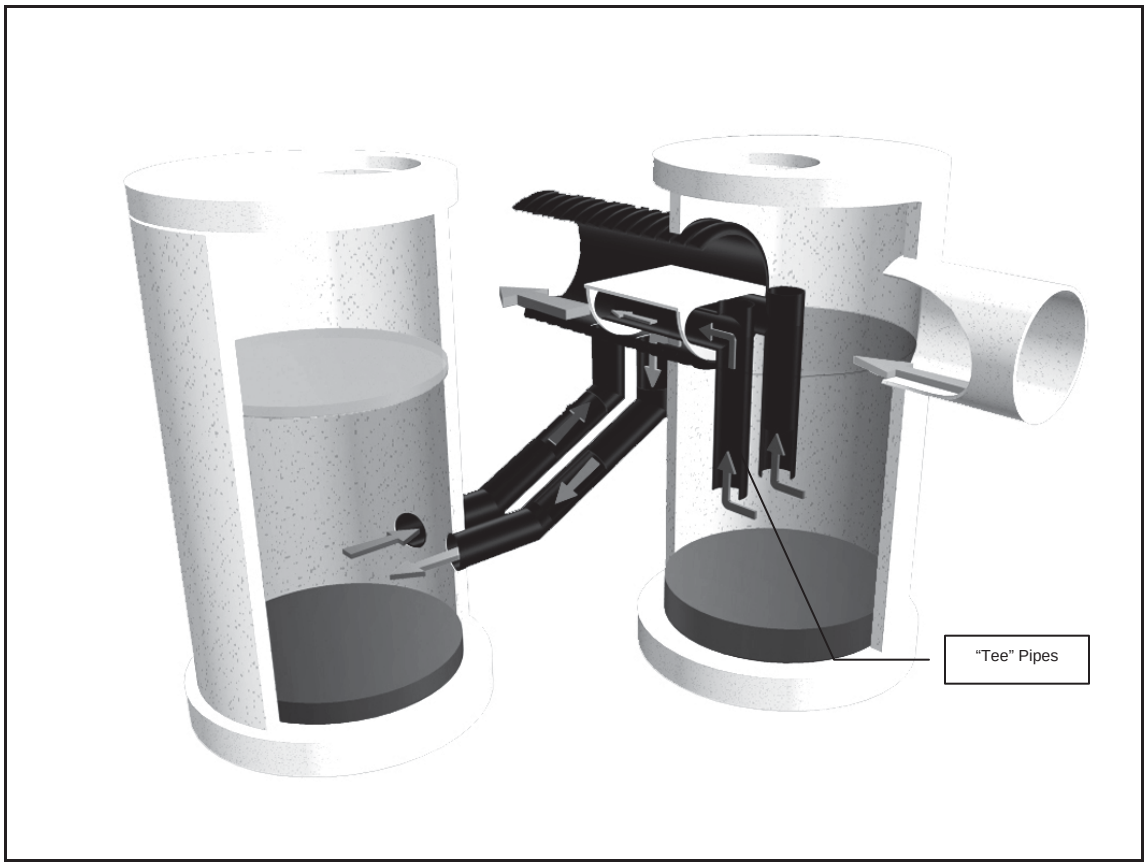


Figure 2.3: Maximum Treatment Flow

Additional flows associated with the larger storm are treated by separation in the Primary Manhole. As the pollutants are separated , the influent water displaces treated water from the center of the column and forces it up the "Tee" pipes to the system outfall.

Peak Design Flow

The BaySeparator™ system also has an internal bypass to prevent flooding of the drainage area. Influent flows with flood potential are directed over the bypass plate and directly through the unit. The BaySeparator™ system uses the weir plate to limit flows into the Storage Manhole, minimizing the risk of resuspending captured pollutants such as fine sediments, oils, and floatables that are stored offline. **By storing pollutants offline, the BaySeparator™ system hydraulically isolates these contaminants from the high energy influent flows, effectively eliminating the risk of resuspending accumulated contaminants.**

Figure 2.4 Peak Design Flow

Figure 2.4 shows the BaySeparator™ system near peak design flow. The open top "Tee" pipes are engineered to minimize resuspension risks in the Primary Manhole. When the flow rate is high enough to present the possibility of resuspension, water is allowed to flow into the top of the "Tee" pipe. This limits the flow from the bottom of the pipe and minimizes turbulence in the center of the Primary Manhole.

Single Structure BaySeparator™ Operation

BaySeparator™ SV Operation

During low flow conditions, influent water enters the BaySeparator™ SV through the Inlet pipe (labeled D in Figure 2.5). It flows directly into the primary chamber (A), causing the water level in that chamber to rise. When the water level in the primary chamber rises, water is skimmed from the surface of that chamber by a pipe (G) that penetrates the wall between the two chambers. This pipe delivers that water to the storage chamber (B), where it enters horizontally below the water surface through a 90 degree fitting (H). When the water enters the storage chamber, the entrained sediments, floatables (oils, trash, debris) separate from the water stream – sediments settle to the structure floor and floatables rise to the water surface. The additional water in the storage chamber displaces clean water from the center of the column, which enters the return pipe (I) and flows to the system outlet assembly (J). From here, the treated water leaves the BaySeparator™ system.

When the flow rate into the BaySeparator™ system increases, an additional flow path is created. During this design treatment rate, water in the primary chamber flows beneath the surface baffle plate (W). The water that passes beneath this baffle is free of oils and floatable pollutants, which will continue to be removed in the storage chamber. When the water level in the primary chamber rises high enough, this cleaner water will flow over the weir (E) shown in the outlet assembly (J).

In extreme storm events, the flow rate into the BaySeparator™ system exceeds the maximum treatment rate (MTR) of the SV unit. Under these rare conditions, the excess flow passes over the surface baffle plate (W) and flows directly to the outlet assembly (J). Because the water level in the primary is higher than the top of the weir, the weir no longer limits the flow to the system outlet. Instead, the high flows pass directly over the walls of the outlet assembly (J) and enter the outlet pipe (F) directly.

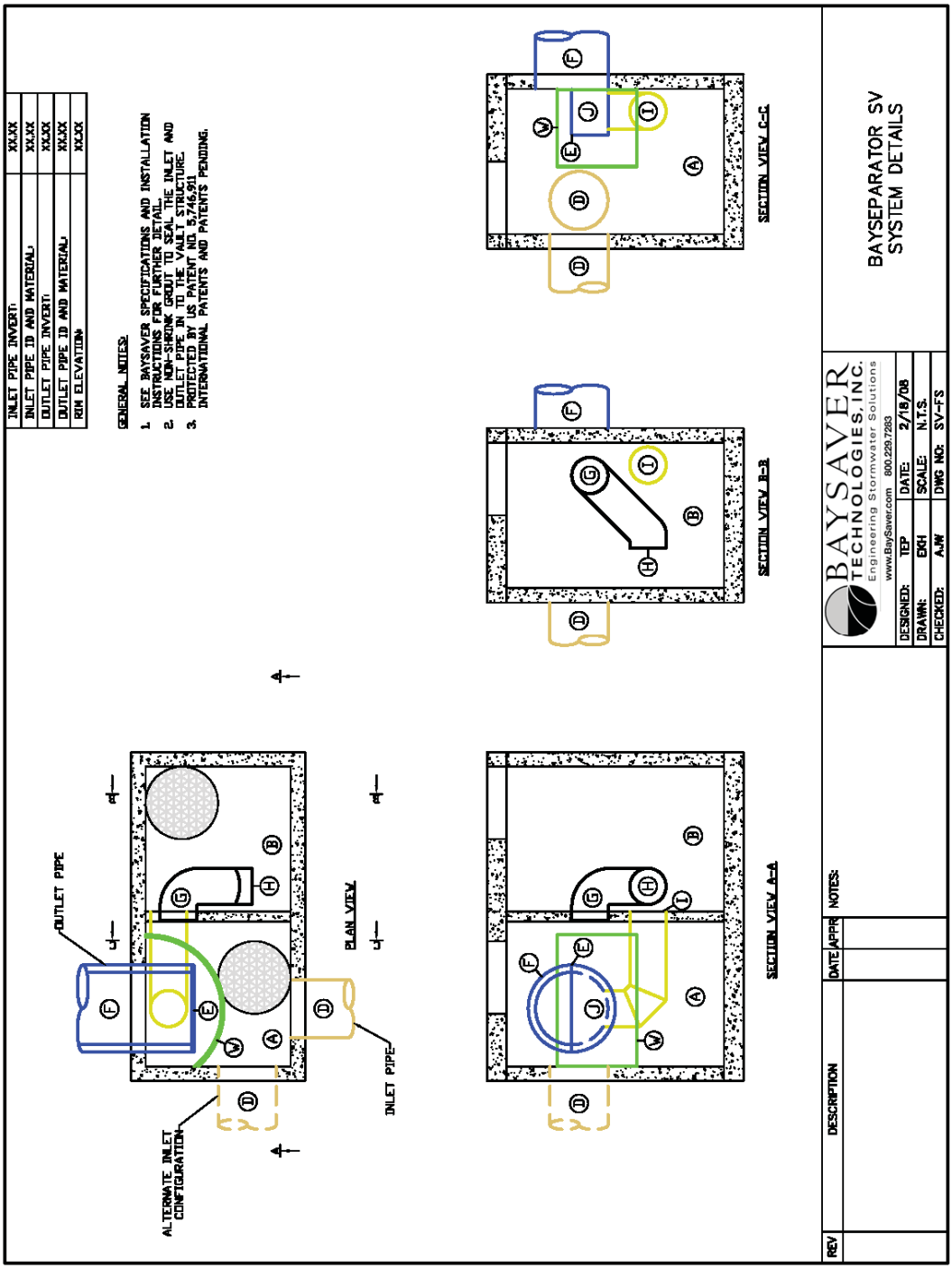


Figure 2.5: BaySeparator SV

BaySeparator™ SV-FS Operation

During low flow conditions, influent water enters the BaySeparator™ SV-FS through the influent pipe (labeled D in Figure 2.6), in the same manner as it does in the standard BaySeparator™ SV system. It flows directly into the primary chamber (A), causing the water level in that chamber to rise. When the water level in the primary chamber rises, water is skimmed from the surface of that chamber by a pipe (G) that penetrates the baffle wall between the two chambers. This pipe delivers that water to the storage chamber (B), where it enters horizontally below the water surface through a 90 degree fitting (H). When the water enters the storage chamber, the entrained sediments and oils begin to separate from the water stream – sediments settle to the structure floor and oils rise to the water surface. The additional water in the storage chamber displaces clean water from the center of the column, which enters the return pipe (I) and flows to the treated flow outlet assembly (J).

When the flow rate into the BaySeparator™ system increases, an additional flow path is created. When the water level in the primary chamber rises to a point higher than the horizontal invert of the tee-pipe (K), water begins to flow into the tee-pipe (K) from below the water surface of the primary chamber. This water is free of oils and other floatable pollutants, and it is conveyed through the tee-pipe to the treated water outlet assembly (J). The geometry of the tee pipe limits the flow rate through this path in such a way as to continue sedimentation in the primary chamber throughout design conditions.

In extreme storm events, the flow rate into the BaySeparator™ system exceeds the maximum treatment rate of the SV-FS unit. Under these rare conditions, the excess flow passes over the surface baffle plate (W) and flows directly to the overflow outlet pipe (F). The overflow outlet assembly (E) prevents water from entering the overflow outlet during design flow conditions. When the water level in the primary chamber rises high enough, however, excess water flows over the outlet assembly walls (E) and leaves the system through the overflow outlet pipe (F).

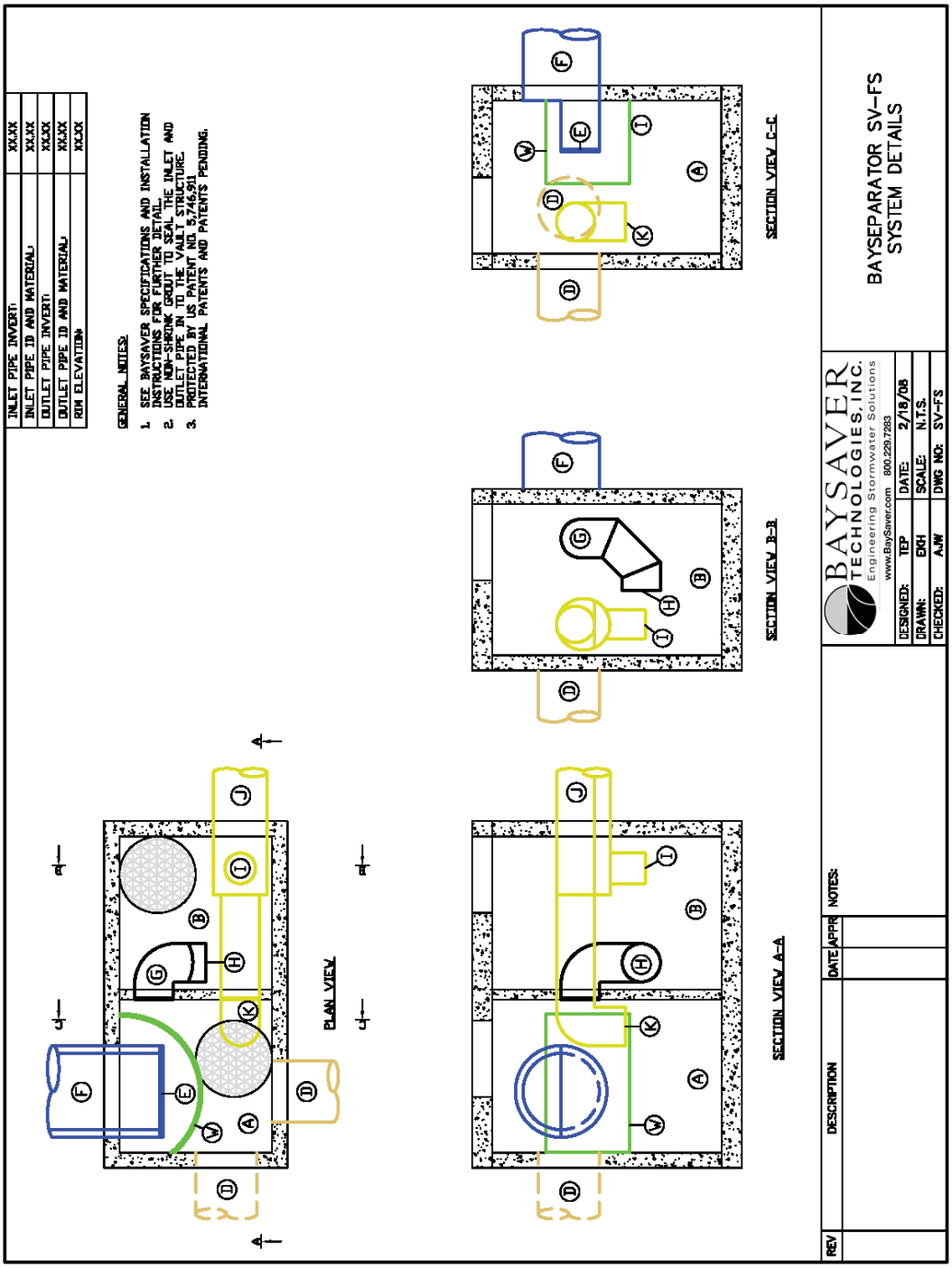


Figure 2.6: BaySeparator™ SV-FS

BaySeparator™ TT Operation

During low flow conditions, influent water enters the BaySeparator™ TT through the inlet pipe (labeled D in Figure 2.7), in the same manner as it does in the BaySeparator™ SV. It flows directly into the primary chamber (A), causing the water level in that chamber to rise. When the water level in the primary chamber rises, water is skimmed from the surface of that chamber by a pipe (G) that penetrates the wall between the two chambers. This pipe delivers the storage inflow water to the storage chamber (B), where it enters horizontally below the water surface through a 90 degree fitting (H). When the water enters the storage chamber, the entrained sediments and floatables separate from the water stream – sediments settle to the structure floor and oils rise to the water surface. The additional water in the storage chamber displaces clean water from the center of the column, and this storage outflow enters the return pipe (I) and flows into the filtration chamber (C). The treated water enters the filtration chamber horizontally through a 90 degree fitting on the end of the pipe (J).

When the flow rate into the BaySeparator™ system increases, a second flow path is utilized. When the water level in the primary chamber rises to a point higher than the horizontal invert of the secondary flow pipe, water begins to flow into the secondary flow pipe from below the water surface of the primary chamber. This secondary treatment flow is free of oils and other floatable pollutants, and it is conveyed through the storage chamber via the secondary flow pipe. The geometry of the pipe limits the flow rate through this path in such a way as to continue sedimentation in the primary chamber throughout design conditions as well as to accommodate the low flow paths as outlined above.

The low flow is released into the filtration chamber so as to ensure that the first flow is used to "prime" the BayFilter™ cartridges to enable full cartridge flow to occur immediately. There is a one-way (flap) valve (V) located in the extended detention weir plate (Q). As water enters the filtration chamber, the valve will be held shut by the pressure difference between this chamber and the water in the extended detention pipes (This seal does not need to be "perfect", a restricted condition is all that is necessary.) Once the water elevation has reached 28", the filters are primed and flow at the design rate will occur. At this point excess water flow goes over the extended detention weir and into the extended detention chamber. After the storm subsides and the filter chamber drains down, the cartridges go into siphon, and the flap valve opens and releases the water in the extended detention chamber into the filtration chamber.

For runoff flow rates up to the design treatment flow rate, 100% of the water that enters the BaySeparator™ TT system is treated by both the physical processes of the BaySeparator™ itself and the media filtration of the BayFilter™ system. When the influent flow rate is greater than the filtration capacity of the BaySeparator™ TT system, but below the maximum treatment flow rate of the BaySeparator™ TT unit, the excess water is diverted to the extended detention system, where it is stored until it can be released to the filtration chamber at the lower flow rate. In the filtration chamber, the water is passed through the BayFilter™ cartridges, and then collected in an underdrain manifold and discharged through the outlet pipe (N). Once the extended detention system is full, the treatment continues because as the water enters the primary chamber (A) , it must flow below the baffle (W) and then over the outlet weir (E) to the outlet pipe (F).

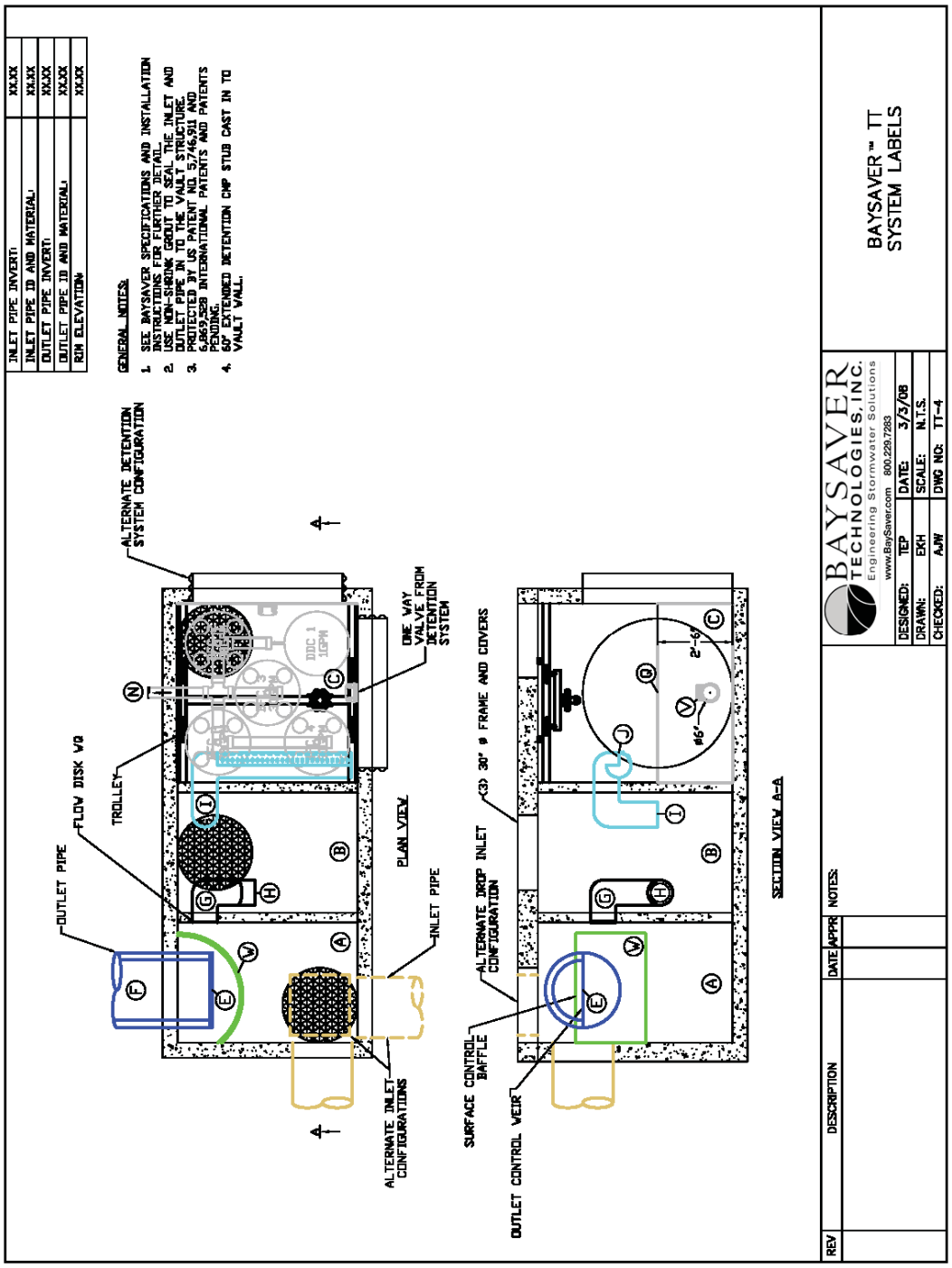


Figure 2.7: BaySeparator™ TT (BayFilters™ not shown, see Appendix B)

In extreme storm events, the flow rate into the BaySeparator™ system exceeds the maximum treatment rate of the BaySeparator™ TT unit. Under these rare conditions, the excess flow passes over the surface baffle plate (W) and flows directly to the overflow outlet pipe (F).

The BaySeparator™ TT-SO offers a slight variation from the "standard" TT unit. Functionally, both units operate in a similar fashion, but the SO unit has a single outlet (F) instead of two separate outlets. This single outlet (F) is located at the vault floor level of the primary chamber. In the TT-SO unit, the filter outlet pipe (N) is connected directly to a standpipe (E), which is open at the top, in the primary chamber. The elevation of this opening is the same as the elevation of the weir in the standard TT unit. All effluent flows (both treated and bypass flows) from the TT SO unit flow into a single outlet pipe (N). This TT SO unit may be used on sites where a single discharge point is advantageous.

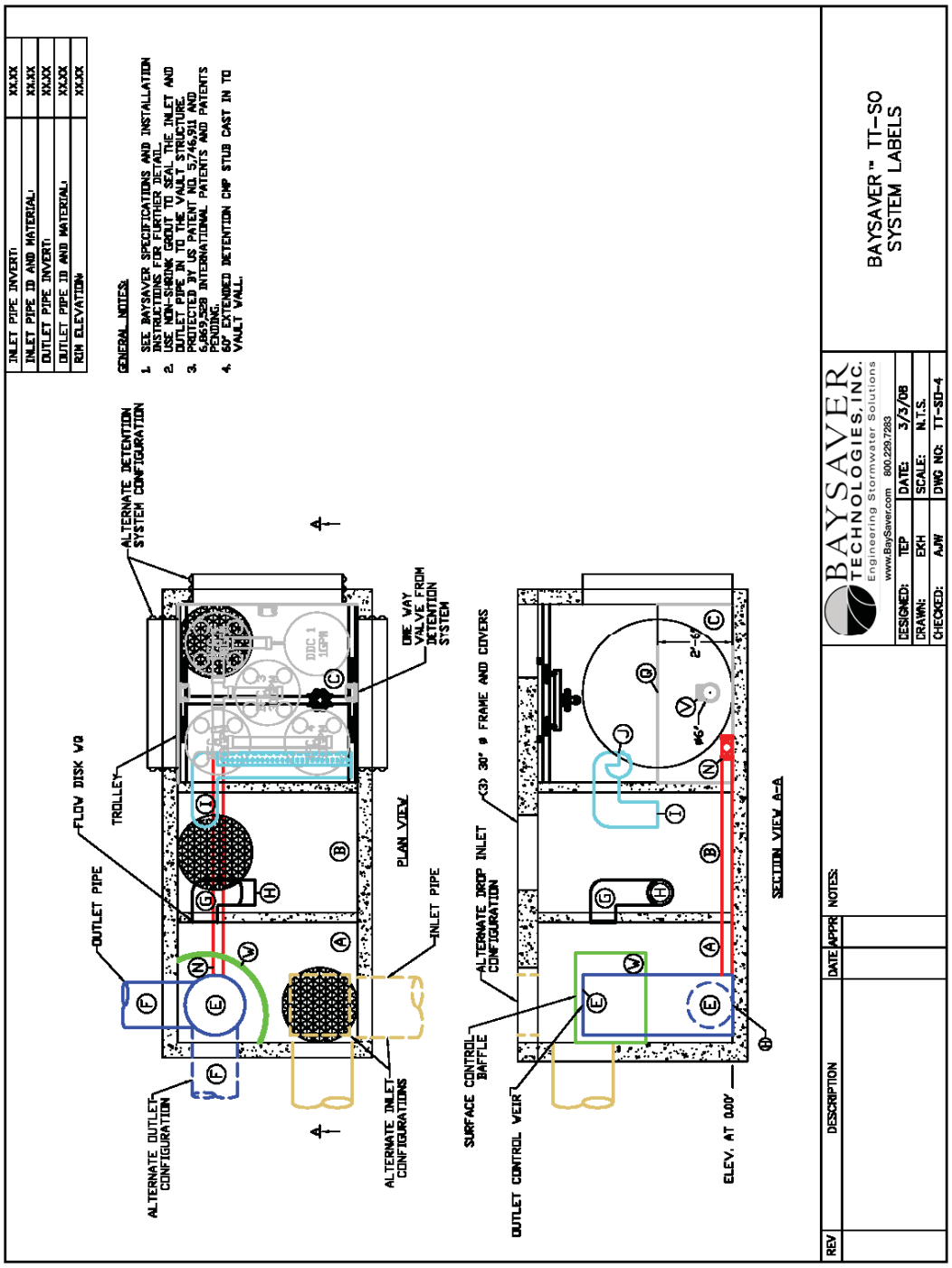


Figure 2.8: BaySeparator™ TT-SO

Chapter

3

Components of the BaySeparator™ System

The BaySeparator™ system comprises two standard precast manholes and the BaySeparator™ unit. The two manholes allow the removal and storage of pollutants, while the separator unit directs the flow of water to provide the most efficient treatment possible. Figure 3.1 shows a cutaway view of the complete BaySeparator™ system with flow patterns.

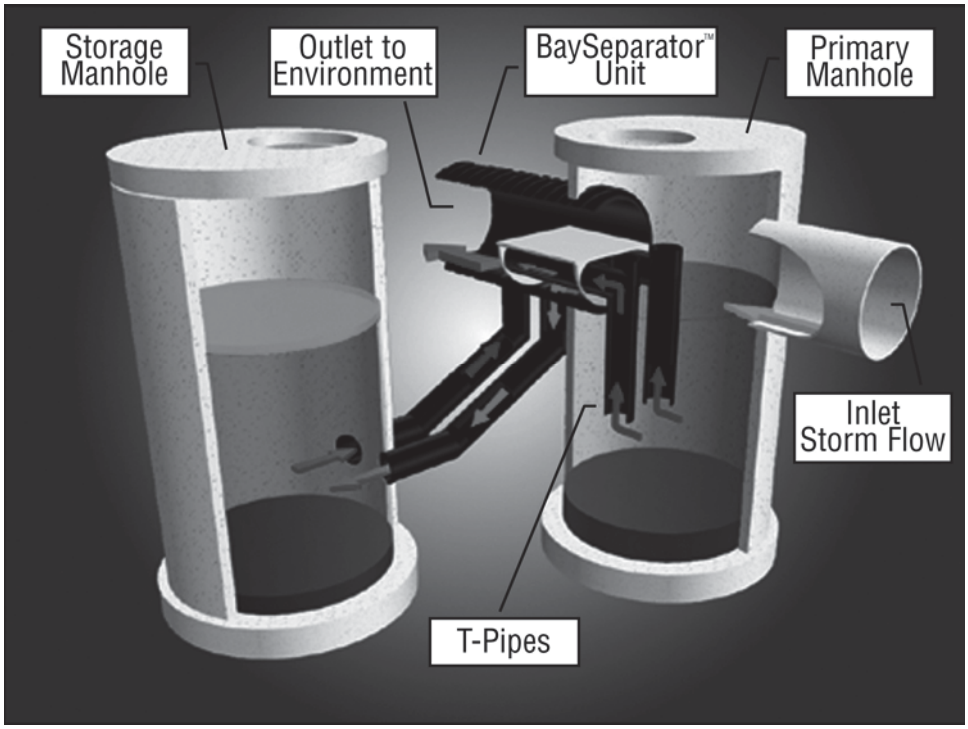


Figure 3.1: BaySeparator™ Flow Patterns

BaySeparator™ Unit

The BaySeparator™ unit is the heart of the BaySeparator™ system. The BaySeparator™ unit controls the influent flow through the two manholes. This device is manufactured by BaySaver Technologies', and can be purchased through our locally authorized sales representative. Contact BaySaver Technologies, Inc. for additional sales information.

The BaySeparator™ unit is fabricated entirely of high density polyethylene (HDPE) infused with UV-resistant carbon-black. HDPE is a non-brittle, chemically inert material known for its corrosion-resistant properties. It is commonly used in applications that expose it to harsh conditions (landfills and chemical plants, for example) and is used in storm drains throughout the world.

The BaySeparator™ unit is constructed using state-of-the-art technology and the best materials available ensuring quality construction. All parts are joined together with extrusion welding. The BaySeparator™ unit is light, easy to install, and is provided with the connecting pipes and couplers needed for a complete system (less the manholes)

Primary and Storage Manholes

The Primary Manhole is a standard precast structure used to remove coarse sediments. This manhole is generally installed inline with the storm drain and can be used as a multiple inlet structure. The precast manholes are purchased from local concrete distributors.

