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: November 1, 2018 - October 31, 2023

VSMP REGISTRATION NUMBER VAR040068

Prepared by:
JBM-HH Directorate of Public Works, Environmental Management Division

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
3	• Added an activity to Section 3.2.2 Public Participation based on discussions with DEQ on what activities qualify for this requirement. • Updated the Stormwater Management Facility Operation and Maintenance Plan (Appendix F) and all associated Standard Operating Procedures (SOPs). • Added Deicing Materials SOP to Appendix G: Good Housekeeping Procedures. • Updated Appendix D: Public Education and Outreach Plan with additional outreach methods and updated target audience/approximate population information.	12 December 2017
4	Plan updates to comply with 2018 reissued MS4 General Permit. • Updated all sections of plan to reflect 2018 MS4 General Permit Conditions. • Updated Appendices A and B with 2018 MS4 Permit and Registration Statement. • Updated Appendix D: Public Education and Outreach Plan. • Added new Appendix E for outfall map and table and Appendix G for construction Inspection and Compliance Procedures • Updated Appendix F: Illicit Discharge Detection Procedures. • Updated Appendix I: Municipal Operations - Daily Good Housekeeping Procedures	May 2019

Revision No.	Summary of Changes	Date
5	• Added MS4 Responsibilities Table. • Added MS4 Interconnection Notification Letters as Appendix E. • Updated the Public Education and Outreach Plan (Appendix D) to include a list of actions the public can take to prevent pollution, replace sediment with bacteria as one of the three high-priority water quality issues, and add details about how public input is handled. • Added details regarding MS4 interconnections to Section 3.3. • Added the MS4 interconnection notification letters as Appendix F. • Revised Section 3.4 to provide clarity on EMD's construction site stormwater runoff control program. • Added EMD staff's RLD and VADEQ Erosion and Sediment Control Inspector Certifications to Appendix H. • Updated the Construction Inspection & Compliance SOP (Appendix H). • Added the Resource Protection Area Map to Section 3.4. • Updated the good housekeeping SOP (Appendix J) to include Building 325, illicit discharge procedures, and waste management procedures. • Updated the training plan and contractor oversight portions of in Section 3.6. • Added MCM goals table to Section 4. • Updated the outfall map in Appendix E. • Updated the SMF O&M Plan (Appendix I) to include more details regarding maintenance timelines and priorities.	November 2020

ACRONYMS

ANC	Arlington National Cemetery
AR	Army Regulation
AST	Aboveground Storage Tank
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CFR	Code of Federal Regulations
DA	Department of the Army
DEQ	Virginia Department of Environmental Quality
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
MCM	Minimum Control Measures
MDW	Military District of Washington
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
NCR	National Capital Region
NPDES	National Pollutant Discharge Elimination System
PCBs	Polychlorinated biphenyls
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
TN	Total nitrogen
TP	Total phosphorus
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
VMF	Vehicle Maintenance Facility
VDOT	Virginia Department of Transportation
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WIP	Watershed Implementation Plan
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 permit is administered by 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 (MCMs):

1) Public education and outreach

2) Public involvement and participation

3) Illicit discharge detection and elimination

4) Construction site stormwater runoff control

5) Post-construction stormwater management in new development and redevelopment

6) Pollution prevention/good housekeeping for municipal operations

This MS4 Program Plan has been prepared for Department of the Army (DA) Joint Base Myer-Henderson Hall (JBM-HH) to comply with the Virginia VSMP Permit No.: VAR04 - General Permit for Discharges of Stormwater from Small MS4s (MS4 General Permit). This MS4 Program Plan was initially prepared to comply with MS4 General Permit effective July 1, 2013 – June 30, 2018. The Plan has been updated to comply with the 2018 reissued MS4 General Permit that is effective November 1, 2018 – October 31, 2023. A copy of the 2018 MS4 General Permit is provided as **Appendix A**. The Registration Statement for Coverage under the permit and letter confirmation of coverage from DEQ are provided in **Appendix B**.

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 (NCR), 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 (FMWR)
- Directorate of Logistics
- DPW, Engineering Division
- DPW, Operations and Maintenance Division
- Office of Public Affairs
- Third U.S. Infantry Regiment (The Old Guard)

The responsibilities of these divisions are described below in **Table 1-1**.

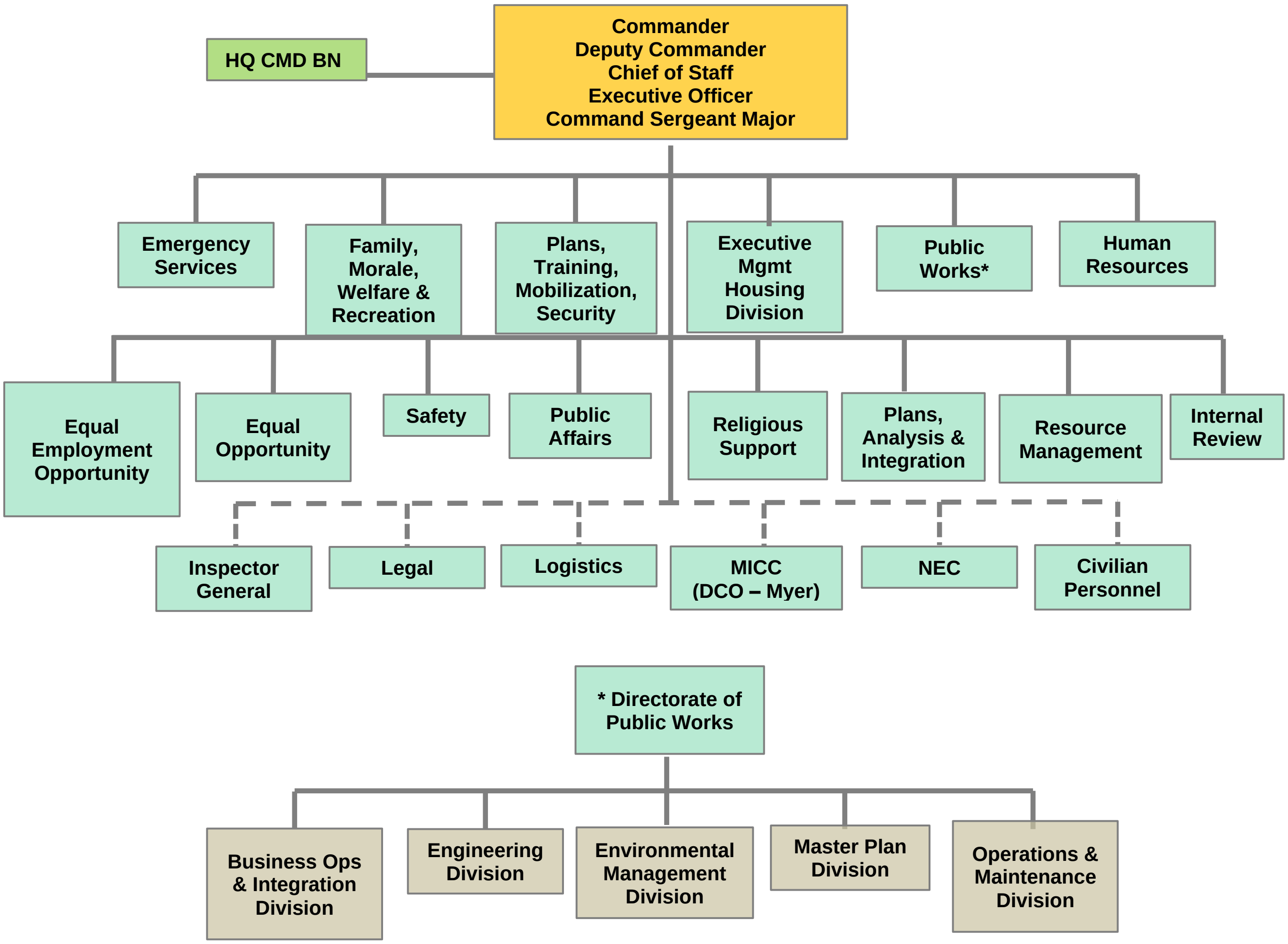

Figure 1. Installation Organizational Structure

Table 1-1. MS4 Program Responsibilities	
Organization	**Responsibilities**
Joint Base Commander	• Signatory authority. • Overall enforcement authority of stormwater pollution prevention requirements on base.
DPW, EMD	• Overall MS4 Program implementation and oversight for tasks involved with each of the MCMs. Responsible for implementing public education and outreach programs, construction stormwater compliance inspections, SWPPP revisions, SWPPP inspections, IDDE inspections and program implementation, recordkeeping, and annual MS4 report preparation.
DPW, Operations & Maintenance	• Addressing deficiencies in SMFs noted during inspections, good housekeeping practices, etc., as noted in inspection finding memos and submitted work orders. • Replacement of fabric inlet filters in high-priority areas on a quarterly basis. • Conducting regular street sweeping. • Operation of the Sign Shop (Building 306), the Roads & Grounds Shop (Building 325), and the Boiler Plant and Storage Yard (Building 447), all of which are high-priority facilities on base. • Implementation of the SWPPP at the above facilities.
DPW, Engineering Division	• Overseeing and managing construction projects on base • Ensuring compliance with Construction General Permit and/or Erosion & Sediment Control requirements, when applicable.
Office of Public Affairs	• Posting MS4 Program Plan and associated documents on JBM-HH's Stormwater Pollution Prevention webpage • Publishing stormwater pollution prevention articles written by EMD in the Installation's newspaper, *The Pentagram*.
Housing Division	• Coordination of the distribution of public outreach materials to residents, including the distribution of informational brochures and posting of stormwater pollution prevention posters in the barracks.
Directorate of Family, Morale, Welfare, and Recreation (FMWR)	• Operation of the Auto Hobby Shop (Building 227), one of the Installation's high-priority facilities. • Implementation of the SWPPP at the Auto Hobby Shop. • Addressing any good housekeeping issues or other stormwater pollution prevention deficiencies noted during quarterly routine SWPPP inspections.
Directorate of Logistics	• Operation of the Transportation Motor Pool (Building 330), one of the Installation's high-priority facilities. • Implementation of the SWPPP at the Transportation Motor Pool. • Addressing any good housekeeping issues or other stormwater pollution prevention deficiencies noted during quarterly routine SWPPP inspections.
Third U.S. Infantry Regiment (The Old Guard)	• Operation of The Old Guard (TOG) Motor Pool (Building 314), one of the Installation's high-priority facilities. • Implementation of the SWPPP at the TOG Motor Pool. • Addresses any good housekeeping issues or other stormwater pollution prevention deficiencies noted during quarterly routine SWPPP inspections.
Contractors, Third Parties	• Implement good housekeeping measures and stormwater pollution prevention practices while working on construction projects and conducting grounds maintenance activities throughout the installation.

1.3 Plan Organization

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 2018 for the Installation to obtain coverage under the 2018 MS4 General Permit. This Registration Statement, provided as **Appendix B**, included the draft updated Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan as required by DEQ. The Chesapeake Bay TMDL Action Plan and PCB TMDL Action Plan are provided in **Appendix C**.

The 2018 MS4 General Permit requires the Installation to update their MS4 Program Plan to meet the requirements of the new permit. 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 as conditions change and programs are modified or updated to comply with the MS4 General Permit.

Section 2 of this Plan provides background information on JBM-HH's watersheds and the status of TMDLs that affect these watersheds. **Section 3** is organized according to the six MCMs required by the MS4 General Permit, and **Section 4** summarizes the annual reporting and program evaluation requirements required under the 2018 MS4 General Permit. Specific plans, procedures, and schedules required by the permit are provided as separate appendices to the Plan.

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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 the 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**).

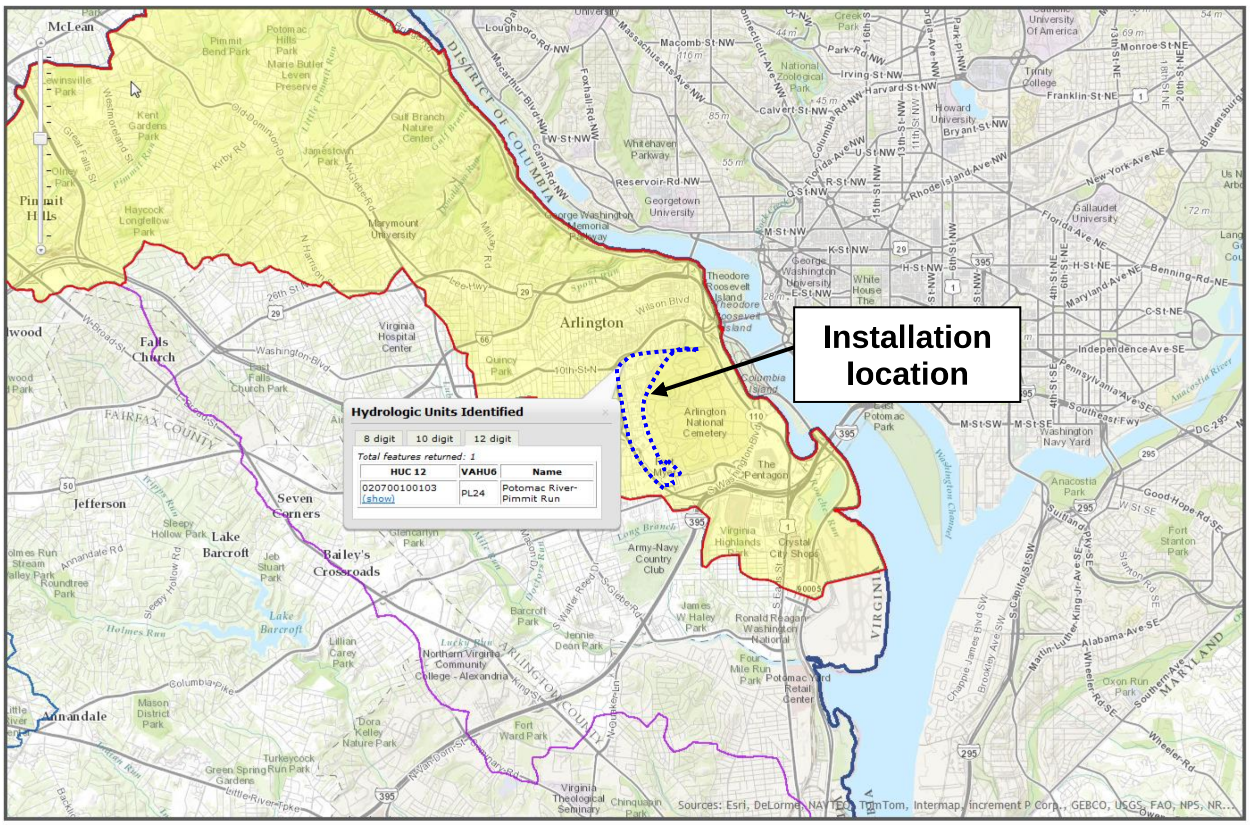

Figure 2. JBM-HH Location and Virginia 6th Order HUC Watershed Boundary[1]

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 the ANC storm drains that discharge 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 ANC 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 PCB impairments. Since Fourmile Run and the Potomac River are tributaries of the Chesapeake Bay, the Installation is also subject to the Chesapeake Bay TMDLs for nutrients and sediment.

2.4 Chesapeake Bay TMDL Special Condition

Part II.A of the MS4 General Permit requires permittees to reduce stormwater pollutant loads for total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) from existing developed lands served by the MS4 as of June 30, 2009. TN, TP, and TSS loads must be reduced by at least 40% of the Level 2 scoping run for existing developed lands as established in Virginia's Phase II Chesapeake Bay Watershed Implementation Plan (WIP). The 40% reduction goal represents an additional 35% over the 5% that was required for the 2013 – 2018 MS4 General Permit Term. The additional 35% reductions must be achieved by June 30, 2023.

Under the 2013 MS4 General Permit, JBM-HH was required to develop a Chesapeake Bay TMDL Action Plan and submit the Plan to DEQ for approval. The Plan, which was prepared by the U.S. Army Corps of Engineers (USACE), was submitted to DEQ and comments were received from DEQ on 26 October 2015. The comments were addressed to DEQ's satisfaction and the revised Final Chesapeake Bay TMDL Action Plan was submitted to DEQ on 10 December 2015.

As a condition of reapplying for coverage under the 2018-2023 MS4 General Permit, permittees were required to prepare a draft update to the Chesapeake Bay TMDL Action Plan and submit the updated Plan to DEQ along with the Registration Statement for permit coverage. The 2018 updated Plan that was submitted with the Installation's Registration Statement is provided in **Appendix C**. Since that time, JBM-HH's planned course of action for reaching the 2023 TMDL reduction goals has changed based on feedback from Installation organizations regarding the feasibility of maintaining the originally proposed BMPs. The Chesapeake Bay TMDL Action Plan is therefore currently being updated to reflect changes in JBM-HH's plan to meet the 2023 pollutant reduction goals.

As required by Part II.A.12 of the MS4 General Permit, the Installation will provide an opportunity for public comment on the proposed best management practices (BMPs) for meeting the pollutant reduction goals, prior to submitting the updated Plan to DEQ. The updated Plan will be provided in **Appendix C** once it has been completed.

2.5 Local TMDL Special Condition

Part II of the 2013 MS4 General Permit contained special conditions regarding approved TMDLs other than the Chesapeake Bay TMDL. The permit required 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 BMPs and other interim milestone activities to be implemented during the term of the MS4 General Permit.

Four Mile Run Fecal Coliform TMDL

A fecal coliform TMDL for Fourmile Run was approved in 2002. The wasteload allocations (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 is no waste load allocated specifically to the Installation.

There are no significant sources of fecal coliform known to be present on the Installation that contribute to stormwater pollution. 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. 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.

Although fecal coliform and the associated sources were not identified as a high-priority water quality issue for the Installation, public education and outreach efforts performed for MCMs 1 and 2 of the MS4 General Permit have included fecal coliform pollutant sources.

Potomac River PCB TMDL

The EPA approved a PCB TMDL for the Potomac River on October 31, 2007. Municipal stormwater discharges covered under National Pollutant Discharge Elimination System (NPDES) permits are included in the TMDL stormwater WLAs. Although there is no specific WLA assigned to the Installation, it is still subject to the TMDL Action Plan requirement. A TMDL Action Plan was prepared for the Installation and submitted to DEQ on June 29, 2016. DEQ provided comments in a letter dated July 13, 2016. A revised Plan was submitted to DEQ on July 18, 2016, and in DEQ approved the revised plan in a letter dated July 26, 2016. The final PCB TMDL Action Plan and DEQ approval letter are provided in **Appendix C**.

According to Part II.B.1.a of the 2018 MS4 General Permit, local TMDL action plans must be updated and submitted to DEQ by May 1, 2020. A public review and comment period of at least 15 days must be provided for the updated plan prior to DEQ submittal. The Installation's PCB TMDL Action Plan was updated in 2020 in accordance with these requirements and is provided in **Appendix C**.

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3.0 MINIMUM CONTROL MEASURES

The 2018 MS4 General Permit requires permittees to “develop, implement, and enforce a MS4 program designed to reduce the discharge of pollutants from the small MS4 to the maximum extent practicable (MEP)…”. The MS4 Program Plan must include six MCMs specified in Part I.E of the permit. A MS4 Program Plan was prepared for the Installation to comply with the MCM conditions contained in the 2013 MS4 General Permit. This 2019 revision of the MS4 Program Plan incorporates the revisions required under the 2018 MS4 General Permit. Details for the Installation’s compliance with each of the six MCMs are provided in the following sections.

3.1 Public Education and Outreach on Stormwater Impacts

MCM 1 requires permittees to implement a public education and outreach program that targets no less than three high-priority stormwater issues. In accordance with the 2013 MS4 General Permit, a Public Education and Outreach Plan was developed for the Installation that identified three high-priority stormwater issues and target audiences, and presented means and methods for public education and outreach. This Plan, which is provided as **Appendix D**, has been updated to incorporate the requirements of the 2018 MS4 General Permit.

3.2 Public Involvement and Participation

MCM 2 of the 2018 MS4 General Permit requires MS4 operators to engage the public in stormwater pollution prevention activities, keep the public informed about the operator’s MS4 permit compliance activities, and provide methods for the public to provide input on the MS4 Program Plan and report stormwater pollution concerns. 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 stated 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." This interpretation was used as guidance for defining the targeted public audience for the public involvement and participation activities included in this Program Plan.

The Installation’s plans and procedures for meeting the public involvement and participation requirements of the 2018 General Permit, including methods for receiving and responding to public input, have been incorporated into the Public Education and Outreach Plan provided as **Appendix D**.

3.3 Illicit Discharge Detection and Elimination

There are three required components for MCM 3, Illicit Discharge Detection and Elimination, specified in the 2018 MS4 General Permit:

- Maintaining an accurate storm sewer system map and information table;
- Effectively prohibiting, through ordinance, policy, standard operating procedures, or other legal mechanism, unauthorized nonstormwater discharges into the storm sewer system; and
- Maintaining, implementing, and enforcing illicit discharge detection and elimination (IDDE) written procedures designed to detect, identify, and address unauthorized nonstormwater discharges, including illegal dumping, to the storm sewer system.

The schedule and deadlines for implementing elements of MCM 3 are presented on **Table 3-1**.

Table 3-1. MCM 3 Compliance Schedule	
Requirement	**Schedule**
Submit a GIS-compatible shapefile of the permittee's MS4 map as described in Part I.E.3.a to DEQ.	1 July 2019
Update the storm sewer system map and outfall information table to include any new outfalls constructed or TMDLs approved or both during the immediate preceding reporting period.	No later than 1 October of each year
Provide written notification to any downstream adjacent MS4 of any known physical interconnection established or discovered after the effective date of the permit.	Upon discovery
Conduct dry weather screening of all base outfalls to look for evidence of illicit discharges.	Annually

Details of the Installation's program for implementing the MCM 3 components are provided below.

Storm Sewer System Map

A map of the Installation's storm sewer system was developed with the Installation's geographic information system (GIS)-based database and is included in **Appendix E**. The map includes known outfall locations, including interconnections to Arlington County and ANC MS4s. The Installation has only a few outfalls that discharge directly to surface waters; most outfalls discharge to Arlington County and ANC MS4 systems that ultimately discharge to surface waters. In these cases, the outfall identified on the map is the point where the Installation's storm drain connects to the Arlington County or ANC MS4. Additionally, interconnections likely exist between JBM-HH's MS4 and VDOT's MS4 systems along Virginia Route 50 (Arlington Boulevard) and Virginia Route 27 (South Washington Boulevard); though specific physical interconnections between the two systems have not been identified. As required by the permit, MS4 interconnection notification letters have been sent to Arlington County, ANC, and VDOT; these letters are included in **Appendix F**.

As required by the permit, the Installation's storm drain map includes the following:

- Stormwater management facilities owned and operated by the Installation;
- A unique identifier for each outfall and stormwater management facility;
- The name and location of receiving waters to which the MS4 outfall or point of discharge discharges;
- The regulated service area (the Installation's boundary); and,
- Notes regarding recent changes made to JBM-HH's property boundary and the transfer of outfalls to ANC.

The map will be updated with new information as it becomes available.

Outfall Information Table

The MS4 General Permit requires permittees to maintain an information table associated with the storm sewer system map that includes the following information for each outfall or point of discharge:

- A unique identifier as specified on the storm sewer system map;
- The latitude and longitude of the outfall or point of discharge;
- The estimated regulated acreage draining to the outfall or point of discharge;
- The name of the receiving water;
- The 6th Order Hydrologic Unit Code of the receiving water;
- An indication as to whether the receiving water is listed as impaired in the Virginia 2016 305(b)/303(d) Water Quality Assessment Integrated Report;
- The predominant land use for each outfall discharging to an impaired water; and,
- The name of any EPA approved TMDLs for which the permittee is assigned a WLA.

A table containing the required information is provided in **Appendix E**.

Nonstormwater Discharge Prohibition

The 2018 MS4 General Permit requires that MS4 operators “prohibit, through ordinance or other legal mechanism, to the extent allowable under federal, state, or local law, regulation, or ordinances, unauthorized nonstormwater discharges into the storm sewer system.” JBM-HH is a Department of the Army-operated military installation and as such, 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 nonstormwater discharges to the storm sewer system include standard operating procedures (SOPs) that have been developed 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. Additionally, JBM-HH has established a base-wide Stormwater Policy that prohibits nonallowable non-stormwater discharges to the MS4. The base-wide Stormwater Policy is included as **Appendix G**.

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 has been continuously implemented since the 2009 permit term. These procedures, which have been updated to conform to the requirements of the 2018 MS4 General Permit, are provided in **Appendix H**.

3.4 Construction Site Stormwater Runoff Control

MCM 4 requires MS4 operators to use their legal authority to address discharges entering the MS4 from regulated construction site stormwater runoff. JBM-HH falls under Part I.E.4.a(4) of MCM 4 in the permit. According to the permit, JBM-HH’s only requirement under MCM 4 is to conduct erosion and sediment control (E&SC) inspections of land-disturbing activities of 10,000 square feet or greater or 2,500 square feet or greater for activities within the designated Chesapeake Preservation Areas. JBM-HH has not developed, and is not required to develop, standards and specifications in accordance with the Virginia Erosion and Sediment Control Regulations, as DEQ is the review and approval authority for stormwater management and E&SC

plans for construction projects on the Installation and issues Virginia Pollutant Discharge Elimination System (VPDES) Construction Stormwater permits.

Major construction activities (generally >1 acre) at JBM-HH are performed under the oversight of 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 E&SC plan for all construction projects. These plans are reviewed by USACE and DEQ. Copies of construction BMPs to be included in DPW's construction contracts are then distributed to the civil engineers. Construction contractors are required to obtain a VPDES stormwater construction general permit (CGP) from DEQ 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*. Construction contractors and the project owner's (either DPW or USACE) project manager are responsible for conducting inspections and implementing corrective actions in accordance with all approved permits, plans, and specifications.

Under Part I.E.4.a(4) of the MS4 General Permit, the Installation is required to inspect all land disturbing activities that result in disturbance activities of 10,000 square feet or greater, or 2,500 square feet or greater in accordance with areas designated under the Chesapeake Bay Preservation Act. The inspections must be conducted as follows:

- During or immediately following initial installation of erosion and sediment controls;
- At least once per every two-week period;
- Within 48 hours following any runoff producing storm event; and
- At the completion of the project prior to the release of any performance bond.

DPW-EMD is responsible for performing the inspections and ensuring compliance with permits and approvals. DPW-EMD staff members conducting the inspections have obtained the DEQ Erosion & Sediment Control Inspector certification, as well as the DEQ Responsible Land Disturber certification. These certificates are included in **Appendix I**.

The majority of the base is located outside of the Chesapeake Bay Preservation Area and therefore is generally only subject to the 10,000-square-foot land disturbance threshold, rather than the 2,500-square-foot threshold. The Arlington County Chesapeake Bay Preservation Area map, which depicts two small Resource Protection Areas on JBM-HH property is provided in **Appendix I**.

Though not required by the permit, as an additional safeguard to help make sure that activities at JBM-HH comply with stormwater regulations, EMD conducts preliminary reviews of proposed construction projects on base and provides guidance on whether or not a CGP, DEQ-approved E&SC Plan, and/or DEQ-approved Stormwater Management Plan is required. Before construction activities commence, 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 stormwater pollution prevention plan (SWPPP) has been prepared.

The construction site inspection and compliance procedures for the Installation are provided as **Appendix I**.

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 2018 MS4 General Permit require that the MS4 Program Plan address the following:

- A description of the legal authorities such as ordinance, state and other permits, orders, specific contract language, and interjurisdictional agreements utilized to ensure compliance with the requirements of Part I.A.5.a related to post-construction stormwater management in new development and development on prior developed lands;
- 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 post-construction stormwater runoff control program.

To meet MCM 5, JBM-HH specifies design criteria in contract language for development and redevelopment projects meeting the applicability criteria in Part I.A.5 of the permit. The design and installation of new stormwater runoff controls are required to meet the appropriate criteria of the Virginia Stormwater Management Program.

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.

<u>Applicable Legal Authorities</u>

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 Regulation
- Design criteria in contract language

The Contractor is responsible for compliance with these authorities.

<u>Final Design and Installation of Stormwater Management Facilities</u>

DPW-EMD will inspect stormwater management facilities over the course of construction to evaluate 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.

<u>Written Inspection, Operations, and Maintenance Protocols</u>

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 J**.

3.6 Pollution Prevention/Good Housekeeping for Municipal Operations

MCM 6 requires MS4 operators to:

- Maintain and implement written procedures for activities at facilities owned or operated by the permittee, such as road, street, and parking lots to minimize or prevent pollutant discharges from daily operations and maintenance activities;
- Identify high priority facilities that have a high potential of discharging pollutants and maintain and implement a site-specific SWPPP for each facility;
- Maintain and implement turf and landscape nutrient management plans on all lands owned or operated by the permittee where nutrients are applied to a contiguous area greater than one acre;
- Require municipal contractors to use appropriate control measures and procedures to minimize the discharge of pollutants to the MS4; and
- Conduct employee training.

Compliance with each of these requirements is discussed below.

Daily Operations and Maintenance Activities

The 2018 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 K**.

High Priority Facilities

Several buildings and areas at the Installation contain operations such as vehicle maintenance and Installation maintenance support that could be considered municipal-type operations. These areas include the following:

- Building 314 – Equipment storage and maintenance at The Old Guard maintenance shop
- Building 325 – The Transportation Motor Pool (TMP) heavy equipment shop
- Building 330 – Bus dispatch and servicing operations
- Building 447 Yard – The DPW maintenance storage yard

Of these operations, the only operation considered a high priority facility with a potential for discharging pollutants as defined in Part I.E.6.c of the MS4 General Permit is the DPW maintenance storage yard at Building 447.

The stormwater discharges from Buildings 306, 314, 325, and 330 were previously covered under the VPDES General Industrial Stormwater Permit. However, in May 2019 DEQ approved the Installation's request to terminate the permit and coverage under the permit ceased on 30 June 2019.

An Installation-wide SWPPP was developed and implemented that includes the areas that were subject to the Industrial General Permit and other high priority areas of the Installation, including the DPW maintenance storage yard at Building 447. The SWPPP specifies appropriate BMPs to prevent or reduce pollutants in runoff. 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 was reviewed and updated after the Industrial Permit was terminated to reflect the change. It will continue to be maintained and implemented to meet the requirements of the MS4 General Permit.

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 approximately 9 acres and is used for ceremonies, parades, and other activities. The coordinates for this area are: N38.881746, E-77.081838. According to DPW Grounds Maintenance Division, nutrients are not applied. The need for a nutrient management plan will be periodically reviewed and evaluated, and if a plan is required it will be prepared and inserted as **Appendix L**.

Training Plan

A classroom-format stormwater pollution prevention and Spill Prevention, Control, and Countermeasures (SPCC) training program was developed in 2020 and deployed to industrial operations shops at the Installation. Good housekeeping and illicit discharge SOPs have been incorporated into the training program. Copies of appropriate SOPs are handed out during the training sessions and are discussed as part of the training. Identified employees must take the training annually. Records of this training are maintained by the EMD. The 2018 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 3-2**.

Table 3-2. 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, illicit discharge, and pollution prevention practices that are to be employed during road, street, and parking lot maintenance.	This topic is covered in the SWPPP/SPCC training program; the SWPPP training was expanded to include a separate training module that specifically addresses road, street, and parking lot maintenance.
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.

Table 3-2. 2013 MS4 General Permit Training Topics and Applicability	
Training Requirement	**Applicability/Status**
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.
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 will be reviewed and augmented as needed to address additional requirements as identified in **Table 3-2**.

<u>Contractor Oversight</u>

Under the 2018 MS4 General Permit MS4 operators must implement "appropriate control measures to minimize the discharge of pollutants to the MS4." A summary of the mechanisms that JBM-HH uses to ensure contractors working on behalf of JBM-HH implement the necessary good housekeeping and pollution prevention procedures is provided below:

- *Required SWPPP Training*: 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. DPW-EMD now requires grounds maintenance contractors to attend stormwater pollution prevention training, provided by EMD staff.
- In 2020, language was added to the Grounds Maintenance Contract to address stormwater pollution prevention training. The language states that all employees will receive annual training in illicit discharge detection and reporting, pollution prevention, and good housekeeping procedures, in accordance with JBM-HH's Stormwater Pollution Prevention Plan (SWPPP) and Municipal Separate Storm Sewer System (MS4) Permit. The contractor will document and maintain training records for all employees, providing notification to the contract officer's representative when new employees arrive to ensure training is provided to each employee on an annual basis and records are updated and accurate. Records of these trainings are maintained by EMD.
- *Construction Contract Language*: Contractors employed at the Installation for construction projects are also required to use appropriate control measures to minimize the discharge of pollutants to the MS4. The language included in the SOWs for construction contracts pertaining to preventing the discharge of pollutants to the MS4 is included in **Appendix I**.
- *Inspections*: As discussed in Section 3.4, DPW-EMD also conducts inspections of construction sites to enforce compliance with approved E&SC Plans, SWM Plans, CGPs, and SWPPPs, including the proper good housekeeping practices.
- *Base-wide Stormwater Policy*: JBM-HH has issued a base-wide stormwater policy which outlines proper protocols for minimizing stormwater pollution during activities that directly and indirectly impact stormwater. The policy is applicable to all military and civilian personnel and contractors who live, work, or are authorized access to the JBM-HH community. The stormwater policy document is included in **Appendix G**.

4.0 ANNUAL REPORT AND PROGRAM EVALUATION

Each year of the MS4 permit cycle, the MS4 Program implementation will be evaluated as required by the permit. The evaluation will include a review of each MCM to determine the MS4 Program's effectiveness and whether or not changes to the MS4 Program Plan are necessary. The MCMs will be evaluated against the goals listed in the table below:

Table 4-1. MCM Goals and Responsible Parties

MCM	Goals	Responsible Parties
1	Increase the JBM-HH public's knowledge about steps that can be taken to reduce stormwater pollution and hazards associated with illegal discharges and improper disposal of waste by distributing information to the public through at least two media materials per year.	EMD with support from: • Public Affairs Office (PAO) • Housing Division
2	Involve the JBM-HH public in stormwater pollution prevention through the following methods: • Provide a method for the public to report illicit discharges, spills, complaints, and other pollution concerns to EMD. • Maintain a website dedicated to JBM-HH's MS4 Program and stormwater pollution prevention. • Implement at least four public involvement activities annually.	EMD with support from: • PAO • Housing Division
3	Prevent and address illicit discharges to JBM-HH's MS4 through the following: • Maintain an accurate storm sewer system map and information table. • Prohibit, through ordinance, policy, standard operating procedures, or other legal mechanism, unauthorized non-stormwater discharges into the storm sewer system. • Maintain, implement, and enforce illicit discharge detection and elimination (IDDE) written procedures. • Inspect JBM-HH's outfalls on an annual basis.	EMD with support from: • DPW GIS
4	Conduct erosion & sediment (E&S) control inspections of all land disturbing activities that result in disturbance activities of 10,000 square feet or greater, or 2,500 square feet or greater in accordance with areas designated under the Chesapeake Bay Preservation Act at the following intervals: • During or immediately following initial installation of E&S controls • At least once per every two-week period • Within 48 hours following any runoff producing storm event • At the completion of the project prior to the release of any performance bond	• EMD
5	Address stormwater runoff entering the MS4 through the proper installation and maintenance of stormwater management facilities on base by conducting the following activities: • Inspect JBM-HH's stormwater management facilities annually. • Conduct maintenance of stormwater management facilities in accordance with designer and/or manufacturer's recommendations and as needed based on inspection results. • Maintaining an electronic database of JBM-HH's stormwater management facilities.	EMD with support from: • DPW Operations & Maintenance (O&M)
6	Prevent pollution through good housekeeping by conducting the following activities: • Maintain and implement written procedures for activities on base to minimize or prevent pollutant discharges from daily operations and maintenance activities. • Maintain and implement a SWPPP for high priority facilities on base	EMD with support from: • DPW O&M (Buildings 306, 325, 447) • Directorate of Family, Morale, Welfare, and Recreation (FMWR) (Building 227)

Table 4-1. MCM Goals and Responsible Parties		
	that have a high potential of discharging pollutants. • Conduct quarterly routine inspections of the high priority facilities, including one annual comprehensive site compliance evaluation. • Conduct employee training on an annual basis.	• Directorate of Logistics (Building 330) • Third U.S. Infantry Regiment (The Old Guard) (Building 314)

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

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

a. Background Information.

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

  2) The annual report permit year; and

  3) Signed certification;

b. A summary of revisions to the MS4 Program Plan made during the reporting year;

c. A report of any instances of noncompliance not reported under Part III I 1 or 2 of the permit as part of the annual reports that are submitted.

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

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

f. The approval status of any programs pursuant to Part I C 5 (if appropriate), or the progress towards achieving full approval of these programs; and

g. A status update on the implantation of any applicable TMDL Action Plans in accordance with Part II B;

h. A status report on the implementation of the Chesapeake Bay TMDL Action Plan, including any revisions to the plan, including:

  1) A list of BMPs implemented during the reporting period but not reported to the DEQ BMP Warehouse in accordance with Part I E 5 g and the estimated reduction of pollutants of concern achieved by each and reported in pounds per year;

  2) If JBM-HH acquired credits during the reporting period to meet all or a portion of the required reductions in Part II A 3, A 4, or A 5, a statement that credits were acquired;

  3) The progress, using the final design efficiency of the BMPs, toward meeting the required cumulative reductions for total nitrogen, total phosphorus, and total suspended solids; and

  4) A list of BMPs that are planned to be implemented during the next reporting period.

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

- MCM 1:
  - A list of the high-priority stormwater issues addressed in the public education and outreach program; and

  - A list of the strategies used to communicate each high-priority stormwater issue to the public.
- MCM 2:
  - A summary of any public input/complaints on the MS4 Program received and how JBM-HH responded;
  - A webpage link to the MS4 Program and Stormwater website;
  - A description of the public involvement activities implemented during that permit year;
  - A report of the metric as defined for each activity and an evaluation as to whether or not the activity is beneficial to improving water quality; and
  - The name of any other MS4 permittees who participated in the public involvement opportunities.
- MCM 3:
  - A confirmation statement that the MS4 map and information table were updated to reflect any changes to the MS4 occurring on or before June 30 of the reporting year;
  - The total number of outfalls screened during the reporting period as part of the dry weather screening; and
  - A list of illicit discharges to the MS4, including spills reaching the MS4, with the following information:
    - The source of illicit discharge;
    - The dates that the discharge was observed, reported, or both;
    - Whether the discharge was discovered by JBM-HH during dry weather screening, reported by the public, or other method and a description of the discovery;
    - How the investigation was resolved;
    - A description of any follow-up activities; and
    - The date the investigation was closed.
- MCM 4:
  - Information regarding regulated land-disturbing activities including:
    1) Total number of inspections conducted; and
    2) Total number of the enforcement actions taken during the reporting period and the type of the enforcement action.
- MCM 5
  - Total number of inspections conducted on stormwater management facilities owned or operated by JBM-HH;
  - A description of the significant activities performed on the stormwater management facilities owned or operated by JBM-HH to ensure it continues to perform as designed.
  - A confirmation statement that JBM-HH submitted stormwater management facility information through the Virginia Construction Stormwater General Permit database for those land disturbing activities for which JBM-HH was required to obtain coverage under the General VPDES Permit for Discharges of Stormwater

from Construction Activities in accordance with Part I.E.5.f of the permit or a statement that JBM-HH did not complete any projects requiring coverage under the General VPDES Permit for Discharges of Stormwater from Construction Activities; and

  - A confirmation statement that JBM-HH electronically reported BMPs using the DEQ BMP Warehouse in accordance with Part I.E.5.g of the permit and the date on which the information was submitted.

- MCM 6
  - A summary of any operational procedures developed or modified in accordance with Part I E 6 a of thee permit during the reporting period;
  - A summary of any new SWPPPs developed in accordance Part I E 6 c of the permit during the reporting period;
  - A summary of any SWPPPs modified in accordance with Part I E 6 f of the permit or the rationale of any high priority facilities delisted in accordance with Part I E 6 h of the permit during the reporting period;
  - A summary of any new turf and landscape nutrient management plans developed that includes:
    - Location and the total acreage of each land area; and
    - The date of the approved nutrient management plan; and
  - 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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VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
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P.O. Box 1105, Richmond, Virginia 23218
(800) 592-5482
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Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director
(804) 698-4000

October 31, 2018

Colonel Kimberly A. Peeples
Joint Base Commander, Joint Base Myer-Henderson Hall
204 Lee Avenue, Ste. 207
Fort Myer, VA 22211

Transmitted electronically: Colonel Kimberly A. Peeples via (kimberly.a.peeples.mil@mail.mil)

Re: General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems General Permit Number 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 November 1, 2018, 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.

Please submit future permit correspondence and your annual MS4 program reports to Anna Tuthill of the DEQ Northern Regional Office at anna.tuthill@deq.virginia.gov . The general permit will expire on October 31, 2023. The conditions of the permit require that you submit a new registration statement on or before August 3, 2023 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 Anna Tuthill at (703) 583 -3837 or anna.tuthill@deq.virginia.gov .

Sincerely,
Allan Brockenbrough II, P.E.

Allan Brockenbrough II

Manager, Office of VPDES Permits

Enc. General Permit VAR040068
Cc: Richard P. LaFreniere, JBMHH
Anna Tuthill, DEQ

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

General Permit No.: VAR040068

Effective Date: November 1, 2018
Expiration Date: October 31, 2023

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

AUTHORIZATION TO DISCHARGE UNDER THE VIRGINIA STORMWATER MANAGEMENT PROGRAM REGULATIONS, VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM REGULATIONS, AND THE VIRGINIA STATE WATER CONTROL LAW

In compliance with the provisions of the Clean Water Act, as amended and pursuant to the State Water Control Law and regulations adopted pursuant thereto, permittees of small municipal separate storm sewer systems are authorized 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 the registration statement filed with the department, this cover page, Part I - Discharge Authorization and Special Conditions, Part II - TMDL Special Conditions, and Part III - Conditions Applicable to All State and VPDES Permits, as set forth in this general permit.

Part 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 permittee is authorized to discharge stormwater and those authorized nonstormwater discharges described in 9VAC25-890-20 D 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. The permittee shall develop, implement, and enforce a MS4 program designed to reduce the discharge of pollutants from the small MS4 to the maximum extent practicable (MEP) in accordance with this permit, to protect water quality, and to satisfy the appropriate water quality requirements of the State Water Control Law and its attendant regulations. The permittee shall utilize the 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, policy, specific contract language, order, or interjurisdictional agreements. The MS4 program shall include the minimum control measures (MCM) described in Part I E. For the purposes of this permit term, implementation of MCMs in Part I E and the Chesapeake Bay and local TMDL requirements in Part II (as applicable) consistent with the provisions of an iterative MS4 program required pursuant to this general permit constitutes compliance with the standard of reducing pollutants to the "maximum extent practicable," provides adequate progress in meeting water quality standards, and satisfies the appropriate water quality requirements of the State Water Control Law and its attendant regulations.

C. The MS4 program plan.

1. The MS4 program plan shall include, at a minimum, the following written items:

    a. The roles and responsibilities of each of the permittee's divisions and departments in the implementation of the requirements of the permit tasked with ensuring that the permit requirements are met;

    b. If the permittee utilizes another entity to implement portions of the MS4 program, a copy of the written agreement. The description of each party's roles and responsibilities, including any written agreements with third parties, shall be updated as necessary;

    c. For each MCM in Part I E, the following information shall be included:

        (1) Each specific requirement as listed in Part I E for each MCM;

        (2) A description of the BMPs or strategies that the permittee anticipates will be implemented to demonstrate compliance with the permit conditions in Part I E;

(3) All standard operating procedures or policies necessary to implement the BMPs;

(4) The measurable goal by which each BMP or strategy will be evaluated; and

(5) The persons, positions, or departments responsible for implementing each BMP or strategy; and

d. A list of documents incorporated by reference including the version and date of the document being incorporated.

2. If the permittee is receiving initial coverage under this general VPDES permit for the discharge of stormwater, the permittee shall:

   a. No later than six months following the date of permit coverage, submit to the department a schedule for the development of each component of the MS4 program plan in accordance with Part I C 1 that does not exceed the expiration date of this permit; and

   b. Provide to the department a copy of the MS4 program plan upon completion of development.

3. If the permittee was previously covered under the General VPDES Permit for the Discharge of Stormwater from MS4 effective July 1, 2013, the permittee shall update the MS4 program plan to meet the requirements of this permit no later than six months after the effective date of this permit unless otherwise specified in another permit condition and shall post the most up-to-date version of MS4 program plan on the permittee's website or location where the MS4 program plan can be obtained as required by Part I E 2 within 30 days of updating the MS4 program plan. Until such time that the MS4 program plan is updated in accordance with Part I E, the permittee shall continue to implement the MS4 program plan in effect at the time that coverage is issued under this general permit.

4. Revisions to the MS4 program plan are expected throughout the life of this permit as part of the iterative process to reduce pollutant loading and protect water quality to the MEP. As such, revisions made in accordance with this permit as a result of the iterative process do not require modification of this permit. The permittee shall summarize revisions to the MS4 program plan as part of the annual report as described in Part I D 2.

5. The permittee may demonstrate compliance with one or more MCM in Part I E through implementation of separate statutory or regulatory programs provided that the permittee's MS4 program identifies and fully describes any program that will be used to satisfy one or more of the minimum control measures of Part I E. If the program that the permittee is using requires the approval of a third party, the program shall be fully approved by the third party, or the permittee shall be working toward getting full approval. Documentation of the program's approval status, or the progress toward achieving full approval, shall be included in the annual report required by

Part I D. The permittee shall remain responsible for compliance with the permit requirements if the other entity fails to implement one or more components of the control measures.

6. The permittee may rely on another entity to satisfy the permit requirements to implement a minimum control measure if:

   a. The other entity, in fact, implements the control measure;

   b. The particular control measure, or component thereof, is at least as stringent as the corresponding permit requirement;

   c. The other entity agrees to implement the control measure on behalf of the permittee; and

   d. The agreement between the parties is documented in writing and retained by the permittee with the MS4 program plan for as long as the agreement is active.

   The permittee shall remain responsible for compliance with requirements of the permit and shall document in the annual reports required in accordance with Part I D that another entity is being relied on to satisfy all or part of the state permit requirements. The permittee shall provide the information required in Part I D.

7. If the permittee relies 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 Part I D, the permittee must note that fact in the registration statement, but is not required to file the periodic reports. The permittee remains responsible for compliance with the state permit requirements if the other entity fails to implement the control measures or components thereof.

D. Annual reporting requirements.

1. The permittee shall submit an annual report to the department no later than October 1 of each year in a format as specified by the department. The report shall cover the previous year from July 1 to June 30.

2. The annual report shall include the following general information:

   a. The permittee, system name, and permit number;

   b. The reporting period for which the annual report is being submitted;

   c. A signed certification as per Part III K;

   d. Each annual reporting item as specified in an MCM in Part I E; and

   e. An evaluation of the MS4 program implementation, including a review of each MCM, to determine the MS4 program's effectiveness and whether or not changes to the MS4 program plan are necessary.

3. For permittees receiving initial coverage under this general VPDES permit for the discharge of stormwater, the annual report shall include a status update on each component of the MS4 program plan being developed. Once the MS4 program plan has been updated to include

implementation of a specific MCM in Part I E, the permittee shall follow the reporting requirements established in Part I D 2.

4. For those permittees with requirements established under Part II A, the annual report shall include a status report on the implementation of the Chesapeake Bay TMDL action plan in accordance with Part II A of this permit including any revisions to the plan.

5. For those permittees with requirements established under Part II B, the annual report shall include a status report on the implementation of the local TMDL action plans in accordance with Part II B including any revisions to the plan.

6. For the purposes of this permit, the MS4 program plan and annual report shall be maintained separately and submitted to the department as required by this permit as two separate documents.

E. Minimum control measures

1. Public education and outreach.

   a. The permittee shall implement a public education and outreach program designed to:

      (1) Increase the public's knowledge of how to reduce stormwater pollution, placing priority on reducing impacts to impaired waters and other local water pollution concerns;

      (2) Increase the public's knowledge of hazards associated with illegal discharges and improper disposal of waste, including pertinent legal implications; and

      (3) Implement a diverse program with strategies that are targeted toward individuals or groups most likely to have significant stormwater impacts.

   b. The permittee shall identify no less than three high-priority stormwater issues to meet the goal of educating the public in accordance with Part I E 1 a. High-priority issues may include the following examples: Chesapeake Bay nutrients, pet wastes, local receiving water impairments, TMDLs, high-quality receiving waters, and illicit discharges from commercial sites.

   c. The high-priority public education and outreach program, as a whole, shall:

      (1) Clearly identify the high-priority stormwater issues;

      (2) Explain the importance of the high-priority stormwater issues;

      (3) Include measures or actions the public can take to minimize the impact of the high-priority stormwater issues; and

      (4) Provide a contact and telephone number, website, or location where the public can find out more information.

   d. The permittee shall use two or more of the strategies listed in Table 1 below per year to communicate to the public the high-priority stormwater issues identified in accordance with Part I E 1 b including how to reduce stormwater pollution.

Table 1 Strategies for Public Education and Outreach	
Strategies	Examples (provided as examples and are not meant to be all inclusive or limiting)
Traditional written materials	Informational brochures, newsletters, fact sheets, utility bill inserts, or recreational guides for targeted groups of citizens
Alternative materials	Bumper stickers, refrigerator magnets, t-shirts, or drink koozies
Signage	Temporary or permanent signage in public places or facilities, vehicle signage, bill boards, or storm drain stenciling
Media Materials	Information disseminated through electronic media, radio, televisions, movie theater, or newspaper
Speaking engagements	Presentations to school, church, industry, trade, special interest, or community groups
Curriculum materials	Materials developed for school-aged children, students at local colleges or universities, or extension classes offered to local citizens
Training materials	Materials developed to disseminate during workshops offered to local citizens, trade organization, or industrial officials

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

f. The MS4 program plan shall include:

(1) A list of the high-priority stormwater issues the permittee will communicate to the public as part of the public education and outreach program;

(2) The rationale for selection of each high-priority stormwater issue and an explanation of how each education or outreach strategy is intended to have a positive impact on stormwater discharges;

(3) Identification of the public audience to receive each high-priority stormwater message;

(4) The strategies from Table 1 of Part I E 1 d to be used to communicate each high-priority stormwater message; and

(5) The anticipated time periods the messages will be communicated or made available to the public.

g. The annual report shall include the following information:

(1) A list of the high-priority stormwater issues the permittee addressed in the public education and outreach program; and

(2) A list of the strategies used to communicate each high-priority stormwater issue.

2. Public involvement and participation.

a. The permittee shall develop and implement procedures for the following:

(1) The public to report potential illicit discharges, improper disposal, or spills to the MS4, complaints regarding land disturbing activities, or other potential stormwater pollution concerns;

(2) The public to provide input on the permittee's MS4 program plan;

(3) Receiving public input or complaints;

(4) Responding to public input received on the MS4 program plan or complaints; and

(5) Maintaining documentation of public input received on the MS4 program and associated MS4 program plan and the permittee's response.

b. No later than three months after this permit's effective date, the permittee shall develop and maintain a webpage dedicated to the MS4 program and stormwater pollution prevention. The following information shall be posted on this webpage:

(1) The effective MS4 permit and coverage letter;

(2) The most current MS4 program plan or location where the MS4 program plan can be obtained;

(3) The annual report for each year of the term covered by this permit no later than 30 days after submittal to the department;

(4) A mechanism for the public to report potential illicit discharges, improper disposal, or spills to the MS4, complaints regarding land disturbing activities, or other potential stormwater pollution concerns in accordance with Part I E 2 a (1); and

(5) (5) Methods for how the public can provide input on the permittee's MS4 program plan in accordance with Part I E 2 a (2).

c. The permittee shall implement no less than four activities per year from two or more of the categories listed in Table 2 below to provide an opportunity for public involvement to improve water quality and support local restoration and clean-up projects.

Table 2 Public Involvement Opportunities	
Public involvement opportunities	Examples (provided as example and are not meant to be all inclusive or limiting)
Monitoring	Establish or support citizen monitoring group
Restoration	Stream or watershed clean-up day, adopt-a-water way program,
Educational events	Booth at community fair, demonstration of stormwater control projects, presentation of stormwater materials to schools to meet applicable education Standards of Learning or curriculum requirements, watershed walks, participation on environmental advisory committees
Disposal or collection events	Household hazardous chemicals collection, vehicle fluids collection
Pollution prevention	Adopt-a-storm drain program, implement a storm drain marking program, promote use of residential stormwater BMPs, implement pet waste stations in public areas, adopt-a-street program.

d. The permittee may coordinate the public involvement opportunities listed in Table 2 with other MS4 permittees; however, each permittee shall be individually responsible for meeting all of the permit requirements.

e. The MS4 program plan shall include:

(1) The webpage address where mechanisms for the public to report (i) potential illicit discharges, improper disposal, or spills to the MS4, (ii) complaints regarding land disturbing activities, or (iii) other potential stormwater pollution concerns;

(2) The webpage address that contains the methods for how the public can provide input on the permittee's MS4 program; and

(3) A description of the public involvement activities to be implemented by the permittee, the anticipated time period the activities will occur, and a metric for each activity to determine if the activity is beneficial to water quality. An example of metrics may include the weight of trash collected from a stream cleanup, the number of participants in a hazardous waste collection event, etc.

f. The annual report shall include the following information:

(1) A summary of any public input on the MS4 program received (including stormwater complaints) and how the permittee responded;

(2) A webpage address to the permittee's MS4 program and stormwater website;

(3) A description of the public involvement activities implemented by the permittee;

(4) A report of the metric as defined for each activity and an evaluation as to whether or not the activity is beneficial to improving water quality; and

(5) The name of other MS4 permittees with whom the permittee collaborated in the public involvement opportunities.

3. Illicit discharge detection and elimination.

a. The permittee shall develop and maintain an accurate MS4 map and information table as follows:

(1) A map of the storm sewer system owned or operated by the permittee within the census urbanized area identified by the 2010 decennial census that includes, at a minimum:

(a) MS4 outfalls discharging to surface waters, except as follows:

(i) In cases where the outfall is located outside of the MS4 permittee's legal responsibility, the permittee may elect to map the known point of discharge location closest to the actual outfall; and

(ii) In cases where the MS4 outfall discharges to receiving water channelized underground, the permittee may elect to map the point downstream at which the receiving water emerges above ground as an outfall discharge location. If there are multiple outfalls discharging to an underground channelized receiving water, the map shall identify that an outfall discharge location represents more than one outfall. This is an option a permittee may choose to use and recognizes the difficulties in accessing outfalls to underground channelized stream conveyances for purposes of mapping, screening, or monitoring.

(b) A unique identifier for each mapped item required in Part I E 3;

(c) The name and location of receiving waters to which the MS4 outfall or point of discharge discharges;

(d) MS4 regulated service area; and

(e) stormwater management facilities owned or operated by the permittee.

(2) The permittee shall maintain an information table associated with the storm sewer system map that includes the following information for each outfall or point of discharge for those cases in which the permittee elects to map the known point of discharge in accordance with Part I E 3 a (1) (a):

(a) A unique identifier as specified on the storm sewer system map;

(b) The latitude and longitude of the outfall or point of discharge;

(c) The estimated regulated acreage draining to the outfall or point of discharge;

(d) The name of the receiving water;

(e) The 6th Order Hydrologic Unit Code of the receiving water;

(f) An indication as to whether the receiving water is listed as impaired in the Virginia 2016 305(b)/303(d) Water Quality Assessment Integrated Report;

(g) The predominant land use for each outfall discharging to an impaired water; and

(h) The name of any EPA approved TMDLs for which the permittee is assigned a wasteload allocation.

(3) No later than July 1, 2019, the permittee shall submit to DEQ a GIS-compatible shapefile of the permittee's MS4 map as described in Part I E 3 a. If the permittee does not have an MS4 map in a GIS format, the permittee shall provide the map as a PDF document.

(4) No later than October 1 of each year, the permittee shall update the storm sewer system map and outfall information table to include any new outfalls constructed or TMDLs approved or both during the immediate preceding reporting period.

(5) The permittee shall provide written notification to any downstream adjacent MS4 of any known physical interconnection established or discovered after the effective date of this permit.

b. The permittee shall prohibit, through ordinance, policy, standard operating procedures, or other legal mechanism, to the extent allowable under federal, state, or local law, regulations, or ordinances, unauthorized nonstormwater discharges into the storm sewer system. Nonstormwater discharges or flows identified in 9VAC25-890-20 D 3 shall only be addressed if they are identified by the permittee as a significant contributor of pollutants discharging to the MS4. Flows that have been identified by the department as de minimis discharges are not significant sources of pollutants to surface water.

c. The permittee shall maintain, implement, and enforce illicit discharge detection and elimination (IDDE) written procedures designed to detect, identify, and address unauthorized nonstormwater discharges, including illegal dumping, to the small MS4 to effectively eliminate the unauthorized discharge. Written procedures shall include:

(1) A description of the legal authorities, policies, standard operating procedures or other legal mechanisms available to the permittee to eliminate identified sources of ongoing illicit discharges including procedures for using legal enforcement authorities.

(2) Dry weather field screening protocols to detect, identify, and eliminate illicit discharges to the MS4. The protocol shall include:

(a) A prioritized schedule of field screening activities and rationale for prioritization determined by the permittee based on such criteria as age of the infrastructure, land use, historical illegal discharges, dumping or cross connections;

(b) If the total number of MS4 outfalls is equal to or less than 50, a schedule to screen all outfalls annually;

(c) If the total number of MS4 outfalls is greater than 50, a schedule to screen a minimum of 50 outfalls annually such that no more than 50% are screened in the previous 12-month period. The 50% criteria is not applicable if all outfalls have been screened in the previous three years; and

(d) A mechanism to track the following information:

(i) The unique outfall identifier;

(ii) Time since the last precipitation event;

(iii) The estimated quantity of the last precipitation event;

(iv) Site descriptions (e.g., conveyance type and dominant watershed land uses);

(v) Whether or not a discharge was observed; and

(vi) If a discharge was observed, the estimated discharge rate (e.g., width and depth of discharge flow rate) and visual characteristics of the discharge (e.g., odor, color, clarity, floatables, deposits or stains, vegetation condition, structural condition, and biology).

(3) A timeframe upon which to conduct an investigation to identify and locate the source of any observed unauthorized nonstormwater discharge. Priority of investigations shall be given to discharges of sanitary sewage and those believed to be a risk to human health and public safety. Discharges authorized under a separate VPDES or state permit require no further action under this permit.

(4) Methodologies to determine the source of all illicit discharges. If the permittee is unable to identify the source of an illicit discharge within six months of beginning the investigation then the permittee shall document that the source remains unidentified. If the observed discharge is intermittent, the permittee shall document that attempts to observe the discharge flowing were unsuccessful.

(5) Methodologies for conducting a follow-up investigation for illicit discharges that are continuous or that permittees expect to occur more frequently than a one-time discharge to verify that the discharge has been eliminated except as provided for in Part I E 3 c (4);

(6) A mechanism to track all illicit discharge investigations to document the following:

(a) The dates that the illicit discharge was initially observed, reported, or both;

(b) The results of the investigation, including the source, if identified;

(c) Any follow-up to the investigation;

(d) Resolution of the investigation; and

(e) The date that the investigation was closed.

d. The MS4 program plan shall include:

(1) The MS4 map and information table required by Part I E 3 a. The map and information table may be incorporated into the MS4 program plan by reference. The map shall be made available to the department within 14 days upon request;

(2) Copies of written notifications of new physical interconnections given by the permittee to other MS4s; and

(3) The IDDE procedures described in Part I E 3 c.

e. The annual report shall include:

(1) A confirmation statement that the MS4 map and information table have been updated to reflect any changes to the MS4 occurring on or before June 30 of the reporting year;

(2) The total number of outfalls screened during the reporting period as part of the dry weather screening program; and

(3) A list of illicit discharges to the MS4 including spills reaching the MS4 with information as follows:

(a) The source of illicit discharge;

(b) The dates that the discharge was observed, reported, or both;

(c) Whether the discharge was discovered by the permittee during dry weather screening, reported by the public, or other method (describe);

(d) How the investigation was resolved;

(e) A description of any follow-up activities; and

(f) The date the investigation was closed.

4. Construction site stormwater runoff control.

a. The permittee shall utilize its legal authority, such as ordinances, permits, orders, specific contract language, and interjurisdictional agreements, to address discharges entering the MS4 from regulated construction site stormwater runoff. The permittee shall control construction site stormwater runoff as follows:

(1) If the permittee is a city, county, or town that has adopted a Virginia Erosion and Sediment Control Program (VESCP), the permittee shall implement the VESCP consistent with the Virginia Erosion and Sediment Control Law (§ 62.1-44.15:51 et seq.

of the Code of Virginia) and Virginia Erosion and Sediment Control Regulations (9VAC25-840);

(2) If the permittee is a town that has not adopted a VESCP, implementation of a VESCP consistent with the Virginia Erosion and Sediment Control Law (§ 62.1-44:15:51 et seq. of the Code of Virginia) and Virginia Erosion and Sediment Control Regulations (9VAC25-840) by the surrounding county shall constitute compliance with Part I E 4 a; such town shall notify the surrounding county of erosion, sedimentation or other construction stormwater runoff problems;

(3) If the permittee is a state agency; public institution of higher education including community colleges, colleges, and universities; or federal entity and has developed standards and specifications in accordance with the Virginia Erosion and Sediment Control Law (§ 62.1-44.15:51 et seq. of the Code of Virginia) and Virginia Erosion and Sediment Control Regulations (9VAC25-840), the permittee shall implement the most recent department approved standards and specifications; or

(4) If the permittee is a state agency; public institution of higher education including community colleges, colleges, and universities; or federal entity and has not developed standards and specifications in accordance with the Virginia Erosion and Sediment Control Law (§ 62.1-44.15:51 et seq. of the Code of Virginia) and Virginia Erosion and Sediment Control Regulations (9VAC25-840), the permittee shall inspect all land disturbing activities as defined in § 62.1-44.15:51 of the Code of Virginia that result in the disturbance activities of 10,000 square feet or greater, or 2,500 square feet or greater in accordance with areas designated under the Chesapeake Bay Preservation Act, as follows:

(a) During or immediately following initial installation of erosion and sediment controls;

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

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

(d) At the completion of the project prior to the release of any performance bond.

(5) If the permittee is a subdivision of a local government such as a school board or other local government body, the permittee shall inspect those projects resulting in a land disturbance as defined in § 62.1-44.15.51 of the Code of Virginia occurring on lands owned or operated by the permittee that result in the disturbance of 10,000 square feet or greater, 2,500 square feet or greater in accordance with areas designated under the Chesapeake Bay Preservation Act, or in accordance with more stringent thresholds established by the local government, as follows:

(a) During or immediately following initial installation of erosion and sediment controls;

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

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

(d) At the completion of the project prior to the release of any performance bond.

b. The permittee 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 D through the MS4 is not authorized by this state permit.

c. The permittee's MS4 program plan shall include:

(1) If the permittee implements a construction site stormwater runoff control program in accordance with Part I E 4 a (1), the local ordinance citations for the VESCP program;

(2) If the permittee implements a construction site stormwater runoff control program in accordance with Part I E 4 a (3):

(a) The most recently approved standards and specifications or if incorporated by reference, the location where the standards and specifications can be viewed; and

(b) A copy of the most recent standards and specifications approval letter from the department;

(3) A description of the legal authorities utilized to ensure compliance with Part I E 4 a to control construction site stormwater runoff control such as ordinances, permits, orders, specific contract language, policies, and interjurisdictional agreements;

(4) Written inspection procedures to ensure the erosion and sediment controls are properly implemented and all associated documents utilized during inspection including the inspection schedule;

(5) Written procedures for requiring compliance through corrective action or enforcement action to the extent allowable under federal, state, or local law, regulation, ordinance, or other legal mechanisms; and

(6) The roles and responsibilities of each of the permittee's departments, divisions, or subdivisions in implementing the construction site stormwater runoff control requirements in Part I E 4.

d. The annual report shall include the following:

(1) If the permittee implements a construction site stormwater runoff program in accordance with Part I E 4 a (3):

(a) A confirmation statement that land disturbing projects that occurred during the reporting period have been conducted in accordance with the current department approved standards and specifications for erosion and sediment control; and

(b) If one or more of the land disturbing projects were not conducted with the department approved standards and specifications, an explanation as to why the projects did not conform to the approved standards and specifications.

(2) Total number of inspections conducted; and

(3) The total number and type of enforcement actions implemented and the type of enforcement actions.

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

a. The permittee shall address post-construction stormwater runoff that enters the MS4 from the following land disturbing activities by implementing a post-construction stormwater runoff management program as follows:

(1) If the permittee is a city, county, or town, with an approved Virginia Stormwater Management Program (VSMP), the permittee shall implement the VSMP consistent with the Virginia Stormwater Management Act (§ 62.1-44.15:24 et seq. of the Code of Virginia) and VSMP Regulations (9VAC25-870) as well as develop an inspection and maintenance program in accordance with Parts I E 5 b and c;

(2) If the permittee is a town that has not adopted a VSMP, implementation of a VSMP consistent with the Virginia Stormwater Management Act (§ 62.1-44.15:24 et seq. of the Code of Virginia) and VSMP Regulations (9VAC25-870) by the surrounding county shall constitute compliance with Part I E 5 a; such town shall notify the surrounding county of erosion, sedimentation, or other post-construction stormwater runoff problems and develop an inspection and maintenance program in accordance with Part I E 5 b and c;

(3) If the permittee is a state agency; public institution of higher education including community colleges, colleges, and universities; or federal entity and has developed standards and specifications in accordance with the Virginia Stormwater Management Act (§ 62.1-44.15:24 et seq. of the Code of Virginia) and VSMP Regulations (9VAC25-870), the permittee shall implement the most recent department approved standards and specifications and develop an inspection and maintenance program in accordance with Part I E 5 b;

(4) If the permittee is a state agency; public institution of higher education including community colleges, colleges, and universities; or federal entity and has not developed standards and specifications in accordance with the Virginia Stormwater Management Act (§ 62.1-44.15:24 et seq. of the Code of Virginia) and Virginia Stormwater Management Regulations (9VAC25-870) the permittee shall implement a post-construction stormwater runoff control program through compliance with 9VAC25-870 and with the implementation of a maintenance and inspection program consistent with Part I E 5 b; or

(5) If the permittee is a subdivision of a local government such as a school board or other local government body, the permittee shall implement a post-construction stormwater runoff control program through compliance with 9VAC25-870 or in accordance with more stringent local requirements, if applicable, and with the implementation of a maintenance and inspection program consistent with Part I E 5 b.

b. The permittee shall implement an inspection and maintenance program for those stormwater management facilities owned or operated by the permittee that discharges to the MS4 as follows:

(1) The permittee shall develop and maintain written inspection and maintenance procedures in order to ensure adequate long-term operation and maintenance of its stormwater management facilities;

(2) The permittee shall inspect stormwater management facilities owned or operated by the permittee no less than once per year. The permittee 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 and rationale is included in the MS4 program plan. The alternative inspection frequency shall be no less than once per five years; and

(3) If during the inspection of the stormwater management facility conducted in accordance with Part I E 5 b (2), it is determined that maintenance is required, the permittee shall conduct the maintenance in accordance with the written procedures developed under Part I E 5 b (1).

c. For those permittees described in Part I E 5 a (1) or (2), the permittee shall:

(1) Implement an inspection and enforcement program for stormwater management facilities not owned by the permittee (i.e., privately owned) that includes:

(a) An inspection frequency of no less than once per five years for all privately owned stormwater management facilities that discharge into the MS4; and

(b) Adequate long-term operation and maintenance by the owner of the stormwater management facility by requiring the owner to develop and record a maintenance agreement, including an inspection schedule to the extent allowable under state or local law or other legal mechanism;

(2) Utilize its legal authority for enforcement of the maintenance responsibilities if maintenance is neglected by the owner; and

(3) The permittee may develop and implement a progressive compliance and enforcement strategy provided that the strategy is included in the MS4 program plan.

d. The permittee shall maintain an electronic database or spreadsheet of all known permittee-owned or permittee-operated and privately owned stormwater management facilities that discharge into the MS4. The database shall also include all BMPs implemented by the permittee to meet the Chesapeake Bay TMDL load reduction as required in Part II A. A database shall include the following information as applicable:

(1) The stormwater management facility or BMP type;

(2) The stormwater management facility or BMPs location as latitude and longitude;

(3) The acres treated by the stormwater management facility or BMP, including total acres, pervious acres, and impervious acres;

(4) The date the facility was brought online (MM/YYYY). If the date brought online is not known, the permittee shall use June 30, 2005;

(5) The 6th Order Hydrologic Unit Code in which the stormwater management facility is located;

(6) Whether the stormwater management facility or BMP is owned or operated by the permittee or privately owned;

(7) Whether or not the stormwater management facility or BMP is part of the permittee's Chesapeake Bay TMDL action plan required in Part II A or local TMDL action plan required in Part II B, or both;

(8) If the stormwater management facility or BMP is privately owned, whether a maintenance agreement exists; and

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

e. The electronic database or spreadsheet shall be updated no later than 30 days after a new stormwater management facility is brought online, a new BMP is implemented to meet a TMDL load reduction as required in Part II, or discovered if it is an existing stormwater management facility.

f. The permittee shall use the DEQ Construction Stormwater Database or other application as specified by the department to report each stormwater management facility installed after July 1, 2014, to address the control of post-construction runoff from land disturbing activities for which the permittee is required to obtain a General VPDES Permit for Discharges of Stormwater from Construction Activities.

g. No later than October 1 of each year, the permittee shall electronically report the stormwater management facilities and BMPs implemented between July 1 and June 30 of each year using the DEQ BMP Warehouse and associated reporting template for any practices not reported in accordance with Part I E 5 f including stormwater management facilities installed to control post-development stormwater runoff from land disturbing activities less than one acre in accordance with the Chesapeake Bay Preservation Act regulations (9VAC25-830) and for which a General VPDES Permit for Discharges of Stormwater from Construction Activities was not required.

h. The MS4 program plan shall include:

(1) If the permittee implements a VSMP in accordance with Part I E 5 a (1) and (2):

(a) A copy of the VSMP approval letter issued by the department;

(b) Written inspection procedures and all associated documents utilized in the inspection of privately owned stormwater management facilities; and

(c) Written procedures for compliance and enforcement of inspection and maintenance requirements for privately owned BMPs.

(2) If the permittee implements a post-development stormwater runoff control program in accordance with Part I E 5 a (3):

(a) The most recently approved standards and specifications or if incorporated by reference, the location where the standards and specifications can be viewed; and

(b) A copy of the most recent standards and specifications approval letter from the department.

(3) A description of the legal authorities utilized to ensure compliance with Part I E 5 a for post-construction stormwater runoff control such as ordinances (provide citation as appropriate), permits, orders, specific contract language, and interjurisdictional agreements;

(4) Written inspection procedures and all associated documents utilized during inspection of stormwater management facilities owned or operated by the permittee;

(5) The roles and responsibilities of each of the permittee's departments, divisions, or subdivisions in implementing the post-construction stormwater runoff control program; and

(6) The stormwater management facility spreadsheet or database incorporated by reference and the location or webpage address where the spreadsheet or database can be reviewed.

i. The annual report shall include the following information:

(1) If the permittee implements a Virginia Stormwater Management Program in accordance with Part I E 5 a (1) and (2):

(a) The number of privately owned stormwater management facility inspections conducted; and

(b) The number of enforcement actions initiated by the permittee to ensure long-term maintenance of privately owned stormwater management facilities including the type of enforcement action;

(2) Total number of inspections conducted on stormwater management facilities owned or operated by the permittee;

(3) A description of the significant maintenance, repair, or retrofit activities performed on the stormwater management facilities owned or operated by the permittee to ensure it continues to perform as designed. This does not include routine activities such as grass mowing or trash collection;

(4) A confirmation statement that the permittee submitted stormwater management facility information through the Virginia Construction Stormwater General Permit database for

those land disturbing activities for which the permittee was required to obtain coverage under the General VPDES Permit for Discharges of Stormwater from Construction Activities in accordance with Part I E 5 f or a statement that the permittee did not complete any projects requiring coverage under the General VPDES Permit for Discharges of Stormwater from Construction Activities; and

(5) A confirmation statement that the permittee electronically reported BMPs using the DEQ BMP Warehouse in accordance with Part I E 5 g and the date on which the information was submitted.

6. Pollution prevention and good housekeeping for facilities owned or operated by the permittee within the MS4 service area.

a. The permittee shall maintain and implement written procedures for those activities at facilities owned or operated by the permittee, such as road, street, and parking lot maintenance; equipment maintenance; and the application, storage, transport, and disposal of pesticides, herbicides, and fertilizers designed to:

(1) Prevent illicit discharges;

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

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

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

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

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

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

b. The written procedures established in accordance with Part I E 6 a shall be utilized as part of the employee training program at Part I E 6 m.

c. Within 12 months of state permit coverage, the permittee shall identify which of the high-priority facilities have a high potential of discharging pollutants. The permittee shall maintain and implement a site specific stormwater pollution prevention plan (SWPPP) for each facility identified. High priority facilities that have a high potential for discharging pollutants are those facilities 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:

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

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

(3) Material handling equipment;

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

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

(6) 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;

(7) Waste material except waste in covered, nonleaking containers (e.g., dumpsters);

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

(9) 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.

d. Each SWPPP as required in Part I E 6 c shall include the following:

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

(2) A description and checklist of the potential pollutants and pollutant sources;

(3) A description of all potential nonstormwater discharges;

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

(5) A description of the applicable training as required in Part I E 6 m;

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

(7) An inspection frequency of no less than once per year and maintenance requirements for site specific source controls. The date of each inspection and associated findings and follow-up shall be logged in each SWPPP; and

(8) A log of each unauthorized discharge, release, or spill incident reported in accordance with Part III G including the following information:

(a) Date of incident;

(b) Material discharged, released, or spilled; and

(c) Estimated quantity discharged, released or spilled .

e. No later than June 30 of each year, the permittee shall annually review any high-priority facility owned or operated by the permittee for which a SWPPP has not been developed to determine if the facility has a high potential to discharge pollutants as described in Part I E 6

c. If the facility is determined to be a high-priority facility with a high potential to discharge pollutants, the permittee shall develop a SWPPP meeting the requirements of Part I E 6 d no later than December 31 of that same year.

f. The permittee shall review the contents of any site specific SWPPP no later than 30 days after any unauthorized discharge, release, or spill reported in accordance with Part III G to determine if additional measures are necessary to prevent future unauthorized discharges, releases, or spills. If necessary, the SWPPP shall be updated no later than 90 days after the unauthorized discharge.

g. The SWPPP shall be kept at the high-priority facility with a high potential to discharge and utilized as part of staff training required in Part I E 6 m. The SWPPP and associated documents may be maintained as a hard copy or electronically as long as the documents are available to employees at the applicable site.

h. If activities change at a facility such that the facility no longer meets the criteria of a high-priority facility with a high potential to discharge pollutants as described in Part I E 6 c, the permittee may remove the facility from the list of high-priority facilities with a high potential to discharge pollutants.

i. The permittee shall maintain and 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 permittee where nutrients are applied to a contiguous area greater than one acre. If nutrients are being applied to achieve final stabilization of a land disturbance project, application shall follow the manufacturer's recommendations.

j. Permittees with lands regulated under § 10.1-104.4 of the Code of Virginia, including state agencies, state colleges and universities, and other state government entities, shall continue to implement turf and landscape nutrient management plans in accordance with this statutory requirement.

k. The permittee 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.

l. The permittee shall require through the use of contract language, training, standard operating procedures, or other measures within the permittee's legal authority that contractors employed by the permittee and engaging in activities with the potential to discharge pollutants use appropriate control measures to minimize the discharge of pollutants to the MS4.

m. The permittee shall develop a training plan in writing for applicable staff that ensures the following:

(1) Field personnel receive training in the recognition and reporting of illicit discharges no less than once per 24 months;

(2) Employees performing road, street, and parking lot maintenance receive training in pollution prevention and good housekeeping associated with those activities no less than once per 24 months;

(3) Employees working in and around maintenance, public works, or recreational facilities receive training in good housekeeping and pollution prevention practices associated with those facilities no less than once per 24 months;

(4) Employees and contractors hired by the permittee who apply pesticides and herbicides are trained or certified in accordance with the Virginia Pesticide Control Act (§ 3.2-3900 et seq. of the Code of Virginia). Certification by the Virginia Department of Agriculture and Consumer Services (VCACS) Pesticide and Herbicide Applicator program shall constitute compliance with this requirement;

(5) 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) Employees and contractors implementing the stormwater program obtain the appropriate certifications as required under the Virginia Stormwater Management Act and its attendant regulations; and

(7) Employees whose duties include emergency response have been trained in spill response. Training of emergency responders such as firefighters and law-enforcement officers on the handling of spill releases as part of a larger emergency response training shall satisfy this training requirement and be documented in the training plan.

n. The permittee shall maintain documentation of each training event conducted by the permittee to fulfill the requirements of Part I E 6 m for a minimum of three years after the training event. The documentation shall include the following information:

(1) The date of the training event;

(2) The number of employees attending the training event; and

(3) The objective of the training event.

o. The permittee may fulfill the training requirements in Part I E 6 m, in total or in part, through regional training programs involving two or more MS4 permittees; however, the permittee shall remain responsible for ensuring compliance with the training requirements.

p. The MS4 program plan shall include:

(1) The written procedures for the operations and maintenance activities as required by Part I E 6 a;

(2) A list of all high-priority facilities owned or operated by the permittee required in accordance with Part I E 6 c, and whether or not the facility has a high potential to discharge;

(3) A list of lands for which turf and landscape nutrient management plans are required in accordance with Part I E 6 i and j, including the following information:

(a) The total acreage on which nutrients are applied;

(b) The date of the most recently approved nutrient management plan for the property; and

(c) The location in which the individual turf and landscape nutrient management plan is located;

(4) A summary of mechanisms the permittee uses to ensure contractors working on behalf of the permittees implement the necessary good housekeeping and pollution prevention procedures, and stormwater pollution plans as appropriate; and

(5) The written training plan as required in Part I E 6 m.

q. The annual report shall include the following:

(1) A summary of any operational procedures developed or modified in accordance with Part I E 6 a during the reporting period;

(2) A summary of any new SWPPPs developed in accordance Part I E 6 c during the reporting period;

(3) A summary of any SWPPPs modified in accordance with Part I E 6 f or the rationale of any high priority facilities delisted in accordance with Part I E 6 h during the reporting period;

(4) A summary of any new turf and landscape nutrient management plans developed that includes:

(a) Location and the total acreage of each land area; and

(b) The date of the approved nutrient management plan; and

(5) A list of the training events conducted in accordance with Part I E 6 m, including the following information:

(a) The date of the training event;

(b) The number of employees who attended the training event; and

(c) The objective of the training event.

Part II
TMDL Special Conditions

A. Chesapeake Bay TMDL special condition.

1. The Commonwealth in its Phase I and Phase II Chesapeake Bay TMDL Watershed Implementation Plans (WIPs) committed to a phased approach for MS4s, affording MS4 permittees up to three full five-year permit cycles to implement necessary reductions. This permit is consistent with the Chesapeake Bay TMDL and the Virginia Phase I and Phase II WIPs to meet the Level 2 (L2) scoping run for existing developed lands as it represents an implementation of an additional 35% of L2 as specified in the 2010 Phase I and Phase II WIPs. In combination with the 5.0% reduction of L2 that has already been achieved, a total reduction at the end of this permit term of 40% of L2 will be achieved. Conditions of future permits will be consistent with the TMDL or WIP conditions in place at the time of permit issuance.

2. The following definitions apply to Part II of this state permit for the purpose of the Chesapeake Bay TMDL 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.

3. Reduction requirements. No later than the expiration date of this permit, the permittee shall reduce the load of total nitrogen, total phosphorus, and total suspended solids from existing developed lands served by the MS4 as of June 30, 2009, within the 2010 Census urbanized areas by at least 40% of the Level 2 (L2) Scoping Run Reductions. The 40% reduction is the sum of (i) the first phase reduction of 5.0% of the L2 Scoping Run Reductions based on the lands located within the 2000 Census urbanized areas required by June 30, 2018; (ii) the second phase reduction of at least 35% of the L2 Scoping Run based on lands within the 2000 Census urbanized areas required by June 30, 2023; and (iii) the reduction of at least 40% of the L2 Scoping Run , which shall only apply to the additional lands that were added by the 2010 expanded Census urbanized areas required by June 30, 2023. The required reduction shall be calculated using Tables 3a, 3b, 3c, and 3d below as applicable:

Table 3a
Calculation Sheet for Estimating Existing Source Loads and Reduction Requirements for the James River, Lynnhaven, and Little Creek Basins

		A	B	C	D	E	F	G
Pollutant	Subsource	Loading rate (lbs/ac/yr)[1]	Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)[2]	Load(lbs/yr)[3]	Percentage of MS4 required Chesapeake Bay total L2 loading	Percentage of L2 required reduction by 6/30/2023	40% cumulative reduction Required by 6/30/2023 (lbs/yr)[4]	Sum of 40% cumulative reduction (lb/yr)[5]
Nitrogen	Regulated urban impervious	9.39			9%	40%		
	Regulated urban pervious	6.99			6%	40%		
Phosphorus	Regulated urban impervious	1.76			16%	40%		
	Regulated urban pervious	0.5			7.25%	40%		
Total suspended solids	Regulated urban impervious	676.94			20%	40%		
	Regulated urban pervious	101.08			8.75%	40%		

[1]Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2.

[2]To determine the existing developed acres required in Column B, permittees should first determine the extent of their regulated service area based on the 2010 Census urbanized area (CUA). Next, permittees will need to delineate the lands within the 2010 CUA served by the MS4 as pervious or impervious as of the baseline date of June 30, 2009.

[3]Column C = Column A x Column B.

[4]Column F = Column C x Column D x Column E.

[5]Column G = The sum of the subsource cumulative reduction required by 6/30/23 (lbs/yr) as calculated in Column F.

Table 3b
Calculation Sheet for Estimating Existing Source Loads and Reduction Requirements for the Potomac River Basin

		A	B	C	D	E	F	G
Pollutant	Subsource	Loading rate (lbs/ac/yr)[1]	Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)[2]	Load (lbs/yr)[3]	Percentage of MS4 required Chesapeake Bay total L2 loading reduction	Percentage of L2 required reduction by	40% cumulative reduction required by 6/30/2023 (lbs/yr)[4]	Sum of 40% cumulative reduction (lb/yr)[5]
Nitrogen	Regulated urban impervious	16.86			9%	40%		
	Regulated urban pervious	10.07			6%	40%		
Phosphorus	Regulated Urban Impervious	1.62			16%	40%		
	Regulated urban pervious	0.41			7.25%	40%		
Total suspended solids	Regulated urban impervious	1171.32			20%	40%		
	Regulated urban pervious	175.8			8.75%	40%		

[1]Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2

[2]To determine the existing developed acres required in Column B, permittees should first determine the extent of their regulated service area based on the 2010 Census urbanized area (CUA). Next, permittees will need to delineate the lands within the 2010 CUA served by the MS4 as pervious or impervious as of the baseline date of June 30, 2009.

[3]Column C = Column A x Column B.

[4]Column F = Column C x Column D x Column E.

[5]Column G = The sum of the subsource cumulative reduction required by 6/30/23 (lbs/yr) as calculated in Column F.

Table 3c
Calculation Sheet for Estimating Existing Source Loads and Reduction Requirements for the Rappahannock River Basin

		A	B	C	D	E	F	G
Pollutant	Subsource	Loading rate (lbs/ac/yr)[1]	Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)[2]	Load (lbs/yr)[3]	Percentage of MS4 required Chesapeake Bay total L2 loading reduction	Percentage of L2 required reduction by 6/30/2023	40% cumulative reduction Required by 6/30/2023 (lbs/yr)[4]	Sum of 40% cumulative reduction (lb/yr)[5]
Nitrogen	Regulated urban impervious	9.38			9%	40%		
	Regulated urban pervious	5.34			6%	40%		
Phosphorus	Regulated urban impervious	1.41			16%	40%		
	Regulated urban pervious	0.38			7.25%	40%		
Total suspended solids	Regulated urban impervious	423.97			20%	40%		
	Regulated urban pervious	56.01			8.75%	40%		

[1]Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2.

[2]To determine the existing developed acres required in Column B, permittees should first determine the extent of their regulated service area based on the 2010 Census urbanized area (CUA). Next, permittees will need to delineate the lands within the 2010 CUA served by the MS4 as pervious or impervious as of the baseline date of June 30, 2009.

[3]Column C = Column A x Column B.

[4]Column F = Column C x Column D x Column E.

[5]Column G = The sum of the subsource cumulative reduction required by 6/30/23 (lbs/yr) as calculated in Column F.

Table 3d
Calculation Sheet for Estimating Existing Source Loads and Reduction Requirements for the York River and Poquoson Coastal Basin

		A	B	C	D	E	F	G
Pollutant	Subsource	Loading rate (lbs/ac/yr)[1]	Existing developed lands as of 6/30/09 served by the MS4 within the 2010 CUA (acres)[2]	Load (lbs/yr)[3]	Percentage of MS4 required Chesapeake Bay total L2 loading reduction	Percentage of L2 required reduction by 6/30/2023	40% cumulative reduction required by 6/30/2023 (lbs/yr)[4]	Sum of 40% cumulative reduction (lb/yr)[5]
Nitrogen	Regulated urban impervious	7.31			9%	40%		
	Regulated urban pervious	7.65			6%	40%		
Phosphorus	Regulated urban impervious	1.51			16%	40%		
	Regulated urban pervious	0.51			7.25%	40%		
Total suspended solids	Regulated urban impervious	456.68			20%	40%		
	Regulated urban pervious	72.78			8.75%	40%		

[1]Edge of stream loading rate based on the Chesapeake Bay Watershed Model Progress Run 5.3.2.

[2]To determine the existing developed acres required in Column B, permittees should first determine the extent of their regulated service area based on the 2010 Census urbanized area (CUA). Next, permittees will need to delineate the lands within the 2010 CUA served by the MS4 as pervious or impervious as of the baseline date of June 30, 2009.

[3]Column C = Column A x Column B.

[4]Column F = Column C x Column D x Column E.

[5]Column G = The sum of the subsource cumulative reduction required by 6/30/23 (lbs/yr) as calculated in Column F.

4. No later than the expiration date of this permit, the permittee shall offset 40% of the increased loads from new sources initiating construction between July 1, 2009, and June 30, 2019, and designed in accordance with 9VAC25-870 Part II C (9VAC25-870-93 et seq.) if the following conditions apply:

   a. The activity disturbed one acre or greater; and

   b. The resulting total phosphorous load was greater than 0.45 lb/acre/year, which is equivalent to an average land cover condition of 16% impervious cover.

   The permittee shall utilize Table 4 of Part II A 5 to develop the equivalent pollutant load for nitrogen and total suspended solids for new sources meeting the requirements of this condition.

5. No later than the expiration date of this permit, the permittee shall offset the increased loads from projects grandfathered in accordance with 9VAC25-870-48 that begin construction after July 1, 2014, if the following conditions apply:

   a. The activity disturbs one acre or greater; and

   b. The resulting total phosphorous load was greater than 0.45 lb/acre/year, which is equivalent to an average land cover condition of 16% impervious cover.

   The permittee shall utilize Table 4 below to develop the equivalent pollutant load for nitrogen and total suspended solids for grandfathered sources meeting the requirements of this condition.

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, Lynnhaven, and Little Creek Basins	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 (including Poquoson Coastal Basin)	1.0	9.5	531.6

6. Reductions achieved in accordance with the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems effective July 1, 2013, shall be applied toward the total reduction requirements to demonstrate compliance with Part II A 3, A 4, and A 5.

7. Reductions shall be achieved in each river basin as calculated in Part II A 3 or for reductions in accordance with Part II A 4 and A 5 in the basin in which the new source or grandfathered project occurred.

8. Loading and reduction values greater than or equal to 10 pounds calculated in accordance with Part II A 3, A 4, and A 5 shall be calculated and reported to the nearest pound without regard to mathematical rules of precision. Loading and reduction values of less than 10 pounds reported in accordance with Part II A 3, A 4, and A 5 shall be calculated and reported to two significant digits.

9. Reductions required in Part II A 3, A 4, and A 5 shall be achieved through one or more of the following:

   a. BMPs approved by the Chesapeake Bay Program;

   b. BMPs approved by the department; or

   c. A trading program described in Part II A 10.

10. The permittee may acquire and use total nitrogen and total phosphorus credits in accordance with § 62.1-44.19:21 of the Code of Virginia and total suspended solids in accordance with § 62.1-44.19:21.1 of the Code of Virginia for purposes of compliance with the required reductions in Table 3a, Table 3b,Table c, Table 3d of Part II A 3; Part II A 4; and Part II A 5, provided the use of credits has been approved by the department. The exchange of credits is subject to the following requirements:

    a. The credits are generated and applied to a compliance obligation in the same calendar year;

    b. The credits are generated and applied to a compliance obligation in the same tributary;

    c. The credits are acquired no later than June 1 immediately following the calendar year in which the credits are applied;

    d. No later than June 1 immediately following the calendar year in which the credits are applied, the permittee certifies on an MS4 Nutrient Credit Acquisition Form that the permittee has acquired the credits;

    e. Total nitrogen and total phosphorus credits shall be either point source credits generated by point sources covered by the Watershed Permit for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed general permit issued pursuant to § 62.1-44.19:14 of the Code of Virginia, or nonpoint source credits certified pursuant to § 62.1-44.19:20 of the Code of Virginia;

    f. Sediment credits shall be derived from one of the following:

       (1) Implementation of BMP in a defined area outside of an MS4 service area, in which case the necessary baseline sediment reduction for such defined area shall be achieved prior to the permittee's use of additional reductions as credit; or

       (2) A point source wasteload allocation established by the Chesapeake Bay total maximum daily load, in which case the credit is the difference between the wasteload allocation specified as an annual mass load and any lower monitored annual mass load that is discharged as certified on an MS4 Sediment Credit Acquisition Form.

g. Sediment credits shall not be associated with phosphorus credits used for compliance with the stormwater nonpoint nutrient runoff water quality criteria established pursuant to § 62.1-44.15:28 of the Code of Virginia.

11. No later than 12 months after the permit effective date, the permittee shall submit an updated Chesapeake Bay TMDL action plan for the reductions required in Part II A 3, A 4, and A 5 that includes the following information:

a. Any new or modified legal authorities, such as ordinances, permits, policy, specific contract language, orders, and interjurisdictional agreements, implemented or needing to be implemented to meet the requirements of Part II A 3, A 4, and A 5.

b. The load and cumulative reduction calculations for each river basin calculated in accordance with Part II A 3, A 4, and A 5.

c. The total reductions achieved as of July 1, 2018, for each pollutant of concern in each river basin.

d. A list of BMPs implemented prior to July 1, 2018, to achieve reductions associated with the Chesapeake Bay TMDL including:

(1) The date of implementation; and

(2) The reductions achieved.

e. The BMPs to be implemented by the permittee prior to the expiration of this permit to meet the cumulative reductions calculated in Part II A 3, A 4, and A 5, including as applicable:

(1) Type of BMP;

(2) Project name;

(3) Location;

(4) Percent removal efficiency for each pollutant of concern; and

(5) Calculation of the reduction expected to be achieved by the BMP calculated and reported in accordance with the methodologies established in Part II A 8 for each pollutant of concern; and

f. A summary of any comments received as a result of public participation required in Part II A 12, the permittee's response, identification of any public meetings to address public concerns, and any revisions made to Chesapeake Bay TMDL action plan as a result of public participation.

12. Prior to submittal of the action plan required in Part II A 11, the permittee shall provide an opportunity for public comment on the additional BMPs proposed to meet the reductions not previously approved by the department in the first phase Chesapeake Bay TMDL action plan for no less than 15 days.

13. For each reporting period, the corresponding annual report shall include the following information:

a. A list of BMPs implemented during the reporting period but not reported to the DEQ BMP Warehouse in accordance with Part I E 5 g and the estimated reduction of pollutants of concern achieved by each and reported in pounds per year;

b. If the permittee acquired credits during the reporting period to meet all or a portion of the required reductions in Part II A 3, A 4, or A 5, a statement that credits were acquired;

c. The progress, using the final design efficiency of the BMPs, toward meeting the required cumulative reductions for total nitrogen, total phosphorus, and total suspended solids; and

d. A list of BMPs that are planned to be implemented during the next reporting period.

B. Local TMDL special condition.

1. The permittee shall develop a local TMDL action plan designed to reduce loadings for pollutants of concern if the permittee discharges the pollutants of concern to an impaired water for which a TMDL has been approved by the U.S. Environmental Protection Agency (EPA) as described in Part II B 1 a and 1 b:

   a. For TMDLs approved by the EPA prior to July 1, 2013, and in which an individual or aggregate wasteload has been allocated to the permittee, the permittee shall update the previously approved local TMDL action plans to meet the conditions of Part II B 3, B 4, B 5, B 6, and B 7 as applicable, no later than 18 months after the permit effective date and continue implementation of the action plan; and

   b. For TMDLs approved by EPA on or after July 1, 2013, and prior to June 30, 2018, and in which an individual or aggregate wasteload has been allocated to the permittee, the permittee shall develop and initiate implementation of action plans to meet the conditions of Part II B 3, B 4, B 5, B 6, and B 7 as applicable for each pollutant for which wasteloads have been allocated to the permittee's MS4 no later than 30 months after the permit effective date.

2. The permittee shall complete implementation of the TMDL action plans as soon as practicable. TMDL action plans may be implemented in multiple phases over more than one permit cycle using the adaptive iterative approach provided adequate progress is achieved in the implementation of BMPs designed to reduce pollutant discharges in a manner that is consistent with the assumptions and requirements of the applicable TMDL.

3. Each local TMDL action plan developed by the permittee shall include the following:

   a. The TMDL project name;

   b. The EPA approval date of the TMDL;

   c. The wasteload allocated to the permittee (individually or in aggregate), and the corresponding percent reduction, if applicable;

   d. Identification of the significant sources of the pollutants of concern discharging to the permittee's MS4 and that are not covered under a separate VPDES permit. For the purposes of this requirement, a significant source of pollutants means a discharge where the expected pollutant loading is greater than the average pollutant loading for the land use identified in the TMDL;

   e. The BMPs designed to reduce the pollutants of concern in accordance with Parts II B 4, B 5, and B 6;

   f. Any calculations required in accordance with Part II B 4, B 5, or B 6;

   g. For action plans developed in accordance with Part II B 4 and B 5, an outreach strategy to enhance the public's education (including employees) on methods to eliminate and reduce discharges of the pollutants; and

h. A schedule of anticipated actions planned for implementation during this permit term.

4. Bacterial TMDLs.

a. If the permittee is an approved VSMP authority, the permittee shall select and implement at least three of the strategies listed in Table 5 below designed to reduce the load of bacteria to the MS4. Selection of the strategies shall correspond to sources identified in Part II B 3 d.

b. If the permittee is not an approved VSMP authority, the permittee shall select at least one strategy listed in Table 5 below designed to reduce the load of bacteria to the MS4 relevant to sources of bacteria applicable within the MS4 regulated service area. Selection of the strategies shall correspond to sources identified in Part II B 3 d.

Table 5
Strategies for Bacteria Reduction Stormwater Control/Management Strategy

Source	Strategies (provided as an example and not meant to be all inclusive or limiting)
Domestic pets (dogs and cats)	Provide signage to pick up dog waste, providing pet waste bags and disposal containers. Adopt and enforce pet waste ordinances or policies, or leash laws or policies. Place dog parks away from environmentally sensitive areas. Maintain dog parks by removing disposed of pet waste bags and cleaning up other sources of bacteria. Protect riparian buffers and provide unmanicured vegetative buffers along streams to dissuade stream access.
Urban wildlife	Educate the public on how to reduce food sources accessible to urban wildlife (e.g., manage restaurant dumpsters and grease traps, residential garbage, feed pets indoors). Install storm drain inlet or outlet controls. Clean out storm drains to remove waste from wildlife. Implement and enforce urban trash management practices. Implement rooftop disconnection programs or site designs that minimize connections to reduce bacteria from rooftops Implement a program for removing animal carcasses from roadways and properly disposing of the same (either through proper storage or through transport to a licensed facility).

Illicit connections or illicit discharges to the MS4	Implement an enhanced dry weather screening and illicit discharge, detection, and elimination program beyond the requirements of Part I E 3 to identify and remove illicit connections and identify leaking sanitary sewer lines infiltrating to the MS4 and implement repairs. Implement a program to identify potentially failing septic systems. Educate the public on how to determine whether their septic system is failing. Implement septic tank inspection and maintenance program. Implement an educational program beyond any requirements in Part I E 1 though E 6 to explain to citizens why they should not dump materials into the MS4.
Dry weather urban flows (irrigations, carwashing,	Implement public education programs to reduce dry weather flows from storm sewers related to lawn and park irrigation practices, carwashing, powerwashing and other nonstormwater flows. Provide irrigation controller rebates.
powerwashing,	Implement and enforce ordinances or policies related to outdoor (etc.) water waste. Inspect commercial trash areas, grease traps, washdown practices, and enforce corresponding ordinances or policies.
Birds (Canadian geese, gulls, pigeons, etc.)	Identify areas with high bird populations and evaluate deterrents, population controls, habitat modifications and other measures that may reduce bird-associated bacteria loading. Prohibit feeding of birds.
Other sources	Enhance maintenance of stormwater management facilities owned or operated by the permittee. Enhance requirements for third parties to maintain stormwater management facilities. Develop BMPs for locating, transporting, and maintaining portable toilets used on permittee-owned sites. Educate third parties that use portable toilets on BMPs for use. Provide public education on appropriate recreational vehicle dumping practices.

5. Local sediment, phosphorus, and nitrogen TMDLs.

a. The permittee shall reduce the loads associated with sediment, phosphorus, or nitrogen through implementation of one or more of the following:

(1) One or more of the BMPs from the Virginia Stormwater BMP Clearinghouse listed in 9VAC25-870-65 or other approved BMPs found on the Virginia Stormwater BMP Clearinghouse website;

(2) One or more BMPs approved by the Chesapeake Bay Program; or

(3) Land disturbance thresholds lower than Virginia's regulatory requirements for erosion and sediment control and post development stormwater management.

b. The permittee may meet the local TMDL requirements for sediment, phosphorus, or nitrogen through BMPs implemented to meet the requirements of the Chesapeake Bay TMDL in Part II A as long as the BMPs are implemented in the watershed for which local water quality is impaired.

c. The permittee shall calculate the anticipated load reduction achieved from each BMP and include the calculations in the action plan required in Part II B 3 f.

d. No later than 36 months after the effective date of this permit, the permittee shall submit to the department the anticipated end dates by which the permittee will meet each WLA for sediment, phosphorus, or nitrogen. The proposed end date may be developed in accordance with Part II B 2.

6. Polychlorinated biphenyl (PCB) TMDLs.

a. For each PCB TMDL action plan, the permittee shall include an inventory of potentially significant sources of PCBs owned or operated by the permittee that drains to the MS4 that includes the following information:

(1) Location of the potential source;

(2) Whether or not the potential source is from current site activities or activities previously conducted at the site that have been terminated (i.e. legacy activities); and

(3) A description of any measures being implemented or to be implemented to prevent exposure to stormwater and the discharge of PCBs from the site.

b. If at any time during the term of this permit, the permittee discovers a previously unidentified significant source of PCBs within the permittee's MS4 regulated service area, the permittee shall notify DEQ in writing within 30 days of discovery.

7. Prior to submittal of the action plan required in Part II B 1, the permittee shall provide an opportunity for public comment proposed to meet the local TMDL action plan requirements for no less than 15 days.

8. The MS4 program plan as required by Part I B of this permit shall incorporate each local TMDL action plan. Local TMDL action plans may be incorporated by reference into the MS4 program plan provided that the program plan includes the date of the most recent local TMDL action plan and identification of the location where a copy of the local TMDL action plan may be obtained.

9. For each reporting period, each annual report shall include a summary of actions conducted to implement each local TMDL action plan.

Part III
Conditions Applicable to All State and VPDES Permits

NOTE: Discharge monitoring is not required for compliance purposes by this general permit. If the operator chooses to monitor stormwater discharges for informational or screening purposes, the operator does not need to comply with the requirements of Parts III A, B, or C.

A. Monitoring.

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitoring 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. Analyses performed according to test procedures approved under 40 CFR Part 136 shall be performed by an environmental laboratory certified under regulations adopted by the Department of General Services (1VAC30-45 or 1VAC30-46).

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

B. Records.

1. Monitoring records and reports shall include:

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

   b. The individuals who performed the sampling or measurements;

   c. The dates and times analyses were performed;

   d. The individuals 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 as may be performed in accordance with 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 that 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 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, department, or EPA 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 board, department, or EPA upon request, copies of records required to be kept by this state 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 § 62.1-44.5 of the Code of Virginia, except in compliance with a state permit issued by the department, 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, 40 CFR Part 302, or § 62.1-44.34:19 of the Code of Virginia 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" (Part III U) or "upset," (Part III V), 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 Part III I 2. Unusual and extraordinary discharges include 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 to the department shall be provided within 24 hours from the time the operator becomes aware of the circumstances. The following shall be included as information that shall be reported within 24 hours under this subdivision:

   a. Any unanticipated bypass; and

   b. Any upset that 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 department may waive the written report on a case-by-case basis for reports of noncompliance under Part 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 Part III I 1 or 2, in writing, as part of the annual reports that are submitted. The reports shall contain the information listed in Part III I 2.

   NOTE: The reports required in Part III G, H, and I shall be made to the department. Reports may be made by telephone, email, or fax. For reports outside normal working hours, leaving a recorded message shall fulfill the immediate reporting requirement. For emergencies, the Virginia Department of Emergency Management 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, including a registrations statement, to the department, the operator 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 that may meet one of the criteria for determining whether a facility is a new source in 9VAC25-870-420:

   b. The operator plans an 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 that 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 chapter, 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 that 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 chapter, 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 and other information. All reports required by state permits, including annual reports, and other information requested by the board or department shall be signed by a person described in Part 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 Part 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 signed and dated written authorization is submitted to the department.

3. Changes to authorization. If an authorization under Part III K 2 is no longer accurate because a different individual or position has responsibility for the overall operation of the MS4, a new authorization satisfying the requirements of Part 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 Part 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. 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" (Part III U), and "upset" (Part 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 and in compliance with all applicable state and federal laws and regulations.

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 ensure efficient operation. These bypasses are not subject to the provisions of Part III U 2 and U 3.

2. Notice.

   a. Anticipated bypass. If the operator knows in advance of the need for a bypass, the operator shall submit prior notice to the department, 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 Part III I.

3. Prohibition of bypass.

   a. Except as provided in Part III U 1, bypass is prohibited, and the board or department 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 Part III U 2.

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

V. Upset.

1. An "upset," as defined in 9VAC25-870-10, means an exceptional incident in which there is unintentional and temporary noncompliance with technology based state permit effluent limitations because of factors beyond the reasonable control of the operator. 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.

2. An upset constitutes an affirmative defense to an action brought for noncompliance with technology-based state permit effluent limitations if the requirements of Part III V 4 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.

3. 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.

4. 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 causes 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 Part III I; and

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

5. 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, EPA, or an authorized representative (including an authorized contractor), 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 and photograph 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 ensuring 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 Part 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 Part III Y 1, this state permit may be automatically transferred to a new operator if:

a. The current operator notifies the department at least 30 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 department 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 Part 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.

APPENDIX B

JBM-HH 2018 GENERAL PERMIT REGISTRATION STATEMENT

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

REPLY TO
ATTENTION OF

Environmental Management Division

1 June 2018

Mr. Jeffrey Selengut, MS4 Permit Writer
Department of Environmental Quality
1111 East Main Street, Suite 1400
Richmond, VA 23219

Subject: Registration Statement Coverage for Joint Base Myer-Henderson Hall under VPDES General Permit Number VAR040068, Small Municipal Separate Storm Sewer System (MS4)

Dear Mr. Selengut:

This submittal provides the Registration Statement for Joint Base Myer-Henderson Hall (JBM-HH), Arlington, Virginia to obtain coverage under the 2018 General VPDES Permit for Discharges of Stormwater from Small MS4s [VAR04] for.

Enclosed, please find copies of the certified Registration Statement and JBM-HH's Draft Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan.

Sincerely,

Richard P. LaFreniere
Chief
Environmental Management Division, DPW

Enclosures
JBM-HH Registration Statement
Draft Chesapeake Bay TMDL Action Plan

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VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY GENERAL PERMIT REGISTRATION STATEMENT FOR STORMWATER DISCHARGES FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS (VAR04)

Section I. General Information

A. Owner/Operator Information:

Name of Owner Applying for Permit Coverage: **Department of the Army, Joint Base Myer-Henderson Hall**		
Mailing Address: **204 Lee Avenue, Suite 207**		
City: **Fort Myer**	State: **VA**	Zip Code: **22211-1116**
Phone Number: **(703) 696-8055**		

B. Responsible Official *(Please note that for municipality, state, federal, and other public agencies, the responsible official is defined in 9VAC25-870-370 A.3 as either a principal executive officer or ranking elected official. A principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency)*

Name: **Colonel Kimberly A. Peeples**		
Title: **Joint Base Commander, Joint Base Myer-Henderson Hall**		
Mailing Address: **204 Lee Avenue, Suite 207**		
City: **Fort Myer**	State: **VA**	Zip Code: **22211-1116**
E-mail Address: **kimberly.a.peeples.mil@mail.mil**		
Phone Number: **(703) 696-3250**		

C. MS4 Permit Contact

Name: **Richard P. LaFreniere**		
Title: **Chief, Environmental Management Division**		
Mailing Address: **111 Stewart Road, Building 321**		
City: **Fort Myer**	State: **VA**	Zip Code: **22211-1116**
E-mail Address: **richard.p.lafreniere2.civ@mail.mil**		
Phone Number: **(703) 696-8055**		

D. MS4 Maintenance Fee Contact

Name: **Richard P. LaFreniere**		
Title: **Chief, Environmental Management Division**		
Mailing Address: **111 Stewart Road, Building 321**		
City: **Fort Myer**	State: **VA**	Zip Code: **22211-1116**
E-mail Address: **richard.p.lafreniere2.civ@mail.mil**		
Phone Number: **(703) 696-8055**		

E. Small MS4 Information

Name: **Joint Base Myer-Henderson Hall**		
MS4 Ownership Type: ☐City ☐County ☐Incorporated Town ☐Unincorporated Town ☐College or University		
☐Local School Board ☒Military Installation ☐Transportation System ☐Federal Facility ☐State Facility		
☐Other ( )		
Facility Address (applicable to state and federal entities only):		
Street: **204 Lee Avenue, Suite 107**		
City: **Fort Myer**	State: **VA**	Zip Code: **22211-1116**

F. List The Names Of Any Physically Interconnected MS4s To Which The Small MS4 Discharges

1) Arlington County MS4
2) Arlington National Cemetery (ANC) MS4

Section II. Stormwater Discharge Information (attach additional sheets as necessary. Permittees may attach alternative tables or spreadsheets in lieu of completing the tables below, as long as all information required below is included)

A. Receiving Water Information: Provide a list of all surface waters receiving discharges from the MS4

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 Four Mile Run.

B. Impaired Waters Information: List all surface waters receiving direct discharges from the MS4, that are listed in the 2016 Virginia 303(d)/305(b) Water Quality Assessment Integrated Report.

Long Branch Creek and the non-tidal portion of Four Mile Run to which Long Branch Creek drains (about 0.8 mile south of JBM-HH) are designated as impaired for fecal coliform on Virginia's 305(b)/303(d) 2016 list of impaired waters. The portion of the Potomac River east of Arlington Cemetery that receives Fort Myer discharges is listed on Virginia's 305(b)/303(d) 2016 list of impaired waters as impaired for dissolved oxygen and polychlorinated biphenyls (PCBs).

Section III. Storm Water Management Program Agreements (please attach additional sheets as necessary)

Agreements: *Attach a list of 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*

Description of Agreement	Permit Requirement(s) Covered by the Agreement	Third Parties Participating in Agreement
Contract with the U.S. Army Corps of Engineers (USACE) to conduct annual inspections of stormwater management facilities (SMFs) on base and submit documentation of the inspections and deficiencies noted so that they may be corrected.	Operate an inspection program for those SMFs owned or operated by JBM-HH that discharge to the MS4.	USACE

Section IV. Draft Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan

Attach a copy of the draft second phase Chesapeake Bay TMDL Action Plan in accordance with Section I.C.5 of the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems effective July 1, 2013.

See Attachment 1.

Section V. Certification Statement and Signature

Read and sign the following certification statement below that is in accordance with 9 VAC 25-870-370 D:

"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 Kimberly A. Pepples**

Title: **Joint Base Commander**

Signature: KimberlyAPepples

Date: 24 May 2018

For Department of Environmental Quality Use Only

Accepted Not Accepted

DEQ Reviewer:

Date:

Comments:

APPENDIX C

CHESAPEAKE BAY TMDL ACTION PLAN & PCB 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

UPDATED - JUNE 2018

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

and

US Army Environmental Command
2450 Connell Road
Fort Sam Houston, TX 78234-7664

Prepared by:

U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, Maryland 21203

UPDATED - JUNE 2018

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 make 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 sediment, measured as 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 2018.

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 as runoff from 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. BMP's will be inspected in 2018 as part of MS4 permit requirements.

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 were 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 demolition of a barracks building and the land's conversion from impervious surface to grass contributed to 15.07 lbs of TN, 1.61 lbs of TP, and 747.94 lbs of TSS per year of the required reductions. The remaining 245.65 lbs of TN, 34.70 lbs of TP, and 30,787.83 lbs of TSS per year may be reduced through proposed structural and non-structural BMPs.

In 2016 and 2017, five new BMP construction contracts were awarded; upon completion, these satisfy Permit Cycle 1 requirements. BMPs such as grass swales, bio-swales, bio-retention ponds, and impervious area removal were implemented to treat total of 1.96 impervious acres with 4.46 lbs TP, 32.12 lbs TN, and 1902.46 lbs TSS per year removed. Specific information can be found in Table 6.4.

Additional areas in JBM-HH where BMPs can be implemented to achieve these reductions are identified in Section 7 of this report. A schedule for BMP implementation to satisfy each permit cycle requirement is included in Section 8.

Costs

The total cost to implement BMPs to satisfy the first phase of the permit for JBM-HH was $2,995,239, excluding the cost of the building demolition. This includes BMPs constructed or in the process of being constructed in FY 17 and 18. The cost to construct the proposed BMPs listed in Section 7 has yet to be determined.

Installation Point of Contact

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

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ATTACHMENTS

Project Disc containing: GIS Data, Updated BMP Database and Digital Report

WORKS CITED

DCR. (1999). *Virginia Stormwater Management Handbook.* Virginia Department of Conservation and Recreation.

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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). 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 body (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 still 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 2018.

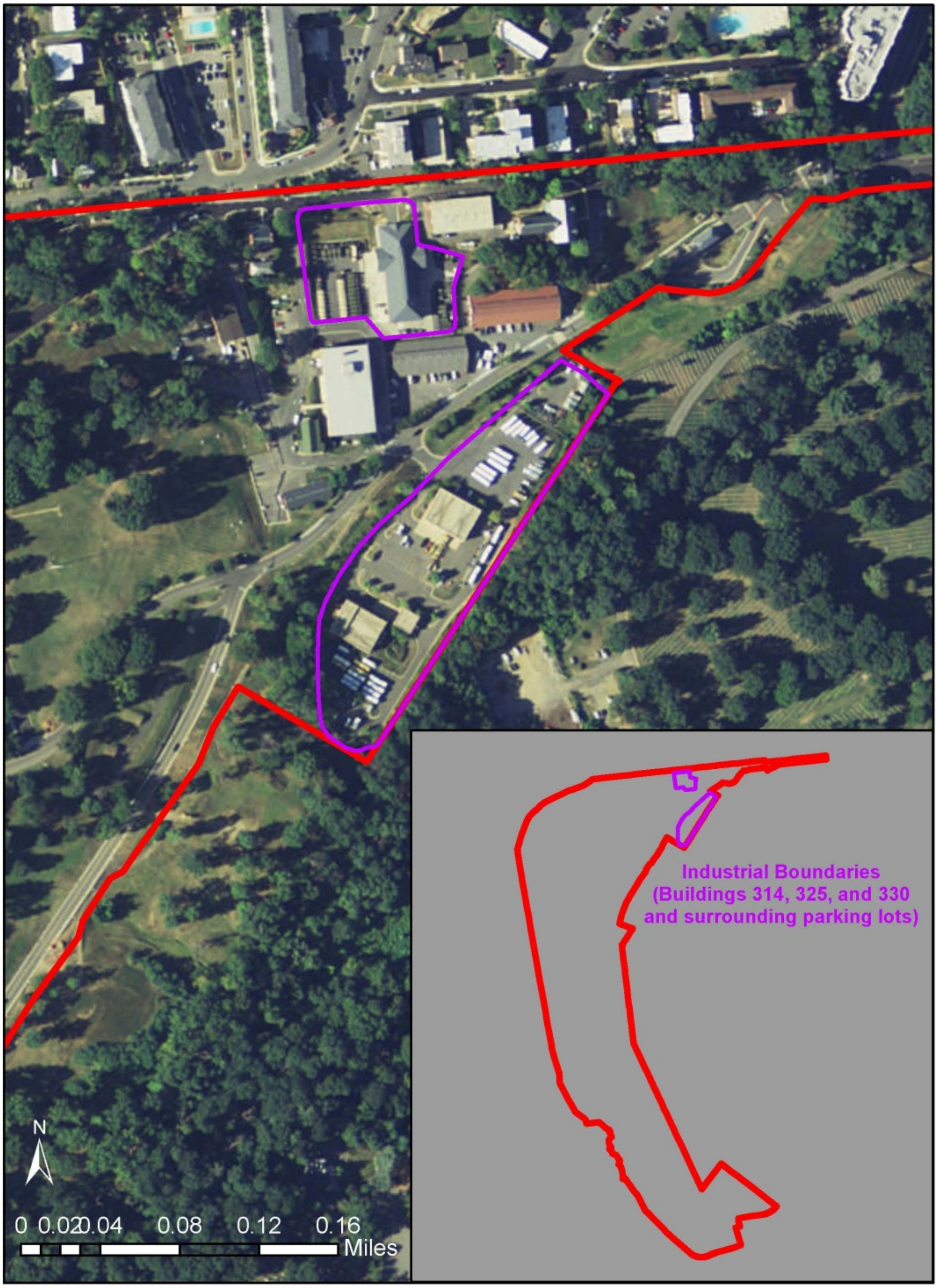
1.2 STUDY AREA

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

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 8
9, 12	Section 9

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 developed and approved in 2016 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.

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).

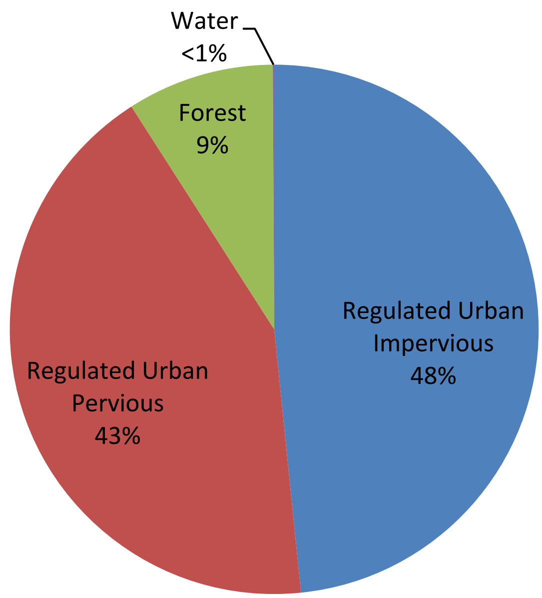
The EPA required each state to submit guidance for how to achieve the goals set forth in the WIP. Virginia Department of Environmental Quality provided draft guidance to USACE in 2013, which provided instructions to permittees for estimating pollutant source loads as of June 30, 2009 (DEQ, 2015). Before 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).

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) is considered part of the Arlington National Cemetery survey group and was therefore not identified. 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. The shapefiles are attributed with soil type and Hydrologic Soil Group (HSG). Figure 3-2 and Table 3-2 summarize JBM-HH soil groups. **Error! Reference source not found.**

FIGURE 3-2 – HYDROLOGIC SOIL GROUPS

TABLE 3-2 SOIL GROUP DISTRIBUTION

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

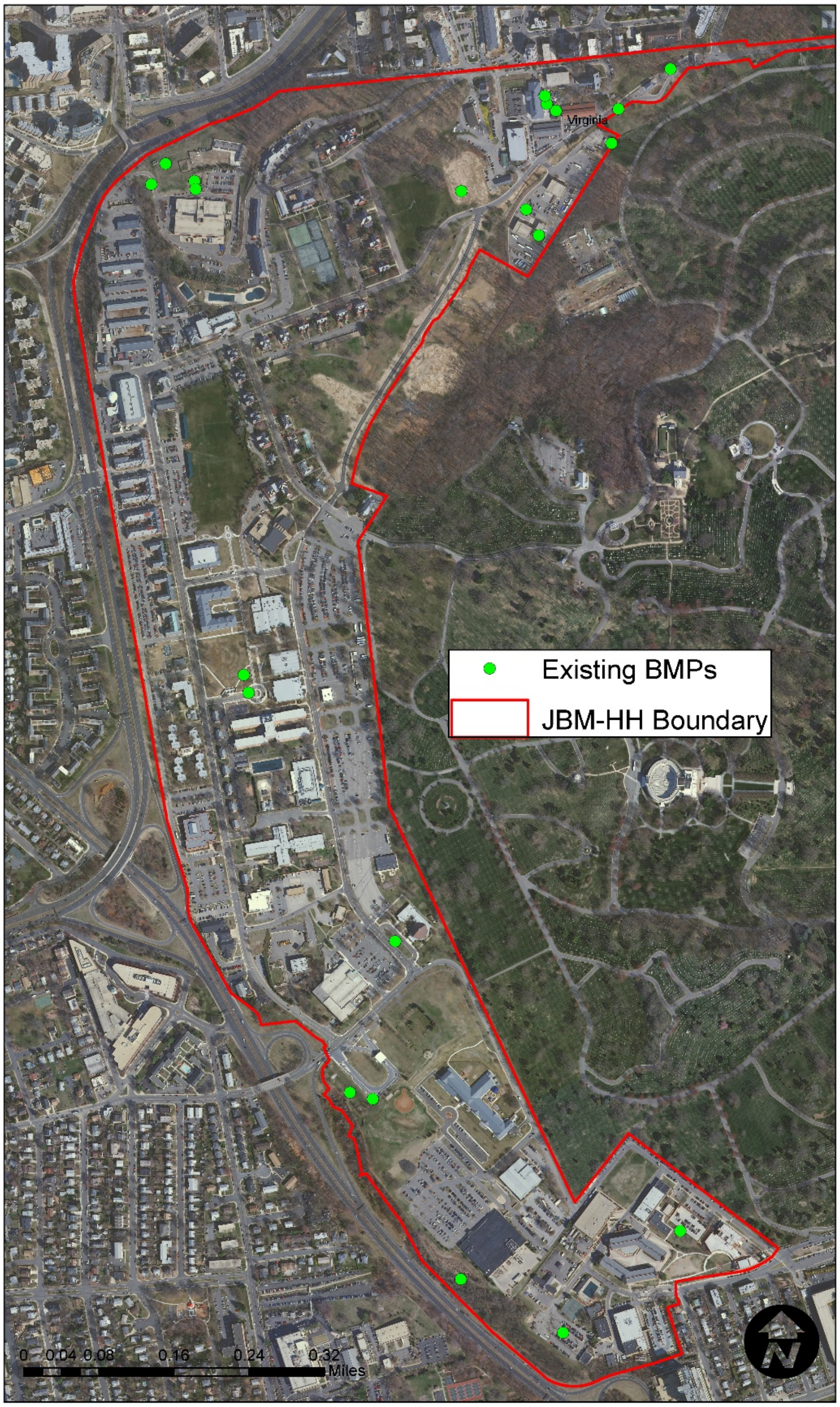
3.3 STORMWATER BEST MANAGEMENT PRACTICES (BMPs)

BMPs were inventoried and inspected annually during the first permit cycle. Drainage areas were established using the final as-built drawings or design plans. For BMPs were plans were not available, drainage areas were delineated using Light Detection and Ranging (LiDAR) data, Digital Elevation Modeling (DEM), topographic contours, and 2009 aerials (TMDL Action Plan baseline year). BMPs were delineated to include all stormwater conveyed to them through existing infrastructure. Figure 3-3 shows the location of all existing BMPs. Data pertaining to each BMPs has been stored in an Access database and GIS are both included on the project disk.

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 EXISTING BMPS



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. Another round of inspections will be performed in 2018.

4.1 STORMWATER BMP INVENTORY AND INSPECTION

During initial BMP evaluations in 2011, 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. This section will be updated after completion of construction and inspection of the 5 BMPs currently under construction.

The end product of the stormwater BMP inventory and inspections is the BMP database, which is discussed in Section 4-2. An overall rating was assigned to each BMP; for the BMPs constructed prior to 2011, the rating was based on field evaluations. All BMPs under construction or with a contract awarded before 2017 will be inspected and rated during the 2018 inspections. 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 for the initial TMDL Action Plan submittal in 2016. The BMPs 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 BMPs in the BMP Access Database, which is discussed in Section 4-2.

TABLE 4-2 BMP INVENTORY RESULTS*

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

TABLE 4-3 BMP INSPECTION RESULTS*

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

TABLES 4-2, 4-3 WILL BE UPDATED WHEN 2018 INSPECTIONS ARE COMPLETE – 9 BMPS WILL BE ADDED TO THE INVENTORY.

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. 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 is located 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 POLLUTANT LOADS

	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 ESTIMATED POLLUTANT LOAD REDUCTIONS

By 2028, JBMHH is prepared to meet their targeted pollutant load reduction. Table 6-1 summarizes the percent pollution reduction requirements for impervious and pervious landuse

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%

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. 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).

VA TMDL Guidance provided a table of CBP BMP load reduction efficiencies, which were used to calculate BMP pollutant removal rates.

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 6-2.

TABLE 6-2 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	13.04	91.25	260.72
TP	1.82	12.71	36.31
TSS	1,576.79	11,037.52	31,535.77

Table 6-3 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). *Permit cycle 1 goals were met; total POC reductions are seen in Table 6.3.*

TABLE 6-3 FIRST PERMIT CYCLE REDUCTIONS

Sub-source	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)**	Actual First Permit Cycle Total Achieved (lbs/yr) and % 2028 *
Regulated Urban Impervious	Nitrogen	127.27	0.08	10.18	47.20 (18.1%)
Regulated Urban Pervious		111.88	0.03	3.36	
Regulated Urban Impervious	Phosphorus	127.27	0.01	1.27	6.07 (16.7%)
Regulated Urban Pervious		111.88	0.001	0.11	
Regulated Urban Impervious	Total Suspended Solids	127.27	11.71	1,490.33	2650.40 (8.4%)
Regulated Urban Pervious		111.88	0.77	86.15	

*BMPs awarded in 2016 and 2017 for construction and 2014 demolition

**Table 3b: 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)

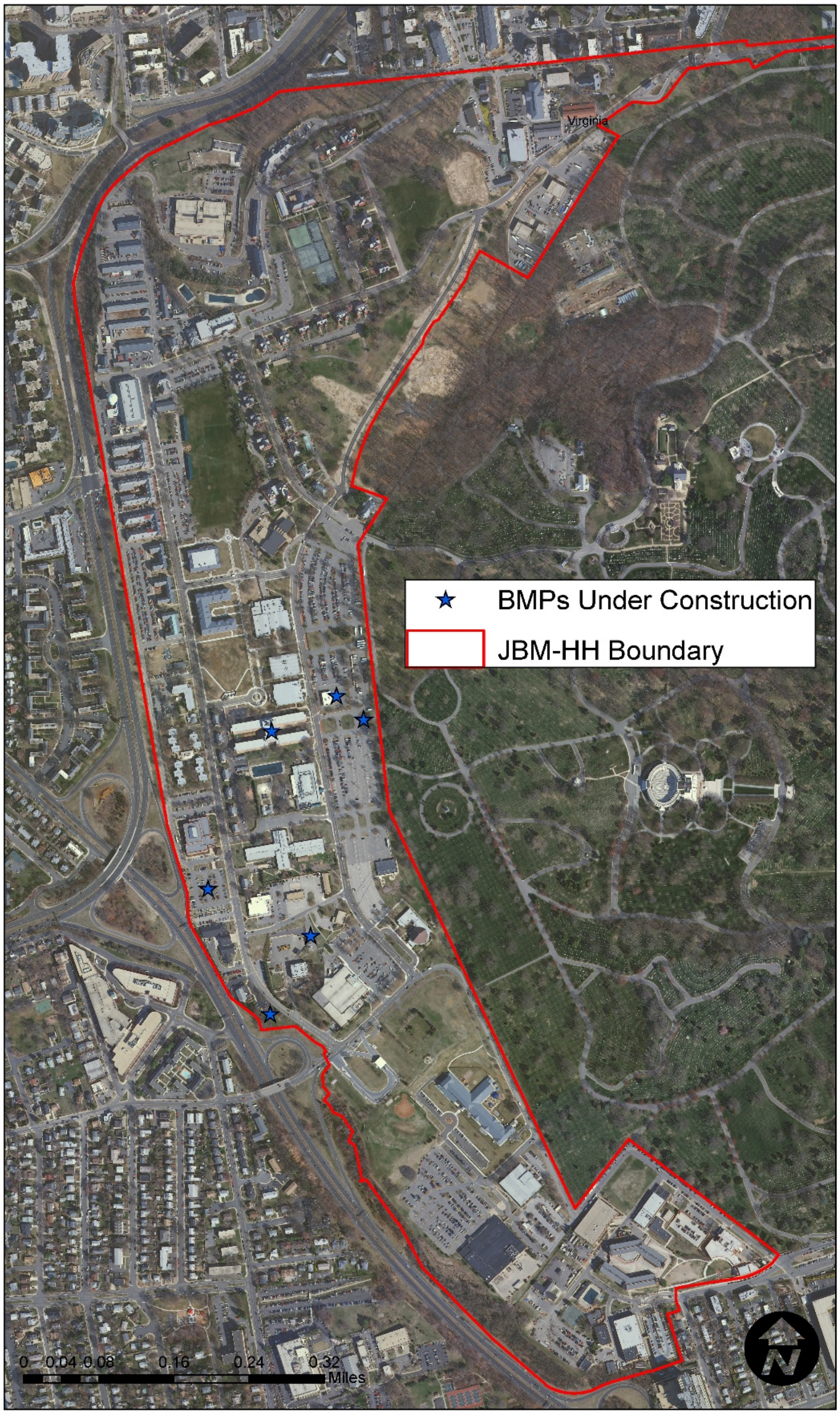
6.1 FIRST PERMIT CYCLE PROGRESS

First Permit Cycle goals were met by awarding contracts for five new BMPs to be built, as well as demolishing building 406 in 2014, which converted the area from impervious surface to grass. Reduction totals from permit cycle one can be seen in table 6-4. Figure 6.1 shows the location of all BMPs to be implemented to meet the first permit cycle goals. VA TMDL Guidance provided a table of CBP BMP load reduction efficiencies, which were used to calculate BMP pollutant removal rates.

TABLE 6-4 FIRST PERMIT CYCLE ESTIMATED POLLUTANT REDUCTION BY BMP

First Permit Cycle BMPs	TN Removed (lbs/yr)	TP Removed (lbs/yr)	TSS Removed (lbs/yr)
Building 406 Demolition	15.07	1.61	747.94
Bio-swale near Sheridan Ave and Pershing Dr.	2.84	0.41	212.90
Permeable Pavement near Sheridan Ave and Pershing Dr.	2.11	0.30	179.62
Bioswale near the Fitness Center Parking Lot	2.63	0.38	165.10
Bio-retention – East Lot Island	8.71	1.19	423.44
Bio-retention and Permeable Pavement at Motorcycle	15.84	2.18	921.40
% 2028 Goal	18.1%	16.7%	8.4%

FIGURE 6-1 FIRST PERMIT CYCLE BMPS UNDER CONSTRUCTION



7 PLAN FOR REMAINING 2028 POLLUTANT LOAD GOALS

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. This section looks at recommended BMPs to meet the remaining 2028 load reductions as outlined in Table 6-2.

7.1 STREET SWEEPING

Street sweeping estimates for TN and TP are based on the Qualifying Lanes Method detailed in the VA TMDL Guidance. TSS loading rates have not been adopted by VADEQ to date, therefore, the 2017 "Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices" approved by the Chesapeake Bay Expert Panel. Lane miles were calculated using GIS mapping of the facility. Expected pollutant reductions per year for three separate scenarios are shown in Table 7-1

TABLE 7-1 STREET SWEEPING REDUCTIONS

	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)
Regenerative/Vacuum ***Street*** Sweeping of ~ 16.5 acres every two weeks	30.82	4.80	13,006.70
% 2028	**12%**	**13%**	**41%**
Regenerative/Vacuum ***Parking Lot*** Sweeping of ~ 40.27 acres every two weeks	75.18	11.72	31,731.70
% 2028	**29%**	**32%**	**100%**
Regenerative/Vacuum ***Street and Parking Lot*** Sweeping every two weeks	106.00	16.52	44,738.40
% 2028	**41%**	**46%**	**142%**

7.2 ADDITIONAL PROPOSED BMPs

Millennium Vault Retrofit

The existing Millennium Stormwater Detention Vault is only used for volume control. The Millennium Vault is a good candidate for water quality retrofit. The proposed plan would be to incorporate proprietary filter cartridges either upstream or in the actual vault to pre-treat the first flush stormwater. The vault could also include a rainwater harvesting component to maximize water quality credits. Table 7.2 shows the removal estimate with and without rainwater harvesting and Figure 7-2 shows the location of the vault and associated drainage area.

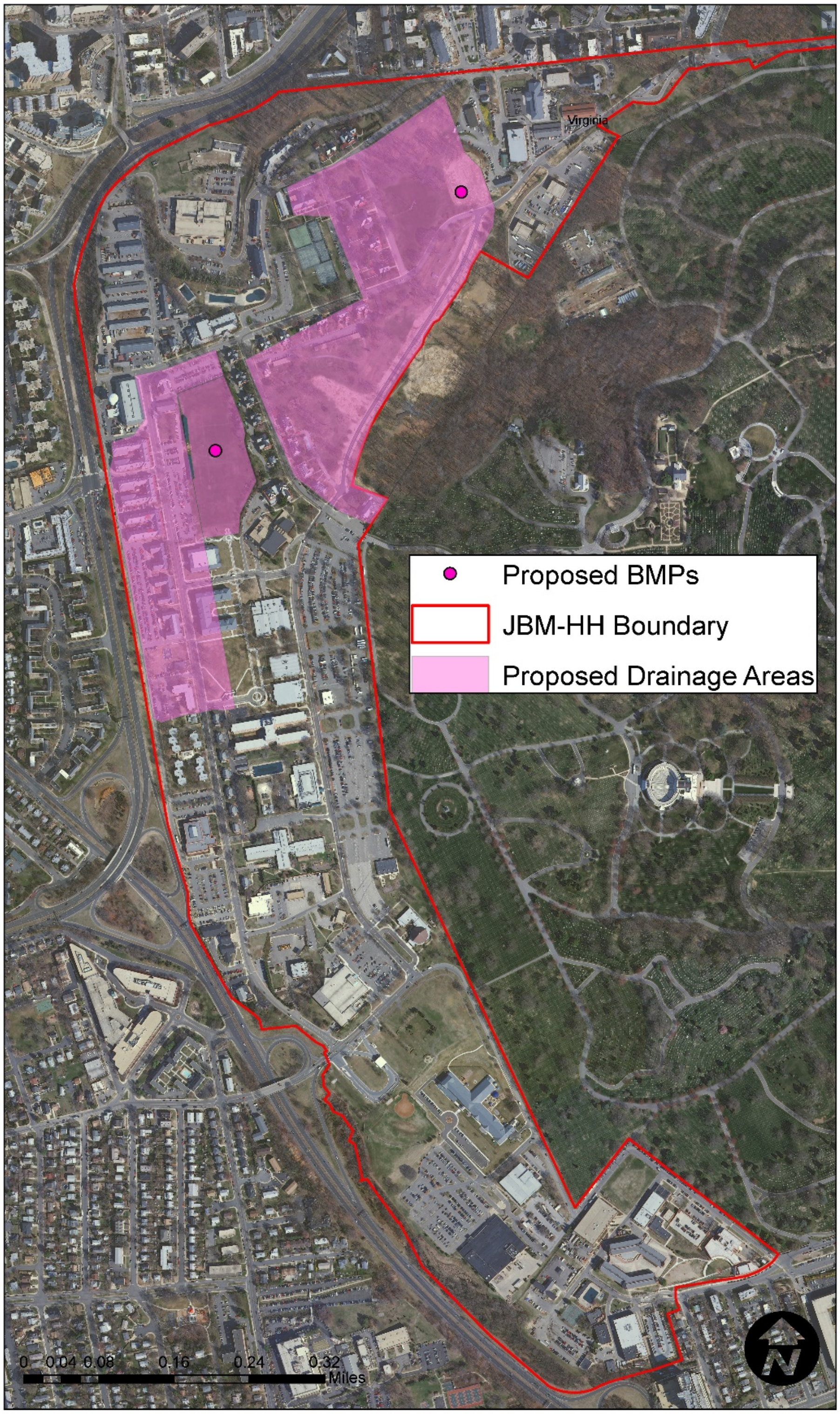
Summerall Field Rainwater Harvesting

The proposed BMP for Summerall Field is a relatively new take on rainwater harvesting. The field will be filled with sand that has a 29% void space. The profile will maintain a 4"-5" depth that is completely saturated in the bottom. Stormwater will be diverted to the sand bed profile and distributed through a 6"-8" dia. PVC "Header" with dozens of 2" pipe connections that extend into EPIC Chambers, followed by a 2" diameter pipe section to another EPIC chamber. The stormwater will be evenly distributed across the entire parade field. Underground detention vaults will be placed upstream of Summerall Field and will retain peak flow to maintain a slow release into the sand bed profile. Once the water enters the parade field it can only: 1) evaporate, 2) transpire through the growth of grass, or 3) discharge (after being filtered from moving through the sand bed) into an overflow pipe that will be connected to an existing stormdrain pipe/system. Table 7.2 show the removal estimates for the proposed Summerall Field Rainwater Harvesting BMP and Figure 7-2 shows the location of the proposed BMP and associated drainage area

TABLE 7-1 PROPOSED BMP REDUCTIONS

	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)
Millennium Vault Retrofit without Rainwater Harvesting (Filter Cartridges only)	50.70	10.42	5,155.00
% 2028	**19%**	**29%**	**16%**
Millennium Vault Retrofit with Rainwater Harvesting	80.00	12.00	7,500.00
% 2028	**31%**	**33%**	**24%**
Summerall Field Rainwater Harvesting	293.10	28.16	20,362.70
% 2028	**112%**	**78%**	**65%**

FIGURE 7-1 PROPOSED BMPS



7.3 SUMMARY

The proposed BMPs outlined in this section are summarized in Table 7-3. A combination of these BMPs will satisfy the final 2028 TMDL Action Plan reduction goal. To meet the 2nd permit cycle 40% intermediate goal, it is recommended that a combination of street sweeping and either the Millennium Vault or Summerall field be implemented by 2023.

***TABLE 7-3 SUMMARY OF PROPOSED BMPS**

	BMP Pollution Reduction (lb/year)			Cumulative Percent of Total Goal		
AOI	**TN**	**TP**	**TSS**	**TN**	**TP**	**TSS**
Street Sweeping (Roads only)	30.82	4.80	13,006.70	**12%**	**13%**	**41%**
Street Sweeping (Parking Lots Only)	75.18	11.72	31,731.70	**29%**	**32%**	**100%**
Street Sweeping (Both Roads and Parking)	106.00	16.52	44,738.40	**41%**	**46%**	**142%**
Millennium Vault (Filter, no RWH)	50.70	10.42	5,155.00	**19.4%**	**28.7%**	**16.3%**
Millennium Vault (Filter, with RWH)	80.00	12.00	7,500.00	**31%**	**33%**	**24%**
Summerall Field	293.10	28.16	20,362.70	**112.42%**	**77.55%**	**64.57%**

*2028 Reduction Goals are 260.72 for TN, 36.31 for TP, and 31,535.77 for TSS

8 IMPLEMENTATION SCHEDULE AND COSTS

Schedule:
VA TMDL Guidance provides a timeline for when these pollutant load reductions must be implemented, as describe in Table 6.2.

In addition to the pollution reduction credits attributed to the Phase one implementation of 5 BMPS and building 401 Demolition, street sweeping, millennium vault, and drainage field are recommended to meet permit cycle two (2023) and three (2028) pollutant reduction goals. Table 8-1 provides a recommended schedule to meet the final 2028 TMDL Action Plan goals.

TABLE 8-1 RECOMMENDED SCHEDULE TO MEET ACTION PLAN REDUCTION GOALS

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	*13.04	**91.25	***260.72
TP	*1.82	**12.71	***36.31
TSS	*1,576.79	**11,037.52	***31,535.77

*First permit cycle reduction goals have been met. Construction contracts have been awarded for five BMPs that are currently either complete or under construction.
**Second permit cycle reductions goals will be met by implementing recommended BMPs outlined in Section 7.
*** Third permit cycle reductions goals will be met by implementing recommended BMPs outlined in Section 7.

Cost:
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 total cost to implement BMPs to satisfy the first phase of the permit for JBM-HH was $2,995,239, excluding the cost of the building demolition.

Costs for street sweeping, millennium vault, and Summerall field are all currently unknown and will be updated once design is initiated.

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, and 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.

9 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. Permit cycle one successfully met the pollutant reduction goals by implementing five stormwater BMPs and demolition of building and converting to pervious. If Street sweeping of roads, a filter is added to the Millennium Vault, and Summerall Field Rainwater Harvesting are implemented (or some combination of the three), JBMHH will exceed their pollutant reduction goals by 2028. The cost to implement the proposed structural BMPs proposed to meet these requirements is unknown and will require a more in depth engineering and cost analysis.

JBM-HH will release the Action Plan information to the public on or around 1 August 2018. 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.

APPENDIX A

ORIGINAL TMDL ACTION PLAN (2015)

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CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD (TMDL) ACTION PLAN 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 2**
Hopkins Plaza
Baltimore, Maryland 21201

DECEMBER 2015
REVISED OCTOBER 2019

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

Prepared for:

Joint Base Myer-Henderson Hall Directorate of Public Works 111 Stewart Rd, Bldg 321
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REVISED OCTOBER 2019

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 make 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 sediment, measured as 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 was performed to satisfy the Chesapeake Bay TMDL Action Plan requirement in Section I C of the 2013 Virginia General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (2013 MS4 General Permit). This document has been revised to comply with the 2018 MS4 General Permit issued by the Virginia Department of Environmental Quality (DEQ) and effective 01 November 2018.

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 as runoff from 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. BMP’s will be inspected in 2018 as part of MS4 permit requirements.

Establishment of Baseline Pollutant Loads

DEQ published guidance for pollutant load reduction requirements (DEQ, 2015) that 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 pounds (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 were 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 demolition of a barracks building and the land’s conversion from impervious surface to grass contributed to 15.07 lbs of TN, 1.61 lbs of TP, and 747.94 lbs of TSS per year of the required reductions. The remaining 245.65 lbs of TN, 34.70 lbs of TP, and 30,787.83 lbs of TSS per year may be reduced through proposed structural and non-structural BMPs.

In 2016 and 2017, five new BMP construction contracts were awarded; upon completion, these satisfy Permit Cycle 1 requirements. BMPs such as grass swales, bio-swales, bio-retention ponds, and impervious area removal were implemented to treat total of 1.96 impervious acres with 4.46 lbs TP, 32.12 lbs TN, and 1902.46 lbs TSS per year removed. Specific information can be found in Table 6.4.

Additional areas in JBM-HH where BMPs can be implemented to achieve these reductions are identified in Section 7 of this report. A schedule for BMP implementation to satisfy each permit cycle requirement is included in Section 8.

Costs

The total cost to implement BMPs to satisfy the first phase of the permit for JBM-HH was $2,995,239, excluding the cost of the building demolition. This includes BMPs constructed or in the process of being constructed in FY 17 and 18. The cost to construct the proposed BMPs listed in Section 7 has yet to be determined.

Installation Point of Contact

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

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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
Environmental Passive Integrated Chamber .... EPIC
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). 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 body (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 still 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 describes the Chesapeake Bay as a “national treasure” and intends to bring more accountability to Bay cleanup efforts (FLCC, 2009). 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 was 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 the use of certain fertilizers.
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 existing BMPs were identified to avoid proposing new BMPs to treat overlapping areas.
Stormwater Infrastructure	Stormwater infrastructure data show 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 would be favorable to reduce pollutant loads to the Chesapeake Bay. The BMP database 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 was undertaken to satisfy the Chesapeake Bay TMDL Action Plan requirement in Section I C of the 2013 Virginia General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (2013 MS4 General Permit). This document has been revised to comply with the 2018 MS4 General Permit issued by the Virginia Department of Environmental Quality (DEQ) and effective 01 November 2018.

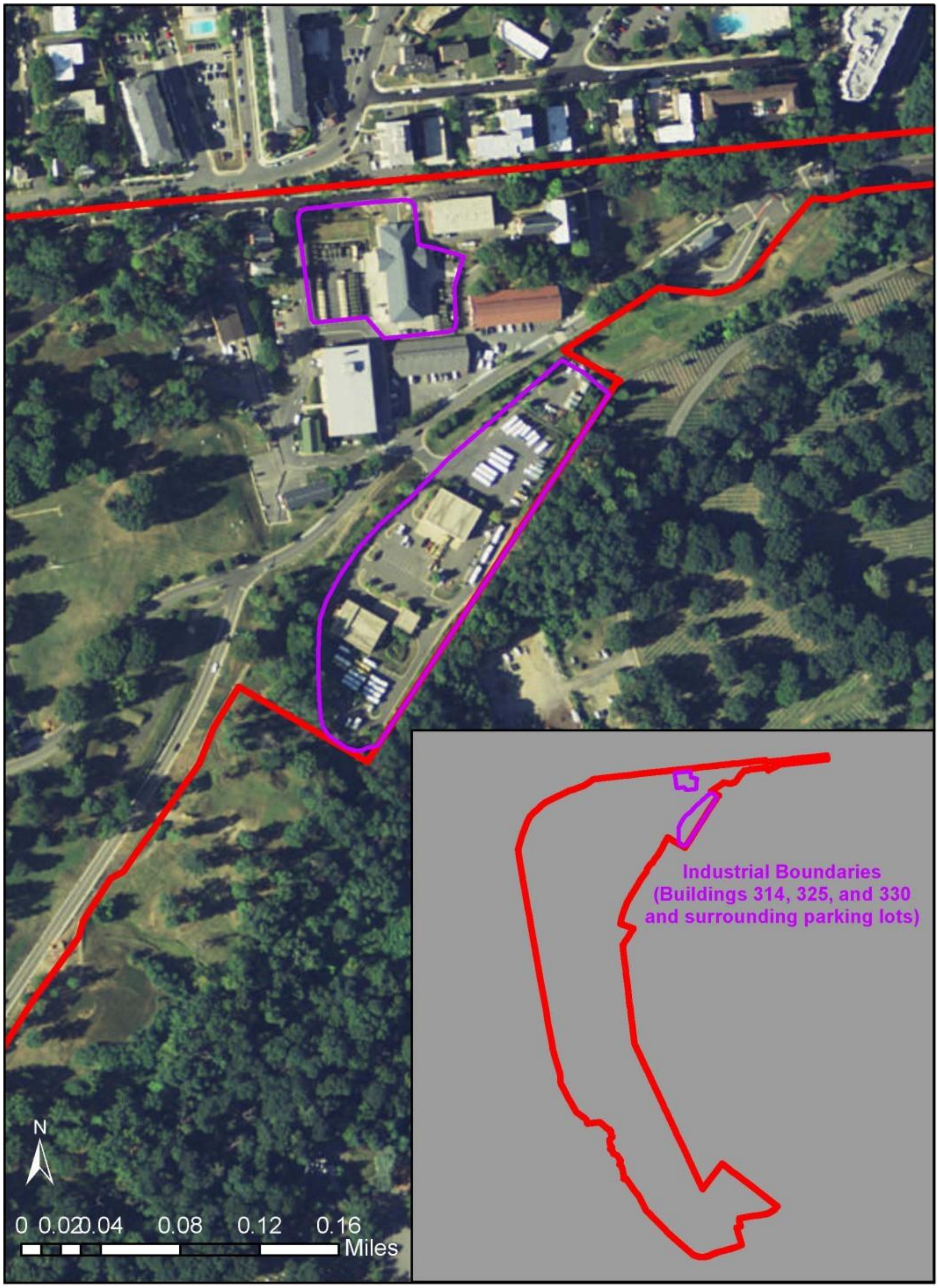
1.2 STUDY AREA

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 2018 General MS4 Permit Part II.A.11 requirements are described in the following sections of this report. Section 2 reviews the current and future MS4 program and legal authorities (II.A.11.a). 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. Section 6 details the nutrient reduction requirements and a plan to meet those requirements. Section 7 shows the suggested BMPs implementation schedule. Section 8 explains the costs to complete the reduction requirements. Section 9 includes conclusions from this study.

TABLE 1-2 RELATING MS4 PERMIT TO THIS REPORT

MS4 Permit Requirement for Action Plan Update	Section in Action Plan
Part II.A.11.a. New or modified legal authorities.	Section 2
Part II.A.11.b. The load and cumulative reduction calculations.	Section 6
Part II.A.11.c. Total reductions achieved in first permit cycle.	Section 6.1
Part II.A.11.d. A list of BMPs implemented to achieve reductions, including date of implementation and reductions achieved.	Section 6.1
Part II.A.11.e. The BMPs to be implemented by the permittee prior to the expiration of this permit to meet the cumulative reductions.	Section 7
Part II.A.11.f. Summary of any comments received as a result of public participation, responses, and resulting revisions made to the Action Plan.	Section 7.3

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 developed and approved in 2016 to address the Installation's compliance with the 2013 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 base-wide policy was updated in September 2019 to reflect the 2018 MS4 Permit.

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 Classifications).