The Storage Manhole acts as a secondary treatment device for the collection and offline storage of oils, fine sediments and floatables. It is also a standard precast manhole that is purchased locally. The Storage Manhole is a key component that sets the BaySeparator™ system apart from other systems. The BaySeparator™ system stores the pollutants offline to prevent resuspension.

System Connections and Miscellaneous Piping

The BaySeparator™ unit is connected to each of the two manholes with standard storm drain pipe connections. The connecting pipes entering and leaving the storage manhole are submerged during normal operation. Those joints must be watertight, and are typically made using flexible pipe-to-manhole connectors (rubber boots) installed in the storage manhole by the precast manufacturer. These connecting pipes are joined to the BaySeparator™ unit using Fernco® seals with shear rings. The shear rings provide additional structural strength and rigidity to this joint. The BaySeparator™ unit is joined to the system outfall pipe with a custom made reducer/adapter provided by BaySaver Technologies, Inc.

The connecting pipes are joined to the BaySeparator™ unit via a high performance flanged connection using a stainless steel V-Retainer Coupling and sealed with a watertight MarMac seal. The connecting pipe orientation (left or right hand) can be easily performed by loosening the clamp screw and rotating the connecting pipe to the desired unit orientation.

Single Structure BaySeparator™ Systems

BaySeparator™ XK systems, BaySeparator™ SV systems, and BaySeparator™ TT systems contain internal components supplied by BaySaver™ Technologies, Inc. In BaySeparator™ XK systems, these components are fabricated from stainless steel, and are joined to the walls of the concrete vault structure using standard hardware provided by BaySaver™ Technologies. BaySaver™ supplies both mounting hardware and watertight seals (where necessary) for these installations.

BaySeparator™ SV and TT systems contain internal flow controls fabricated from HDPE and PVC. Like the components of the XK systems, these flow controls are provided by BaySaver™ Technologies with the necessary mounting hardware and watertight seals. The component mounting hardware and seals utilize standard utility connections, and are selected to meet all storm drain construction specifications. The flow controls are designed to be easy for any experienced utility contractor to install.

Chapter

4

Engineering and Design

BaySeparator™ units are manufactured in six (6) standard sizes (see Table 4.1). The BaySeparator™ is also available in a custom configuration XK model for sites requiring higher flow rates than the standard units, SV configurations for constrained sites that require a compact, single structure unit, and a TT (treatment train) single structure unit that incorporates an SV BaySeparator™ coupled with an integral extended detention structure, and a BayFilter™ system with controlled release.

The sizes of both the Primary and Storage Manholes in the BaySeparator™ may be varied to suit specific site conditions and treatment requirements as necessary. By selecting the appropriate separator unit size and determining the manhole diameters, the design engineer has the freedom to adapt the BaySeparator™ unit to the needs of a particular site. The entire system can easily be customized and hydraulically scaled to treat a wide array of stormwater flows varying from 1.5 cfs to 15.9 cfs with standard units. BaySaver Technologies can also accommodate significantly larger flows by using the BaySeparator™ XK model.

Table 4.1: BaySeparator™ Hydraulic Performance Characteristics

Standard BaySeparator™ Model Designation	BaySeparator™ Nominal Diameter (in inches)	Maximum Treatment Rate (MTR) (in cfs)	Maximum Hydraulic Rate (MHR) (in cfs)	Manhole Diameter/ Length Flow Based Systems (inches)	Manhole/ Vault Depth (in ft)
24	24	1.5	9.4	48	4
30	30	2.3	15.2	48-60	4-6
36	36	3.3	23.3	60-72	5-8
42	42	6.9	40.6	72-96	6-8
48	48	8.1	54.0	72-120	6-10
60	60	15.9	95.5	96-144	10-12
SV	24	2.6	15.0	60	4
SV-FS	24	2.6	15.0	60	4
TT-4 (TT-SO-4)	24	2.6*/0.27**	15.0	48	4
TT-7 (TT-SO-7)	24	2.6*/0.47**	15.0	48	4

Note: cfs = cubic feet per second

*Maximum flow to extended detention, ** Maximum filtration rate

Specifying BaySeparator™ Systems

Location

The first step in specifying a BaySeparator™ system is determining where to place it. One of the advantages of the BaySeparator™ system is its flexibility in site placement. The BaySeparator™ system can be configured as either a right- or left-hand unit to design around existing structures and can be placed under load bearing surfaces or in green spaces. Looking downstream through the system, if the Storage Manhole is placed to the left of the Primary Manhole, then a left-hand unit is needed, and if the Storage Manhole is placed to the right of the Primary Manhole, then a right-hand unit is needed.

For either pretreatment or full treatment flows that exceed the hydraulic capacities and/or performance capability of the 60″ BaySeparator™, BaySaver Technologies BaySeparator™ XK custom product line can accommodate higher hydraulic capacities and treatment flows to match a special application. Call BaySaver's Engineering Department at 1.800.229.7283 for sizing and design information.

One of the most important considerations in specifying the site of the BaySeparator™ system is choosing a location where inspection and maintenance access is readily available. The BaySeparator™ systems can be designed downstream of multiple inlets or catch basins to reduce the number of devices needed onsite, thus decreasing regulatory and maintenance costs.

BaySeparator™ systems are typically shown on site plans as shown in Figure 4.1. BaySaver Technologies also has available a standardized AutoCad® Detail Generator Program of the system in electronic format. This program generates all the information necessary to develop the plans and specifications for the system. Please contact BaySaver Technologies for a copy of this program or visit our web site at www.BaySaver.com.

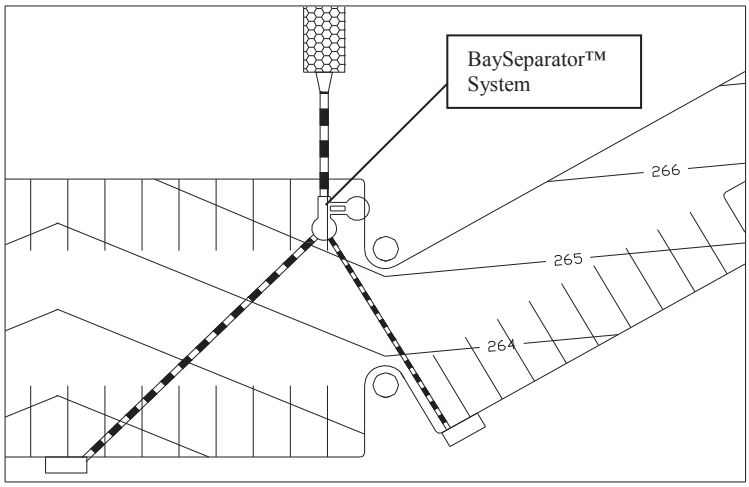


Figure 4.1: Site Plan Example

The location of the BaySeparator™ on the site is determined by several factors. Maintenance access, the unit's footprint, available drop, available depth, and the surface elevation of the receiving waters must be considered when selecting the system's location.

The BaySeparator™ system must be installed in an area that is accessible to maintenance equipment. The annual maintenance of a BaySeparator™ system requires a vacuum truck, and the manhole covers of the BaySeparator™ must be placed in locations that can be easily reached by such a vehicle.

The BaySeparator™ should be placed in a location that minimizes its interference with existing or planned underground utilities.

Hydraulic Performance Characteristics of the BaySeparator™

The BaySeparator™ system has two characteristic flow rates: the maximum treatment rate (MTR) and the maximum hydraulic rate (MHR). The MTR is the maximum flow rate that can be fully treated by the BaySeparator™ unit without any bypass. The MHR is the maximum flow rate that can be conveyed through the BaySeparator™. The MHR, or bypass flow capacity, allows BaySeparator™ systems to be installed online, without the need for a separate diversion structure. Table 4.1 shows the MTR, MHR, and Head Loss for each of the six BaySeparator™ units.

The BaySeparator™ has been extensively tested at a major university. This testing has been carried out using an F-95 sediment gradation (See Appendix C). F-95 is a graded sediment mixture, with 75% of the sediment by mass between 65 and 200 microns in diameter. The d_{50} of the F-95 sediment is approximately 125 microns. Laboratory testing has shown that the sediment removal efficiency of the BaySeparator™ system can be predicted through the use of Peclet Numbers. The Peclet Number is a dimensionless characteristic number that describes the ration of advective motion (in this case, sedimentation) to turbulent diffusion in a hydraulic system. Peclet Numbers for both the Primary and Storage manholes can be used to predict the removal efficiency of a BaySeparator™ system over a range of flow rates. For a complete explanation of the Peclet Number, see Appendix D.

BaySeparator™ systems can be designed for pretreatment (50% sediment annual aggregate removal efficiency), for stand alone / full treatment (80% annual aggregate removal efficiency), or for other values of annual aggregate removal efficiencies. The design criteria used for each project will depend on the applicable regulations of the jurisdiction in which the project site is located. Please consult BaySaver Technologies' Engineering Department at 1.800.229.7283 for special sizing requirements or questions.

System Sizing

BaySeparators™ can be sized following different criteria which include:

1. Flow Based Sizing: This applies when a locality specifies the required treatment flow (MTR) the separator has to treat together with the maximum hydraulic rate (MHR) associated with a peak design storm. In some cases a treatment volume is given which then needs to be converted to a flow using approved methods.
2. Annual Aggregate Removal (AAR) Based Sizing: This is a very common criteria used to size hydrodynamic separators to a given suspended solids removal performance.
3. Other Sizing Criteria: Certain jurisdictions might have special sizing criteria that do not fit the sizing criteria 1 or 2. In this case, BaySaver Technologies will work with the design engineer and regulators to design a system meeting these local regulations or concerns.

Explanation of the BaySeparator™ PT or SA Model Nomenclature

The BaySeparator™ can be a "PT" unit, in which case the unit is meant to remove at least 50% of the TSS on an annual aggregate removal basis. The "PT" BaySeparators™ are usually part of a treatment train. The "SA" unit is a stand alone BaySeparator™ usually designed to remove 80% (or more) of the TSS on an annual aggregate removal basis.

Sizing by Flow Rate

To size the BaySeparator™ unit, the design maximum flow through the storm drain must first be calculated. Compare that flow rate to the Peak Design Flow Rate listed in Table 4.1. Select a unit with a Peak Design Flow Rate equal to or higher than the design flow. The unit selected and all larger BaySeparator™ units have the capacity to convey the design flow without backup.

Local regulations may specify that a certain flow rate must be treated. In that case, compare the Maximum Treatment Flow Rate with the treatment flow specified by the local regulations. Again, the BaySeparator™ unit must have a maximum treatment flow rate (MTR) that is greater than or equal to the determined treatment flow rate. This ensures that the BaySeparator™ unit will meet the local regulations. Contact BaySaver Technologies for the recommended manhole sizes for flow based systems at 1.800.229.7283.

<u>Example</u>:

Stormwater treatment is needed for a 3.2 acre site located in the US East Coast. The site has an imperviousness coefficient of 0.85.

For this jurisdiction, the peak design flow is the 10-year 1-hour storm which is 2.6 inches. Using the Rational Method, this translates into calculated peak flow of 7.07 cfs of runoff to be conveyed. Using Table 4.1, we cross-reference this value against the Peak Design Flow Rates. The smallest unit that can convey this peak design flow is a 24 inch BaySeparator™.

If local regulations require full treatment of the 1-year 1-hour storm which is 1.1 inches for this location, this yields an average rainfall intensity of 1.1 inches per hour that need full treatment resulting in a treatment requirement of 2.99 cfs. Again, using Table 4.1, we cross-reference this value against the Peak Design Flow Rates. The smallest unit that can convey both the peak design flow and the required treatment rate is a 36 inch BaySeparator™.

Annual Aggregate Removal

The performance of the BaySeparator™ system is dependent on not only the BaySeparator™ unit size, but also the diameter and depth of the Primary and Storage manholes. As described above, hydrodynamic separators operate at varying efficiencies, depending on the treatment flow rate through the separator. The sizing of the manholes is done by BaySaver Technologies, Inc, or the designer using the BaySeparator™ Sizing Program. A general explanation of the procedure followed by the sizing program is given next.

In the BaySeparator™ system, the removal efficiency is related to the flow rate by a general logarithmic function shown below in Equation 1.

$$E = m * \ln\left(\frac{Q}{MTR}\right) + b \qquad \textit{Equation 1}$$

In Equation 1, E is the suspended solids removal efficiency of the system at the given flow rate Q, (≤MTR) and the parameters m and b are characteristics of the particular BaySeparator™ unit.

To size BaySeparator™ systems to meet AAR efficiencies, more information about the site is required. This sizing is done using the BaySeparator™ Sizing Program. In addition to the characteristics of the BaySeparator™ system, the drainage area, runoff coefficient for the site, the target TSS removal efficiency, and the maximum hydraulic rate (MHR) must be considered. The site location must be entered to determine which precipitation record to use as the basis for AAR calculations.

To calculate the AAR efficiency of a BaySeparator™ system, rainfall intensity is calculated to correspond to the MTR for the chosen system (100% of fraction of MTR in Table 4.3). The fraction of the total rainfall falling at or below that intensity is calculated for that maximum intensity based on historical precipitation records. Increments (10%) of that intensity and a runoff flow rate are then calculated for each of these increments. The fraction of the rainfall that generates a given runoff flow rate is multiplied by the removal efficiency at that flow rate to find the fraction of the total sediment removed under those conditions. Finally, the load reductions for each increment up to the MTR of the BaySeparator™ unit are added together to give the AAR efficiency of the system. An example of AAR calculations is shown in Table 4.3.

Scarsdale, New York Drainage Area: 0.76 Acres m = -0.3913 b = 0.3466				
Fraction of MTR (percent)	**Removal Efficiency (percent)**	**Rainfall Intensity (in/hr)**	**Fraction of Rainfall below Intensity (percent)**	**Incremental Efficiency (percent)**
10	99.0	0.11	43.6	43.1
20	97.6	0.22	23.5	23.0
30	81.8	0.33	12.3	10.1
40	70.5	0.44	6.7	4.7
50	61.8	0.55	5.5	3.4
60	54.6	0.66	2.5	1.4
70	48.6	0.77	1.4	0.7
80	43.4	0.88	1.2	0.5
90	38.8	0.99	0.9	0.3
100	34.7	1.10	0.7	0.2
			Aggregate Removal Efficiency:	**87.4**

Table 4.3: Calculation Example Annual Aggregate Removal Efficiency (AAR)

Because AAR sizing calculations require precipitation data that may not be available to designers, BaySaver staff can perform these calculations whenever they are required. In the near future, BaySaver Technologies Inc.'s website will contain an AAR sizing program that can perform the required calculations and generate design documents for AAR-based system designs.

AAR-based BaySeparator™ designs take into account the typical precipitation patterns throughout the United States. In most locations, the vast majority of precipitation falls at low intensities, generating low runoff flow rates. In Baltimore, Maryland, for example, 80% of the total precipitation falls at an hourly intensity of 0.37 inches per hour or less, and 95% of the total rainfall comes at hourly intensities below 1 inch per hour.

Hydrodynamic separators usually function better at low flow rates, and the performance degrades as the flow rate through the separator increases. Since the vast majority of precipitation falls at low intensity and generates low runoff flow rates, this runoff is treated at a high efficiency. The small fraction of the total precipitation that falls at higher intensities is still treated, but not with the same efficiency that the majority of the runoff was treated.

When the majority of the runoff is treated to greater than 80% efficiency, and a small fraction is treated less effectively, the end result is the net removal of still over 80% of the total sediment load. See Appendix C for more details on the AAR methodology.

BaySeparator™ PT Pretreatment Systems

BaySeparator™ PT systems may be incorporated into a stormwater treatment train as a pretreatment technology for systems including filters or other BMPs. In these cases, the BaySeparator™ is normally sized to achieve 50% sediment removal on an AAR basis or other locally mandated methodology. The pretreatment removes a portion of the suspended sediment load and other pollutants (oils and floatables) from stormwater runoff before the runoff is routed to a second treatment technology. For example, a stormwater treatment train may include a BaySeparator™ system that discharges into a BayFilter™ system. The BaySeparator™ removes 50% of the influent sediment load, thus drastically reducing the maintenance requirements and operating costs of the downstream BayFilter™.

BaySeparator ™ SA Full Treatment Systems

The BaySeparator™ SA systems are designed to typically remove 80% of the suspended sediment load on an AAR basis or other locally mandated methodology. It is important to note that the separator's efficiency can be easily customized to removal efficiencies other than 80% depending on project needs. This design is typically used on sensitive sites that require a greater degree of protection – sites that discharge to wetlands or trout streams, for example. The BaySeparator™ SA is the most effective BaySeparator™ system available. This unit is typically designed as a stand alone BMP.

BaySeparator ™ XK Treatment Systems

The BaySeparator™ XK system is a single structure unit that is capable of treating very high flow rates. These systems can be used on large sites, sites with very intense precipitation, or sites that require much higher treatment flows. Like standard BaySeparator™ systems, BaySeparator™ XK systems can be designed for a specified treatment flow rate or for a target annual aggregate removal efficiency. BaySeparator™ XK systems can be designed as pretreatment or standalone devices.

BaySeparator ™ SV Treatment Systems

Like the BaySeparator™ XK system, the BaySeparator™ SV system is a single structure unit. However, the BaySeparator™ SV system is entirely contained in a 10' x 6' precast vault (all dimensions are inside dimension of chambers). The BaySeparator™ SV system is used on sites with limited footprint or in jurisdictions which limit the use of dual-structure units. The BaySeparator™ PV system can also be designed as a standalone (SA) or pretreatment unit (PT).

BaySeparator SV-FS

In addition to the standard BaySeparator™ SV system, BaySaver™ Technologies also offers a single structure BaySeparator™ configuration that acts as a flow splitter. The BaySeparator™ SV-FS utilizes the same contaminant removal mechanisms and flow paths as the standard SV, but includes two separate outfall streams. The treated effluent is discharged to a water quality outfall such as extended detention, a BayFilter™ system, or infiltration trench.The untreated bypass flows from extreme storm events are discharged to an overflow outlet.

BaySeparator ™ TT Treatment Systems

The BaySeparator™ TT (treatment train) system is a single structure unit. The BaySeparator™ TT system is entirely contained in a precast vault (all dimensions are inside dimension of chambers), but this vault also includes the outlet control structure for an attached underground storage system. The BaySeparator™ TT-4 system was designed for sites in Montgomery County, Maryland, to comply with the applicable local regulations from the Montgomery County Department of Permitting Services (MCDPS). This single, below-grade structure offers Maryland developers the option of capturing and treating the water quality volume from a one acre site with a single, standardized system. This system is typically for sites with just over one (1.18) acre impervious (WQv of 4,100 ft^3) For sites having up to 1.95 acres impervious (WQv = 6,750 ft^3) the BaySeparator™ TT-7 would be recommended.

Design Tools for the BaySeparator™ System

To fully specify a BaySeparator™ system, the designer must specify the BaySeparator™ unit size, as well as the diameters and depths for the Primary and Storage manholes. The diameters and depths of both the Primary and Storage manholes are determined by BaySaverTechnologies or the engineer using our BaySeparator™ Sizing Program. The output from this software fully specifies the BaySeparator™ design, separator size, and manhole configuration based on user selected inputs. This sizing program is based on the AAR model. These inputs include design parameters such as drainage area, imperviousness coefficient, site location, and the desired suspended removal parameters.

In addition to the BaySeparator™ sizing software, the BaySeparator™ Detail Generator Program is also available to the designer. The Detail Generator enables the user to readily generate complete AutoCad® drawings of the selected BaySeparator™ unit(s) via an intuitive Windows®-based interface running as an AutoCad® add-on. These standard AutoCad® drawings can then be seamlessly incorporated into the overall project drawings package and specifications. This is available for download at www.BaySaver.com

Treatment Trains

BaySeparator™ systems, especially those designed as pretreatment units (PT), are often installed as part of a stormwater treatment train. In these applications, a BaySeparator™ is installed upstream from a second stormwater treatment technology such as a BayFilter™ system.

When the BaySeparator™ is installed in series with other technologies, it is important to consider headwater and tailwater effects between the technologies. Please contact the BaySaver Technologies Engineering Department at 1.800.229.7283 for assistance in the design of treatment trains.

Chapter

5

Installation, Maintenance and Cleaning

Installation Instructions

Overview

BaySeparator™ systems are installed as part of the stormwater treatment system. The BaySeparator™ unit and the system inlet pipe are grouted into the Primary Manhole using standard storm drain connections. The connecting pipes entering and leaving the Storage Manhole require watertight connections. These connections are made using standard boots or other locally approved seals. Flexible couplers join the BaySeparator™ unit to the parallel inlet and outlet pipes (connecting pipes) from the storage manhole. These flexible couplers account for differential settlement between the two structures.

The pipes extending down from the separator (connecting pipes) must be backfilled with a free flowing and self-compacting material such as pea gravel or 3/4" minus crushed stone. The remaining fill material must be a Class I, II or III backfill and should be taken to at least 6" over the crown of the separator unit.

The following Table 5.1 provides the minimum burial depths for the different separator models.

Table 5.1: Minimum Burial Depths

BaySeparator™ Diameter (in inches)	Minimum Cover For H-20 Load (in inches)
24	12
30	12
36	12
42	12
48	12
60	18

Figure 5.1: BaySeparator™ Installation at a Typical Site

Contact the local utility and follow any special requirements regarding installation of manholes and/or underground structures such as the BaySeparator™ unit. To demonstrate the configuration of a standard BaySeparator™ System, an exploded view of the entire system is shown below in Figure 5.2.

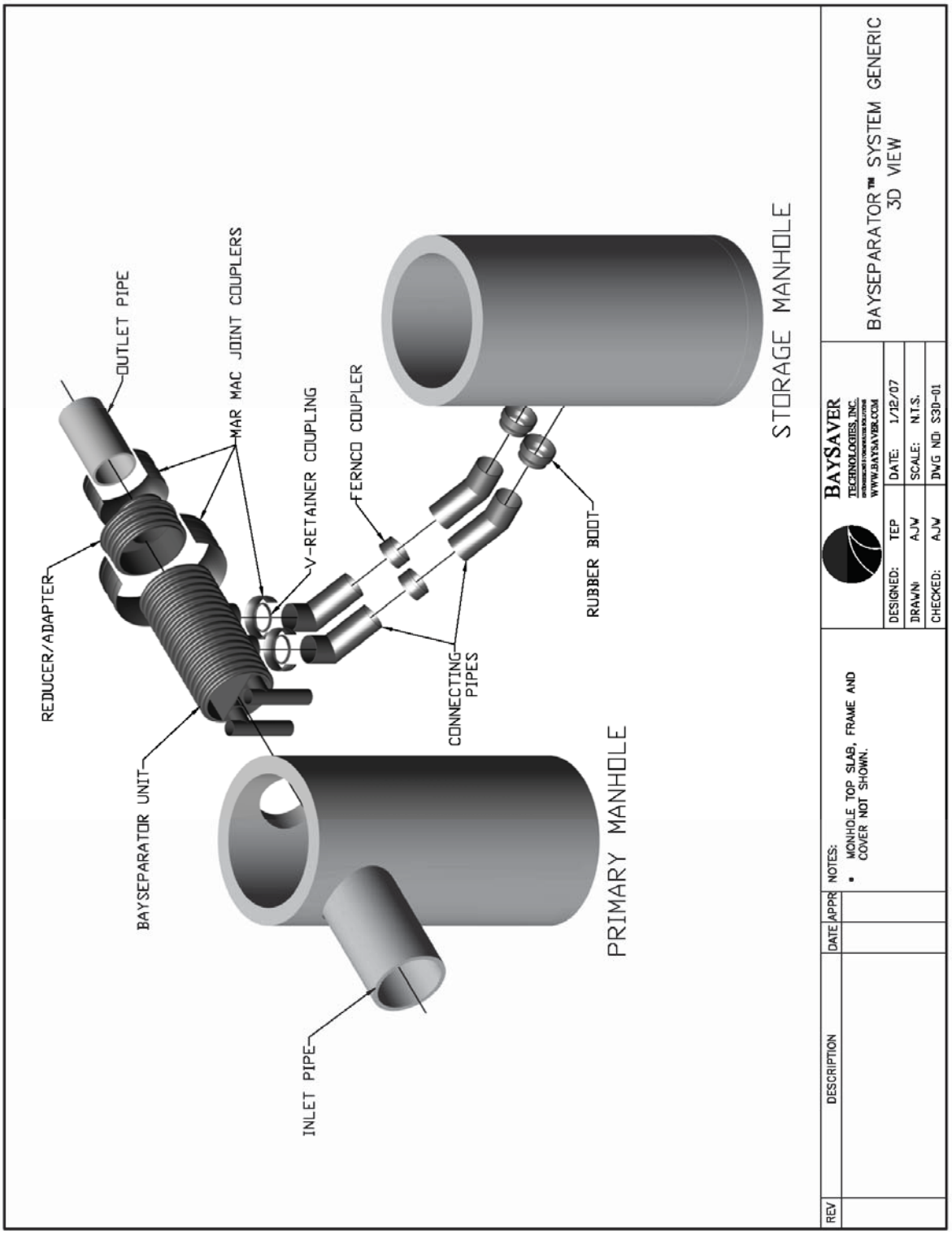


Figure 5.2: Exploded View of Standard BaySeparator™ System Components

Installation Instructions

1. Contact utility locator to mark underground utilities and to make certain it is safe to excavate.
2. Reference the site plan to determine the location of the BaySeparator™ system. Determine the separator configuration (right-handed or left-handed), and compare it to the configuration specified on the BaySeparator™ Detail Sheet. Looking downstream from the Primary Manhole, determine whether the Storage Manhole is on the left or right side of the BaySeparator™ unit, and determine whether the unit is properly configured as delivered. If the unit is not properly configured, the stub pipes must be repositioned (see instruction 3). If correct, go to instruction 6.
3. Beginning with V-Retainer Coupling (retainer), loosen the retainer.
4. Turn the stub pipe 180 degrees from its original configuration.
5. Ensure stub pipe is perpendicular to the unit. Tighten retainer to the appropriate torque.
6. Excavate to proper depth, length, and width in accordance with regulations to ensure safe site conditions.
7. Level subgrade to the proper elevation and check against finished grade and structure dimensions to ensure adequate depth.
8. Set the base of the Primary Manhole on approved subgrade.
9. Set the base of the Storage Manhole downstream as specified by dimensions on the BaySeparator™ standard detail sheet and offset to either the left or right side as specified by dimensions on the BaySeparator™ standard detail sheet.
10. Check the level of both the Primary and Storage Manhole bases and correct level if needed before adding additional risers.
11. Add watertight seal (either mastic rope or rubber gasket) to the base of each manhole.
12. Set riser section on the base of each structure.
13. Add additional riser sections as previously detailed, until structures reach grade. Be sure to install water tight seals.
14. Align the opening in the Primary Manhole for the separator unit with the proposed outlet to the storm drain.
15. Align the inlet and outlet holes in the Storage Manhole so that they will be 90 degrees on center to the separator unit.
16. Once the inlets and outlets for the Primary and Storage Manholes are properly aligned, backfill to the bottom of the inlet and outlet of the Storage Manhole.
17. Insert the BaySeparator™ unit into the Primary Manhole. Be sure of the following:

    A - The BaySeparator™ unit penetrates the inside wall of the Primary Manhole to a depth of at least 1 corrugation.

    B - The tee pipes of the BaySeparator™ unit are vertical and not skewed.

20. Support the body of the BaySeparator™ unit and level the unit so that there is no slope from the front to the back of the separator unit.
21. Once the BaySeparator™ is level, insert the two connecting pipes into the inlet and outlet of the Storage Manhole. Be sure the end of the connecting pipe labeled “IN” is inserted into the Storage Manhole.
22. Line up the connector pipes with the stub pipes coming out of the bottom of the BaySeparator™ unit.
23. Tighten the watertight boots in the Storage Manhole onto on the connector pipes.
24. Tighten Fernco® couplers and shear rings on the joint between the stub pipes and the connector pipes.

25. Backfill around the connector pipes up to the bottom of the separator unit using free flowing, self-compacting material such as pea gravel or 3/4"or smaller crushed stone without fines
26. If the outlet pipe that is to be attached to the BaySeparator™ unit is of a different diameter than the BaySeparator™, then the supplied reducer/adapter must be used to make the connection.
27. Align reducer/adapter such that the small end of the reducer/adapter is in alignment with the outlet pipe.
28. Use the larger supplied MarMac to couple the BaySeparator™ to the reducer/adapter provided by BaySaver Technologies, Inc. Use the smaller MarMac to couple the reducer to the outlet pipe. For further information see instructions included with MarMacs.
29. Using non-shrinking grout, seal the separator unit into the primary manhole.
30. Continue to back fill with Class I, II, or III material to at least 6” above the top of the BaySeparator™ unit.
31. Install additional grade riser as needed and install frame and covers.
32. Backfill to grade using Class I, II or III backfill or other suitable material. Compact the backfill according to geotechnical recommendations.

Maintenance

One of the advantages of the BaySeparator™ systems is the ease of maintenance. Like any system that collects pollutants, the BaySeparator™ systems must be periodically maintained for continued effectiveness. Maintenance is a simple procedure performed using a vacuum truck or similar equipment. The systems were designed to minimize the volume of water removed during routine maintenance, reducing disposal costs.

Contractors can access the pollutants stored in each manhole through a 30″ manhole cover. This allows them to gain unobstructed access to the full depth of the system. There is no confined space entry necessary for inspection or maintenance.

Vacuum hoses can reach the entire sump area of both manholes to remove sediments and trash. The entire maintenance procedure typically takes less than an hour.

Local regulations may apply to the maintenance procedure. Safe and legal disposal of pollutants is the responsibility of the maintenance contractor. Maintenance should be performed only by a qualified contractor. Contact BaySaver Technologies Inc. at 1-800-229-7283 for a list of approved contractors in your area.

Inspection and Cleaning

Periodic inspection is required to determine the need for and frequency of maintenance. Inspections should be performed initially every six (6) months. Typically, the system needs to be cleaned every 12 to 36 months, depending on site conditions. The system needs to be cleaned when the sediment has accumulated to within one foot of the bottom of the connecting pipes.

Measuring Sediment Depth

The sediment depth can be determined by using a measuring stick.