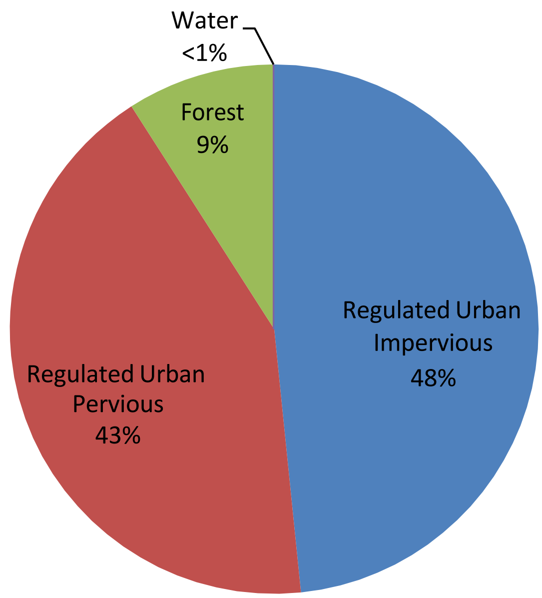
The EPA required each state to submit guidance for how to achieve the goals set forth in the WIP. Virginia Department of Environmental Quality provided draft guidance to USACE in 2013, which provided instructions to permittees for estimating pollutant source loads as of June 30, 2009 (DEQ, 2015). Before 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. 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).

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) is considered part of the Arlington National Cemetery survey group and was therefore not identified. 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. The shapefiles are attributed with soil type and Hydrologic Soil Group (HSG). Figure 3-2 and Table 3-2 summarize JBM-HH soil groups.

FIGURE 3-2 – HYDROLOGIC SOIL GROUPS

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 STORMWATER BEST MANAGEMENT PRACTICES (BMPS)

BMPs were inventoried and inspected annually during the first permit cycle. Drainage areas were established using the final as-built drawings or design plans. For BMPs where plans were not available, drainage areas were delineated using Light Detection and Ranging (LiDAR) data, Digital Elevation Modeling (DEM), topographic contours, and 2009 aerials (TMDL Action Plan baseline year). BMPs were delineated to include all stormwater conveyed to them through existing infrastructure. Figure 3-3 shows the location of all existing BMPs.

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 have previously been submitted to DEQ.

FIGURE 3-3 EXISTING BMPS

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

During initial BMP evaluations in 2011, 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. Aboveground and underground BMPs at JBM-HH were then inspected by USACE in April and August of 2018 and again in September 2019. The 2019 inspections included the five recently-installed BMPs constructed on base to meet the first permit cycle reduction goals.

The end product of the stormwater BMP inventory and inspections is the BMP database, which is discussed in Section 4-2. An overall rating was assigned to each BMP; for the BMPs constructed prior to 2011, the rating was based on field evaluations. All BMPs with a contract awarded in 2016 and 2017 were inspected and rated during the 2018 inspections. 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 for the initial TMDL Action Plan submittal in 2016. The BMPs were inventoried by the USACE field crew in 2011. Inspections were again conducted in 2018, where an additional 11 BMPs were added to the inventory for a total of 23 BMPs. Table 4-2 shows the BMP Inventory Results and Table 4-3 shows the inspection results based on condition ratings. The location and type of BMPs are recorded for the BMPs in the BMP Access Database, which is discussed in Section 4.2.

TABLE 4-2 BMP INVENTORY RESULTS

BMP type	Number
Filtration	7
Infiltration	1
Manufactured	6
Miscellaneous	3
Ponds	6

TABLE 4-3 BMP INSPECTION RESULTS

Rating	Number
A	7
B	9
C	2
D	4
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. 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 is located 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 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).

TABLE 5-1 BASELINE POLLUTANT LOADS

Regulated Urban Land Use Type	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
Impervious	Nitrogen	127.27	16.86	2,145.77
Pervious		111.88	10.07	1,126.63
Impervious	Phosphorus	127.27	1.62	206.18
Pervious		111.88	0.41	45.87
Impervious	Suspended Solids	127.27	1,171.32	149,073.90
Pervious		111.88	175.80	19,668.50

6 ESTIMATED POLLUTANT LOAD REDUCTIONS

By 2028, JBMHH is prepared to meet their targeted pollutant load reduction. Table 6-1 summarizes the percent pollution reduction requirements for impervious and pervious land useL2 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.

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%

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 the number of sweeping events per year, number of curb lane miles swept per event, and the type of street sweeper used. Permittees may receive credit for urban stream restoration, based on linear footage of restoration completed. 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).

VA TMDL Guidance provided a table of CBP BMP load reduction efficiencies, which were used to calculate BMP pollutant removal rates.

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 6-2.

TABLE 6-2 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

Table 6-3 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). Permit cycle 1 goals were met; total POC reductions are seen in Table 6.3.

TABLE 6-3 FIRST PERMIT CYCLE REDUCTIONS

<table>
<tr><th>Regulated Urban Land Use Type</th><th>Pollutant</th><th>Total Existing Acres Served by MS4 (6/30/09)</th><th>First Permit Cycle Required Reduction in Loading Rate (lbs/acre/yr)</th><th>Total Reduction Required First Permit Cycle (lbs/yr)**</th><th>Actual First Permit Cycle Total Achieved (lbs/yr) and % 2028 *</th></tr>
<tr><td>Impervious</td><td rowspan="2">Nitrogen</td><td>127.27</td><td>0.08</td><td>10.18</td><td rowspan="2">47.20 (17.4%)</td></tr>
<tr><td>Pervious</td><td>111.88</td><td>0.03</td><td>3.36</td></tr>
<tr><td>Impervious</td><td rowspan="2">Phosphorus</td><td>127.27</td><td>0.01</td><td>1.27</td><td rowspan="2">6.07 (22.0%)</td></tr>
<tr><td>Pervious</td><td>111.88</td><td>0.001</td><td>0.11</td></tr>
<tr><td>Impervious</td><td rowspan="2">Total Suspended Solids</td><td>127.27</td><td>11.71</td><td>1,490.33</td><td rowspan="2">2,650.40 (8.4%)</td></tr>
<tr><td>Pervious</td><td>111.88</td><td>0.77</td><td>86.15</td></tr>
</table>

*BMPs awarded in 2016 and 2017 for construction and 2014 demolition

**Table 3b: 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)

6.1 FIRST PERMIT CYCLE PROGRESS

First Permit Cycle goals were met by awarding contracts for five new BMPs to be built, as well as demolishing Building 406 in 2014, which converted the area from impervious surface to grass. Reduction totals from permit cycle one can be seen in Table 6-4. Figure 6.1 shows the location of all BMPs implemented to meet the first permit cycle goals. Several of the BMPs were scheduled to be completed prior to July 2018 but experienced delays due to funding difficulties and construction contractor delays; these BMPs were all completely by April 2019. VA TMDL Guidance provided a table of CBP BMP load reduction efficiencies, which were used to calculate BMP pollutant removal rates.

Table 6-4 First Permit Cycle Estimated Pollutant Reductions by BMP

BMP Name	BMP Type	Location	Implementation Date	TN Removal Efficiency/ TN Removed (lbs/yr)	TP Removal Efficiency/ TP Removed (lbs/yr)	TSS Removal Efficiency/ TSS Removed (lbs/yr)
Special Events Area Bio-retention	Bio-retention	38.878002, -77.079534	May 2018	60% 11.61	50% 1.59	70% 657.01
Special Events Area Permeable Pavement	Permeable Pavement	38.877827, -77.079491	May 2018	25% 4.23	25% 0.59	67% 264.39
Building 406 Demolition	Impervious to Pervious Conversion	38.877354, -77.080576	2014	15.07	1.61	747.94
Sheridan Avenue Bio-swale	Bio-swale	38.872978, -77.080705	April 2019	35% 2.84	40% 0.41	67% 212.90
Pershing Drive Permeable Pavers	Permeable Pavers	38.874226, -77.079997	April 2019	25% 2.11	25% 0.30	62% 179.62
Fitness Center Parking Lot Bio-swales	Bio-swales	38.874987, -77.082009	April 2019	35% 2.63	40% 0.38	58% 165.10
East Lot Island Bio-retention	Bio-retention	38.877477, -77.079375	April 2019	60% 8.71	50% 1.19	58% 423.44
Total Pollutant Removal				**47.20**	**6.07**	**2,650.40**
2028 Pollutant Goal (lbs)				**270.80**	**27.60**	**31,529.60**
% 2028 Goal				**17.4%**	**22.0%**	**8.4%**

FIGURE 6-1 FIRST PERMIT CYCLE BMPS

7 PLAN FOR REMAINING 2028 POLLUTANT LOAD GOALS

In addition to structural BMPs, permittees may receive credit for street sweeping, 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. This section presents recommended BMPs to meet the remaining 2028 load reductions as outlined in Table 6-2.

7.1 STREET SWEEPING

Street sweeping estimates for TN, TP, and TSS are based on the removal rates and calculation methods detailed 2016 “Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices” approved by the Chesapeake Bay Expert Panel (Chesapeake Stormwater Network et al., 2016). Lane miles were calculated using GIS mapping of the facility.

In developing the new street sweeping program, JBM-HH anticipates using a regenerative street sweeper twice per month, which corresponds with Street Sweeping Practice 3 described in the Expert Panel Report (SCP-3). Table 7-1 below shows the calculation of pollutant reductions that would be removed per year with the implementation of the new street sweeping program at JBM-HH. The Expert Panel report assumes an annual load from impervious cover of 1,300 pounds per acre per year (lbs/ac/year) of TSS, 5.5 lbs/ac/year of TN, and 1.93 lbs/ac/year of TP. These annual loads, as well as pollutant removal rates associated with SCP-3, are included in Table 7-1 (Chesapeake Stormwater Network et al., 2016).

TABLE 7-1 ANNUAL POLLUTANT LOAD REDUCTION CALCULATION

Pollutant	Load (lbs/ac/year)	x	Acres Swept	=	Annual Load/Year (lbs)	x	Removal Rates (%)*	=	Pollutant Load Removed/Year (lbs)
TN	15.5	x	45.4	=	703.70	x	2	=	14.07
TP	1.93	x	45.4	=	87.62	x	5	=	4.38
TSS	1300	x	45.4	=	59,020.00	x	11	=	6492.20

*Based on SCP-3 in Table 17 of the 2016 Expert Panel Report

Table 7-2 shows the progress toward the 2028 pollutant reductions goal that would be achieved with the implementation of the above-described street sweeping program.

TABLE 7-2 GOAL PROGRESS ACHIEVED WITH STREET SWEEPING (SCP-3)

Pollutant	Pollutant Load Removed/Year (lbs)	Reductions Required by 2028 (100%) (lbs)	Percent of Goal Achieved with Street Sweeping
TN	14.07	270.80	**5.2%**
TP	4.38	27.60	**15.9%**
TSS	6492.20	31,529.60	**20.6%**

7.2 ADDITIONAL POTENTIAL PROPOSED BMPS

Street sweeping would achieve 2023 reduction goal for TP removal but will not achieve the 2023 reduction goal for TN and TSS. To achieve the required reductions for 2023 and 2028, the following BMPs are being evaluated.

Millennium Vault Retrofit

The existing Millennium Stormwater Detention Vault is used primarily to provide volume control with some water quality control provided by a hydrodynamic separator. The Millennium Vault is a good candidate for water quality retrofit. The proposed plan would be to incorporate proprietary filter cartridges either upstream or in the actual vault to pre-treat the first flush stormwater. The vault could also include a rainwater harvesting component to maximize water quality credits. Table 7-3 shows the removal estimate with and without rainwater harvesting and Figure 7-2 shows the location of the vault and associated drainage area.

Summerall Field Rainwater Harvesting

The proposed BMP for Summerall Field is a relatively new take on rainwater harvesting. The field will be filled with sand that has a 29% void space. The profile will maintain a 4-inch -5-inch depth that is completely saturated in the bottom. Stormwater will be diverted to the sand bed profile and distributed through a 6-inch -8-inch diameter PVC "header" with dozens of 2-inch-diameter pipe connections that extend into Environmental Passive Integrated Chambers (EPIC chambers), followed by a 2-inch diameter pipe section to another EPIC chamber. The stormwater will be evenly distributed across the entire parade field. Underground detention vaults will be placed upstream of Summerall Field and will retain peak flow to maintain a slow release into the sand bed profile. Once the water enters the parade field it can only: 1) evaporate, 2) transpire through the growth of grass, or 3) discharge (after being filtered from moving through the sand bed) into an overflow pipe that will be connected to an existing storm drain pipe/system.

Table 7-3 shows the removal estimates for the proposed Summerall Field Rainwater Harvesting BMP and Figure 7-1 shows the location of the proposed BMP and associated drainage area.

TABLE 7-3 PROPOSED BMP REDUCTIONS

	TN (lb/yr)	TP (lb/yr)	TSS (lb/yr)
Millennium Vault Retrofit without Rainwater Harvesting (Filter Cartridges only)	50.70	10.42	5,155.00
% 2028	**18.7%**	**37.8%**	**16.4%**
Millennium Vault Retrofit with Rainwater Harvesting	80.00	12.00	7,500.00
% 2028	**29.5%**	**43.5%**	**23.8%**
Summerall Field Rainwater Harvesting	293.10	28.16	20,362.70
% 2028	**108.2%**	**102.0%**	**64.6%**

FIGURE 7-1 PROPOSED BMPS

7.3 PUBLIC PARTICIPATION

The Chesapeake Bay TMDL Action Plan was uploaded to JBM-HH's Stormwater Pollution Prevention webpage in May 2019 and made available for public comment. The Action Plan included street sweeping, the Millennium Vault retrofit, and Summerall Field BMPs. No comments were received from the public on the Action Plan. This Plan was updated in October 2019, ahead of the November 1 submission deadline, to address changes in calculation methods for pollutant reductions from street sweeping in order to reflect the guidance provided in the 2016 Expert Panel Report, as suggested by VADEQ. This version of the TMDL Action Plan will be uploaded to JBM-HH's website and made available for public comment by the end of October.

7.4 SUMMARY

The proposed BMPs outlined in this section are summarized in Table 7-4. A combination of these BMPs will satisfy the final 2028 TMDL Action Plan reduction goal. To meet the 2nd permit cycle 40% intermediate goal, it is recommended that a street sweeping program be implemented by 2023. To meet the 3rd permit cycle 100% goal, it is recommended that a combination of street sweeping and either the Millennium Vault or Summerall field be implemented by 2028.

***TABLE 7-4 SUMMARY OF PROPOSED BMPS**

	BMP Pollution Reduction (lb/year)		
AOI	**TN**	**TP**	**TSS**
Street Sweeping (twice per month)	14.07	4.38	6492.20
Percent of 2028 Goal	**5.2%**	**15.87%**	**20.59%**
Millennium Vault (Filter, no RWH)	50.70	10.42	5,155.00
Percent of 2028 Goal	**18.72%**	**37.75%**	**16.35%**
Millennium Vault (Filter, with RWH)	80.00	12.00	7,500.00
Percent of 2028 Goal	**29.54%**	**43.48%**	**23.79%**
Summerall Field	293.10	28.16	20,362.70
Percent of 2028 Goal	**108.23%**	**102.03%**	**64.58%**

*2028 Reduction Goals are 270.80 for TN, 27.60 for TP, and 31,529.60 for TSS

8 IMPLEMENTATION SCHEDULE AND COSTS

8.1 SCHEDULE

VA TMDL Guidance provides a timeline for when these pollutant load reductions must be implemented, as describe in Table 6-2.

In addition to the pollution reduction credits attributed to the Phase One implementation of five BMPs and Building 401 Demolition, street sweeping and the Millennium Vault is recommended to meet permit cycle two (2023) pollutant reduction goals. To meet the final 2028 reduction goals, it is recommended that the Summerall Field project be completed by 2028.

8.2 COST

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 total cost to implement BMPs to satisfy the first phase of the permit for JBM-HH was $2,995,239, excluding the cost of the building demolition.

Costs for street sweeping, Millennium Vault retrofit, and Summerall field are all currently unknown and will be updated once design is initiated.

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, and 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.

9 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 270.8 lbs of TN, 27.6 lbs of TP and 31,529.6 lbs of TSS by the end of the third MS4 permit cycle in 2028. Permit cycle one successfully met the pollutant reduction goals by implementing five stormwater BMPs and demolition of building and converting to pervious. If street sweeping, Millennium Vault retrofit, and Summerall Field Rainwater Harvesting are implemented (or some combination of the three), JBMHH will exceed their pollutant reduction goals by 2028. The cost to implement the proposed structural BMPs proposed to meet these requirements is unknown and will require a more in-depth engineering and cost analysis.

JBM-HH will release the Action Plan information to the public via JBM-HH's stormwater pollution prevention webpage. It will be available for comment for 30 days. 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).

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 report

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JOINT BASE MYER – HENDERSON HALL
MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
PROGRAM PLAN

APPENDIX C.1

PCB TMDL ACTION PLAN

FOR
FORT MYER & HENDERSON HALL INSTALLATIONS
FORT MYER, VIRGINIA

April 2020 Update

Prepared in accordance with:

Virginia Stormwater Management Program (VSMP) General Permit No.: VAR04
General Permit for Discharges of Stormwater from Small MS4s

VSMP Registration Number VAR040068

Prepared by:
JBM-HH Directorate of Public Works, Environmental Management Division

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ACRONYMS

ANC	Arlington National Cemetery
ATSDR	Agency for Toxic Substances and Disease Registry
BMP	Best Management Practice
BRAC	Base Realignment and Closure
CDC	Child Development Center
DA	Department of the Army
DoD	Department of Defense
DPW	Directorate of Public Works
EPA	U.S. Environmental Protection Agency
FMMC	Fort Myer Military Community
JBM-HH	Joint Base Myer-Henderson Hall
JFHQ-NCR	Joint Force Headquarters-National Capital Region
LA	Load Allocation
MDW	Military District of Washington
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
OWS	Oil/water Separator
PCB	Polychlorinated Biphenyls
POC	Pollutants of Concern
ppb	parts per billion
ppm	parts per million
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USMC	U.S. Marine Corps
VADEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VSMP	Virginia Stormwater Management Program
WLA	Wasteload Allocation
WQLS	Water Quality Limited Segments

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1.0 INTRODUCTION AND BACKGROUND

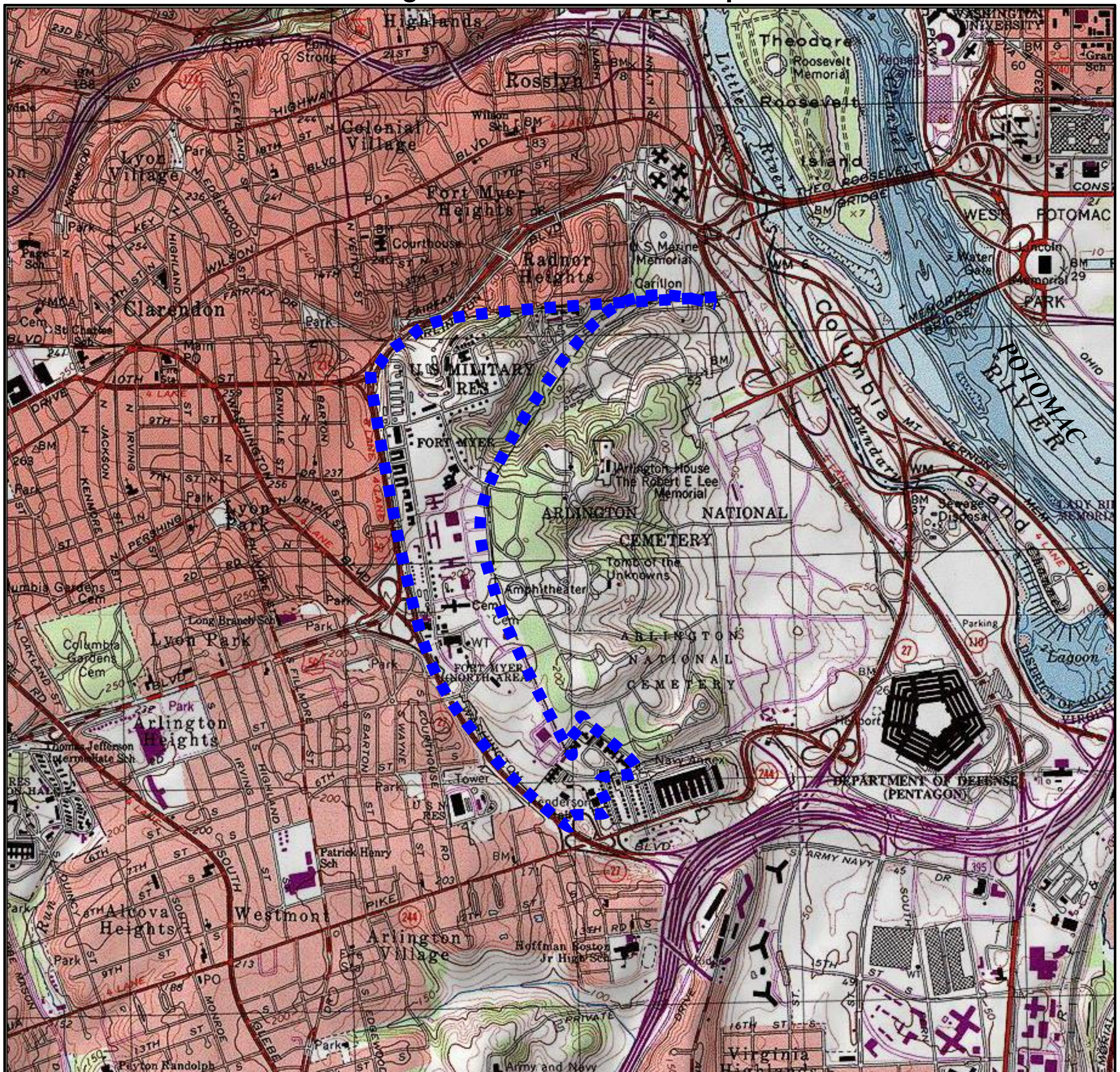
1.1 Installation Description and Organization

Joint Base Myer-Henderson Hall (JBM-HH) is located in the District of Columbia 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 integration of some functions and services between U.S. Army Installation Fort Myer (Fort Myer) and Marine Corps Headquarters Battalion Henderson Hall (Henderson Hall) to provide more efficient support of the on-Installation and regional populations. JBM-HH, which includes Fort McNair in Washington, D.C., serves as the Joint Force Headquarters-National Capital Region (JFHQ-NCR), and the Military District of Washington (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. 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 Myer and Henderson Hall, jointly referred to as 'the Installation' in this Plan, are located in Arlington, Virginia, directly across the Potomac River from Washington, DC. The Installation occupies approximately 270 acres and 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). Stormwater from the Installation ultimately discharges to the Potomac River, which is the nearest open water body and is located approximately 0.9 mile to the east of the Installation. Stormwater discharges from the Installation 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 Creek and Arlington County storm drains that drain to the Potomac River via Fourmile Run, a Potomac River tributary.

A site location map is provided as **Figure 1** below.

Figure 1: Site Location Map



▪▪▪▪▪▪ JBM-HH Property Boundary

Property size = approximately 269 acres

1.2 MS4 Permit

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, the National Pollutant Discharge Elimination System (NPDES), 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 Virginia MS4 General Permit issued to JBM-HH applies to Fort Myer and Henderson Hall.

The MS4 Permit requires permit holders to develop a Chesapeake Bay Total Maximum Daily Load (TMDL) Action Plan in order to meet required pollutant load reductions for nitrogen, phosphorus, and sediment. A TMDL is the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. Facilities located in a watershed that has a TMDL for a particular pollutant are often required to monitor outfall discharge for that pollutant and implement Best Management Practices (BMPs) to help control pollutants and prevent them from reaching the impaired waterways.

Part II.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.

The US Environmental Protection Agency (EPA) approved a TMDL for Polychlorinated Biphenyls (PCBs) for the Potomac River on October 31, 2007. Municipal stormwater discharges covered under NPDES permits are included in the TMDL stormwater Waste Load Allocations (WLAs). Therefore, small MS4s must develop and implement local TMDL Action Plans to reduce nonpoint source pollutant loads of pollutants of concern (POC) in order to meet the MS4's assigned WLA for PCBs.

To meet the permit requirements, this Action Plan describes the current and historic uses of PCBs on the installation, outlines a sampling and analysis plan to determine potential areas of concern, and recommends Best Management Practices (BMPs) to address potential PCB pollutant concerns.

The PCB TMDL Action Plan for JBM-HH was developed from March-July 2016 and submitted to the Virginia DEQ on 18 July 2016. The Plan was approved by the Virginia Department of Environmental Quality (VADEQ) in a letter dated 26 July 2016. This revised Action Plan addresses requirements in the MS4 Permit that went into effect on November 1, 2018.

1.3 MS4 Program and Legal Authorities

The provisions contained in the MS4 Permit and associated regulations are enforced through JBM-HH policy memorandums and standardized procedures for project review and implementation. An Installation-wide stormwater policy was developed in 2016 and updated in 2019 to address the Installation's compliance with the Virginia MS4 permit and other stormwater regulations. The policy outlines proper protocols for minimizing stormwater pollution during activities that directly and indirectly impact stormwater. The policy was most recently signed by the Joint Base Commander on November 8, 2019 and is included as **Appendix A**.

2.0 PCB CHARACTERISTICS AND FATE AND TRANSPORT

PCBs are a group of synthetic organic chemicals that were used for a variety of purposes from 1929 until 1979, when the U.S. banned manufacturing, processing, distribution, and use of PCBs. The molecular structure of PCBs include two benzene rings (known as biphenyl) and up to 10 chlorine atoms substituted on each of the benzene molecules, creating a total of 209 individual PCM compounds known as congeners.

There are no known naturally occurring sources of PCBs, so detections in air, water, or soil are related to the manufacture, use, or disposal of PCBs. At the height of their use, PCBs were found primarily in closed systems and heat transfer fluids, such as in transformers, capacitors, and fluorescent light ballasts. Historically, PCBs entered the environment from accidental spills and leaks during their transport and from leaks or fires in products containing PCBs. Currently, they can still be released from hazardous waste sites, illegal or improper disposal of industrial wastes and consumer products, leaks from old electrical transformers containing PCBs, and burning of some wastes in incinerators (ATSDR, 2014).

PCBs are highly resistive to chemical reaction. This stability means they remain in the environment for a long time without breaking down. The low vapor pressure of PCBs reduces their potential to volatilize.

PCBs are hydrophobic – meaning they are not easily dissolved in water – so the majority of PCBs will bind to organic particles and bottom sediments. PCBs bind strongly to soils and can enter surface water via contaminated soil particles in runoff. Therefore, limiting sediment transport from PCB sites would reduce the potential for PCB contributions to surface water.

PCBs can accumulate in leaves and other aboveground parts of plants and are also taken up by small organisms and fish. Consequently, ingesting fish may expose people to PCBs that have bioaccumulated in the fish tissue. Concerns over this bioaccumulation and exposure led to the development of PCB TMDLs for impaired water bodies.

3.0 POTOMAC WATERSHED PCB TMDL APPLICABILITY TO JBM-HH MS4 PERMIT

PCB TMDLs were established for 28 listed impaired water body segments in tidal portions of the Potomac and Anacostia Rivers in the District of Columbia, Maryland, and Virginia in 2007. The purpose of establishing the PCB TMDL was to ensure that fish tissue PCB concentrations do not exceed the impairment thresholds set for each jurisdiction, in order to protect human health with respect to fish consumption. The fish tissue impairment threshold for Virginia is 54 parts per billion (ppb). Section 303(d) of the Clean Water Act and EPA's implementing regulations require the states to identify impaired waters, called water quality limited segments (WQLS), where current pollutant controls are inadequate to achieve water quality standards and establish a TMDL for those WQLSs. Virginia has listed 19 tidal embayments of the Potomac River as impaired by PCB contamination. The impairment generally includes all tidal waters within each embayment, from the head-of-tide to the Potomac River mainstem.

A TMDL is the sum of the waste load allocations (WLAs), load allocations (LAs), and the margin of safety (MOS). The WLA portion consists of the permitted point sources that contribute to the total PCB load, such as waste water treatment plants, regulated stormwater, and combined sewer overflow. The LA portion consists of nonpoint source runoff, atmospheric deposition, tributaries, and identified contaminated sites. The MOS accounts for uncertainty in the load estimates.

JBM-HH's MS4 Permit falls under the WLA portion of the TMDL, as regulated stormwater. While JBM-HH does not directly impact the impaired waterbodies listed for Virginia, stormwater discharges from the Installation eventually discharge to the Potomac River, including Fourmile Run, which is an impaired waterbody. Therefore, any PCB contamination discharged through the Installation's storm drain system has the potential to impact the Potomac River and contribute to the total PCB load.

EPA allows pollutant loads attributed to NPDES-regulated stormwater outfalls to be expressed as a single stormwater WLA for each impaired waterbody (US EPA, 2002). Rather than assign numeric pollutant limits on discharges from NPDES-regulated municipal and small construction stormwater discharges, EPA recommends that "effluent limits be expressed as best management practices (BMPs) or other similar requirements, rather than as numeric effluent limits."

4.0 JBM-HH PCB TMDL ACTION PLAN FOR SMALL MS4 PERMIT

4.1 PCB TMDL Action Plan

This Action Plan complies with the MS4 Permit requirement for addressing the PCB TMDL for JBM-HH. The Plan consists of the following:

- Historic use inventory and analysis
- Summary of the historic PCB site analysis
- Recommendations for sites with potential PCB sources
- Evaluation of existing Best Management Practices (BMPs)
- Sampling and analysis plan.

As required by the Permit, JBM-HH will provide a public comment period for the updated Action Plan for no less than 15 days and will notify DEQ in writing within 30 days if a previously unidentified significant source of PCBs is discovered within the MS4 permitted area.

4.2 PCB Historic Use Inventory Analysis

The PCB historic use inventory analysis of JBM-HH addresses transformers and other areas on the installation where PCBs currently exist, or have been stored, transported or spilled in the past. This information was compiled from available historical documents for the installation and transformer inspections performed as of May 2016.

Historically, transformers have been the main source of PCBs on the Installation. Information on current and historic transformers was requested from Dominion Virginia Power (Dominion), who has owned and maintained the transformers on the Installation since August 2007. Dominion states that since their contract started with JBM-HH in 2007, there have been no active transformers with over 50 ppm PCB content on the installation.

The transformer inventory, included as **Appendix B**, lists current and historic transformer, including locations, serial numbers, manufacturers, PCB content, and other information pertaining to the transformers. **Figure 2** shows the locations of the active transformers currently on the Installation. In May 2016, transformers currently located on the installation were inspected for signs of current or past oil staining or leaking. **Appendix C** lists locations where possible signs of PCB staining were noted near transformers during recent and past inspections, as well as locations where historical documents indicated PCB impacts were determined to exist based on samples and laboratory results. These sites are then evaluated for the potential for remaining PCBs to impact stormwater runoff. **Section 4.3** below details the site analysis. **Section 5.0** describes the sampling and analysis plan for two sites that were identified as having potential to impact stormwater.

Historical documentation for JBM-HH also indicates the previous use and disposal of PCB light ballasts. They were formerly stored in 90-day Hazardous Waste containers before disposal. PCB light ballasts are no longer used at JBM-HH and historical documentation did not reveal any incidents of PCB spills or impacts from light ballasts.

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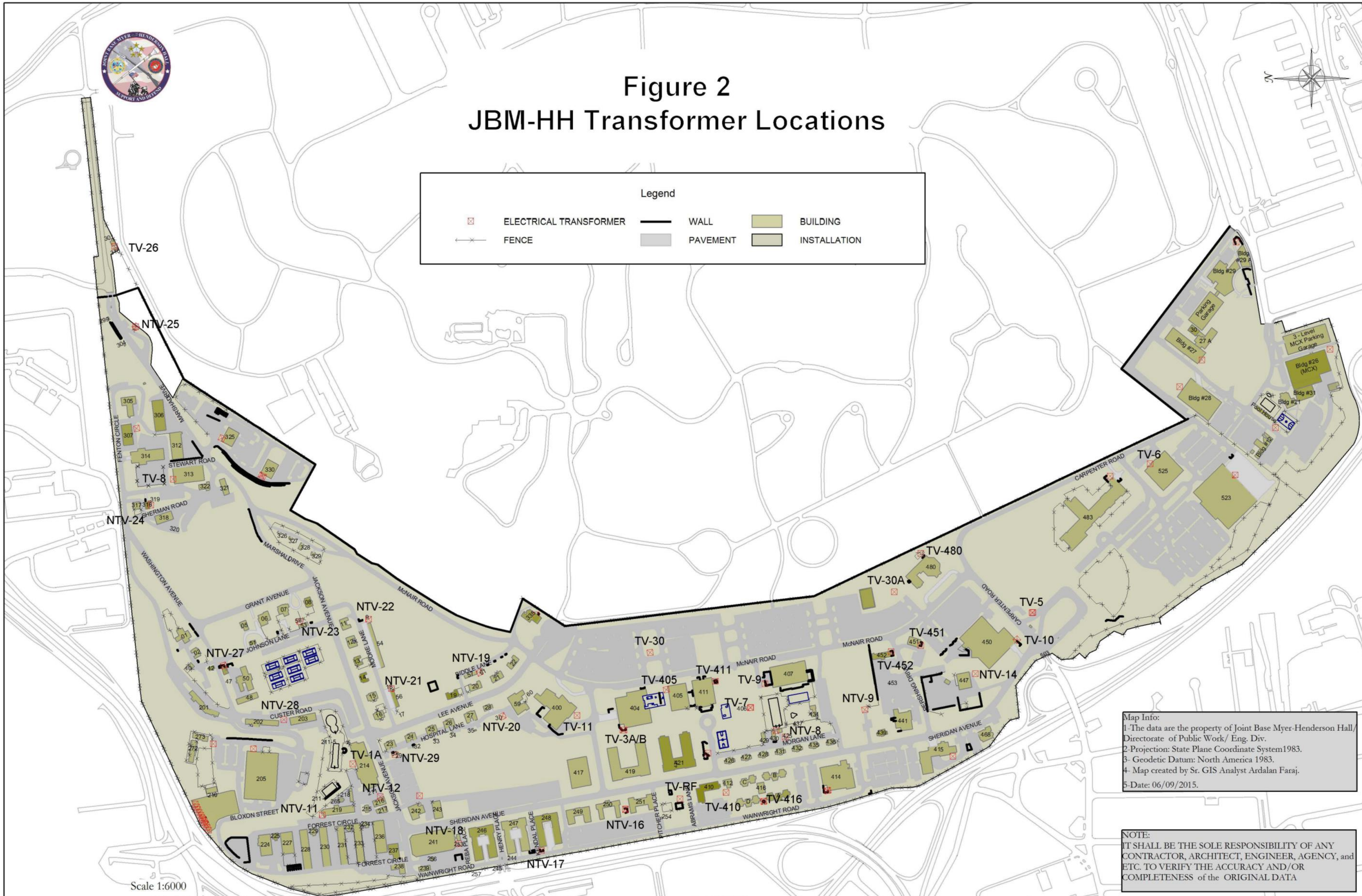
Figure 2
JBM-HH Transformer Locations
Legend
ELECTRICAL TRANSFORMER
WALL
BUILDING
FENCE
PAVEMENT
INSTALLATION
TV-26
NTV-25
TV-8
NTV-24
NTV-22
NTV-23
NTV-27
NTV-28
NTV-19
NTV-21
NTV-20
TV-1A
NTV-29
NTV-12
NTV-11
NTV-18
NTV-17
NTV-16
TV-30
TV-405
TV-411
TV-9
TV-7
TV-11
TV-3A/B
TV-RF
TV-410
TV-416
NTV-8
NTV-9
TV-452
TV-451
TV-30A
TV-480
TV-5
TV-10
NTV-14
TV-6
McNAIR ROAD
WASHINGTON AVENUE
MARSHALL DRIVE
JACKSON AVENUE
GRANT AVENUE
JOHNSON LANE
STEWART ROAD
SHERMAN ROAD
FENTON CIRCLE
LEE AVENUE
HOSPITAL LANE
CUSTER ROAD
BLOXON STREET
FORREST CIRCLE
SHERIDAN AVENUE
WAINWRIGHT ROAD
MORGAN LANE
CARPENTER ROAD
Bldg #29
Parking Garage
Bldg #27
27 A
3 - Level MCX Parking Garage
Bldg #26 (MCX)
Bldg #28
Bldg #31
Map Info:
1-The data are the property of Joint Base Myer-Henderson Hall/ Directorate of Public Work/ Eng. Div.
2-Projection: State Plane Coordinate System1983.
3- Geodetic Datum: North America 1983.
4- Map created by Sr. GIS Analyst Ardalan Faraj.
5-Date: 06/09/2015.
NOTE:
IT SHALL BE THE SOLE RESPONSIBILITY OF ANY CONTRACTOR, ARCHITECT, ENGINEER, AGENCY, and ETC. TO VERIFY THE ACCURACY AND/OR COMPLETENESS of the ORIGINAL DATA
Scale 1:6000

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4.3 Summary of Site Analysis

Sites that could be a potential source of PCB impacts were evaluated through the review of historical records and in-person site inspections. The table in **Appendix C** lists the locations that were assessed, including sites with current and/or historic transformers and other locations where evidence of PCB leaks was recorded. This section describes the sites identified to be of potential concern and provides a detailed explanation of the reason these sites are not considered to be potential PCB sources or to explain why further sampling and characterization is recommended. The sites not described in this section were not identified as potential sources of PCBs because transformers have been removed or replaced, the buildings have been demolished, previous sampling determined there were no PCB-impacted materials, and/or site inspections determined there were no signs of staining or other conditions to suggest potential PCB impacts.

Historically, the transformers on the installation were owned and operated by Fort Myer and Henderson Hall. However, in 2007, operation of the Installation's electrical distribution system including transformers was assumed by Dominion Virginia Power, who now operates and maintains the transformers. When this transfer of operation occurred, the Dominion's contract stated that all PCB transformers contained less than 50 ppm.

<u>Building 301</u>: Historic transformers were removed and replaced by a current transformer in December 2012. The inspection of the current transformer found that there was no indication of leaking. In 1988, a leak was detected from a historic transformer. It was determined that the transformer had been leaking for five years and that much of the soil surrounding it was PCB-impacted. In a 1990 site plan, a plan was outlined to test the pad and area for PCBs and remediate the area as needed. However, no documentation was found to confirm that this activity was completed. This area has also undergone construction over the years. It is unlikely this area is a current source of PCB impacts to surface water given the time since the leak occurred and the amount of soil disturbance that has occurred at the site. It is expected that even if this area was not remediated as planned, any impacted soil or materials that had existed would have been removed by construction activities.

<u>Building 403</u>: Three historic transformers were previously located in Building 403 on concrete surfaces. Previous wipe samples were collected in 1996. Remediation of this building was completed as of March 1993, but subsequent wipe samples showed that additional remediation was required. Documentation of this remediation was not found. However, the PCB impacts appear to have been limited to the concrete surfaces underlying the pad with no indication that underlying soils were impacted. The building has since been demolished and since the transformers were in the building and the building has been removed, there is no current source of PCBs at this site.

<u>Building 406</u>: Three historic transformers were previously located in Building 406 on concrete surfaces. Remediation of this building was completed as of March 1993, but subsequent wipe samples showed that additional remediation was required. Documentation of this remediation was not found. However, the PCB impacts appear to have been limited to the concrete surfaces underlying the pad with no indication that underlying soils were impacted. It was determined that two of the transformers were removed prior to 2007 and the third one was discovered in the basement of Building 406. This transformer was removed in 2009 and the building has since been demolished. Since the transformers were in the building and the building has been removed, there is no current source of PCBs at this site.

<u>Building 410</u>: There was a historic transformer in this building, which was replaced by a new transformer. The site inspection found no evidence of leaks from the new transformer. Remediation was completed in the area around the historic transformer in 1993 presumably related to a transformer leak, but subsequent sample results indicated that additional remediation

was required in one area. A sampling plan noted that this area would be remediated by removing one inch of the concrete floor, as well as the concrete curb adjacent to the transformer. No documentation was found to confirm that this was completed; however, the building has since been demolished and the impacted concrete removed. Since the transformers were in the building and the building has been removed, there is no current source of PCBs at this site.

Building 270/273: The transformer at Building 273 was listed as Building 270 Dog Kennels in the 1996 Inventory. The 2016 site inspection found some corrosion at the bottom of the transformer and some staining of indeterminate source. Since the nature and age of the staining could not be determined, this site could not be ruled out as a potential source of PCB impacts, stormwater runoff characterization was recommended in the 2016 Action Plan. This site was included in the sampling analysis plan.

Child Development Center and surrounding areas: The Child Development Center (CDC) (Building 483) is a new building that was constructed in the location of former burn areas at the Installation. These areas, known as the north and south burn areas, were historically used to burn waste materials such as wood and paper. Sampling conducted of these areas as part of remediation efforts found a maximum PCB concentration of 34 ppm, exceeding the USEPA PCB cleanup levels for non-restricted access areas (10 ppm).

The area to the north and northwest of Building 483 was formerly occupied by Building 501 and a playground area. The building and playground have been removed and these areas are currently grassy fields. The playground area was remediated in 1984-1985, when 200 cubic feet of PCB-impacted sand and soil were excavated and replaced with clean fill (clay and loose sand). The area northeast of Building 501 was a former sanitary landfill that contained PCB-impacted soils. Surface soil samples collected in 1984 found a concentration of 2.24 ppm, which is below the USEPA PCB cleanup levels for non-restricted access areas (10 ppm).

Soil samples were also previously collected from the area east of former Building 501 that is currently occupied by a parking lot for the Rader Health Clinic and ballfield area. None of these samples had PCB concentrations that exceeded the USEPA PCB cleanup levels for non-restricted access areas (10 ppm).

This area is not anticipated to be a significant source of PCBs in stormwater runoff given that PCB-impacted soils in these areas were either remediated or concentrations were found to be below EPA cleanup levels, and that a substantial amount of construction and demolition has occurred in these areas. However, given the large size of the area and the history of PCB impacts, stormwater runoff characterization was recommended in the 2016 Action Plan and this site was included in the sampling analysis plan.

4.4 Best Management Practices (BMPs) Analysis and Implementation Plan

Best management practices (BMPs) are control measures used to reduce pollution in stormwater and surface waters. BMPs can be temporary, such as silt fences used to control sediment pollution from active construction sites, or permanent, such as detention basins used to manage runoff from a parking lot.

BMPs can also be structural or nonstructural. Structural BMPs are physical controls designed to divert, contain, treat, reuse, or otherwise manage stormwater runoff to reduce pollutants in stormwater discharged from the site. Examples of structural BMPs include vegetation controls (rain gardens, bioretention areas), infiltration systems, detention basins, retention basins, oil/water separators, and pervious surfaces (pavers, porous pavement).

Non-structural BMPs are operational practices intended to improve stormwater quality by minimizing or eliminating the potential contact of pollutants with runoff at or near their source.

Examples of nonstructural BMPs include public education, good housekeeping practices, preventative maintenance, spill prevention and response procedures, and routine inspections.

4.4.1 BMP Evaluation

The structural control measures currently implemented at the Installation to control the discharge of pollutants primarily include oil/water separators (OWSs), stormwater detention ponds, sand filter systems, and bioretention systems. The current non-structural control measures primarily include good housekeeping, preventive maintenance, spill prevention and response, and visual inspections. **Table 1** below lists structural and non-structural BMPs implemented at the Installation and evaluates whether they address PCB concerns, and provides recommendations for addressing PCBs where applicable.

Table 1. Evaluation and Recommendation of Existing BMPs at JBM-HH

General BMP Description	Evaluations and Recommendations
Structural Controls	
Detention basins – treats stormwater from vehicle parking, exterior material storage, and fueling areas; helps to manage the quantity of runoff.	**Evaluation:** If located in an area downgradient from a potential PCB source, any BMP designed to promote settling and retention of sediment could help in limiting the transport of PCB-contaminated soil. **Recommendation:** None
Oil/water separators – most trench drains and floor drains are connected to the OWSs, which then discharge to the sanitary sewer system. One OWS treats runoff from a vehicle fueling station and discharges to a detention basin.	**Evaluation:** In general, this BMP does not apply to the PCB TMDL. **Recommendation:** None
Sand filter systems – treats stormwater from vehicle parking and exterior material storage areas; often connected to underground detention basins; filters out sediment, grease, and other vehicle fluids from the runoff.	**Evaluation:** If located in an area downgradient from a potential PCB source, any BMP designed to promote settling and retention of sediment could help in limiting the transport of PCB-contaminated soil. **Recommendation:** None
Roof cover – over fueling areas and equipment, limits stormwater exposure for potential pollutant sources.	**Evaluation:** This BMP does not apply to the PCB TMDL. **Recommendation:** None
Bioretention systems (includes tree filter boxes) – treats stormwater primarily from roadway areas; filters out sediment, grease, and other vehicle fluids from the runoff	**Evaluation:** If located in an area downgradient from a potential PCB source, any BMP designed to promote settling and retention of sediment could help in limiting the transport of PCB-contaminated soil. **Recommendation:** None

Table 1. Evaluation and Recommendation of Existing BMPs at JBM-HH

General BMP Description	Evaluations and Recommendations
Non-structural Controls	
Perform Illicit Discharge Detection and Elimination Procedures	**Evaluation:** Not likely to detect PCBs since procedures rely on visible indicators of pollutants; however, eliminating sources of sediment discharges detected by the program could help limit the transport of PCB-contaminated soil. **Recommendation:** None
Indoor vehicle maintenance activities and equipment/material storage – eliminates stormwater exposure for potential pollutant sources.	**Evaluation:** This BMP does not apply to the PCB TMDL. **Recommendation:** None
Regular inspections – helps to identify leaks, spills, and potential pollution sources to reduce the potential impact to stormwater; inspections of industrial areas are currently performed quarterly.	**Evaluation:** Regular inspections could identify releases of potentially PCB-containing materials. **Recommendation:** Train inspectors about potential PCB-specific sources (e.g., leaking transformer).
Spill kits available – located near vehicle maintenance and fueling areas; kits include booms and absorbent material.	**Evaluation:** Spill kits could help prevent future potential PCB contributions by ensuring timely containment and cleanup of future spills. **Recommendation:** None
Good housekeeping – performed throughout the installation; reduces possibility of accidental spills; includes routine sweeping and cleanup, use of drip pans and absorbent materials; regular waste disposal, and proper storage of materials.	**Evaluation:** Good housekeeping measures could aid in identifying PCB release or potential release, including the need to repair or remove potential sources (e.g., transformers). **Recommendation:** Train staff about potential PCB-specific sources (e.g., leaking transformer).
Use of water-tight dumpsters, waterproof storage cabinets/sheds for outdoor material storage – located throughout the installation; minimizes stormwater exposure for potential pollutant sources.	**Evaluation:** This BMP does not apply to the PCB TMDL. **Recommendation:** None
Preventative Maintenance – includes the regular inspection and maintenance of stormwater control structures, equipment, and systems.	**Evaluation:** Regular maintenance of stormwater control measures that promote settling and retention of sediment could help in limiting the transport of PCB-impacted soil. **Recommendation:** None

Table 1. Evaluation and Recommendation of Existing BMPs at JBM-HH

General BMP Description	Evaluations and Recommendations
Filling operations of USTs and ASTs are monitored by facility personnel – ensures that the tanks are filled properly and any spills are cleaned up immediately and appropriately.	**Evaluation:** This BMP does not apply to the PCB TMDL. **Recommendation:** None
Public education and outreach programs regarding the protection of stormwater.	**Evaluation:** Public education and outreach programs regarding the protection of stormwater provide an opportunity to increase awareness of PCBs and the PCB TMDL at Fort Myer. **Recommendation:** Develop an information sheet that includes: basic facts about PCBs and the PCB TMDL, a summary of PCBs at the Installation, what has been done to eliminate PCB contamination, and what an individual should do if they observe a condition such as a leaking transformer that could be a source of PCBs.

4.4.2 Site Specific BMP Analysis

Although not specifically in place to address PCB issues, JBM-HH has a variety of structural stormwater and erosion control BMPs in place. Many of these, mostly those that are aimed at reducing the erosion and transport of sediment, may limit the transport of PCB-contaminated soil. These include natural vegetation, detention basins, sand filter systems, vegetated swales, and bioretention systems. Non-structural BMPs, such as regular inspections and maintenance of structural BMPs and good housekeeping measures throughout the installation, also may aid in reducing the potential for PCB releases.

Stormwater discharges from the area surrounding Building 270/273 Dog Kennels transformer that was observed with unidentified staining is treated by structural stormwater BMPs. The transformer is surrounded by a well-vegetated, grassy area, which would limit the transport of any soil that may be or become contaminated by PCBs. This area drains to a dry detention basin, which promotes settling of sediments.

The CDC (Building 483), which is in the location of the former south and north burn areas, has a large building that occupies most of the former burn areas and is surrounded by vegetated and paved areas. The area to the east of the CDC is mostly occupied by a large parking lot. The area to the north of the parking lot is a maintained ballfield, and the area to the north of the CDC, the former Building 501 and playground, is a well-vegetated area. Buildings and paved areas essentially act as a cap preventing soils from eroding. If well maintained, the vegetated, grassy areas should prevent erosion.

4.4.3 BMP Recommendations Summary and Implementation Plan

General BMPs recommended for implementation, the schedule for implementation and reporting, and the status of the BMP implementation as of the 2020 Action Plan Update are provided in **Table 2** below. The status of PCB-focused BMPs has also been included in the MS4 Annual Reports. **Table 3** includes the schedule for implementation of BMPs during the 2018-2023 permit term.

Table 2. 2013-2018 Permit Term BMP Implementation Progress

BMP Description	Implementation and Reporting Schedule	Progress as of 2020
Develop a fact sheet that includes the following: • Basic facts about PCBs and the PCB TMDL • Summary of history of PCBs at Fort Myer • Steps taken to eliminate PCB contamination • Steps one should take if they observe oil leaking from a transformer Make fact sheet available through housing occupant orientation, annual training on the Stormwater Pollution Prevention Plan (SWPPP) installation operations and maintenance training materials.	Fact sheet development will begin during the 2016-2017 reporting cycle. The fact sheets will be available by then end of the 2016 calendar year. Status of development and implementation will be summarized in Annual Reports.	To reach a wide audience of base-wide residents, employees, and military personnel (current and retirees) that utilize the services at JBM-HH, an article about PCBs and the PCB TMDL Action Plan was prepared and published in the widely-read base newspaper, *The Pentagram*. The article was published on March 7, 2017 and is included as **Appendix D**. Additionally, training slides were developed to address these PCB topics and were included in the annual SWPPP Training provided to employees at JBM-HH and brochures geared towards residents on base and new hires were updated to include information on PCBs.
Continue to perform routine maintenance, as required, of BMPs that may help to control PCBs, such as detention basins.	To be augmented as needed to address potential PCB-impacted discharges. Routine maintenance performed will be summarized in Annual Reports.	Routine maintenance of systems and BMPs that may help control PCBs is scheduled and performed as needed. JBM-HH has contracted with USACE to conduct annual inspections of all aboveground and underground structural BMPs at the Installation, which will more quickly identify issues and allow them to be addressed.
Develop PCB sampling plan to comply with PCB TMDL requirements.	Completed and provided as part of this Action Plan. Results from sampling will be included in Annual Report.	Three outfalls were identified in areas with historic PCB use for sampling. To date, two of the outfalls have been sampled twice and one outfall has been sampled once. There were no PCBs detected in any of the samples collected to date. Issues with access have prevented the collection of a second sample at the third outfall. Access to the outfall is being coordinated and sampling will be completed as soon as possible. Further details are provided in Section 5.
Modify existing stormwater pollution prevention training materials for municipal operations to include a section on identifying and reporting potential PCB leaks.	New training language to be developed during the 2016-2017 reporting cycle. Inclusion of PCB section in training materials will occur early 2017. Status of development and implementation will be summarized in Annual Reports.	Annual stormwater pollution prevention training materials for Public Works employees were modified in 2017 to include PCB TMDL awareness, PCB source identification, and reporting information.

Table 3. 2018-2023 Permit Term BMP Implementation Schedule

BMP Description	Implementation and Reporting Schedule
Update stormwater pollution prevention brochures to include basic facts about PCBs and the PCB TMDL and steps one should take if they observe oil leaking from a transformer. Distribute the brochures to new hires employed at JBM-HH.	Brochure will be updated and distributed through New Hire Packets in 2020.
Continue to perform routine maintenance, as required, of BMPs that may help to control PCBs, such as detention basins.	To be augmented as needed to address potential PCB-impacted discharges. Routine maintenance performed will be summarized in Annual Reports.
Gain access to Outfall 012 and complete second sampling event as described in Section 5.	Access is currently being coordinated and sampling will occur as soon as possible.
Continue to provide information on identifying and reporting potential PCB leaks during the annual stormwater pollution prevention training for municipal operations staff.	The training slides have been completed and will continue to be used during annual training sessions.

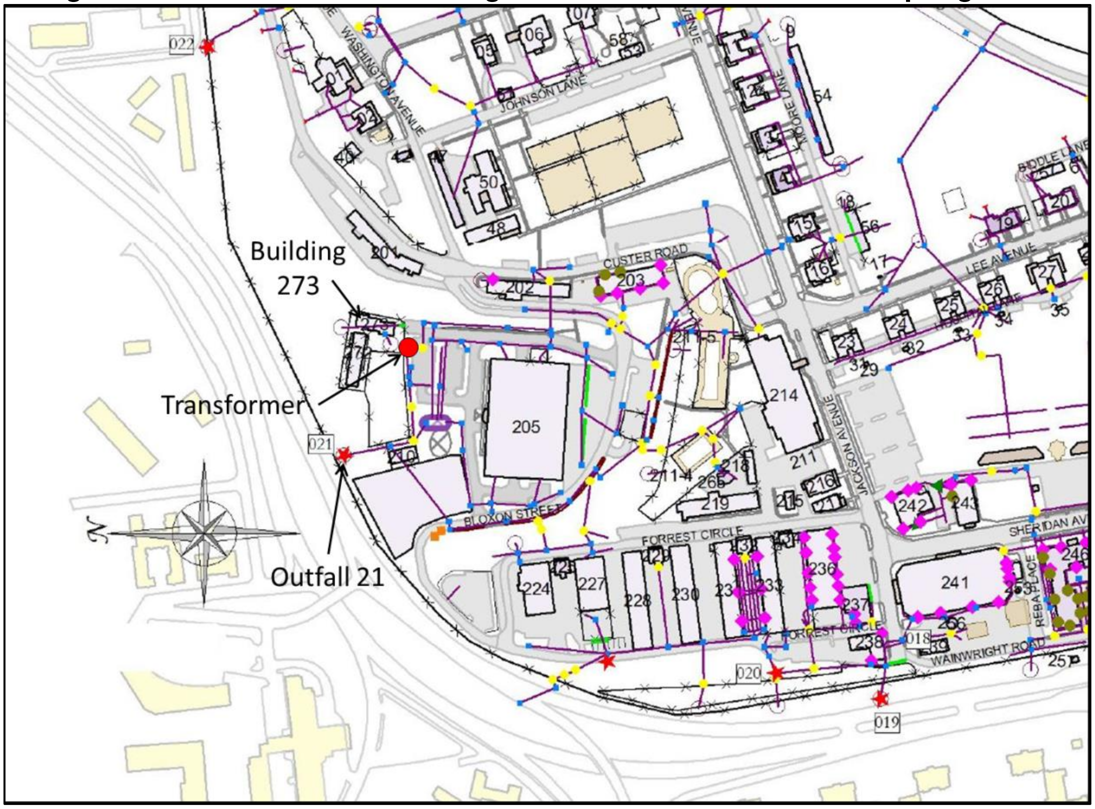
5.0 SAMPLING AND ANALYSIS PLAN

To comply with the MS4 permit, this plan documents the proposed sampling plan developed in 2016 for stormwater runoff from areas surrounding the transformer by Building 270/273 as well as the area surrounding the CDC. Results from the planned sampling have been documented in the MS4 Annual Reports and are included below in **Section 5.2**.

5.1 2016 Sampling Plan

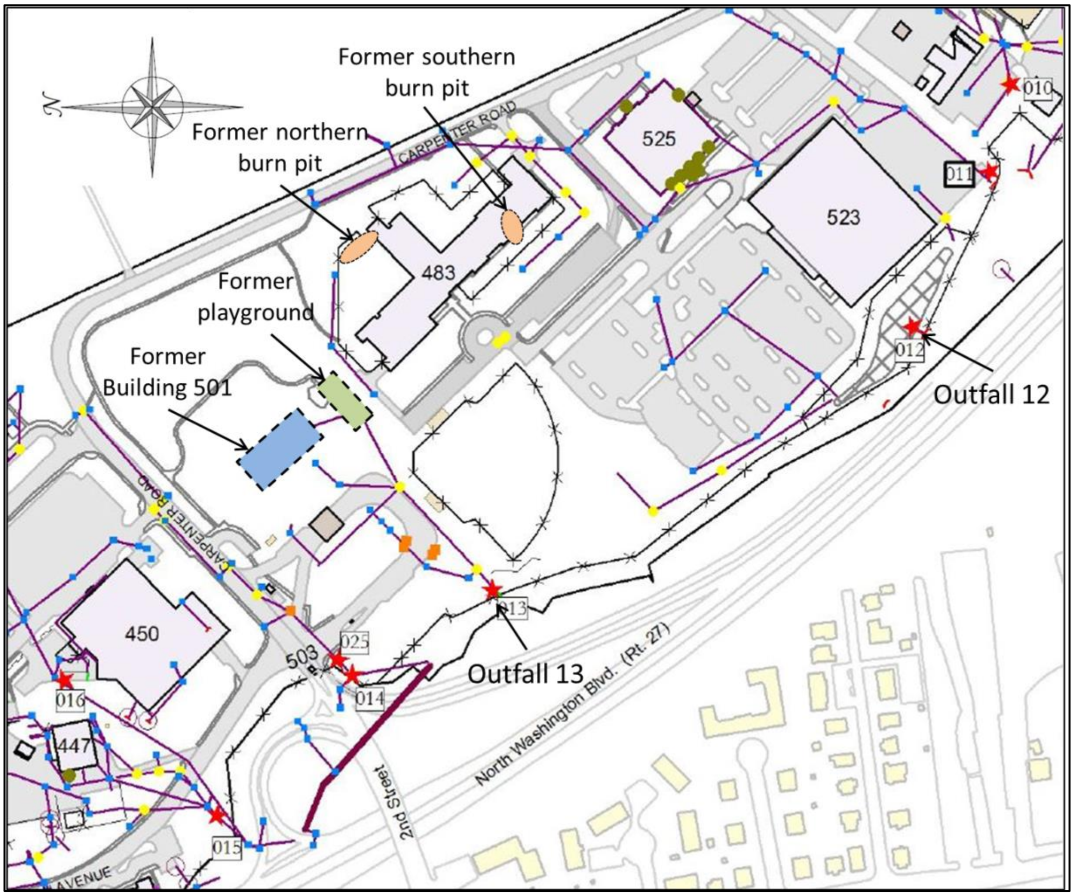
Site access for sampling will be coordinated with facility staff. Stormwater runoff will be collected at stormwater Outfall 21 from two storm events to assess the runoff from the area of the transformer at Building 270/273 (Dog Kennels). **Figure 3** below shows the transformer and Outfall 21 locations.

Figure 3. Transformer at Building 270/273 and Outfall 021 Sampling Point



Stormwater runoff will also be collected from stormwater Outfalls 12 and 13 from two storm events to assess the area surrounding the CDC. **Figure 4** below shows the locations of the former northern burn pit, southern burn pit, Building 501, and playground.

Figure 4. Area Surrounding Child Development Center and Outfalls 12 and 13 Sampling Points



These locations will be sampled during two wet events. These events must occur at least 72 hours from the previously measured (>0.1 inch) storm event, and the storm event during which sampling occurs must yield at least 0.1 inch of precipitation. One grab sample will be collected from the outfalls during each sampling event. The samples must be collected during the first 30 minutes of discharge, or within the first hour if the first 30 minutes is impractical.

For each sample, a volume of at least 2 liters, but ideally 4 liters, of unfiltered water will be collected directly into one 4-liter amber glass jar. All sampling bottles will be laboratory supplied and must be certified pre-cleaned and PCB-free with Teflon lined caps. While collecting the sample, the cap will be temporarily placed in aluminum foil and immediately returned to the bottle once the sample is collected. As recommended by the VADEQ, duplicate samples and field blanks will be collected.

All sample bottles will be labeled and placed on ice in a hard-sided shipping cooler and chilled to <6°C. Sample bottles will be wrapped in bubble wrap and secured to prevent breakage or sample loss and shipped to the laboratory completing the analysis immediately following the sampling event. Coolers will be sufficiently packed with ice to ensure the temperature is maintained at < 6°C for shipment to the analytical laboratory.

All samples will be recorded on a laboratory provided Chain-of-Custody form, sealed in a waterproof bag (i.e., sealable freezer bag), and taped to the inside of the cooler lid. The coolers will be sealed and shipped to the laboratory for immediate analysis by EPA Method 1668, which is capable of detecting low-level concentrations of all 209 PCB congeners. Individual congeners are summed to form total PCB. The samples will be analyzed by Phase Separation Science, a Virginia Environmental Laboratory Accreditation Program certified laboratory included in the VADEQ list of laboratories, performing low level PCB congener analysis (EPA Method 1668).

Method Number/Analysis	EPA Method 1668/PCB
Preservatives	< 6°C immediately
Analytical Holding Time	365 days
Sample Volume Container	$\geq$ 2 liters $\leq$ 4 liters 1 4-liter Amber Glass Bottle

The Annual Report will include a characterization of the discharges and an estimate of annual PCB loading in stormwater discharges based on precipitation records and land uses and the quantity of PCBs. The report will also include recommendations for further characterization or remediation, if necessary.

5.2 Sampling & Analysis Plan Implementation Progress

Implementation of the Plan began in Fall 2016 with the preparation for the PCB sampling and coordination with the analytical laboratory. The first sampling event occurred on 11 May 2017. PCB concentrations were not detected in discharges from any of the three outfalls included in the sampling plan. A second qualifying rain event that produced flow from the three outfalls did not occur by the end of 2017. The next sampling event occurred on April 24, 2018, when flow was produced from Outfall 021. PCB concentrations were not detected in the sample. Outfall 013 was sampled on August 21, 2018 and laboratory results indicated PCB concentrations were not detected in the sample. Access to Outfall 012 was interrupted with security activities related to the new perimeter security fence installation on base. EMD has been working to coordinate the installation of a new gate to regain access to Outfall 012. The final sampling event for Outfall 012 will be conducted as soon as access is obtained.

Sampling and analysis results are presented in the tables below:

STORM EVENT #1:

Date	Duration		Rainfall total (in.)	Preceding Event	
	Hrs	Min		Days	Hrs
11-May-17	12	0	1.04	4	18

Monitoring Date: May 11, 2017

Outfall ID	Units	Date Sampled	Time Sampled	PCB-1016	PCB-1221	PCB-1232	PCB-1242	PCB-1248	PCB-1254	PCB-1260
Outfall 012	ug/L	11-May-17	9:25 AM	ND	ND	ND	ND	ND	ND	ND
Outfall 013	ug/L	11-May-17	9:02 AM	ND	ND	ND	ND	ND	ND	ND
Outfall 021	ug/L	11-May-17	8:45 AM	ND	ND	ND	ND	ND	ND	ND
Field Duplicate (Outfall 013)	ug/L	11-May-17	-	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected

STORM EVENT #2:

Date	Duration		Rainfall total (in.)	Preceding Event	
	Hrs	Min		Days	Hrs
24-Apr-18	10	0	0.46	8	4

Monitoring Date: April 24, 2018

Outfall ID	Units	Date Sampled	Time Sampled	PCB-1016	PCB-1221	PCB-1232	PCB-1242	PCB-1248	PCB-1254	PCB-1260
Outfall 021	ug/L	24-Apr-18	3:40 PM	ND	ND	ND	ND	ND	ND	ND
Field Duplicate (Outfall 021)	ug/L	24-Apr-18	-	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected

STORM EVENT #3:

Date	Duration		Rainfall total (in.)	Preceding Event	
	Hrs	Min		Days	Hrs
21-Aug-18	7	0	2.46	8	18

Monitoring Date: August 21, 2018

Outfall ID	Units	Date Sampled	Time Sampled	PCB-1016	PCB-1221	PCB-1232	PCB-1242	PCB-1248	PCB-1254	PCB-1260
Outfall 013	ug/L	21-Aug-18	1:45 PM	ND	ND	ND	ND	ND	ND	ND
Field Duplicate (Outfall 013)	ug/L	21-Aug-18	-	ND	ND	ND	ND	ND	ND	ND

ND = Not Detected

6.0 CONCLUSIONS AND GENERAL PERMIT REISSUANCE

The transformer at Building 270/273 and the CDC and surrounding areas were the two sites selected for stormwater runoff sampling at the time of the initial assessment in 2016. Based on historical records review, the removal or replacement of old transformers, and the 2016 site inspection results, the remaining historical PCB locations identified in 2016 are unlikely sources of PCB contamination to surface water.

Based on sampling events conducted thus far, analytical results indicated that the drainage areas identified for stormwater sampling have not been impacting stormwater runoff with PCBs. One more sampling event will be conducted when access is regained to Outfall 012.

No new potential sources of PCBs have been identified on the Installation through reviews and monitoring of proposed projects. Due to the restrictions in the manufacturing, processing, distribution, and use of PCBs, it is assumed that any new transformers installed on base will contain non-PCB oils. As required by the permit, VADEQ will be notified in writing within 30 days if a previously unidentified significant source of PCBs is discovered at JBM-HH.

Stormwater outreach materials and training slides will continue to include information on PCBs and structural BMPs will continue to be inspected on a regular basis to ensure proper functionality. Additionally, site inspections will continue to include transformers in order to identify signs of leakage.

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Appendix A – JBM-HH 2019 Stormwater Policy

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

IMMH-PW 8 Nov 19

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Joint Base Myer-Henderson Hall (JBM-HH) Policy Memorandum PW-9, Stormwater Policy

1. REFERENCES.

a. General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, Permit No. VAR040068 (Effective Date: 1 Nov 18, Expiration Date: 31 Oct 23).

b. Federal Water Pollution Control Act (The Clean Water Act) (enacted in 1948, amended in 1972).

c. Energy Independence and Security Act (EISA), Section 438, 4 Jan 07.

d. National Pollutant Discharge Elimination System (NPDES), 40 CFR Part 122, revised 12 Jun 19.

e. Executive Order 13834, Efficient Federal Operations, 17 May 18.

f. Executive Order 13508, Chesapeake Bay Protection and Restoration, 12 May 09.

g. Chesapeake Bay Preservation Area Designation and Management Regulations, 9VAC25-830, 23 Oct 13.

h. Virginia Erosion and Sediment Control Regulations, 9VAC25-840, 23 Oct 13.

i. EPA NPDES General Permit for Discharges from Construction Activity, 16 Feb 19, as amended 27 Jun 19.

j. Virginia Stormwater Management Program Regulation, 9VAC25-870, 26 Feb 14.

k. Virginia General Permit for Discharges of Stormwater from Construction Activities, 9VAC25-880, 1 Jul 19.

l. Environment, Safety, and Occupational Health, 4715.1E, 31 Aug 18.

m. Environmental Protection and Enhancement, AR 200-1, 13 Dec 07.

2. PURPOSE. This memorandum sets forth the JBM-HH policy governing stormwater pollution prevention. The policy guidance provided in the enclosure outlines proper protocols for minimizing stormwater pollution during activities that directly and indirectly impact stormwater.

3. APPLICABILITY. This policy is applicable to all military and civilian personnel and contractors who live, work, or are authorized access to the JBM-HH community.

4. POLICY & PROCEDURES. All actions on JBM-HH shall comply with applicable regulations and policy set forth in the attached policy and procedures enclosed with this policy memorandum.

5. PROPONENT. The JBM-HH Directorate of Public Works, Environmental Management Division is the proponent for this policy. The POC is the Environmental Management Chief at (703) 696-8055.

Encl

KIMBERLY A. PEEPLES
COL, EN
Commanding

DISTRIBUTION:
I

Stormwater Management Procedures
Joint Base Myer-Henderson Hall

1. PERMITS AND APPLICABLE REGULATIONS.

a. Permits: General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4), Permit No. VAR040068 (Effective Date: 1 November 2018, Expiration Date: 31 October 2023)

b. Applicable Regulations: In addition to the permit named above, the Stormwater Program must comply with federal and state regulations, and Department of Defense and Department of the Army policies, including the following:

(1) Federal:
(a) Federal Water Pollution Control Act (The Clean Water Act).
(b) Energy Independence and Security Act (EISA), Section 438.
(c) Executive Order 13834, Efficient Federal Operations .
(d) Executive Order 13508, Chesapeake Bay Protection and Restoration.
(e) National Pollutant Discharge Elimination System, 40 CFR Part 122.
(f) EPA NPDES General Permit for Discharges from Construction Activity.

(2) Virginia:
(a) Chesapeake Bay Preservation Area Designation and Management Regulations, 9VAC25-830.
(b) Erosion and Sediment Control Regulations, 9VAC25-840.
(c) Virginia Stormwater Management Program Regulation, 9VAC25-870.
(d) Virginia General Permit for Discharges of Stormwater from Construction Activities, 9VAC25-880.
(e) Virginia General VPDES Permit for Discharges from Small Municipal Separate Storm Sewer Systems, 9VAC25-890.

(3) District of Columbia
(a) 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control, Chapter 5 of Title 21 of the District of Columbia Municipal Regulations (DCMR), §§ 546, 547, and 552

(4) Department of Defense:
(a) Environment, Safety, and Occupational Health, 4715.1E

(5) Department of the Army:
(a) Environmental Protection and Enhancement, AR 200-1

2. POLICY & PROCEDURES.

a. Stormwater runoff at Fort Myer and Henderson Hall flows to JBM-HH's storm sewer system, which is permitted by the Virginia Department of Environmental Quality (DEQ) as a small MS4 under the VPDES permit.

(1) Stormwater runoff at Fort McNair is not regulated by a specific permit; instead, stormwater from Fort McNair flows directly into the Potomac River or to the District of Columbia's MS4, which is permitted by the US Environmental Protection Agency (EPA). The Department of Energy and Environment (DOEE) has oversight of the MS4 and has the authority to take measures that reduce pollutants at the source, by inspecting facilities and issuing notices of violation, fines, and penalties for noncompliance with the District of Columbia's stormwater regulations.

(2) These permits and the District of Columbia's stormwater regulations serve as the basis for JBM-HH's Environmental Management Division (EMD) Stormwater Program's duties. The Stormwater Program is responsible for maintaining compliance with permit conditions; however, compliance with permit conditions requires cooperation from other Directorates and Installation entities, as well as the Installation's residents, employees, and visitors. See Section 1.b for applicable regulations.

b. The following pollution prevention measures will be implemented to protect surface waters that receive stormwater discharges from JBM-HH:

(1) Illicit Discharges. JBM-HH's stormwater permit allows only stormwater into its storm sewer system. With a few exceptions, materials other than stormwater discharged to the storm drain system are called illicit discharges and are strictly prohibited.

(a) Any sort of dumping or disposal of material into a storm drain is considered an illicit discharge. Illicit discharges may be deliberate or unintentional and can occur at any time. Illicit discharges can range from oil spills to muddy runoff or tracked sediment to a sanitary sewer cross-connection, all allowing pollutants to enter the storm sewer system.

(b) EMD will investigate illicit discharges; however, residents, employees, and visitors should notify EMD when they observe an illicit discharge occurring. Examples of reportable incidents include:

1. Any flow observed 72 hours or more after the last rain event.
2. Muddy runoff or tracked sediment, especially near a construction site.
3. Washwater from vehicle and equipment washing (other than residents' personal vehicles).
4. Spilled or dumped chemicals or waste materials (dry or wet) that are entering a storm drain.
5. Pet wastes.

(c) Exceptions to the illicit discharge rule include water from firefighting activities; hydrant and potable water line flushings; and groundwater or spring water. Any concerns or suspected illicit discharges should be reported to EMD for further investigation.

(2) Vehicle Washing. Vehicle washing generates washwater that may be contaminated with grease, oil, fuel, dusts and residues, soaps, and other pollutants, which then flow untreated into storm sewer systems and waterways. JBM-HH residents may wash personal vehicles in residential areas of the Installation, but when possible, shall use the commercial vehicle wash at Henderson Hall or the vehicle wash rack at Fort McNair, which filter and recycle washwater before finally discharging water to the sanitary sewer system.

(a) JBM-HH's stormwater permit explicitly prohibits the discharge of washwater associated with municipal vehicle washing operations to JBM-HH's storm sewer system. Municipal vehicles include:

1. JBM-HH police cars.
2. JBM-HH fire trucks and engines.
3. Military vehicles.
4. Public Works vehicles.
5. Public Works equipment.
6. Buses.
7. Contractor vehicles and equipment.
8. All other vehicles designated for official government use at JBM-HH.

(3) Spills and Leaks.

(a) Every precaution should be taken when working with chemicals and materials outdoors so that spills are minimized. When they occur, respond to spills and leaks immediately to keep spilled material from entering the storm drain system. Spill kits are located at the AAFES fueling station for spill clean-up and in various workshops for employees' use.

(b) All spills and leaks are required to be reported to EMD for proper cleanup. Emergency spills and leaks involving hazardous substances should also be reported to Emergency Services by calling 911.

(4) Construction Projects. During their planning phase, construction projects of all sizes are required to consider their potential impacts to stormwater and adhere to the following guidelines to minimize stormwater pollution. Residents, employees, and visitors observing any stormwater incidents stemming from construction projects (e.g. runoff during dry weather, excessive sediment, trash and litter, concrete washout) should contact EMD.

(a) Fort Myer and Henderson Hall.

1. Stormwater discharges from construction must be minimized by using erosion and sediment controls and protective barriers around disturbed land and stockpiles. Projects disturbing 5,000 square feet of land or more must submit an Erosion and Sediment Control Plan to the Virginia DEQ for review and approval. Projects disturbing one acre or more must develop a stormwater pollution prevention plan (SWPPP) and apply for a Construction General Permit. Virginia DEQ must approve Erosion and Sediment Control Plans and SWPPPs and/or issue a Construction General Permit before land disturbing activities take place.