Maintenance Instructions

1. For each BaySeparator™ system, there are 2 manholes to clean: the **Primary Manhole** and **Storage Manhole**.
2. Remove the manhole covers to provide access to the pollutant storage.
3. **Storage Manhole**: Use a vacuum truck or other similar equipment to remove all water, debris, oils, and sediment.
4. **Storage Manhole**: Use a high pressure hose to clean the manhole of all the remaining sediment and debris. Then, use the vacuum truck to remove the rinse water.
5. **Primary Manhole**: Use a submersible pump to pump the bulk of the water from the Primary Manhole into the clean Storage Manhole. Stop pumping when the water surface falls to one foot above the accumulated sediments.
6. **Primary Manhole**: Use a vacuum truck or other similar equipment to remove all remaining water, debris, and sediment.
7. **Primary Manhole**: Use a high pressure hose to clean the manhole of all the remaining sediment and debris. Then, use the vacuum truck to remove the rinse water.
8. **Both Manholes**: On sites with a high water table or other conditions which may cause flotation, it is necessary to fill the manholes with clean water after maintenance
9. Replace the two manhole covers.
10. Dispose of the polluted water, oils, sediment, and trash at an approved facility.
    - Most local regulations prohibit the discharge of solid material into the sanitary system. Check with the local sewer authority for any required permits and/or conditions to discharge the liquid.
    - Many places require the pollutants removed from BaySeparator™ systems to be treated in a leachate treatment facility. Check with local regulators about disposal requirements.
11. Additional local regulations may apply to the maintenance procedure.

This procedure is intended to remove all the collected pollutants from the system while minimizing the volume of water that must be disposed. Additional local regulations may apply to the maintenance procedure. Safe and legal disposal of pollutants is the responsibility of the maintenance contractor; therefore maintenance should be performed only by a qualified contractor.

Summary

- Access the pollutants through the two manhole covers.
- See the entire floor/sump area of each manhole from the surface.
- No confined space entry for inspection or maintenance.
- During maintenance, transfer "clean" water from the Primary to the Storage Manhole, minimizing the amount of water for disposal.

BaySaver Technologies can assist in coordinating a maintenance contractor in the installation area, or work directly with owners who wish to perform their own maintenance. Contact BaySaver Technologies at 1-800-229-7283 (1-800-BaySaver) for more information

Chapter

6

System Costs and Availability

BaySeparator™ systems are available throughout the United States from BaySaver Technologies, Inc. or from an authorized representative. Material, installation, and maintenance costs may vary throughout the country. **The BaySeparator™ System is your best value per treated CFS regardless of your geographic location.** For BaySeparator™ pricing in your area, please contact BaySaver Technologies Inc. at 1-800-229-7283 (1-800-BAYSAVE) or an authorized representative directly.

The BaySeparator™ unit and materials can be shipped anywhere in the continental United States within two weeks or less. Custom systems may require additional time. The system's precast manholes need to be ordered locally to arrive in conjunction with the BaySeparator™ Unit.

Appendices

Appendix A	Stormwater Treatment Unit(s) Specification — Online System
Appendix B	Engineering Drawings
Appendix C	BaySeparator™ System: F-95 Sediment Removal Efficiency Data
Appendix D	The Peclet Number — An Innovative Method For Modeling, Analysis, and Prediction of Structural Stormwater BMP Performance
Appendix E	Project Information Sheet

Appendix

A

Stormwater Treatment Unit(s) Specification — Online System

STORMWATER TREATMENT UNIT(S) SPECIFICATION – ONLINE SYSTEM

PART 1.00 GENERAL

1.1 DESCRIPTION

A. Work Included:

The manufacturer selected by the Contractor and approved by the Engineer, shall furnish all labor, materials, equipment and incidentals required to manufacture the stormwater treatment system(s) specified herein in accordance with the attached Drawing(s) and these specifications.

1.2 QUALITY CONTROL INSPECTION

A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the worksite after delivery, or at both places, and shall be subject to rejection at any time if material conditions fail to meet substantially any of the specification requirements. If a Stormwater Treatment Unit is rejected after delivery to the site, it shall be marked for identification and removed from the site. The Stormwater Treatment Unit(s) which have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer's and manufacturer's acceptance level, if permitted.

B. All sections shall be field inspected for general appearance, dimensions, soundness, etc.

1.3 SUBMITTALS

A. Plan, elevation, and profile dimensional drawings shall be submitted to the Engineer for review and approval. The Contractor shall be provided with the approved plan, elevation, and profile dimensional drawings.

PART 2.00 PRODUCTS

2.1 MATERIALS AND DESIGN

A. Concrete structures shall be designed for H-20 traffic loading and applicable soil loads or as otherwise determined by a Licensed Professional Engineer. The materials and structural design of the devices shall be per ASTM C857 and ASTM C858.

1. The minimum compressive strength of the concrete in the manhole base, riser, and top sections shall be 4000 psi.
2. The minimum wall thickness shall be one twelfth of the internal diameter of the riser or largest cone diameter.
3. Cement shall conform to the requirements for Portland cement of Specification C150.
4. Aggregates shall conform to Specification C33, except that the requirement for gradation shall not apply.
5. Reinforcement shall consist of wire conforming to Specification A82 or Specification A496, of wire fabric conforming to Specification A185 or Specification A497, or of bars of Grade 40 steel conforming to Specification A615/A615M.
6. The access cover shall be designed for HS20-44 traffic loading and shall provide a minimum 30 inch clear opening.
7. All joints shall be waterproof with wrapped gaskets or sealed with a mastic treatment.
8. Any grout used within the system shall meet the ASTM C 1107 "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)". Grades A, B and C at a pourable and plastic consistency at 70ºF. CRD C 621 "Corps of Engineers Specification For Non-Shrink Grout."
9. Storage manhole connector pipes shall be equipped with a seal gasket that meets or exceeds material specifications of ASTM C-923 or other locally approved methods.

B. The separator structure shall be substantially constructed of HDPE or equivalent corrosion resistant material meeting ASTM D330, ASTM F412, and ASTM C-425.

C. Pipes within the unit, (i.e., tee pipes, connector pipes and down pipes) shall be constructed of at least SDR 32.5 HDPE pipe of standard ASTM F412.

D. Pipe and fitting material shall be high-density polyethylene meeting ASTM D330 minimum cell classification 335400C for 24-inch through 60-inch diameters. The 24- through 60- inch pipe material shall be slow

crack resistant HDPE material, evaluated using the single point notched constant tensile load (SP-NCTL) test.

E. The reducer/adaptor to the mainline shall be installed with an exterior joining coupler. The joint coupler shall be Polyseal Pipe Coupler as manufactured by MarMac Manufacturing Company or an approved equal and shall be installed according to the manufacturer's recommendations.

F. The connector pipes shall be connected with the down pipes using Fernco® Flexible Couplings that have been manufactured to conform to ASTM C-425.

G. The connector pipes linked to the BaySeparator™ unit shall be connected with V-Retainer Couplings with T-Bolt and Trunnion Latch manufactured by Voss Industries or an approved equal. The retainer shall be installed with an exterior sealing coupler. This sealing coupler shall be Polyseal Pipe Coupler as manufactured by Mar-Mac Manufacturing Company or an approved equal and shall be installed according to the manufacturer's recommendations.

2.2 PERFORMANCE

A. The stormwater treatment unit shall be an online unit capable of conveying 100% of the design peak flow.

B. The BaySeparator™ PT stormwater treatment unit shall be designed to remove at least 50% of the suspended solids on an annual aggregate removal basis. The BaySeparator™ SA stormwater treatment unit shall be designed to remove at least 80% of the suspended solids load on an annual aggregate removal basis. Said removal shall be based on full-scale third party testing using F-95 media gradation (manufactured by US Silica) or equivalent. Said full scale testing shall have included sediment capture based on actual total mass collected by the Stormwater Treatment Unit (s).

C. The stormwater treatment unit shall consist of one (1) prefabricated separator structure, one (1) online coarse sediment capture structure, and one (1) offline sediment and floatable capture structure. The separator structure shall be substantially constructed of HDPE or equivalent corrosion resistant material. The offline sediment storage structure must provide for offline sediment storage of sediments and floatables that are isolated from high intensity storms.

D. The stormwater treatment unit(s) head loss at the Peak Design Flow Rate shall not exceed the head loss specified by the Engineer.

E. The unit shall be designed to remove sediment particles as well as floating oils and debris.

F. Individual stormwater treatment systems shall have the Maximum Treatment Rate (MTR) and Maximum Hydraulic Rate (MHR) listed in Table 2.2, and shall not resuspend trapped sediments.

Table 2.2: Hydraulic Capacities BaySeparator™ Models

BaySeparator™ Unit Diameter (inches)	Maximum Treatment Rate – MTR (cfs)	Maximum Hydraulic Rate - MHR (cfs)	Maximum Filtration Rate (cfs)
24	1.5	9.4	N/A
30	2.3	15	N/A
36	2.7	22	N/A
42	7.0	41	N/A
48	10.0	57	N/A
60	15.0	94	N/A
SV	2.6	15.0	N/A
SV-FS	2.6	15.0	N/A
TT-4 (TT-SO-4)	2.17*	17.90	0.27
TT-7 (TT-SO-7)	2.93*	14.48	0.47

*Maximum flow to extended detention

2.3 MANUFACTURER

A. The stormwater treatment unit(s) shall be of a basic design that has been installed and used successfully for a minimum of 5 years.

B. Each stormwater treatment system shall be a BaySeparator™ system as manufactured by BAYSAVER®, INC., 1302 Rising Ridge Rd, Unit 1, Mount Airy, MD 21771, Phone: (301) 829-6470, Fax: (301) 829-3747, Toll Free: 1-800-229-7283 (1-800-BaySaver), E-mail: Info@BaySaver. Protected under U.S. Patent Number 5746911.

PART 3.00 EXECUTION

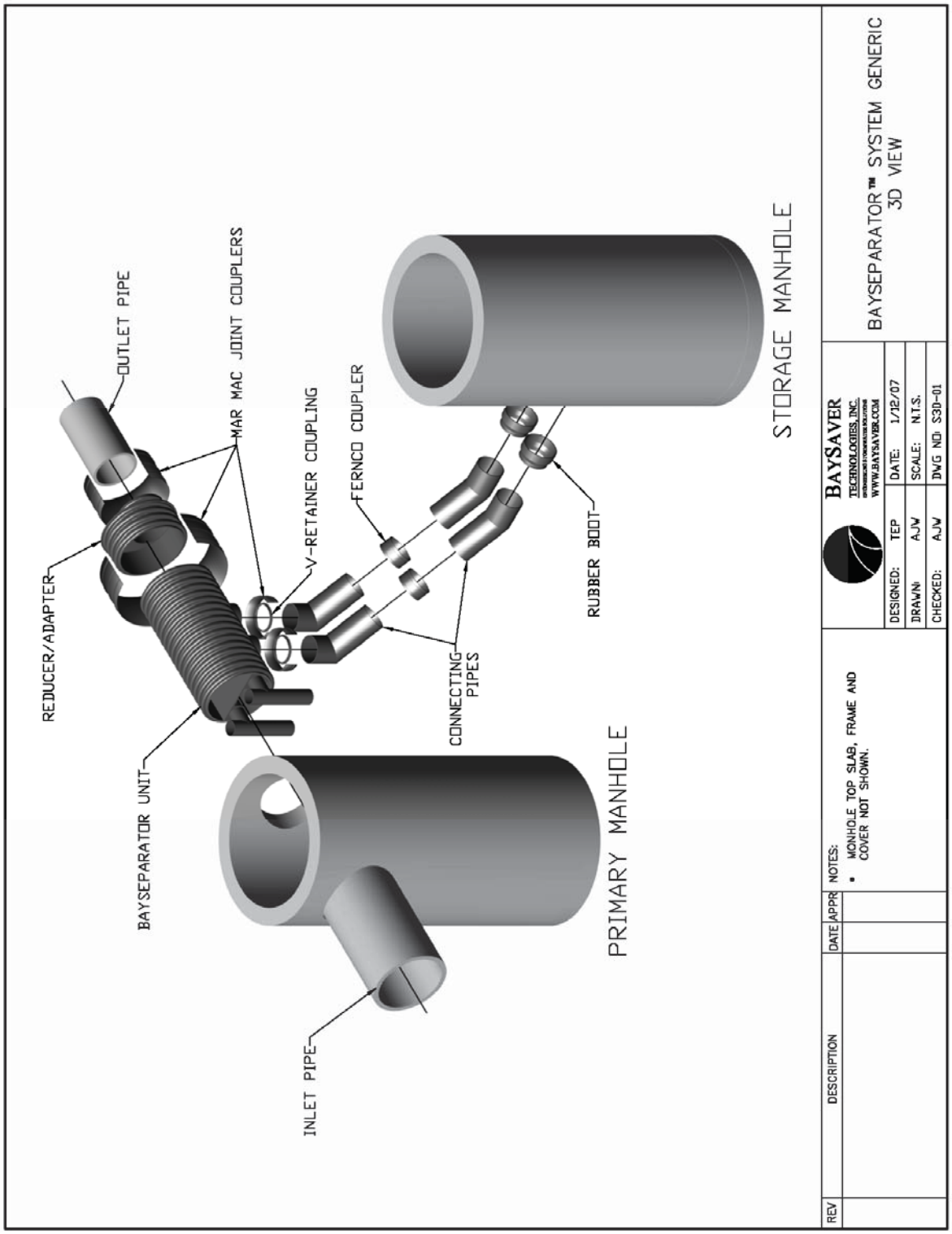
3.1 INSTALLATION

A. Installation of the Stormwater Treatment Unit(s) shall be performed per manufacturer's Installation Instructions. Such instructions can be obtained by calling BaySaver Technologies, Inc. at 1.800.229.7283 or by login to www.BaySaver.com.

Appendix

B

Engineering Drawings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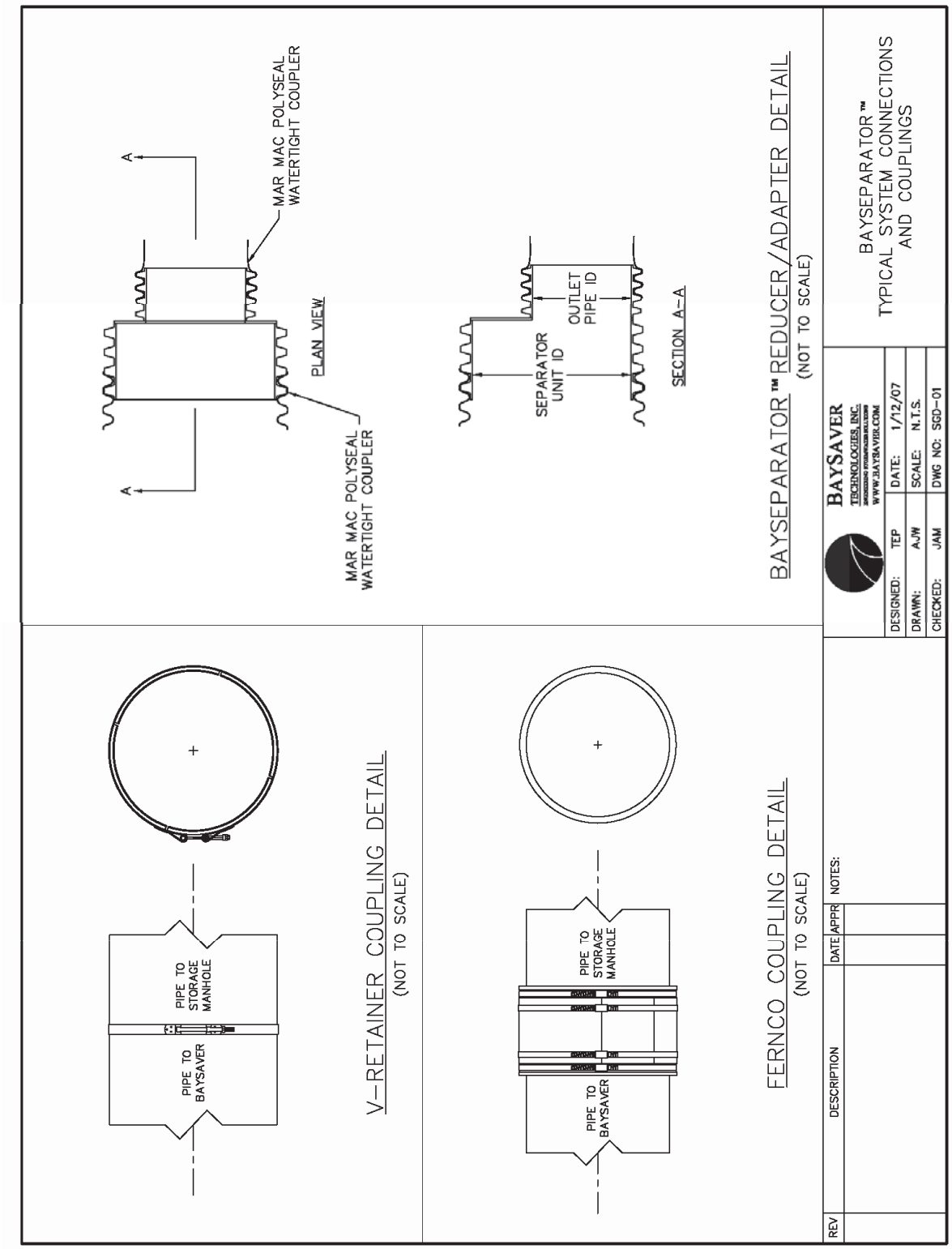
REDUCER/ADAPTER
V-RETAINER COUPLING
FERNCO COUPLER
STORAGE MANHOLE
RUBBER BOOT
CONNECTING PIPES
BAYSEPARATOR UNIT
PRIMARY MANHOLE
INLET PIPE
BAYSEPARATOR™ SYSTEM GENERIC 3D VIEW
BAYSAVER TECHNOLOGIES, INC.
WWW.BAYSAVER.COM
DESIGNED: TEP
DATE: 1/12/07
DRAWN: AJW
SCALE: N.T.S.
CHECKED: AJW
DWG NO: S3D-01
NOTES:
• MANHOLE TOP SLAB, FRAME AND COVER NOT SHOWN.
REV
DESCRIPTION
DATE
APPR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MAR MAC POLYSEAL WATERTIGHT COUPLER
PLAN VIEW
A
MAR MAC POLYSEAL WATERTIGHT COUPLER
SEPARATOR UNIT ID
OUTLET PIPE ID
SECTION A-A
BAYSEPARATOR™ REDUCER/ADAPTER DETAIL
(NOT TO SCALE)
BAYSEPARATOR™
TYPICAL SYSTEM CONNECTIONS
AND COUPLINGS
PIPE TO STORAGE MANHOLE
PIPE TO BAYSAVER
V-RETAINER COUPLING DETAIL
(NOT TO SCALE)
PIPE TO STORAGE MANHOLE
PIPE TO BAYSAVER
FERNCO COUPLING DETAIL
(NOT TO SCALE)
BAYSAVER
TECHNOLOGIES, INC.
WWW.BAYSAVER.COM
DESIGNED: TEP
DATE: 1/12/07
DRAWN: AJW
SCALE: N.T.S.
CHECKED: JAM
DWG NO: SGD-01
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DESCRIPTION
DATE
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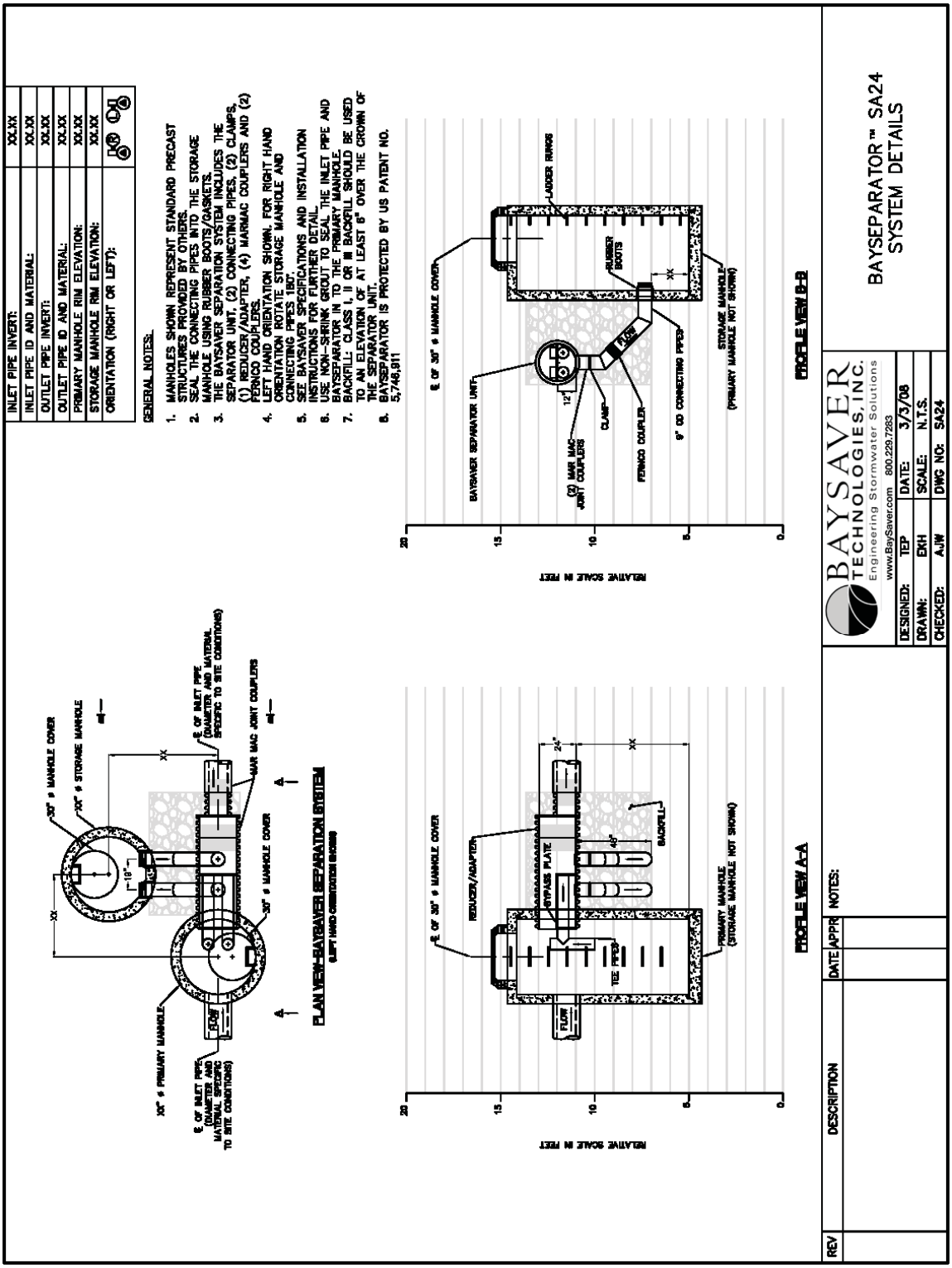
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STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL: CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,748,911
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
PROFILE VIEW A-A
PROFILE VIEW B-B
RELATIVE SCALE IN FEET
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
RUBBER BOOTS
CLAMP
FERNCO COUPLER
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
REDUCER/ADAPTER
BYPASS PLATE
BACKFILL
FLOW
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP DATE: 3/3/08
DRAWN: EKH SCALE: N.T.S.
CHECKED: AJW DWG NO: SA24
BAYSEPARATOR™ SA24
SYSTEM DETAILS
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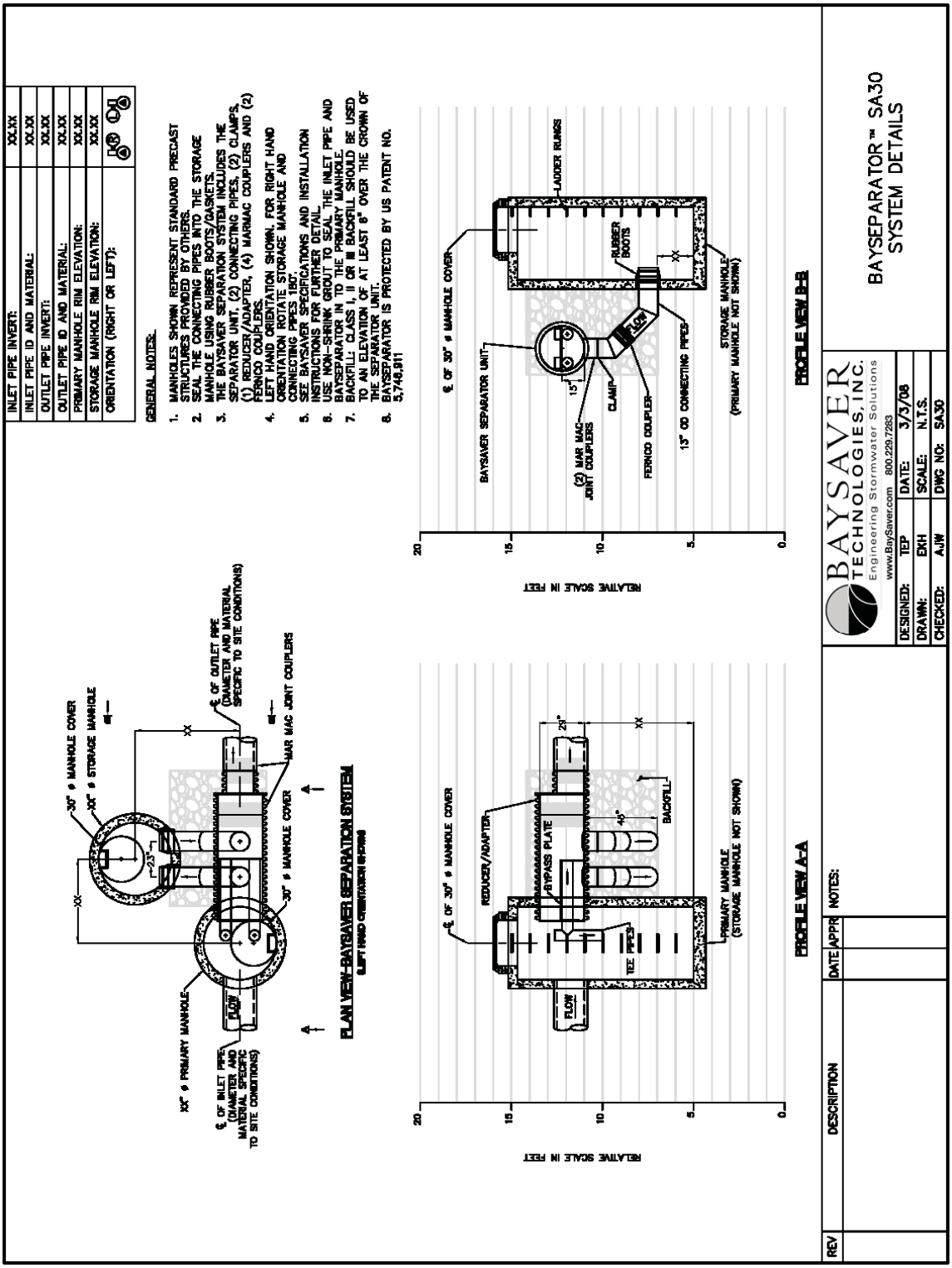
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STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNICO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL: CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,748,911
30" ø MANHOLE COVER
XX" ø STORAGE MANHOLE
XX
23.5"
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
MAR MAC JOINT COUPLERS
30" ø MANHOLE COVER
XX" ø PRIMARY MANHOLE
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
A
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
RUBBER BOOTS
13"
(2) MAR MAC JOINT COUPLERS
CLAMP
FLOW
FERNICO COUPLER
13" OD CONNECTING PIPES
XX
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
20
15
10
5
0
RELATIVE SCALE IN FEET
PROFILE VIEW B-B
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
29"
40"
BACKFILL
FLOW
TEE PIPES
XX
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
20
15
10
5
0
RELATIVE SCALE IN FEET
PROFILE VIEW A-A
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 3/3/08
DRAWN: EKH
SCALE: N.T.S.
CHECKED: AJW
DWG NO: SA30
BAYSEPARATOR™ SA30
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DESCRIPTION
DATE
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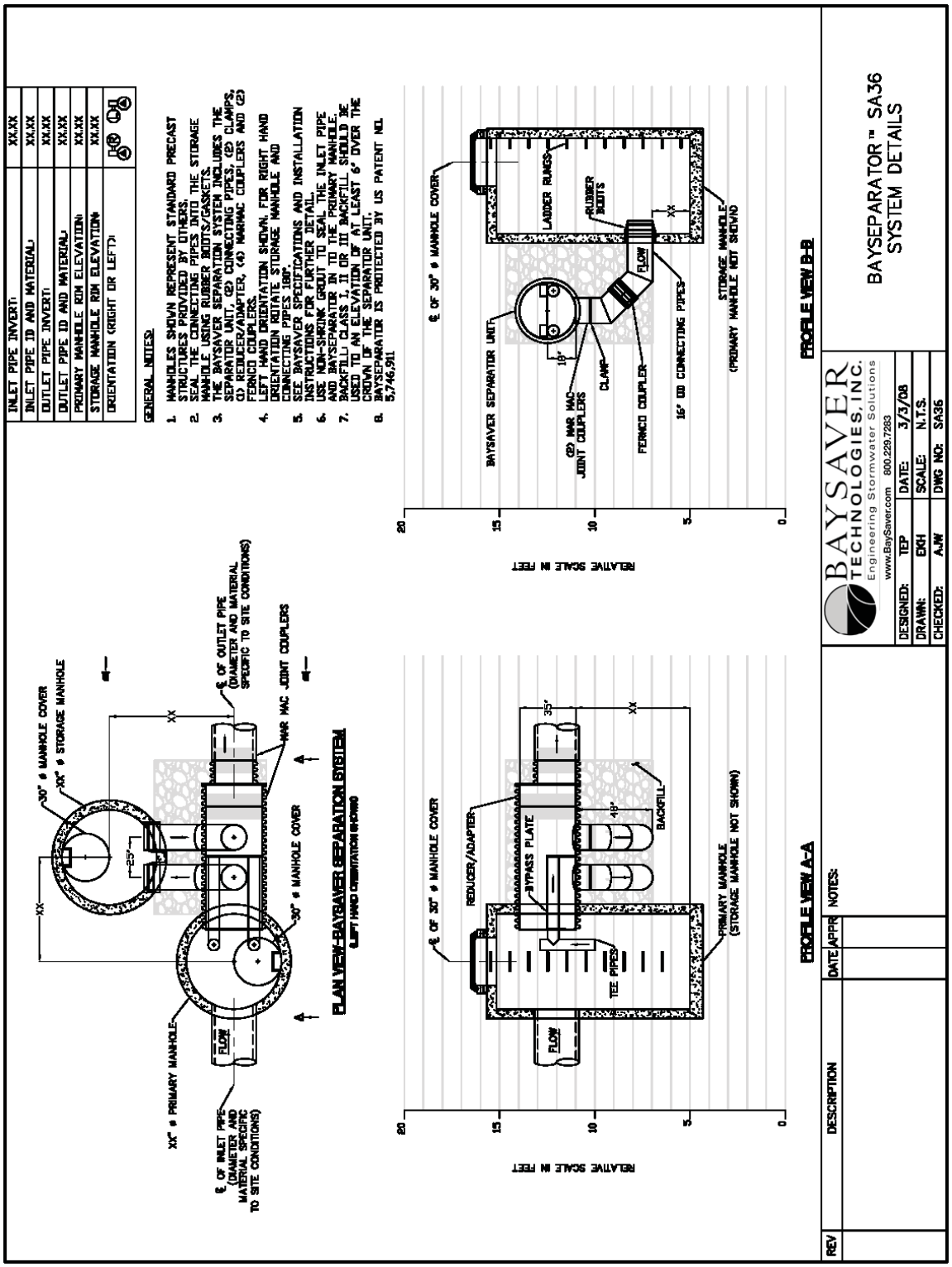
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ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,746,911
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XX" ø STORAGE MANHOLE
XX
25"
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
MAR MAC JOINT COUPLERS
30" ø MANHOLE COVER
XX" ø PRIMARY MANHOLE
FLOW
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
35"
48"
XX
BACKFILL
TEE PIPES
FLOW
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW A-A
℄ OF 30" ø MANHOLE COVER
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
RUBBER BOOTS
XX
18"
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
FLOW
16" ID CONNECTING PIPES
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW B-B
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 3/3/08
DRAWN: EKH
SCALE: N.T.S.
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BAYSEPARATOR™ SA36
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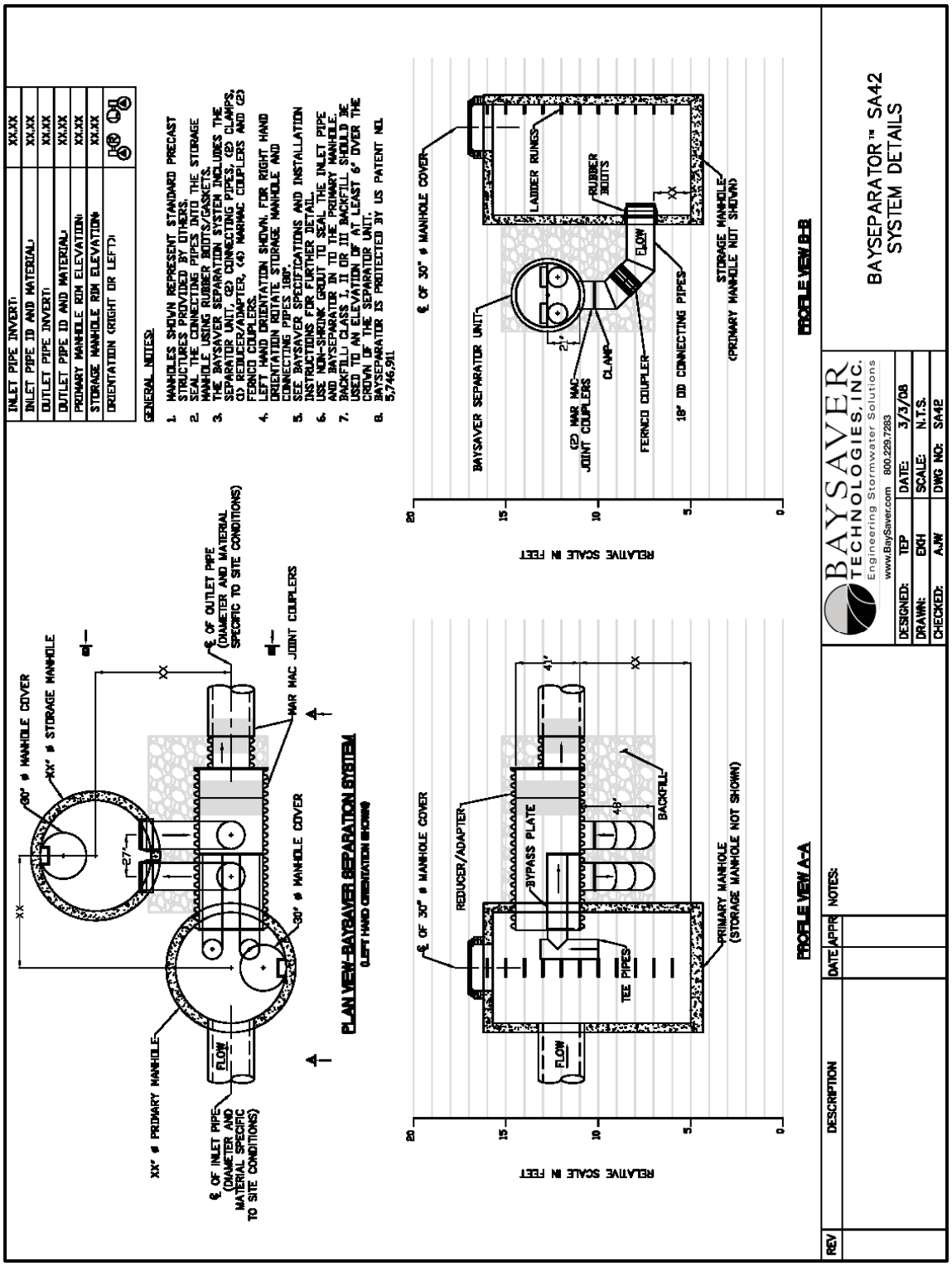
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GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,746,911
30" ø MANHOLE COVER
XX" ø STORAGE MANHOLE
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
MAR MAC JOINT COUPLERS
30" ø MANHOLE COVER
XX" ø PRIMARY MANHOLE
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
RUBBER BOOTS
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
18" OD CONNECTING PIPES
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
PROFILE VIEW B-B
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
TEE PIPES
BACKFILL
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
PROFILE VIEW A-A
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP DATE: 3/3/08
DRAWN: EKH SCALE: N.T.S.
CHECKED: AJW DWG NO: SA42
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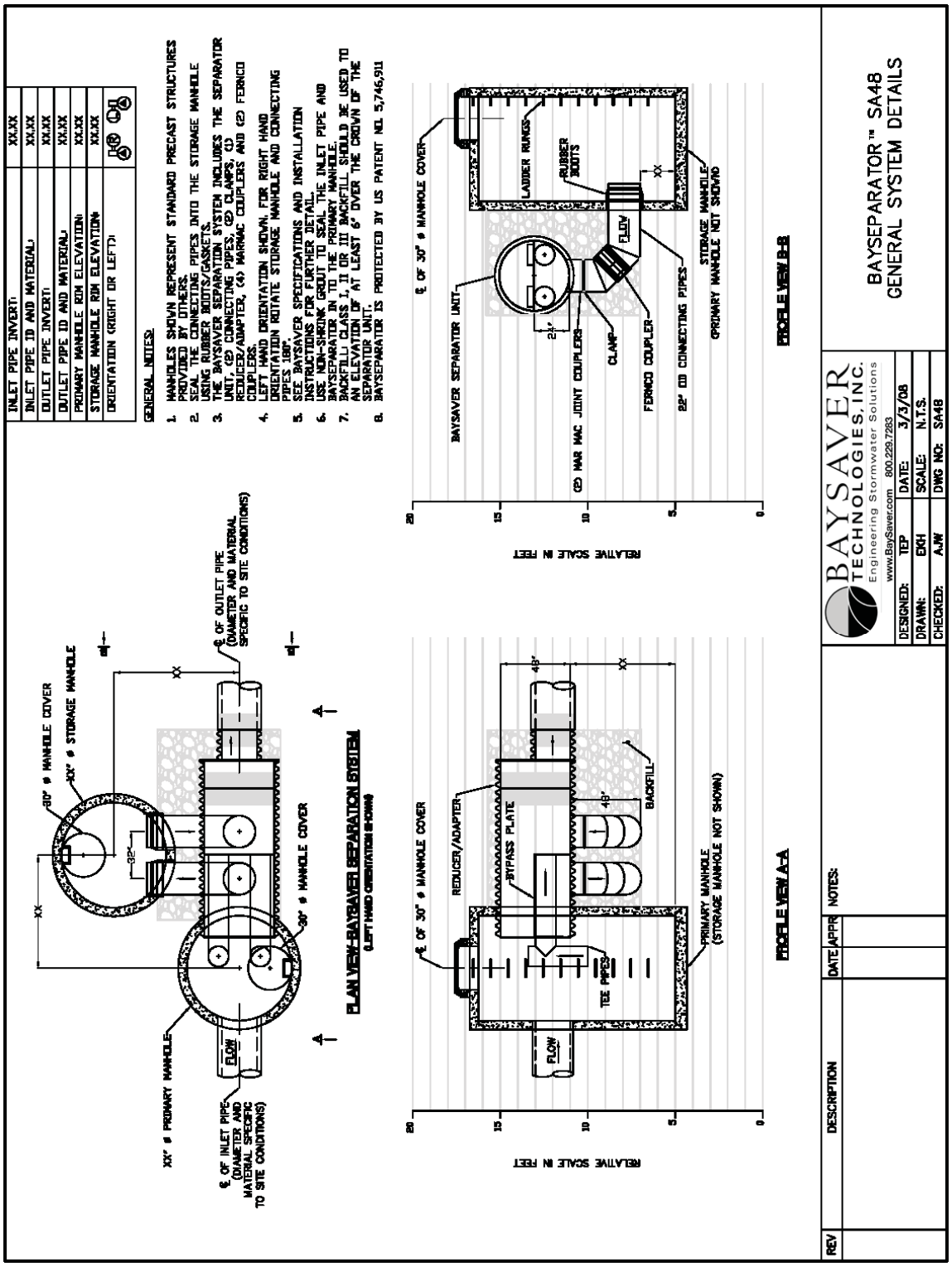
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OUTLET PIPE ID AND MATERIAL: XX.XX
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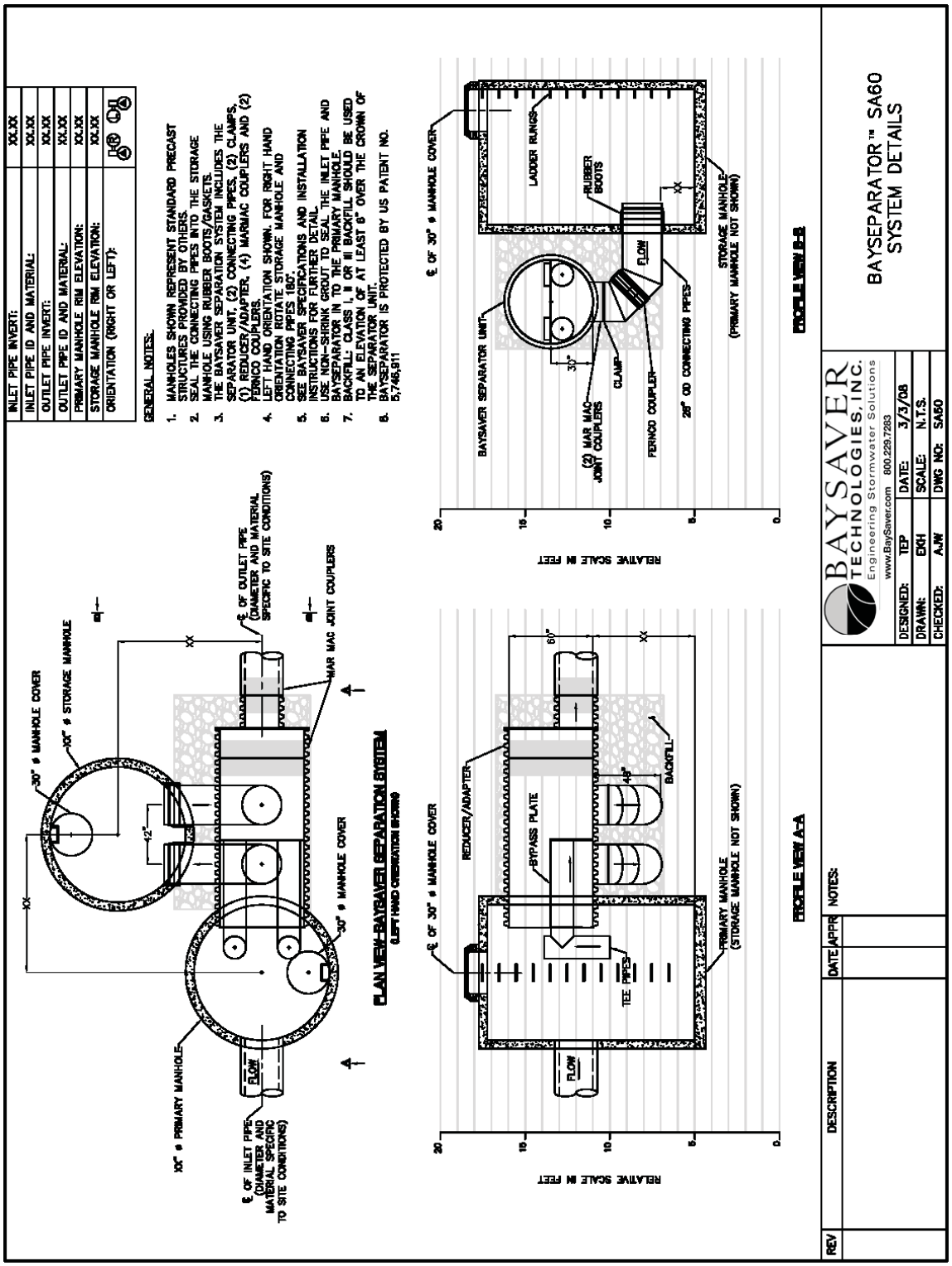
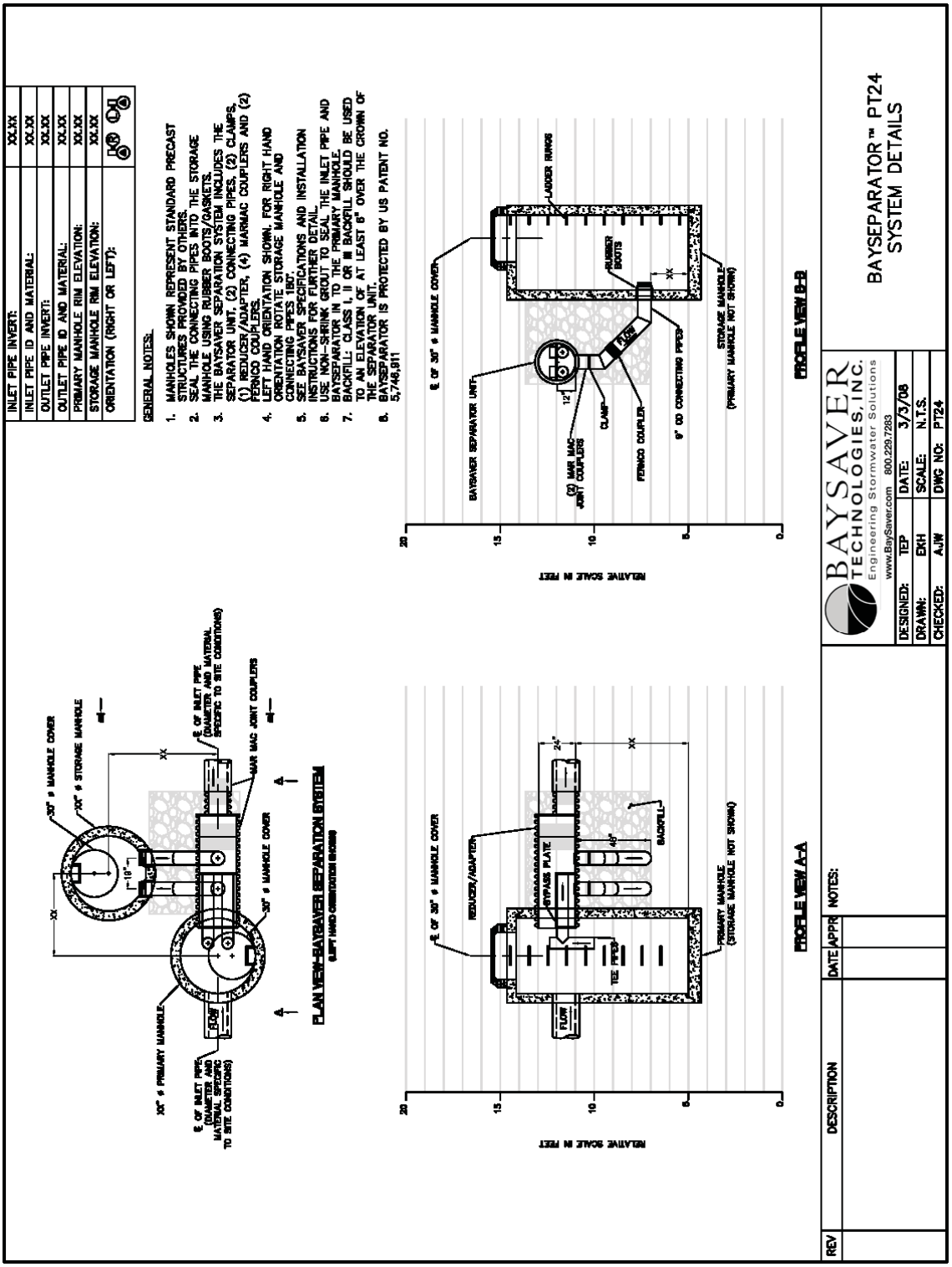
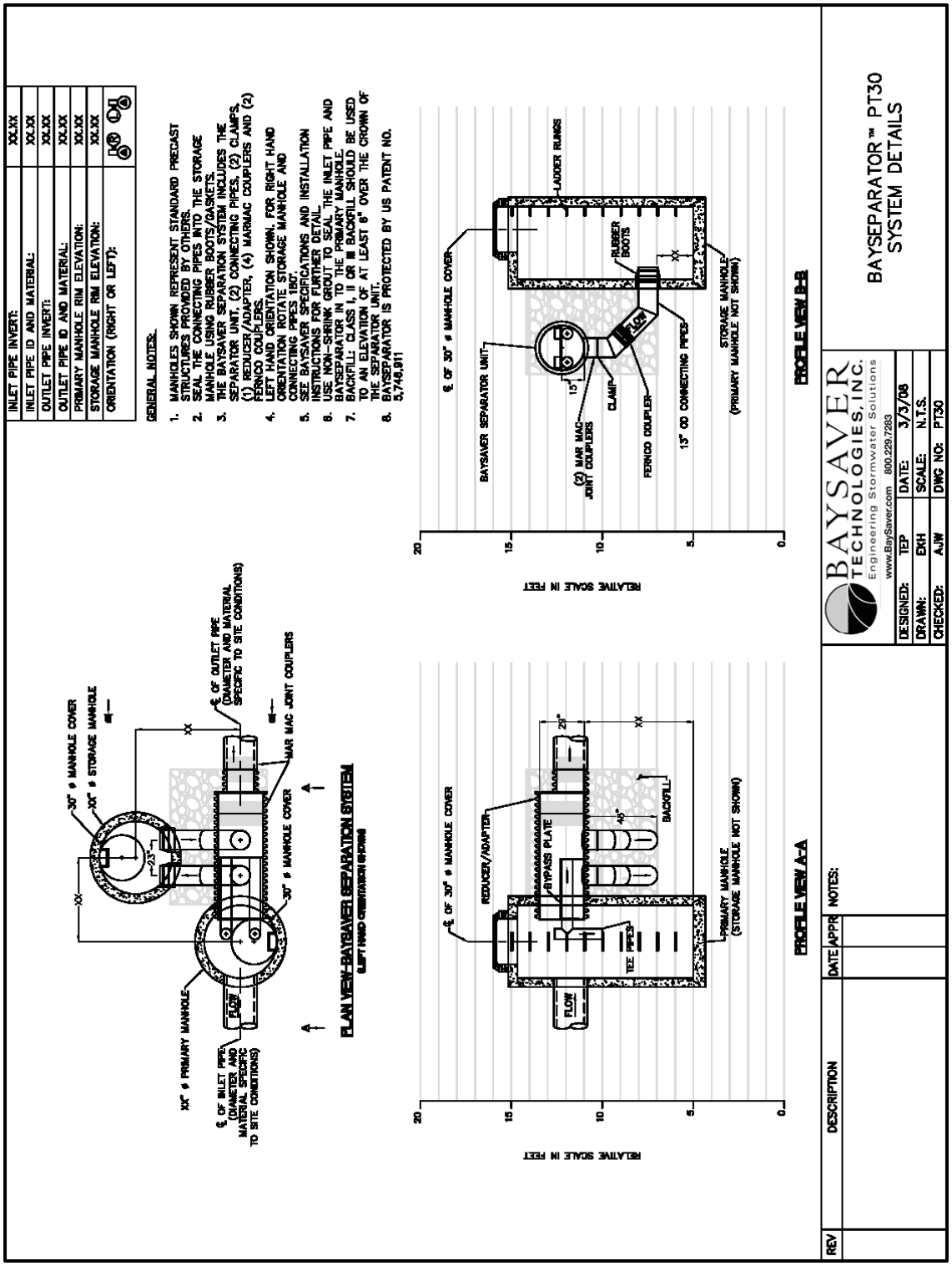
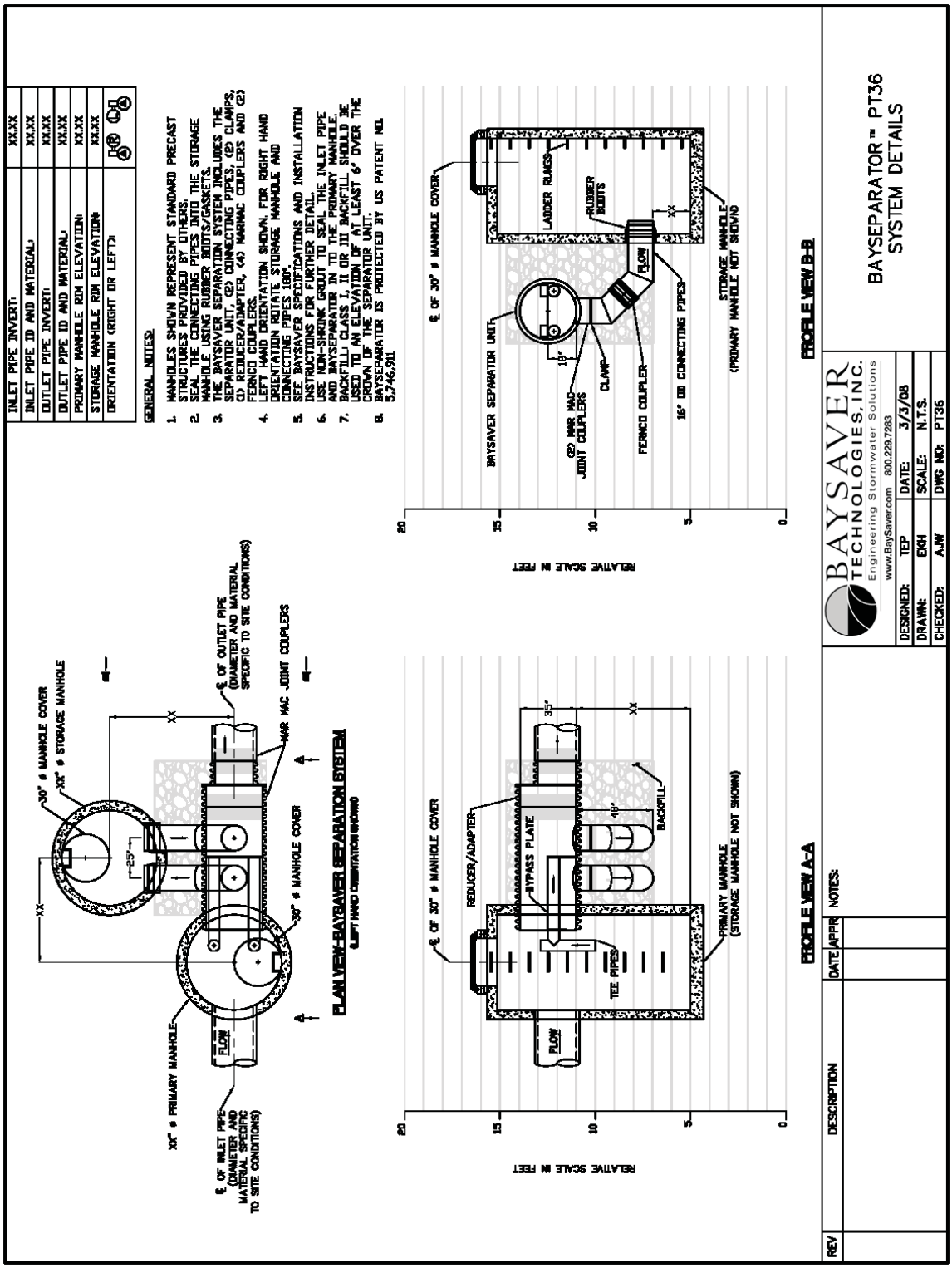
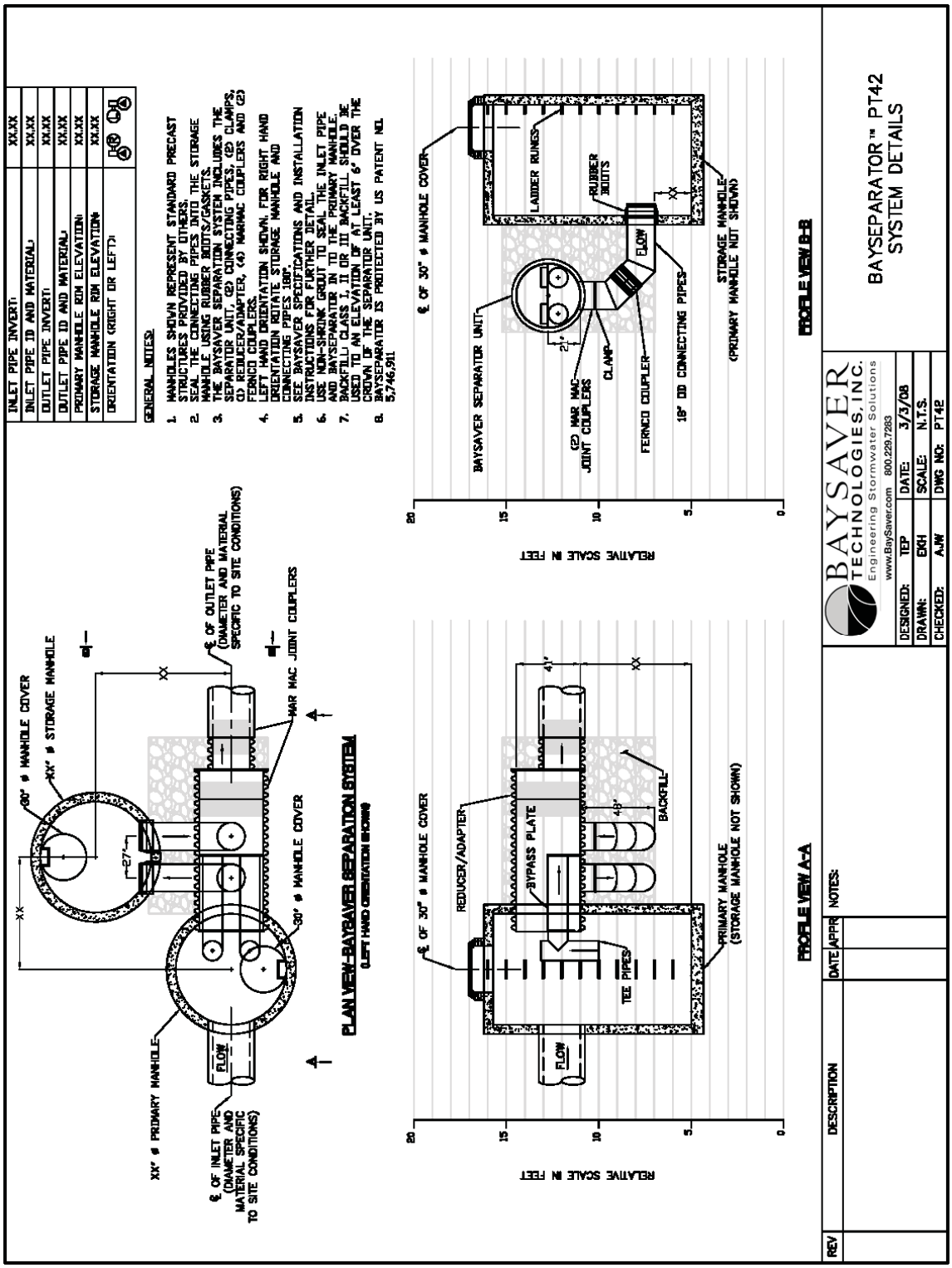
STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,746,911
30" ø MANHOLE COVER
XX" ø STORAGE MANHOLE
32"
XX
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
30" ø MANHOLE COVER
XX" ø PRIMARY MANHOLE
FLOW
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
RUBBER BOOTS
FLOW
2'
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
22" OD CONNECTING PIPES
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW B-B
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
48"
XX
18"
BACKFILL
TEE PIPES
FLOW
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW A-A
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 3/3/08
DRAWN: EKH
SCALE: N.T.S.
CHECKED: AJW
DWG NO: SA48
BAYSEPARATOR™ SA48
GENERAL SYSTEM DETAILS
REV
DESCRIPTION
DATE
APPR
NOTES:

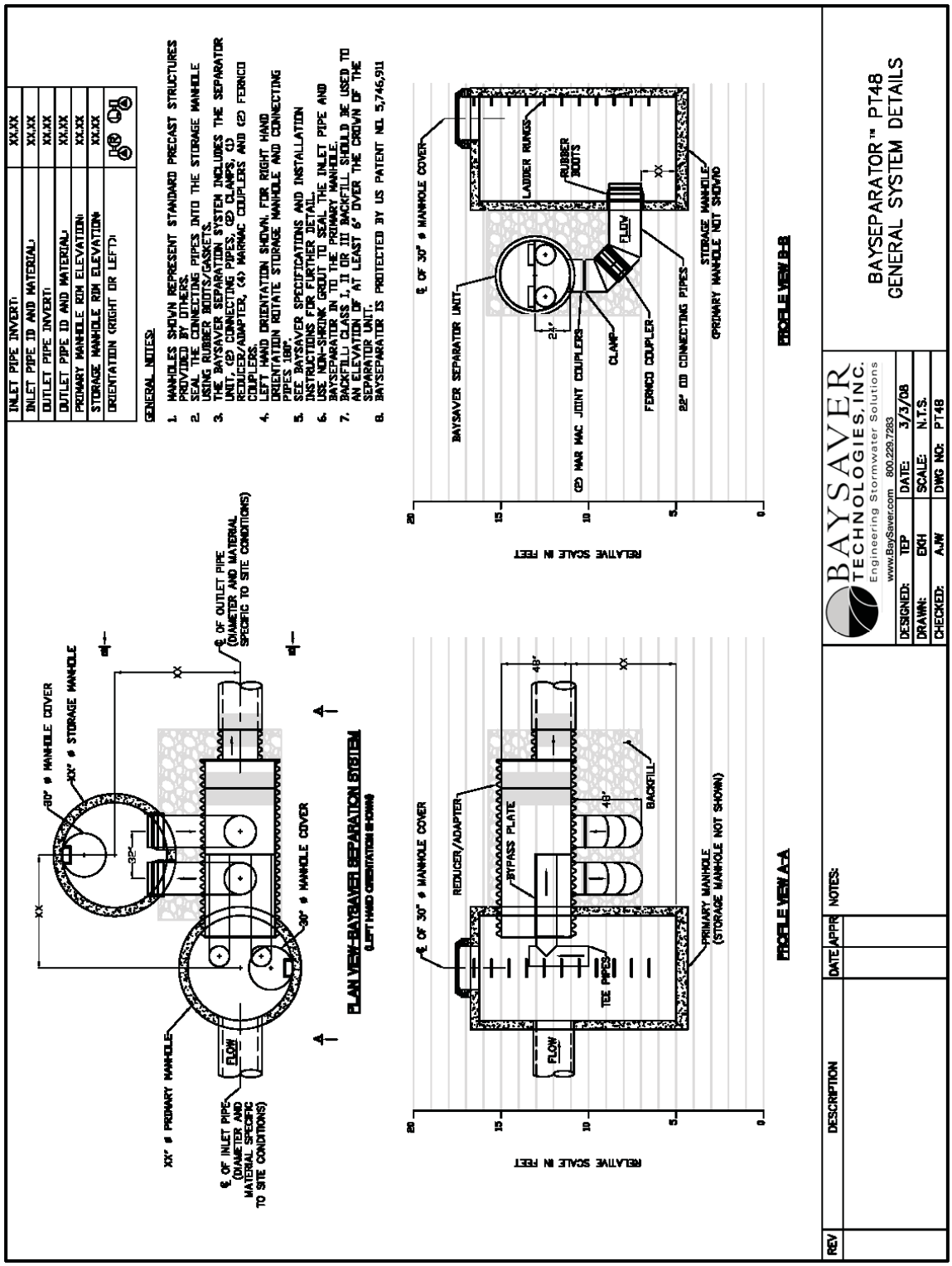

INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
PRIMARY MANHOLE RIM ELEVATION: XX.XX
STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL: CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,746,911
30" ø MANHOLE COVER
30" ø STORAGE MANHOLE
12"
XX
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
MAR MAC JOINT COUPLERS
30" ø MANHOLE COVER
30" ø PRIMARY MANHOLE
FLOW
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
RUBBER BOOTS
30"
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
FLOW
28" OD CONNECTING PIPES
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW B-B
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
8½"
48"
BACKFILL
TEE PIPES
FLOW
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW A-A
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP DATE: 3/3/08
DRAWN: EKH SCALE: N.T.S.
CHECKED: AJW DWG NO: SA60
BAYSEPARATOR™ SA60
SYSTEM DETAILS
REV
DESCRIPTION
DATE
APPR
NOTES:

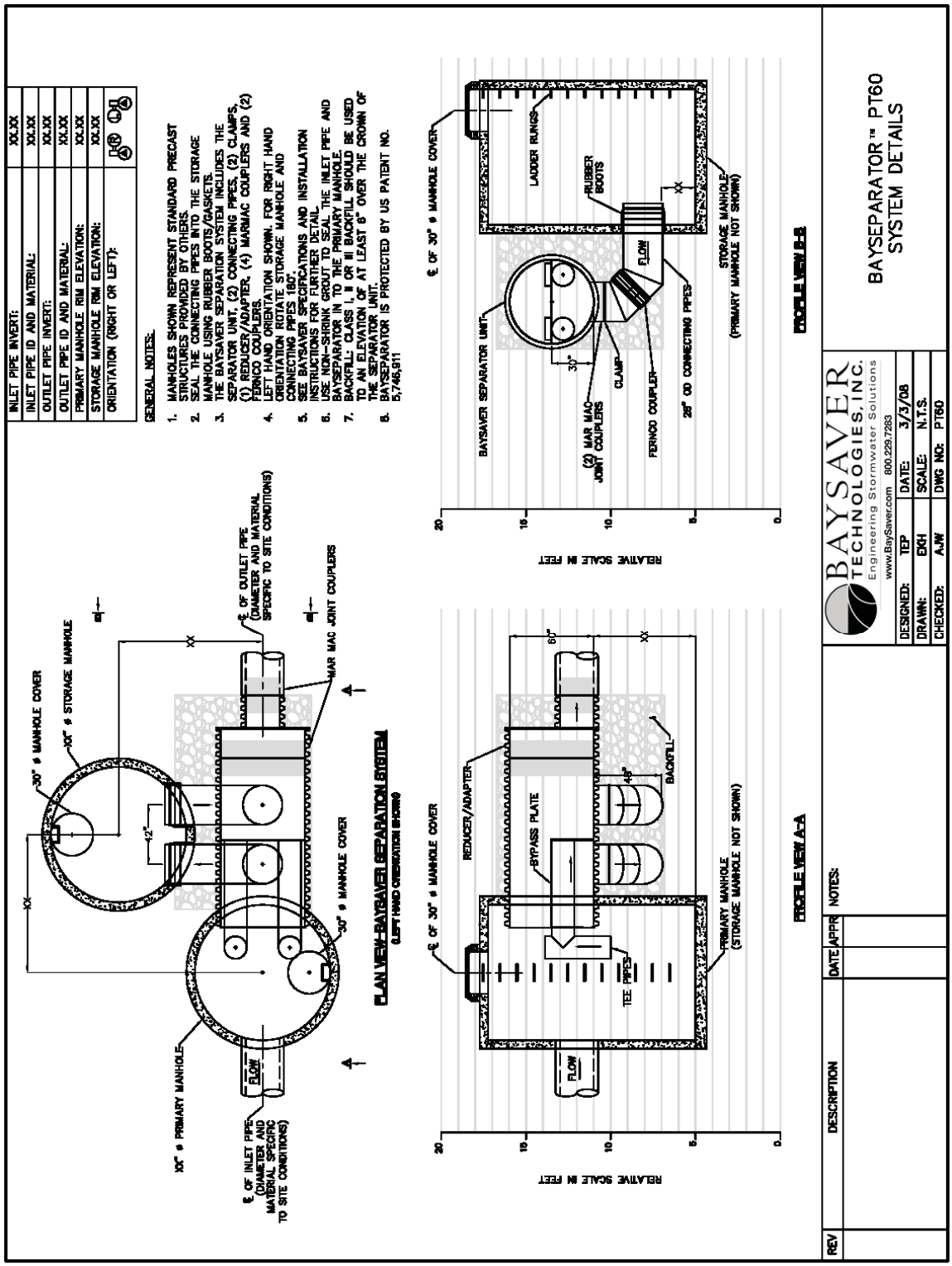

INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
PRIMARY MANHOLE RIM ELEVATION: XX.XX
STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL: CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,748,911
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
PROFILE VIEW A-A
PROFILE VIEW B-B
RELATIVE SCALE IN FEET
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP DATE: 3/3/06
DRAWN: EKH SCALE: N.T.S.
CHECKED: AJW DWG NO: PT24
BAYSEPARATOR™ PT24
SYSTEM DETAILS
REV DESCRIPTION DATE APPR NOTES:

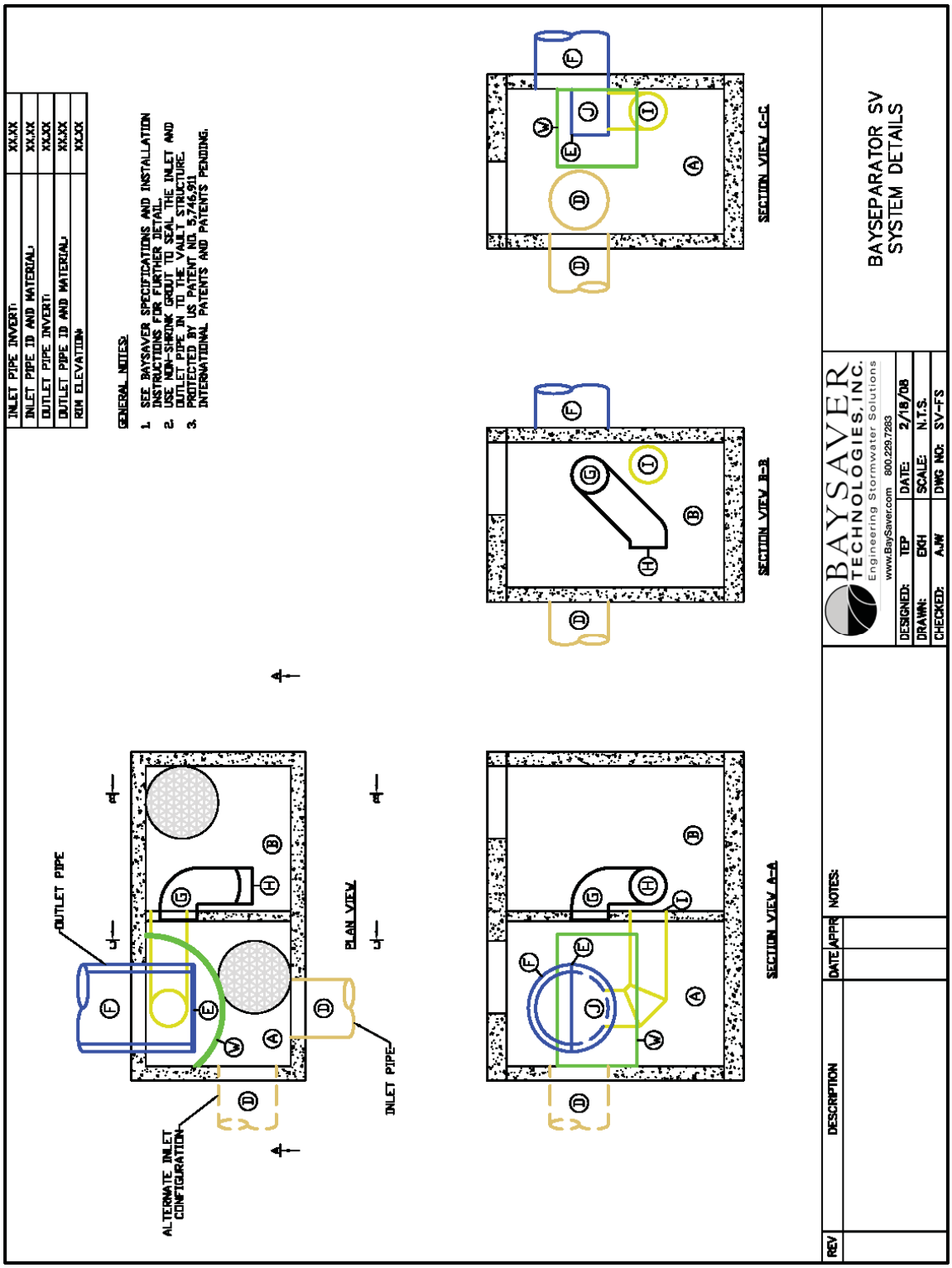

INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
PRIMARY MANHOLE RIM ELEVATION: XX.XX
STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNICO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL: CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,748,911
30" ø MANHOLE COVER
30" ø STORAGE MANHOLE
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
MAR MAC JOINT COUPLERS
30" ø MANHOLE COVER
30" ø PRIMARY MANHOLE
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
XX
23°
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
BAYSAVER SEPARATOR UNIT
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNICO COUPLER
13" OD CONNECTING PIPES
RUBBER BOOTS
LADDER RUNGS
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
15°
PROFILE VIEW B-B
RELATIVE SCALE IN FEET
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
TEE PIPES
BACKFILL
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
29°
40°
PROFILE VIEW A-A
RELATIVE SCALE IN FEET
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP DATE: 3/3/08
DRAWN: EKH SCALE: N.T.S.
CHECKED: AJW DWG NO: PT30
BAYSEPARATOR™ PT30
SYSTEM DETAILS
REV DESCRIPTION DATE APPR NOTES:

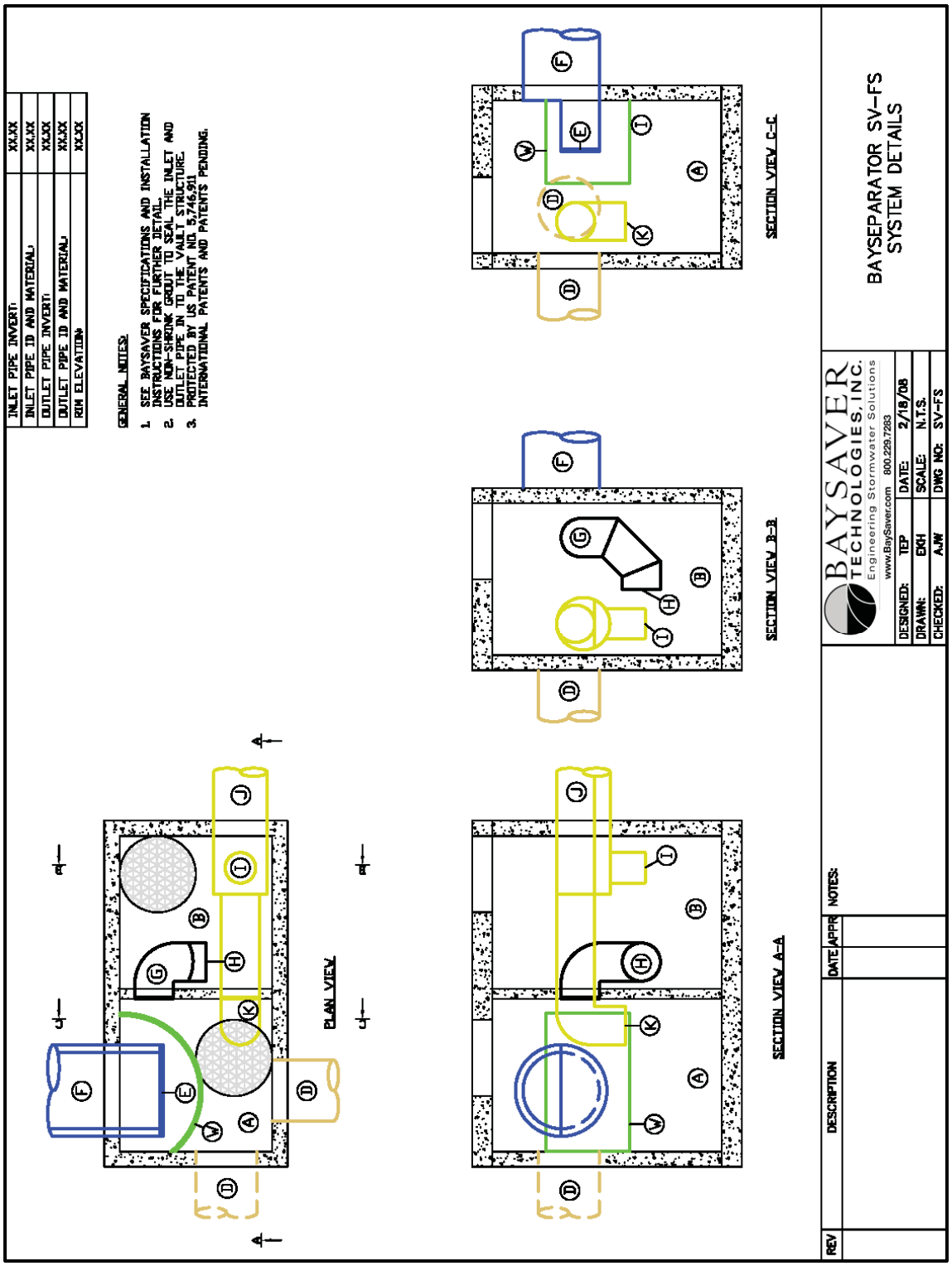

INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
PRIMARY MANHOLE RIM ELEVATION: XX.XX
STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT)
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL: CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,746,911
30" ø MANHOLE COVER
XX" ø STORAGE MANHOLE
XX
25"
XX" ø PRIMARY MANHOLE
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
MAR MAC JOINT COUPLERS
30" ø MANHOLE COVER
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
TEE PIPES
35"
48"
BACKFILL
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
PROFILE VIEW A-A
RELATIVE SCALE IN FEET
20
15
10
5
0
BAYSAVER SEPARATOR UNIT
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
16" OD CONNECTING PIPES
LADDER RUNGS
RUBBER BOOTS
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
PROFILE VIEW B-B
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 3/3/08
DRAWN: EKH
SCALE: N.T.S.
CHECKED: AJW
DWG NO: PT36
BAYSEPARATOR™ PT36
SYSTEM DETAILS
REV
DESCRIPTION
DATE
APPR
NOTES:

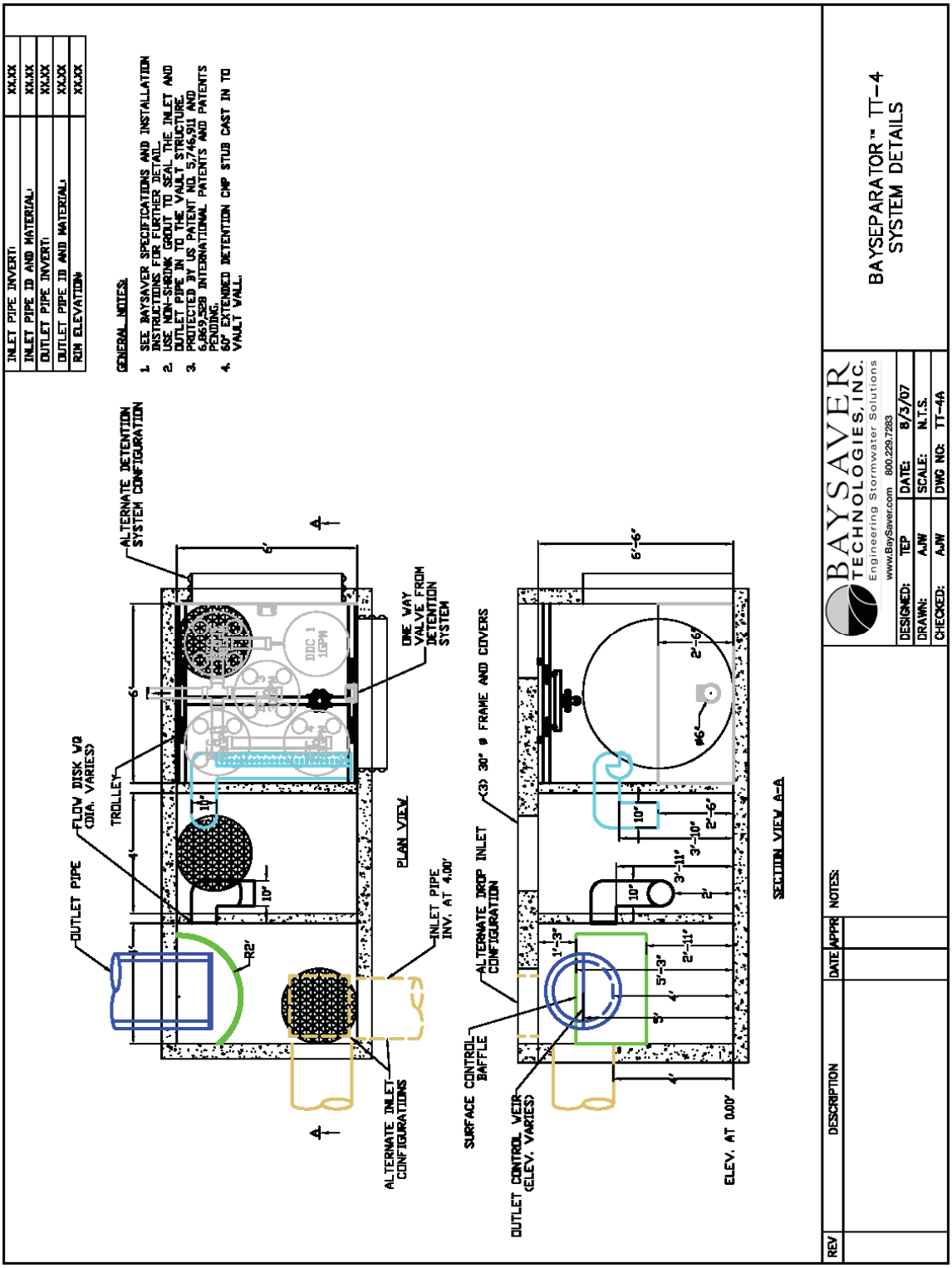

INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
PRIMARY MANHOLE RIM ELEVATION: XX.XX
STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL: CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,746,911
60" ø MANHOLE COVER
XX" ø STORAGE MANHOLE
XX
27"
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
MAR MAC JOINT COUPLERS
30" ø MANHOLE COVER
XX" ø PRIMARY MANHOLE
FLOW
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
RUBBER BOOTS
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
18" OD CONNECTING PIPES
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
2'
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW B-B
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
4'
BACKFILL
TEE PIPES
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
PROFILE VIEW A-A
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 3/3/08
DRAWN: EKH
SCALE: N.T.S.
CHECKED: AJW
DWG NO: PT42
BAYSEPARATOR™ PT42
SYSTEM DETAILS
REV
DESCRIPTION
DATE
APPR
NOTES:


INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
PRIMARY MANHOLE RIM ELEVATION: XX.XX
STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,746,911
30" ø MANHOLE COVER
XX" ø STORAGE MANHOLE
XX" ø PRIMARY MANHOLE
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
30" ø MANHOLE COVER
FLOW
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
TEE PIPES
BACKFILL
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
PROFILE VIEW A-A
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
RUBBER BOOTS
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
22" ID CONNECTING PIPES
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
PROFILE VIEW B-B
RELATIVE SCALE IN FEET
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP DATE: 3/3/08
DRAWN: EKH SCALE: N.T.S.
CHECKED: AJW DWG NO: PT48
BAYSEPARATOR™ PT48
GENERAL SYSTEM DETAILS
REV
DESCRIPTION
DATE
APPR
NOTES:


INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
PRIMARY MANHOLE RIM ELEVATION: XX.XX
STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED BY OTHERS.
2. SEAL THE CONNECTING PIPES INTO THE STORAGE MANHOLE USING RUBBER BOOTS/GASKETS.
3. THE BAYSAVER SEPARATION SYSTEM INCLUDES THE SEPARATOR UNIT, (2) CONNECTING PIPES, (2) CLAMPS, (1) REDUCER/ADAPTER, (4) MARMAC COUPLERS AND (2) FERNCO COUPLERS.
4. LEFT HAND ORIENTATION SHOWN. FOR RIGHT HAND ORIENTATION ROTATE STORAGE MANHOLE AND CONNECTING PIPES 180°.
5. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
6. USE NON-SHRINK GROUT TO SEAL THE INLET PIPE AND BAYSEPARATOR IN TO THE PRIMARY MANHOLE.
7. BACKFILL: CLASS I, II OR III BACKFILL SHOULD BE USED TO AN ELEVATION OF AT LEAST 6" OVER THE CROWN OF THE SEPARATOR UNIT.
8. BAYSEPARATOR IS PROTECTED BY US PATENT NO. 5,746,911
30" ø MANHOLE COVER
10" ø STORAGE MANHOLE
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
MAR MAC JOINT COUPLERS
30" ø MANHOLE COVER
10" ø PRIMARY MANHOLE
℄ OF INLET PIPES (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
RUBBER BOOTS
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
28" OD CONNECTING PIPES
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
PROFILE VIEW B-B
RELATIVE SCALE IN FEET
REDUCER/ADAPTER
BYPASS PLATE
TEE PIPES
BACKFILL
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
PROFILE VIEW A-A
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP DATE: 3/3/08
DRAWN: EKH SCALE: N.T.S.
CHECKED: AJW DWG NO: PT60
BAYSEPARATOR™ PT60
SYSTEM DETAILS
REV DESCRIPTION DATE APPR NOTES:


INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
RIM ELEVATION: XX.XX
GENERAL NOTES:
1. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
2. USE NON-SHRINK GROUT TO SEAL THE INLET AND OUTLET PIPE IN TO THE VAULT STRUCTURE.
3. PROTECTED BY US PATENT NO. 5,746,911 INTERNATIONAL PATENTS AND PATENTS PENDING.
OUTLET PIPE
ALTERNATE INLET CONFIGURATION
PLAN VIEW
INLET PIPE
SECTION VIEW A-A
SECTION VIEW B-B
SECTION VIEW C-C
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 2/18/08
DRAWN: EKH
SCALE: N.T.S.
CHECKED: AJW
DWG NO: SV-FS
BAYSEPARATOR SV
SYSTEM DETAILS
REV
DESCRIPTION
DATE
APPR
NOTES:


INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
RIM ELEVATION: XX.XX
GENERAL NOTES:
1. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
2. USE NON-SHRINK GROUT TO SEAL THE INLET AND OUTLET PIPE IN TO THE VAULT STRUCTURE.
3. PROTECTED BY US PATENT NO. 5,746,911 INTERNATIONAL PATENTS AND PATENTS PENDING.
PLAN VIEW
SECTION VIEW A-A
SECTION VIEW B-B
SECTION VIEW C-C
BAYSEPARATOR SV-FS
SYSTEM DETAILS
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 2/18/08
DRAWN: EKH
SCALE: N.T.S.
CHECKED: AJW
DWG NO: SV-FS
REV
DESCRIPTION
DATE
APPR
NOTES: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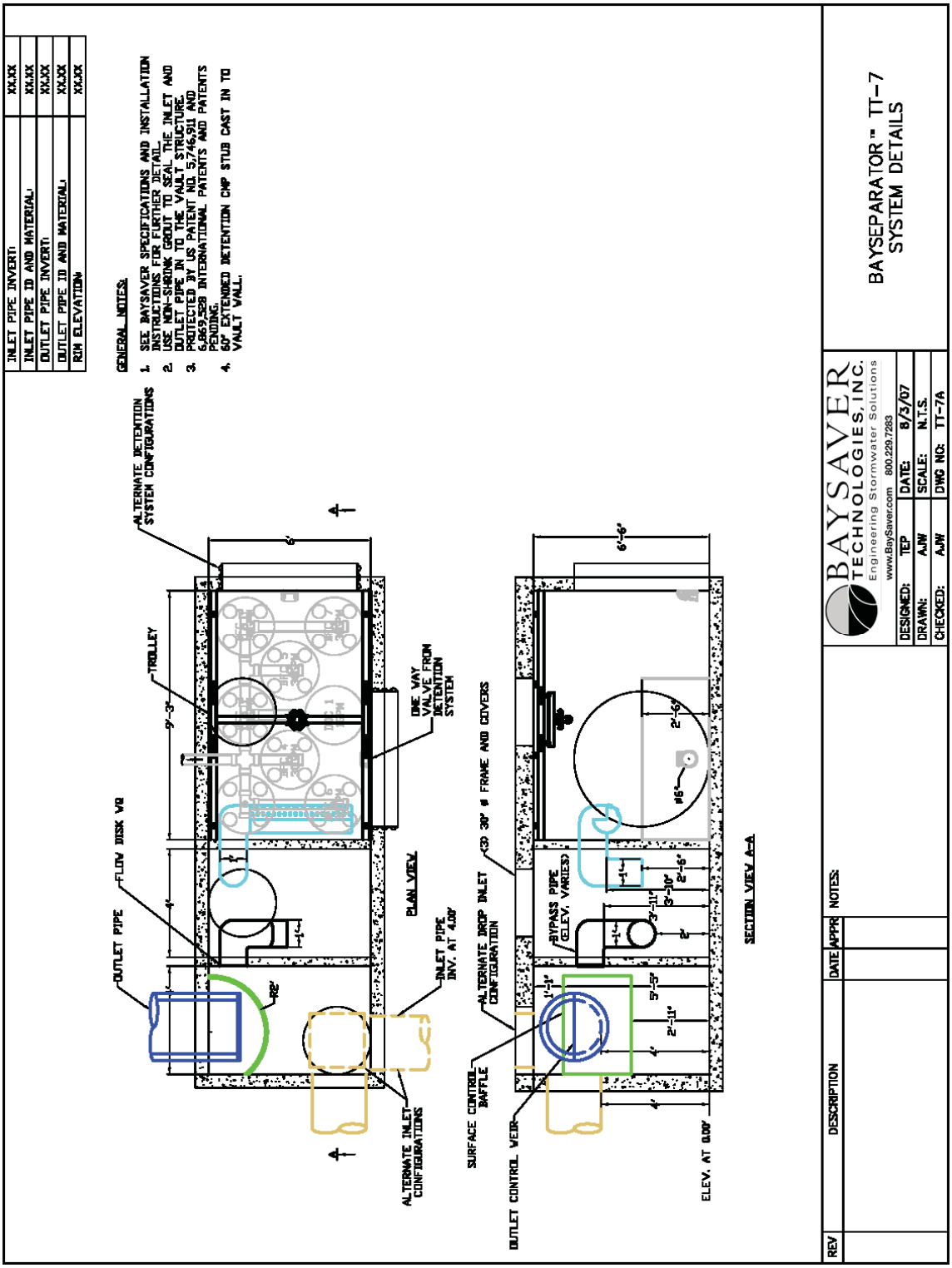
RIM ELEVATION XX.XX
GENERAL NOTES:
1. SEE BAYSAVER SPECIFICATIONS AND INSTALLATION INSTRUCTIONS FOR FURTHER DETAIL.
2. USE NON-SHRINK GROUT TO SEAL THE INLET AND OUTLET PIPE IN TO THE VAULT STRUCTURE.
3. PROTECTED BY US PATENT NO. 5,746,911 AND 6,869,528 INTERNATIONAL PATENTS AND PATENTS PENDING.
4. 60" EXTENDED DETENTION CMP STUB CAST IN TO VAULT WALL.
ALTERNATE DETENTION SYSTEM CONFIGURATION
FLOW DISK W/O (DIA. VARIES)
TROLLEY
OUTLET PIPE
R2'
10"
6'
DDC 1 1GPM
ONE WAY VALVE FROM DETENTION SYSTEM
PLAN VIEW
INLET PIPE INV. AT 4.00'
ALTERNATE INLET CONFIGURATIONS
(3) 30" ø FRAME AND COVERS
ALTERNATE DROP INLET CONFIGURATION
SURFACE CONTROL BAFFLE
OUTLET CONTROL WEIR (ELEV. VARIES)
ELEV. AT 0.00'
6'-6"
2'-6"
ø6"
1'-3"
5'-3"
2'-11"
3'-11"
3'-10"
2'-6"
2'
SECTION VIEW A-A
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 8/3/07
DRAWN: AJW
SCALE: N.T.S.
CHECKED: AJW
DWG NO: TT-4A
BAYSEPARATOR™ TT-4
SYSTEM DETAILS
NOTES:
REV
DESCRIPTION
DATE
APPR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4. 60" EXTENDED DETENTION CMP STUB CAST IN TO VAULT WALL.
ALTERNATE DETENTION SYSTEM CONFIGURATIONS
TROLLEY
FLOW DISK V2
OUTLET PIPE
ONE WAY VALVE FROM DETENTION SYSTEM
PLAN VIEW
INLET PIPE INV. AT 4.00'
ALTERNATE INLET CONFIGURATIONS
ALTERNATE DROP INLET CONFIGURATION
BYPASS PIPE (ELEV. VARIES)
SURFACE CONTROL BAFFLE
OUTLET CONTROL WEIR
ELEV. AT 0.00'
SECTION VIEW A-A
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP DATE: 8/3/07
DRAWN: AJW SCALE: N.T.S.
CHECKED: AJW DWG NO: TT-7A
BAYSEPARATOR™ TT-7
SYSTEM DETAILS
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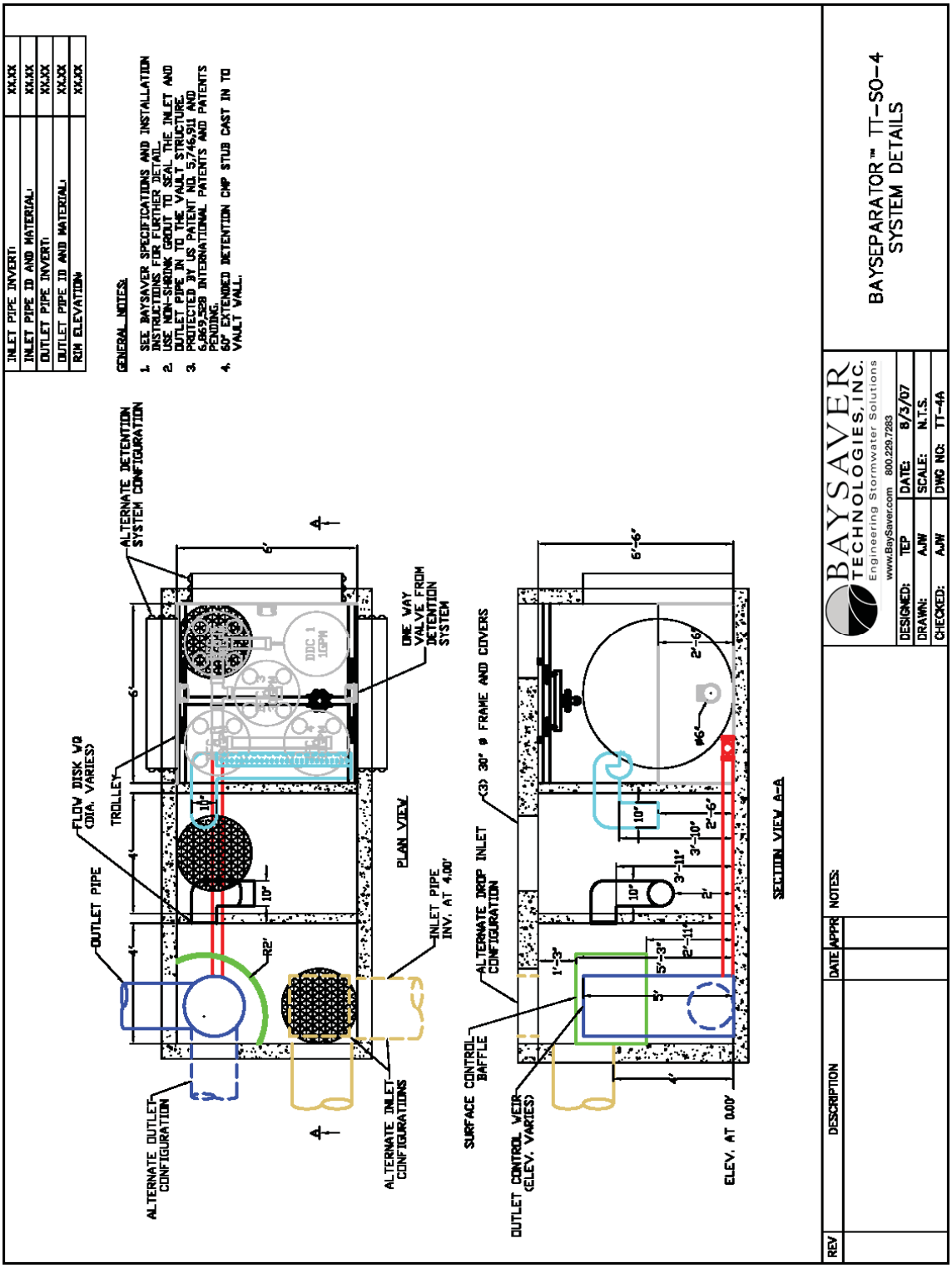
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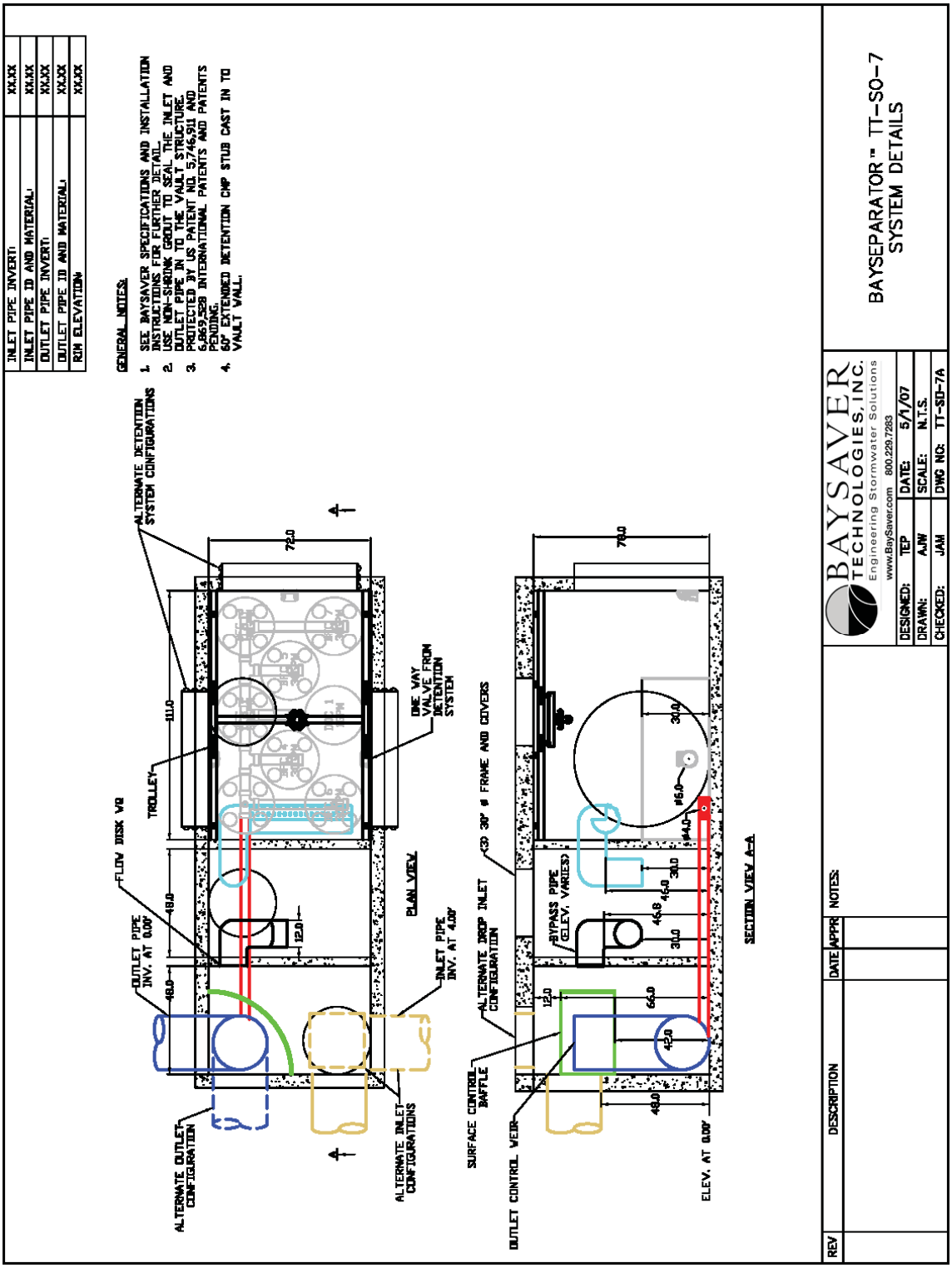
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP DATE: 8/3/07
DRAWN: AJW SCALE: N.T.S.
CHECKED: AJW DWG NO: TT-4A
BAYSEPARATOR™ TT-SO-4
SYSTEM DETAILS
REV DESCRIPTION DATE APPR NOTES: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BAYSAVER TECHNOLOGIES, INC.
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www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 5/1/07
DRAWN: AJW
SCALE: N.T.S.
CHECKED: JAM
DWG NO: TT-SO-7A
BAYSEPARATOR™ TT-SO-7
SYSTEM DETAILS
REV
DESCRIPTION
DATE
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Appendix

C

BaySeparator™ System:

F-95 Sediment Removal Efficiency Data

BaySeparator™ System: F-95 Sediment Removal Efficiency Data

During 2004, BaySaver Technologies, Inc. began a thorough series of laboratory tests with the University of Minnesota's St. Anthony Falls Laboratory (SAFL). SAFL is an internationally known hydraulics laboratory that has extensive experience in academic-industrial partnerships. The project was conducted by Dr. Omid Mohseni, the laboratory's Associate Director of Applied Research.

SAFL researchers began testing the standard BaySaver system using an F-95 sediment gradation in August, 2004. At the same time, researchers created an empirical model of the system based on experimental data. This model was used to quantify the flow rates through the different system components under varying flow conditions. After the model and initial testing were completed, research was focused on optimizing the design. After two years of work with SAFL, BaySaver is introducing the BaySeparator™ System

The BaySeparator™ system is based on the same principles and protected by the same patent as the original BaySaver Separation System. However, modifications to the separator unit have improved both the flow capacities and the sediment removal efficiencies of the system. The system has been extensively modeled and tested in the laboratory, and this research program has resulted in a superior product.

A 24″ system was constructed in the laboratory. This system comprised the 24″ separator unit as well as two fiberglass manholes. The system was tested with both 48″ and 60″ manholes. Tests were run at varying flow rates to establish the efficiency under a range of operating conditions. Once flow began, the system was run until steady state conditions (verified with a salt tracer) were established. After steady state was reached, sediment was introduced into the inlet pipe by a metered sediment feeder. The target influent concentration was 200 mg/l, and this concentration was confirmed by grab samples taken from the influent water. The system was allowed to run for a given length of time before the flow was cut off. Following the test run, the manholes were dewatered and the mass of collected sediment was measured. This mass was compared to the total influent sediment load to calculate removal efficiency.

F-95 sediment is a commercially available mix that contains sediments ranging in size from 53 microns to 425 microns. The bulk of the sediment (87%) is between 75 microns and 212 microns in diameter. Table 1 shows the sediment grain size distribution for F-95 mix used during the tests. The F-95 sediment gradation has a d_{50} of 125 microns.

Sediment Size (μm)	% by Mass
300 – 425	1
212 - 300	9
150 - 212	30
106 - 150	42
75 - 106	15
53 – 75	3
0 - 53	0

TABLE 1: F95 SEDIMENT GRADATION

A number of tests were run on the 24″ laboratory installation. The first of these series of tests was run on the 24″ BaySeparator™ system with two 72″ manholes. Six tests were conducted on this configuration: two tests at 100% of the unit's maximum treatment rate (MTR); two tests at 50% MTR; and two tests at 25% MTR. MTR is defined as the maximum flow the unit can treat without bypassing any water during high intensity storm events. The influent concentration of all tests was set at about 200mg/l with the F-95 gradation.

The second series of tests featured the same 24″ Separator Unit and 72″ Storage Manhole, but with a 48” Primary Manhole. Four tests were conducted in this configuration, two at 100% MTR and two at 15% MTR. Each test again had an influent concentration of approximately 200 mg/l of F-95 sediment gradation.

For each test run, three removal values were calculated: the fraction of sediment removed by the Primary Manhole; the fraction of sediment removed by the Storage Manhole; and the overall removal efficiency of the system. The fraction of sediment removed in each manhole is calculated by dividing the total mass of sediment introduced by the mass of sediment retained in each manhole. The overall efficiency of the system is calculated by dividing the total mass of sediment introduced by the total mass of sediment collected in *both* manholes. A brief summary of the test results can be found in Table 2.

Q/Qmax	Primary MH (inches)	Storage MH (inches)	System Efficiency (percent)
0.25	72	72	84
0.50	72	72	70
1.00	72	72	55
0.15	48	72	94
1.00	48	72	46
0.15	48	72	95
0.25	48	72	90
0.50	48	72	76
0.75	48	7	64
1.00	48	72	53

TABLE 2: TEST DATA SUMMARY

Calculating these numbers using mass balances rather than grab samples or composite samples provides a much more robust and accurate dataset and reduces to a large extent the potential for sampling errors common in stormwater sampling projects.

SAFL researchers established a relationship between the sediment removal in each manhole and the Peclet Number in that structure. The Peclet Number is a dimensionless characteristic number of fluid flow that represents the ratio of advection to diffusion within a fluid system. In the case of the BaySeparator™ system, advection is the settling of sediment particles, while diffusion is measured with a turbulence factor [1]. The Peclet Number for a manhole is a function of the manhole dimensions (depth and diameter), the settling velocity of the target sediment particle, and the flow rate through the manhole. Note that, for a given flow rate, each manhole in the BaySeparator™ system will have a different Peclet Number.

Separate sediment removal functions were developed for each manhole. The sediment removal in each manhole is expressed as a function of the Peclet Number, which is in turn a function of the flow rate through the manhole. These functions can be combined with the hydraulic model developed by SAFL to determine the removal efficiency of a given system over a range of flow rates. Because of the variability of manhole sizes and flow rates, each configuration has a slightly different flow rate vs. efficiency function. However, all of the functions are of the form shown in Equation 1 and Figure 2 below.

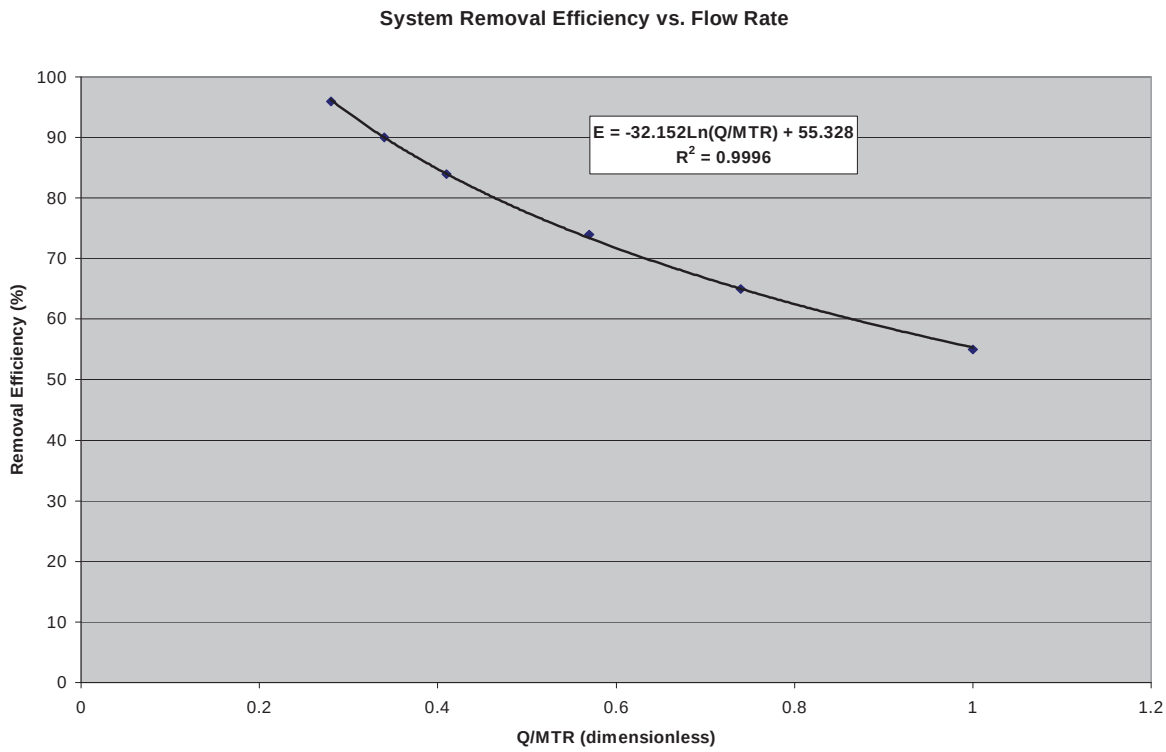

FIGURE 2: TYPICAL BAYSEPARATOR™ FUNCTION

In Equation 1, *E* is the removal efficiency of the system, *Q* is the flow rate through the system, *MTR* is the maximum treatment rate of the BaySeparator™ unit, and *m* and *b* are constants that depend on the configuration of the BaySeparator™ system. The value of *m* varies between -0.261 and -0.386 while *b* falls between -0.105 and 0.825. For each BaySeparator™ configuration, this function describes the performance of the system over the range of design flows. A typical function is shown above in Figure 2.

As expected, the function indicates that the BaySeparator™ system's sediment removal efficiency increases as the flow rate through the system decreases. Low flow rates typically correspond to the more frequent, low intensity storms on the site. As the flow rate through the system increases, the system's performance decreases. At the same time, low intensity storms represent 90% or more of the storm events on a site. To quantify the rainfall patterns on a site, BaySaver uses precipitation databases going back more than 45 years. These databases have been reviewed for integrity and consistency by BaySaver Technologies' engineers. This distribution of storm events is

the basis for BaySaver Technologies' recommended Annual Aggregate Removal Efficiency sizing methodology.

Cost-effective BaySeparator™ systems can be designed for most sites by taking advantage of the frequency of low-intensity storms. In most jurisdictions, BaySeparator™ systems are designed to remove 80% of the suspended sediment load on an annual aggregate basis. In addition to the 80% annual aggregate removal, the system must also be capable of conveying the peak design flow rate during bypass, and the head loss through the system must be low enough to avoid backing up the flow upstream.

The peak design capacity of the BaySeparator™ determines the minimum separator size. Each separator unit has a maximum treatment rate (MTR) associated with it as well. Using the Rational Method, this MTR flow can be translated into rainfall intensity on the design site. The Rational Method, show below in Equation 2, is a hydrologic computation used to relate

$$Q = ciA \qquad \textit{Equation 2}$$

runoff flow rate to rainfall intensity and the characteristics of the site. In Equation 2, Q is the runoff flow rate; c is the runoff coefficient (a constant between 0 and 1 that represents the fraction of total precipitation that runs off the site); i is the rainfall intensity on the site, and A is the drainage area of the site. Given Q (the MTR of the selected BaySeparator™), c, and A, we can rearrange Equation 2 and solve for i, as shown in Example 1.

<u>Example 1</u>

Site Description:
A 3.8 acre site in Nashville, Tennessee
$c = 0.85$
Peak design flow (bypass) = 12.6 cfs

The 12.6 cfs bypass flow requires a BaySeparator SA30, since the BaySeparator SA24 cannot handle flows greater than 9.4 cfs. The BaySeparator SA30 has an MTR of 2.32 cfs. Substituting Q=2.32 cfs, c=0.85, and A=3.8 acres into Equation 2 returns a rainfall intensity i of 0.71 inches per hour. This rainfall intensity corresponds to the MTR of the BaySeparator unit.

On a typical site, the vast majority of precipitation comes at intensities far below the calculated intensity of 1.01 inches per hour. Figure 3, for example, shows the precipitation distribution for Nashville, Tennessee. As that plot demonstrates, approximately 90% of the total precipitation in Nashville falls at an hourly intensity below 0.71 inches per hour.

To include the distribution of precipitation in the sizing methodology, it is necessary to determine the fraction of precipitation falling at incremental intensities between 0 and the intensity associated with the MTR of the BaySeparator™. Example 2 shows this calculation, using the rainfall data from Nashville shown in Figure 3. The total amount of precipitation falling on the site is divided into 10 intensity increments. The lowest intensity increment, which corresponds to rainfalls between 0.01 and 0.10 inches per hour, contains more than 30% of the total precipitation that falls on the site. The second increment, rainfalls between 0.11 and 0.20 inches per hour, contains over 20% of the total precipitation, and subsequent increments contain less. For each increment, the fraction of total precipitation falling at that intensity is determined from the rainfall record.

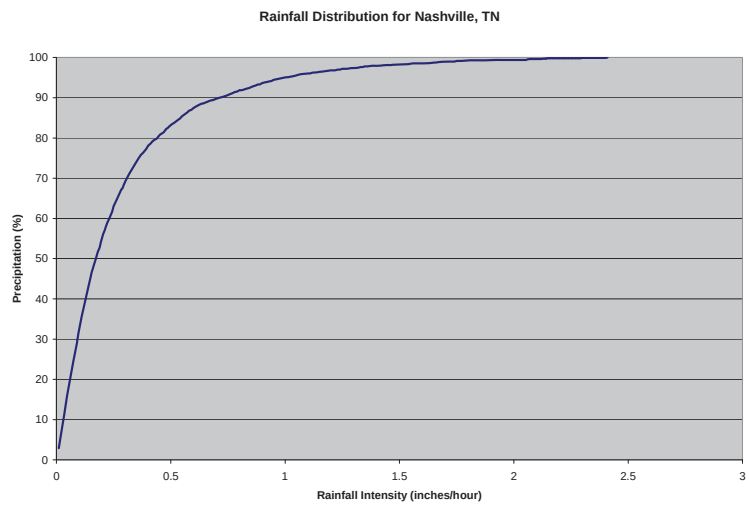

FIGURE 3: PRECIPITATION DISTRIBUTION FOR NASHVILLE, TN

The removal efficiency of the system is determined for the flow rate associated with each particular increment, and the percent of the sediment load for that increment is calculated by multiplying the fraction of precipitation by the incremental removal efficiency. In Example 2, 23.2% of the total precipitation falls within the intensity range between 0.01 and 0.10 inches per hour. According to the efficiency function for a BaySeparator SA30457.0 system, runoff generated by precipitation in this intensity range is treated at an efficiency of 99%. Therefore,

Example 2

Q/MTR	i(Q/MTR)	% of Precip.	E(Q/MTR)	Incremental Efficiency
0.10	0.07	23.2	99.0	22.9
0.20	0.14	19.7	99.0	19.5
0.30	0.21	13.8	97.1	13.3
0.40	0.28	9.9	87.7	8.6
0.50	0.36	7.4	80.5	5.9
0.60	0.43	4.9	74.6	3.6
0.70	0.50	3.4	69.6	2.3
0.80	0.57	3.2	65.3	2.0
0.90	0.64	2.7	61.5	1.6
1.00	0.71	1.3	58.1	0.7
		Annual Aggregate Removal Efficiency:		**80.4**

22.9% of the total sediment load (23.2% * 99%) is removed from these flows. The annual aggregate removal efficiency of the system is calculated by adding together the ten incremental load reductions.

For sites in ecologically sensitive areas or those with particular runoff concerns, the BaySeparator™ system may be designed to remove a given fraction of the sediment load at a specified flow rate. This methodology is usually reserved for sites that discharge into wetland watersheds, fish spawning areas, or other critically sensitive drainages.

Dhamotharan, S., Gulliver, J., Stephan, H., Unsteady One-Dimensional Settling of Suspended Sediment, Water Resources Research, Vol. 17 (4), pp 1125-1132 (1981)

Appendix

D

The Peclet Number

THE PECLET NUMBER
AN INNOVATIVE METHOD FOR MODELING, ANALYSIS, AND PREDICTION OF STRUCTURAL STORMWATER BMP PERFORMANCE

Many stormwater structural Best Management Practices (BMPs) rely on gravitational particle settling for sediment removal. The University of Minnesota's St. Anthony Falls Laboratory (SAFL) and BaySaver Technologies, Inc. (BaySaver), a manufacturer of hydrodynamic structural BMPs, have been able to establish statistically valid empirical correlations between the dimensionless Peclet Number (Pe) and sediment removal efficiencies in the hydrodynamic BaySeparator™. The Pe is defined here as the ratio of advection (particle settling velocity) to diffusion (turbulence) in the hydrodynamic environment [1].

The use of the Pe has practical significance in areas such as stormwater treatment because it provides a basic dimensionless framework for sediment removal efficiency prediction that is independent of the specific dimensions of a given BMP design. Hence, the performance of a particular design can be adequately predicted once the underlying Pe-sediment removal functionality is established via experimental measurements. This article outlines the use of Pe - sediment removal relationships and experimental data to develop models for projecting BMP sediment removal performance. The use of the Pe in stormwater treatment is a new approach useful towards both characterizing and predicting the sediment removal efficiency of a hydrodynamic BMP.

INTRODUCTION

Rigorous analysis of solid-liquid separators such as hydrodynamic BMPs can be a very complex task. From the theoretical perspective, the explicit solution of the fluid mechanics equations that govern single-phase fluid flow under laminar conditions in relatively simple geometries can be complex. For turbulent flow regimes, the equations and their corresponding solutions are even more complex. If solids (sediment particles) are added, the fluid flow equations increase in complexity.

In many instances, the approximate solution of such fluid flow equations is approached via numerical methods. More recently, with the widespread use of computational fluid dynamics software (CFD), the characterization of fluid flow patterns in hydrodynamic BMPs has also been achieved [2]. CFD models are very useful in providing graphical visualizations of fluid flow patterns and behavior. CFD techniques often require a rigorous understanding of the theoretical aspects of fluid flow, expertise in setting up the problem, and ability to use the CFD software. Still, solutions resulting from either numerical solutions or CFD techniques often need to be calibrated in order to get more useful solutions.

Another technique that has been used for many years to model complex fluid flow problems has been the use of empirical correlations involving dimensionless numbers such as the Reynolds Number (Re), Peclet Number (Pe), and other dimensionless numbers. This technique does not

require a complete analytical formulation of the phenomena per se, but a general understanding of the factors that affect the process being studied [3,4]. The use of empirical correlations involving dimensionless numbers is of widespread use in many areas of engineering such as fluid flow and heat and mass transfer.

The benefit of using empirical correlations involving dimensionless numbers is that once the equations are developed for a particular process, these same correlations can be used to predict the behavior of similar processes having different relative dimensions. These empirical correlations are developed based on experimental techniques and statistical data analysis. Hence, the solutions obtained from this technique are approximate solutions. Still, empirical techniques often provide very useful solutions to real life problems. This article outlines the development and use of correlations involving Pe – sediment removal in a hydrodynamic BMP.

EXPERIMENTAL FACILITY

The test stand set-up at the University of Minnesota St. Anthony Falls Laboratory is depicted in Figure 2. The water supply for the tests was from the Mississippi River. Figure 3 shows a simplified diagram of the data collection procedure. A sediment feeder was used to control sediment supply rates and concentrations. Weirs were used to measure discharge flows. The weirs were equipped with electronic level sensors and connected to a PC-based data acquisition system.

The next sections describe the experimental results and how the Peclet Number was used to derive empirical correlations for sediment removal in the Separator System.

THE PECLET NUMBER

The Peclet Number is one of the several dimensionless numbers commonly used in engineering and science. This dimensionless number was named after Jean Claude Eugene Peclet who was a notable French scientist born in the eighteenth century [5].

In studying sediment transport and settling, Pe can be defined as the ratio of advective mass transport to turbulent mass transport [1,6] in the vertical direction. Specifically, in studying particle settling phenomena, Pe has been defined as [1]:

$$Pe = \frac{Vs\, L_1}{Diff} \qquad \textit{Equation 1}$$

Where Vs is the particle settling velocity (ft/s), L_1 a length scale (ft), and Diff is the turbulent diffusion coefficient (ft^2/s). It can be seen that the Pe has no dimensions. The gravitational settling velocity Vs can be calculated using the well known Stokes Law for particles having a particle Reynolds Number < 1 [3,10]. According to the Stokes Law, gravity driven particle terminal velocity (Vs in ft/s) is proportional to the difference in density between the particle (ρ_p in lbs/ft^3) and the fluid (ρ_f in lbs/ft^3) and to the square of particle diameter (d_p in ft); and inversely proportional to the absolute fluid viscosity (μ in lb_f-sec/ft^2). The Stokes terminal velocity is the steady state settling velocity of the particle [3].

$$Vs = \frac{g\,(\rho_p - \rho_f)\,d_p^{\,2}}{g_c\,18\,\mu} \qquad \textit{Equation 2}$$

It is important to note that real systems are complex and those theoretical equations, such as Equation 2, yield numbers that represent a simplified and ideal world. Still, Vs estimation via the Stokes Law provides a useful starting point towards understanding particle settling velocities in real engineering systems and for that reason the Stokes Law is of common use [7]. From examining the Stokes Law equation, one can observe that the heavier the particle and the larger it is, the faster it will fall. Also, as temperature decreases, water viscosity increases slowing down the falling particle.

Of the three terms that make the Pe, Vs and L_1 are, in most cases, relatively easy to determine. The Diff term, or turbulent diffusion coefficient, is much more difficult to establish, both theoretically and experimentally, as mentioned in research papers that deal with numerical simulations of particle settling dynamics [6,8]. Based on experimental work and theoretical understanding, the turbulent diffusion term in the BaySeparator™ has been approximated by researchers [1] to be:

$$Diff \sim \frac{Q}{L_2} \qquad \textit{Equation 3}$$

Where L_2 (ft) is a scale length, Q is the flow through the manhole (ft^3/s), and ~ is the proportional symbol. The scale length refers to a particular and functionally relevant dimension of the BMP device being studied. It is important to emphasize that only similar systems having the same Pe will exhibit similar particle removal dynamics. In other words, if one develops sediment removal correlations based on Pe for a specific BMP design, those specific correlations cannot used to predict the behavior of a geometrically dissimilar BMP design that might have the same Pe.