2. Any planned submittals to the Virginia DEQ must be submitted to the EMD for review at least 30 days prior to submission to Virginia DEQ. All construction projects are subject to inspection by EMD personnel. Access to the construction sites must therefore be granted to EMD personnel whenever inspections are conducted.

3. JBM-HH's stormwater permit requires qualified Installation personnel to conduct inspections of construction projects disturbing 10,000 square feet of land or greater (or 2,500 square feet of land or greater in areas designated under the Chesapeake Bay Preservation Act) to ensure appropriate controls have been implemented to prevent non-stormwater discharges to the MS4. Inspections must be conducted at the following intervals:

- During or immediately following initial installation of erosion and sediment controls;
- At least once per every two-week period;
- Within 48 hours following any runoff producing storm event; and
- At the completion of the project prior to the release of any performance bond.

4. The construction project manager will be notified of any deficiencies noted during the above-described inspections via a memorandum. The contractor and/or project manager must complete the required corrective actions by the deadline noted in the memorandum. EMD personnel will conduct follow-up inspections to ensure the deficiencies were properly addressed.

(b) Fort McNair:

1. Stormwater discharges from construction must be minimized by using erosion and sediment controls and protective barriers around disturbed land and stockpiles. All projects are subject to the DOEE's soil erosion and sediment control regulations, except projects that disturb less than 50 square feet of land. DOEE must review and approve soil erosion and sediment control plans before land disturbing activities take place.

2. In addition to a soil erosion and sediment control plan, projects disturbing greater than 5,000 square feet of land must develop a SWPPP, which must be submitted to DOEE for review and approval before land disturbing activities take place.

3. Projects disturbing one or more acres of land must obtain coverage under the EPA NPDES Construction General Permit.

4. Any plans and/or permits must be submitted to EMD for review at least 30 days prior to submission to DOEE and EPA. All construction projects are subject to inspection by EMD personnel.

(5) Stormwater Best Management Practices for High-Priority Facilities.

(a) Operations at Fort Myer with higher potential of discharging pollutants include the following:

Building 306 – Directorate of Public Works (DPW) Sign Shop

Building 325 – DPW Roads & Grounds Shop

Building 447 – DPW Boiler Plant & Storage Yard

Building 314 – The Old Guard (TOG) Motor Pool

Building 330 – Directorate of Logistics TMP Motor Pool

(b) Stormwater pollutant prevention at each of these facilities is described in JBM-HH's SWPPP. The Directorate of Public Works and TOG are responsible for implementing the stormwater best management practices (BMPs) as described in the Installation's SWPPP. The EMD is responsible for maintaining and updating the Installation's SWPPP, conducting quarterly compliance inspections of industrial areas, and notifying DPW and TOG of deficiencies in BMP implementation at the high-priority facilities.

(6) General Stormwater Best Management Practices. The following BMPs should be implemented at Fort Myer, Henderson Hall, and Fort McNair where possible to prevent the pollution of stormwater:

(a) Recycle. Do not throw recyclable materials in the regular trash.

(b) Keep trash cans and dumpsters closed. Report leaking trash cans or dumpsters to EMD.

(c) Do not throw trash, including cigarette butts, on the ground.

(d) Have your vehicle maintained regularly.

(e) Do not top off your vehicle tank when refueling.

(f) Use commercial car washes that recycle washwater.

(g) Immediately clean up spilled materials.

(h) If you see a spill of oil or of a hazardous material, report it by calling 911.

(i) If you see a condition that is causing or could cause stormwater pollution, notify EMD.

(7) Contacting the Environmental Management Division. Report any conditions that could cause stormwater pollution to the Environmental Management Division's Stormwater Program at (703) 696-8055. The Environmental Management Division is located in Building 321 at Fort Myer, along Marshall Drive.

Appendix B – Transformer Inventory

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Table B.1 –Transformers Currently In Use at JBM-HH

Location	Trans-former No.	ID Tag	Serial No.	Manufacturer	Oil Capacity (Gal.)	Size (kVA)	PCB Content
AC Pit (between Buildings 251 and 410)	TV-RF	C1018-AC46	DF10023164	Atlantic Power System	157	1000	None
AC Pit (between Buildings 251 and 410)	TV-RF	C1018- AC36	81309691846	ERMCO	-	1000	<50 ppm
Building 12 (Henderson Hall)	-	C1017-EK73	3466684614	Howard Industries	184	500	<50 ppm
Building 203	NTV-28	-	G-73522-1	Hevi-Duty	195	225	<50 ppm
Building 203	NTV-28	C1018-BH42	2286141512	Howard Industries	-	500	<1 ppm
Building 205	-	C1018-BH16	GF09295211	Atlantic Power System	270	750	None
Building 214	TV-1A	C1018-AG37	71109234656	ERMCO	-	750	<50 ppm
Building 216	NTV-12	C1C18-AG50	CP0750018190	-	-	300	<50 ppm
Building 219	NTV-11	C1018-AG38	A0808784833	ERMCO	208	750	7.4 ppm
Building 241	NTV-18	C1018-AF01	CP0750018187	Cooper	241	300	<50 ppm
Building 241	NTV-18	C1018-AF02	-	Cooper	241	750	<50 ppm
Building 241	-	C1018-AF00	11JC35085001 4	-	-	1000	<1 ppm
Building 242	-	C1018-AF55	-	ABB	-	300	<50 ppm
Building 248	NTV-17	C1018-XE62	A1109301611	ERMCO	208	750	<50 ppm
Building 25 (Henderson Hall)	-	C1017-FL63	-	-	-	-	<50 ppm
Building 251	NTV-16	C1018-AD32	3435413702	Howard Industries	-	500	<50 ppm
Building 26 (Henderson Hall)	-	C1017-FJ67	1480499090015	-	250	1500	<1 ppm
Building 270/273	-	C1018-BI21	GF09295212	Atlantic Power System	250	75	None
Building 28 (Henderson Hall)	-	C1017-FL26	-	-	250	-	<50 ppm
Building 280	-	C1018-AI11	CP1650000338	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI12	CP1650000114	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI22	CP1650000271	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI20	CP165000270	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI10	CP165000140	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI42	CP165000167	Cooper	-	-	<50 ppm

Location	Trans-former No.	ID Tag	Serial No.	Manufacturer	Oil Capacity (Gal.)	Size (kVA)	PCB Content
Building 280	-	C1018-AI33	CP165000115	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI23	CP165000361	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI34	CP165000362	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI53	CP165000168	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI44	CP165000517	Cooper	-	-	<50 ppm
Building 280	-	C1018-AI40	CP165000471	Cooper	-	-	<50 ppm
Building 29 (Henderson Hall)	-	C1017-GL40	14JC49909001 4	-	-	1500	<1 ppm
Building 301	NTV-26	C1018-HS01	AB 00J986281	-	-	500	<50 ppm
Building 307	-	C1018-EI00	-	-	-	-	<50 ppm
Building 313	TV-8	C1018-EI35	DF09263160	Atlantic Power System	295	750	None
Building 316	NTV-24	C1018-EI27	75H292205	Westinghouse	-	300	5 ppm
Building 325	-	C1018-EH89	GF09295214	Atlantic Power System	230	150	None
Building 330	-	C1018-EH44	-	-	-	-	<50 ppm
Building 330	-	C1018-EH44	-	-	-	-	<50 ppm
Building 400	TV-11	C1018-BD56	RHK-0597	Standard	385	1500	<1 ppm
Building 404	TV-3B	C1018-B230	DF10013162	Standard	166	750	None
Building 404	TV-3A	C1018-B220	3313672107	Howard Industries	302	300	<50 ppm
Building 405	TV-405	C1018-BC76	PGB-0160	Alstom	130	300	<50 ppm
Building 407	TV-9	C1018-BB83	RBC6453	Standard	285	750	2 ppm
Building 407	TV-7	C1018-BB46	CP095009535	Cooper	300	-	<50 ppm
Building 410	TV-410	C1018-AB58	DF09123159	Atlantic Power System	165	225	None
Building 411	TV-411	C1018-BC80	DF0410010	Sunbelt Transformers	179	300	None
Building 414	-	C1018-AA57	PAD-0422	GEC Alsthom	250	500	None
Building 415	-	C1017-B001	6140987291	ERMCO	-	750	<50 ppm
Building 416	TV-416	C1018-AB44	75L099019	Westinghouse	-	500	10 ppm
Building 421	-	C1018-AC92	6100951402	ERMCO	-	750	<50 ppm
Building 425	NTV-8	C1018-BB11	21309590566	ERMCO	195	300	<50 ppm
Building 430 (SE corner near pool)	-	C1018-BB32	L-707760	General Electric	74	75	5 ppm
Building 447	NTV-14	C1017-BO91	51409856650	ERMCO	168	300	5 ppm
Building 450	TV-10	C1017-CN25	946001823	Cooper	330	750	None
Building 451	TV-451	C1017-CO27	POH-0399	Standard	147	75	<50 ppm
Building 452	TV-452	C1017-CP10	830208-1	Balleau	106	112.5	5 ppm

Location	Trans-former No.	ID Tag	Serial No.	Manufacturer	Oil Capacity (Gal.)	Size (kVA)	PCB Content
Building 469 (former CDC)	NTV-9	C1018-BA53	G-73520	Hevi-Duty	162	112.5	-
Building 47	NTV-27	C1018-BH89	21209347861	ERMCO	208	750	<50 ppm
Building 480	TV-480	C1017-D038	41009034820	ERMCO	208	300	<50 ppm
Building 482	TV-30A	C1017-CP70	-	-	-	225	<50 ppm
Building 483	-	C1017-EM24	4707923907	Sunbelt Transformers	-	-	<50 ppm
Building 523	-	C1017-EK29	10JC32850000 9	-	-	1500	<1 ppm
Building 525	TV-6	C1017-EL50	4829634107	Howard Industries	-	750	<50 ppm
Building 59	NTV-20	C1018-BE28	2589593314	Howard Industries	67	1500	<50 ppm
Hatfield Gate VCP	TV-5	C1017-CN72	V-290019	Sunbelt Transformers	301	750	<50 ppm
Parking lot E of Building 405	TV-30	C1018-CC27	CP0750018189	Cooper	-	300	<50 ppm
Quarters 11	NTV-22	C1018-CG71	1534660903	Howard Industries	195	300	<50 ppm
Quarters 15	NTV-21	C1018-BF88	AB11JC329320 019	-	-	300	<1 ppm
Quarters 19&21	NTV-19	C1018-CE09	-	ERMCO	-	300	<50 ppm
Quarters 23	NTV-29	C1018-BF08	AB085016040	ERMCO	208	300	<50 ppm
Quarters 7&8	NTV-23	C1018-CG70	2738532702	Howard Industries	-	-	<50 ppm
Wright Gate VCP	NTV-25	C0108-GI20	G-10735-2	Hevi-Duty	164	150	10 ppm

Table B.2 – Former Transformers (Decommissioned)

Location	Trans-former No.	ID Tag	Serial No.	Manufacturer	Oil Capacity (Gal.)	Size (kVA)	PCB Content
AC Pit (between Buildings 251 and 410)	TV-RF	-	44261	Square D	240	1000	>50%
Ball Field	-	-	MB1-2895	Standard	72	100	5 ppm
Ball Field	-	-	MB1-2896	Standard	72	100	<2 ppm
Building 203	NTV-28	C1018-BH42	86J0664265	Westinghouse	-	500	<1 ppm
Building 214	TV-1	-	8437177	Esco	378	700	1,000,000 ppm
Building 216	NTV-12	-	G-10694-2	Hevi-Duty	195	225	65 ppm
Building 219	NTV-11	C1018-AG37	7022552	Westinghouse	208	750	7.4 ppm
Building 219	NTV-11	-	7022552	Westinghouse	-	-	-
Building 241	NTV-18	-	G-73523-2	Hevi-Duty	211	300	5 ppm
Building 241	NTV-18	-	959001611	Cooper	241	500	None
Building 241	NTV-18	-	72L35001	Westinghouse	-	500	5 ppm
Building 248	NTV-17	C1018-XE62	G-10695-2	Hevi-Duty	211	300	25 ppm
Building 25 (Henderson Hall)	-	C1017-FL62	-	-	-	-	-
Building 251	NTV-16	-	G-10694-8	Hevi-Duty	195	225	55 ppm
Building 280	-	C1018-AI52/ CO1018-AI3200	-	-	-	-	-
Building 301	NTV-26	-	G-73523-1	Hevi-Duty	211	300	45 ppm
Building 301	NTV-25A/26	-	G-73529	Hevi-Duty	221	300	330 ppm
Building 301	NTV-26A	C0108-HJ10/11	2.089E+09	Square D	-	300	None
Building 301	NTV-26	-	70V5102	Vantran	-	37.5	10 ppm
Building 301	NTV-26	-	C-4549904	McGraw-Ed.	-	37.5	10 ppm
Building 301	NTV-26	-	C-622210	McGraw-Ed.	-	37.5	5 ppm
Building 313	-	-	70V2138	Vantran	-	167	>50%
Building 313	-	-	70V2136	Vantran	-	167	>50%
Building 313	-	-	70V2137	Vantran	-	167	>50%
Building 323	-	-	-	-	-	-	-
Building 325 (N parking lot)	-	-	-	-	255	300	-
Building 402	TV-2	-	F-958965	General Electric	74	300	>50%
Building 402	TV-2	-	F-958966	General Electric	99	500	>50%
Building 402	TV-2	-	DF10013161	Atlantic Power	204	500	None

Location	Trans-former No.	ID Tag	Serial No.	Manufacturer	Oil Capacity (Gal.)	Size (kVA)	PCB Content
				System			
Building 403	TV-4	-	177348	Standard	125	300	>50%
Building 403	TV-4	-	DF10033163	Atlantic Power System	196	750	None
Building 403	TV-4	-	177302	Standard	216	750	>50%
Building 404	TV-3C	-	176251	Standard	109	300	>50%
Building 404	TV-3B	C1018-BD31	DF10013162	Atlantic Power System	166	300	None
Building 404	TV-3A	C1018-BD21	PMF-0705	Standard	302	750	<2 ppm
Building 404	TV-3C	C1018-BD10	-	-	-	-	-
Building 405	TV-8	-	181691	Standard	140	300	-
Building 406	TV-7	-	F-963883	General Electric	90	300	>50%
Building 406	TV-7	-	F-963884	General Electric	160	750	>50%
Building 406	TV-7	-	DF10033165	Atlantic Power System	301	750	None
Building 410	-		20346-AO1	ITE	100	225	>50%
Building 414	-	C1018-AA32	-	-	-	-	-
Building 415	-	C1017-AO94	-	-	-	300	-
Building 423 (former Commissary)	NTV-15	-	G-72356	Hevi-Duty	195	750	75 ppm
Building 447	NTV-14	-	G-10695-3	Hevi-Duty	211	300	7,210 ppm
Building 448	NTV-10	-	G-10735-1	Hevi-Duty	164	150	<2 ppm
Building 448	NTV-10	-	G-73530	Hevi-Duty	273	500	>50%
Building 450	TV-10	C1017-CN25	796007456	Square D	465	750	-
Building 468	NTV-13	C1017-BO11	G-106095-1	Hevi-Duty	211	300	35 ppm
Building 469 (former CDC)	NTV-9B	-	81JK574032	Westinghouse	-	300	<2 ppm
Building 469 (former CDC)	NTV-9A	-	-	-	-	-	135 ppm
Building 47	NTV-27A	C1018-CH19	G-73521	Hevi-Duty	164	150	26 ppm
Building 47	NTV-27B	C1018-CH18	G-73523-1	Hevi-Duty	211	300	None
Building 47	NTV-27C	C1018-CH20	-	-	-	-	-
Building 480	TV-480	C1017-D038	F-49142	Delta-Star	195	225	10 ppm
Building 480	TV-480A	C1017-D037	-	-	-	-	-
Building 483	-	C1017-FM13	-	-	-	-	-
Building 501	NTV-8	-	G-10694-7	Hevi-Duty	195	225	30 ppm
Building 525	TV-6	-	8639526	ESCO	374	750	<2 ppm

Location	Trans-former No.	ID Tag	Serial No.	Manufacturer	Oil Capacity (Gal.)	Size (kVA)	PCB Content
Building 525	TV-6	C1017-EL39	-	-	-	-	-
Building 59	NTV-20	C1018-BE36	830414	Square D	239	500	<2 ppm
Building 59	NTV-20	-	G-73528	Hevi-Duty	273	500	80 ppm
Building 406	TV-7	-	F-963884	General Electric	160	750	>50%
Field	NTV-15	-	G-73526	Hevi-Duty	346	750	<0.65 ppm
Hatfield Gate VCP	TV-5	C1018-CN63	V-290019	Delta-Star	301	750	-
Parking lot E of Building 405	TV-30	-	-	-	-	37.5	-
Quarters 11	NTV-22	C1018-CG71	G-10694-4	Hevi-Duty	195	225	45 ppm
Quarters 15	NTV-21	C1018-BF99	-	Hevi-Duty	-	225	90 ppm
Quarters 19&21	NTV-19	C1018-CE08	G-10694-6	Hevi-Duty	195	225	35 ppm
Quarters 23	NTV-29	C1018-BF08	G-10694-1	Hevi-Duty	195	300	60 ppm
Quarters 7&8	NTV-23	-	G-10694-3	Hevi-Duty	195	225	660ppm
Street Light	-	-	8639525	ESCO	-	37.5	10 ppm
Street Light	-	-	RBE-7144	Standard	-	25	<2 ppm
Wright Gate VCP	NTV-25	C0108-GI19	-	-	-	-	-

Appendix C – Historic Site Analysis

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Location	Trans-former Number	ID Tag	Description	Evaluation
Building 214 (Historic)	TV-1	-	An inspection performed in 1988 noted leaks at this transformer location. The transformer was removed in 2000.	This transformer was replaced. No signs of leaks were observed during the 2016 inspection.
Building 216 (Historic)	NTV-12	-	An inspection performed in 1988 noted leaks at this transformer location, though any contamination of soil could not be visibly determined at that time.	This transformer was replaced. No signs of leaks were observed during the 2016 inspection.
Building 219 (Historic)	NTV-11	C1018-AG37	Oil staining on the transformer case and pad and old saturated absorbent was observed during the 2009 inspection.	This transformer was replaced. No signs of leaks were observed during the 2016 inspection.
Building 248 (Historic)	NTV-17	C1018-XE62	An inspection performed in 1988 noted leaks from this transformer.	This transformer was removed.
Building 251 (Historic)	NTV-16	-	An inspection performed in 1988 noted leaks from this transformer.	This transformer was removed and replaced with a new transformer. No signs of leaks were detected from this transformer during the 2016 inspection.
Building 270/273	-	C1018-BI21	1996 inventory lists this transformer at Building 270 Dog Kennels. Replacement transformer.	The inspection revealed some corrosion, organic material staining, and possible leakage. This site is included in the sampling analysis plan.
Building 3	-	-	In 1990, a PCB transformer at leaked a small quantity of transformer oil.	The leak was contained inside the building and remediated. The building was eventually demolished.
Building 301 (Historic)	NTV-25/26	-	The transformer was leaking at the time of an inspection in 1988 and reportedly had been leaking for five years. The soil in the area had been contaminated.	Site plans dated 1990 for testing and decontaminated were available but closure documentation could not be located. This transformer was removed and replaced with a new transformer. No signs of leaks were detected from this transformer during the 2016 inspection.
Building 313 (Historic)	-	-	An inspection performed in 1988 noted leaks from two of the three transformers in the storage rooms. The surrounding area was not found to be contaminated.	The leaks were contained inside the building and remediated in 1990. These transformers appear to have been removed and only one transformer is located at this building. No signs of recent leaks

Location	Trans-former Number	ID Tag	Description	Evaluation
				were observed on this transformer at the time of the 2016 inspection.
Building 316 (Current)	NTV-24	C1018-EI27	An inspection performed in 2009 noted oil staining on the transformer pad.	The concrete pad appeared to be replaced and no signs of leaking were observed during the 2016 inspection.
Building 323 (Historic)	-	-	In 1990, a transformer leaked a small quantity of transformer oil and contaminated the soil down to approximately 6 inches.	The soil was reportedly removed. Site investigation and inspection revealed that this building was demolished and the transformer was removed.
Building 330 (Current)	-	C1018-EH44	An inspection performed in 2009 noted possible oil staining on the transformer pad and corrosion at the base of the transformer.	No signs of leaks were observed during the 2016 inspection.
Building 330 (Current)	-	C1018-EH45	An inspection performed in 2009 noted possible oil staining on the transformer pad.	No signs of leaks were observed during the 2016 inspection.
Building 403 (Historic)	TV-4	-	A remediation contract was completed as of March 1993, but sample results afterwards showed that additional remediation was required and the transformer would have to be cleaned.	This transformer was removed and Building 406 was demolished.
Building 404 (Historic)	TV-3	-	An inspection performed in 1988 noted leaks from this transformer, which extended to the soil area. The area remained contaminated until 1998, when the PCB-contaminated soil was excavated.	Lab results from 8 soil samples indicated that the PCB concentration levels were below remediation goal levels. No signs of leaks were observed from the transformers at this location during the 2016 inspection.
Building 406 (Historic)	TV-7	-	A remediation contract was completed as of March 1993, but sample results afterwards showed that additional remediation was required and the transformer would have to be cleaned.	This transformer was removed and Building 406 was demolished in 2009.

Location	Trans-former Number	ID Tag	Description	Evaluation
Building 410	-	-	A remediation contract was completed as of March 1993, but sample results afterwards showed that additional remediation was required and the transformer would have to be cleaned. Wipe samples indicated some elevated levels of PCBs and an area was designated for remediation.	The remediation in this building could not be confirmed, but the building has since been demolished.
Building 411 (Current)	TV-411	C1018-BC80	Potential oil staining around the pipe leading from case to baffles and minor rust/corrosion was noted at this transformer 2009.	No signs of leaks were observed during the 2016 inspection.
Building 423 (Historic)	NTV-15	-	At the time of an inspection in 1988, a leak was detected and absorbents were in use. The transformer had been leaking since 1979 and the entire area was contaminated.	PCB remediation was completed as of March 1993. Sample results indicated that no additional remediation was required. The transformer has been removed and the building was demolished.
Building 447 (Historic)	NTV-14	-	An inspection performed in 1988 noted leaks from this transformer.	This transformer has been removed.
Building 447 (Current)	NTV-14	C1017-BO91	Any possible signs of leaking were unable to be seen due to heavily oxidized paint and leaves/organic debris covering pad and surrounding ground during a 2009 inspection.	No signs of leaks were observed during the 2016 inspection.
Building 448	NTV-10	-	In 1996, wipe samples taken from the transformer vault indicated PCB concentrations exceeding the cleanup standard of 10 $\mu g/cm^3$.	In 1998, the concrete pad was double washed and rinsed. Results from two wipe samples taken after the cleaning were below the cleanup standard. Additionally, the building has been demolished.
Building 450	TV-10	C1017-CN25	In 1990, the PCB transformer leaked a small amount of transformer oil onto asphalt.	The asphalt was double washed and the transformer was replaced.

Location	Trans-former Number	ID Tag	Description	Evaluation
Building 468 (Historic)	NTV-13	C1017-BO11	An inspection performed in 1988 noted leaks from this transformer. Potential oil staining on the transformer case (possibly paint oxidation) was also noted in a 2009 inspection.	This transformer has been removed.
Building 469 (former CDC)	NTV-9	-	In 1995, there was a PCB spill of approximately 5 gallons at the former CDC.	The transformer pad and transformer were cleaned and decontaminated within a few weeks of the spill. The final soil samples indicated the levels were below the regulatory limits.
Building 47 (Historic)	NTV-27A	C1018-CH19	A leak was detected during a 1988 inspection.	Inspection notes state that the leak never contaminated the soil and that the unit was retrofilled with non-PCB fluid. This transformer was replaced by NTV-27. No signs of leaks were observed during the 2016 inspection.
Building 480 (Historic)	TV-480	C1017-D038	A leak was detected during a 1988 inspection. Possible oil staining on the outside of the case near the base of the transformer was observed during a 2009 inspection.	This transformer was replaced. No signs of leaks were observed during the 2016 inspection.
Field (Historic)	NTV-15	-	During an inspection in 1995, the transformer was disconnected and there was visible staining on the pad and the ground.	Wipe samples detected no PCBs in the area.
Quarters 11 (Historic)	NTV-22	C1018-CG71	Oil staining was observed on the north side of the transformer case and on the north side of the transformer pad during a 2009 inspection. Old saturated absorbent pads were also observed underneath the case during the inspection.	This transformer was replaced. No signs of leaks were observed during the 2016 inspection.
Quarters 19&21 (Historic)	NTV-19	C1018-CE08	Oil staining on the transformer case and old absorbent material was observed around the exterior pipes during the 2009 inspection.	This transformer was replaced. There were no signs of leaks at the time of the 2016 inspection.

Location	Trans-former Number	ID Tag	Description	Evaluation
Quarters 23 (Historic)	NTV-29	C1018-BF08	Possible oil staining was observed during a 2009 inspection.	This transformer was replaced. There were no signs of leaks at the time of the 2016 inspection.
Wright Gate VCP (Historic)	NTV-25	C0108-GI19	A leak was detected during a 1988 inspection. Possible oil staining was observed on the west side of the transformer pad during a 2009 inspection.	This transformer was removed. The transformer now located at NTV-25 looked new and there were no signs of leaks at the time of the 2016 inspection.
AC Pit (grassy area between Buildings 251 and 410	TV-RF	-	Samples were collected from the AC Pit in 1993. Results indicated the presence of PCB contamination. Samples collected in 1996 confirmed that PCB contamination remained in the area.	In 1998, the concrete pad was double washed and rinsed. Two wipe samples were collected; lab results were below the remediation goal levels.
Area surrounding Child Development Center (CDC)	-	-	In the mid-1980s, approximately 200 cubic feet of PCB-contaminated soil was excavated from the site. Contamination was estimated to cover four acres. Samples were previously collected from the area where the current CDC building, grassy areas to the north and northeast, and current parking area to the east.	Most soil samples collected had concentrations below the USEPA PCB cleanup levels for non-restricted access areas (10 ppm). The maximum concentration in soil at the former north burn pit, currently a courtyard area on the north side of the CDC, was 34 ppm. The former playground area (to the northeast of the CDC) was remediated in 1984-1985, with 200 cubic feet of PCB-contaminated soil was excavated, taken offsite for disposal, and replaced with clean fill. This area is included in the sampling analysis plan.

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Appendix D – *The Pentagram* PCB Article

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Killer Thermostats: Countering the Internet of Terrorism (IoT)

Co-Authored by Col. Patrick M. Duggan Commander, Joint Base Myer-Henderson Hall

Col. Patrick M. Duggan

Should you be scared of your new thermostat? Maybe, if it is WIFI-enabled and you haven't secured it.

Why? The next generation of terrorism is here, and it will use your connected devices – thermostats, fridges, lights, elevators, industrial controls, cars – even toys. These smart devices represent the latest pathways for tech-savvy terrorists to wreak chaos. But before unplugging everything you own to live off the grid, take heart in the fact, at least at the national level, we still have time to prepare.

While traditional DoD counter-terrorism (CT) efforts have mainly emphasized direct action, future U.S. security measures must also adapt to harness the Internet of Things (IoT). Simply put, the IoT's inexorable growth portends new methods for destruction but also provides new mechanisms for defense.

These same IoT devices are as capable for U.S. Special Operations Forces (SOF) hunting terrorists as they are to the enemies who use them. This phenomena of unconventional cyberwarfare will become increasingly critical to defending the nation and heralds the birth of a new form of CT: countering the Internet of Terrorism (IoT).

The concept of "edge computing" is breeding entirely new ecosystems – and terrorist threats. Edge computing is a critical driving force behind IoT's ever-expanding adaption to new fields of computer application. Instead of a centralized hub to process data or information, edge computing enables virtually anything with a mini-processor to use its own "smarts" to respond at the very source of the data. This capability means that end-user client devices can carry out a multitude of nefarious activities independently or as part of a more coordinated "foggy network."

According to leading reports, by 2025 a huge percentage of the devices we use regularly in our daily life will be connected; and our wearables, ingestibles, sensors, transportation systems and devices will all become a node on constantly emitting and transmitting networks. Not only will this explosion of technology drive privacy issues and self-determined freedom over our individual lives, but it can kill us as well.

Take for example, the fact that the Islamic State in Iraq and Syria (ISIS) is already employing off-the-shelf drones to drop bombs and fly kamikaze-like missions into U.S. and Iraqi SOF partners in Northern Iraq. How much longer will it take for the next "terror-byte" step, to use edge computing technology so that a terrorist can build his own swarm of killer drones in a garage?

And making it even harder to counter, the garage can be a thousand miles away, with units operated like some sort of macabre video game.

How will Soldiers destroy a swarm of bomb-laden drones coming at them from multiple directions when they are moving on the ground? The answer is to use a defensive structure that is as flexible and adaptive as the enemy. The best protection requires leveraging our own network of miniaturized and remote systems to create a counter-swarm!

Special and Cyber operations can work together effectively to provide low-cost, high effectiveness defense against a number of newly emerging terrorist threats. There are clearly big-data threats that require big-computer systems to defend against – exactly the type of capabilities developed by U.S. Cyber Command (CYBERCOM). Many threats, however, are both more tactical and more distributed. In order to defend against these dangers, it is necessary to have counter-capabilities that are also tactical and locally disseminated.

We encourage the creation of a new Special Operations Command-Cyber (SOC-CYBER). Similar to the Theater Special Operations Commands (TSOCs) every Geographic Combatant Commands owns, SOC-CYBER would provide the same integration, synchronization and oversight of better fused cyber-SOF missions.

Co-locating some of the nation's most talented warriors with those trained to counter emerging technical threats would help ensure America stays ahead of the coming Internet of Terror.

But still, don't forget to add a password to your thermostat.

Editor's note: Duggan's co-author is Scott S. Gartner, Director of Pennsylvania State School of International Affairs. Reprinted by permission, this article first appeared in the Huffington Post March 3, 2017.

PCBs: Cleaning up the former 'miracle chemical'

By Jen Tolbert Environmental Management Division, JBM-HH Directorate of Public Works

A substance that has low flammability, chemical stability, and excellent insulating properties and could come in the form of liquid oil or a waxy solid – this was every industrial and commercial manufacturer's dream chemical.

Because of these valuable properties, polychlorinated biphenyls (PCBs) were used in a wide variety of products including transformers, capacitors, pesticides, paints, adhesives, plastics and many more.

PCBs were manufactured from 1929 until 1979, when production was banned due to negative human health and environmental impacts. While PCBs are no longer manufactured, and many PCB-containing products have been taken out of use, they can still be released into the environment from improper maintenance and disposal of older PCB products.

Poorly managed hazardous waste sites, illegal dumping, disposal of PCB-containing products at landfills not designed to handle hazardous waste, burning of PCB waste in incinerators and leaks from PCB-containing transformers have all been causes of PCB releases to the environment.

States in the Chesapeake Bay area are working to reduce PCB contamination in the Bay by establishing new regulations and requirements to prevent PCBs from entering waterways.

In 2007, Virginia, Maryland, and the District of Columbia, developed Total Maximum Daily Loads (TMDLs) for PCBs for tidal portions of the Potomac and Anacostia Rivers. These TMDLs establish amounts of PCBs that a waterbody can receive while still meeting required water quality standards and allow states to place restrictions on facilities with the potential to discharge stormwater to the Bay.

These facilities are often required to develop PCB TMDL Action Plans to identify any potential sources of PCBs and plan how to ensure they do not pollute waterways.

Even though Fort Myer and Henderson Hall do not discharge directly to the Bay or the Potomac River, the Environmental Management Division recently developed a PCB TMDL Action Plan for Fort Myer and Henderson Hall, as a requirement for the Installation's Virginia Municipal Separate Storm Sewer System (MS4) Permit. Because Fort McNair is not located in Virginia and does not have the same requirements, it was not included in the action plan.

COURTESY PHOTO
The Potomac River is covered under the Total Maximum Daily Load (TMDL) for polychlorinated biphenyls (PCBs).

The purpose of the action plan is to identify potential sources of PCBs on the base and ensure the public and environment are protected from the effects of PCBs.

No significant sources of PCBs were identified at Joint Base Myer-Henderson Hall through the research conducted for this action plan. Historically, the main potential sources of PCBs on JBM-HH have been transformers. However, all pure PCB transformers have been removed from the installation or retrofitted with mineral oil to prevent adverse environmental and human health impacts should a transformer leak oil.

Fluorescent light ballasts are another historical source of PCBs on base. After the manufacture of PCB-containing light ballasts was banned by EPA in 1979, existing PCB-containing fixtures on the installation were gradually replaced. If old fluorescent light ballasts are discovered, they are replaced.

The PCB ballasts, which contain only a very small amount of PCBs, are properly managed and disposed. In fact, all hazardous waste is effectively managed on base to protect people and the environment and ensure harmful substances, including PCBs, are properly contained and disposed.

To report conditions that could cause stormwater pollution or to get more involved with stormwater activities at JBM-HH, call the Environmental Management Division at 703-696-8055.

For more information and guidance resources on PCBs, visit EPA's PCB webpage (www.epa.gov/pcbs).

PAO recognized in Army-wide competition

By Public Affairs Office Staff

We would like to take a small space (we want to keep to telling, not being the news) here to give praise to one of our own (okay, we're patting ourselves on the back).

Emily Myers, public affairs specialist, first served a developmental assignment with JBM-HH PAO in 2016; then, we were fortunate to hire her away from Aberdeen Proving Ground, Maryland, in January.

Bottom line: Annual Keith L. Ware Journalism awards were distributed in late February, and we are proud to note that Ms. Myers – our EM – is on a team of five at Aberdeen Proving Ground who won first place in Installation Management Command's Community Relations category for "Community Leader Engagements."

Myers' job on the APG team was filming social media videos and broadcasting various community augmentation events between civilian community and base leaders, enhancing partnership opportunities on and off APG: school systems, housing partners, municipal and state government partners. She did her part to explore issues that are important to military and civilian neighbors divided by a fence and helped foster relationships and share solutions. This IMCOM first place has been forwarded on to Department of Army.

She brought her talent and expertise with her from APG, and we are proud to say that Myers won an individual award in Social Media Video at JBM-HH for her video "See Something, Say Something."

Always topical, see it at https://www.facebook.com/jbmhh/videos/10154621001902074/.

Contact Myers in the Fusion Cell, Building 59, room 219, Fort Myer, emily.n.myers.civ@mail.mil or 703-696-8897.

PHOTO BY FRANCIS CHUNG
Public affairs specialist Emily Myers poses outside of Joint Base Myer-Henderson Hall Headquarters March 7.

Stay connected! www.army.mil/jbmhh Facebook: Facebook.com/jbmhh Flickr: Flickr.com/photos/jbm-hh Twitter: @jbmhh Slideshare: slideshare.net/jbmhh

Pentagram

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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 2018 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) stated 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]." The 2018 MS4 Permit does not indicate a change in VADEQ's interpretation of "public." Therefore, 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 I.E.1.a 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.

[1] 9VAC25-890-40, Section II B

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.

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 (fecal coliform and E. Coli), 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
- Storage 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 storage
- Installation operation and maintenance activities

Routine inspections of the Installation's industrial areas and stormwater discharge monitoring are conducted in accordance with JBM-HH's Stormwater Pollution Prevention Plan (SWPPP). 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 (specifically fecal coliform and E. Coli):** Sources of bacteria at JBM-HH include animal waste from the resident pet population, dog kennels, and horse stables on base. 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:** A PCB TMDL Action Plan was developed for the Installation in 2016 to assess current and historic uses of PCBs and address potential PCB pollutant concerns. The development of the Action Plan confirmed that 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. As a precautionary measure, sampling for PCBs was conducted at three outfalls; PCBs were not detected in the samples.
- **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. Construction site stormwater runoff control is addressed in accordance with the requirements for MCM #4 of the MS4 General Permit.
- **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;
- **Bacteria** associated with animal wastes from the resident pet populations, dog kennels, and horse stables on base (though the number of resident pets is minimal and the wastes from dog kennels and horse stables are strictly managed, in comparison to the other potential pollutants described above, bacteria from animal wastes is a higher priority and is more likely to be successfully addressed through public outreach efforts); and
- **Trash and litter** (particularly cigarette butt 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: 2,020; attached: 5,900
- **Civilian Workforce**: 5,600
- **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:** 120,000
- **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** below.

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/ 5,600 Active duty military population/ 7,900
Bacteria	Civilian workforce with relevant duties that could impact bacteria discharges/100-500 Base residents with pets/ 20-50
Trash and Litter	Civilian workforce/ 5,600 Active duty military population/ 7,900 Military Family Members, Retirees, spouses accessing services/ 120,000

2.3 Public Outreach Messages

JBM-HH's public outreach program aims to increase awareness of the high-priority water quality issues and provide actions that the previously described target audience members can take to prevent stormwater pollution.

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[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

Suggested actions the public can take to prevent stormwater pollution included in JBM-HH's outreach materials include, but are not limited to, the following:

- Use proper waste receptacles – Never throw trash or cigarette butts on the ground.
- Use recycling bins. Don't discard recyclable materials in the regular trash.
- Set an example for others by not littering.
- Take pride in your neighborhood, and remind others to respect your neighborhood by not polluting.
- Pick up after your dog to prevent the pollution of local waters and the spread of diseases.
- Have your vehicle maintained regularly. Well-maintained vehicles run better and pollute less.
- Do not top off your vehicle tank when refueling.
- Use commercial car washes that treat washwater.
- Take public transportation or carpool whenever possible to reduce emissions and leaks.
- Consider walking or biking whenever possible.
- Immediately clean up spilled materials.
- Observe good housekeeping practices in outdoor material storage areas; limit excess storage of materials.
- Ask your supervisor if any of your activities are subject to the JBM-HH Stormwater Pollution Prevention Plan.
- Contact EMD if you have any hazardous materials for disposal.
- If you see a spill of oil or of a hazardous material, report it by calling 911.
- If you see a condition that is causing or could cause stormwater pollution, notify JBM-HH EMD.

In addition to the above actions, horse stables staff are encouraged to take the following actions to protect stormwater quality:

- Observe outdoor stable and yard areas during a rain event to determine where stormwater contacts soil and horse wastes and flows to storm drains and swales.
- Remove manure from paddocks and other outdoor areas frequently.
- Keep manure and used bedding piles covered (on the ground or in dumpsters).
- Use watertight dumpsters for manure and used bedding; promptly replace leaky dumpsters.
- Only perform horse bathing and grooming in areas that drain to the sanitary sewer.
- Do NOT hose wastes from stable entrances and outdoor areas into storm drains – use dry materials, such as wood shavings, to absorb liquid wastes and shovel up wastes for disposal in manure dumpsters.
- Do not allow wash water and drainage from horse stalls to discharge to storm sewers; discharge to sanitary sewers instead.

Additionally, the following actions are suggested for staff at dining facilities on base:

- Dispose of mop water and wash water in proper indoor mop sinks; never outside.
- Clean equipment, mats, wash buckets, and food containers in an indoor sink.
- Clean up oil and grease spills on the grease collection drums/containers or on the ground.
- Ensure waste containers are in good condition, with no cracks or holes. Ensure lids are closed at all times.
- Use dry cleaning methods - Use absorbent materials to soak up oil and grease. Sweep up the absorbent material, bag it, and dispose of it in the trash.

3.0 PUBLIC EDUCATION AND OUTREACH PLANNING (MCM #1)

3.1 Outreach 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, handouts, and table tents
- 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 3-1. Public Education and Outreach Messages and Distribution Methods

Pollutant	Messages	Audiences	Distribution Methods
Oil & grease, hydrocarbons, and related pollutants	• Take care of your vehicle - poorly maintained vehicles pollute waterways • Do not overfill fuel tanks • Clean up spills – do not let oils get into storm drains • Use good housekeeping BMPs in work areas to prevent leaks and spills • Properly manage food service waste oil & grease	• Residents • Users of fueling facilities • DPW, Fire Department, maintenance shop employees • Food service employees	• Signs • Brochures and Pentagram articles • Employee training • Website and Facebook postings • Table tents • Posters
Bacteria	• Bacteria pollutes waterways and harms aquatic life • Clean up and properly dispose of pet waste. • Clean up and properly dispose of horse waste around the stables. • Promptly clean up horse waste as horses travel around the Installation and ANC property. • Clean up and properly dispose dog waste at the kennel facilities. • Report discharges of animal waste into storm drains to EMD.	• Caisson stables staff • Dog kennels staff • Residents and employees • DPW	• Brochures and Pentagram articles • Employee training • Website and Facebook postings • Table tents • Posters
Trash and Litter	• Do not 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 – use appropriate receptacles • 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 • Table tents • Posters

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.

3.2 Outreach Efforts Implemented Previously

A number of public education and outreach efforts 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 Public Education and Outreach Plan elements implemented during previous permit terms and the continuation plans for each are summarized in **Table 3-1**.

Table 3-1. MCM #1 Public Education and Outreach Implementation Plan

#	Plan Element	Continuation Plan
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.
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 and current stormwater issues relevant to the local communities. 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.
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.
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 target the horse stables, dining facilities, residents, and more.	Brochures that were previously prepared will be updated and redistributed in. New brochures will be developed as needed.
5	Install “No Dumping, Drains to Stream” medallions on stormwater inlets. An event was held in April 2016 involving military personnel and DPW employees in the effort to install medallions on inlets throughout JBM-HH. Informational door hangers were then distributed to base residents on the purpose of the medallions and importance of preventing stormwater pollution.	Medallions will be installed on stormwater inlets that were missed during the 2016 event and as needed (i.e. if the previously installed markers are removed or damaged). The door hangers will also be redistributed to provide the information to new residents.
6	Provide stormwater pollution prevention training to DPW staff and base contractors. Topics include best management practices, prevention methods, reporting procedures, and more.	This training will continue to be held annually.

3.3 Additional Outreach Efforts for 2018 MS4 General Permit Term

While the outreach efforts described above will be continued during 2018 MS4 General Permit term, other public outreach activities are to be implemented to further the reach of the Stormwater Public Outreach Program, as described in **Table 3-2** below.

Table 3-3. JBM-HH Additional MCM #1 Efforts

#	Description	Audiences
1.6	Installation of informational signs near each new stormwater management facility (SMF) constructed on the Installation. The signs will provide the public with information on the purpose of each SMF and how they work. Signs will be installed as new SMFs are constructed.	• Employees • Residents • Non-residents using Installation services
1.7	Installation of eight dog waste bag stations and signs throughout the Installation. Handouts will be distributed to the residents on base during the planning stages to provide information on the importance of cleaning up dog waste and requesting input for the station locations.	• Residents
1.8	Provide training to DPW Staff using the DPW 447 Storage Yard on proper storage practices, leak prevention techniques, cleanup methods, and more.	• DPW Employees

3.4 Anticipated Timeline

The anticipated timeline and frequency of distribution of the above-described public education and outreach BMPs are identified in **Table 3-3** below:

Table 3-4. Anticipated Timeline for Public Education & Outreach Implementation

BMP Category	Strategies	Permit Year				
		1	2	3	4	5
Traditional Written Materials	Informational Brochures	✓ Two Distributed	✓ Two Distributed	✓ Two Distributed	✓ Two Distributed	✓ Two Distributed
	Table Tents at DFAC	✓		✓		
Signage	Cigarette Butt Littering Posters			✓		✓
	New SMF Signs			✓ 6 Installed	(As needed for new SMFs)	(As needed for new SMFs)
	Stormwater Inlet Medallions	✓ As needed	✓ As needed	✓ As needed	✓ As needed	✓ As needed
	Dog Waste Bag Station Signs			✓ 8 Installed	✓ As needed	✓ As needed
Media Materials	Pentagram Articles	✓ Two articles/year	✓ Two articles/year	✓ Two articles/year	✓ Two articles/year	✓ Two articles/year
Speaking Engagements	EQCC Presentations	✓ Quarterly	✓ Quarterly	✓ Quarterly	✓ Quarterly	✓ Quarterly
	Providing DPW Training	✓	✓	✓	✓	✓

4.0 PUBLIC INVOLVEMENT & PARTICIPATION (MCM #2)

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** will be used to engage the public and solicit input.

4.1 Public Involvement Procedures

In accordance with the requirements in Section I.E.2.a of the MS4 General Permit, identified below, JBM-HH has developed and implemented the following procedures:

Table 4-1. JBM-HH Public Involvement Procedures

Section I.E.2.a "The permittee shall develop and implement procedures for the following:"	**JBM-HH Procedures**
The public to report potential illicit discharges, improper disposal, or spills to the MS4, complaints regarding land disturbing activities, or other potential stormwater pollution concerns.	• JBM-HH's Stormwater Pollution Prevention webpage provides contact information and instructions for reporting stormwater pollution concerns; information provided includes an Environmental Incident/Inquiry Report Form, EMD's address and phone numbers, and an email address specific to JBM-HH's Stormwater Program, which was created in 2020 to provide the public with an additional method of contacting EMD. • EMD phone numbers are also provided in Pentagram articles, informational brochures, posters, and table tents for the public to contact about stormwater-related issues or concerns. Additionally, the Stormwater Program email address is being added to the outreach materials as they are updated.
The public to provide input on the permittee's MS4 program plan.	• When the MS4 Program is updated, a notice is posted on the main page of JBM-HH's website informing the public that the Program Plan is available for review and a link to the Plan is provided. Contact information for the EMD is provided as a method of submitting comments on the Plan and/or obtaining a copy of the Plan. • JBM-HH's Stormwater Pollution Prevention webpage provides a link to a Stormwater Program email address and encourages the public to submit comments on the MS4 Program Plan, Chesapeake Bay TMDL Action Plan, and more to EMD at the provided email address.
Receiving public input or complaints.	• EMD phone numbers and the Stormwater Program email address are provided at the end of Pentagram articles, on the back of distributed informational brochures, and on posters. • When a call or email is received, the input/comments are recorded and provided to the person assigned to address the input or complaint. The record of the input/comment is then saved in a specific file in the EMD office and network folders and maintained for a minimum of five years.

Responding to public input received on the MS4 program plan or complaints.	• If a complaint is received, the caller's contact information is collected so that closure on the issue can be provided when the issue has been addressed. • If comments are received on the MS4 Program Plan, they are compiled and a written response is provided. The comment/response document would be uploaded to the JBM-HH Website along with the Plan.
Maintaining documentation of public input received on the MS4 program and associated MS4 program plan and the permittee's response.	• Public input and complaints are recorded and maintained in the stormwater filing system kept at the EMD office on base and in EMD network folders for a minimum of five years.

4.2 JBM-HH Stormwater Webpage

JBM-HH has designed a webpage dedicated to the Installation's Stormwater Pollution Prevention Program. This webpage includes the following documents and information:

- The effective MS4 permit and coverage letter
- JBM-HH's MS4 Program Plan
- The MS4 Annual Report for each year of the permit term covered by this permit (uploaded to the website within 30 days of submittal to VADEQ)
- The Environmental Incident/Inquiry Report for the public to report potential illicit discharges, improper disposal, or spills to the MS4, complaints regarding land disturbing activities, or other potential stormwater pollution concerns
- Methods for how the public can provide input on JBM-HH's MS4 Program Plan

EMD's webpage can be found here:
https://home.army.mil/jbmhh/index.php/teamJBMHH/about/Base/environmental-management-division.

The Stormwater Program webpage can be found here:
https://home.army.mil/jbmhh/index.php/teamJBMHH/about/Base/stormwater-pollution-prevention-jbm-hh.

4.3 Public Involvement and Participation Activities

The public involvement and participation activities identified in **Table 4-2** below are anticipated for this permit term. Several of these activities are already held on a regular basis and are anticipated to be continued. **Table 4-2** includes the targeted audiences and the metrics used to determine if the activity if beneficial to water quality.

Table 4-2. JBM-HH Public Involvement & Participation – MCM #2 BMPs

#	BMP Description	Metrics	Audiences
2.1	Participation on environmental advisory committee – an EMD representative gives a presentation to base-wide division and organizational leaders at Environmental Quality Control Committee (EQCC) meetings on a quarterly basis, providing information on current stormwater and other environmental	Number of attendees at each EQCC meeting	• Employees and military personnel across the Installation

	issues on base. The attendees then disseminate the information to their respective organizations.		
2.2	Installation of eight dog waste bag stations and signs throughout the Installation. Handouts will be distributed to the residents on base during the planning stages to provide information on the importance of cleaning up dog waste and requesting input for the station locations.	Number of residents reached with distribution of informational handout	• Residents
2.3	Provide training to DPW Staff using the DPW 447 Storage Yard on proper storage practices, leak prevention techniques, cleanup methods, and more.	Number of staff members included in training session	• DPW Employees
2.4	A base-wide clean-up day is held for Earth Day every year. During this event, Installation employees, military personnel, and residents are encouraged to participate in picking up trash around the Installation, cleaning out no longer used chemicals for proper disposal, and more.	Number of bags of trash collected	• Installation employees • Military personnel • Residents
2.5	A public Shredding Event is held annually on base and advertised for residents, employees, and military personnel. A large shredding truck is brought to multiple locations on base and made available for the public to bring documents and paper products for shredding and recycling.	Number of participants in the collection event and/or amount of paper shredded and recycled	• Installation employees • Military personnel • Residents
2.6	To further cooperation with local regulatory entities and share information, a representative of JBM-HH will attend public outreach meetings related to stormwater issues held by the regional VADEQ office and Arlington County. A JBM-HH representative also calls in for the quarterly Chesapeake Bay Action Team conference calls.	Number of participants attending the meetings	• Installation employees • Surrounding communities
2.7	Install “No Dumping, Drains to Stream” medallions on stormwater inlets. An event was held in April 2016 involving military personnel and DPW employees in the effort to install medallions on inlets throughout JBM-HH. Informational door hangers were then distributed to base residents on the purpose of the medallions and importance of preventing stormwater pollution. Medallions will be installed on stormwater inlets that were missed during the 2016 event and as needed (i.e. if the previously installed markers are removed or damaged). The door hangers will also be redistributed to provide the information to new residents.	Number of medallions installed on stormwater inlets and number of residents reached with distribution of informational handout	• Installation employees • Military personnel • Residents
2.8	The EMD regularly collects old/no longer used household chemicals, batteries, and oil from the public for proper disposal. The collection of these materials and the drop off location is advertised to the employees, residents, and military personnel on base.	Number of containers of materials collected	• Installation employees • Military personnel • Residents

4.4 Anticipated Timeline

The anticipated timeline and frequency of distribution of the above-described public involvement and participation activities are identified in **Table 4-3** below:

Table 4-3. Anticipated Timeline for Public Involvement & Participation Activities						
BMP Category	Strategies	Permit Year				
		1	2	3	4	5
Restoration	Base-wide Clean-up Day	✓	✓	✓	✓	✓
Educational Events	EQCC Presentations	✓ Quarterly	✓ Quarterly	✓ Quarterly	✓ Quarterly	✓ Quarterly
	Attending Public Outreach Meetings	✓	✓	✓	✓	✓
	DPW Training	✓	✓	✓	✓	✓
Disposal or Collection Events	Shredding Event	✓		✓	✓	✓
	Chemical Collection /Disposal	✓		✓	✓	✓
Pollution Prevention	Dog Waste Bag Station Signs			✓ 8 Installed	✓ As needed	✓ As needed
	Stormwater Inlet Medallions	✓ As needed	✓ As needed	✓ As needed	✓ As needed	✓ As needed

5.0 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 high-priority stormwater issues JBM-HH addressed in the public education and outreach program.
- A list of the strategies used to communicate each high-priority stormwater issue to the public.
- A summary of any public input on the MS4 Program received (including stormwater complaints) and how JBM-HH responded.
- A webpage address to JBM-HH's MS4 Program and Stormwater Pollution Prevention webpage.
- A description of the public involvement activities implemented during the reporting year.
- A report of the metric for each activity and an evaluation as to whether or not each activity is beneficial to improving water quality.
- The name of other MS4 permittees with whom JBM-HH collaborated in any public involvement opportunities.

APPENDIX E

OUTFALL MAP AND OUTFALL INFORMATION TABLE

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Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide

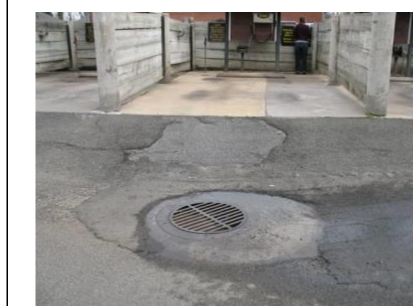
Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
001 **Not Moni-tored**	38.887528, -77.071895	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	1.2 acres	24-inch RCP w/headwall Structure #1838 **No longer monitored: outfall and drainage area determined to be on ANC property**	Marshall Dr., N. Meade St., canopy for Wright Gate. **No industrial activities**	Long-handled dipper required to collect monitoring samples.	
002 (MP002a and MP002b)	38.886876, -77.072906	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	3.9 acres	**Outfalls to ANC MS4** Monitoring point is 4' x 4' drop inlet structure. **Outfall has been determined to be on ANC property. Two monitoring points have been identified on JBM-HH property – MP002a and MP002b on the map.**	Marshall Dr., VCP roof drainage, Bldg 305 yard area. **No industrial activities**	**Outfall is now on ANC property.** Monitoring points are the two immediately upgradient manholes, as shown on the map. Will need J-hook to remove manhole covers and cable sampler or long-handled dipper to collect samples.	
003	38.886125, -77.074054	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	52.4 acres	**Outfalls to ANC MS4** Monitoring point is 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 previously covered under VPDES Industrial General Permit**	**Outfalls to ANC MS4** 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).	
004 **Not Moni-tored**	38.885284, -77.074661	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	1.3 acres	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.	
005	38.884861, -77.075052	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	3.0 acres	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 previously covered under VPDES Industrial General Permit**	Located on E side of retaining wall that is E of Bldg 330 fueling station. **Outfall is located on the ANC side of the new perimeter security fence – must contact DPW (Dave Mayeda) for access through the new gate.**	

Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
006 **Not Moni-tored**		• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs		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 Moni-tored**		• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs		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	38.880913, -77.078509	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	0.8 acres	**Outfalls to ANC Millennium area** Monitoring point is Inlet for Post Chapel parking lot.	Parking lot drainage from Post Chapel parking and roof drainage. **No industrial activities**	Outfalls to ANC Millennium area. Monitoring point is inlet at NE corner of Post Chapel rear parking lot.	
008	38.867449, -77.074078	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	3.0 acres	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	38.867509, -77.074848	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	0.1 acres	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	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**	

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
						reconstruction. Structure has twin 24" CMP entering on N side and single 32" RCP entering from W side			
010	38.868566, -77.075915	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	7.8 acres	Stormwater inlet at end of concrete flume	Henderson Hall; parking and storage areas around Building 12. **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.	
011	38.868528, -77.076312	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	16.6 acres	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	38.868946, -77.07731	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	7.8 acres	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	38.871402, -77.079177	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	3.6 acres	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	

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
014	38.871929, -77.079609	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	0.1 acres	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.	
015	38.87291, -77.08066	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	62.5 acres	**Outfalls to Arlington Co MS4.** 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**	**Outfalls to Arlington Co MS4.** Monitoring point is 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	38.873736, -77.079713	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	27.1 acres	**Outfalls to Arlington Co MS4.** 36-inch RCP Structure #7876	Parking, roadways, and roof drainage from many buildings 59, 400, 450, 480, 482. **No industrial activities**	**Outfalls to Arlington Co MS4.** 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	38.873607, -77.081763	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	4.7 acres	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	38.883041, -77.084096	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	3.9 acres	15-inch RCP Structure #6826	Drainage from Forrest Cir. roadway areas around Bldg 238 **No industrial activities**	**Outfall is adjacent to Route 50/Arlington Blvd.** Monitoring point is 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.	

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
019	38.883675, -77.084032	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	1.0 acres	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**	**Outfall is adjacent to Route 50/Arlington Blvd.** Monitoring point is manhole 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	38.884711, -77.083967	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	4.6 acres	15-inch RCP Structure #6808	Vehicle wash bay, Auto Craft Shop, horse paddock area, horse stables, roadway drainage. **Industrial activities**	**Outfall is adjacent to Route 50/Arlington Blvd.** 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	38.886569, -77.08224	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	23.9 acres	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	38.887375, -77.078785	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	2.3 acres	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	

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
023	38.869808, -77.071943	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	8.9 acres	15-inch RCP Manhole on east side of Carpenter Road, across from southeast corner of parking garage	**Outfalls to Arlington Co MS4.** Drainage from Henderson Hall including parking garage, roadways, parking lots, and roof drainage from Building 27 **No industrial activities**	**Outfalls to Arlington County MS4** Monitoring point is manhole for 15-inch RCP that runs along Carpenter Road;	
024	38.869014, -77.071217	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	1.9 acres	**Outfalls to to Arlington County MS4** Monitoring point is 15-inch RCP Manhole located in outdoor patio on east side of theater	**Outfalls to ANC MS4** 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**	**Outfalls to Arlington County MS4** Monitoring point is manhole for 15-inch RCP south of Building 29;	
025	38.872183, -77.079739	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	1.9 acres	24-inch RCP Manhole in grassy area southwest of Hatfield Gate, just inside fence	Drainage from roadway areas along Carpenter Road	Outfall discharges to Lower Long Branch on east side of headwall for 2nd St. So. culvert Monitoring point is manhole in grassy area southwest of Hatfield Gate, just inside fence.	

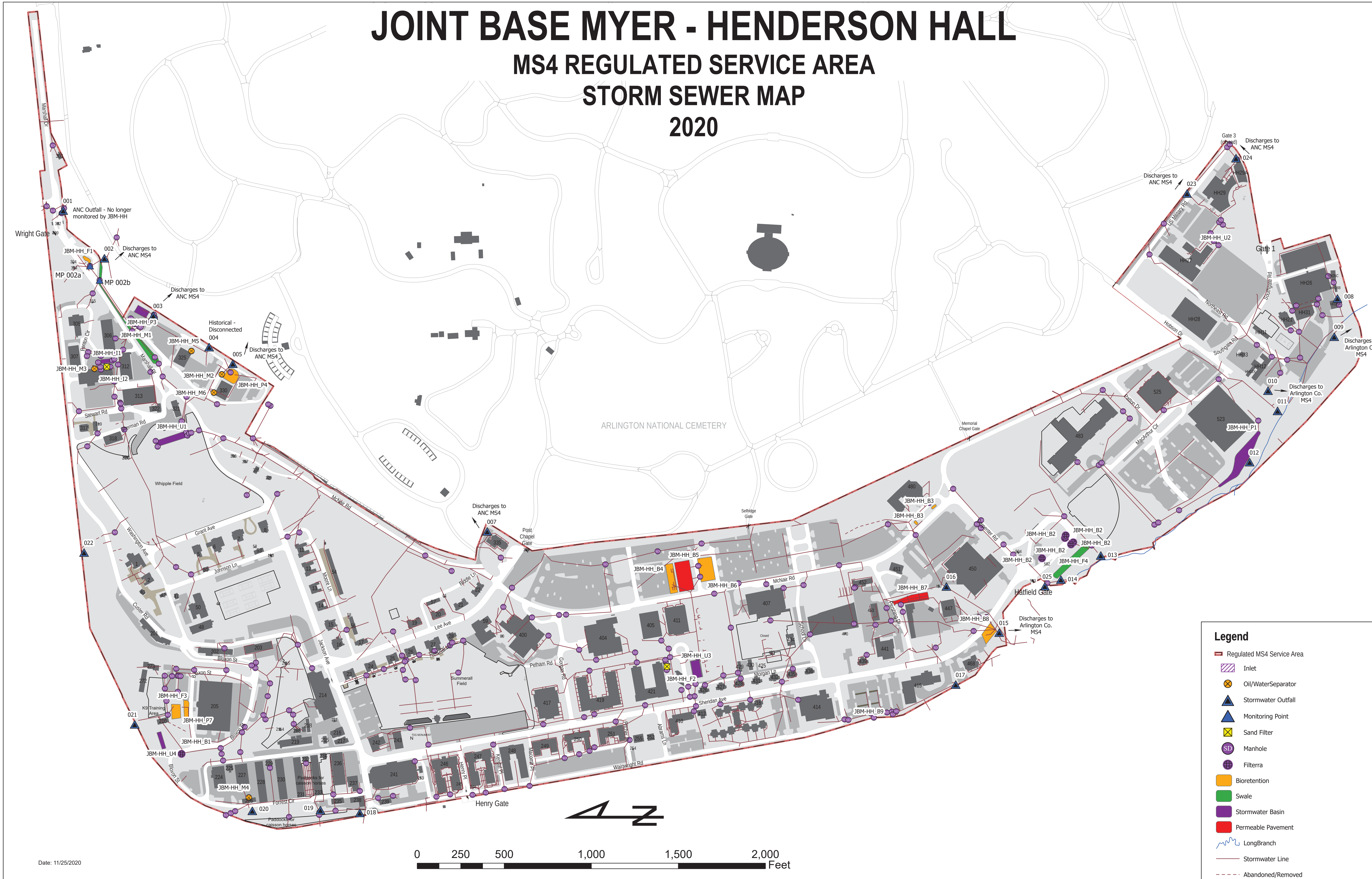
1. TMDLs with wasteload allocations applicable to JBM-HH

CEM/PENT – Cemetery/Pentagon Sub-watershed
DS – Downstream
FMR – Fourmile Run
HH – Henderson Hall

LLB – Lower Long Branch Subwatershed
OWS – Oil-water separator
POT – Potomac River
RR – Rocky Run Subwatershed

JOINT BASE MYER - HENDERSON HALL

MS4 REGULATED SERVICE AREA
STORM SEWER MAP
2020



Date: 11/25/2020

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APPENDIX F

MS4 INTERCONNECTION NOTIFICATION LETTERS

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

REPLY TO
ATTENTION OF

Environmental Management Division 17 September 2020

SUBJECT: MS4 Interconnection Notification

Ms. Stacey Rosenquist
Environmental Compliance Program Manager
Arlington National Cemetery
1 Memorial Drive
Arlington, Virginia 22211

Dear Ms. Rosenquist:

Joint Base Myer-Henderson Hall (JBM-HH) is a Phase II small municipal separate storm sewer system (MS4) and is covered under the General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (Permit Number VAR040068). The purpose of this letter is to notify you of interconnections between JBM-HH's MS4 and Arlington National Cemetery's MS4. The MS4 permit requires that JBM-HH notify any downstream regulated MS4 of interconnections to JBM-HH's MS4. At this time, interconnections are known to exist between the two MS4s along the shared property boundary.

If you have any questions about the above or require additional information, please contact me at (703) 696-8055.

Sincerely,

LAFRENIERE.RICHARD.P.1263373150 Digitally signed by LAFRENIERE.RICHARD.P.1263373150 Date: 2020.09.17 13:09:34 -04'00'

Richard LaFreniere
Chief
Environmental Management Division, DPW

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

REPLY TO
ATTENTION OF

December 4, 2014

SUBJECT: Notification of Discharge to Arlington County Municipal Separate Storm Sewer Systems (MS4) by Joint Base Myer-Henderson Hall and Submittal of Discharge Monitoring Report for July-December 2014

Mr. Greg Emanuel, Director
Arlington County Department of Environmental Services
2100 Clarendon Boulevard, Suite 900
Arlington, VA 22201

Dear Mr. Emanuel:

Joint Base Myer-Henderson Hall (JBM-HH) obtained coverage under the VPDES Industrial Stormwater General Permit for stormwater discharges associated with industrial activity from U.S. Army Installation Fort Myer (Fort Myer) and Marine Corps Headquarters Battalion Henderson Hall (Henderson Hall), in Fort Myer, Virginia. Stormwater associated with industrial activities covered by the General Permit discharges to Arlington National Cemetery (ANC) storm drains at two locations on the eastern boundary of Fort Myer. JBM-HH understands the ANC storm drain system is included with Arlington County's MS4 service area. In accordance with VPDES permit conditions, JBM-HH's Environmental Management Division (EMD) is providing this notification of discharge to the Arlington County-owned MS4 and the following information:

Facility Name and Address: Fort Myer and Henderson Hall

VPDES Permit No. VAR051296

Contact Person: Richard LaFreniere, Chief, EMD

Telephone Number: (703) 696-8055

Location of the Discharge: Two discharge points to Arlington National Cemetery, designated as Outfalls 003 and 005. These outfalls are located near the northeast corner of Fort Myer, and convey runoff and treated stormwater.

Included as an attachment is a signed copy of the semiannual discharge monitoring reports for both outfalls for the monitoring period July-December 2014. Original copies are submitted to the Virginia Department of Environmental Quality.

If you have any questions about the information herein or require additional information, please contact Richard LaFreniere at (703) 696-8055.

Sincerely,

M D Henderson

Michael D. Henderson
Colonel, US Army
Commanding

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM (VPDES)
DISCHARGE MONITORING REPORT (DMR)

DEPT. OF ENVIRONMENTAL QUALITY
(REGIONAL OFFICE)
Northern Regional Office
13901 Crown Court
Woodbridge VA 22193
(703)583-3800

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM

TYPE: **STORM WATER**
BENCHMARK MONITORING

VAR051296	003
PERMIT NUMBER	**OUTFALL NO.**

PERMITTEE NAME US Army - Fort Myer-Headquarters US Army Garrison

FACILITY NAME US Joint Base - Myer Henderson Hall
ADDRESS 111 Stewart Rd
US Army-Fort Myer-DPWEnv Div IMND MNH PWE Blvd 315
Fort Myer VA 22211

FACILITY LOCATION Washington Blvd and Arlington Blvd
Arlington VA 22211

CONTACT PERSON Richard LaFreniere
TELEPHONE 703-696-8055

Check One	MONITORING PERIOD						
	YEAR	MONTH	DAY	TO	YEAR	MONTH	DAY
X	2014	July	1		2014	December	31
	2015	January	1		2015	June	30
	2015	July	1		2015	December	31
	2016	January	1		2016	June	30
	2016	July	1		2016	December	31
	2017	January	1		2017	June	30
	2017	July	1		2017	December	31
	2018	January	1		2018	June	30
	2018	July	1		2018	December	31
	2019	January	1		2019	June	30

PARAMETER		CONCENTRATION				NO. EX.	SAMPLE TYPE
		MINIMUM	AVERAGE	MAXIMUM	UNITS		
004 TSS	REPORTED	*********	*********	21	mg/L	0	Grab
	BENCHMARK CONC	*********	*********	100	MG/L		GRAB
257 PETROLEUM HYDROCARBONS, TOTAL R	REPORTED	*********	*********	0.19	mg/L	0	Grab
	BENCHMARK CONC	*********	*********	15	MG/L		GRAB

STORM EVENT INFORMATION			
DATE	YR	MO	DAY
	14	11	06
DURATION	HRS	MIN	
	9	0	
RAINFALL TOTAL (IN.)	0.51		
PRECEDING EVENT	DAYS	HRS	
	8	0	

Comments:

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,

PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		DATE		
Michael D. Henderson Colonel, US Army Commanding	MA Henderson	14	12	15
TYPED OR PRINTED NAME	SIGNATURE	YEAR	MO.	DAY

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM (VPDES)
DISCHARGE MONITORING REPORT (DMR)

DEPT. OF ENVIRONMENTAL QUALITY
(REGIONAL OFFICE)
Northern Regional Office
13901 Crown Court
Woodbridge VA 22193
(703)583-3800

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM

TYPE: **STORM WATER**
BENCHMARK MONITORING

VAR051296	005
PERMIT NUMBER	**OUTFALL NO.**

PERMITTEE NAME US Army - Fort Myer-Headquarters US Army Garrison

FACILITY NAME US Joint Base - Myer Henderson Hall
ADDRESS 111 Stewart Rd
US Army-Fort Myer-DPWEnv Div IMND MNH PWE Blvd 315
Fort Myer VA 22211

FACILITY LOCATION Washington Blvd and Arlington Blvd
Arlington VA 22211

CONTACT PERSON Richard LaFreniere
TELEPHONE 703-696-8055

Check One	MONITORING PERIOD YEAR	MONTH	DAY	TO	YEAR	MONTH	DAY
X	2014	July	1		2014	December	31
	2015	January	1		2015	June	30
	2015	July	1		2015	December	31
	2016	January	1		2016	June	30
	2016	July	1		2016	December	31
	2017	January	1		2017	June	30
	2017	July	1		2017	December	31
	2018	January	1		2018	June	30
	2018	July	1		2018	December	31
	2019	January	1		2019	June	30

PARAMETER		CONCENTRATION MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX.	SAMPLE TYPE
004 TSS	REPORTED	*********	*********	2.2	mg/L	0	Grab
	BENCHMARK CONC	*********	*********	100	MG/L		GRAB
257 PETROLEUM HYDROCARBONS, TOTAL R	REPORTED	*********	*********	< 0.10	mg/L	0	Grab
	BENCHMARK CONC	*********	*********	15	MG/L		GRAB

STORM EVENT INFORMATION			
DATE	YR	MO	DAY
	14	11	17
DURATION	HRS	MIN	
	16	0	
RAINFALL TOTAL (IN.)	0.71		
PRECEDING EVENT	DAYS	HRS	
	3	0	

Comments:

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,

PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		DATE		
Michael D. Henderson Colonel, US Army Commanding	[signature]	14	12	15
TYPED OR PRINTED NAME	SIGNATURE	YEAR	MO.	DAY

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM (VPDES)
DISCHARGE MONITORING REPORT (DMR)

DEPT. OF ENVIRONMENTAL QUALITY
(REGIONAL OFFICE)
Northern Regional Office
13901 Crown Court
Woodbridge VA 22193
(703)583-3800

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM

TYPE: **STORM WATER**
TMDL WASTE LOAD ALLOCATION MONITORING

PERMIT NUMBER	OUTFALL NO.
VAR051296	003

PERMITTEE NAME US Army - Fort Myer-Headquarters US Army Garrison

FACILITY NAME US Joint Base - Myer Henderson Hall
ADDRESS 111 Stewart Rd
US Army-Fort Myer-DPWEnv Div IMND MNH PWE Blvd 315
Fort Myer VA 22211

FACILITY LOCATION Washington Blvd and Arlington Blvd
Arlington VA 22211

CONTACT PERSON Richard LaFreniere
TELEPHONE 703-696-8055

Check One	YEAR	MONTH	DAY	TO	YEAR	MONTH	DAY
X	2014	July	1		2014	December	31
	2015	January	1		2015	June	30
	2015	July	1		2015	December	31
	2016	January	1		2016	June	30
	2016	July	1		2016	December	31
	2017	January	1		2017	June	30
	2017	July	1		2017	December	31
	2018	January	1		2018	June	30
	2018	July	1		2018	December	31
	2019	January	1		2019	June	30

PARAMETER		CONCENTRATION MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX.	SAMPLE TYPE
929 ChesBay TMDL TSS	REPORTED	*********	*********	21	mg/L	0	Grab
	REQUIREMENT	*********	*********	NL	MG/L		GRAB
930 ChesBay TMDL Nitrogen, Total (as N	REPORTED	*********	*********	< 1	mg/L	0	Grab
	REQUIREMENT	*********	*********	NL	MG/L		GRAB
931 ChesBay TMDL Phosphorus, Total (as	REPORTED	*********	*********	0.09	mg/L	0	Grab
	REQUIREMENT	*********	*********	NL	MG/L		GRAB

STORM EVENT INFORMATION			
DATE	YR 14	MO 11	DAY 06
DURATION	HRS 9	MIN 0	
RAINFALL TOTAL (IN.)	0.51		
PRECEDING EVENT	DAYS 8	HRS 0	

Comments: Chesapeake Bay TMDL monitoring is only required July 1, 2014 through June 30, 2016.

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,

PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		DATE		
Michael D. Henderson Colonel, US Army Commanding	MD Henderson	14	12	15
TYPED OR PRINTED NAME	SIGNATURE	YEAR	MO.	DAY

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM (VPDES)
DISCHARGE MONITORING REPORT (DMR)

DEPT. OF ENVIRONMENTAL QUALITY
(REGIONAL OFFICE)
Northern Regional Office
13901 Crown Court
Woodbridge VA 22193
(703)583-3800

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM

TYPE: **STORM WATER**
TMDL WASTE LOAD ALLOCATION MONITORING

PERMIT NUMBER	OUTFALL NO.
VAR051296	005

PERMITTEE NAME US Army - Fort Myer-Headquarters US Army Garrison

FACILITY NAME US Joint Base - Myer Henderson Hall
ADDRESS 111 Stewart Rd
US Army-Fort Myer-DPWEnv Div IMND MNH PWE Blvd 315
Fort Myer VA 22211

FACILITY LOCATION Washington Blvd and Arlington Blvd
Arlington VA 22211

CONTACT PERSON Richard LaFreniere
TELEPHONE 703-696-8055

Check One	YEAR	MONTH	DAY	TO	YEAR	MONTH	DAY
X	2014	July	1		2014	December	31
	2015	January	1		2015	June	30
	2015	July	1		2015	December	31
	2016	January	1		2016	June	30
	2016	July	1		2016	December	31
	2017	January	1		2017	June	30
	2017	July	1		2017	December	31
	2018	January	1		2018	June	30
	2018	July	1		2018	December	31
	2019	January	1		2019	June	30

PARAMETER		CONCENTRATION MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX.	SAMPLE TYPE
929 ChesBay TMDL TSS	REPORTED	*********	*********	2.2	mg/L	0	Grab
	REQUIREMENT	*********	*********	NL	MG/L		GRAB
930 ChesBay TMDL Nitrogen, Total (as N	REPORTED	*********	*********	< 1	mg/L	0	Grab
	REQUIREMENT	*********	*********	NL	MG/L		GRAB
931 ChesBay TMDL Phosphorus, Total (as	REPORTED	*********	*********	< 0.01	mg/L	0	Grab
	REQUIREMENT	*********	*********	NL	MG/L		GRAB

STORM EVENT INFORMATION			
DATE	YR 14	MO 11	DAY 17
DURATION	HRS 16	MIN 0	
RAINFALL TOTAL (IN.)	0.71		
PRECEDING EVENT	DAYS 3	HRS 0	

Comments: Chesapeake Bay TMDL monitoring is only required July 1, 2014 through June 30, 2016.

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,

PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		DATE		
Michael D. Henderson Colonel, US Army Commanding	MDHenderson	14	12	15
TYPED OR PRINTED NAME	SIGNATURE	YEAR	MO.	DAY

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

REPLY TO
ATTENTION OF

Directorate of Public Works,
Environmental Management Division

18 November 2020

SUBJECT: Potential MS4 Interconnection Notification

Mr. J. Alex Foraste, P.E.
State Water Resources Program Manager
VDOT – Location & Design Division
1401 East Broad Street
Richmond, VA 23219

Dear Mr. Foraste:

Joint Base Myer-Henderson Hall (JBM-HH) in Fort Myer, Virginia is a Phase II small municipal separate storm sewer system (MS4) and is covered under the Virginia General Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (Permit Number VAR040068). The MS4 permit requires that JBM-HH notify any downstream regulated MS4 of interconnections to JBM-HH's MS4. This letter is to notify you that interconnections likely exist between JBM-HH's MS4 and VDOT's MS4 systems along Virginia Route 50 (Arlington Boulevard) and Virginia Route 27 (South Washington Boulevard). At this time, we have not identified specific physical interconnections between the two systems. Runoff from the northwestern region of the installation is known to discharge to open drainage channels along Route 50.

If you have any questions about the above or require additional information, please contact me at (703) 696-8055.

Sincerely,

LAFRENIERE.RICHARD.P.1263373150
Digitally signed by LAFRENIERE.RICHARD.P.1263373150
Date: 2020.11.18 16:48:28 -05'00'

Richard LaFreniere
Chief
Environmental Management Division, DPW

APPENDIX G

JBM-HH STORMWATER POLICY

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

IMMH-PW 13 November 2020

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Joint Base Myer-Henderson Hall (JBM-HH) Policy Memorandum PW-9, Stormwater Policy

1. REFERENCES.

a. General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems, Permit No. VAR040068 (Effective Date: 1 Nov 18, Expiration Date: 31 Oct 23).

b. Federal Water Pollution Control Act (The Clean Water Act) (enacted in 1948, amended in 1972).

c. Energy Independence and Security Act (EISA), Section 438, 4 Jan 07.

d. National Pollutant Discharge Elimination System (NPDES), 40 CFR Part 122, revised 12 Jun 19.

e. Executive Order 13834, Efficient Federal Operations, 17 May 18.

f. Executive Order 13508, Chesapeake Bay Protection and Restoration, 12 May 09.

g. Chesapeake Bay Preservation Area Designation and Management Regulations, 9VAC25-830, 23 Oct 13.

h. Virginia Erosion and Sediment Control Regulations, 9VAC25-840, 23 Oct 13.

i. EPA NPDES General Permit for Discharges from Construction Activity, 16 Feb 19, as amended 27 Jun 19.

j. Virginia Stormwater Management Program Regulation, 9VAC25-870, 26 Feb 14.

k. Virginia General Permit for Discharges of Stormwater from Construction Activities, 9VAC25-880, 1 Jul 19.

l. Environment, Safety, and Occupational Health, 4715.1E, 31 Aug 18.

m. Environmental Protection and Enhancement, AR 200-1, 13 Dec 07.

2. PURPOSE. This memorandum sets forth the JBM-HH policy governing stormwater pollution prevention. The policy guidance provided in the enclosure outlines proper protocols for minimizing stormwater pollution during activities that directly and indirectly impact stormwater.

3. APPLICABILITY. This policy is applicable to all military and civilian personnel and contractors who live, work, or are authorized access to the JBM-HH community.

4. POLICY & PROCEDURES. All actions on JBM-HH shall comply with applicable regulations and policy set forth in the attached policy and procedures enclosed with this policy memorandum.

5. PROPONENT. The JBM-HH Directorate of Public Works, Environmental Management Division is the proponent for this policy. The POC is the Environmental Management Chief at (703) 696-8055.

Encl

KIMBERLY A. PEEPLES
COL, EN
Commanding

DISTRIBUTION:
I

Stormwater Management Procedures
Joint Base Myer-Henderson Hall

1. PERMITS AND APPLICABLE REGULATIONS.

a. Permits: General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4), Permit No. VAR040068 (Effective Date: 1 November 2018, Expiration Date: 31 October 2023)

b. Applicable Regulations: In addition to the permit named above, the Stormwater Program must comply with federal and state regulations, and Department of Defense and Department of the Army policies, including the following:

(1) Federal:
(a) Federal Water Pollution Control Act (The Clean Water Act).
(b) Energy Independence and Security Act (EISA), Section 438.
(c) Executive Order 13834, Efficient Federal Operations .
(d) Executive Order 13508, Chesapeake Bay Protection and Restoration.
(e) National Pollutant Discharge Elimination System, 40 CFR Part 122.
(f) EPA NPDES General Permit for Discharges from Construction Activity.

(2) Virginia:
(a) Chesapeake Bay Preservation Area Designation and Management Regulations, 9VAC25-830.
(b) Erosion and Sediment Control Regulations, 9VAC25-840.
(c) Virginia Stormwater Management Program Regulation, 9VAC25-870.
(d) Virginia General Permit for Discharges of Stormwater from Construction Activities, 9VAC25-880.
(e) Virginia General VPDES Permit for Discharges from Small Municipal Separate Storm Sewer Systems, 9VAC25-890.

(3) District of Columbia
(a) 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control, Chapter 5 of Title 21 of the District of Columbia Municipal Regulations (DCMR), §§ 546, 547, and 552

(4) Department of Defense:
(a) Environment, Safety, and Occupational Health, 4715.1E

(5) Department of the Army:
(a) Environmental Protection and Enhancement, AR 200-1

2. POLICY & PROCEDURES.

a. Stormwater runoff at Fort Myer and Henderson Hall flows to JBM-HH's storm sewer system, which is permitted by the Virginia Department of Environmental Quality (DEQ) as a small MS4 under the VPDES permit.

(1) Stormwater runoff at Fort McNair is not regulated by a specific permit; instead, stormwater from Fort McNair flows directly into the Potomac River or to the District of Columbia's MS4, which is permitted by the US Environmental Protection Agency (EPA). The Department of Energy and Environment (DOEE) has oversight of the MS4 and has the authority to take measures that reduce pollutants at the source, by inspecting facilities and issuing notices of violation, fines, and penalties for noncompliance with the District of Columbia's stormwater regulations.

(2) These permits and the District of Columbia's stormwater regulations serve as the basis for JBM-HH's Environmental Management Division (EMD) Stormwater Program duties. The Stormwater Program is responsible for maintaining compliance with permit conditions; however, compliance with permit conditions requires cooperation from other Directorates and Installation entities, as well as the Installation's residents, employees, and visitors. See Section 1.b for applicable regulations.

b. The following pollution prevention measures will be implemented to protect surface waters that receive stormwater discharges from JBM-HH:

(1) Illicit Discharges**.** JBM-HH's stormwater permit allows only stormwater into its storm sewer system. With a few exceptions, materials other than stormwater discharged to the storm drain system are called illicit discharges and are strictly prohibited.

(a) Any sort of dumping or disposal of material into a storm drain is considered an illicit discharge. Illicit discharges may be deliberate or unintentional and can occur at any time. Illicit discharges can range from oil spills to muddy runoff or tracked sediment to a sanitary sewer cross-connection, all allowing pollutants to enter the storm sewer system.

(b) EMD will investigate illicit discharges; however, residents, employees, and visitors should notify EMD when they observe an illicit discharge occurring. Examples of reportable incidents include:

1. Any flow observed 72 hours or more after the last rain event.
2. Muddy runoff or tracked sediment, especially near a construction site.
3. Washwater from vehicle and equipment washing (other than residents' personal vehicles).
4. Spilled or dumped chemicals or waste materials (dry or wet) that are entering a storm drain.
5. Pet wastes.

(c) Exceptions to the illicit discharge rule include water from firefighting activities; hydrant and potable water line flushings; irrigation water from landscape watering; and groundwater or spring water. Any concerns or suspected illicit discharges should be reported to EMD for further investigation.

(2) Vehicle Washing**.** Vehicle washing generates washwater that may be contaminated with grease, oil, fuel, dusts and residues, soaps, and other pollutants, which then flow untreated into storm sewer systems and waterways.

(a) JBM-HH residents may wash personal vehicles in residential areas of the Installation, but when possible, shall use the commercial vehicle wash at Henderson Hall or the vehicle wash rack at Fort McNair, which filters washwater before discharging water to the sanitary sewer system.

(b) JBM-HH's stormwater permit explicitly prohibits the discharge of washwater associated with municipal vehicle washing operations to JBM-HH's storm sewer system. Municipal vehicles include:

1. JBM-HH police cars.
2. JBM-HH fire trucks and engines.
3. Military vehicles.
4. Public Works vehicles.
5. Public Works equipment.
6. Buses.
7. Contractor vehicles and equipment.
8. All other vehicles designated for official government use at JBM-HH.

(3) Spills and Leaks.

(a) Every precaution should be taken when working with chemicals and materials outdoors so that spills are minimized. When they occur, respond to spills and leaks immediately to keep spilled material from entering the storm drain system. Spill kits are located at the AAFES fueling station for spill clean-up and in various workshops for employees' use.

(b) All spills and leaks are required to be reported to EMD for proper cleanup. Emergency spills and leaks involving hazardous substances should also be reported to Emergency Services by calling 911.

(4) Construction Projects**.** During their planning phase, construction projects of all sizes are required to consider their potential impacts to stormwater and adhere to the following guidelines to minimize stormwater pollution. Residents, employees, and visitors observing any stormwater incidents stemming from construction projects (e.g. runoff during dry weather, excessive sediment, trash and litter, concrete washout) should contact EMD.

(a) Fort Myer and Henderson Hall.

1. Stormwater discharges from construction must be minimized by using erosion and sediment controls and protective barriers around disturbed land and stockpiles. Projects disturbing 10,000 square feet of land or more must submit an Erosion and Sediment Control Plan to the Virginia DEQ for review and approval. Projects disturbing one acre or more must submit a Stormwater Management Plan to the Virginia DEQ for approval, develop a stormwater pollution prevention plan (SWPPP), and apply for a Construction General Permit. Virginia DEQ must approve Erosion and Sediment Control Plans, Stormwater Management Plans, and SWPPPs and/or issue a Construction General Permit before land disturbing activities take place.

2. Any planned submittals to the Virginia DEQ must be submitted to the EMD for review at least 30 days prior to submission to Virginia DEQ. All construction projects, regardless of size, are subject to inspection by EMD personnel. Access to the construction sites must therefore be granted to EMD personnel whenever inspections are conducted.

3. JBM-HH's stormwater permit requires qualified Installation personnel to conduct inspections of construction projects disturbing 10,000 square feet of land or greater (or 2,500 square feet of land or greater in areas designated under the Chesapeake Bay Preservation Act) to ensure appropriate controls have been implemented to prevent non-stormwater discharges to the MS4. Inspections must be conducted at the following intervals:

- During or immediately following initial installation of erosion and sediment controls;
- At least once per every two-week period;
- Within 48 hours following any runoff producing storm event; and
- At the completion of the project prior to the release of any performance bond.

4. EMD has the authority to require compliance through corrective actions to ensure E&S and pollution prevention controls are properly implemented and maintained according to the site-specific E&S Plans and SWPPP. The construction project manager will be notified of any deficiencies noted during the above-described inspections. The contractor and/or project manager must complete the required corrective actions by the deadline established by EMD. EMD personnel will conduct follow-up inspections to ensure the deficiencies were properly addressed.

5. EMD has the authority to implement enforcement actions, including but not limited to issuing a stop-work order until deficiencies in E&S and pollution prevention controls or other incidents of non-compliance with the approved plans, permits, or requirements set forth in this policy are addressed and proof of compliance is provided to EMD. EMD's enforcement authority applies to all construction projects on base, regardless of size.

(b) Fort McNair:

1. Stormwater discharges from construction must be minimized by using erosion and sediment controls and protective barriers around disturbed land and stockpiles. All projects are subject to the DOEE's soil erosion and sediment control regulations, except projects that disturb less than 50 square feet of land. DOEE must review and approve soil erosion and sediment control plans before land disturbing activities take place.

2. In addition to a soil erosion and sediment control plan, projects disturbing greater than 5,000 square feet of land must develop a Stormwater Management Plan, which must be submitted to DOEE for review and approval before land disturbing activities take place.

3. Projects disturbing one or more acres of land must develop a SWPPP and obtain coverage under the EPA NPDES Construction General Permit.

4. Any plans and/or permits must be submitted to EMD for review at least 30 days prior to submission to DOEE and EPA. All construction projects are subject to inspection by EMD personnel.

5. All construction projects are subject to inspection by JBM-HH EMD personnel. Access to the construction sites must therefore be granted to EMD personnel whenever inspections are conducted.

6. EMD has the authority to require compliance through corrective actions to ensure E&S and pollution prevention controls are properly implemented and maintained according to the site-specific E&S Plan and SWPPP. The construction project manager will be notified of any deficiencies noted during the above-described inspections. The contractor and/or project manager must complete the required corrective actions by the deadline established by EMD. EMD personnel will conduct follow-up inspections to ensure the deficiencies were properly addressed.

7. EMD has the authority to implement enforcement actions, including but not limited to issuing a stop-work order until deficiencies in E&S and pollution prevention controls or other incidents of non-compliance with the approved plans, permits, or requirements set forth in this policy are addressed and proof of compliance is provided to EMD. EMD's enforcement authority applies to all construction projects on base, regardless of size.

(5) Stormwater Best Management Practices for High-Priority Facilities.

(a) Operations at Fort Myer with higher potential of discharging pollutants include the following:

Building 306 – Directorate of Public Works (DPW) Sign Shop

Building 325 – DPW Roads & Grounds Shop

Building 447 – DPW Boiler Plant & Storage Yard

Building 314 – The Old Guard (TOG) Motor Pool

Building 330 – Directorate of Logistics TMP Motor Pool

(b) Stormwater pollutant prevention at each of these facilities is described in JBM-HH's SWPPP. The Directorate of Public Works and TOG are responsible for implementing the stormwater best management practices (BMPs) as described in the Installation's SWPPP. The EMD is responsible for maintaining and updating the Installation's SWPPP, conducting quarterly compliance inspections of industrial areas, and notifying DPW and TOG of deficiencies in BMP implementation at the high-priority facilities.

(6) General Stormwater Best Management Practices. The following BMPs should be implemented at Fort Myer, Henderson Hall, and Fort McNair where possible to prevent the pollution of stormwater:

(a) Recycle. Do not throw recyclable materials in the regular trash.

(b) Keep trash cans and dumpsters closed. Report leaking trash cans or dumpsters to EMD.

(c) Do not throw trash, including cigarette butts, on the ground.

(d) Have your vehicle maintained regularly.

(e) Do not top off your vehicle tank when refueling.

(f) Use commercial car washes that recycle washwater.

(g) Immediately clean up spilled materials.

(h) If you see a spill of oil or of a hazardous material, report it by calling 911.

(i) If you see a condition that is causing or could cause stormwater pollution, notify EMD.

(7) Contacting the Environmental Management Division. Report any conditions that could cause stormwater pollution to the Environmental Management Division's Stormwater Program at (703) 696-1222 or at usarmy.jbmhh.asa.mbx.fort-myer-fort-mcnair-stormwater-program@mail.mil. The Environmental Management Division is located in Building 321 at Fort Myer, along Marshall Drive.

APPENDIX H

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	Last revised: November 2020	Review Date: November 2020

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 Part I.E.3 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 22 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 22 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 physical 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. Information regarding the number of outfalls inspected and the status and results of any IDDE investigations must be reported in the annual MS4 Annual Report.

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

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Figure 1

Fort Myer and Henderson Hall Outfall Monitoring Location Map

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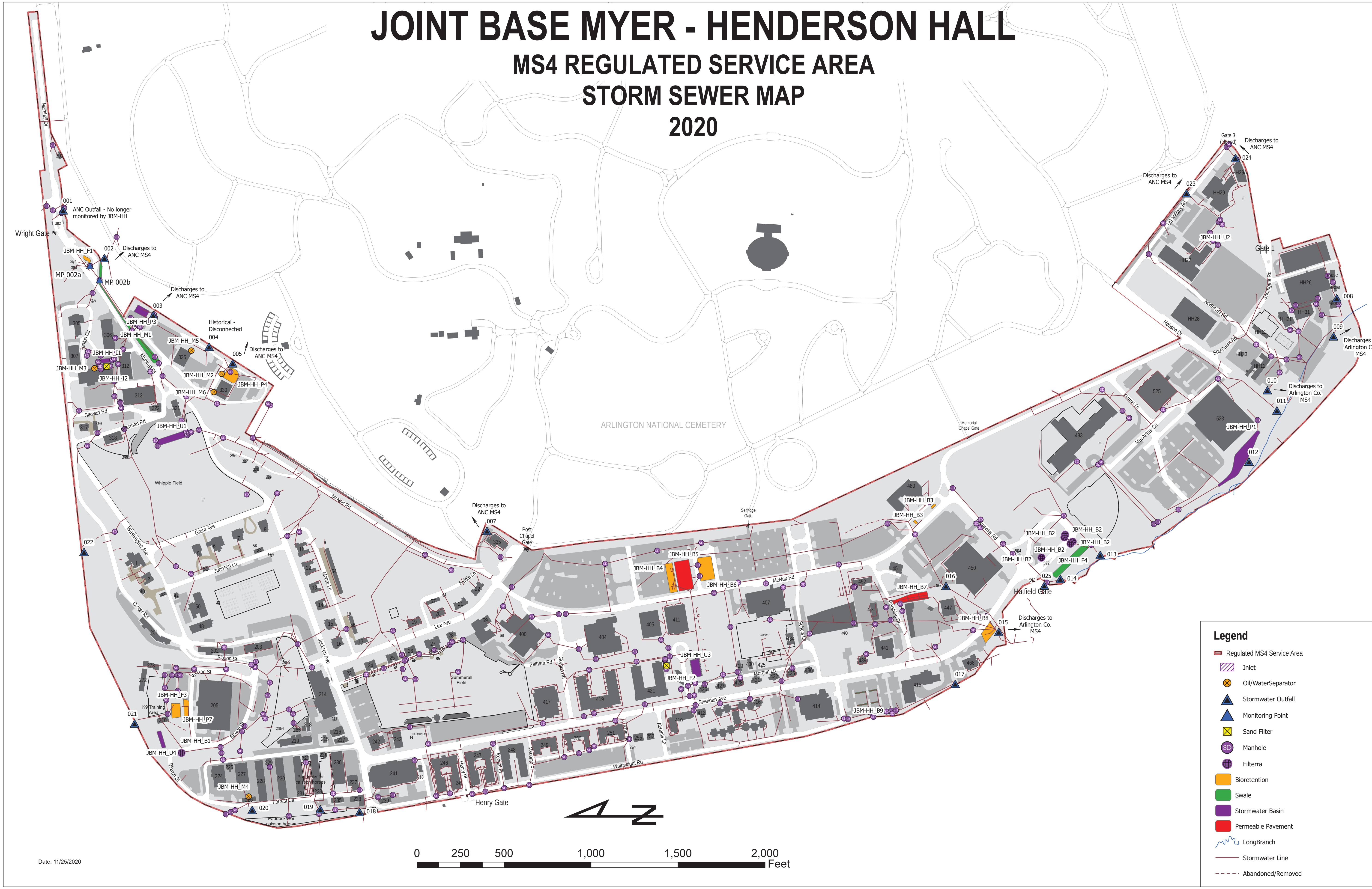
JOINT BASE MYER - HENDERSON HALL
MS4 REGULATED SERVICE AREA
STORM SEWER MAP
2020



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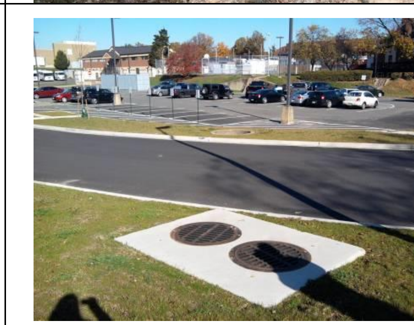
Attachment 1

JBM-HH Stormwater Outfall Monitoring Guide

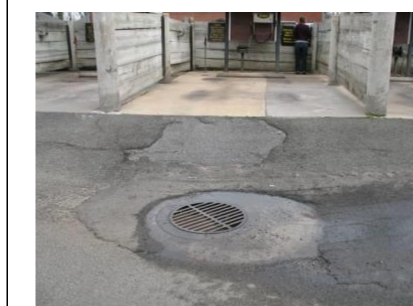
Joint Base Myer-Henderson Hall Stormwater Outfall Monitoring Guide

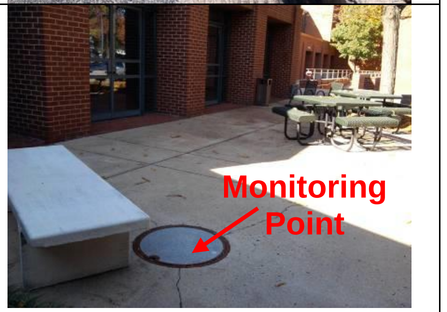
Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
001 **Not Moni-tored**	38.887528, -77.071895	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	1.2 acres	24-inch RCP w/headwall Structure #1838 **No longer monitored: outfall and drainage area determined to be on ANC property**	Marshall Dr., N. Meade St., canopy for Wright Gate. **No industrial activities**	Long-handled dipper required to collect monitoring samples.	
002 (MP002a and MP002b)	38.886876, -77.072906	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	3.9 acres	**Outfalls to ANC MS4** Monitoring point is 4' x 4' drop inlet structure. **Outfall has been determined to be on ANC property. Two monitoring points have been identified on JBM-HH property – MP002a and MP002b on the map.**	Marshall Dr., VCP roof drainage, Bldg 305 yard area. **No industrial activities**	**Outfall is now on ANC property.** Monitoring points are the two immediately upgradient manholes, as shown on the map. Will need J-hook to remove manhole covers and cable sampler or long-handled dipper to collect samples.	
003	38.886125, -77.074054	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	52.4 acres	**Outfalls to ANC MS4** Monitoring point is 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 previously covered under VPDES Industrial General Permit**	**Outfalls to ANC MS4** 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).	
004 **Not Moni-tored**	38.885284, -77.074661	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	1.3 acres	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.	
005	38.884861, -77.075052	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	3.0 acres	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 previously covered under VPDES Industrial General Permit**	Located on E side of retaining wall that is E of Bldg 330 fueling station. **Outfall is located on the ANC side of the new perimeter security fence – must contact DPW (Dave Mayeda) for access through the new gate.**	

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
006 **Not Moni-tored**		• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs		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 Moni-tored**		• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs		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	38.880913, -77.078509	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	0.8 acres	**Outfalls to ANC Millennium area** Monitoring point is Inlet for Post Chapel parking lot.	Parking lot drainage from Post Chapel parking and roof drainage. **No industrial activities**	Outfalls to ANC Millennium area. Monitoring point is inlet at NE corner of Post Chapel rear parking lot.	
008	38.867449, -77.074078	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	3.0 acres	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	38.867509, -77.074848	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	0.1 acres	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	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**	

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
						reconstruction. Structure has twin 24" CMP entering on N side and single 32" RCP entering from W side			
010	38.868566, -77.075915	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	7.8 acres	Stormwater inlet at end of concrete flume	Henderson Hall; parking and storage areas around Building 12. **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.	
011	38.868528, -77.076312	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	16.6 acres	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	38.868946, -77.07731	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	7.8 acres	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	38.871402, -77.079177	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	3.6 acres	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	

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
014	38.871929, -77.079609	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	0.1 acres	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.	
015	38.87291, -77.08066	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	62.5 acres	**Outfalls to Arlington Co MS4.** 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**	**Outfalls to Arlington Co MS4.** Monitoring point is 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	38.873736, -77.079713	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	27.1 acres	**Outfalls to Arlington Co MS4.** 36-inch RCP Structure #7876	Parking, roadways, and roof drainage from many buildings 59, 400, 450, 480, 482. **No industrial activities**	**Outfalls to Arlington Co MS4.** 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	38.873607, -77.081763	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	4.7 acres	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	38.883041, -77.084096	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	3.9 acres	15-inch RCP Structure #6826	Drainage from Forrest Cir. roadway areas around Bldg 238 **No industrial activities**	**Outfall is adjacent to Route 50/Arlington Blvd.** Monitoring point is 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.	

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
019	38.883675, -77.084032	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	1.0 acres	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**	**Outfall is adjacent to Route 50/Arlington Blvd.** Monitoring point is manhole 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	38.884711, -77.083967	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	4.6 acres	15-inch RCP Structure #6808	Vehicle wash bay, Auto Craft Shop, horse paddock area, horse stables, roadway drainage. **Industrial activities**	**Outfall is adjacent to Route 50/Arlington Blvd.** 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	38.886569, -77.08224	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	23.9 acres	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	38.887375, -77.078785	• POT- RR • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • pH in RR (aquatic life) • Benthic-Macroinvertebrate Bioassessments in RR (aquatic life) • E. coli in RR (recreation) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	2.3 acres	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	

Outfall No.	Lat/Long	Receiving Water and 6th Order HUC	Impairments	TMDLs[1]	Estimated Drainage Area	Monitoring Point Description	Land Use	Notes	Photograph
023	38.869808, -77.071943	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	8.9 acres	15-inch RCP Manhole on east side of Carpenter Road, across from southeast corner of parking garage	**Outfalls to Arlington Co MS4.** Drainage from Henderson Hall including parking garage, roadways, parking lots, and roof drainage from Building 27 **No industrial activities**	**Outfalls to Arlington County MS4** Monitoring point is manhole for 15-inch RCP that runs along Carpenter Road;	
024	38.869014, -77.071217	• POT – CEM/PENT • HUC 020700100103 • VAHU6 PL24	• PCBs in POT (fish consumption) • E. coli in tributaries of POT (recreation) • pH in tributaries of POT (aquatic life)	POT TMDL for PCBs	1.9 acres	**Outfalls to to Arlington County MS4** Monitoring point is 15-inch RCP Manhole located in outdoor patio on east side of theater	**Outfalls to ANC MS4** 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**	**Outfalls to Arlington County MS4** Monitoring point is manhole for 15-inch RCP south of Building 29;	
025	38.872183, -77.079739	• POT via FMR-LLB • HUC 020700100103 • VAHU6 PL24	• Chlordane in FMR (fish consumption) • E. coli in FMR (recreation) • Benthic-Macroinvertebrate Bioassessments in Long Branch (aquatic life)	POT TMDL for PCBs	1.9 acres	24-inch RCP Manhole in grassy area southwest of Hatfield Gate, just inside fence	Drainage from roadway areas along Carpenter Road	Outfall discharges to Lower Long Branch on east side of headwall for 2nd St. So. culvert Monitoring point is manhole in grassy area southwest of Hatfield Gate, just inside fence.	

1. TMDLs with wasteload allocations applicable to JBM-HH

CEM/PENT – Cemetery/Pentagon Sub-watershed
DS – Downstream
FMR – Fourmile Run
HH – Henderson Hall

LLB – Lower Long Branch Subwatershed
OWS – Oil-water separator
POT – Potomac River
RR – Rocky Run Subwatershed

Attachment 2

Outfall Reconnaissance Inventory/Sample Collection Field Sheet

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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)? ______________________________

____

APPENDIX I

CONSTRUCTION INSPECTION AND COMPLIANCE PROCEDURES

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Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Construction Inspection and Compliance Procedures			
Owner: DPW EMD Stormwater Program Manager	Approved By: Chief, EMD	Last revised: November 2020	Review Date: November 2020

1.0 PURPOSE

These Construction Inspection and Compliance Procedures are a written guideline for controlling construction site stormwater runoff and addressing discharges entering the storm drain system from regulated construction sites within the municipal separate storm sewer system (MS4) service area, as required under Minimum Control Measure (MCM) 4: Construction Site Stormwater Runoff Control. 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 (Permit No. VAR040068) for discharges from the MS4 that serves the Fort Myer and Henderson Hall Installations (collectively referred to as “the Installation”).

JBM-HH falls under Part 1.E.4.a(4) of the MS4 General Permit as a federal entity that has not developed standards and specifications in accordance with the Virginia Erosion and Sediment Control Law (§ 62.1-44.15:51 et seq. of the Code of Virginia) and Virginia Erosion and Sediment Control Regulations (9VAC25-840). The Virginia Department of Environmental Quality (VDEQ) is the review and approval authority for stormwater management and erosion and sediment control plans for construction projects on the Installation and issues Construction Stormwater permits.

In accordance with Part I.E.4 of the General Permit, the Installation has developed written procedures for:

- Inspecting construction sites to ensure the erosion and sediment (E&S) controls and construction-related pollution prevention controls are properly implemented (including the proper use of associated inspection documents and the inspection schedule); and
- Requiring compliance through corrective action or enforcement action to the extent allowable under federal, state, or local law, regulation, ordinance, or other legal mechanisms.

The procedures in this document serve as a reference to employees involved with construction site inspection and compliance enforcement activities on base.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. BMP – Best Management Practice
b. DPW – Directorate of Public Works
c. EMD – Environmental Management Division
d. E&S – Erosion and Sediment
e. MCM – Minimum Control Measure
f. MS4 – Municipal Separate Storm Sewer System
g. PPE – Personal Protective Equipment
h. SOP – Standard Operating Procedure
i. SWPPP – Stormwater Pollution Prevention Plan

3.0 INSPECTIONS

Construction site inspections must be conducted for all construction sites that conduct land disturbance activities of 10,000 square feet or greater, or 2,500 square feet or greater within areas designated under the Chesapeake Bay Preservation Act.

The majority of the installation is not located within the Chesapeake Bay Preservation Area and therefore is generally only subject to the 10,000 square foot threshold, rather than the 2,500 square foot threshold. JBM-HH would fall under Arlington County's Chesapeake Bay Preservation Area map, which is provided in **Attachment 1**.

Below are the procedures for conducting construction site inspections.

3.1 Pre-Inspection Activities

a. Prior to inspections, obtain a copy of the construction project's approved E&S Control Plans and/or Stormwater Pollution Prevention Plan (SWPPP) to review best management practices (BMPs) and E&S control procedures.

b. Coordinate inspections with the Site Manager.

  i. Schedule inspections for days where site operations will not pose a safety concern. If possible, also schedule inspections for days where the Site Manager will be available.

  ii. Confirm personal protective equipment (PPE) requirements with the Site Manager.

3.2 Construction Site Inspections

a. Assess the condition of site-specific BMPs/E&S controls (e.g., stabilized construction entrance, inlet protection, silt fence, etc.) and construction activities (e.g., stabilized disturbed areas/slopes, material storage, washout facilities, etc.) to determine whether any maintenance or corrective actions are needed.

  i. Assess controls designed to prevent nonstormwater discharges (such as wastewater, concrete washout, fuels and oils, and other illicit discharges) to the MS4 to ensure nonstormwater discharges are not present.

ii. Ensure E&S controls are implemented according to the site-specific E&S Plans.

b. Document all site inspections using the Construction Site Inspection Form, included as **Attachment 2**.

3.3 Post-Inspection Activities

a. Finalize observations on the Construction Site Inspection Form.

i. Develop corrective actions for any deficiencies noted.

ii. Determine if a follow-up inspection is needed.

b. Convey deficiencies and corrective actions in a Corrective Action memorandum to the Site Manager. A template for the Corrective Action Memorandum is included as **Attachment 3**.

3.4 Safety Considerations

a. Always wear safety-toed boots to protect feet from possible crushing and puncture injuries and provide ankle support on uneven or wet terrain on the construction site.

b. Wear all other required PPE as identified by the Site Manager.

c. Observe the crew's accepted safety protocols while on the construction site. Be aware of heavy machinery: operators may not be able to see or hear your presence.

3.5 Inspection Schedule

Inspections of construction sites must be conducted at the following intervals:

a. During or immediately following initial of installation E&S controls

b. At least once every two weeks

c. Within 48 hours following any runoff producing storm events

d. At the completion of the project prior to the release of any performance bond.

4.0 COMPLIANCE AND ENFORCEMENT

The following compliance and enforcement authorities and procedures apply to all construction project on base, including those disturbing greater than once acre and requiring a construction general permit as well as smaller, non-permitted construction projects.

4.1 Legal Authority

a. Scopes of Work for construction projects on base include a "Tab J," which identifies requirements for the contractor to minimize water quality impacts from construction-related stormwater discharges and describes EMD's role in ensuring proper controls are in place. Tab J is included as **Attachment 4**.

b. JBM-HH has developed a base-wide policy giving EMD authority to implement enforcement actions, such as issuing a stop-work order until deficiencies in E&S controls have been corrected. EMD has the authority to require compliance through corrective actions to ensure E&S controls are properly implemented and maintained according to the site-specific E&S Plans. This policy is currently being reviewed and will be signed by the Joint Base Commander.

4.2 Requiring Compliance

The following procedures must be followed when deficiencies are observed during the construction site inspections:

a. The inspector must complete the Construction Site Inspection Form (**Attachment 2**) with corrective actions for the deficiencies observed.

b. The inspector must complete a Corrective Action Memorandum (**Attachment 3**), which should include the following:

- **i.** Date of the inspection
- **ii.** Description of the deficiency(ies) in E&S controls observed
- **iii.** Photographs of the deficiency(ies)
- **iv.** Description of the required corrective action
- **v.** Date the corrective action must be completed
- **vi.** Signature of the Chief, DPW-EMD

c. The Corrective Action Memorandum must be submitted to the Site Manager (USACE or other applicable Project Manager for the construction project).

d. The corrective actions must be completed by the deadline stated in the memorandum. The contractor and/or Site Manager must sign the Corrective Action Memo when the corrective actions have been completed and return to the EMD.

e. EMD should conduct a follow-up inspection to ensure the corrective action has been completed.

5.0 RESPONSIBILITIES

The following is an overview of the roles and responsibilities of JBM-HH's departments, divisions or subdivisions in implementing the above requirements. A roles and responsibilities matrix is provided as **Attachment 5**.

5.1 DPW-EMD

a. Conducting construction site inspections. Two staff members have obtained the VDEQ Erosion & Sediment Control Inspector Certifications, as well as the

Virginia Responsible Land Disturber (RLD) Certifications. These certificates are included as **Attachment 6**.

- **b.** Documenting inspections by completing the Construction Site Inspection Form.
- **c.** During or immediately following initial installation of E&S controls
- **d.** Developing corrective actions for any deficiencies noted.
- **e.** Conveying deficiencies and corrective actions in a memorandum to the Site Manager (memorandums must be signed by the Chief, DPW-EMD).
- **f.** Conducting follow-up inspections, as needed.

5.2 US Army Corps of Engineers

Major construction activities (generally >1 acre) at JBM-HH are performed under the oversight of the U.S. Army Corps of Engineers (USACE).

- **a.** Reviewing E&S Plans.
- **b.** Managing the construction project and contractor.
- **c.** Conveying any deficiencies noted during stormwater construction inspections and required corrective actions to the contractor to be addressed.

6.0 Attachments

Attachment 1: Chesapeake Bay Preservation Area Map

Attachment 2: JBM-HH Construction Site Inspection Form

Attachment 3: Corrective Action Memorandum

Attachment 4: Tab J of Construction Project Scope of Work: Stormwater Requirements

Attachment 5: Roles & Responsibilities Matrix

Attachment 6: Inspector Certifications

Attachment 1

Chesapeake Bay Preservation Area Map

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ARLINGTON COUNTY, VIRGINIA
Chesapeake Bay Preservation Area
Effective January 1, 2018

Map prepared by GIS Mapping Center
2100 Clarendon Blvd., Suite 813
Arlington, VA 22201
Email: gismc@arlingtonva.us
Maps are available for sale at the above location.

Spatial reference: Virginia State Plane North, NAD 1983.
Base map updated from April 2015 digital aerial photography.
Potomac River from USGS 1:24,000 DLG files.
Map does not display all County Wetlands, only those designated for RPA.
Area outside of desginated RPA is considered Resource Management Area.
Map shall not be construed as legal document.

Pursuant to Section 54.1-402 of the Code of Virginia, any determination of topography or contours, or any depiction of physical improvements, property lines or boundaries is for general information only and shall not be used for the design, modification, or construction of improvements to real property or for flood plain determination.

Printed: September 2017

Block Numbers on Numbered Streets

200	Ball	2000	Taft	3700	Nelson	5400	Harrison
300	Clark	2100	Uhle	3800	Oakland	5500	Illinois
400	Dale	2200	Veitch	3900	Pollard	5600	Jefferson
500	Eads	2300	Wayne	4000	Quincy	5700	Kensington
600	Fern	2400	Adams	4100	Randolph	5800	Lexington
700	Grant	2500	Barton	4200	Stafford	5900	Madison
800	Hayes	2600	Cleveland	4300	Taylor	6000	Nottingham
900	Ives	2700	Danville	4400	Utah	6100	Ohio
1000	Joyce	2800	Edgewood	4500	Vermont	6200	Powhatan
1100	Kent	2900	Fillmore	4600	Wakefield	6300	Quantico
1200	Lynn	3000	Garfield	4700	Abingdon	6400	Roosevelt
1300	Meade	3100	Highland	4800	Buchanan	6500	Sycamore
1400	Nash	3200	Irving	4900	Columbus	6600	Tuckahoe
1500	Oak	3300	Jackson	5000	Dinwiddie	6700	Underwood
1600	Pierce	3400	Kenmore	5100	Edison	6800	Van Buren
1700	Queen	3500	Lincoln	5200	Frederick	6900	Westmoreland
1800	Rolfe	3600	Monroe	5300	Greenbrier	7000	Arizona
1900	Scott						

South and West Sides are Even Address Numbers

Attachment 2

Construction Site Inspection Form

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General Information			
Project Name/Description			
Location			
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection: ❑ After initial installation of E&S controls ❑ Regular (every 2 weeks) ❑ Within 48 house of storm event ❑ Completion of Project			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs from E&S Plan and/or SWPPP

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1		❑Yes ❑No	❑Yes ❑No	
2		❑Yes ❑No	❑Yes ❑No	
3		❑Yes ❑No	❑Yes ❑No	
4		❑Yes ❑No	❑Yes ❑No	
5		❑Yes ❑No	❑Yes ❑No	
6		❑Yes ❑No	❑Yes ❑No	
7		❑Yes ❑No	❑Yes ❑No	
8		❑Yes ❑No	❑Yes ❑No	
9		❑Yes ❑No	❑Yes ❑No	
10		❑Yes ❑No	❑Yes ❑No	
11		❑Yes ❑No	❑Yes ❑No	
12		❑Yes ❑No	❑Yes ❑No	
13		❑Yes ❑No	❑Yes ❑No	
14		❑Yes ❑No	❑Yes ❑No	
15		❑Yes ❑No	❑Yes ❑No	
16		❑Yes ❑No	❑Yes ❑No	
17		❑Yes ❑No	❑Yes ❑No	
18		❑Yes ❑No	❑Yes ❑No	
19		❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

Print name and title: ____

Signature:____ **Date:**_____________________

Attachment 3

Corrective Action Memorandum

This page intentionally left blank.

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

REPLY TO
ATTENTION OF

IMMH-PW-E [Date]

MEMORANDUM FOR [Construction Project Name]

SUBJECT: Stormwater Construction Site Inspection – Deficiencies Identified

1. The purpose of this memorandum is to provide the results of a recent Stormwater Construction Inspection conducted at the above-mentioned construction project site on [Insert Inspection Date].

2. The purpose of this inspection was to assess the condition of site-specific stormwater best management practices and erosion and sediment controls and evaluate compliance with the site's Erosion and Sediment Control Plan.

3. Deficiencies were identified during the inspection. Enclosed is the Corrective Action Form for your review and action. This form includes a description of the deficiency, photograph, and required corrective action.

4. Please complete the right-hand column of the attached Corrective Action Form with resolution provided for each action item and return to Mr. Richard LaFreniere of the Directorate of Public Works, Environmental Management Division, by [date].

5. For additional information or assistance contact Mr. Richard LaFreniere at 703-696-8055 or richard.p.lafreniere2.civ@mail.mil.

AUTHORITY LINE:

Encl

RICHARD P. LAFRENIERE
Chief
DPW – Environmental Management Division

Construction E&S Controls Corrective Action Form

EMD Inspection Assessment for (location): ____
Inspector(s): **Date:**

Item #	*This column to be completed by EMD*	*Photograph*	*Resolution Response – To be completed by contractor*
1.	**Observation:**		**Corrective Action(s) Taken:**
	Corrective Action(s):		**Date Completed:** **Signature:**
2.	**Observation:**		**Corrective Action(s) Taken:**
	Corrective Action(s)		**Date Completed:** **Signature:**

Attachment 4

Tab J of Construction Project Scope of Work: Stormwater Requirements

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TAB J - STORM DRAINAGE/LOW IMPACT DEVELOPMENT

Pre-construction

Water quality impacts from construction-related stormwater discharges within the Fort Myer-Henderson Hall installation in Virginia must be minimized by using erosion and sediment controls and protective barriers around disturbed land and stockpiles.

If the project disturbs 10,000 square feet of land or more (or 2,500 square feet of land or greater in areas designated under the Chesapeake Bay Preservation Act), a VADEQ-approved erosion and sediment control (E&SC) plan is required. If the project disturbs one or more acres of land, a Stormwater Management Plan (SWP), Virginia Department of Environmental Quality (VADEQ) General Permit for Discharges of Stormwater from Construction Activities, and Stormwater Pollution Prevention Plan (SWPPP) are required.

The Virginia Stormwater Management Program (VSMP) regulation requires use of the Virginia Runoff Reduction Method (VRRM) or another equivalent methodology approved by VADEQ for compliance with the Part IIB water quality criteria (9VAC25-870-65). The VRRM New Development or Redevelopment compliance spreadsheets should be used to ensure compliance with the runoff reduction requirements.

Additionally, if the project footprint is greater than 5,000 gross square feet, or expands the footprint of existing facilities by more than 5,000 gross square feet, then the total volume of rainfall from a 95th percentile storm is required to be managed on-site. The project "footprint" consists of all horizontal hard surfaces and disturbed areas associated with the project development, including both building area and pavements (such as roads, parking, and sidewalks). The 1 February 2016 Unified Facilities Criteria (UFC 3-210-10) provides technical criteria, requirements, and references to comply with the Energy Independence and Security Act (EISA) (EISA Section 438, 2007 DoD Army LID Policy, and Executive Order 13693 Compliance).

The JBM-HH Environmental Management Division (EMD) is responsible for ensuring water quality impacts from construction site stormwater discharges are minimized and are in compliance with the Installation's stormwater permit and applicable regulatory requirements. Any plans and/or permits (including E&SC Plans, SWPPPs, and SWM Plans) must be submitted to EMD for review at least 30 days prior to submission to VADEQ.

During Construction

Appropriate controls must be implemented to prevent the discharge of construction-related pollutants to the JBM-HH storm water drainage system. Non-stormwater discharges from construction activities including but not limited to wastewater discharges, concrete washout, and fuels and oils constitute illicit discharges and are strictly prohibited under the Installation's stormwater permit.

All construction projects are subject to inspection by EMD personnel. Access to the construction sites must therefore be granted to EMD personnel whenever inspections are conducted.

JBM-HH’s stormwater permit requires EMD staff to conduct inspections of construction projects disturbing 10,000 square feet of land or greater (or 2,500 square feet of land or greater in areas designated under the Chesapeake Bay Preservation Act) to ensure appropriate controls have been implemented to prevent non-stormwater discharges to the municipal separate storm sewer system (MS4). Inspections will be conducted at the following intervals:

- During or immediately following initial installation of erosion and sediment controls;
- At least once per every two-week period;
- Within 48 hours following any runoff producing storm event; and
- At the completion of the project prior to the release of any performance bond.

The construction project manager will be notified of any deficiencies noted during the above-described inspections via a memorandum. Deficiencies in erosion and sediment controls and best management practices identified during EMD’s inspections must be addressed within the timeline established by the inspector through corrective actions outlined by EMD. EMD personnel will conduct follow-up inspections to ensure the deficiencies were properly addressed.

Post-construction

The contractor must remove temporary erosion and sediment control measures at the appropriate intervals and removal all materials from construction staging areas, including sweeping up and disposing of trash and debris.

If a VADEQ General Permit for Discharges of Stormwater from Construction Activities was required, the contractor must coordinate closure of the permit, including coordinating final inspections by VADEQ, if required, and submitting the Notice of Termination (NOT). The NOT must be submitted to EMD for review before submittal to the state. The permit closure letter must be submitted to EMD when obtained.

Attachment 5

Roles and Responsibilities Matrix

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Construction Projects at JBM-HH
Roles and Responsibilities

Task/Compliance Milestone	State/VSMP	USACE (Engineering and/or Design Divisions)	DPW	EMD	Construction Contractor
Before Construction					
Stormwater Pollution Prevention Plan (SWPPP) *Required for projects disturbing ≥ 1 acre of land	Review and approval as part of the Construction General Permit application.	If project owner, USACE is responsible for ensuring contractor prepares SWPPP in a timely manner. Coordinates submittal to EMD for initial review and submittal to the state after EMD's approval.	If project owner, DPW is responsible for ensuring contractor prepares SWPPP in a timely manner. Coordinates submittal to EMD for initial review and submittal to the state after EMD's approval.	Responsible for reviewing SWPPP and maintaining a copy of plan in EMD office.	Responsible for preparing SWPPP in accordance with the requirements of the General VPDES Permit for Discharges of Stormwater from Construction Activities.
Construction General Permit (CGP) *Required for projects disturbing ≥ 1 acre of land	Will review permit application, issue permit, and send fee invoice after permit issuance.	If project owner, USACE is responsible authority for permit. Will provide funding to pay any fees/invoices related to the permit. Support EMD by providing necessary information and materials concerning any upcoming construction projects, in a timely manner – prior to their approval. Work with contractor to develop CGP compliance checklist.	If project owner, DPW is responsible authority for permit. Will provide funding to pay any fees/invoices related to the permit. Support EMD by providing necessary information and materials concerning any upcoming construction projects, in a timely manner – prior to their approval. Work with contractor to develop CGP compliance checklist.	Staffing documents in a timely manner to obtain review/approval of the Joint Base Commander when necessary. Providing USACE/DPW ample time to pay any fees/invoices.	Will apply for General Permit at least 14 days before construction will begin. Must be listed as the "Operator" on the CGP.
Erosion and Sediment Control (ESC) Plan *Required for projects disturbing ≥ 10,000 ft^2 (or ≥ 2,500 ft^2 of land or greater in areas designated under the Chesapeake Bay Preservation Act)	ESC Plan must be approved by localities. The Virginia Stormwater Management Program (VSMP) authority for the Installation is DEQ. Local authority must identify a "responsible land disturber" before land can be disturbed.	If project owner, USACE is responsible authority for ESC Plan. Coordinates submittal to EMD for initial review and submittal to the state after EMD's approval.	If project owner, DPW is responsible authority for ESC Plan. Coordinates submittal to EMD for initial review and submittal to the state after EMD's approval.	Responsible for reviewing the ESC Plan prior to submittal to DEQ for approval.	Contractor is required to provide a qualified "responsible land disturber" for the duration of construction.
Stormwater Management Plan *Required for projects disturbing ≥ 1 acre of land	Stormwater Management Plan must be approved by localities. The VSMP authority for the Installation is DEQ.	If project owner, USACE is responsible authority for Stormwater Management Plan. Coordinates submittal to EMD for initial review and submittal to the state after EMD's approval.	If project owner, DPW is responsible authority for Stormwater Management Plan. Coordinates submittal to EMD for initial review and submittal to the state after EMD's approval.	Responsible for reviewing the ESC Plan prior to submittal to DEQ for approval.	N/A
During Construction					
Erosion and Sediment Control Minimum Standards	N/A	If project owner, USACE Construction Manager responsible for ensuring construction contractor implements ESC Plan as required and responsible for obtaining regulatory approval for any changes to ESC Plan.	If project owner, DPW is responsible for ensuring ESC Plan is implemented during active construction projects and responsible for obtaining regulatory approval for any changes to ESC Plan.	EMD is responsible for ensuring construction projects meet all minimum standard requirements by conducting regular site inspections.	Contractor is responsible for implementing approved ESC Plan as required and notifying project owner if changes to ESC Plan are required.
CGP	N/A	Submit the compliance checklist to DPW and EMD on a monthly basis.	N/A	Responsible for maintaining proof of permit coverage with the stormwater program files for a minimum of three years.	Responsible for complying with all requirements of the permit and paying any fines related to the permit.
Construction General Permit (CGP) Public Notification	N/A	If project owner, USACE is responsible for ensuring public notification requirement is met by the contractor.	If project owner, DPW is responsible for ensuring public notification requirement is met by the contractor.	Responsible for checking for posted CGP notice of coverage letter during compliance inspections.	Upon commencement of land disturbance, Contractor shall conspicuously post a copy of the CGP notice of coverage letter near the main entrance of the construction activity; for linear projects, the contractor shall post the notice of coverage letter at a publicly accessible location near an active part of the construction project.

Construction Projects at JBM-HH
Roles and Responsibilities

Task/Compliance Milestone	State/VSMP	USACE (Engineering and/or Design Divisions)	DPW	EMD	Construction Contractor
During Construction (continued)					
SWPPP	N/A	If project owner, USACE is responsible for ensuring contractor complies with all requirements of the approved SWPPP.	If project owner, DPW is responsible for ensuring contractor complies with all requirements of the approved SWPPP.	Responsible for checking compliance with the SWPPP during inspections.	Responsible for implementing all control measures identified in SWPPP and maintaining a copy of the SWPPP in a location accessible to those identified with responsibilities under the SWPPP.
Inspections	The VSMP will periodically inspect approved projects. When violations or damages are found, the inspector notifies the owner and/or developer about required corrections and a deadline for completion.	USACE is responsible for ensuring construction contractor is conducting inspections and that contractor is addressing issues noted during EMD or Contractor inspections.	If project owner, DPW is responsible for ensuring construction contractor is conducting inspections and that contractor is addressing issues noted during EMD or Contractor inspections.	EMD is responsible for conducting compliance inspections of construction activities. When it is evident that minimum standards are not being met, EMD is responsible for providing USACE and/or DPW with corrections and a deadline for completion. EMD has the authority to issue a stop-work order, when necessary, until compliance is achieved.	Contractor is responsible for conducting routine inspections of all active construction sites. This includes: • During or immediately following initial installation of erosion and sediment controls; • At least once per every two-week period; • Within 48 hours following any runoff producing storm event; and • At the completion of the project. When minimum standards are not being met at the sites, contractor is responsible for addressing violations immediately. Responsible for maintaining all required records for a minimum of three years and providing to EMD upon request.
After Construction					
Post-Construction Stormwater Management	Responsible for approving Notice of Termination (NOT).	If project owner, USACE is responsible for submitting NOT to DEQ. Responsible for submitting as-built construction documents and necessary information and materials, including the NOT form and proof of termination of CGP, to EMD in a timely manner.	If project owner, DPW is responsible for submitting NOT to DEQ. Responsible for submitting as-built construction documents and necessary information and materials, including the NOT form and proof of termination of CGP, to EMD in a timely manner.	Responsible for obtaining the NOT from the project team and maintaining proof of permit termination with the stormwater program files for a minimum of three years.	Responsible for completing NOT, to signal the end of active construction. Responsible for coordinating with DEQ for a final site inspection, if required. Responsible for performing an inspection with the project owner (DPW/USACE), at the completion of the project prior to the release of any performance bond. Responsible for paying any fines related to the permit.
MS4 Annual Report	N/A	Support EMD by providing necessary information and materials concerning annual report, in a timely manner.	Support EMD by providing necessary information and materials concerning annual report, in a timely manner.	Completing MS4 Annual Report and including applicable information regarding construction projects on base. Staffing documents in a timely manner to obtain review/approval of the Joint Base Commander.	Responsible for providing a confirmation statement that land disturbing projects which occurred during the reporting period have been conducted in accordance with the current DEQ-approved standards. If projects were not conducted with the DEQ-approved standards and specifications, responsible for providing an explanation as to why. Also responsible for listing the total number of inspections conducted and the total number and type of enforcement actions implemented and providing this to EMD.

Attachment 6

Inspector Certifications

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COMMONWEALTH OF VIRGINIA

State Water Control Board

1111 East Main Street, Richmond, Virginia 23219

EROSION AND SEDIMENT CONTROL

Inspector

Agrima Poudel

CERTIFICATE NUMBER

ESIN1722

EXPIRATION DATE

10/1/2023

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

This certificate is for your records and should be kept in a safe location. Please detach the above certificate and the two wallet size cards below. It is your responsibility to ensure that your certification is kept current and that you meet the requirements for re-certification before the expiration date.

COMMONWEALTH OF VIRGINIA
State Water Control Board
1111 East Main Street, Richmond, Virginia 23219

EROSION AND SEDIMENT CONTROL
Inspector
Agrima Poudel

Certificate Number ESIN1722

Expiration Date 10/1/2023

COMMONWEALTH OF VIRGINIA
State Water Control Board
1111 East Main Street, Richmond, Virginia 23219

EROSION AND SEDIMENT CONTROL
Inspector
Agrima Poudel

Certificate Number ESIN1722

Expiration Date 10/1/2023

COMMONWEALTH OF VIRGINIA

State Water Control Board

1111 East Main Street, Richmond, Virginia 23219

RESPONSIBLE LAND DISTURBER

Agrima Poudel

CERTIFICATE NUMBER

RLD13009

EXPIRATION DATE

7/29/2022

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

This certificate is for your records and should be kept in a safe location. Please detach the above certificate and the two wallet size cards below. It is your responsibility to ensure that your certification is kept current and that you meet the requirements for re-certification before the expiration date.

COMMONWEALTH OF VIRGINIA
State Water Control Board
1111 East Main Street, Richmond, Virginia 23219

RESPONSIBLE LAND DISTURBER

Agrima Poudel

Certificate Number
RLD13009

Expiration Date
7/29/2022

COMMONWEALTH OF VIRGINIA
State Water Control Board
1111 East Main Street, Richmond, Virginia 23219

RESPONSIBLE LAND DISTURBER

Agrima Poudel

Certificate Number
RLD13009

Expiration Date
7/29/2022

COMMONWEALTH OF VIRGINIA

State Water Control Board

1111 East Main Street, Richmond, Virginia 23219

EROSION AND SEDIMENT CONTROL

Inspector

Jennifer Marie Tolbert

CERTIFICATE NUMBER

ESIN1710

EXPIRATION DATE

9/24/2023

This certificate is for your records and should be kept in a safe location. Please detach the above certificate and the two wallet size cards below. It is your responsibility to ensure that your certification is kept current and that you meet the requirements for re-certification before the expiration date.

COMMONWEALTH OF VIRGINIA
State Water Control Board
1111 East Main Street, Richmond, Virginia 23219

EROSION AND SEDIMENT CONTROL
Inspector
Jennifer Marie Tolbert

Certificate Number ESIN1710

Expiration Date 9/24/2023

COMMONWEALTH OF VIRGINIA
State Water Control Board
1111 East Main Street, Richmond, Virginia 23219

EROSION AND SEDIMENT CONTROL
Inspector
Jennifer Marie Tolbert

Certificate Number ESIN1710

Expiration Date 9/24/2023

COMMONWEALTH OF VIRGINIA

State Water Control Board

1111 East Main Street, Richmond, Virginia 23219

RESPONSIBLE LAND DISTURBER

Jenny Tolbert

CERTIFICATE NUMBER

RLD14926

EXPIRATION DATE

4/1/2023

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

This certificate is for your records and should be kept in a safe location. Please detach the above certificate and the two wallet size cards below. It is your responsibility to ensure that your certification is kept current and that you meet the requirements for re-certification before the expiration date.

COMMONWEALTH OF VIRGINIA
State Water Control Board
1111 East Main Street, Richmond, Virginia 23219

RESPONSIBLE LAND DISTURBER

Jenny Tolbert

Certificate Number
RLD14926

Expiration Date
4/1/2023

COMMONWEALTH OF VIRGINIA
State Water Control Board
1111 East Main Street, Richmond, Virginia 23219

RESPONSIBLE LAND DISTURBER

Jenny Tolbert

Certificate Number
RLD14926

Expiration Date
4/1/2023

APPENDIX J

STORMWATER MANAGEMENT FACILITY INSPECTION PROCEDURES

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JOINT BASE MYER – HENDERSON HALL

MUNICIPAL SEPARATE STORM SEWER SYSTEM
(MS4) PROGRAM PLAN

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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LIST OF TABLES

LIST OF APPENDICES

Stormwater Management Facility Maintenance Standard Operating Procedures & Forms

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1.0 INTRODUCTION

Joint Base Myer-Henderson Hall (JBM-HH) owns and operates a municipal separate storm sewer system (MS4) that serves U.S. Army Installation Fort Myer (Fort Myer) and the U.S. Marine Corps (USMC) installation at Henderson Hall (Henderson Hall), which are jointly referred to as 'the Installation' in this manual. 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 the 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 and 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 stormwater runoff before it is discharged to the MS4 system.

Although not covered under the Virginia General Permit, Fort McNair in Washington, D.C. 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 manual.

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. JBM-HH 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 detention basins and bioretention areas, underground retention vaults, permeable pavement and pavers, sand filters and oil/water separators, Filterra filtration systems, and rain gardens, currently treat runoff from approximately 122 acres of the Installation.

Fort McNair has 6 BaySaver® proprietary storm water treatment devices, several stormwater detention and bioretention areas and a green roof.

3.0 JBM-HH-OWNED STORMWATER MANAGEMENT FACILITIES

Stormwater management facilities owned by JBM-HH are required to be inspected and maintained. The Environmental Management Division (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 Appendices in this Plan:

Table 1. Stormwater Management Facilities at Fort Myer and Henderson Hall.

Stormwater Management Facility Type	Location/Description
Sand Filter	B314 The Old Guard (TOG) Vehicle Maintenance Facility
	Sheridan Ave UEPH (B421) Barracks
Underground Detention Structures	Underground Pipe Detention behind Henderson Hall Gym and Parking Garage
	B314 Underground Detention/Infiltration Basin
	Millennium Underground Detention Vault at Whipple Field
	Underground Detention Vault under Basketball Court (B419 & 421)
	Radnor Heights Substation Underground Detention Vault
Detention Basins	B205 Partial Underground Dry Extended Detention Basin
	B325 Partial Underground Dry Extended Detention Basin
	B330 Fueling Station Pond
Wet Ponds	Long Branch Detention Basin (West of B523)
Bioretention Areas	Wright Gate Vehicle Inspection Station Bioretention
	Bioretention Area behind Radnor Heights Substation
	Memorial Chapel Rain Gardens (2)
	East Parking Lot Bioretention Area (S of Special Events Parking Area)
	Bioretention area across from B411
	B414 (Fitness Center) Parking Lot Bioswales
	Sheridan Ave Bioswale (AAFMAA)
	Henderson Hall Parking Lot Bioswales (3)
Grassed Swales	Marshall Drive Grassed Swale
	Hatfield Gate Grassed Swale
Filterra® Systems	Hatfield Gate vehicle inspection loop (4)
	Radnor Heights Substation (2)
StormFilter® Stormwater Treatment Device	Radnor Heights Substation
Permeable Pavement/Pavers	Pershing Drive lot (pavers)
	Special Events Parking Area across from B411 (pavement)
	Old Post Chapel Lot Permeable Pavers
Oil-Water Separator	B330 fueling station
	Building 227 vehicle wash
	Building 314 (TOG) Maintenance Facility
	Building 325 – Vehicle/Equipment Maintenance
	Building 330 bus wash – Not in use

Table 2. Stormwater Management Facilities at Fort McNair.	
Stormwater Management Facility Type	**Location/Description**
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	Detention basin west of Building 64
Bioretention Areas	Northeast of B69
	Southeast of B62
	East of USATA Garage
	West of USATA Garage
Green Roof	Roof of USATA Garage
Grassed Swale	West of Parking Lot between B69 and B64

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 once annually. Inspections shall be documented on the form provided by EMD or on forms developed by the USACE for inclusion in the USACE JBM-HH BMP Access Database. During the inspection, each SMF is assigned a letter grade based on its condition. The letter grades are described below:

- **A**: SMF is in good condition. Nothing to suggest that the conditions surrounding the SMF have the potential to impede the SMF from functioning.
- **B**: SMF is in good condition. Some minor maintenance may be needed in order to prevent a situation which may impede the SMF.
- **C**: SMF is functioning properly, some maintenance necessary to keep the SMF functioning properly.
- **D**: SMF is impeded and needs maintenance in order to function properly.
- **E**: SMF is in poor condition and is not functioning as intended.

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 the appendices for specific inspection schedules and inspection and maintenance forms. Records of inspections are maintained with the EMD's stormwater files.

3.2 Maintenance

Maintenance of stormwater management facilities shall be performed as necessary and to the manufacturer's or designer's specifications, as appropriate. The timeframe in which the maintenance is to be conducted, and the date of the follow-up inspection both coincide with the assigned letter grade the SMF received during the inspection. The timeframes are described below:

- **A**: SMF does not need maintenance. Follow-up inspection to be performed within 1 year to ensure SMF remains in good condition.

- **B**: SMF maintenance is low priority and to be initiated within 7-8 months of the initial inspection. Follow-up inspection to be performed within 2 months of completion.
- **C**: SMF maintenance is to be initiated within 5-6 months of inspection. Follow-up inspection to be performed within 2 months of completion.
- **D**: High priority, SMF maintenance needs to be prioritized. Maintenance is to be initiated within 3-4 months of inspection. Follow-up inspection to be performed within 2 months of completion.
- **E**: High priority, SMF needs immediate maintenance. Maintenance is to be initiated within 2 months of inspection. Follow-up inspection to be performed within 1 month of completion.

SMFs constructed to meet the required Chesapeake Bay TMDL reduction goals are the highest priority and must be prioritized above all other SMF maintenance requests. Chesapeake Bay TMDL SMF maintenance is to be initiated within 1 month of inspection. A follow-up inspection is to be performed within 1 month of completion.

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.

The majority of required maintenance will be conducted by a contractor engaged for SMF maintenance. Occasionally, required maintenance will be submitted to DPW O&M via work order and will be conducted by in-house staff. Large-scale maintenance involving land-disturbing activities must be permitted by the appropriate regulatory authorities and approved by EMD.

Appendices:

Stormwater Management Facility Inspection and Maintenance Standard Operating Procedures & Forms

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Appendix A
Sand Filters

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Environmental and Sustainability Management System

Joint Base Myer-Henderson Hall Standard Operating Procedures: *Sand Filters*

Owner: DPW EMD Stormwater Program Manager	Approved By: Chief, DPW EMD	Last revised: July 2019	Review Date: July 2019

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 Part I.E.5.b.1 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

Sand filters at the Installation must be inspected annually, at a minimum. It is recommended, though not a regulatory requirement, that sand filters are also inspected once annually during active precipitation.

b. Inspection Locations

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 required on an as-needed basis, determined through regular inspection of sand filters, though it is recommended that they are cleaned and pumped out annually by a contractor.

Inspection Finding	**Maintenance Required**
Cracks, spalling, or other signs of deterioration in the concrete above the	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. 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

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

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

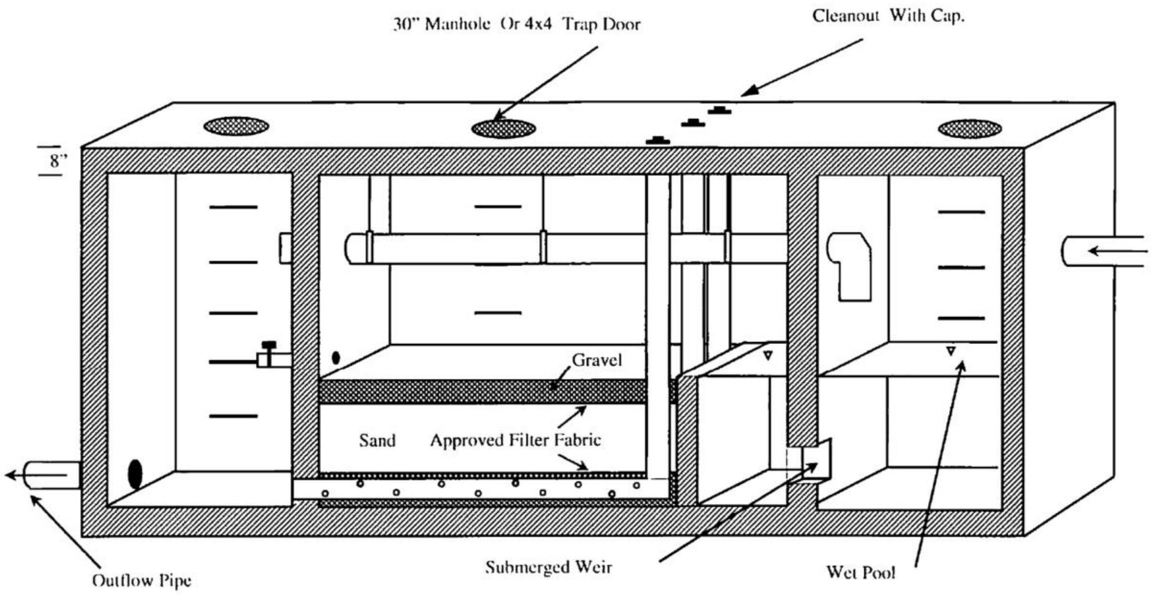
5.1 DPW

DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

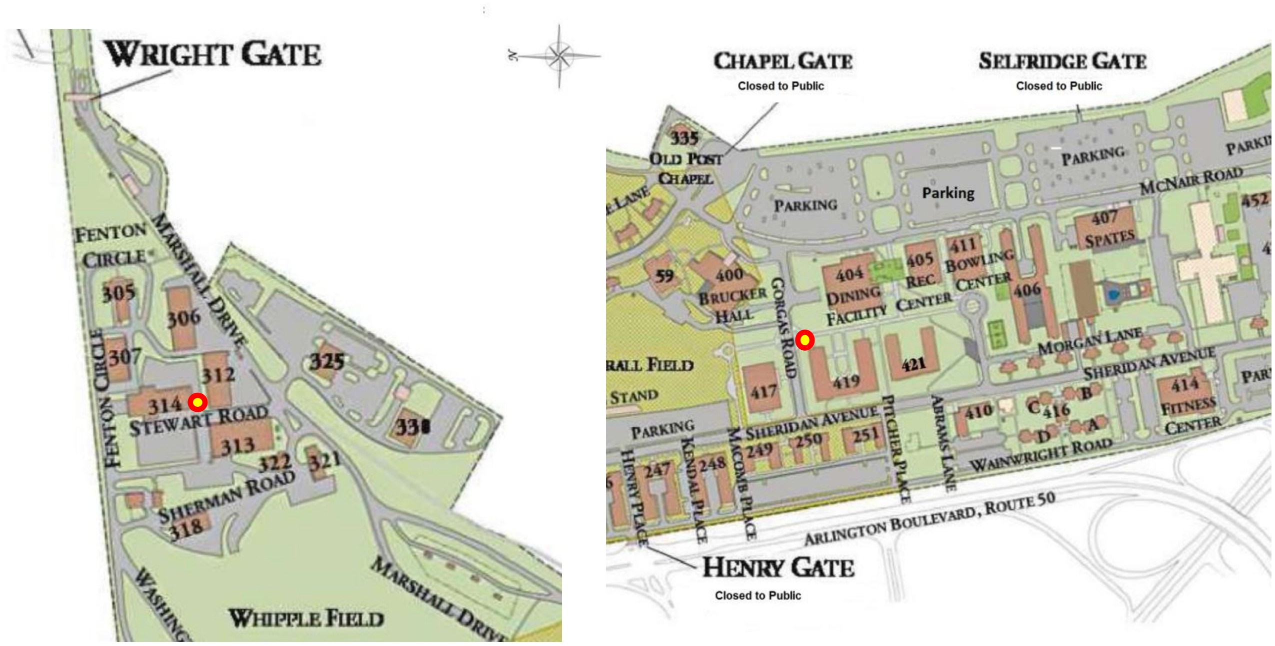
6.0 FIGURES



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

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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

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Appendix B
Detention Structures & Basins

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Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Detention Structures*			
Owner: DPW EMD Stormwater Program Manager	Approved By: Chief, DPW EMD	Last revised: July 2019	Review Date: July 2019

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 Part I.E.5.b.1 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 annually, at a minimum. It is recommended, though not a regulatory requirement, that detention structures are also inspected once annually during active precipitation.

b. Inspection Locations

1. Refer to Figure 1 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	Repair 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.
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

a. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES

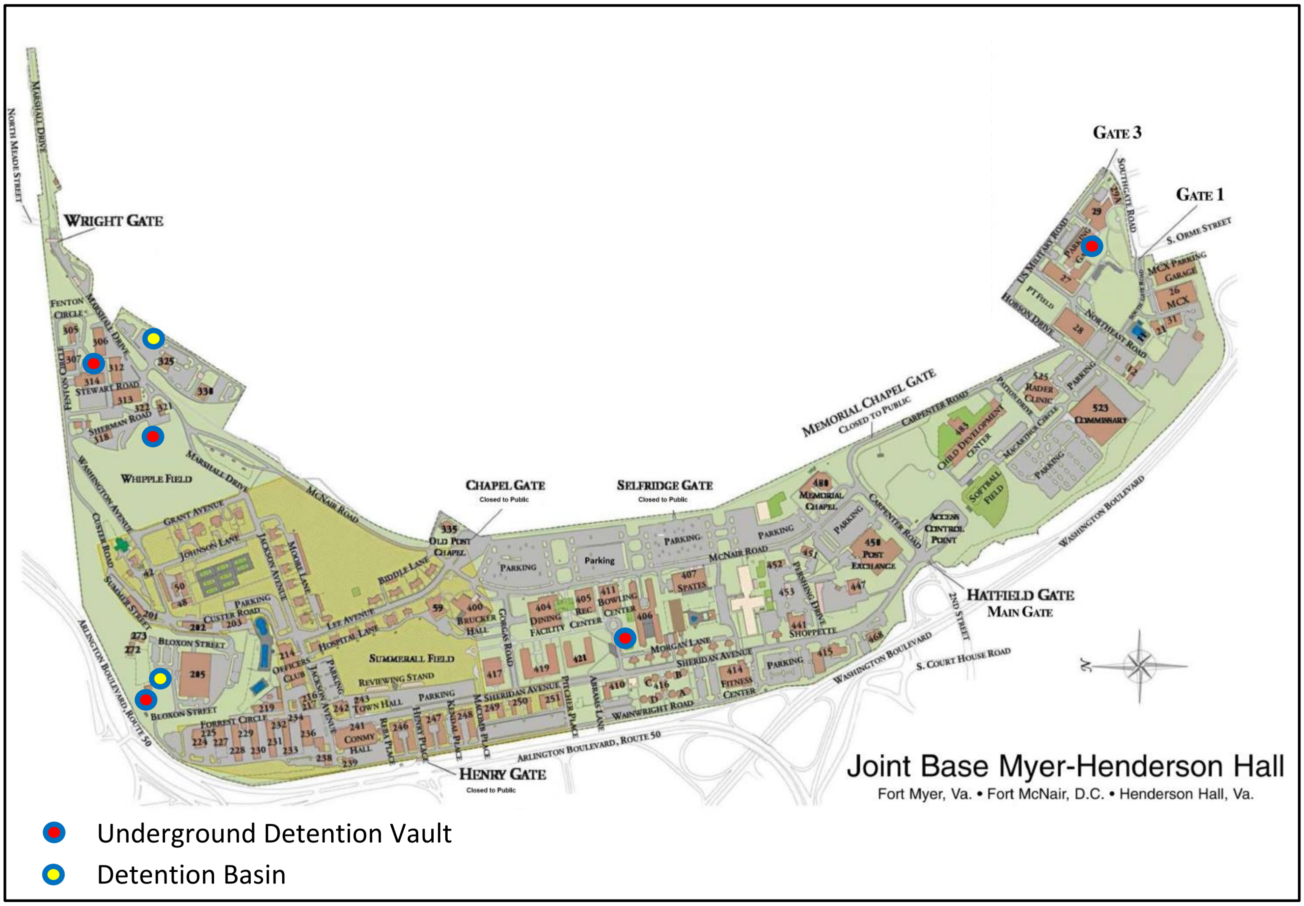

Figure 1: Detention Structure Locations Map – Fort Myer and Henderson Hall

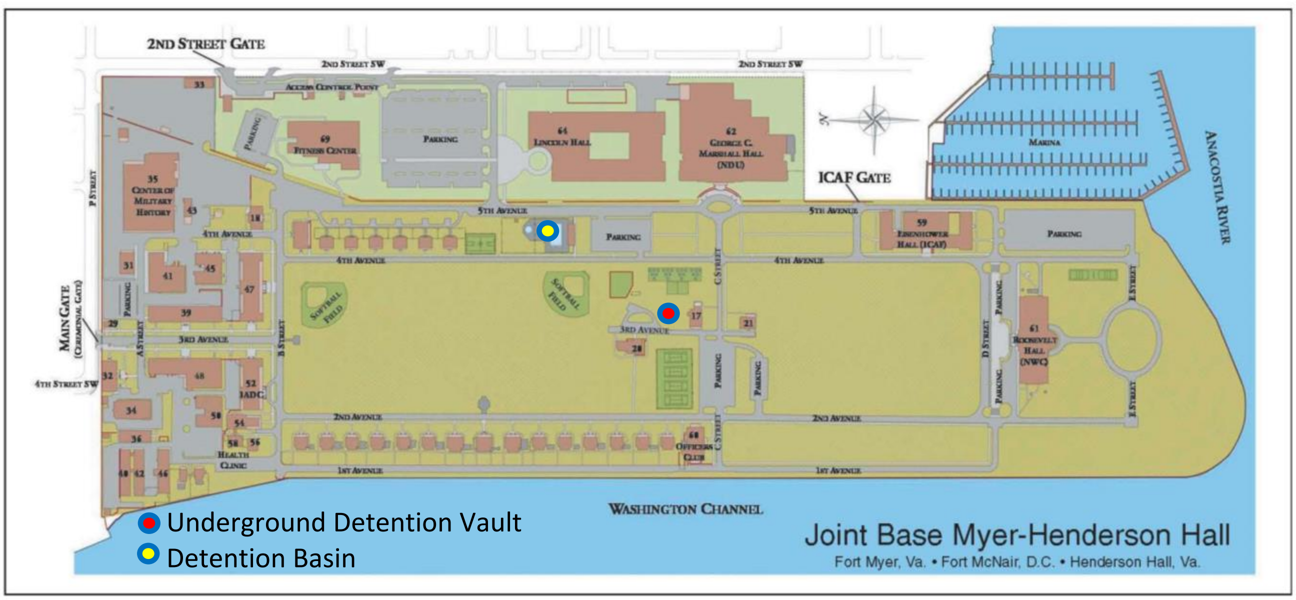

Figure 2: Detention Structure Locations Map – Fort McNair

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

Attachment 1

Inspection and Maintenance Record

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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

Appendix C

Wet Ponds

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Joint Base Myer-Henderson Hall Standard Operating Procedures: *Wet Ponds*

Owner: DPW EMD Stormwater Program Manager	Approved By: Chief, DPW EMD	Last revised: July 2019	Review Date: July 2019

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 Part I.E.5.b.1 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

Wet ponds at the Installation must be inspected annually, at a minimum. It is recommended, though not a regulatory requirement, that wet ponds are also inspected once annually during active precipitation.

b. Inspection Locations

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.