The final form of the Pe arrived by SAFL and used in the analysis of the separator is:

$$Pe = \frac{Vs\,D_m}{Q/h} \qquad \textit{Equation 4}$$

Where Vs is the settling velocity for the d_{50} particle in the sediment gradation, D_m is the diameter of either the PM or the SM, Q is the flow through the separator with $Q \leq MTR$, and h is a dimensional scale characteristic of every BaySeparator™. It is important to note that each manhole will have its own Pe-sediment removal correlation.

How can the Pe be used to predict the behavior of a stormwater BMP? An approach that was used by SAFL and BaySaver Technologies was to develop a family of dimensionless equations for the BaySeparator™ as a function of flow (Q) through the system, MTR, and mass accumulation measurements in both the PM and the SM (See Figure 3). Mass accumulation measurements were then used to calculate sediment removal efficiencies in the BaySeparator™

System. F-95, a sediment gradation manufactured by US Silica, was added to the source water as the source of sediment mass (see Table 1).

Table 1: F-95 Grain Size Distribution

Sediment Size (µm)	Percent Finer
425	100
300	99
212	90
150	60
106	18
75	3
53	0

In general terms, sediment removal efficiency of a BMP is defined in Equation 5: This definition has been used in the past in other types of BMP efficiency analysis efforts [2].

$$\textit{Removal Efficiency} = \frac{\textit{Mass of Sediment Collected}}{\textit{Mass of Sediment Injected}} \qquad \textit{Equation 5}$$

Based on the experimental work at SAFL, dimensionless relationships were developed for percent sediment removal (100 x Removal Efficiency) in the SM and PM as a function of Pe in each structure (Pe_{PM} and Pe_{SM}). The empirical equations developed as a result of this ongoing experimental program are presented in Figures 4 and 5. As can be seen from the previous discussion, Pe correlations can provide a very useful approach towards understanding and predicting sediment removal mechanisms and efficiencies in storm water BMPs.

Given the practical impossibility to perform these experiments at a controlled temperature, the temperature during these tests varied approximately between 54 °F and 76 °F. As predicted by Stokes Law, higher sediment removal efficiencies were observed at higher temperatures than at lower temperatures.

For a given BaySeparator™ configuration, the sediment removal efficiency was evaluated over a range of flows. The results of this evaluation were synthesized into an individual equation having the following general form:

$$\textit{Percent Sediment Removal for Separator}_i = A \ln (Q/MTR) + B \qquad \textit{Equation 6}$$

Where A, MTR, and B are specific to each Separator design, A and B are also numerical constants. Q is the stormwater flow with $Q \leq MTR$. These equations then formed the basis for the development software model for the optimum design of BaySeparator™ based on target percent sediment removal requirements, precipitation data, and economics (See Figure 3).

As can be seen in Figures 4 and 5, the percent sediment removal efficiency in both the PM and SM increase as the Pe increases. The following observations can be made based on Equation 4 and Table 2.

1. As the particle settling velocity increases, the efficiency of the separator increases. The opposite being also true.

2. As the depth of the manholes increases, the efficiency of the separator also increases. It is believed that an increased distance between the turbulent region in the manholes and the sediment rich strata towards the bottom of the manhole mitigate particle resuspension and upward sediment transport resulting in more effective particle settling.

3. As the diameter of the manholes increases, the efficiency of the separator also increases. A larger manhole diameter creates a longer horizontal trajectory and a correspondingly greater hydraulic retention time between the inlet and the outlet. Therefore particles have a larger chance of reaching the quiescent areas of the manhole increasing settling efficiency.

4. As the flow increases system efficiency decreases. It is believed this is caused by a decrease in residence time in the system and on increased turbulence that work against particle settling and removal.

Table 2: Effect of Pe Changes on Percent Sediment Removal Efficiency[1]

Factor	**Increase Vs** (1)	**Increase h** (2)	**Increase D_m** (3)	**Increase Q** (4)
Pe in PM	Increases	Increases	Increases	Decreases
Pe in SM	Increases	Increases	Increases	Decreases
% Sediment Removal Efficiency	Increases	Increases	Increases	Decreases

[1] See Figures 4 and 5 for details.

CONCLUSIONS

1. The Peclet Number is a very useful tool in characterizing the performance of hydrodynamic separators. It is believed that statistically valid correlations between the Peclet Number and sediment removal in the BMP structure can be obtained through the use of robust data collection and data analysis procedures.

2. In a hydrodynamic BMP, particle settling is opposed by turbulence in the BMP structure. The Peclet Number predicts that the higher the particle settling velocities (advection) relative to the turbulence in the BMP, the more effective the separator will be in

removing sediments, all other factors being equal. Hence, higher Peclet Numbers lead to higher sediment removal efficiencies.

3. It is likely that resultant particle removal efficiencies in the BaySeparator™ System are also influenced by other mechanisms such as particle interactions, particle characteristics, wall effects, etc. These factors were not quantified, in terms of their influence, during this project.

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Figure 1: BaySeparator™ System Layout

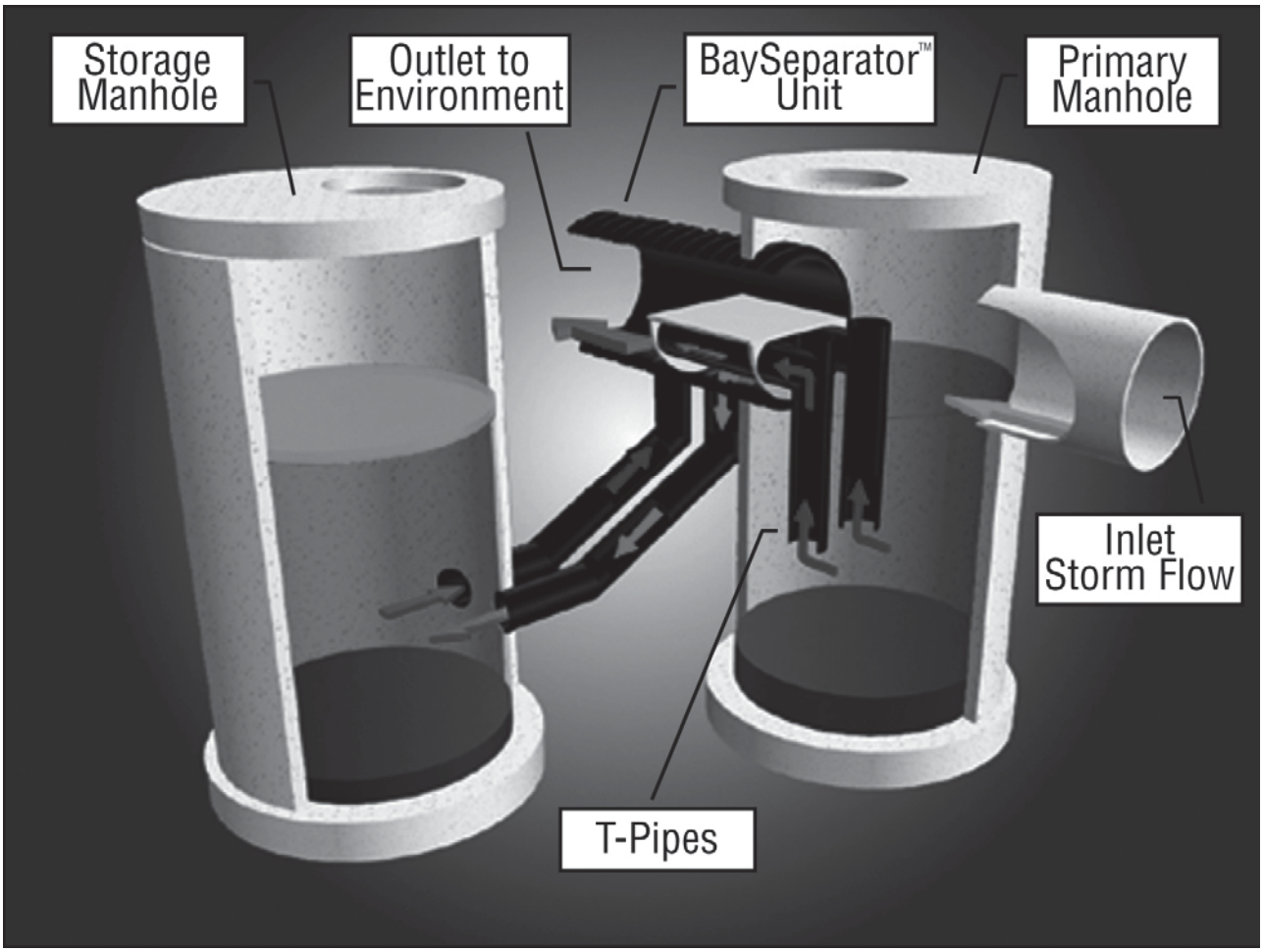


Figure 2: Testing Facility Diagram (Carlson, 2005)

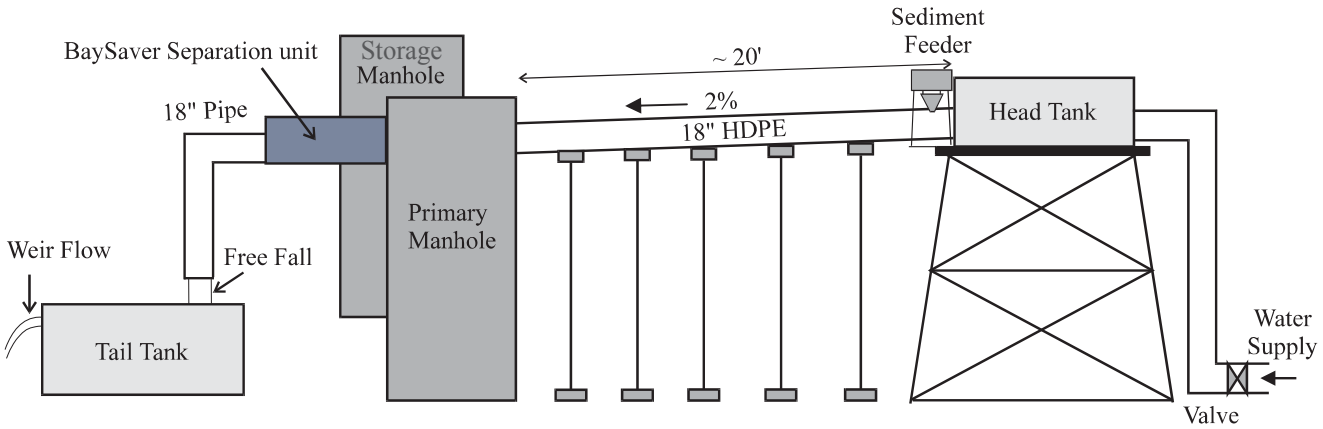
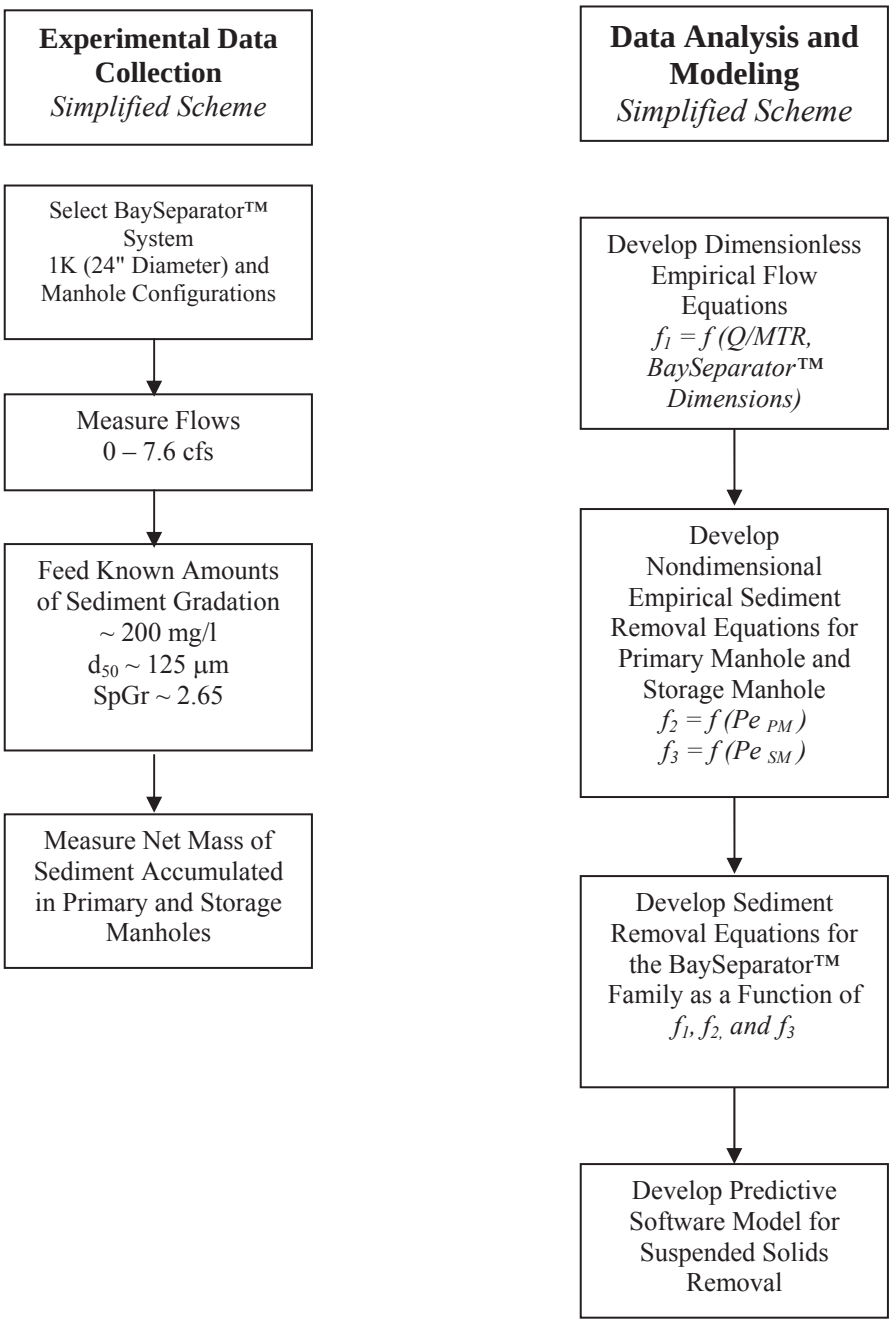


Figure 3: Simplified Experimental and Data Analysis Procedure – BaySeparator™ Modeling



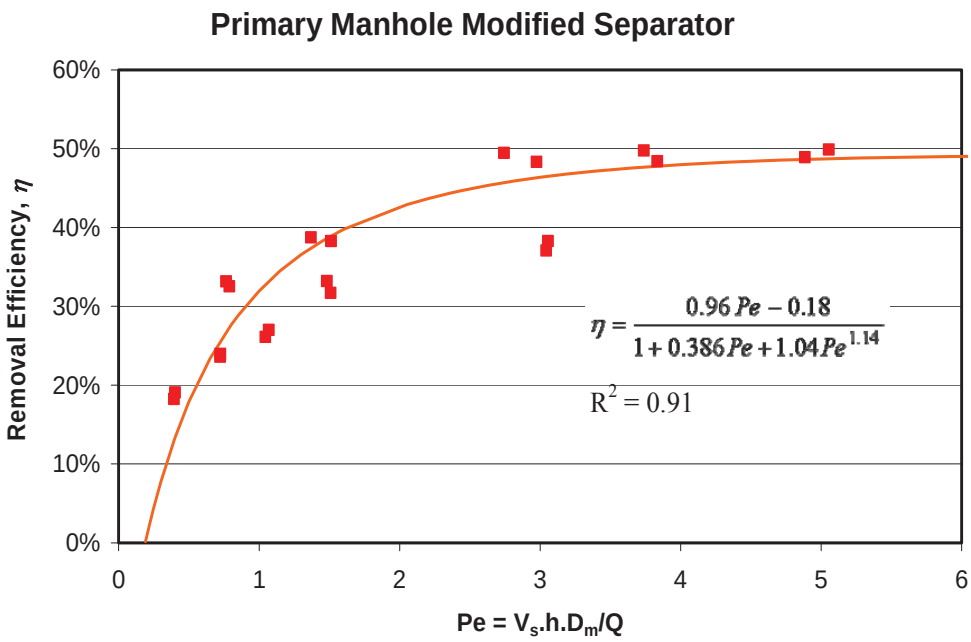


Figure 4: Measured removal efficiency of the Primary Manhole versus Peclet Number and the proposed function to describe the relationship (Carlson, 2005)

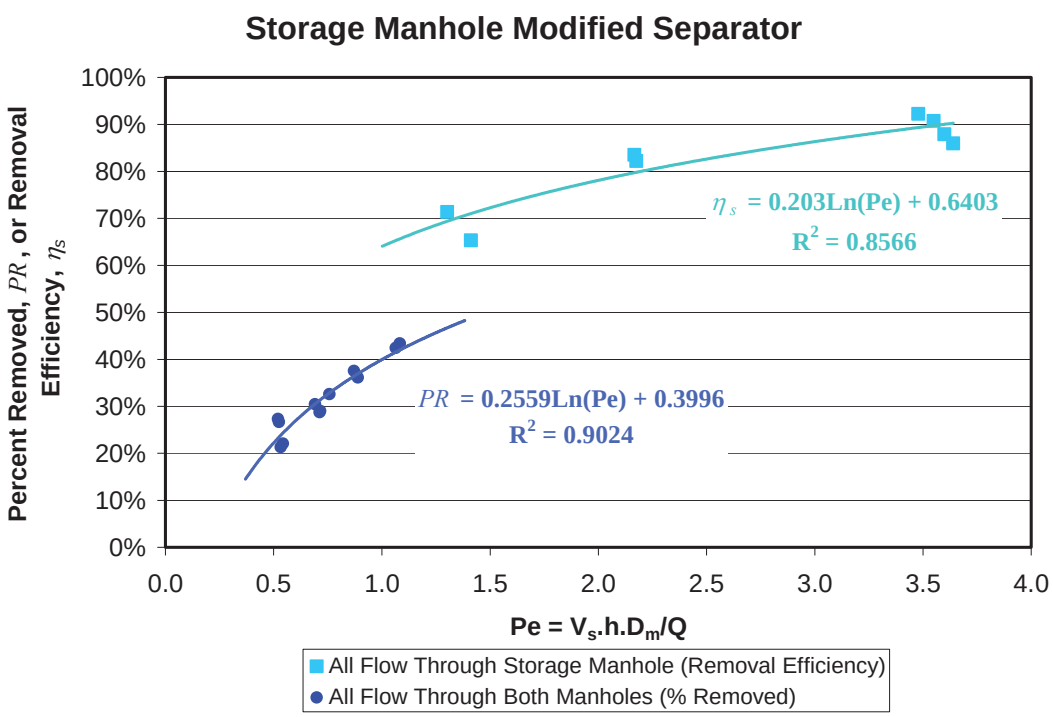


Figure 5: Measured removal efficiency and the percent removed in the Storage Manhole versus Peclet Number and the proposed functions to describe the relationships (Carlson, 2005).

Appendix E

Project Information Sheet

BaySeparator™ Sizing Form

Project Contact Information

Company Name	Date
Contact Name	☐ Engineer ☐ Developer ☐ Contractor
Project Name	Email
Telephone	Fax
City	State Zip
Site Characteristics ☐ Residential ☐ Commercial ☐ Industrial ☐ Mixed	Due Date
Additional comments/project information	

Site Information

Total Drainage Area (acres)	Impervious Area (acres)
Peak/Design Flow Rate	Treatment Flow Rate
Project Stage ☐ Conceptual Design ☐ Preliminary Design ☐ Final Design ☐ Other	
Project Location: City ST	
Additional Site Comments	

Regulatory Requirements

% Total Suspended Solids Removal (ex. 80%)	% Total Phosphorus Removal (ex. 50%)
Other Contaminants of Concern or Additional Requirements	

Thank you for supplying the required information! You're almost done!
We will also need:

√ Plan(s) View
√ Profile(s)

MKTG0012A#

Please email this form and any drawings to **Engineering@BaySaver.com**
Phone 800-BAYSAVER (800.229.7283) Fax 301.829.3747

Attachment 2

BaySeparator™ Stormwater Filtration System Inspection and Maintenance Record

ATTACHMENT 2 – INSPECTION AND MAINTENANCE RECORD

BaySeparator™ Structure No. _____

Technician(s): _____ Date:_____

Date of last storm/total rainfall: _____ Current weather: _____

Inspection Observations:

Are trash and excess sediment present in the surrounding drainage area? **Y N**

Are there serious cracks in the pavement around the BaySeparator™? **Y N**

Primary Manhole				Storage Manhole			
Depth of sediment:				Depth of sediment:			
Evidence of a chemical spill?	**Y**	**N**		Evidence of a chemical spill?	**Y**	**N**	
Significant amount of oil in manhole?	**Y**	**N**		Significant amount of oil in manhole?	**Y**	**N**	
Is maintenance required?	**Y**	**N**		Is maintenance required?	**Y**	**N**	

Maintenance Activities:

Primary Manhole				Storage Manhole			
Volume of water removed:				Volume of water removed:			
Volume of solids removed:				Volume of solids removed:			
Pressure-wash completed:	**Y**	**N**		Pressure-wash completed:	**Y**	**N**	
Volume of rinse water removed:				Volume of rinse water removed:			
Manholes refilled with clean water:	**Y**	**N**	**N/A**	Manholes refilled with clean water:	**Y**	**N**	**N/A**

Name of waste disposal facility: _____

(attach chain of custody or copy of waste disposal receipt to this record)

Other notes:

Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Contech Stormwater Management StormFilter® Systems*			
Owner: EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD Date: April 2015	Last revised: April 2015	Review Date: April 2015

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for performing inspections and maintenance of the Contech Stormwater Management StormFilter® system located at the Radnor Heights Substation. Written inspection and maintenance procedures for stormwater management facilities, including StormFilter® systems, are a component of Minimum Control Measure (MCM) 5: Post-construction stormwater management in new development and development on prior developed lands. This MCM is required under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (9VAC25-890-40 et. seq.). JBM-HH has obtained coverage under this permit (issued as Permit No. VAR040068) for discharges from the municipal separate storm sewer system (MS4) that serves the Fort Myer and Henderson Hall Installations (collectively referred to as "the Installation" in this SOP).

In accordance with Section II.B.5.c.2 of the General Permit, the Installation must provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan. This and other SOPs specifically developed for the stormwater management facilities present onsite serve as written guidance to Installation staff on how to properly inspect and maintain Installation-owned stormwater management facilities.

The Contech Stormwater Management StormFilter® system is a combination bypass structure and filtration unit in the form of an underground vault containing eight cylinders of proprietary filter media. Stormwater from the adjacent stormwater retention vault fills the StormFilter® system, and the cylinders of filter media remove sediment, oils, and metals from runoff. Filtered stormwater exits the StormFilter® via outlet sump to the Installation's MS4. Refer to Figure 1 for a diagram of a typical Contech StormFilter® system.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. DPW – Directorate of Public Works
b. EMD – Environmental Management Division
c. MS4 – Municipal Separate Storm Sewer System
d. PPE – Personal Protective Equipment
e. SOP – Standard Operating Procedure

2.2 Definitions

a. *Contech Stormwater Management StormFilter® system* – an underground stormwater treatment system using filter cartridges to remove sediment, oils, and metals from stormwater runoff. See Figure 1 for schematic.

b. *Stormwater Management Facility* - a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

3.0 OPERATIONAL PROCEDURES

3.1 Inspections

a. Inspection Requirements

1. The Contech Stormwater Management StormFilter® system must be visually inspected at least annually, during a period when no precipitation or snow melt is occurring and at least 72 hours from the previous measurable storm event.
    i. Follow-up inspections and/or maintenance activities are required if standing water or excess sediment is observed within the vault.
    ii. Visual inspections should be performed after significant rainfall events.

b. Inspection Locations

1. Refer to Figure 2 for the location of the Contech Stormwater Management StormFilter® system at the Installation.

c. Inspection Procedures (refer to Attachment 1, *StormFilter® Inspection and Maintenance Procedures*)

1. Conduct visual field screening of the StormFilter® system and record observations on an Inspection Report (Attachment 2). The observations should include the following:
    i. Cracks, spalling, or other signs of deterioration in the concrete vault
    ii. Visible damage or obstructions in inlet, outlet, and/or manhole

iii. Excessive erosion in areas draining to the StormFilter® system

iv. Observations of the vault:

1. Presence and depth of standing water in the vault
2. Presence and depth of sediment
3. Visible damage or deterioration of structural components

v. Trash and debris in inlet/outlet openings

2. Based on the physical inspection, determine if maintenance activities are required.

i. Submit a Work Request (Form 4283) with photos to DPW detailing inspection observations and solutions.

ii. Work that requires entering the StormFilter® system must be performed by a qualified contractor.

d. Inspection Supplies

1. Inspection equipment
   - Inspection and Maintenance Record (see Attachment 2)
   - Flashlight
   - Camera
2. Personal Protective Equipment (PPE)
   - Work gloves
   - Steel-toed boots

3.2 Typical Required Maintenance

a. Maintenance is only required on an as-needed basis, determined through regular inspection of the StormFilter® system.

Contech Stormwater Management StormFilter® System	
Inspection Finding	**Maintenance Required**
Cracks, spalling, or other signs of deterioration in the concrete above the StormFilter® system vault	Fill cracks in concrete to prevent further damage.
Visible damage or obstructions in inlet, outlet, and/or manhole	Repair inlet, outlet, and manhole to ensure their functionality. Remove obstructions.
Excessive erosion in areas draining to the StormFilter® system	Replant and/or re-mulch eroded areas to limit the amount of sediment being conveyed to the StormFilter® system.
Standing water observed in vault 72+ hours after rain	Contact contractor to remove water. Contact Contech to replace filter cartridges.

Contech Stormwater Management StormFilter® System	
Inspection Finding	**Maintenance Required**
Vault contains >4” of sediment, OR >1/4” of sediment is accumulated on top of filter cartridges	Contact contractor to remove excess sediment. Contact Contech to replace filter cartridges.
Visible damage or deterioration of structural components	Contact contractor to initiate repairs.
Trash and debris in control opening	Remove trash and debris.

b. Record all maintenance activities on an Inspection and Maintenance Record (Attachment 2)

3.3 Safety Considerations

a. Always wear steel-toed boots to protect feet from possible crushing injuries while handling manhole covers.

b. Use proper lifting techniques when removing manhole covers to prevent back injury.

c. Use extreme caution when working over the open StormFilter® system; no part of your body should enter the plane created by the opening, as this would constitute confined space entry.

d. DO NOT enter the StormFilter® system under any conditions. Vault entry must comply with OSHA rules for confined space entry.

4.0 RECORDKEEPING AND REPORTING REQUIREMENTS

4.1 Recordkeeping Requirements

a. Complete the Inspection and Maintenance Record (Attachment 1) for each inspection and maintenance activity. DPW shall maintain these forms and their associated Work Requests.

4.2 Reporting Requirements

a. DPW shall provide EMD with written records of inspection and maintenance activities within seven days of the date the activity was performed.