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.

Inspection Finding	Maintenance Required
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

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

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

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

DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES

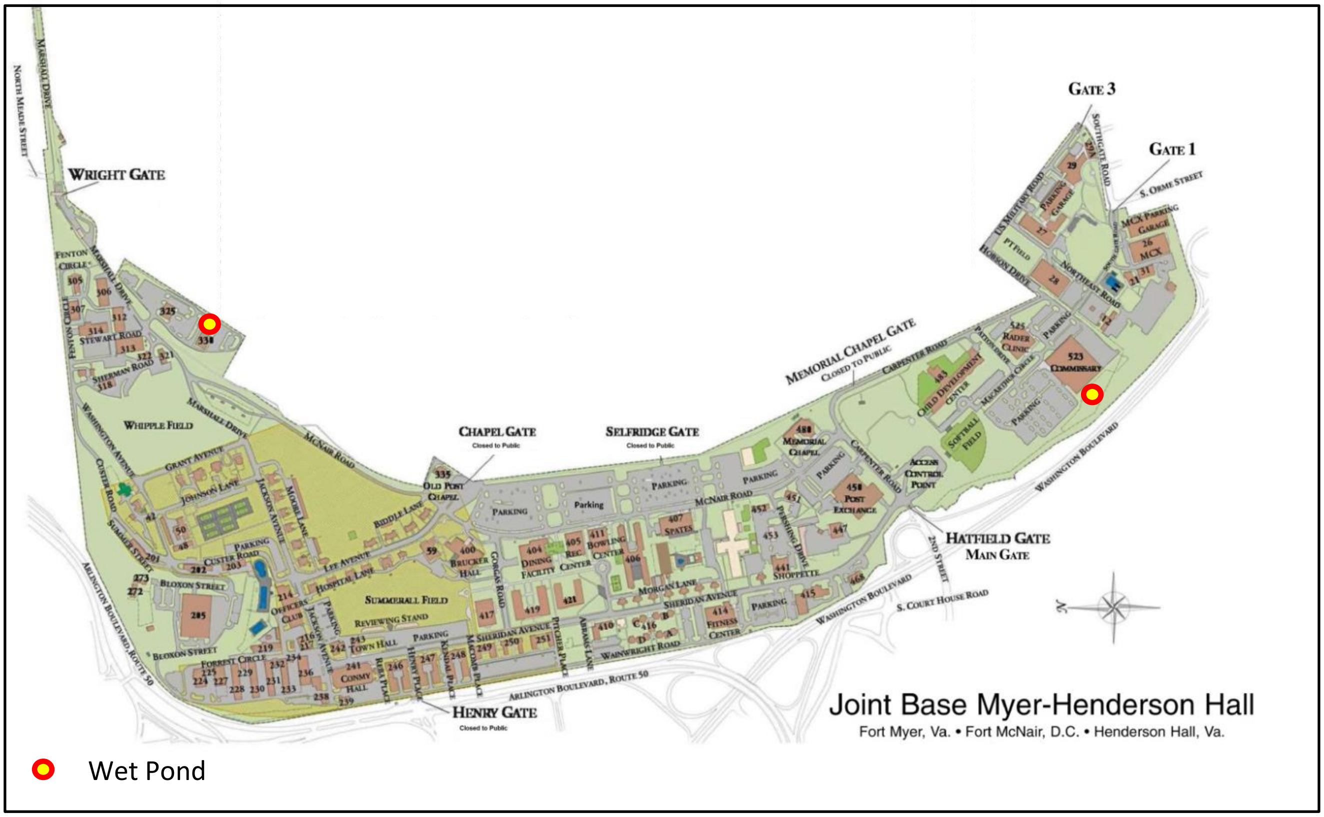

Figure 1: Wet Pond Location Map

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

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Attachment 1

Inspection and Maintenance Record

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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

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Appendix D
Bioretention Areas

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Joint Base Myer-Henderson Hall Standard Operating Procedures:
Bioretention Areas

Owner: DPW EMD Stormwater Program Manager	Approved By: Chief, DPW EMD	Last revised: July 2019	Review Date: July 2019

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 Part I.E.5.b.1 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.

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 annually, at a minimum. It is recommended, though not a regulatory requirement, that bioretention areas are also inspected once annually during active precipitation.

b. Inspection Locations

1. Refer to Figure 1 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. During periods of prolonged drought during the normal growing season (April 1 through October 31), plants in bioretention facilities shall be irrigated weekly or as necessary to prevent drought-related damage.

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. Evaluate irrigation practices. 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.
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

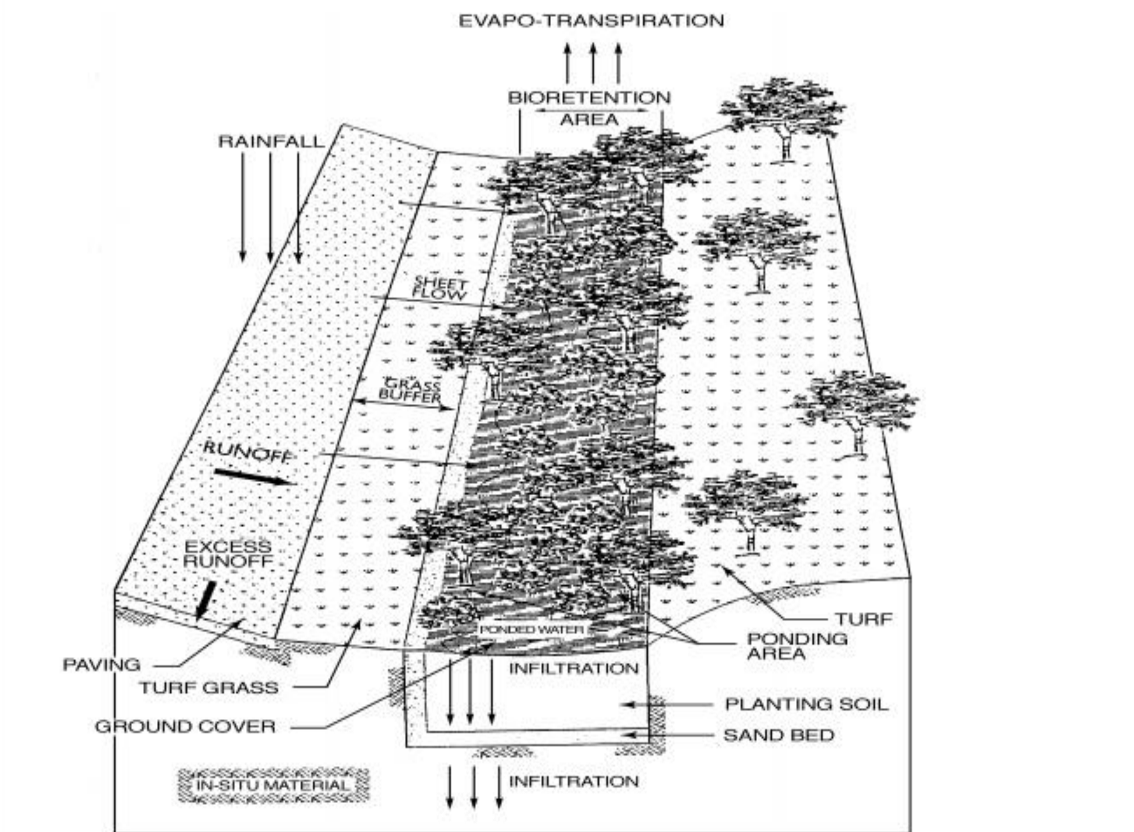
5.1 DPW

a. DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

a. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES



Source: http://water.epa.gov/scitech/wastetech/upload/2002_06_28_mtb_biortn.pdf

Figure 1: Bioretention Area Diagram

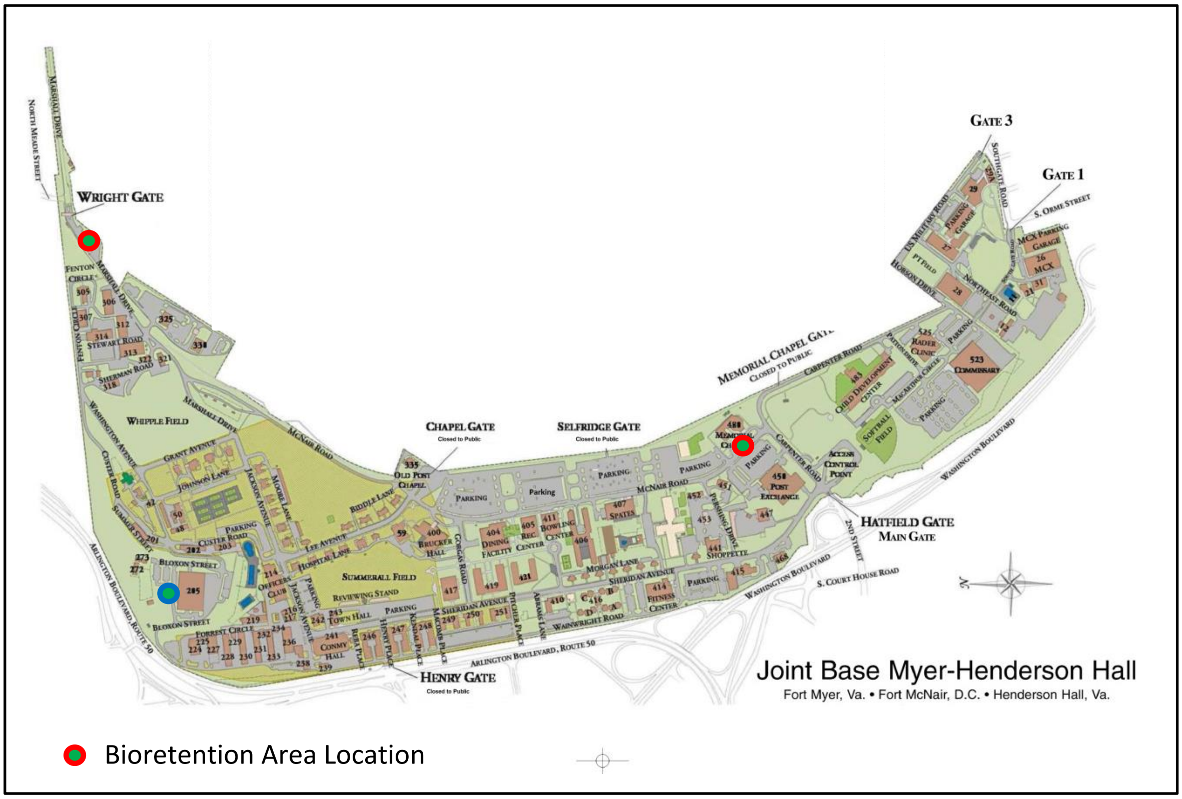


Figure 2: Bioretention Area Locations Map – Fort Myer

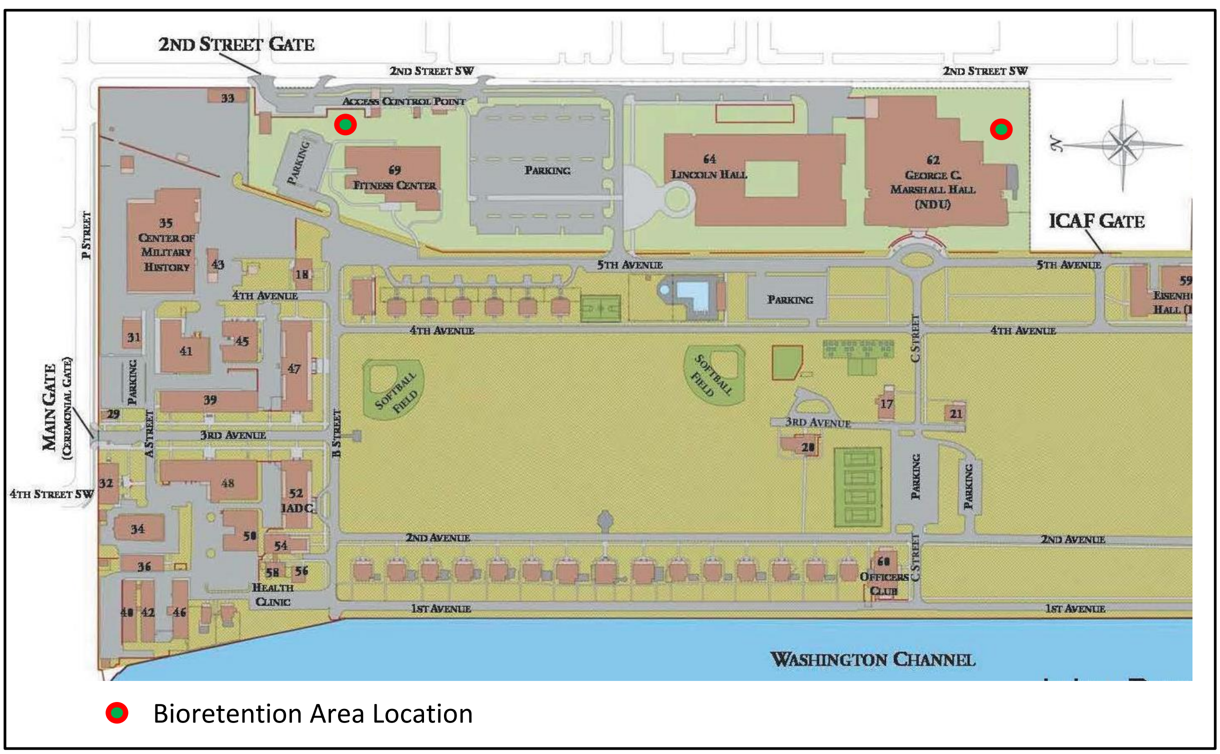


Figure 3: Bioretention Area Locations Map – Fort McNair

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

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Attachment 1

Inspection and Maintenance Record

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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

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Appendix E
Filterra® Stormwater Bioretention Filtration Systems

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Environmental and Sustainability Management System

Joint Base Myer-Henderson Hall Standard Operating Procedures:

Filterra® Stormwater Bioretention Filtration Systems

Owner: DPW EMD Stormwater Program Manager	Approved By: Chief, DPW EMD	Last revised: July 2019	Review Date: July 2019

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 Part I.E.5.b.1 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. At least one 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.

b. DPW is responsible for providing irrigation as described in Section 3.2.

5.2 EMD

a. EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 Figures

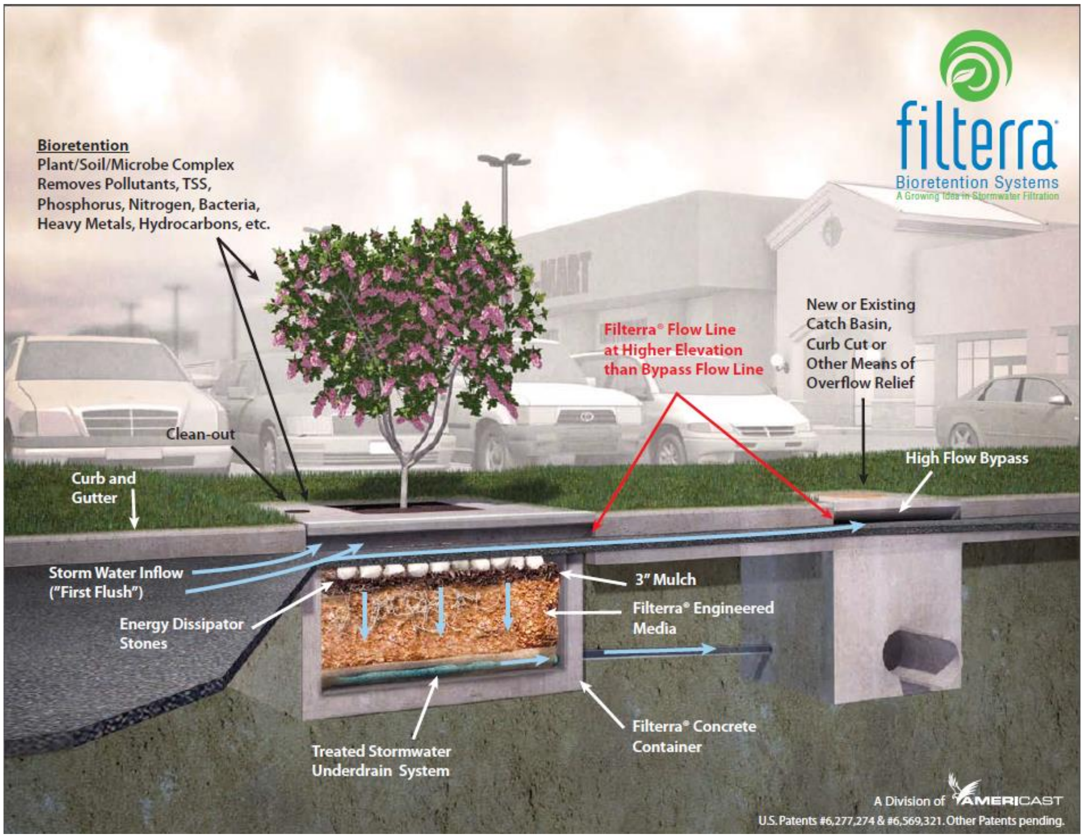

Figure 1: Typical Filterra® Unit

Figure 2: JBM-HH Filterra® Unit installed at Hatfield Gate.

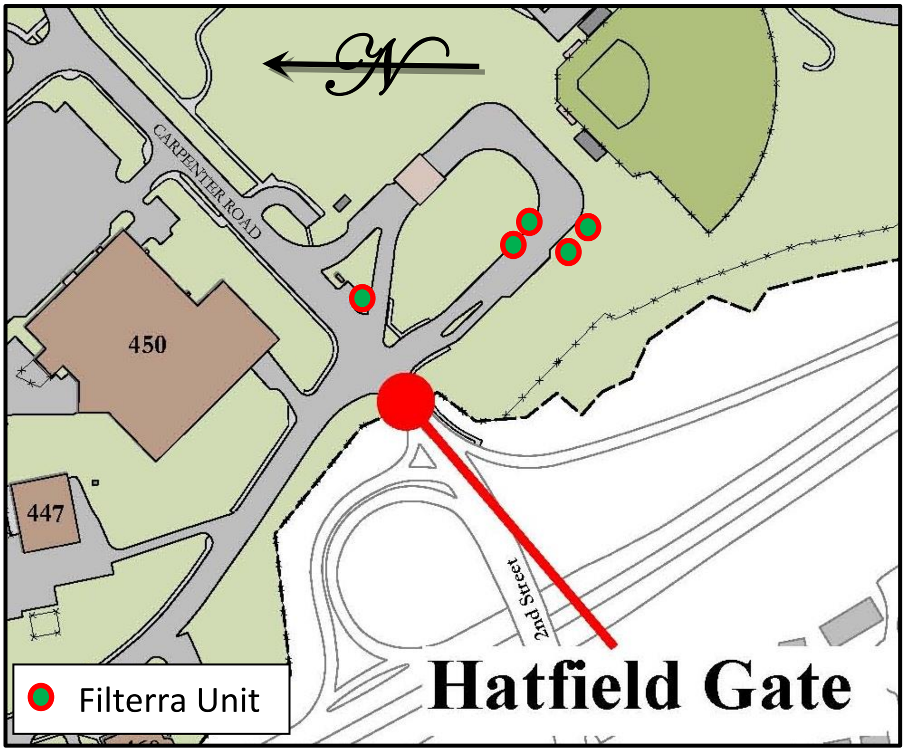

Figure 3: Installation Filterra® location map – Hatfield Gate

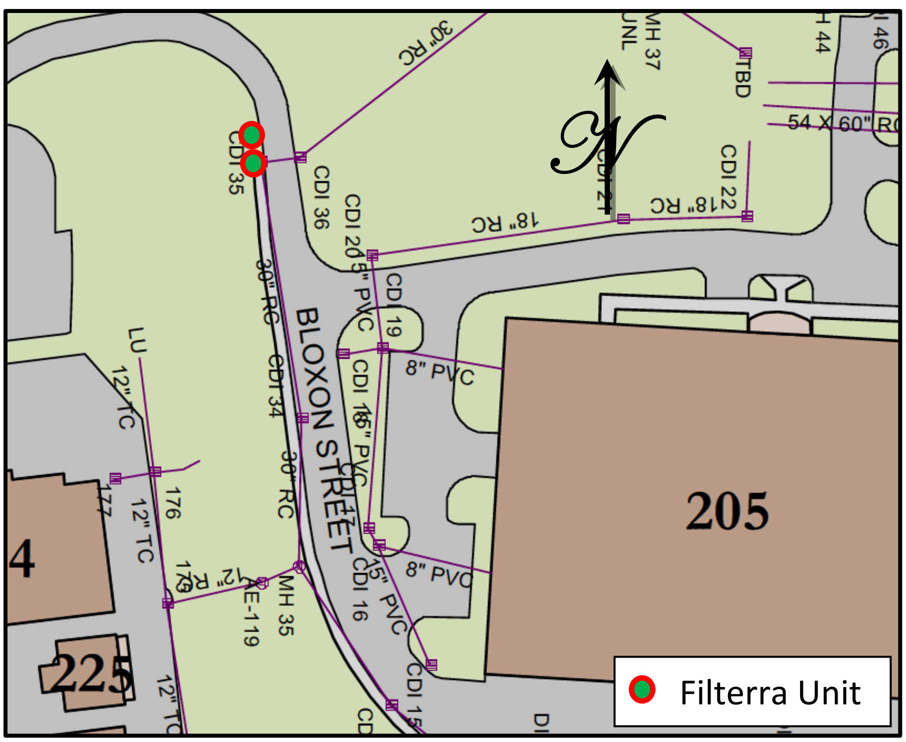

Figure 4: Installation Filterra® location map – Radnor Heights Substation

7.0 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:

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Filterra® Stormwater Bioretention Filtration System

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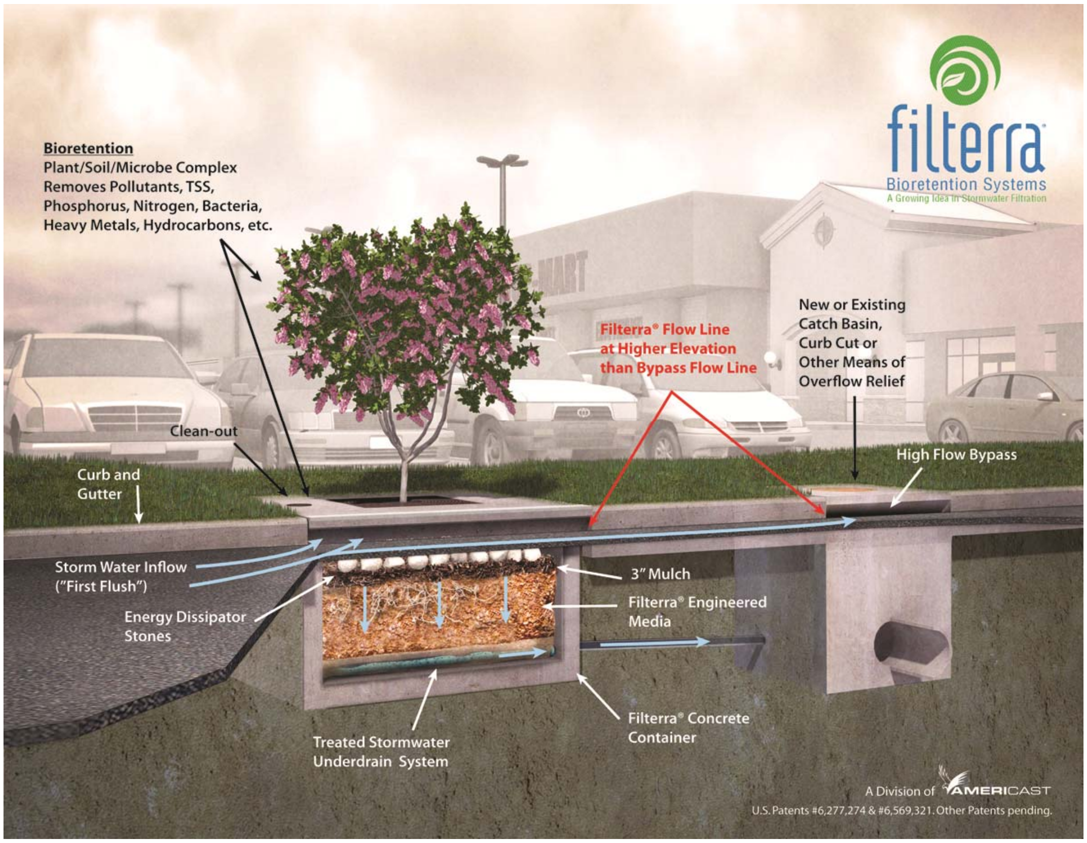
Table of Contents

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

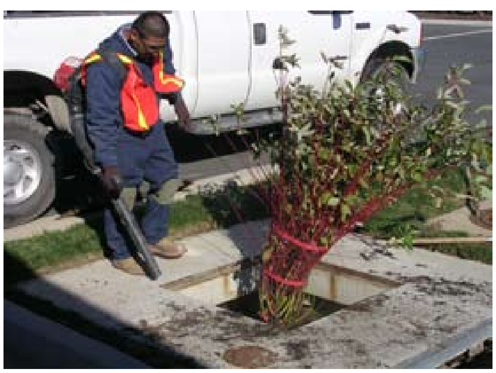
- Please see mulch specifications.
- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Ensure correct repositioning of erosion control stones by the Filterra® inlet to allow for entry of trash during a storm event.
- Replace Filterra® grates correctly using appropriate lifting 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.

toll free: **(866) 349 3458** | fax: **(804) 798 8400** | maintenance@filterra.com | filterra.com

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®

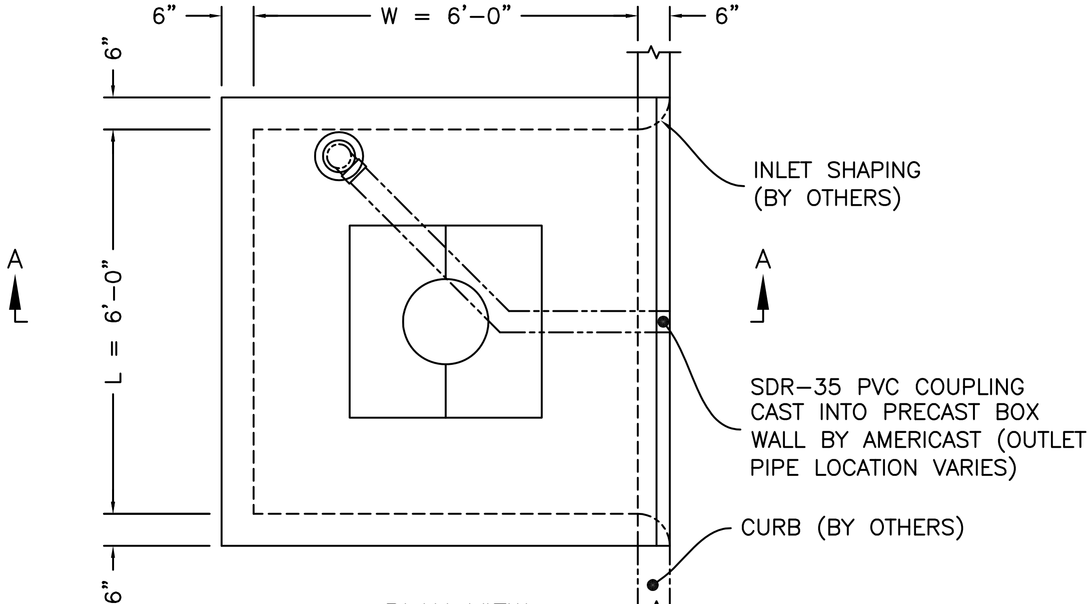
Filterra® Warranty

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.

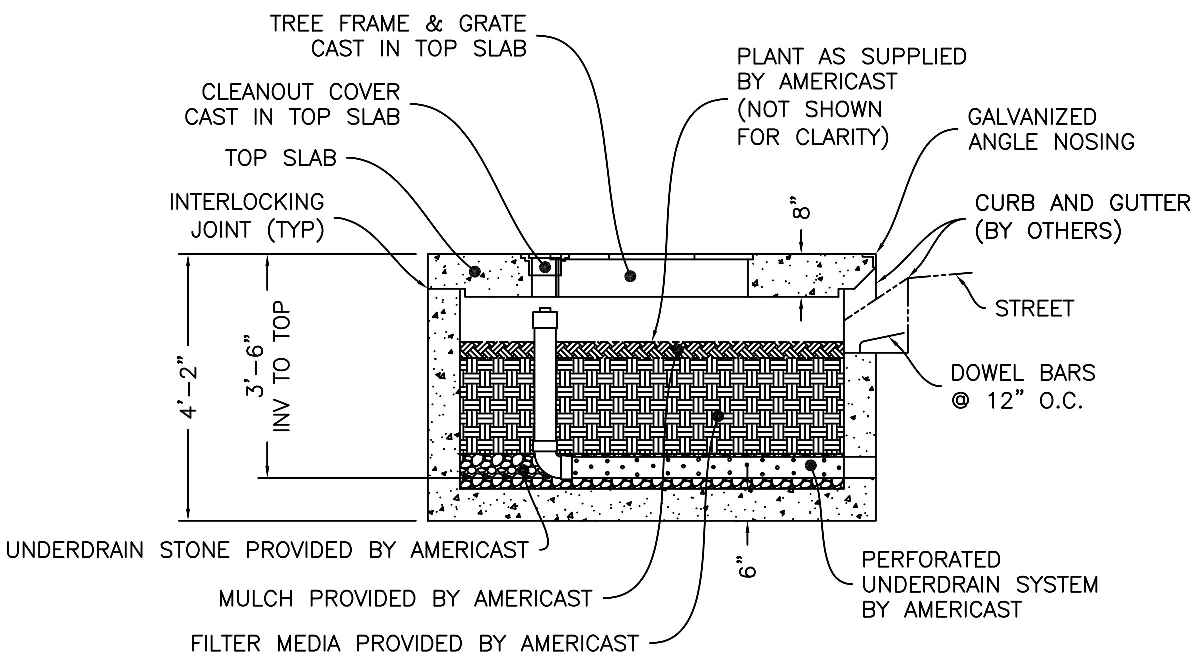
Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall 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

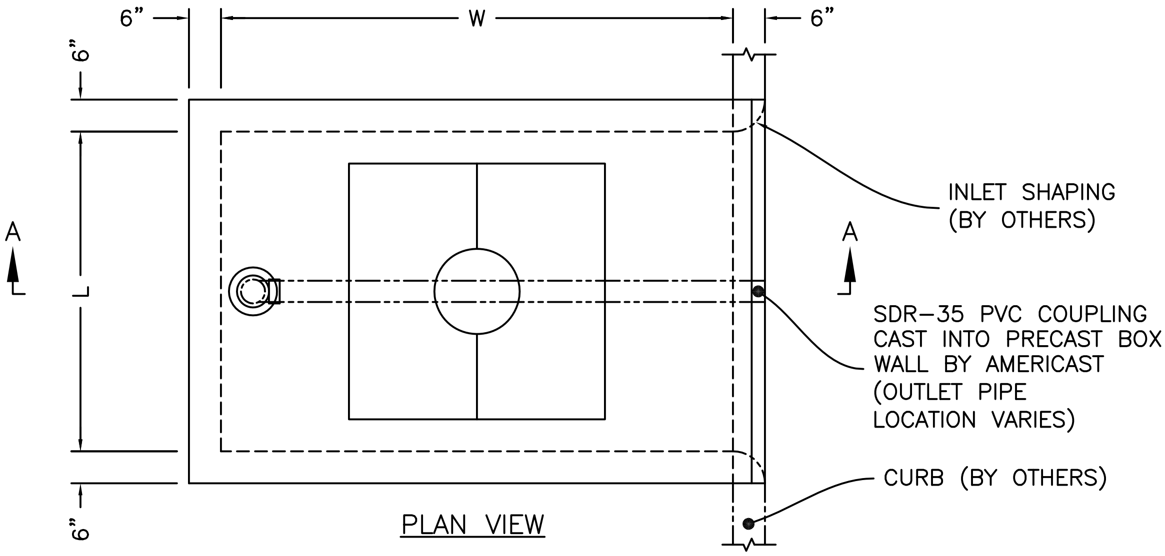
AMERICAST®

DATE: 03-04-14 | DWG: FTST-2

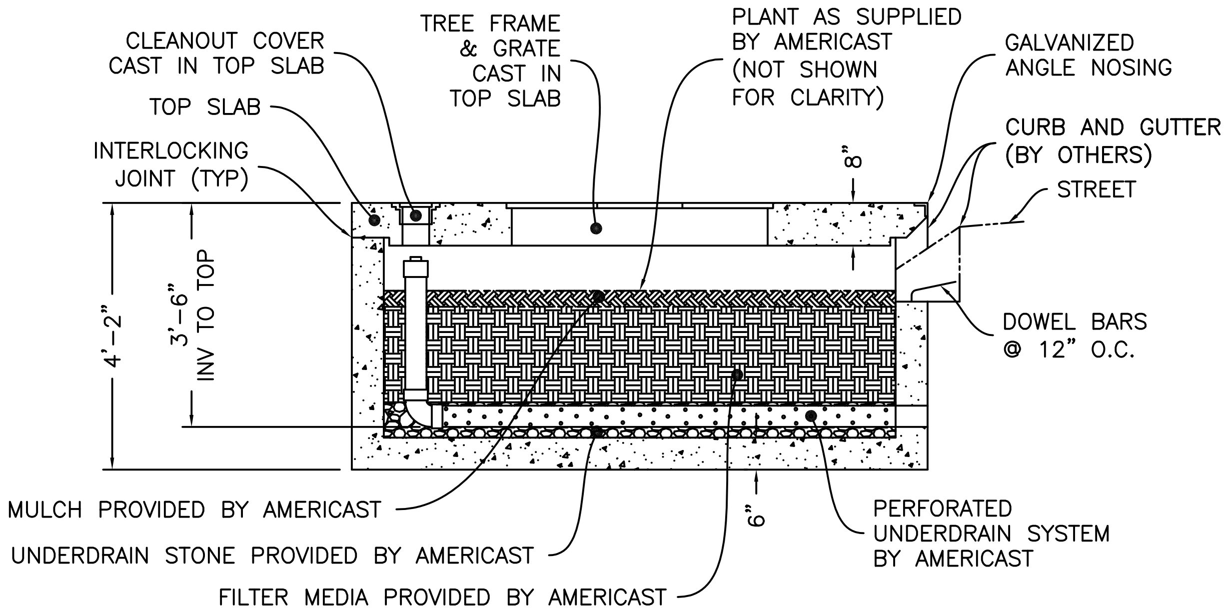
PRECAST FILTERRA® UNIT
STANDARD CONFIGURATION

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

** SIZES SHOWN ARE FOR THE MID ATLANTIC AND MAY VARY ACROSS THE COUNTRY
PLEASE CONTACT FILTERRA FOR A LIST OF SIZES WITHIN YOUR REGION

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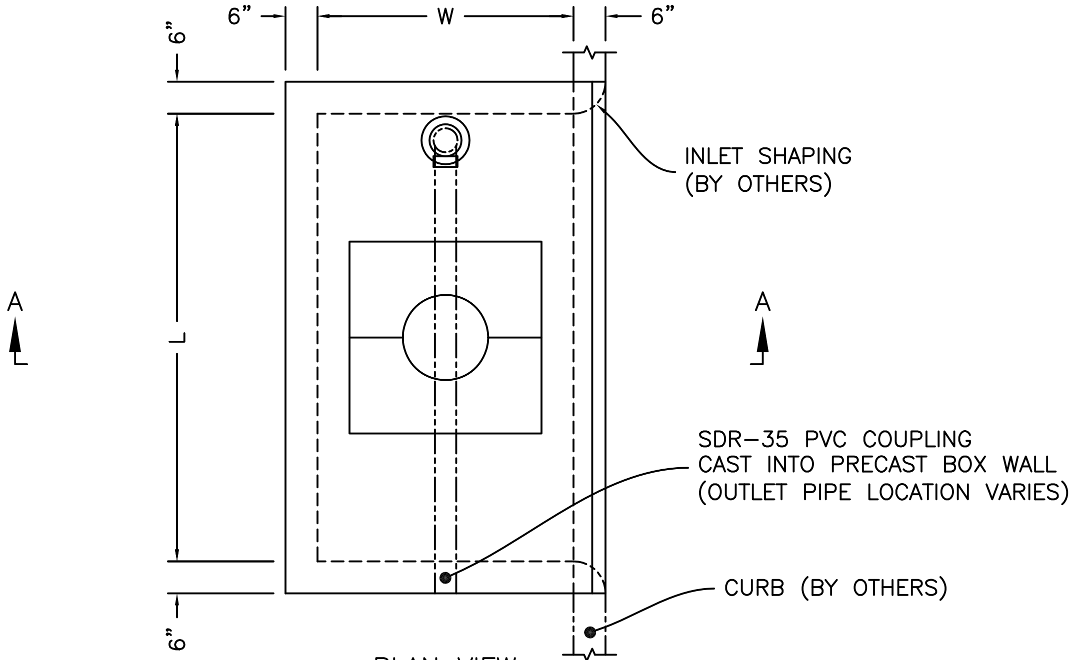
DATE: 03–05–14 | DWG: FTNL–3

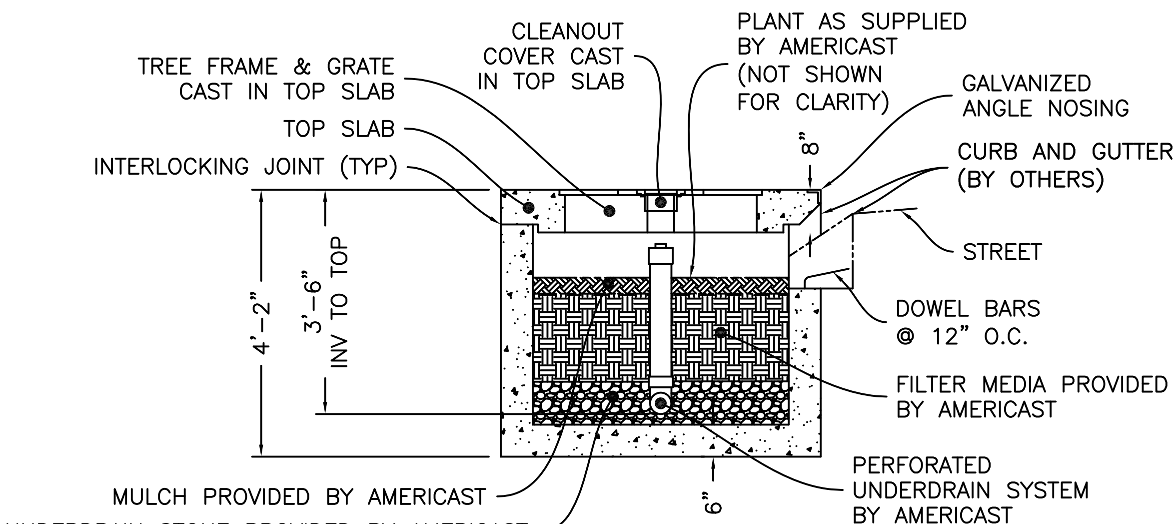
PRECAST FILTERRA® UNIT
NARROW LENGTH CONFIGURATION

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
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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DATE: 03-05-14 DWG: FTNW-3

PRECAST FILTERRA® UNIT
NARROW WIDTH CONFIGURATION

filterra®

US PAT 6,277,274
6,569,321 AND
7,625,485

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Attachment 2

Inspection and Maintenance Record

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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

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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

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Appendix F
StormFilter® Stormwater Treatment Devices

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Environmental and Sustainability Management System

Joint Base Myer-Henderson Hall Standard Operating Procedures:

Contech Stormwater Management StormFilter® Systems

Owner: DPW EMD Stormwater Program Manager	Approved By: Chief, DPW EMD	Last revised: July 2019	Review Date: July 2019

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 Part I.E.5.b.1 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.

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.

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.
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

4.1 Recordkeeping Requirements

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

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

DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES

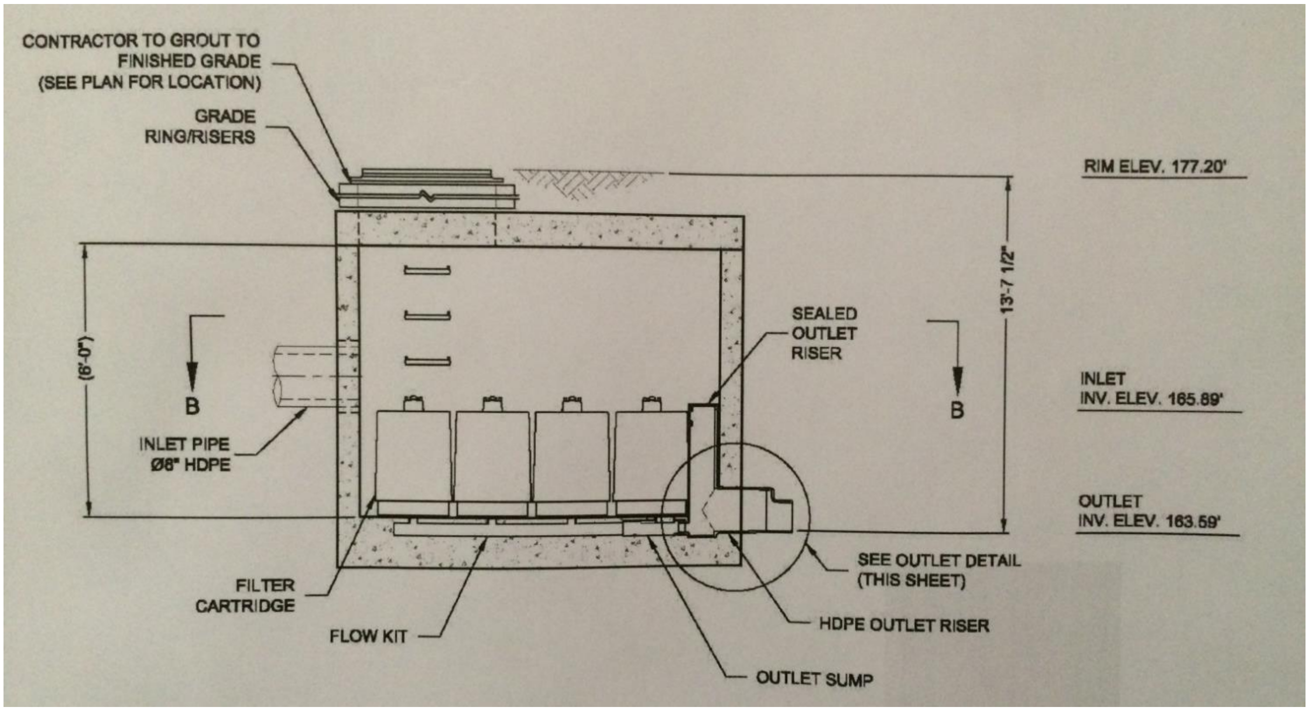

Figure 1: Contech Stormwater Management StormFilter® System Profile

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

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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 <u>empty</u> 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.

CONTECH CONSTRUCTION PRODUCTS INC.
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.

CONTECH Construction Products Inc. provides site solutions for the civil engineering industry. CONTECH's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other CONTECH division offerings, visit contech-cpi.com or call 800.338.1122

Attachment 2

Inspection and Maintenance Records

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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:

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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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Appendix G
Permeable Pavement/Pavers

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Joint Base Myer-Henderson Hall Standard Operating Procedures: *Permeable Pavement*

Owner: DPW EMD Stormwater Program Manager	Approved By: Chief, DPW EMD	Last revised: November 2020	Review Date: November 2020

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for performing inspections and maintenance of permeable pavement and pavers (hereafter collectively referred to permeable pavement) located in the Pershing Drive and Special Events Area parking lots. Written inspection and maintenance procedures for stormwater management facilities, including permeable pavement, 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.). Joint Base Myer-Henderson Hall (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 Part I.E.5.b.1 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.

Permeable pavement is constructed of a porous surface pavement layer, an underlying stone aggregate reservoir layer, and a filter layer or fabric installed on the bottom. Water infiltrates the surface pavement layer and enters into an "open-graded" crushed stone layer. This stone layer filters stormwater and stores it while it infiltrates the soil subgrade. Permeable pavement helps to reduce the volume of surface runoff, while also trapping and filtering out solids from the stormwater. After percolating through the permeable pavement materials, the stormwater is then further filtered by the 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. *Permeable Pavement* – alternative paving surfaces that allow stormwater runoff to filter through voids in the pavement surface into an underlying reservoir, where it is temporarily stored and/or infiltrated into the soil subsurface. Includes poured pavement as well as pavers, or paving stones.
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

Permeable pavement at the Installation must be inspected twice annually, at a minimum. The inspections shall occur after rainstorms to ensure the permeable pavement areas are allowing water to infiltrate properly. It is recommended, though not a regulatory requirement, that a spring maintenance inspection and cleanup be conducted at each permeable pavement site.

b. Inspection Locations

1. An area of permeable pavement is located in the Old Post Chapel parking lot, just east of Building 411. Parking in this area generally only occurs during special events or large memorial services where extra parking is needed.

2. An area of permeable pavers is located in an overflow lot off Pershing Drive, adjacent to the east of the DPW Building 447 Storage Yard.

Refer to **Figure 1** for locations of permeable pavement at the Installation.

c. Inspection Procedures

1. Conduct visual field screening of permeable pavement and record observations on an Inspection and Maintenance Record (Attachment 1). The observations should include the following:

i. Surface deterioration, such as slumping, cracking, spalling or broken pavers;

ii. Structural damage or sediment buildup in inlets, pretreatment cells, and any flow diversion structures;

iii. Sediment deposition, organic debris, staining or ponding on the surface;

iv. Following a storm event in excess of ½ inch in depth, drawdown rate should be measured at the observation well for three (3) days;

v. Observation well remains capped; and,

vi. Controllable sources of sediment or erosion in the drainage area.

2. Based on the physical inspection, determine if maintenance activities are required. Submit a Work Request (Form 4283) with photos to the Directorate of Public Works (DPW) Environmental Management Division (EMD) detailing inspection observations and recommended corrective actions.

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 required annually and on an as-needed basis, as determined through regular inspection of permeable pavement. While not a regulatory requirement, the permeable pavement should be monitored for proper dewatering following a large storm event (in excess of ½ inch in depth). The following table identifies corrective actions for each type of anticipated possible inspection finding.

Inspection Finding	Maintenance Required
Surface deterioration (e.g., slumping, cracking, spalling, or broken pavers).	Replace or repair affected areas, as necessary.
Structural damage or sediment buildup in inlets, pretreatment cells, and any flow diversion structures.	Remove any observed sediment and repair structural damage.
Sediment deposition, organic debris, staining, or ponding on the surface	If signs of clogging are noted, schedule a vacuum sweeper to remove deposited material. No brooms or water sprays should be used. Vacuum settings should be calibrated so they do not pick up the stones between pavement blocks.
Standing water observed in the observation well three (3) days following a storm event in excess of ½ inch in depth.	If signs of clogging are noted, schedule a vacuum sweeper to remove deposited material. No brooms or water sprays should be used. Vacuum settings should be calibrated so they do not pick up the stones between pavement blocks.
Observation well is uncapped.	Cap observation well.
Controllable sources of sediment or erosion are observed in the area that drains to the permeable pavement	Sediment and erosion in the CDA should be controlled to the extent feasible.

b. Permeable pavement should be vacuumed annually by a contractor. It is recommended that vacuuming be conducted during dry weather in the spring months. A vacuum sweeper that does not use water spray must be used, as spraying water may lead to subsurface clogging.

c. Conventional parking lot maintenance tasks must be avoided (e.g., sanding, re-sealing, re-surfacing, power-washing, storing snow piles containing sand, storing mulch or soil materials, staging construction materials on unprotected pavement).

d. Record all maintenance activities on an Inspection and Maintenance Record (Attachment 1).

3.3 Safety Considerations

a. Always wear proper footwear and be aware of any uneven surfaces.

4.0 RECORDKEEPING AND REPORTING

4.1 Recordkeeping Requirements

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

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

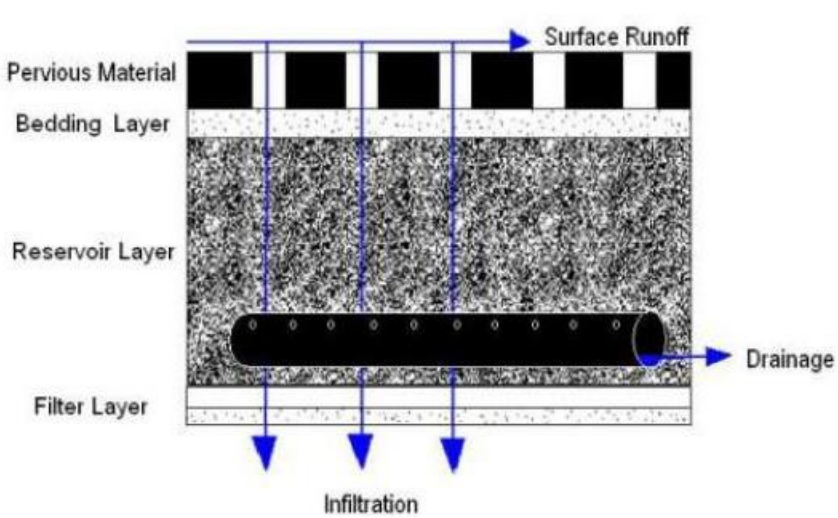
5.1 DPW

DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

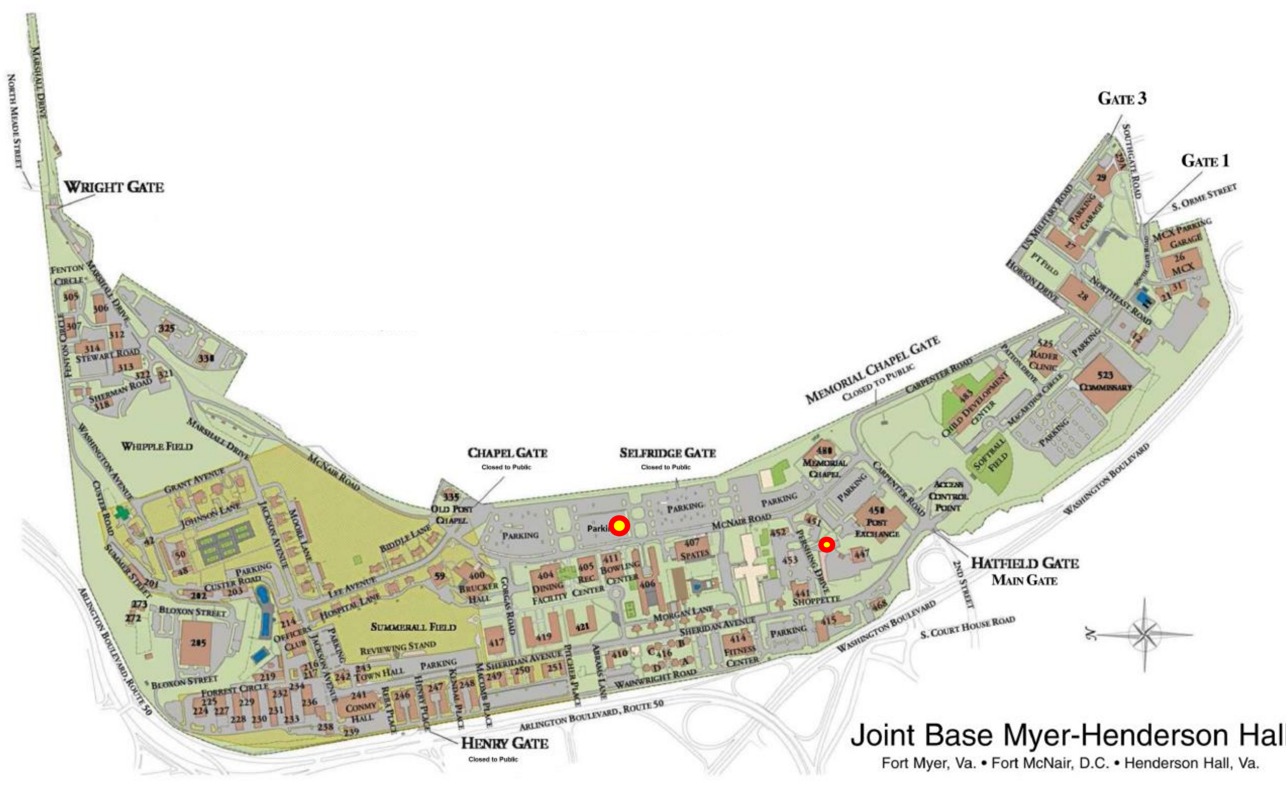
EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES



(Source: Hunt & Collins, 2008 as cited in Virginia Department of Environmental Quality, 2011)

Figure 1: Typical Permeable Pavement Diagram



Permeable Pavement Location

Figure 2: Permeable Pavement Location Map

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

Attachment 1

Inspection and Maintenance Record

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ATTACHMENT 1

PERMEABLE PAVEMENT INSPECTION AND MAINTENANCE RECORD

Permeable Pavement Location:__________________________ Structure No. ________

Technician(s): ___________________________________ Date:_______________

Date of last storm/total rainfall: _______________ Current weather: ____________________

Y	N	Observation	Maintenance Performed/ Maintenance Required
		Is there structural damage to inlets, pretreatment cells, and flow diversion structures?	
		Is sediment buildup in inlets, pretreatment cells, and flow diversion structures?	
		Are there signs of slumping, cracking, spalling, or broken pavers?	
		Is there sediment deposition, organic debris, or staining on the surface?	
		Is water ponding on the surface?	
		Is the observation well capped?	
		Is standing water present inside the observation well 72+ hours after rain?	
		Is there evidence of erosion or sediment in areas draining to the permeable pavement?	

Other notes (use back if necessary):

Follow-up inspection required?
___ Y ___ N

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Appendix H

Oil/Water Separators

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Joint Base Myer-Henderson Hall Standard Operating Procedures:

Oil-Water Separators

Owner:	Approved By:	Last revised:	Review Date:
DPW EMD Stormwater Program Manager	Chief, DPW EMD	July 2019	July 2019

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 Part I.E.5.b.1 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

Oil-water separators at the Installation must be inspected annually, at a minimum.

b. Inspection Locations

Refer to Figure 1 for the locations of oil-water separators on the Installation.

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

DPW is responsible for performing the inspection and maintenance procedures described in this SOP internally or through a contractor.

5.2 EMD

EMD is responsible for maintaining records of inspection and maintenance procedures provided by DPW.

6.0 FIGURES

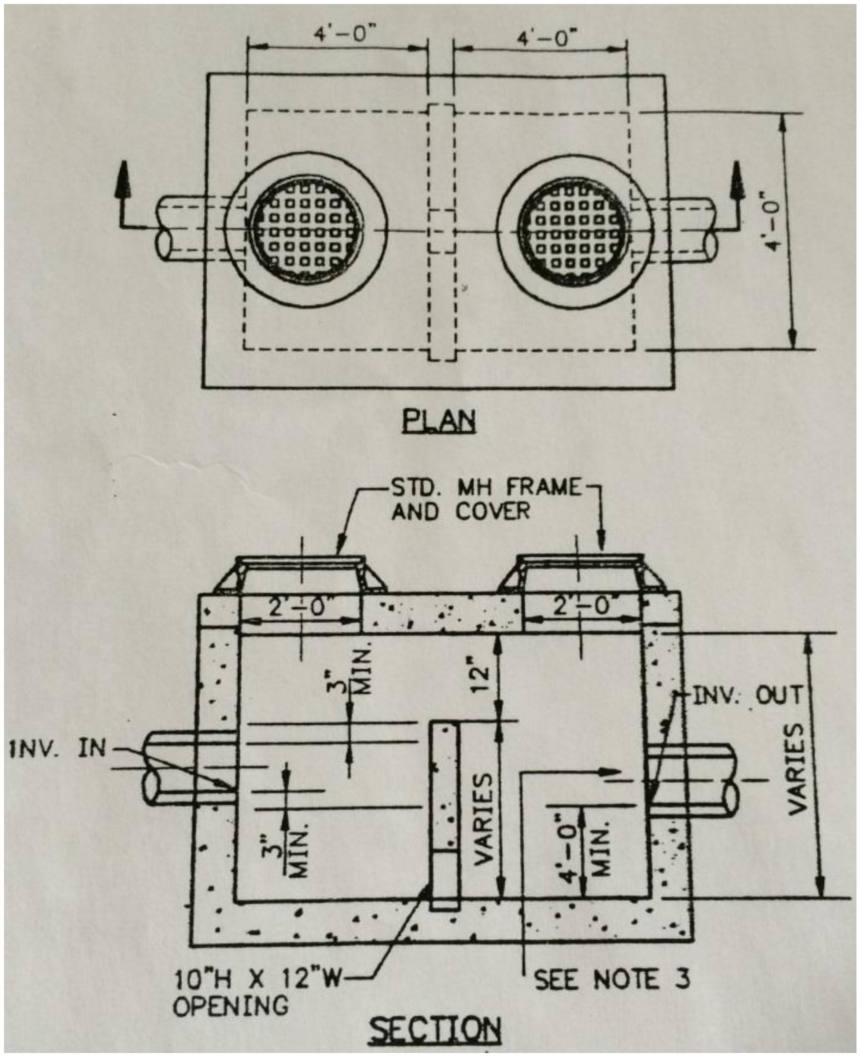

Figure 1: Oil-Water Separator Diagram

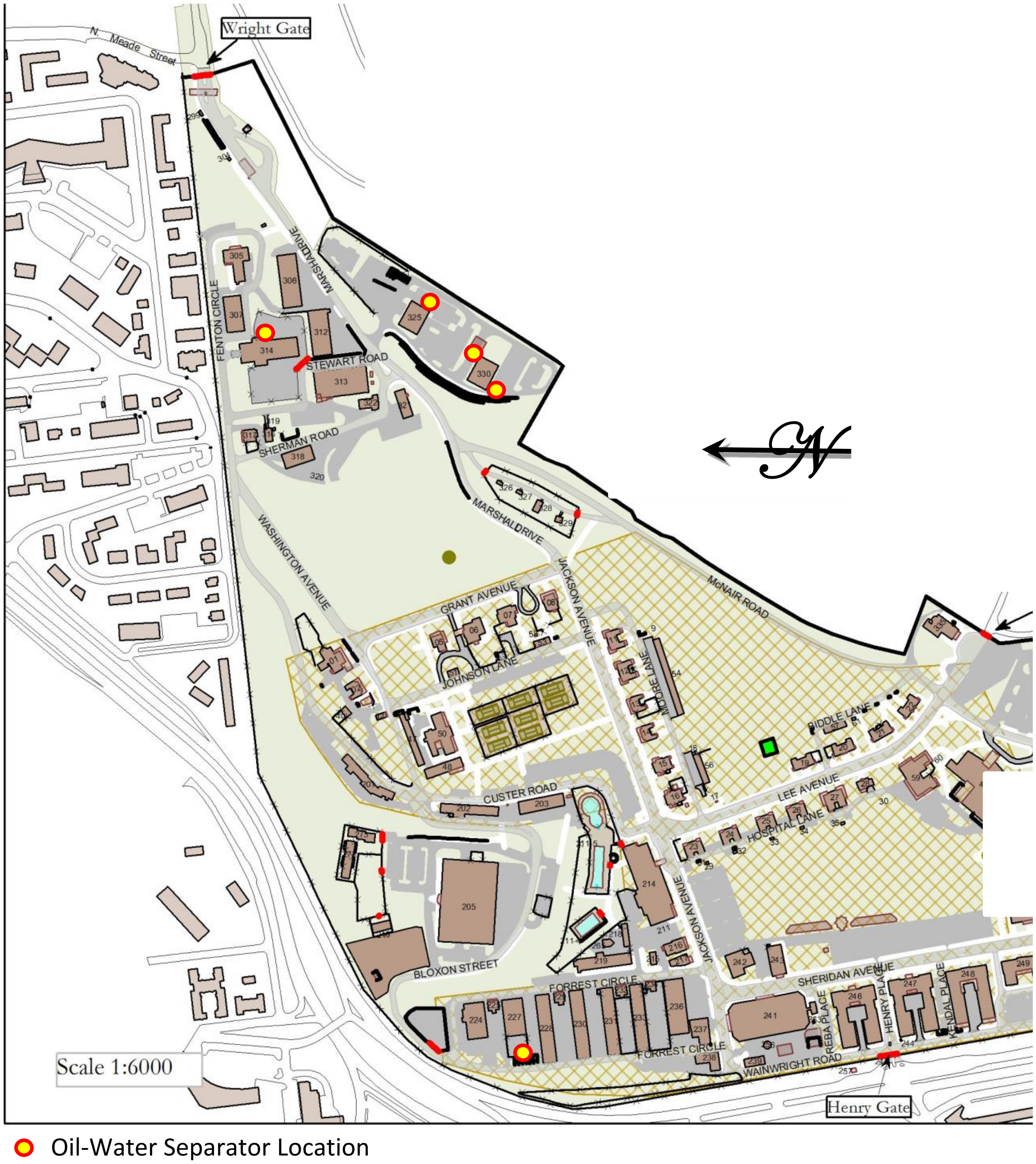

Figure 2: Oil-Water Separator Location Map

7.0 ATTACHMENTS

Attachment 1: Inspection and Maintenance Record

Attachment 1

Inspection and Maintenance Record

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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 I

BaySaver Technologies© BaySeparator^{TM} Systems

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Joint Base Myer-Henderson Hall Standard Operating Procedures:

BaySaver Technologies© BaySeparator™ System

Owner:	Approved By:	Last revised:	Review Date:
DPW EMD Stormwater Program Manager	Chief, DPW EMD	June 2019	July 2019

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.

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^{TM} 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^{TM} 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^{TM} System manhole. Measure the depth of the sediment in each manhole using a measuring stick. The BaySeparator^{TM} 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^{TM} 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 saftety 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

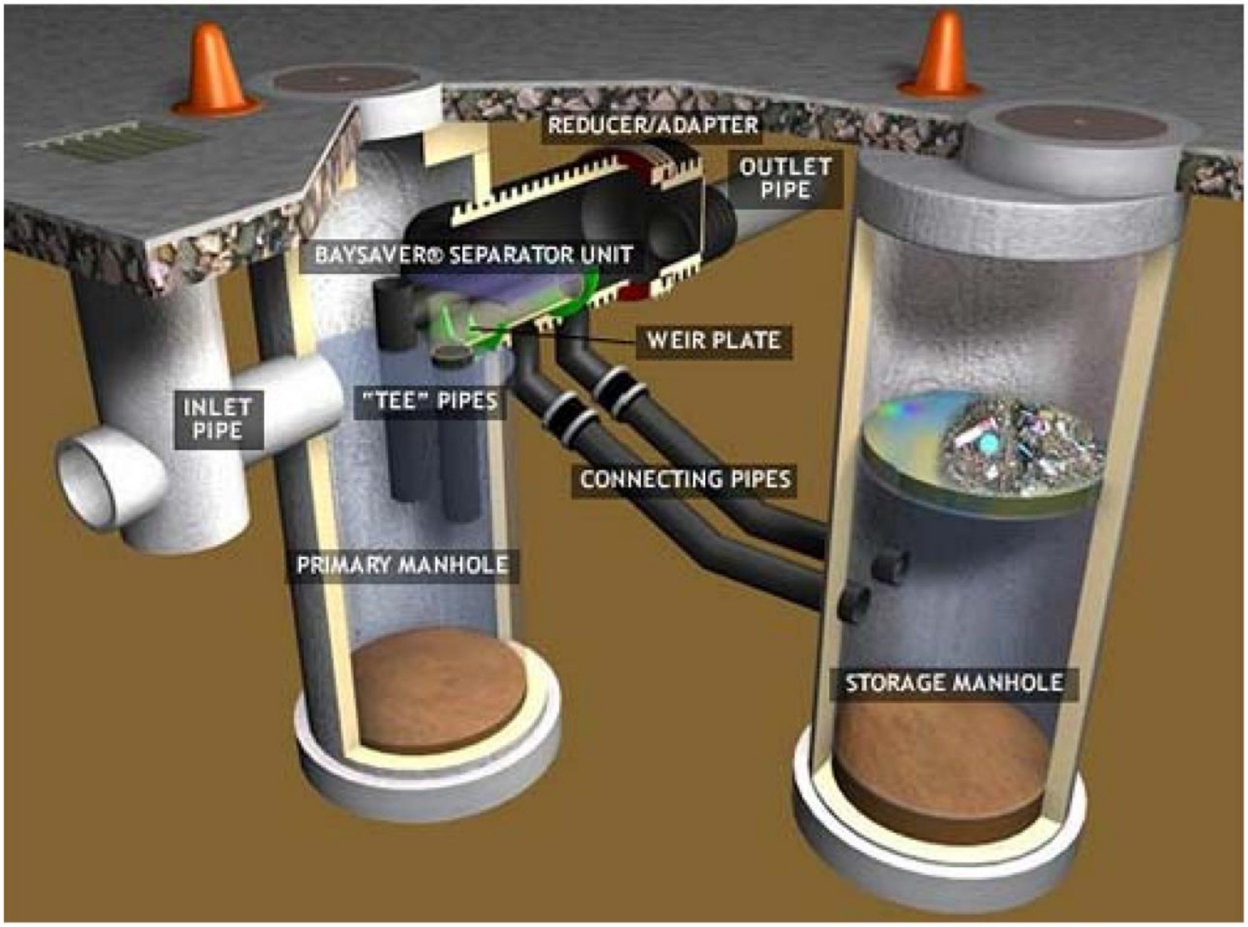

Figure 1: Typical BaySeparator^{TM} Stormwater Filtration System

Figure 2: BaySeparator™ Stormwater Filtration System location map – Fort McNair

7.0 Attachments

Attachment 1: BaySeparator^{TM} Stormwater Filtration System Technical and Design Manual

Attachment 2: Inspection and Maintenance Record

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Attachment 1

BaySeparator™ Stormwater Filtration System Technical and Design Manual

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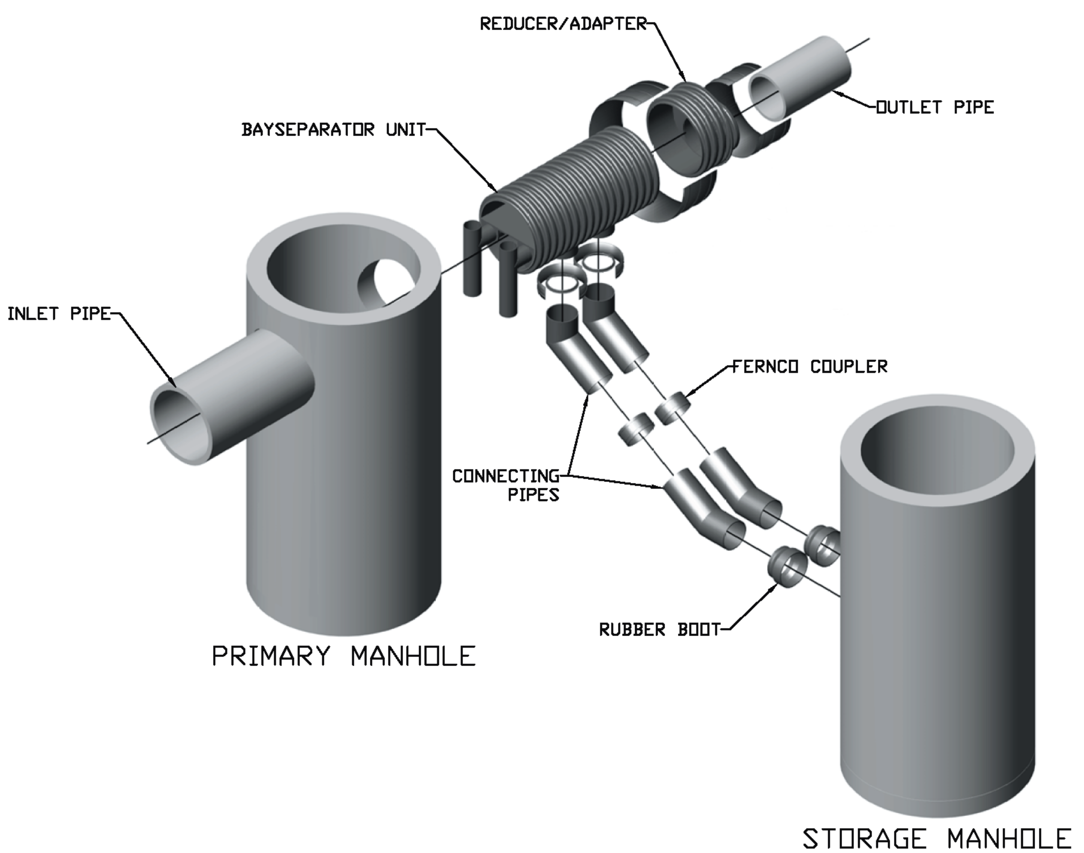
BAYSAVER
TECHNOLOGIES, INC.
Engineering Stormwater Solutions

BaySeparator™

Technical and Design Manual



www.BaySaver.com

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BAYSEPARATOR™ SYSTEM

Technical and Design Manual

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Mount Airy, Maryland 21771
Phone 301-829-6470 • Fax 301-829-3747

Table of Contents

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.

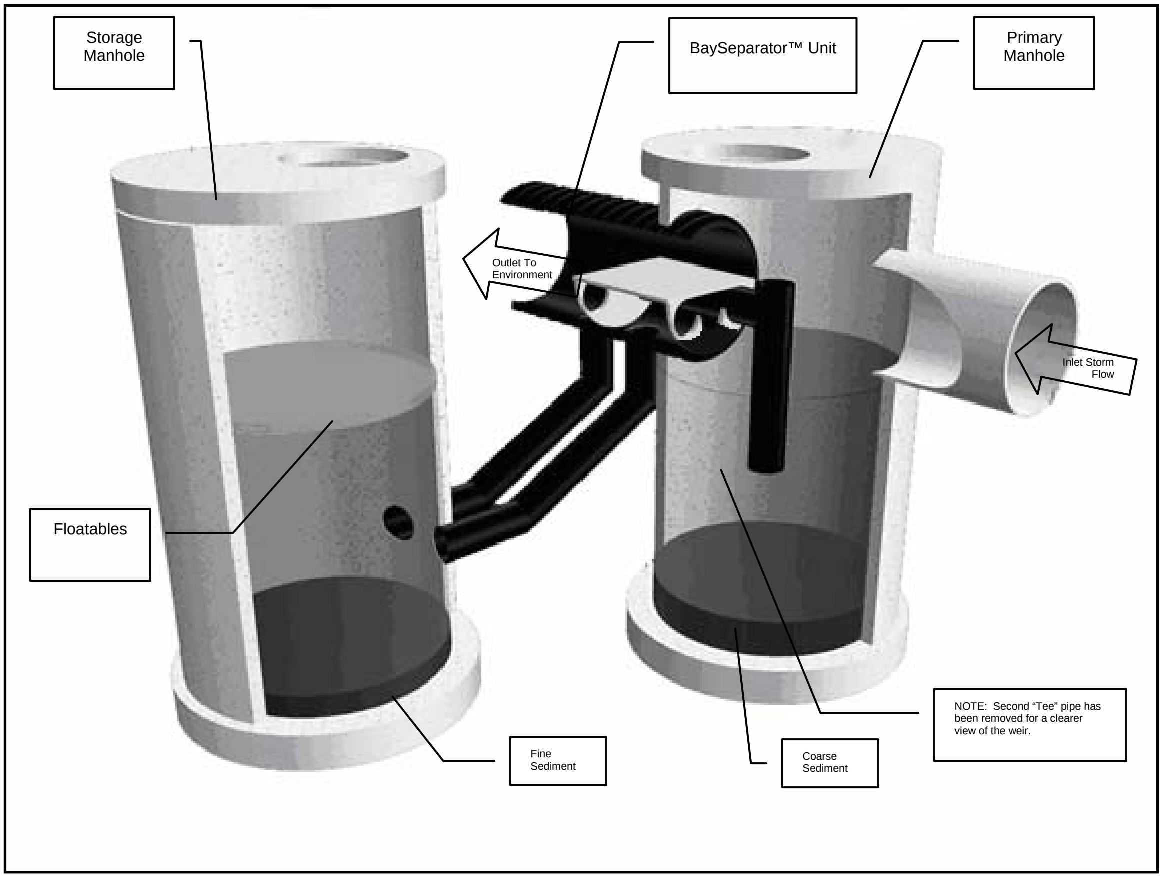


Figure 2.1: The BaySeparator™ System

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.