5.0 RESPONSIBILITIES

5.1 DPW

a. DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

b. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES

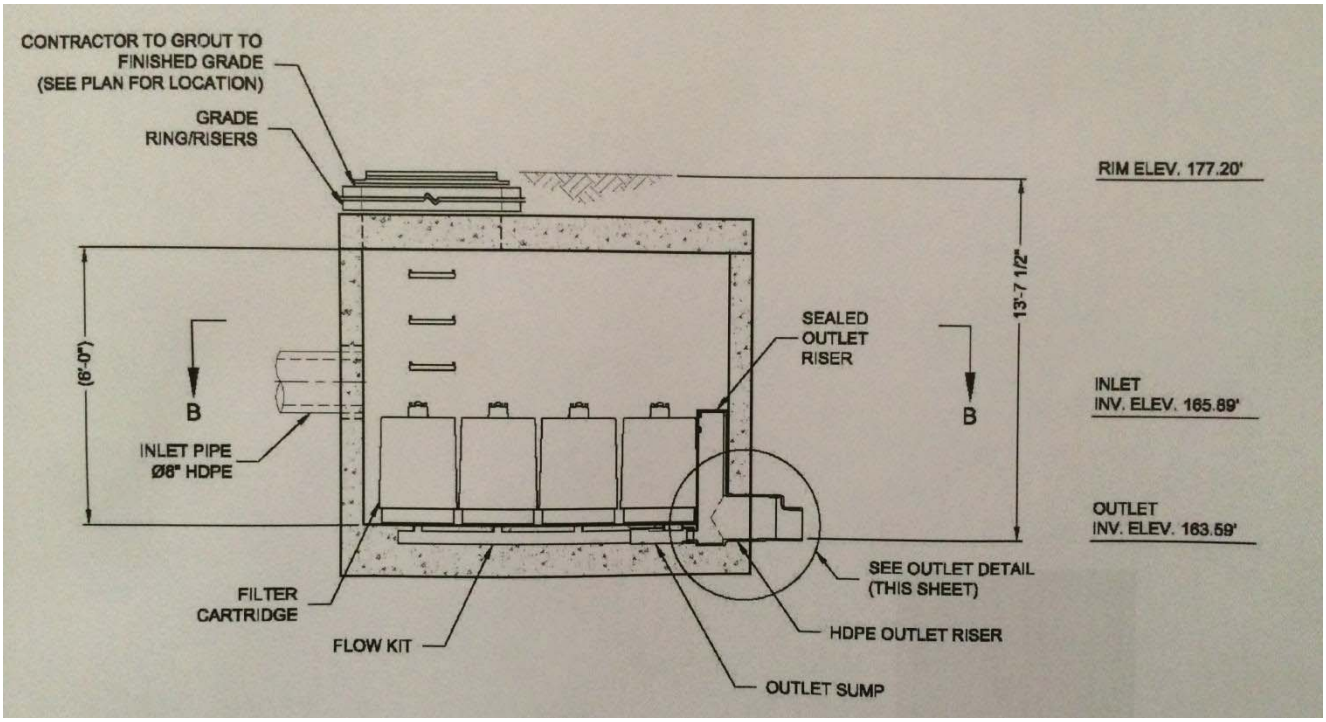


Figure 1: Contech Stormwater Management StormFilter® System Profile

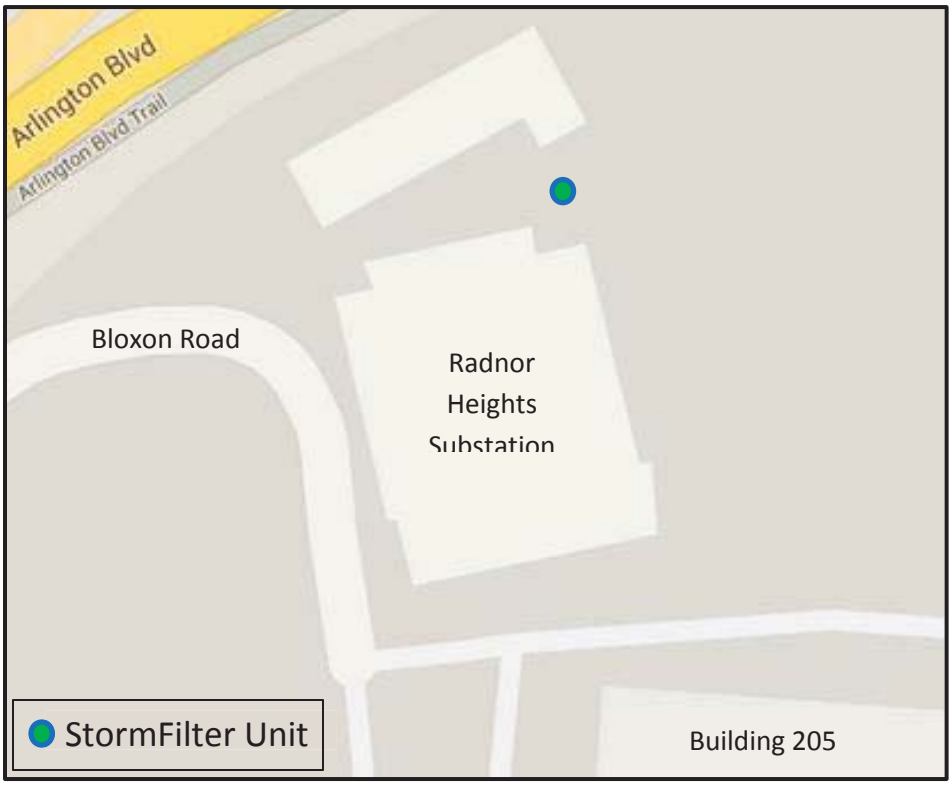


Figure 2: Contech Stormwater Management StormFilter® System Location Map

7.0 ATTACHMENTS

Attachment 1: StormFilter Inspection and Maintenance Procedures

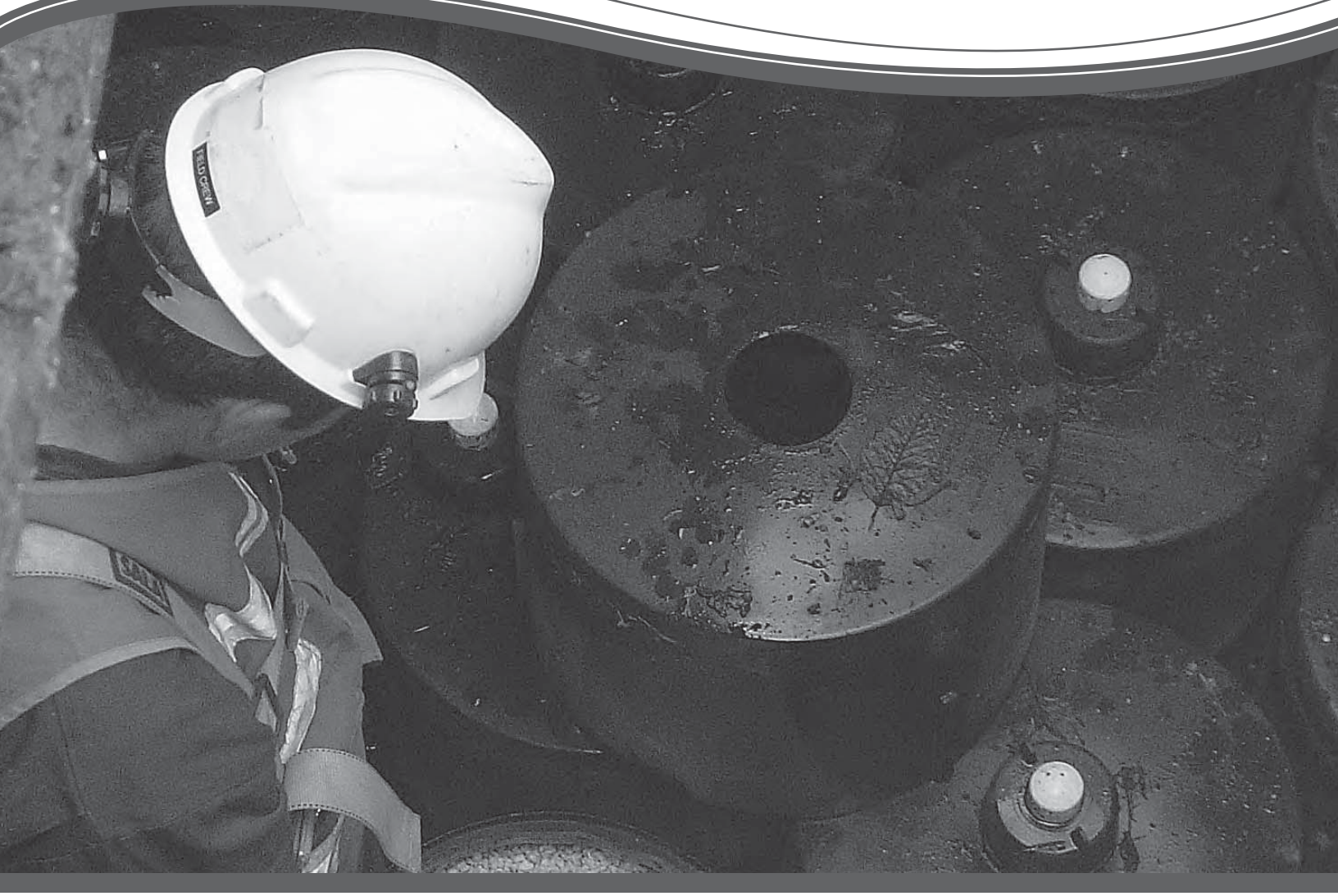
Attachment 2: Inspection and Maintenance Records

Attachment 1

StormFilter Inspection and Maintenance Procedures

CONTECH
CONSTRUCTION PRODUCTS INC.

StormFilter Inspection and Maintenance Procedures



The Stormwater Management
StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter out and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are likely many effective maintenance options, we believe the following procedure is efficient and can be implemented using common equipment and existing maintenance protocols. A two step procedure is recommended as follows:

1. Inspection

Inspection of the vault interior to determine the need for maintenance.

2. Maintenance

Cartridge replacement

Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, in late summer to early fall when flows into the system are not likely to be present.

Maintenance Frequency

The primary factor controlling timing of maintenance of the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs.

Prior to the development of the maintenance database, the following maintenance frequencies should be followed:

Inspection

One time per year

After major storms

Maintenance

As needed, based on results of inspection (The average maintenance lifecycle is approximately 1-3 years)

Per Regulatory requirement

In the event of a chemical spill

Frequencies should be updated as required. The recommended initial frequency for inspection is one time per year. StormFilter units should be inspected after major storms.

Sediment removal and cartridge replacement on an as needed basis is recommended unless site conditions warrant.

Once an understanding of site characteristics has been established, maintenance may not be needed for one to three years, but inspection is warranted and recommended annually.

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH Construction Products immediately.

To conduct an inspection:

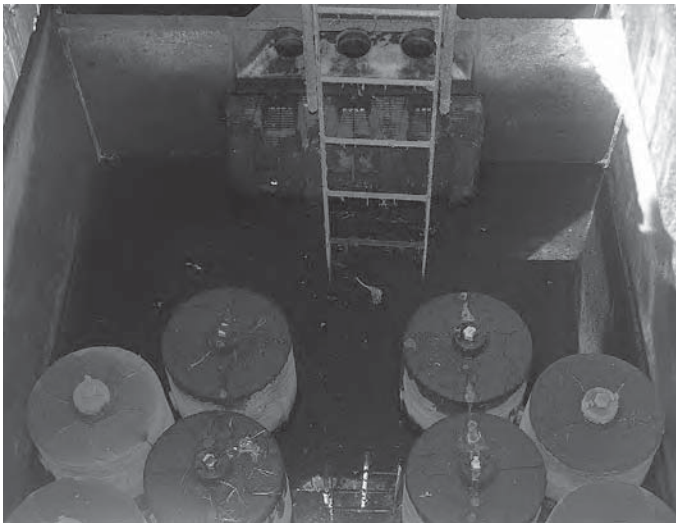
Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.

3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to weather or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)



1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water in the cartridge bay for more that 24 hours after end of rain event, maintenance is required.
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.
8. Calendar Lifecycle.
   a. If system has not been maintained for 3 years maintenance is required.

Assumptions

- No rainfall for 24 hours or more
- No upstream detention (at least not draining into StormFilter)
- Structure is online
- Outlet pipe is clear of obstruction
- Construction bypass is plugged

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from CONTECH Construction Products.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and CONTECH Construction Products immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Unscrew (counterclockwise rotations) each filter cartridge from the underdrain connector. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact CONTECH Construction Products for suggested attachment devices.

Important: Note that cartridges containing leaf media (CSF) do not require unscrewing from their connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and could be capped during the maintenance activity to prevent sediments from entering the underdrain manifold.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner unless CONTECH Construction Products performs the maintenance activities and damage is not related to discharges to the system.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. Enter the vault using appropriate confined space protocols.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood screws (3) hood and float.

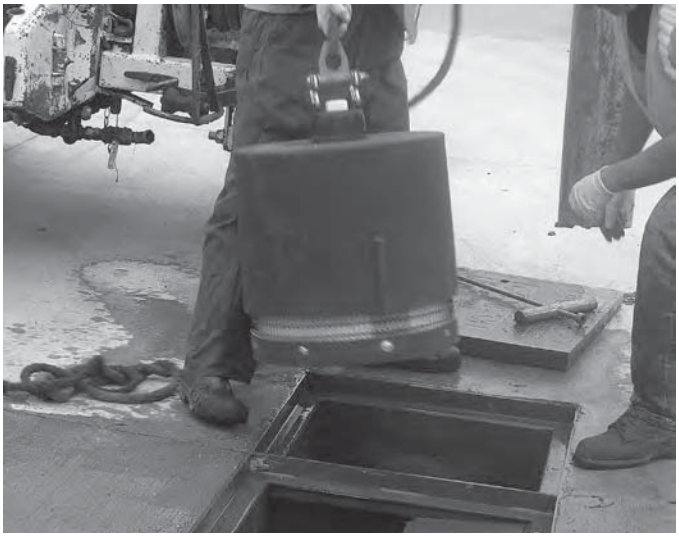
D. At location under structure access, tip the cartridge on its side.

Important: Note that cartridges containing media other than the leaf media require unscrewing from their threaded connectors. Take care not to damage the manifold connectors. This connector should remain installed in the manifold and capped if necessary.

D. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

E. Set the empty, used cartridge aside or load onto the hauling truck.

F. Continue steps a through e until all cartridges have been removed.



8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors. The connectors are short sections of 2-inch schedule 40 PVC, or threaded schedule 80 PVC that should protrude about 1" above the floor of the vault. Lightly wash down the vault interior.
   a. Replace any damaged connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used empty cartridges to CONTECH Construction Products.

Related Maintenance Activities -

Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

RECYCLED PAPER

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800.338.1122
www.contech-cpi.com

Support

- Drawings and specifications are available at contechstormwater.com.
- Site-specific design support is available from our engineers.

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Inspection Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: _____ Date: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: _____

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: _____

☐ Minor Structural Repairs: _____

☐ Drainage Area Report _____

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

Items Needing Further Work: _____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

_____

_____

_____

_____

_____

_____

_____

_____

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service:

Oil in Forebay: Yes ☐ No ☐

Sediment Depth in Forebay: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

_____

_____

_____

_____

_____

Attachment 2

Inspection and Maintenance Records

Inspection Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: _____ Date: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Estimated Flow from Drainage Pipes (if available): _____

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: _____

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: _____

☐ Minor Structural Repairs: _____

☐ Drainage Area Report _____

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

Items Needing Further Work: _____

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

_____

_____

_____

_____

_____

_____

_____

_____

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service:

Oil in Forebay: Yes ☐ No ☐

Sediment Depth in Forebay: _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

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Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Oil-Water Separators*			
Owner: EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD Date: April 2015	Last revised: April 2015	Review Date: April 2015

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for performing inspections and maintenance of the oil-water separator (OWS) located at Building 330. Written inspection and maintenance procedures for stormwater management facilities, including oil-water separators, are a component of Minimum Control Measure (MCM) 5: Post-construction stormwater management in new development and development on prior developed lands. This MCM is required under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (9VAC25-890-40 et. seq.). JBM-HH has obtained coverage under this permit (issued as Permit No. VAR040068) for discharges from the municipal separate storm sewer system (MS4) that serves the Fort Myer and Henderson Hall Installations (collectively referred to as “the Installation” in this SOP). Additional oil-water separators are located at the Installation; however, they are connected to the sanitary sewer and are thus not the focus of JBM-HH’s MS4 permit or this SOP.

In accordance with Section II.B.5.c.2 of the General Permit, the Installation must provide for adequate long-term operation and maintenance of its stormwater management facilities in accordance with written inspection and maintenance procedures included in the MS4 Program Plan. This and other SOPs specifically developed for the stormwater management facilities present onsite serve as written guidance to Installation staff on how to properly inspect and maintain Installation-owned stormwater management facilities.

Oil-water separators are multi-chambered vaults used to hold stormwater and separate oils and grease from the water. The OWS at Building 330 uses gravity separation to filter stormwater in two chambers. Stormwater from the fueling island enters the first chamber, and flow is slowed with a baffle. As the stormwater sits in the OWS, oils and grease, which are lighter than water, float to the top, and solids settle to the bottom. Filtered stormwater flows

beneath the baffle to the second chamber and through the outlet pipe and into the wet pond at Building 330.

OWSs may be constructed with two or more vaults. As the number of vaults increase, so do the levels of filtration. OWSs are especially useful in areas prone to generating contaminated stormwater runoff, such as garages, carwashes, and fueling islands.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. DPW – Directorate of Public Works
b. EMD – Environmental Management Division
c. MS4 – Municipal Separate Storm Sewer System
d. PPE – Personal Protective Equipment
e. SOP – Standard Operating Procedure

2.2 Definitions

a. *Oil-water separator* – an underground chambered treatment system using gravity to separate oil, grease, and solids from stormwater runoff.

b. *Stormwater Management Facility* - a control measure that controls stormwater runoff and changes the characteristics of that runoff including, but not limited to, the quantity and quality, the period of release or the velocity of flow.

3.0 OPERATIONAL PROCEDURES

3.1 Inspections

a. Inspection Requirements

1. Oil-water separators at the Installation must be inspected at least three times annually:
    i. One inspection must be performed during a period when no precipitation or snow melt is occurring and at least 72 hours from the previous measurable storm event.
    ii. The second inspection must be performed during a period of active precipitation.
    iii. The third inspection must be performed within 24 hours of a storm that exceeds 0.5” of rainfall.

b. Inspection Locations

1. Refer to Figure 1 for the location of the oil-water separator at Building 330.

c. Inspection Procedures

1. Conduct visual field screening of oil-water separators and record observations on an Inspection and Maintenance Record (Attachment 1). The observations should include the following:
    i. Cracks, spalling, or other signs of deterioration in the concrete above the OWS
    ii. Visible damage or obstructions in inlet and outlet pipes
    iii. Excessive erosion in areas draining to the OWS
    iv. Signs of spills or leaks in areas draining to the OWS
    v. Observations of the chambers:
        1. The remaining capacity of the OWS
        2. The depth of sludge at the bottom of the OWS exceeds 10 inches
        3. Oil/grease is accumulated on top of the water in the OWS
        4. Visible damage or deterioration of structural components
    vi. Trash and debris in pipes or chambers
2. Based on the physical inspection, determine if maintenance activities are required.
    i. Submit a Work Request (Form 4283) with photos to DPW detailing inspection observations and solutions.
    ii. Work that requires entering the OWS must be performed by a qualified contractor.

d. Inspection Supplies

1. Inspection equipment
    - Inspection and Maintenance Record (see Attachment 1)
    - Camera
    - Measuring stick
    - Flashlight
2. Personal Protective Equipment (PPE)
    - Work gloves
    - Steel-toed boots

3.2 Typical Required Maintenance

a. Maintenance is only required on an as-needed basis, determined through regular inspection of oil-water separators.

Oil-Water Separators	
Inspection Finding	**Maintenance Required**
Cracks, spalling, or other signs of deterioration in the concrete above the OWS	Fill cracks in concrete to prevent further damage.
Visible damage or obstructions in inlet and outlet pipes	Repair and remove obstructions from inlet and outlet pipes.
Signs of spills or leaks in areas draining to the OWS	Clean spills and leaks up immediately. Remove used absorbent materials.
< 25% remaining capacity of the OWS	Contact contractor to remove water and accumulated oils and sludge from OWS.
The depth of sludge at the bottom of the OWS exceeds 10 inches	Contact contractor to remove water and accumulated oils and sludge from OWS.
Oil/grease is accumulated on top of the water in the OWS	Contact contractor to remove water and accumulated oils and sludge from OWS.
Visible damage or deterioration of structural components	Contact contractor to initiate repairs.
Trash and debris are present in pipes and chambers	Remove trash and debris.

b. Underground oil-water separators should be cleaned and pumped out annually by a contractor.
c. Record all maintenance activities on an Inspection and Maintenance Record (Attachment 1)

3.3 Safety Considerations

a. Always wear steel-toed boots to protect feet from possible crushing injuries while handling the manhole covers.
b. Use proper lifting techniques when removing manhole covers to prevent back injury.
c. Use extreme caution when working over open manhole covers; no part of your body should enter the plane created by the opening, as this would constitute confined space entry.
d. DO NOT enter oil-water separators under any conditions.

4.0 RECORDKEEPING AND REPORTING REQUIREMENTS

4.1 Recordkeeping Requirements

a. Complete the Inspection and Maintenance Record (Attachment 1) for each inspection and maintenance activity. DPW shall maintain these forms and their associated Work Requests.

4.2 Reporting Requirements

a. DPW shall provide EMD with written records of inspection and maintenance activities within seven days of the date the activity was performed.

5.0 RESPONSIBILITIES

5.1 DPW

a. DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

a. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES

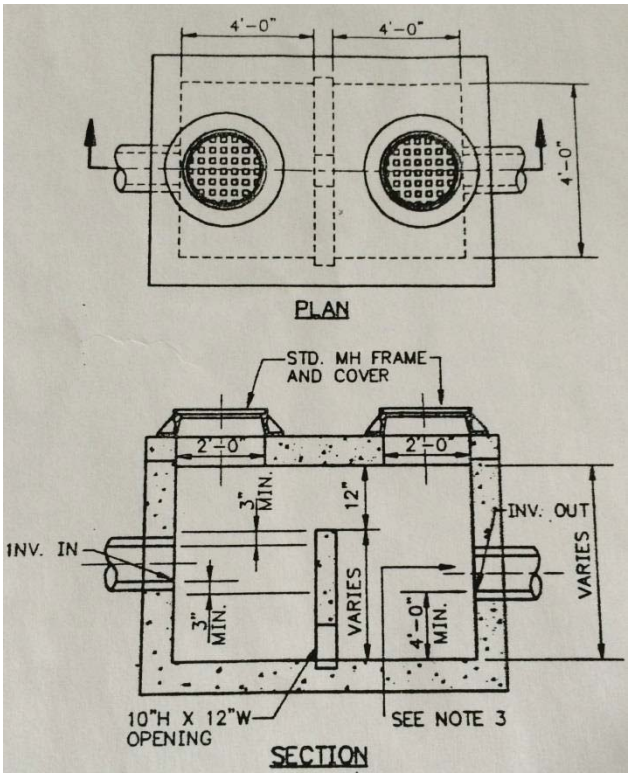

Figure 1: Oil-Water Separator Diagram

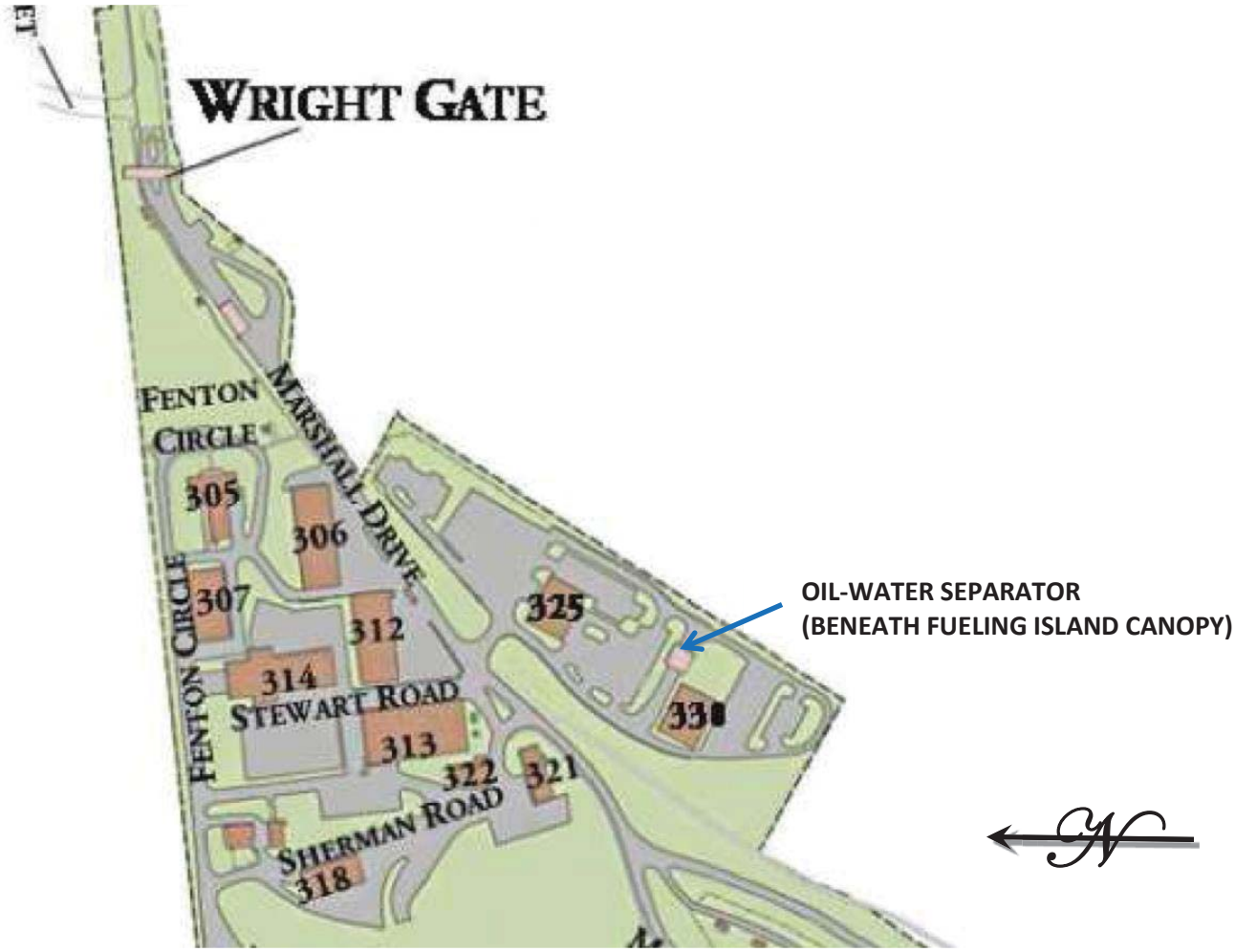

Figure 2: Oil-Water Separator Location Map

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

Attachment 1

Inspection and Maintenance Record

ATTACHMENT 1 – OIL-WATER SEPARATOR INSPECTION AND MAINTENANCE RECORD

Technician(s): _____ Date:_____

Date of last storm/total rainfall: _____ Current weather: _____

Y	N	Observation	Maintenance Performed/ Maintenance Required
		Cracks, spalling, or other signs of deterioration in the concrete above the OWS	
		Visible damage or obstructions in inlet and outlet pipes	
		Signs of spills or leaks in areas draining to the OWS	
		< 25% remaining capacity of the OWS	
		The depth of sludge at the bottom of the OWS exceeds 10 inches	
		Oil/grease is accumulated on top of the water in the OWS	
		Visible damage or deterioration of structural components	
		Trash and debris are present in pipes and chambers	
		Routine maintenance has been performed in the last year	

Other notes (use back if necessary):

Follow-up inspection required?
___ Y ___ N

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APPENDIX G

MUNICIPAL OPERATIONS - DAILY GOOD HOUSEKEEPING PROCEDURES

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Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Good Housekeeping Procedures: *Old Boiler Plant and DPW Yard*			
Owner: EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD Date: June 2015	Last revised: June 2015	Review Date: June 2015

1.0 PURPOSE

These Good Housekeeping Procedures are a written guideline for performing outdoor tasks at the Old Boiler Plant and Directorate of Public Works (DPW) Yard in a manner that will minimize stormwater impacts. Written procedures to minimize or prevent pollutant discharge via stormwater runoff are required under Minimum Control Measure (MCM) 6: Pollution Prevention/Good Housekeeping for Municipal Operations. This MCM is required under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (9VAC25-890-40 et. seq.). JBM-HH has obtained coverage under this permit (issued as Permit No. VAR040068) for discharges from the municipal separate storm sewer system (MS4) that serves the Fort Myer and Henderson Hall Installations (collectively referred to as “the Installation” in this SOP).

In accordance with Section II.B.6.a of the General Permit, the Installation must develop written procedures for municipal operations, including:

- Daily operations such as road, street, and parking lot maintenance;
- Equipment maintenance; and
- Application, storage, transport, and disposal of pesticides, herbicides, and fertilizers

The purpose of the Good Housekeeping Procedures in this document is to serve as a reference to employees working at the Old Boiler Plant and DPW Yard. The Virginia Department of Environmental Quality considers the Old Boiler Plant and DPW Yard as a high-priority facility, because it serves as equipment, vehicle, chemical, and materials storage public works yard for use by DPW crews. Stormwater runoff from paved areas drains into storm drain inlets located throughout the yard and discharges into the Lower Long Branch tributary, which in turn discharges to Fourmile Run.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. DPW – Directorate of Public Works
b. EMD – Environmental Management Division
c. MS4 – Municipal Separate Storm Sewer System

3.0 OPERATIONAL PROCEDURES

3.1 Road, Street, and Parking Lot Maintenance

a. Protect storm drain inlets near work areas using covers, filters, wattles, etc. Do not remove inlet protection until all work has been completed, including final waste removal or sweeping.

b. Remove leaves, trash, excess sand/salt, or other debris from storm drain inlets and paved surfaces when observed during maintenance work on roads and parking lots.

c. Where dumpsters are present, ensure that doors are closed and there is no evidence of leaks. Report leaking dumpsters to the disposal company identified on the dumpster.

d. Schedule paving, painting, and other outdoor maintenance projects for dry weather days only.

e. When maintenance requires earth-disturbing activities, use appropriate erosion and sediment controls to prevent pollutants from entering storm drains.

f. Sweep or vacuum sediment and debris from work areas before each rain event and at the conclusion of maintenance activities.

g. Never hose down streets, parking lots, or work areas.

h. Do not dump materials into storm drains.

3.2 Street Sweeping

a. Conduct sweeping of grounds, streets, and parking lots as needed to prevent debris from entering the storm drain system.

b. Dispose of collected material properly. Collected material may not be emptied, stockpiled, or disposed in manner that will allow it to discharge to the storm drain system or otherwise come in contact with stormwater runoff.

3.3 Winter Road Maintenance

a. Minimize spills by not overloading salt and sand spreading trucks and equipment.

b. Use the least amount of sand and salt necessary to achieve safe walking/driving conditions.

c. Establish snow storage areas that are not located near storm drains. Ideal snow storage areas are located on pervious areas where snow melt can infiltrate.

d. Sweep excess salt and sand from paved areas after the last snow.

3.4 Equipment and Vehicle Storage

a. Store leaking vehicles or equipment indoors or under cover. If leaking vehicles or equipment cannot be moved under cover, use drip pans to contain the leak, and check fluid levels regularly.

b. Always clean up leaks and spills when they are observed; immediately remove absorbent materials used for spill cleanup. Report large spills to the Installation's Fire Department and the Environmental Management Division.

c. Never hose down equipment and vehicles in the DPW Yard.

3.5 Materials Storage

a. Store materials indoors or under cover. Use secondary containment for liquids, and check for leaks regularly.

b. Material storage containers should be compatible with the contents and clearly labeled.

c. Limit quantities of stored materials to the extent possible to meet usage needs.

d. Salt and sand piles should be fully under cover. Properly push back piles and use berms to prevent contact with stormwater.

e. Place spill kits near liquid material storage areas. Ensure spill kits are adequately stocked, especially after contents are used during spill response activities.

f. Always clean up leaks and spills when they are observed. Report large spills to the Installation's Fire Department and the Environmental Management Division.

g. Never hose down spilled material in the DPW Yard.

3.6 Waste Storage

a. Pick up loose trash and dispose in dumpster.

b. Keep dumpster doors closed at all times.

c. Regularly check area around dumpsters for indication of leaks. Report leaking dumpsters to the disposal company identified on the dumpster. Report overfilled dumpsters.

d. Contact Mark Luckers at 703-696- to dispose of hazardous wastes in the 90-day hazardous waste storage area. Hazardous wastes include solvents, fuel, some paints and aerosol paint cans, acids, pesticides, and herbicides. Hazardous wastes must be stored neatly and properly labeled.

e. Always clean up leaks and spills when they are observed. Report large spills to the Installation's Fire Department and the Environmental Management Division.

3.7 Miscellaneous

a. Implement best management practices when discharging water pumped from utility construction and maintenance activities. Do not pump water that may be contaminated with sediment, chemicals, or other pollutants to the storm drain system.

b. Ensure that DPW contractors also observe the good housekeeping procedures outlined in this document.

APPENDIX H

NUTRIENT MANAGEMENT PLAN

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