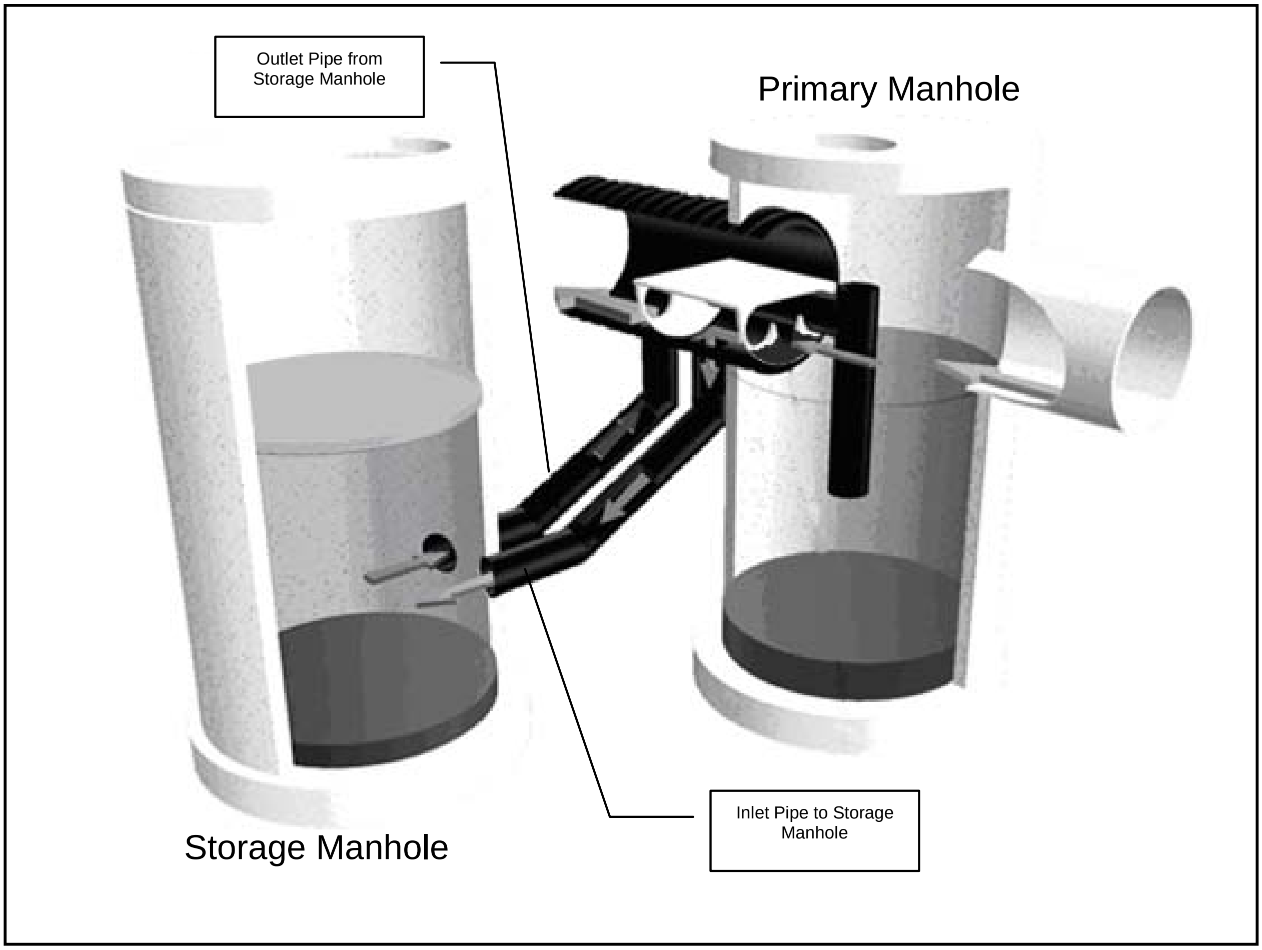


Figure 2.2: Low Flow Operation

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).

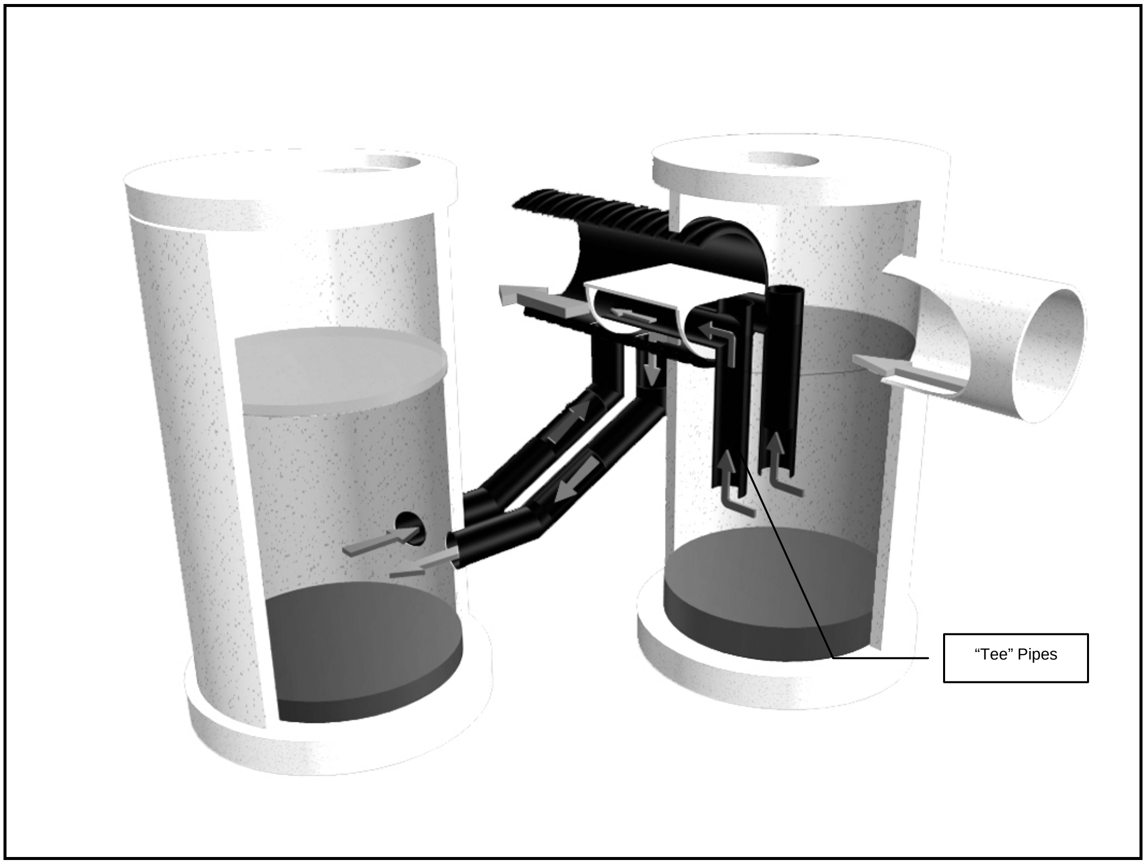


Figure 2.3: Maximum Treatment Flow

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.

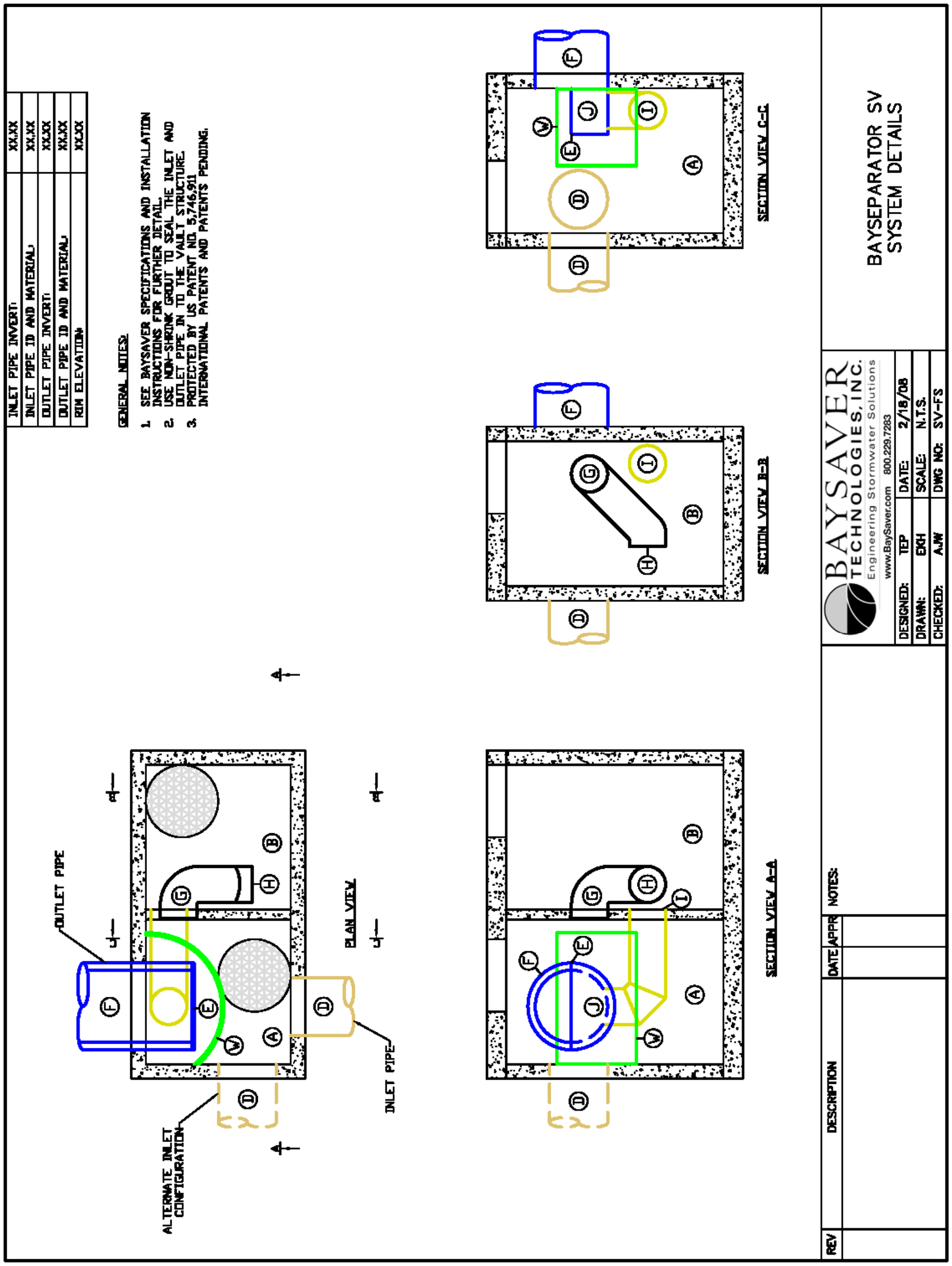


Figure 2.5: BaySeparator SV

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).

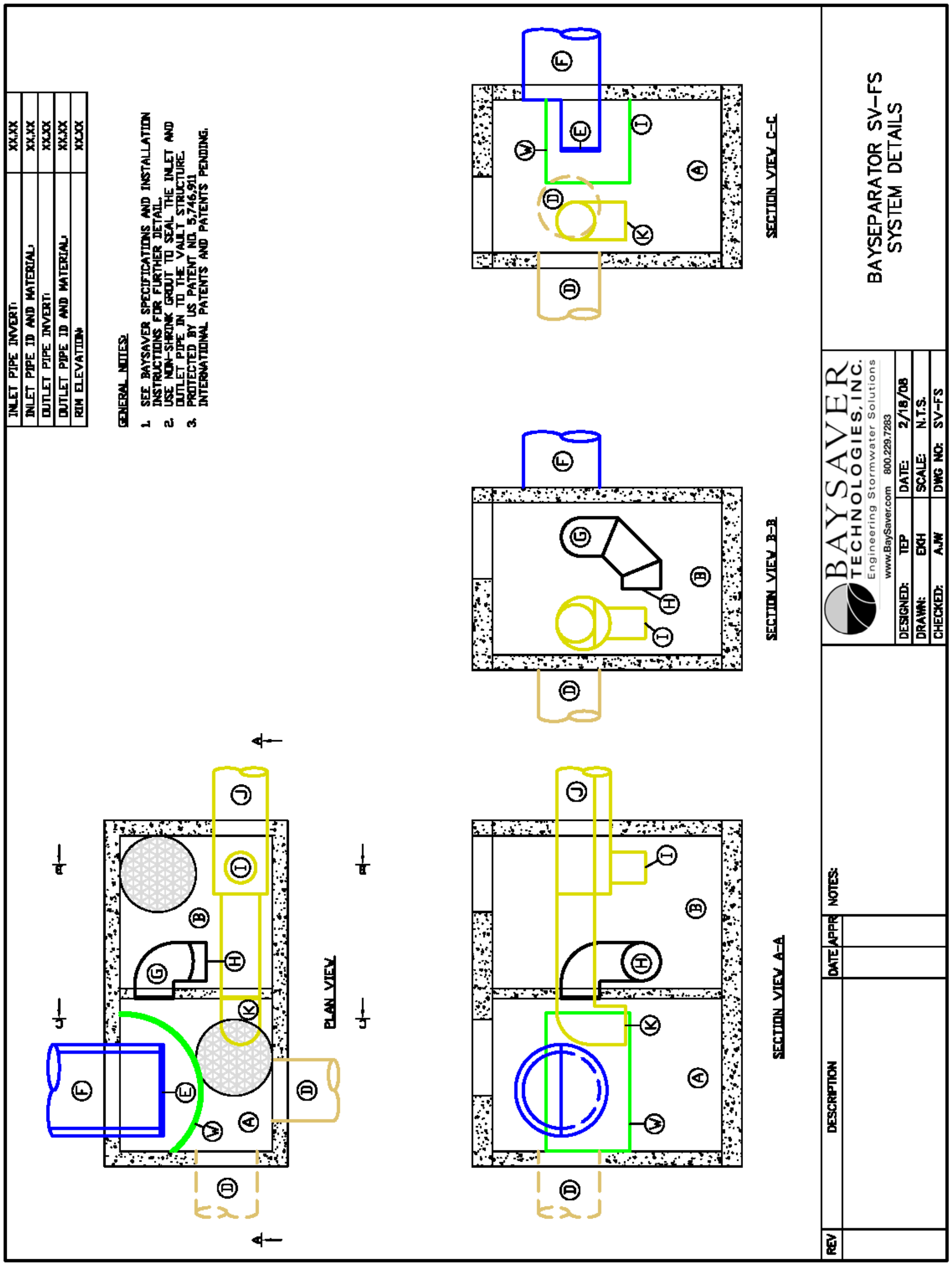


Figure 2.6: BaySeparator™ SV-FS

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).

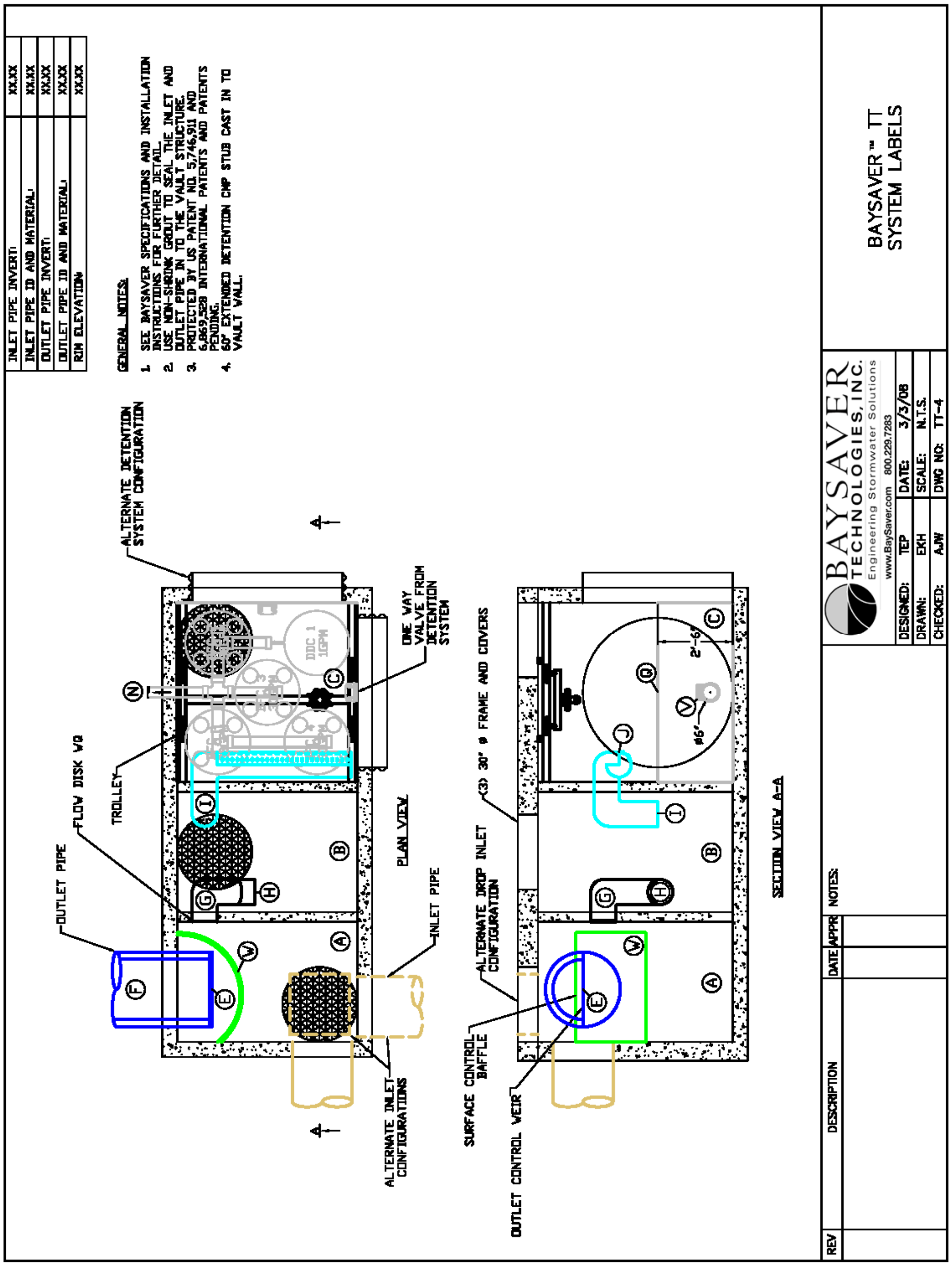


Figure 2.7: BaySeparator™ TT (BayFilters™ not shown, see Appendix B)

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.

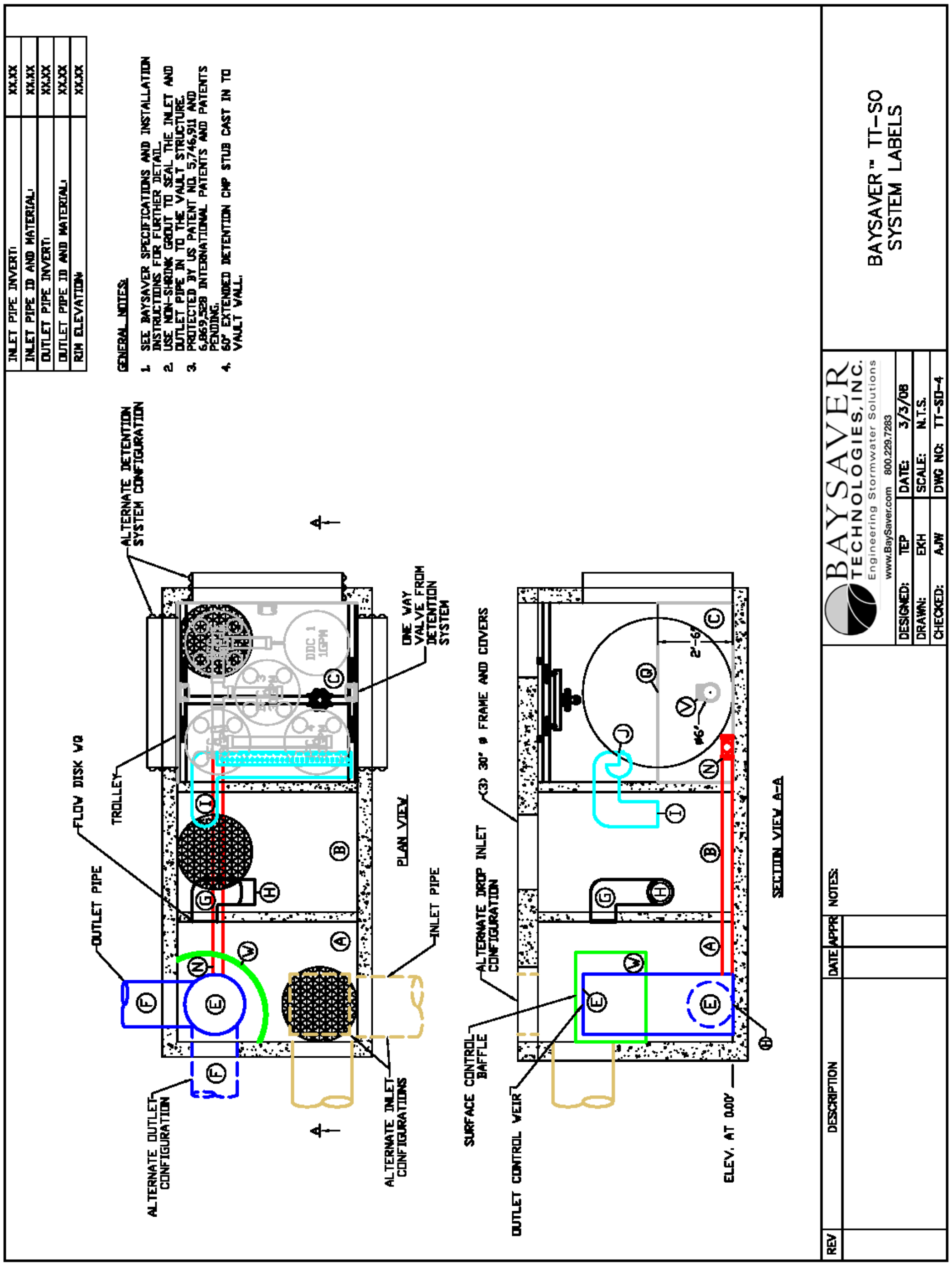


Figure 2.8: BaySeparator™ TT-SO

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.

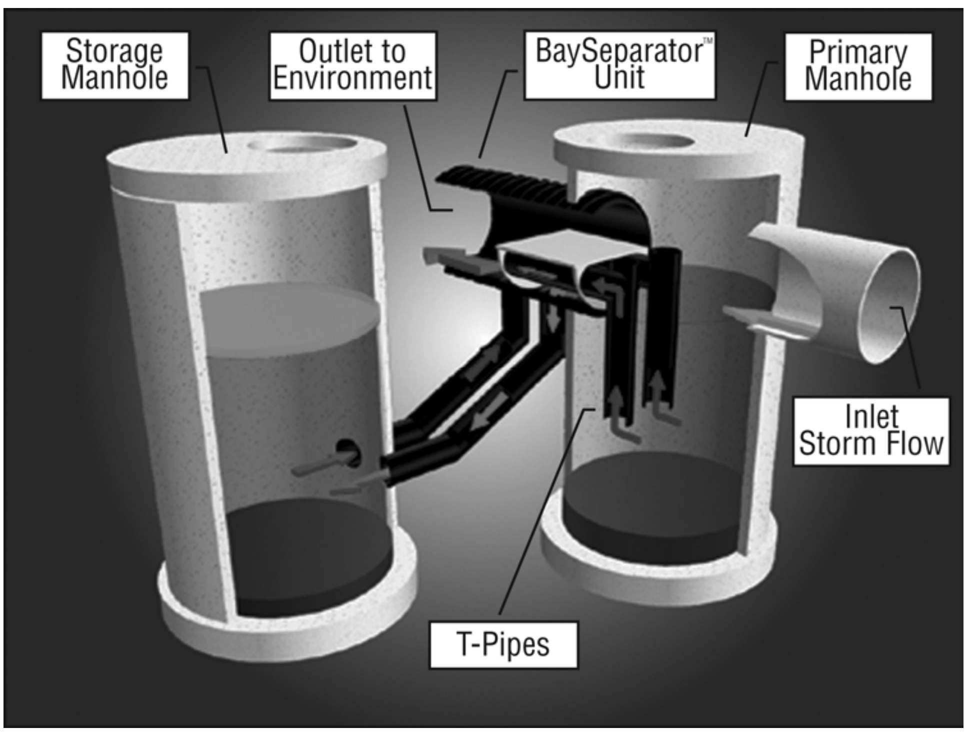


Figure 3.1: BaySeparator™ Flow Patterns

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.

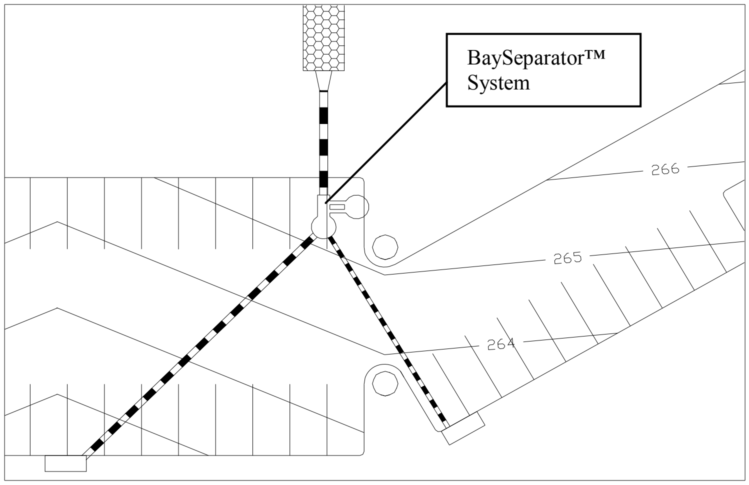


Figure 4.1: Site Plan Example

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.

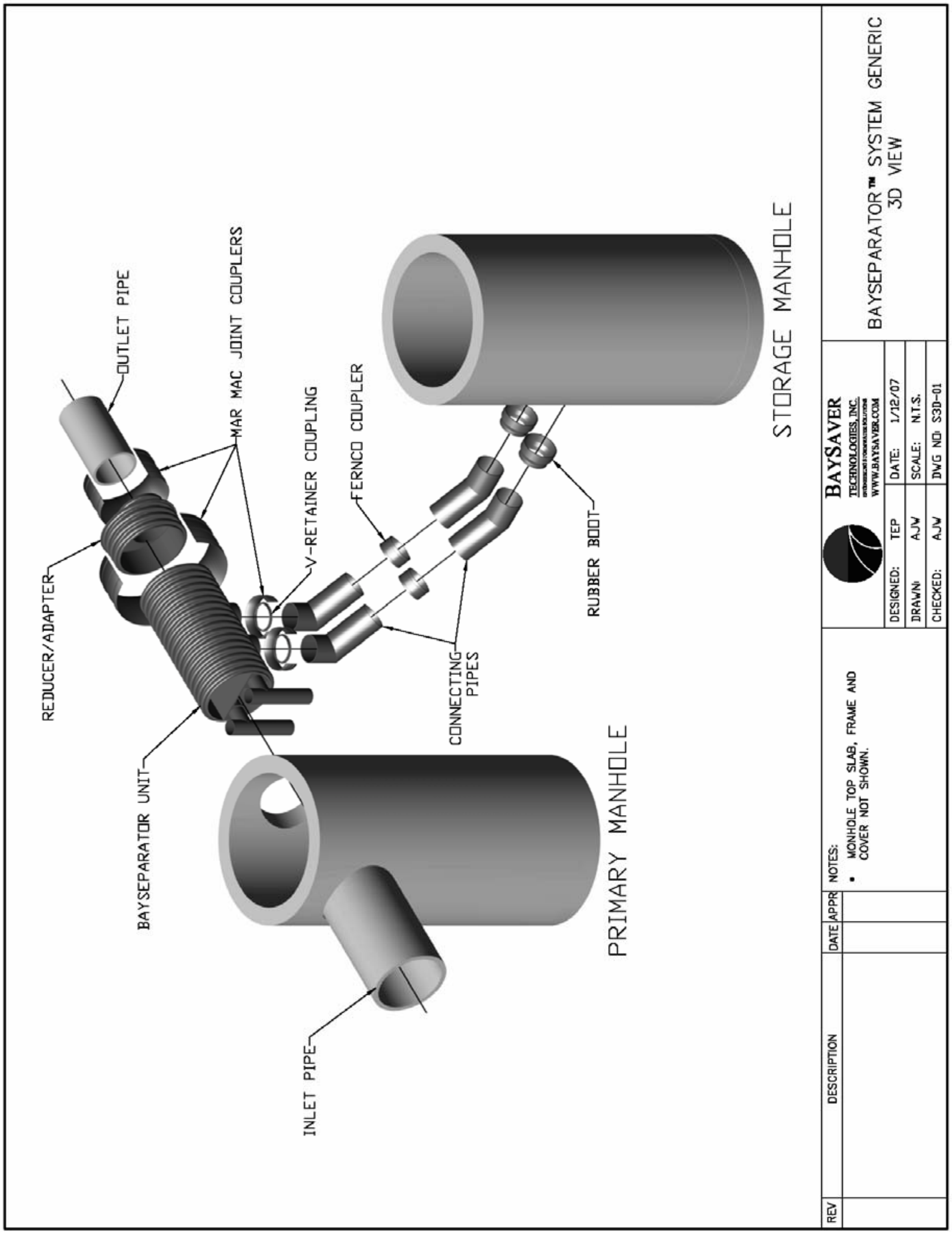


Figure 5.2: Exploded View of Standard BaySeparator™ System Components

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.

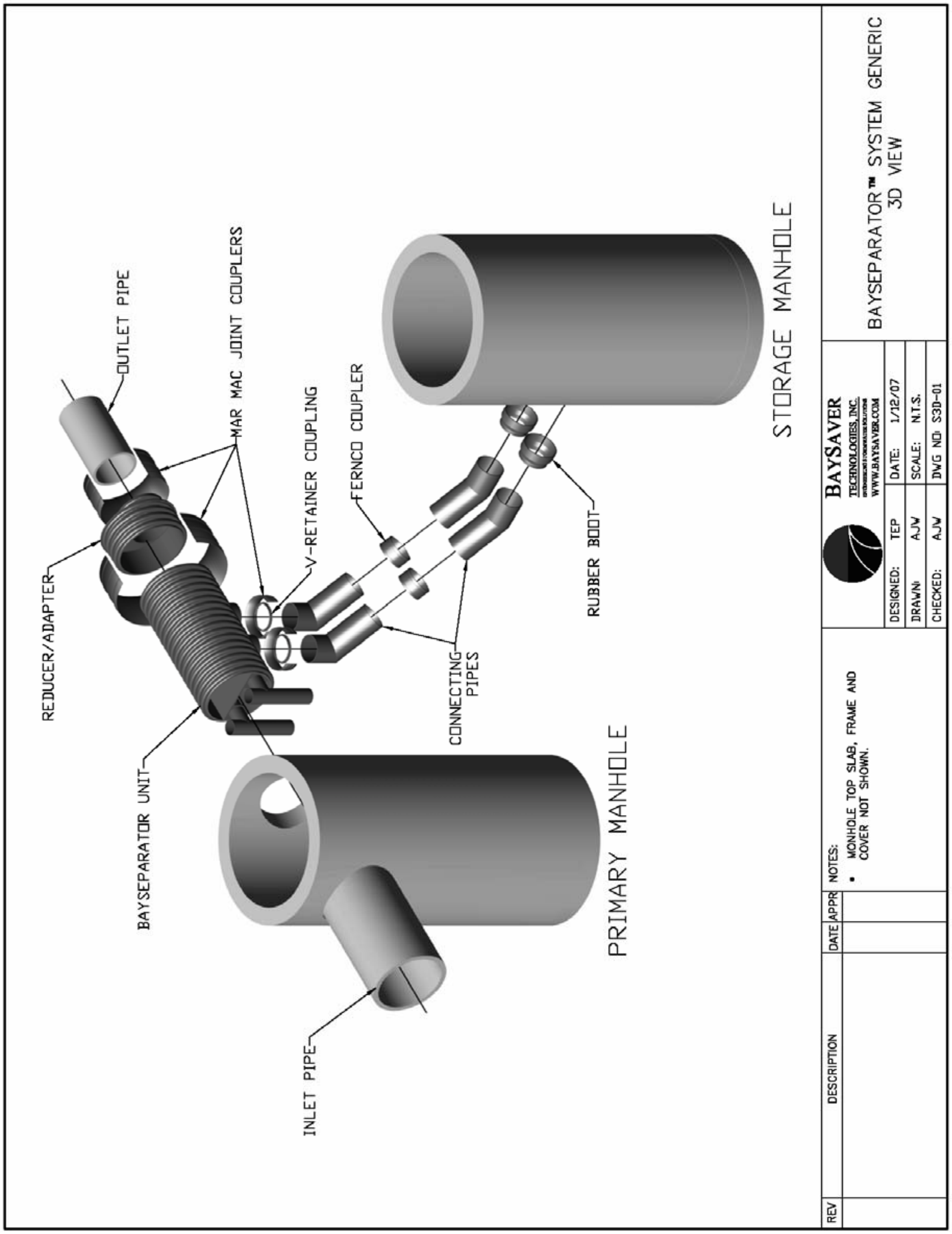
PART 3.00 EXECUTION

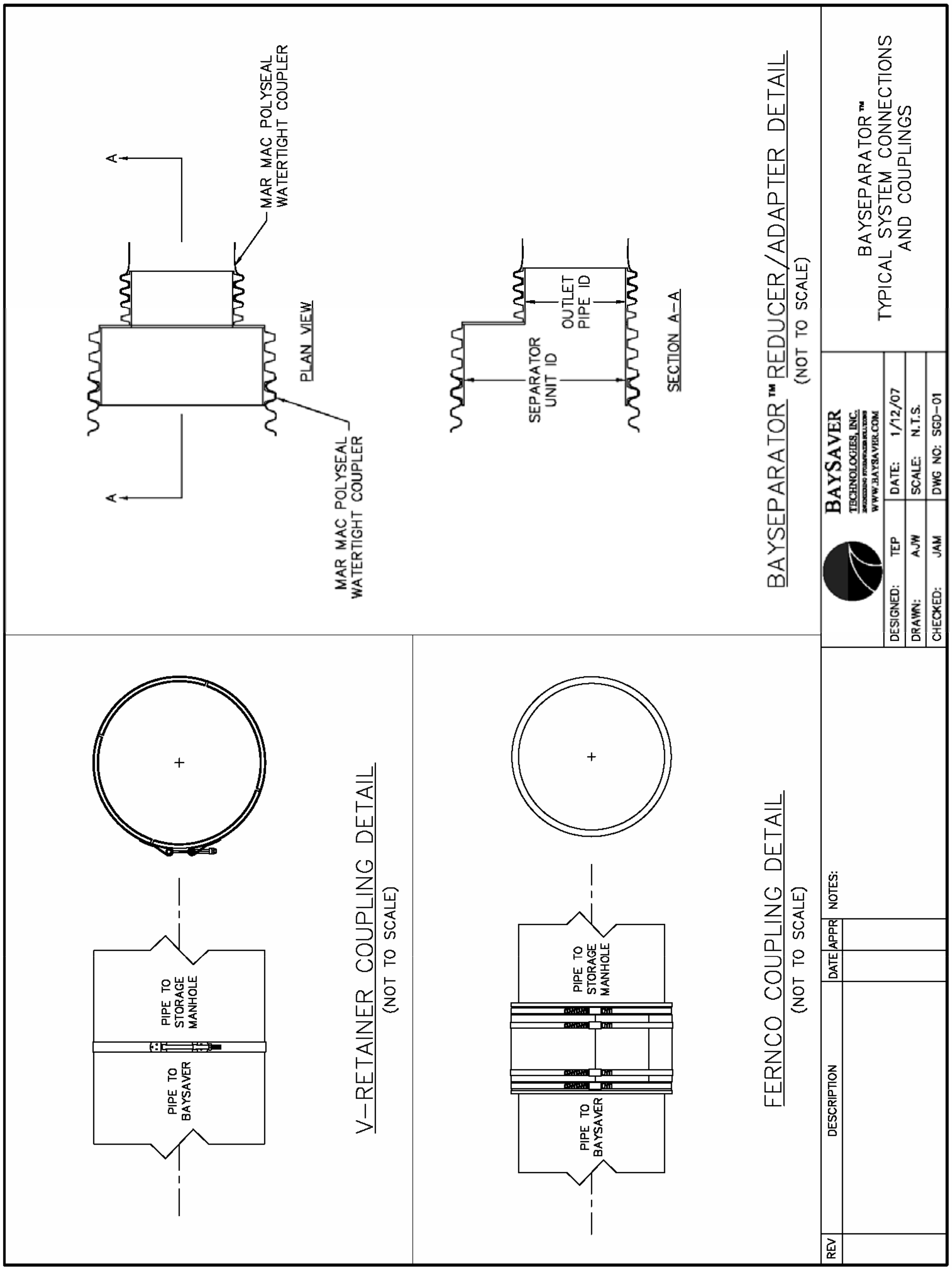
3.1 INSTALLATION

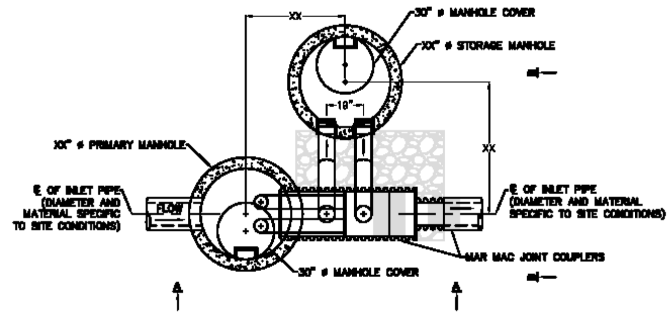
A. Installation of the Stormwater Treatment Unit(s) shall be performed per manufacturer's Installation Instructions. Such instructions can be obtained by calling BaySaver Technologies, Inc. at 1.800.229.7283 or by login to www.BaySaver.com.

Appendix B

Engineering Drawings


OUTLET PIPE
MAR MAC JOINT COUPLERS
V-RETAINER COUPLING
FERNCO COUPLER
REDUCER/ADAPTER
BAYSEPARATOR UNIT
CONNECTING PIPES
RUBBER BOOT
INLET PIPE
PRIMARY MANHOLE
STORAGE MANHOLE
REV
DESCRIPTION
DATE
APPR
NOTES:
• MONHOLE TOP SLAB, FRAME AND COVER NOT SHOWN.
BAYSAVER
TECHNOLOGIES, INC.
WWW.BAYSAVER.COM
DESIGNED: TEP
DRAWN: AJW
CHECKED: AJW
DATE: 1/12/07
SCALE: N.T.S.
DWG NO: S3D-01
BAYSEPARATOR™ SYSTEM GENERIC 3D VIEW


V–RETAINER COUPLING DETAIL
(NOT TO SCALE)
PIPE TO BAYSAVER
PIPE TO STORAGE MANHOLE
FERNCO COUPLING DETAIL
(NOT TO SCALE)
PIPE TO BAYSAVER
PIPE TO STORAGE MANHOLE
MAR MAC POLYSEAL WATERTIGHT COUPLER
MAR MAC POLYSEAL WATERTIGHT COUPLER
A
A
PLAN VIEW
SEPARATOR UNIT ID
OUTLET PIPE ID
SECTION A–A
BAYSEPARATOR™ REDUCER/ADAPTER DETAIL
(NOT TO SCALE)
REV
DESCRIPTION
DATE
APPR
NOTES:
BAYSAVER
TECHNOLOGIES, INC.
WWW.BAYSAVER.COM
DESIGNED: TEP
DRAWN: AJW
CHECKED: JAM
DATE: 1/12/07
SCALE: N.T.S.
DWG NO: SGD–01
BAYSEPARATOR™
TYPICAL SYSTEM CONNECTIONS
AND COUPLINGS

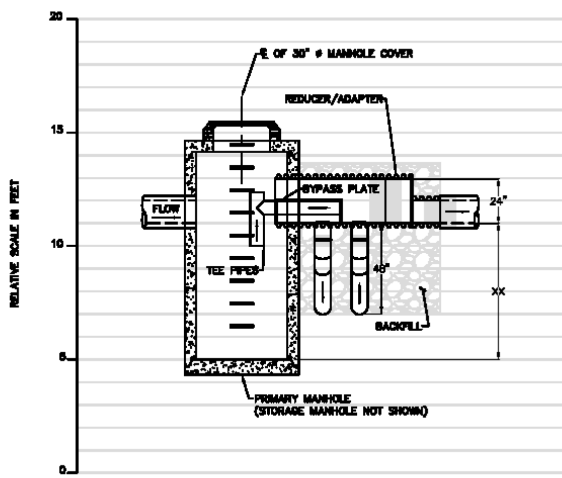


PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)

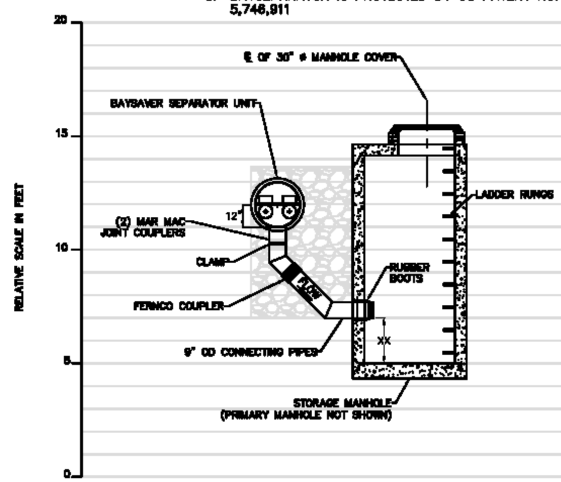
INLET PIPE INVERT:	XX.XX
INLET PIPE ID AND MATERIAL:	XX.XX
OUTLET PIPE INVERT:	XX.XX
OUTLET PIPE ID AND MATERIAL:	XX.XX
PRIMARY MANHOLE RIM ELEVATION:	XX.XX
STORAGE MANHOLE RIM ELEVATION:	XX.XX
ORIENTATION (RIGHT OR LEFT):	R L

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



PROFILE VIEW A-A



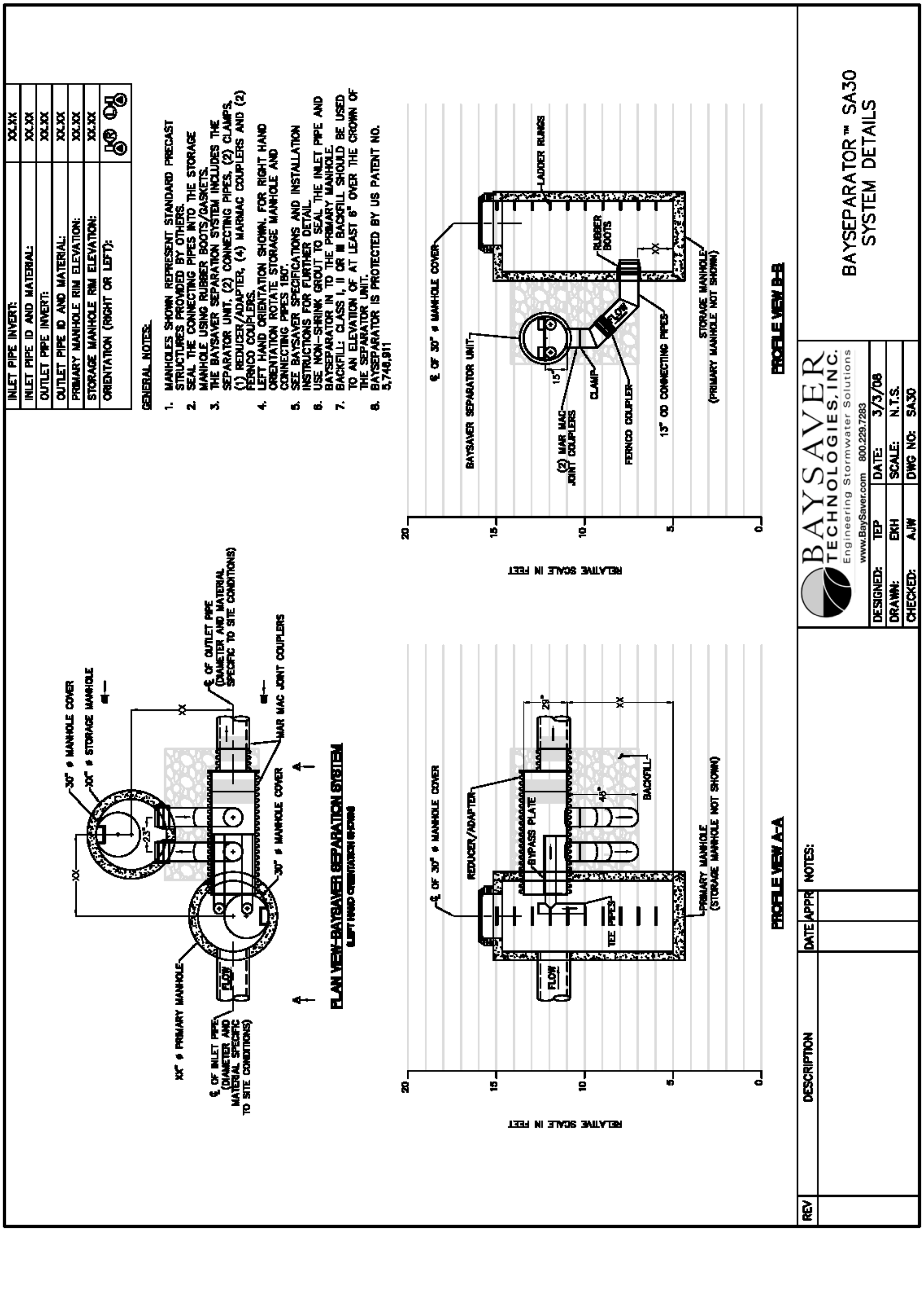
PROFILE VIEW B-B

REV	DESCRIPTION	DATE	APPR	NOTES:

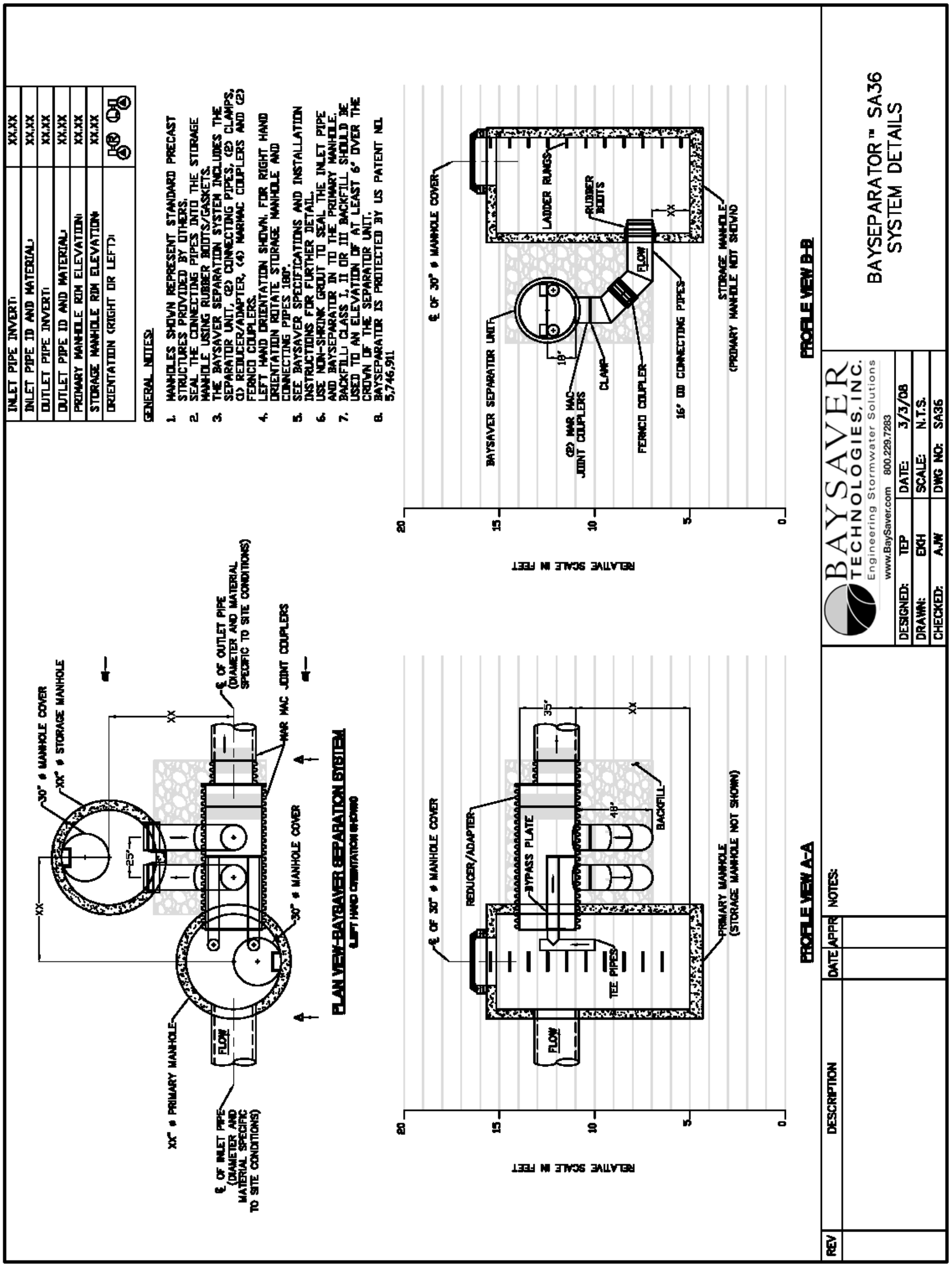
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283

DESIGNED:	TEP	DATE:	3/3/08
DRAWN:	EKH	SCALE:	N.T.S.
CHECKED:	AJW	DWG NO:	SA24

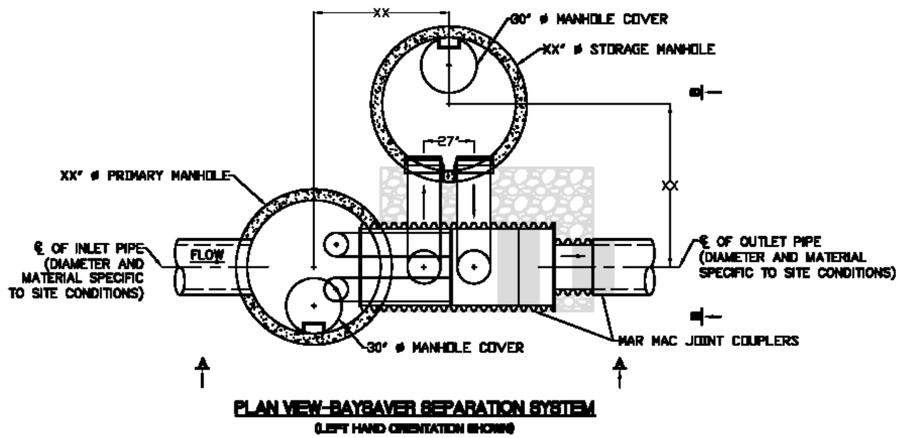
BAYSEPARATOR™ SA24
SYSTEM DETAILS



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
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
PROFILE VIEW A-A
PROFILE VIEW B-B
RELATIVE SCALE IN FEET
BAYSEPARATOR™ SA30
SYSTEM DETAILS
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
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" ⌀ MANHOLE COVER
XX" ⌀ STORAGE MANHOLE
XX" ⌀ PRIMARY MANHOLE
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
MAR MAC JOINT COUPLERS
FLOW
XX
25"
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ⌀ MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
TEE PIPES
BACKFILL
35"
48"
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW A-A
BAYSAVER SEPARATOR UNIT
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
16" OD CONNECTING PIPES
18"
LADDER RUNGS
RUBBER BOOTS
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
PROFILE VIEW B-B
REV
DESCRIPTION
DATE
APPR
NOTES:
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: SA36
BAYSEPARATOR™ SA36 SYSTEM DETAILS

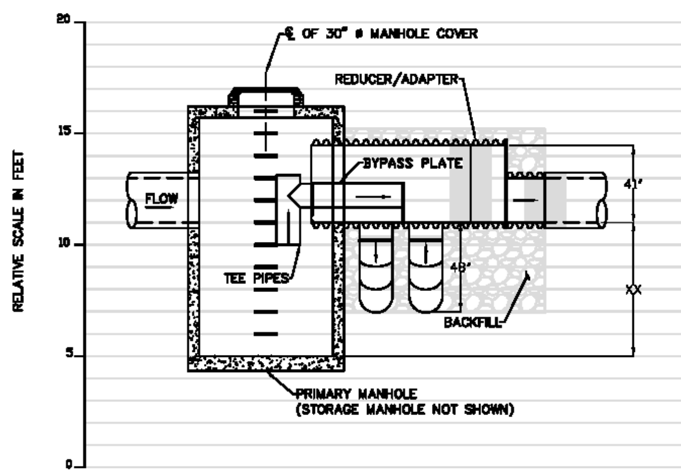


PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)

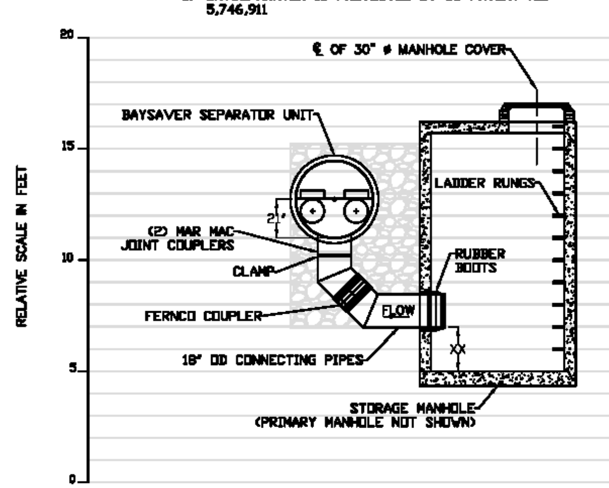
INLET PIPE INVERT:	XX.XX
INLET PIPE ID AND MATERIAL:	XX.XX
OUTLET PIPE INVERT:	XX.XX
OUTLET PIPE ID AND MATERIAL:	XX.XX
PRIMARY MANHOLE RIM ELEVATION:	XX.XX
STORAGE MANHOLE RIM ELEVATION:	XX.XX
ORIENTATION (RIGHT OR LEFT):	R L

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



PROFILE VIEW A-A



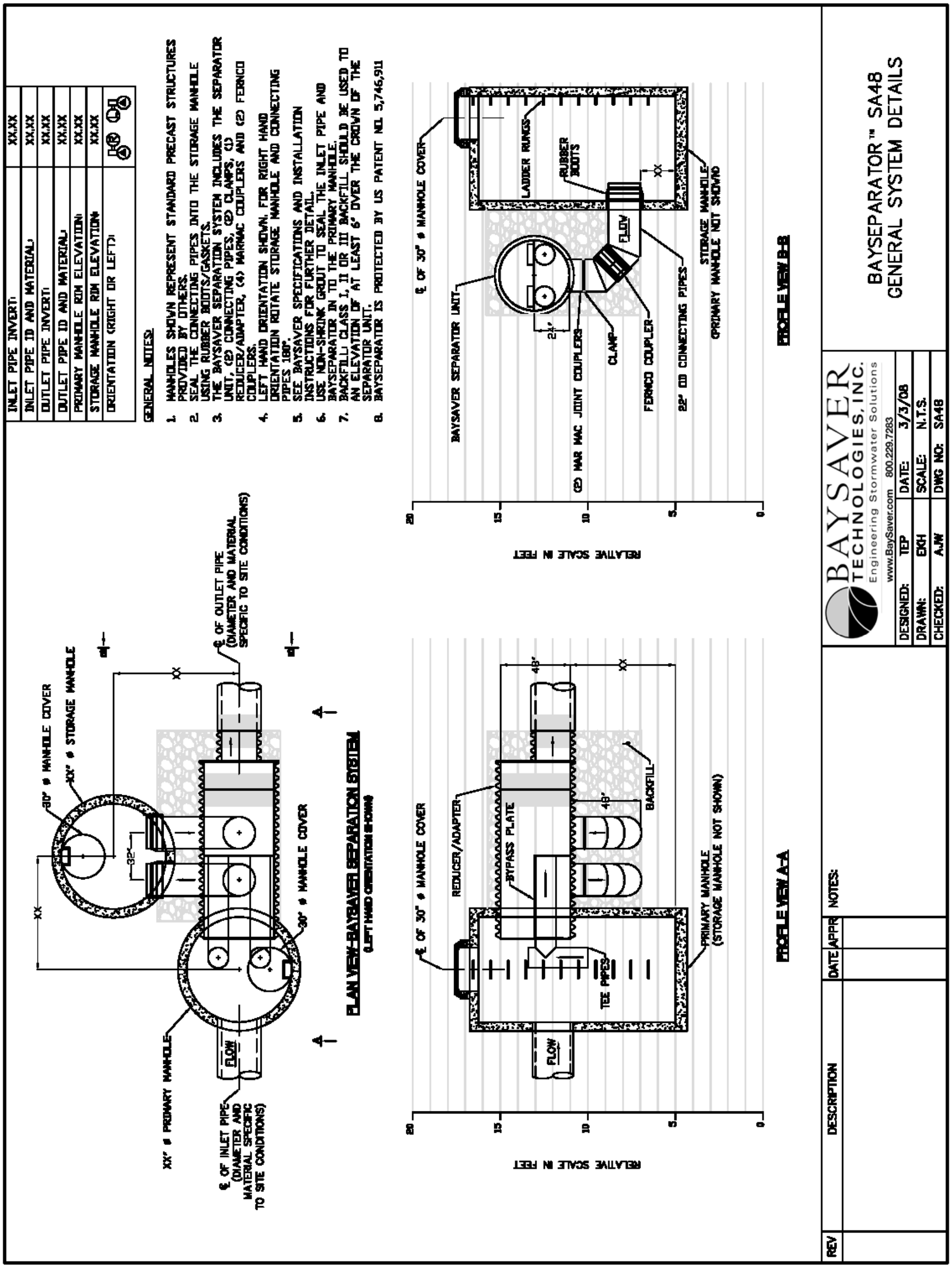
PROFILE VIEW B-B

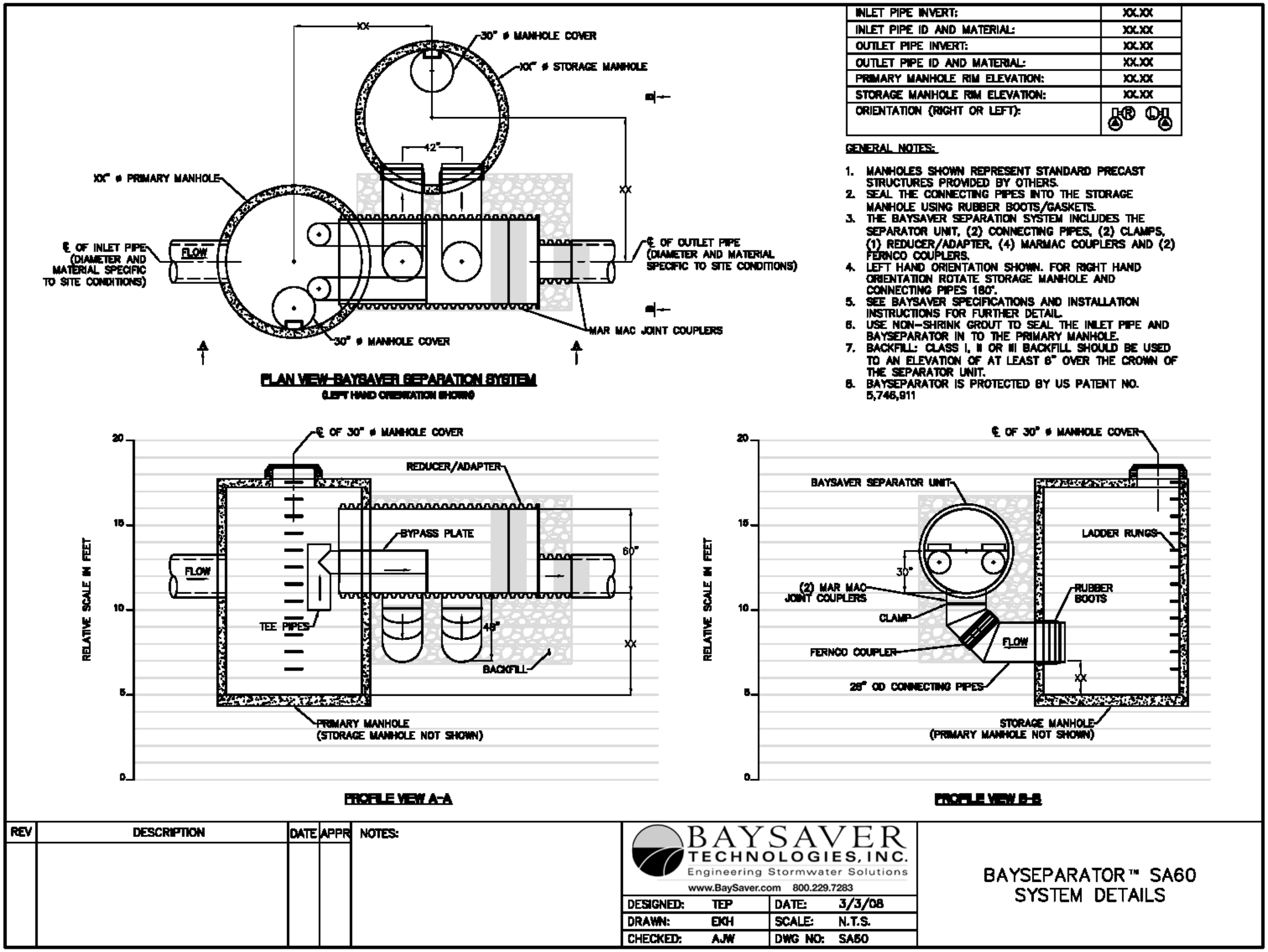
REV	DESCRIPTION	DATE	APPR	NOTES:

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

BAYSEPARATOR™ SA42
SYSTEM DETAILS


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
XX" ø PRIMARY MANHOLE
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
30" ø MANHOLE COVER
XX" ø STORAGE MANHOLE
32"
XX
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
A
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
TEE PIPES
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
48"
BACKFILL
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW A-A
BAYSAVER SEPARATOR UNIT
(2) MAR MAC JOINT COUPLERS
24"
CLAMP
FERNCO COUPLER
32" OD CONNECTING PIPES
(PRIMARY MANHOLE NOT SHOWN)
STORAGE MANHOLE
RUBBER BOOTS
LADDER RUNGS
PROFILE VIEW B-B
REV
DESCRIPTION
DATE
APPR
NOTES:
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DRAWN: EKH
CHECKED: AJW
DATE: 3/3/08
SCALE: N.T.S.
DWG NO: SA48
BAYSEPARATOR™ SA48
GENERAL SYSTEM DETAILS

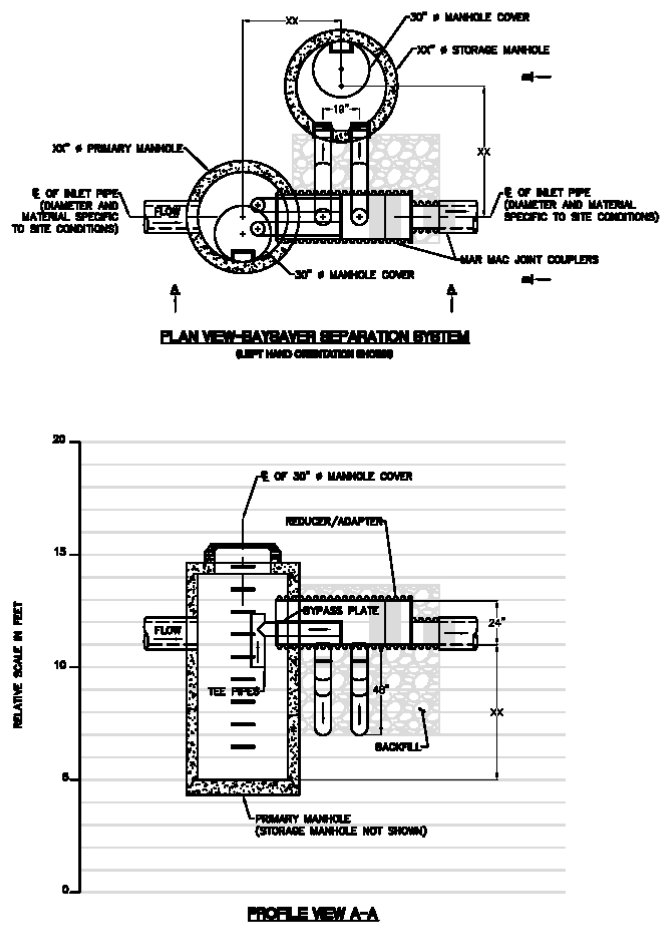


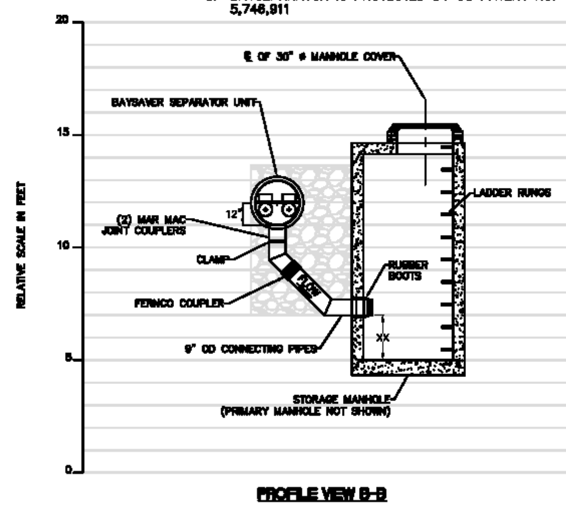
INLET PIPE INVERT: XX.XX
INLET PIPE ID AND MATERIAL: XX.XX
OUTLET PIPE INVERT: XX.XX
OUTLET PIPE ID AND MATERIAL: XX.XX
PRIMARY MANHOLE RIM ELEVATION: XX.XX
STORAGE MANHOLE RIM ELEVATION: XX.XX
ORIENTATION (RIGHT OR LEFT):
GENERAL NOTES:
1. MANHOLES SHOWN REPRESENT STANDARD PRECAST STRUCTURES PROVIDED 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" ⌀ MANHOLE COVER
XX" ⌀ STORAGE MANHOLE
XX" ⌀ PRIMARY MANHOLE
XX
42"
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
30" ⌀ MANHOLE COVER
MAR MAC JOINT COUPLERS
A
B
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ⌀ MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
60"
TEE PIPES
48"
BACKFILL
XX
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW A-A
℄ OF 30" ⌀ MANHOLE COVER
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
30"
(2) MAR MAC JOINT COUPLERS
RUBBER BOOTS
CLAMP
FERNCO COUPLER
FLOW
28" OD CONNECTING PIPES
XX
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
PROFILE VIEW B-B
REV
DESCRIPTION
DATE
APPR
NOTES:
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

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):	R L

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



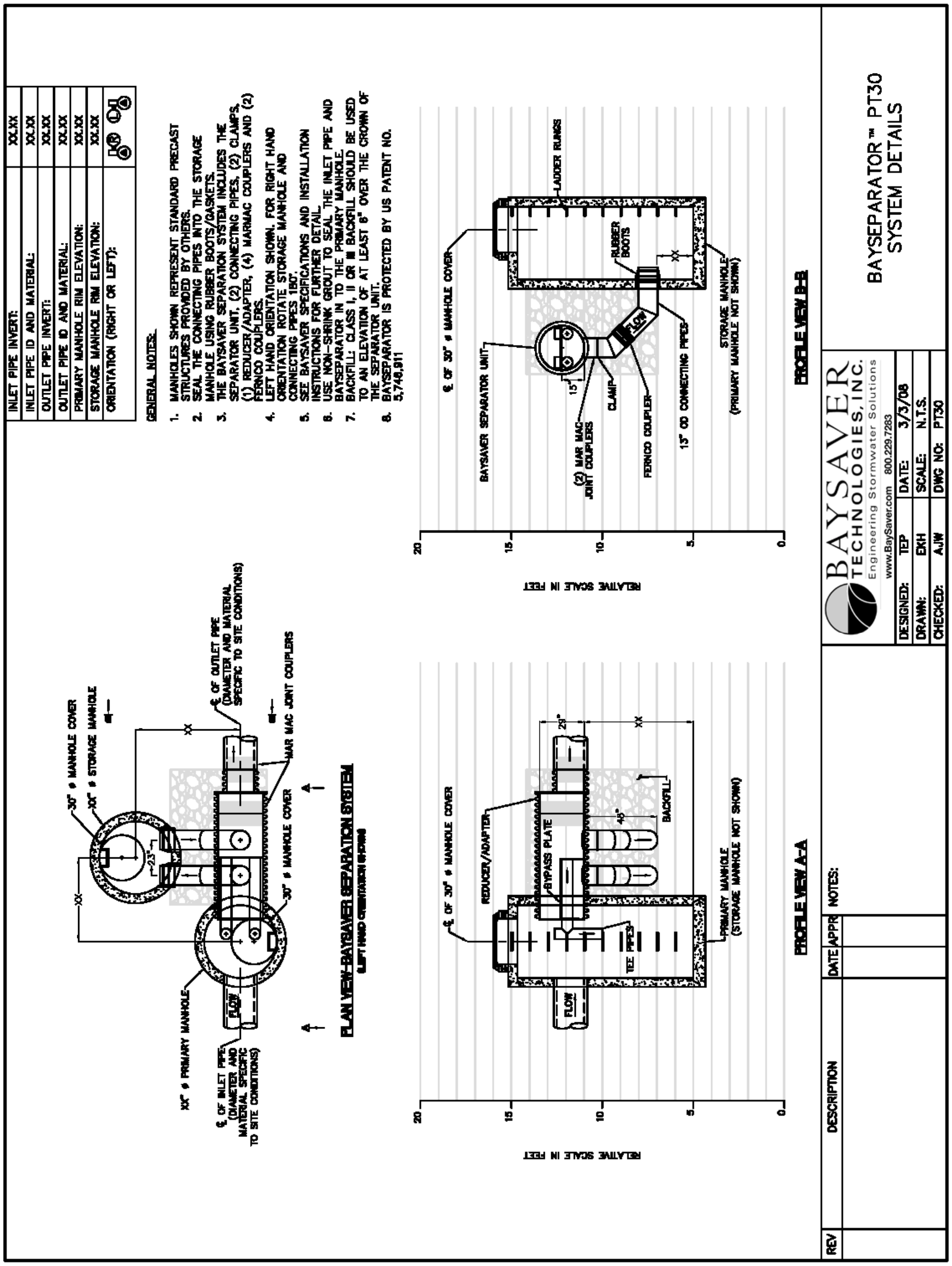


REV	DESCRIPTION	DATE	APPR	NOTES:

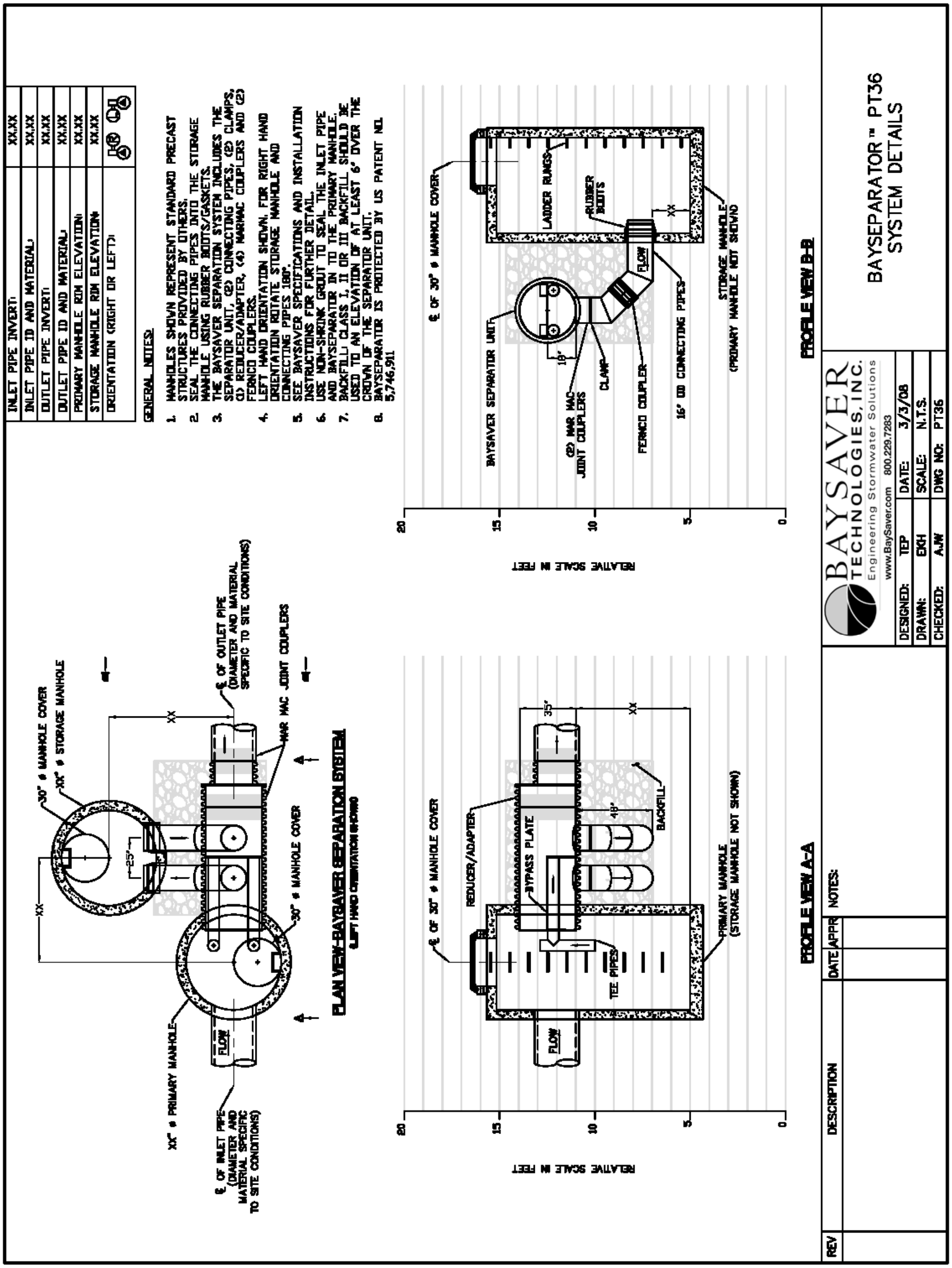
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283

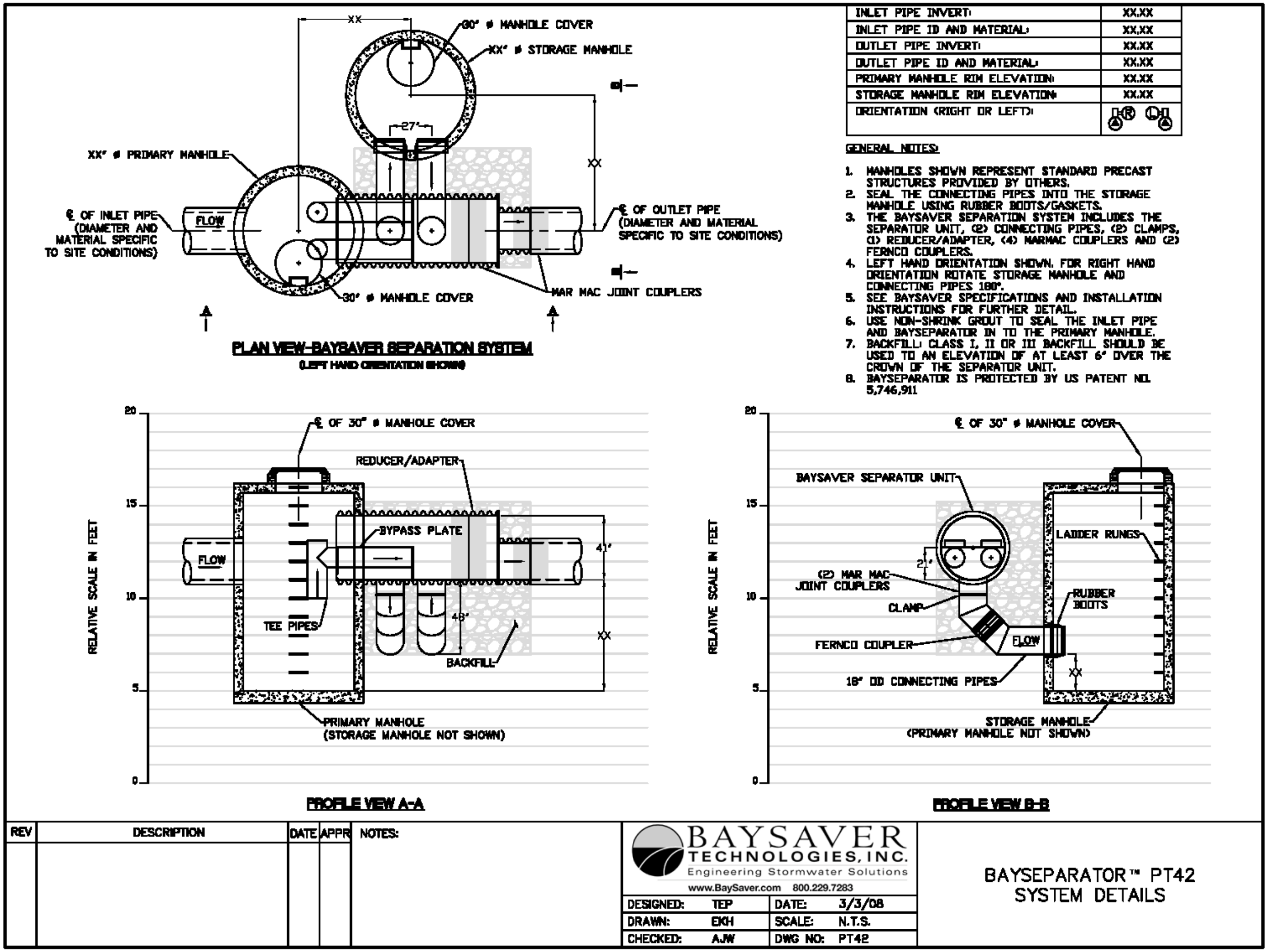
DESIGNED:	TEP	DATE:	3/3/08
DRAWN:	EKH	SCALE:	N.T.S.
CHECKED:	AJW	DWG NO:	PT24

BAYSEPARATOR™ PT24
SYSTEM DETAILS



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" ⌀ MANHOLE COVER
XX" ⌀ STORAGE MANHOLE
XX" ⌀ PRIMARY MANHOLE
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
23"
XX
30" ⌀ MANHOLE COVER
MAR MAC JOINT COUPLERS
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
℄ OF 30" ⌀ MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
29"
TEE PIPES
45°
BACKFILL
XX
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
PROFILE VIEW A-A
℄ OF 30" ⌀ MANHOLE COVER
BAYSAVER SEPARATOR UNIT
15°
(2) MAR MAC JOINT COUPLERS
CLAMP
FERNCO COUPLER
13" OD CONNECTING PIPES
LADDER RUNGS
RUBBER BOOTS
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
PROFILE VIEW B-B
REV
DESCRIPTION
DATE
APPR
NOTES:
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


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" ⌀ MANHOLE COVER
XX" ⌀ STORAGE MANHOLE
XX" ⌀ PRIMARY MANHOLE
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
XX
25"
30" ⌀ MANHOLE COVER
MAR MAC JOINT COUPLERS
A
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
℄ OF 30" ⌀ MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
FLOW
TEE PIPES
35"
48"
XX
BACKFILL
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
PROFILE VIEW A-A
BAYSAVER SEPARATOR UNIT
18"
(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
REV
DESCRIPTION
DATE
APPR
NOTES:
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


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)
FLOW
27"
XX
30" ø MANHOLE COVER
MAR MAC JOINT COUPLERS
A
B
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
FLOW
TEE PIPES
48"
41"
XX
BACKFILL
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
PROFILE VIEW A-A
℄ OF 30" ø MANHOLE COVER
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
2"
(2) MAR MAC JOINT COUPLERS
CLAMP
RUBBER BOOTS
FERNCO COUPLER
FLOW
18" OD CONNECTING PIPES
XX
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
PROFILE VIEW B-B
REV
DESCRIPTION
DATE
APPR
NOTES:
BAYSAVER TECHNOLOGIES, INC.
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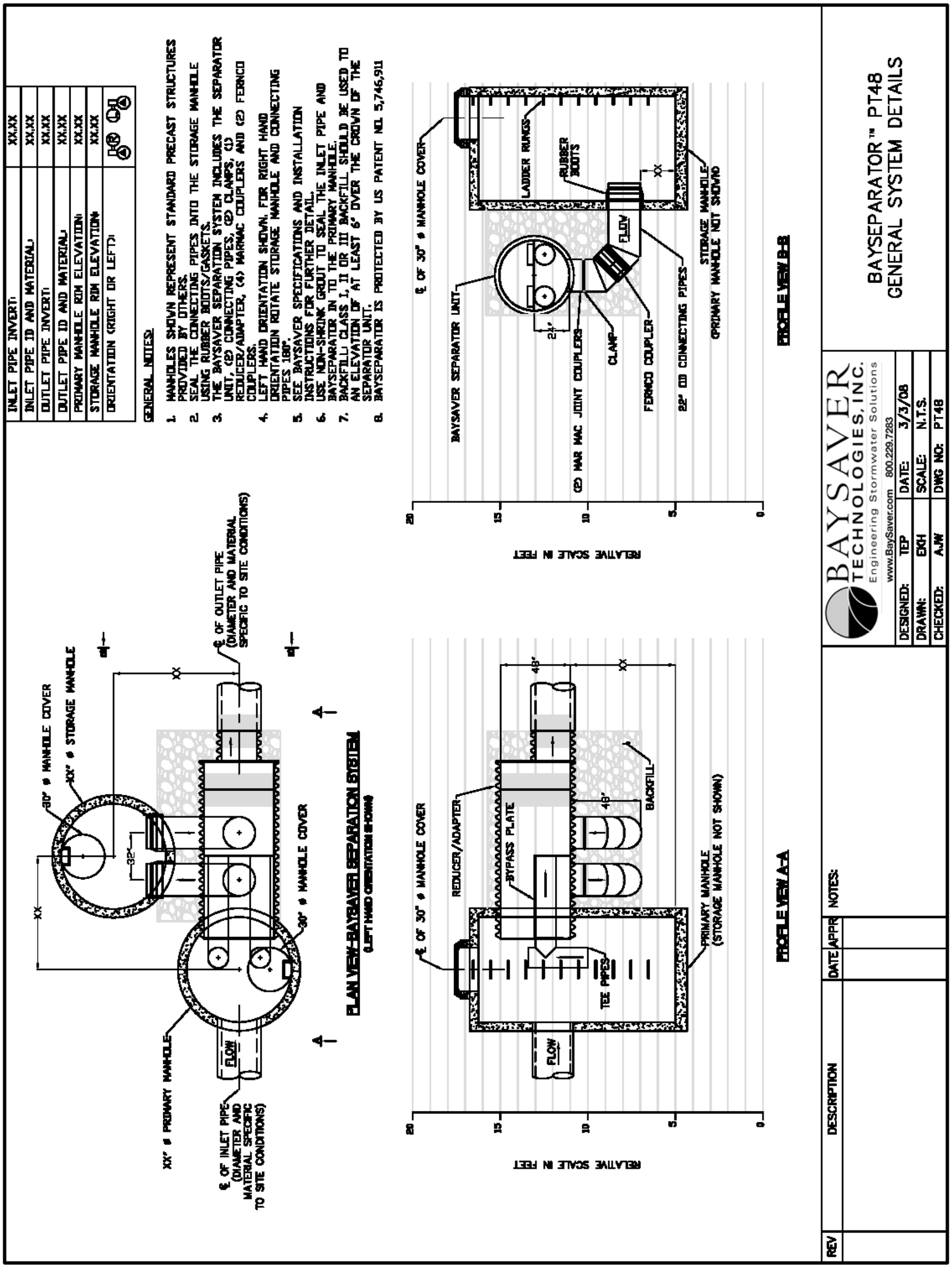
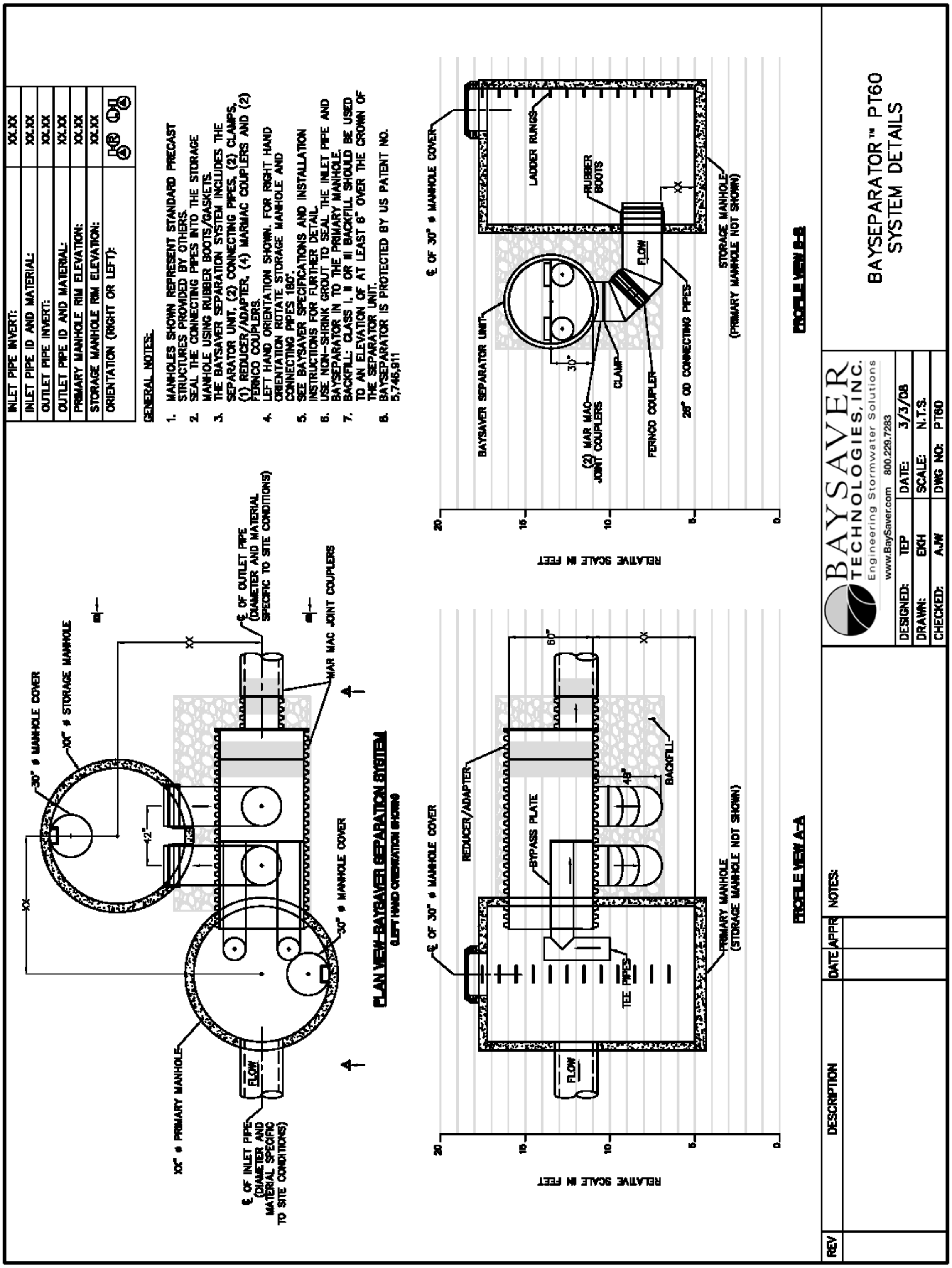
DESIGNED: TEP
DATE: 3/3/08
DRAWN: EKH
SCALE: N.T.S.
CHECKED: AJW
DWG NO: PT42
BAYSEPARATOR™ PT42
SYSTEM DETAILS


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
32"
XX
FLOW
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
30" ø MANHOLE COVER
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
48"
TEE PIPES
BACKFILL
PRIMARY MANHOLE
(STORAGE MANHOLE NOT SHOWN)
PROFILE VIEW A-A
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
24"
(2) MAR MAC JOINT COUPLERS
RUBBER BOOTS
CLAMP
FERNCO COUPLER
22" OD CONNECTING PIPES
STORAGE MANHOLE
(PRIMARY MANHOLE NOT SHOWN)
PROFILE VIEW B-B
REV
DESCRIPTION
DATE
APPR
NOTES:
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


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
42"
XX
℄ OF INLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
℄ OF OUTLET PIPE (DIAMETER AND MATERIAL SPECIFIC TO SITE CONDITIONS)
FLOW
MAR MAC JOINT COUPLERS
PLAN VIEW-BAYSAVER SEPARATION SYSTEM
(LEFT HAND ORIENTATION SHOWN)
℄ OF 30" ø MANHOLE COVER
REDUCER/ADAPTER
BYPASS PLATE
TEE PIPES
48"
60"
BACKFILL
PRIMARY MANHOLE (STORAGE MANHOLE NOT SHOWN)
RELATIVE SCALE IN FEET
20
15
10
5
0
PROFILE VIEW A-A
BAYSAVER SEPARATOR UNIT
LADDER RUNGS
30"
(2) MAR MAC JOINT COUPLERS
CLAMP
RUBBER BOOTS
FERNCO COUPLER
28" OD CONNECTING PIPES
STORAGE MANHOLE (PRIMARY MANHOLE NOT SHOWN)
PROFILE VIEW B-B
REV
DESCRIPTION
DATE
APPR
NOTES:
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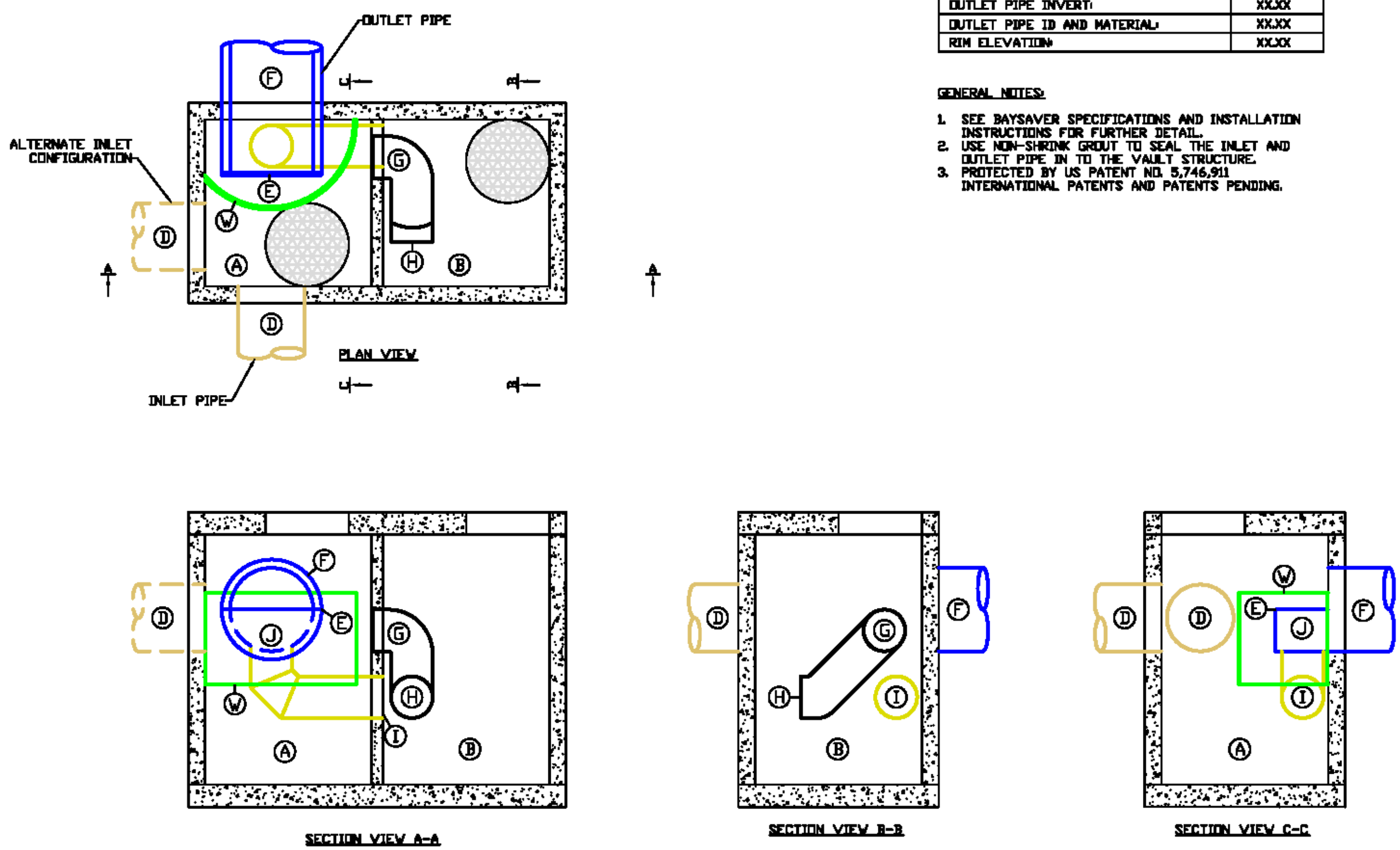
Engineering Stormwater Solutions
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 3/3/08
DRAWN: EKH
SCALE: N.T.S.
CHECKED: AJW
DWG NO: PT60
BAYSEPARATOR™ PT60
SYSTEM DETAILS

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.



REV	DESCRIPTION	DATE	APPR	NOTES:

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Engineering Stormwater Solutions
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DESIGNED:	TEP	DATE:	2/18/08
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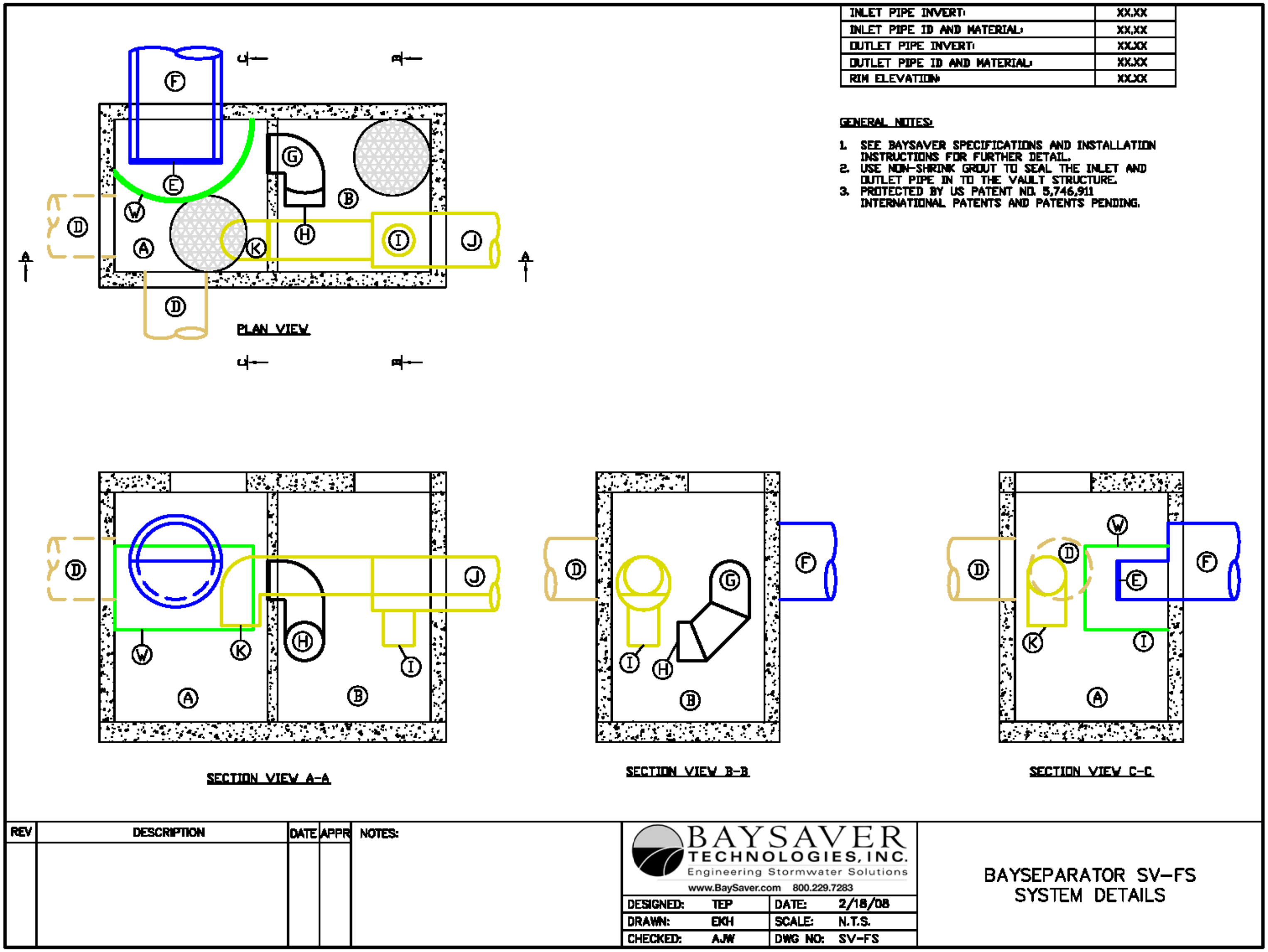
CHECKED:	AJW	DWG NO:	SV-FS

BAYSEPARATOR SV
SYSTEM DETAILS


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
REV
DESCRIPTION
DATE
APPR
NOTES:
BAYSAVER TECHNOLOGIES, INC.
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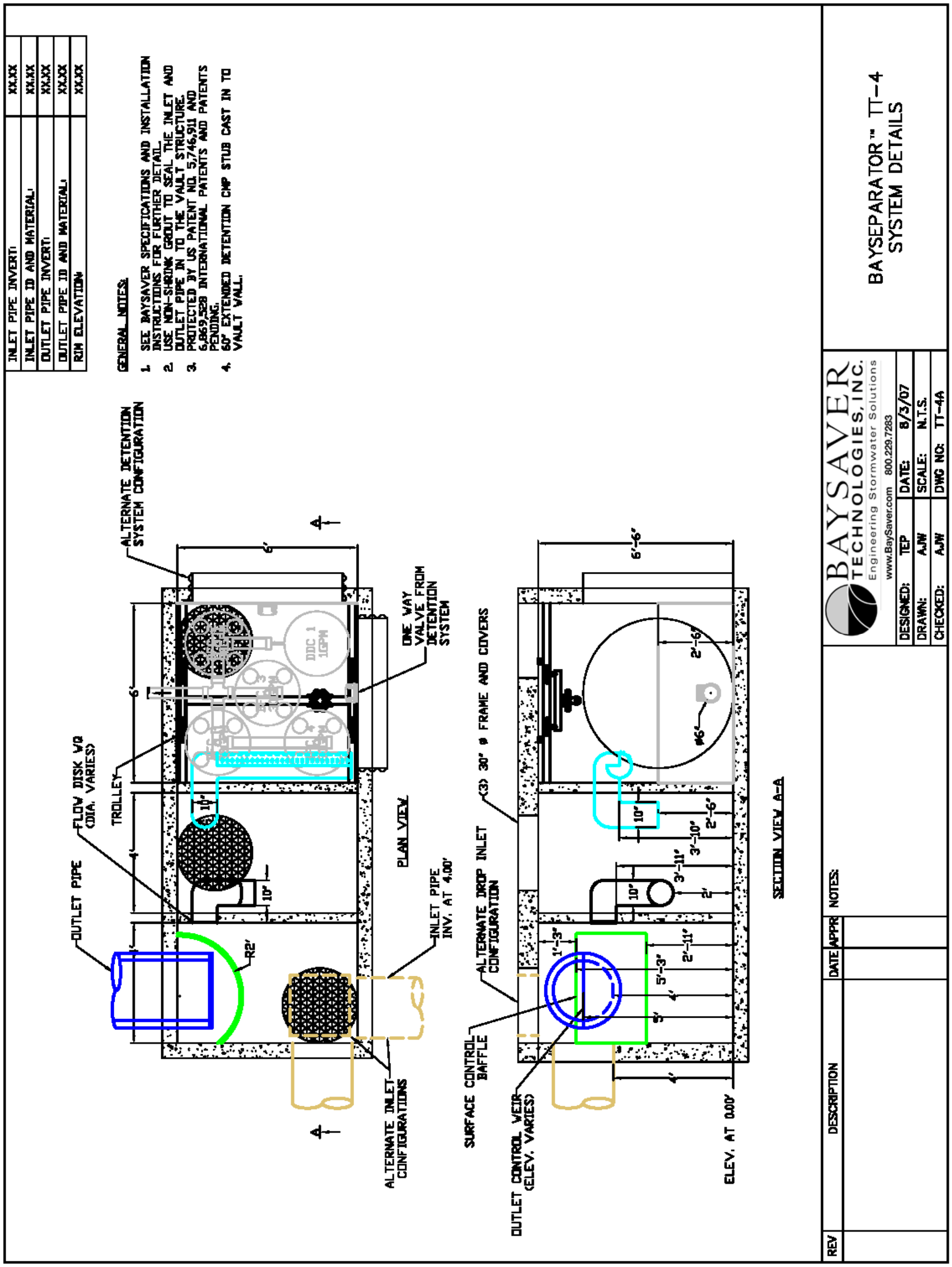
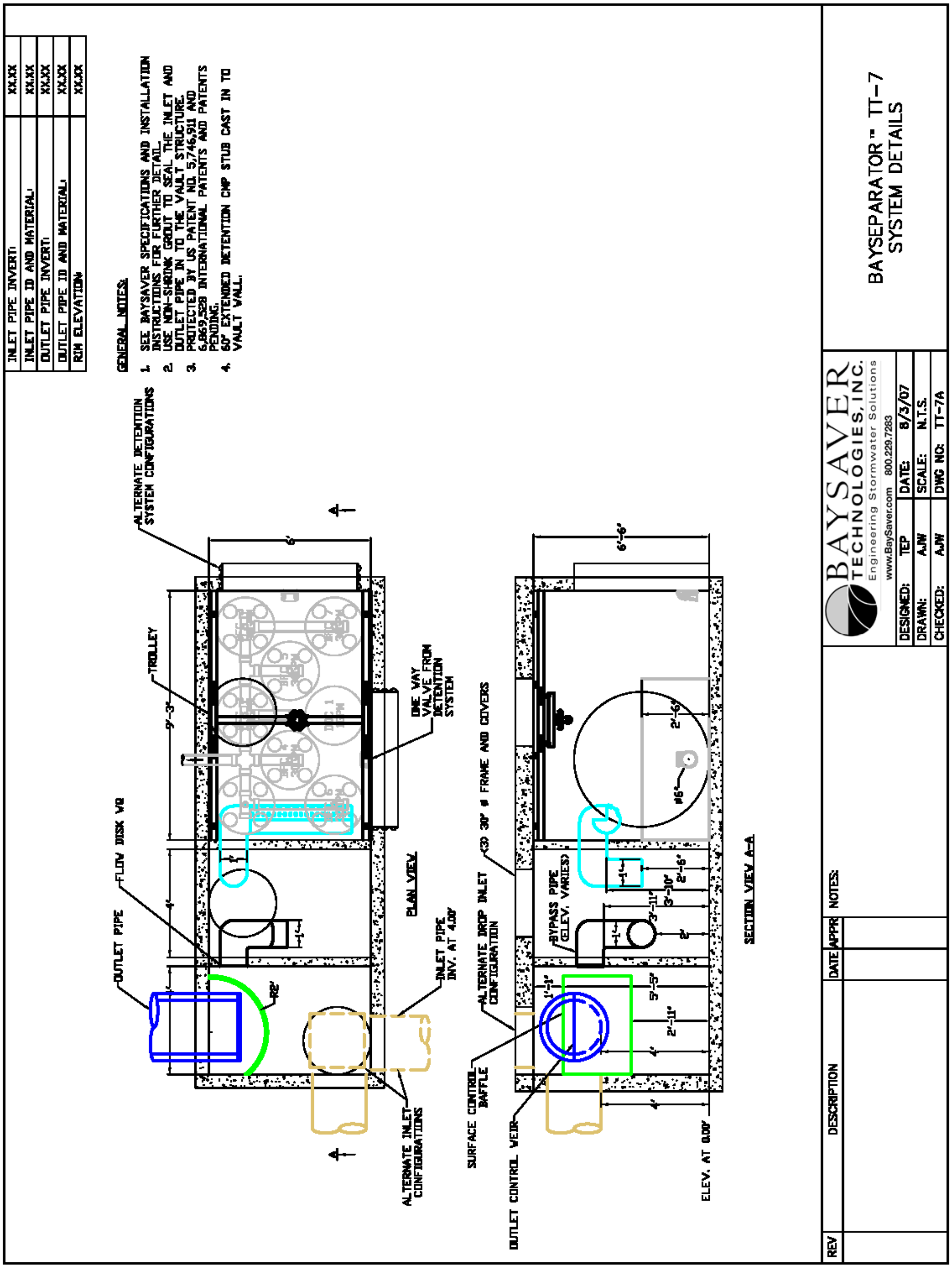
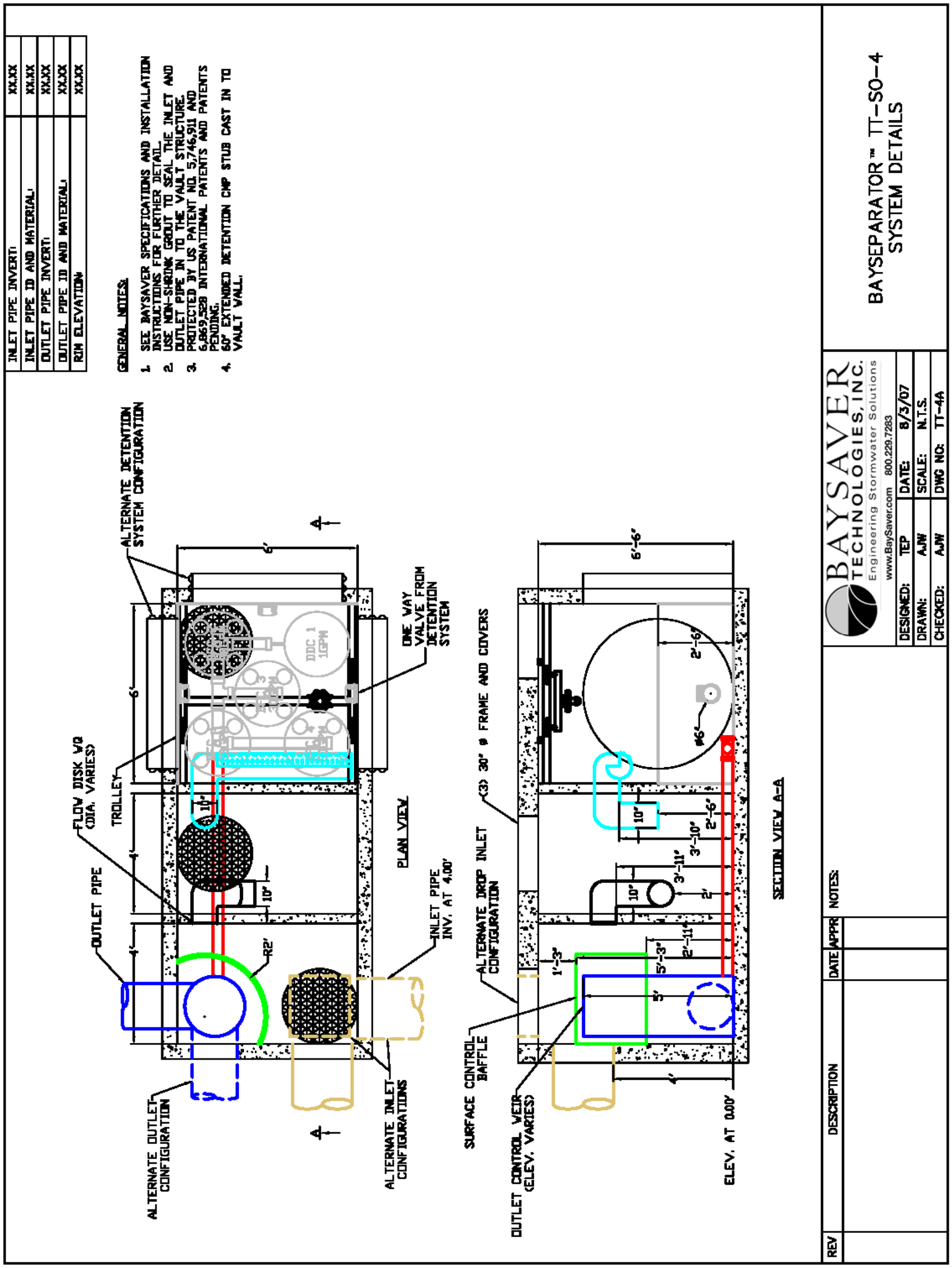
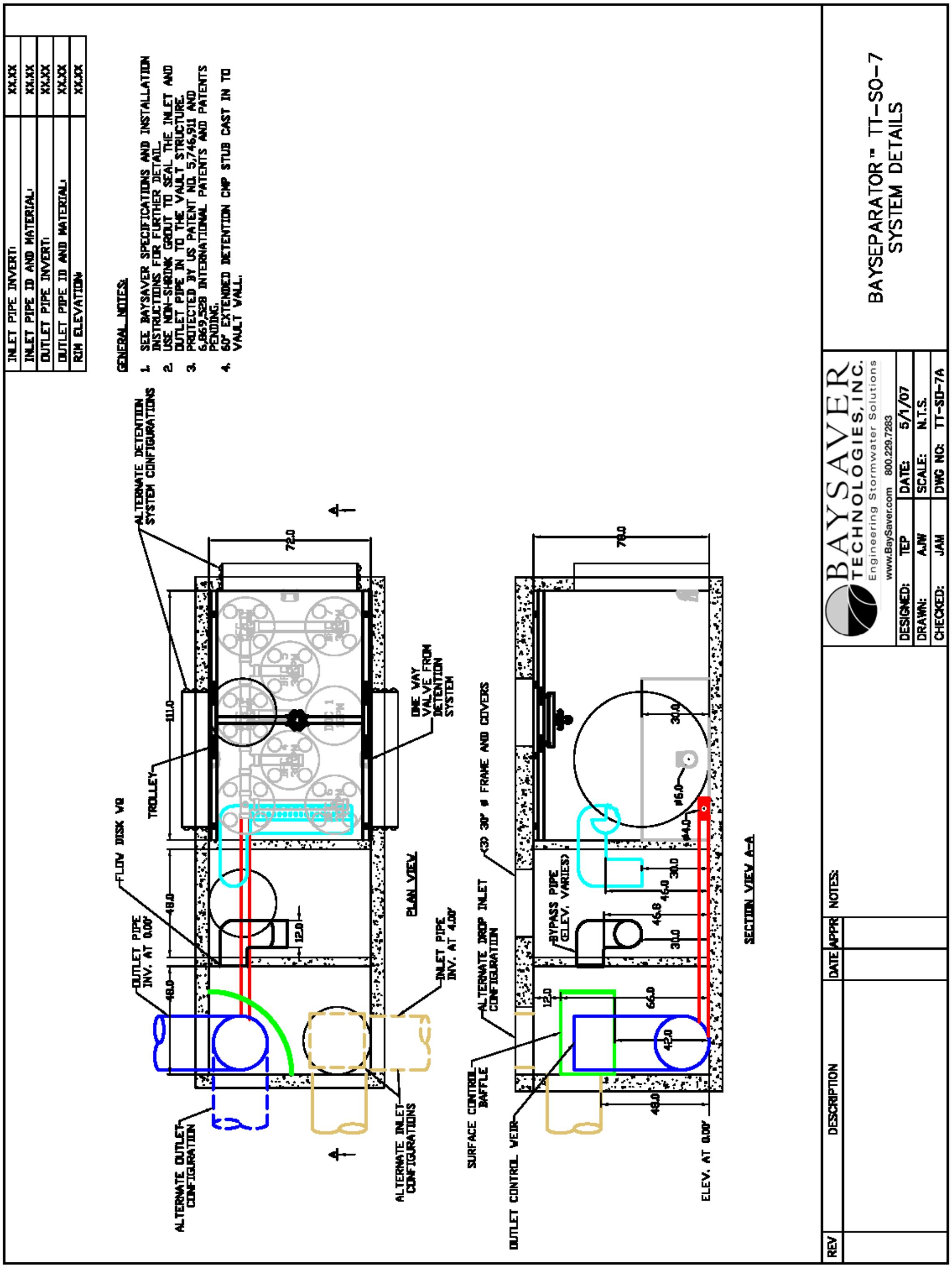
www.BaySaver.com 800.229.7283
DESIGNED: TEP
DATE: 2/18/08
DRAWN: EKH
SCALE: N.T.S.
CHECKED: AJW
DWG NO: SV-FS
BAYSEPARATOR SV-FS SYSTEM DETAILS



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 AND 6,869,528 INTERNATIONAL PATENTS AND PATENTS PENDING.
4. 60" EXTENDED DETENTION CMP STUB CAST IN TO VAULT WALL.
ALTERNATE DETENTION SYSTEM CONFIGURATION
ONE WAY VALVE FROM DETENTION SYSTEM
FLOW DISK VQ (DIA. VARIES)
TROLLEY
OUTLET PIPE
INLET PIPE INV. AT 4.00'
PLAN VIEW
ALTERNATE INLET CONFIGURATIONS
R2'
DDC 1 1GPM
(3) 30" ø FRAME AND COVERS
ALTERNATE DROP INLET CONFIGURATION
SURFACE CONTROL BAFFLE
OUTLET CONTROL WEIR (ELEV. VARIES)
ELEV. AT 0.00'
SECTION VIEW A-A
BAYSEPARATOR™ TT-4 SYSTEM DETAILS
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
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 AND 6,869,528 INTERNATIONAL PATENTS AND PATENTS PENDING.
4. 60" EXTENDED DETENTION CMP STUB CAST IN TO VAULT WALL.
OUTLET PIPE
FLOW DISK WQ
TROLLEY
ALTERNATE DETENTION SYSTEM CONFIGURATIONS
4'
9'-3"
6'
R2'
1'
ALTERNATE INLET CONFIGURATIONS
PLAN VIEW
INLET PIPE INV. AT 4.00'
ONE WAY VALVE FROM DETENTION SYSTEM
SURFACE CONTROL BAFFLE
ALTERNATE DROP INLET CONFIGURATION
(3) 30" Ø FRAME AND COVERS
OUTLET CONTROL WEIR
BYPASS PIPE (ELEV. VARIES)
1'-1"
4'
5'-5"
2'-11"
3'-11"
3'-10"
2'-6"
2'
#6"
6'-6"
ELEV. AT 0.00'
SECTION VIEW A-A
REV
DESCRIPTION
DATE
APPR
NOTES:
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


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 AND 6,869,528 INTERNATIONAL PATENTS AND PATENTS PENDING.
4. 60" EXTENDED DETENTION CMP STUB CAST IN TO VAULT WALL.
OUTLET PIPE
FLOW DISK WQ (DIA. VARIES)
TROLLEY
ALTERNATE DETENTION SYSTEM CONFIGURATION
ALTERNATE OUTLET CONFIGURATION
ALTERNATE INLET CONFIGURATIONS
INLET PIPE INV. AT 4.00'
ONE WAY VALVE FROM DETENTION SYSTEM
DDC 1 1GPM
PLAN VIEW
SURFACE CONTROL BAFFLE
ALTERNATE DROP INLET CONFIGURATION
(3) 30" ø FRAME AND COVERS
OUTLET CONTROL WEIR (ELEV. VARIES)
ELEV. AT 0.00'
SECTION VIEW A-A
REV
DESCRIPTION
DATE
APPR
NOTES:
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-SO-4
SYSTEM DETAILS


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 AND 6,869,528 INTERNATIONAL PATENTS AND PATENTS PENDING.
4. 60" EXTENDED DETENTION CMP STUB CAST IN TO VAULT WALL.
ALTERNATE DETENTION SYSTEM CONFIGURATIONS
72.0
11.0
TROLLEY
ONE WAY VALVE FROM DETENTION SYSTEM
FLOW DISK VQ
OUTLET PIPE INV. AT 0.00'
48.0
12.0
PLAN VIEW
INLET PIPE INV. AT 4.00'
ALTERNATE OUTLET CONFIGURATION
ALTERNATE INLET CONFIGURATIONS
(3) 30" Ø FRAME AND COVERS
78.0
30.0
Ø6.0
Ø4.0
BYPASS PIPE (ELEV. VARIES)
46.8
45.0
30.0
ALTERNATE DROP INLET CONFIGURATION
SECTION VIEW A-A
66.0
42.0
SURFACE CONTROL BAFFLE
OUTLET CONTROL WEIR
ELEV. AT 0.00'
REV
DESCRIPTION
DATE
APPR
NOTES:
BAYSAVER TECHNOLOGIES, INC.
Engineering Stormwater Solutions
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

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.

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.

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

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.

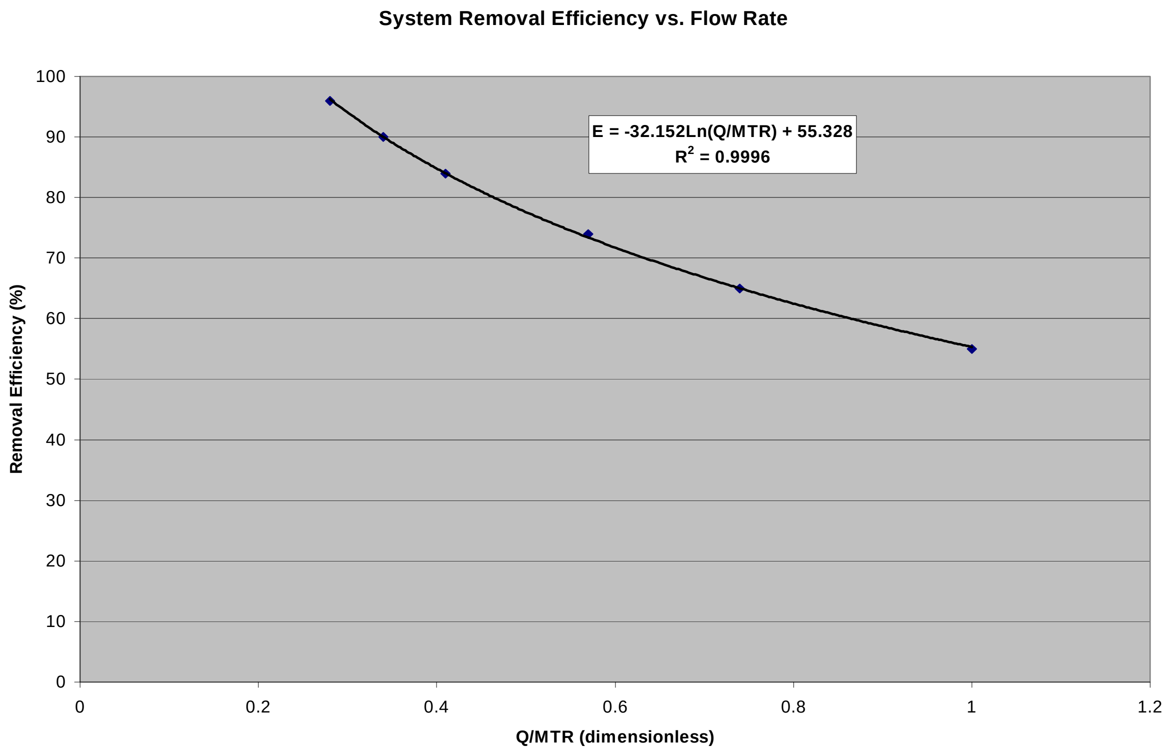


FIGURE 2: TYPICAL BAYSEPARATOR™ FUNCTION

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.

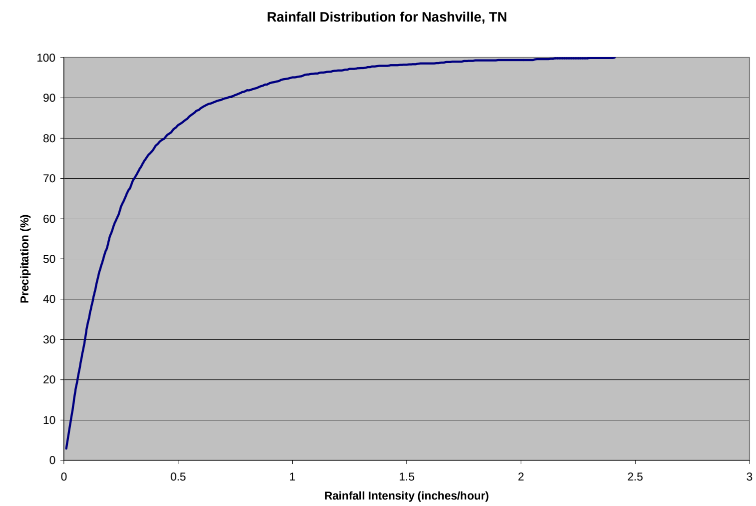


FIGURE 3: PRECIPITATION DISTRIBUTION FOR NASHVILLE, TN

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.

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

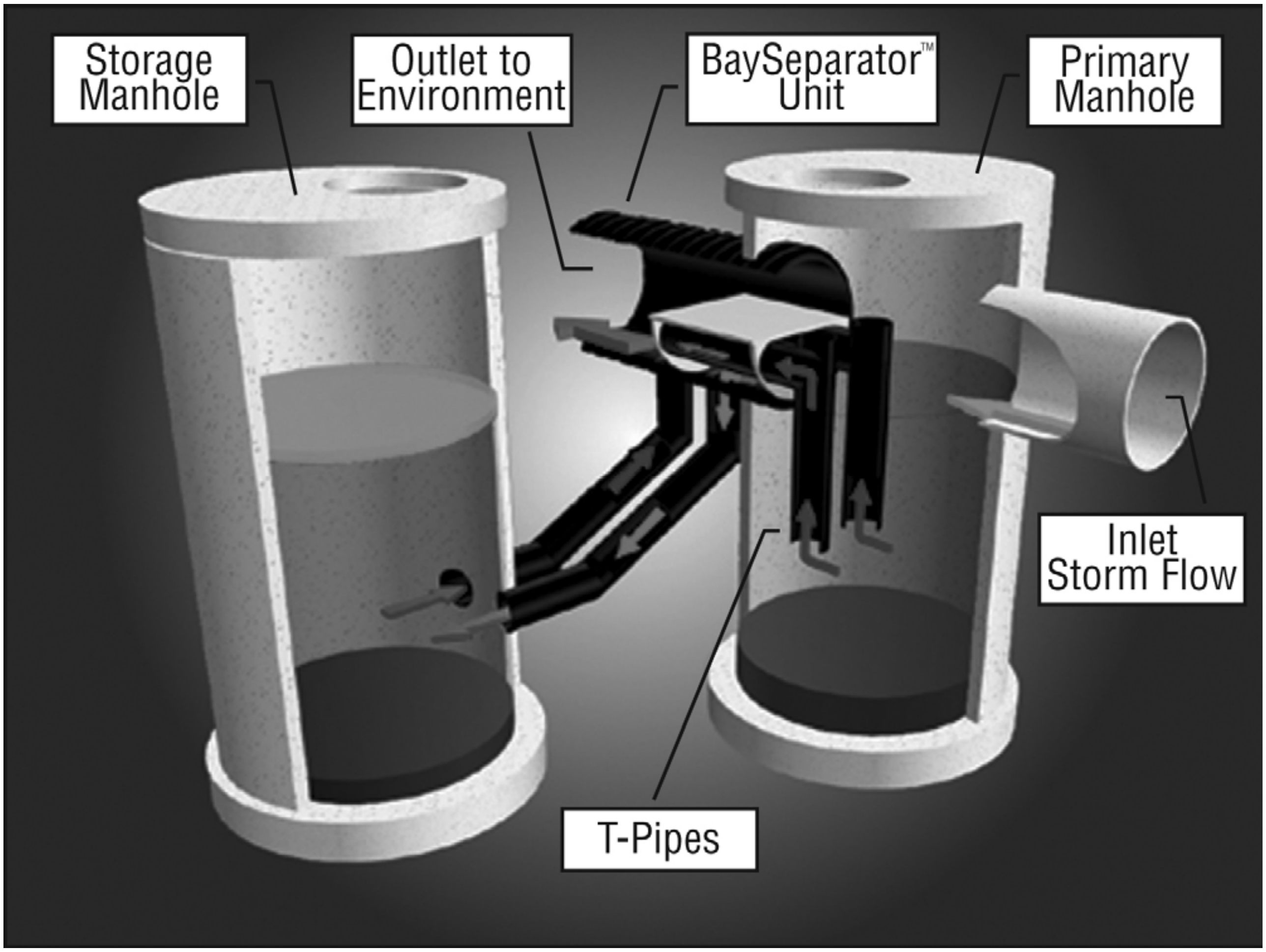


Figure 2: Testing Facility Diagram (Carlson, 2005)

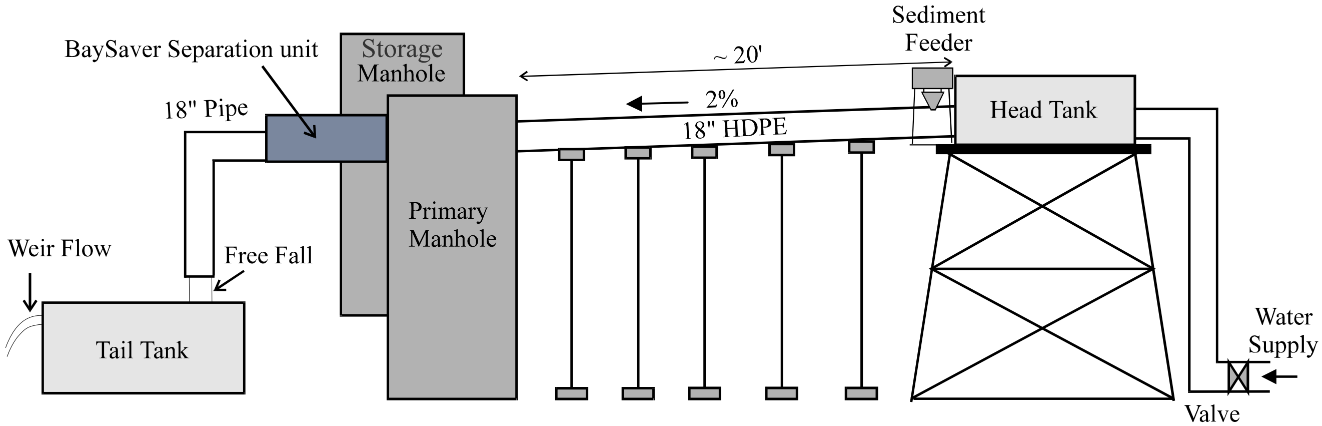
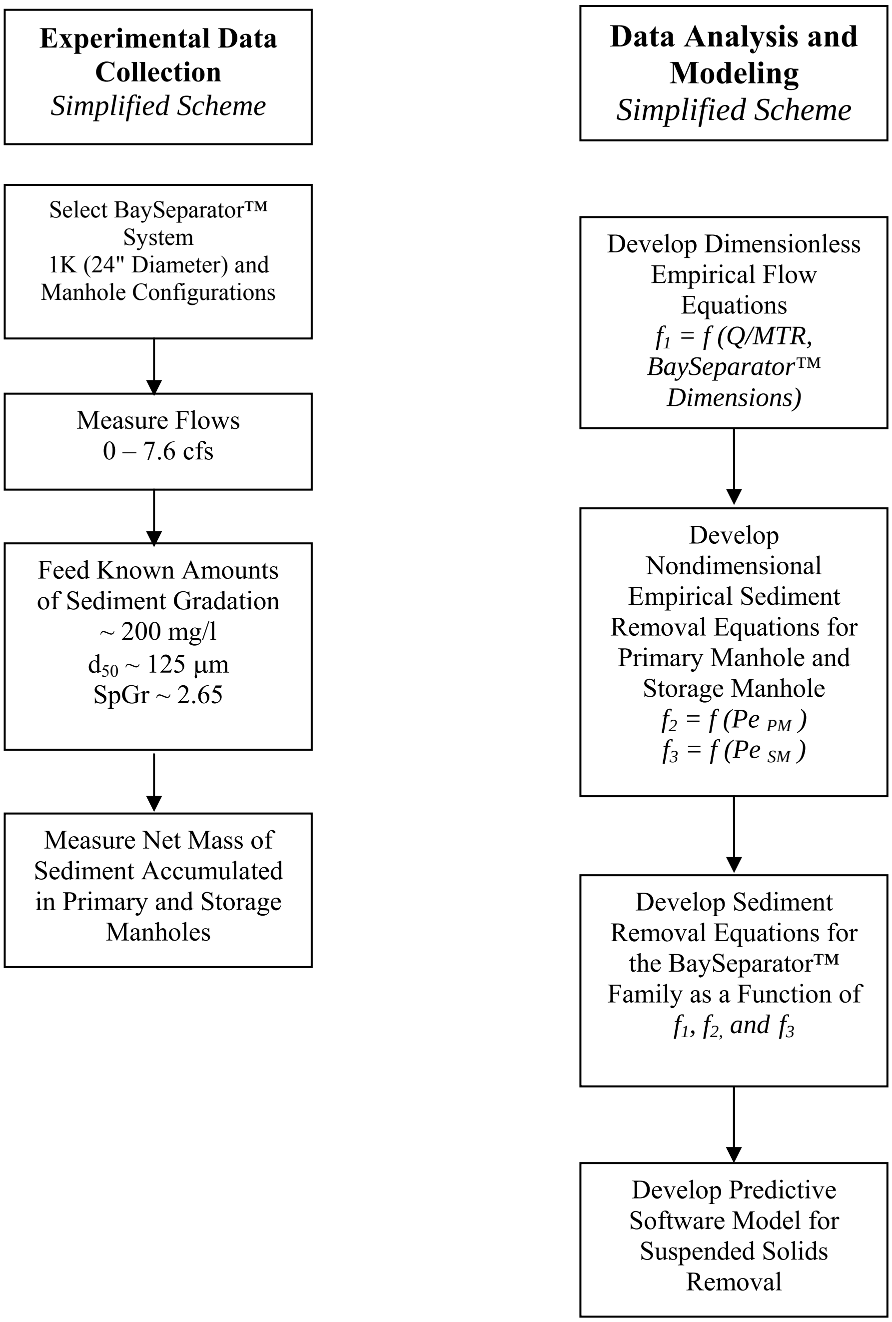


Figure 3: Simplified Experimental and Data Analysis Procedure – BaySeparator™ Modeling



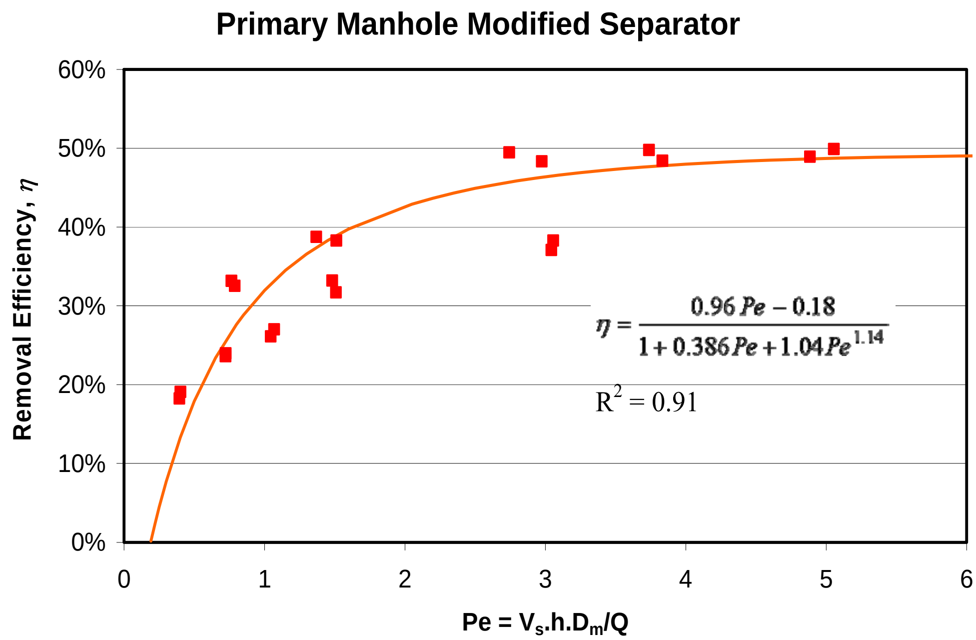


Figure 4: Measured removal efficiency of the Primary Manhole versus Peclet Number and the proposed function to describe the relationship (Carlson, 2005)

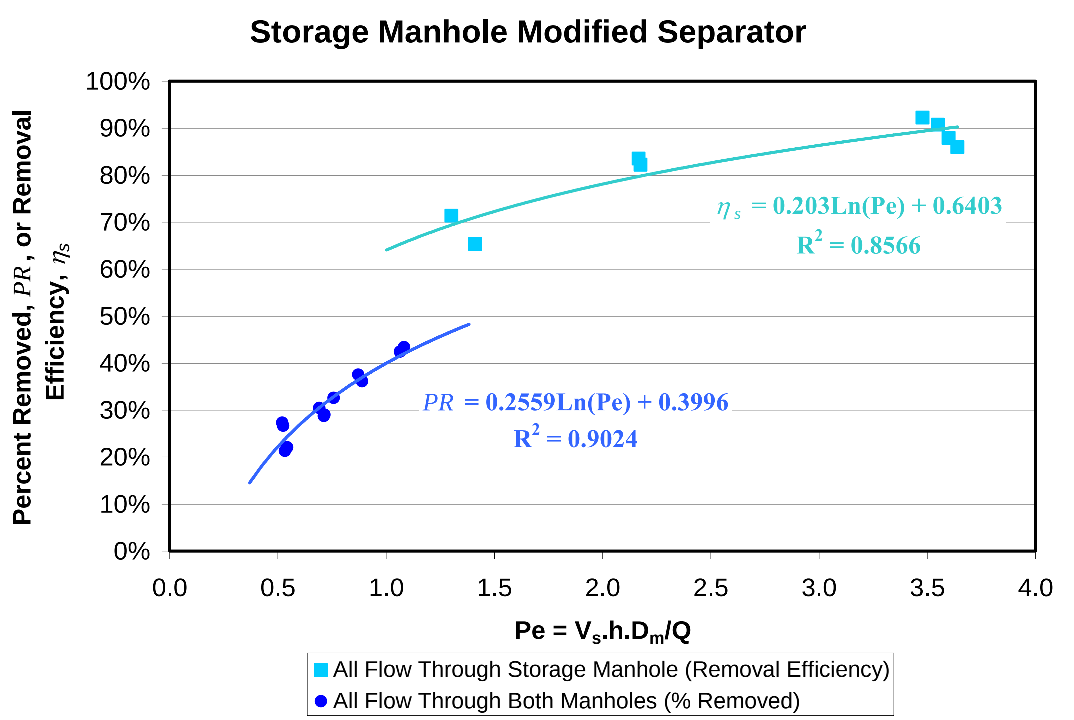


Figure 5: Measured removal efficiency and the percent removed in the Storage Manhole versus Peclet Number and the proposed functions to describe the relationships (Carlson, 2005).

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

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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:

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Appendix J

Green Roofs

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Environmental and Sustainability Management System			
Joint Base Myer-Henderson Hall Standard Operating Procedures: *Green Roofs*			
Owner: DPW EMD Stormwater Program Manager	Approved By: Chair, DPW EMD	Last revised: March 2020	Review Date: March 2020

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for maintaining green roofs. Green roofs are vegetated roof covers consisting of plants, grass and other growing media that take the place of standard roofing materials. Green roofs have many benefits, including stormwater management, general aesthetics, increased sustainability, lower energy consumption, and increased environmental biodiversity. There are three main categories of green roofs: extensive, semi-intensive and intensive. Extensive green roofs have the thinnest layer of soil, are low maintenance/self-sustaining, are lighter in weight in comparison to the other types, are the most budget friendly, and can be constructed on slopes up to 30°. Semi-intensive green roofs have a slightly thicker layer of soil than the extensive green roofs and are designed to incorporate elements from both extensive and intensive green roofs. Intensive green roofs contain a thicker layer of soil and can therefore grow a wide variety of plants, shrubs and trees. Intensive green roofs often have social spaces (including waterfalls, ponds, gazebos, recreation areas, etc.), require flat roofs, and require the most maintenance. This SOP applies to the green roof located at Fort McNair's USATA Garage, which is an extensive green roof.

Overall, green roofs are relatively low maintenance. It is necessary, however, to conduct routine inspections and maintenance to ensure that each green roof is in adequate condition and prevent future issues. Green roofs are designed using drought-resistant vegetation; however, during periods of extended drought, it may be necessary to water the green roof in order to keep it healthy. Typical care includes fertilizing, trimming and weeding. The remainder of this SOP details inspection and maintenance guidelines for green roofs.

2.0 ABBREVIATIONS AND DEFINITIONS

2.1 Abbreviations

a. BMP – Best Management Practice
b. EMD – Environmental Management Division
c. PPE – Personal Protective Equipment
d. SOP – Standard Operating Procedure

2.2 Definitions

a. *Qualified Personnel* - any inspections and maintenance activities performed on a green roof should be done by professionals who have the expertise and skills required to care for the green roofs carefully and safely.

3.0 OPERATIONAL PROCEDURES

3.1 Green Roof Inspections

a. Inspection Requirements

1. Always use trained and qualified personnel to conduct inspections, maintenance, and repairs.

b. Inspection Procedures

Complete the Inspection Form (included as Attachment 1) by examining the green roof for the following items. Take photos of any identified issues.

1. Ensure that soil is fully covered with vegetation. Note any areas of bare soil or exposed roofing material.
2. Note any weeds that are compromising the ability of other vegetation to survive.
3. Note areas of burned/dead vegetation that could signal impacts from drought.
4. Identify areas of accumulating dead leaves or similar biomass, which can present a fire hazard.
5. Inspect for standing water, clogged drains and leaks. If observed, these may indicate that the green roof is not functioning properly.

c. Inspection Supplies

1. Inspection equipment
    - Tool for removing weeds or providing the ability to more closely examine vegetation, soil, or roofing materials (bucket, gardening tools, etc.)
2. Personal Protective Equipment (PPE)
    - Gardening gloves
    - Insect Repellant
    - Sunscreen
    - Sturdy boots
    - Sunglasses (recommended)

3.2 Safety Considerations

a. Always wear insect repellant and sunscreen when working around plants and in direct sunlight.

b. Use proper lifting techniques when removing tree saplings or rooted plants to prevent back injury.

c. Use extreme caution when climbing ladders and working near the edges of the roof.

3.3 Green Roof Maintenance

a. Maintenance Procedures

1. Replant vegetation in bare areas.
2. Remove weeds, dead leaves and debris from the green roof as preventative maintenance. Tree saplings must be removed with care to prevent damage to the roof membrane from the roots.
3. If dead vegetation is observed, remove it and replace with new plants.
4. Remove any accumulating dead leaves or similar biomass.
5. If standing water, clogged drains and/or leaks are observed, repair immediately.
6. Water only when signs dead vegetation caused by drought is observed.

b. Maintenance Frequency

1. The green roof should be visually inspected, and spot weeded every 2-4 weeks from the Spring through Fall to prevent flowering and reseeding.
2. It is recommended that the green roof be fertilized annually in the spring for the first five years after installation.
3. Vegetation should be trimmed every 1-3 years to optimize plant health.

3.4 Recordkeeping Requirements

a. Complete the Green Roof Inspection and Maintenance Record (Attachment 1) during each inspection. These forms shall be maintained in the EMD files.

3.5 Responsibilities

a. EMD is responsible for coordinating inspections of green roofs.

b. DPW O&M is responsible for conducting required maintenance activities or helping to arrange for a contractor to conduct maintenance activities.

4.0 TABLES & ATTACHMENTS

Table 1: Seasonal Green Roof Maintenance

Attachment 1: Green Roof Inspection and Maintenance Record

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Table 1

Seasonal Green Roof Maintenance

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Seasonal Green Roof Maintenance – Most U.S. Regions

Plant Type	Spring	Summer	Fall
Sedums	Fertilize (April) Weed (May) Trim* (optional – May)	Weed (every 2-4 weeks) Watering (during droughts)	Weed (October)
Perennials	Trim* (March-Apr) Fertilizer (April) Replant* (if necessary)	Weed (every 2 weeks) Activate irrigation system	Weed (October) Replant* (if necessary) Winterize irrigation
Ornamental Grasses	Trim* (March-April) Fertilizer (April) Replant* (if necessary)	Weed (every 2 weeks) Set Watering Schedule (or use irrigation system)	Weed (October) Replant* (if necessary) Winterize irrigation

Trimming of grasses and perennials should be conducted early spring before new growth appears, or late fall, depending on the specific plant variety. Sedum trimming should be conducted during active growth in spring. Replanting in spring or fall will also be determined by the specific plant variety.

Retrieved from: http://www.greengridroofs.com/wp-content/uploads/2017/11/GreenGrid_Maintenance_Guide.pdf

Attachment 1

Green Roof Inspection and Maintenance Record

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ATTACHMENT 1 – GREEN ROOF INSPECTION AND MAINTENANCE RECORD

Technician(s): ________________________________

Date/Time:______________

Date of last inspection: __________________ Current weather: ___________________

Y	N	Observation	Maintenance Performed/ Maintenance Required
		Standing water, clogged drains, or other signs of leaks in the green roof	
		Visible damage observed to plants/vegetation	
		Signs of burnt plants or other visible signs of a drought	
		Areas of exposed soil or roof materials	
		Weeds, saplings, or other unwanted vegetation	
		Trash and debris are present on green roof	
		Routine maintenance has been performed in the last year	
		Other:	

Other notes (use back if necessary):

Follow-up inspection required?

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APPENDIX K

MUNICIPAL OPERATIONS - DAILY GOOD HOUSEKEEPING PROCEDURES

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Environmental and Sustainability Management System			
	Joint Base Myer-Henderson Hall Good Housekeeping Procedures: *DPW Activities*		
Owner: DPW EMD Stormwater Program Manager	Approved By: Chief, DPW-EMD	Last revised: November 2020	Review Date: November 2020

1.0 PURPOSE

These Good Housekeeping Procedures are a written guideline for performing Directorate of Public Works (DPW) activities in outdoor areas 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 and good housekeeping for facilities owned or operated by the permittee within the Joint Base Myer-Henderson Hall (JBM-HH) municipal separate storm sewer system (MS4) service area. 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 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 Part I.E.6 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 DPW Yard and Building 325, and applies to all areas of the Installation that where DPW activities occur. These procedures apply to all DPW employees and DPW contractors performing the activities described in this SOP. The DPW Yard and Building 325 are considered high-priority facilities because they serve 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 installation 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. MCM – Minimum Control Measure
d. MS4 – Municipal Separate Storm Sewer System
e. SOP – Standard Operating Procedure

3.0 OPERATIONAL PROCEDURES

3.1 Road, Street, and Parking Lot Maintenance

a. General Procedures

1. 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.
2. 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.
3. 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.
4. Schedule paving, painting, and other outdoor maintenance projects for dry weather days only.
5. When maintenance requires earth-disturbing activities, use appropriate erosion and sediment controls to prevent pollutants from entering storm drains.
6. Sweep or vacuum sediment and debris from work areas before each rain event and at the conclusion of maintenance activities.
7. Prevent discharge of wastewater and or wash water into the MS4 without proper authorization.
8. Never hose down streets, parking lots, or work areas.
9. Do not dump materials into storm drains.

b. Street Sweeping

1. Conduct sweeping of grounds, streets, and parking lots as needed to prevent debris from entering the storm drain system.
2. 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.

c. Winter Road Maintenance

1. Minimize spills by not overloading salt and sand spreading trucks and equipment.
2. Use the least amount of sand and salt necessary to achieve safe walking/driving conditions.
3. 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.
4. Sweep excess salt and sand from paved areas after the last snow.
5. Follow the guidance in **Attachment A**: Deicing Materials SOP for the use and storage of salt, sand, and salt brine.

3.2 Equipment, Vehicle, Material, and Waste Storage and Maintenance

a. Equipment and Vehicle Storage

1. 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.
2. 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.
3. Never hose down equipment and vehicles in the DPW Yard.

b. Materials Storage

1. Store materials indoors or under cover. Use secondary containment for liquids, and check for leaks regularly.
2. Material storage containers should be compatible with the contents and clearly labeled.
3. Limit quantities of stored materials to the extent possible to meet usage needs.
4. Salt and sand piles should be fully under cover. Properly push back piles and use berms to prevent contact with stormwater.
5. Place spill kits near liquid material storage areas. Ensure spill kits are adequately stocked, especially after contents are used during spill response activities.
6. Always clean up leaks and spills when they are observed. Report large spills to the Installation's Fire Department and the Environmental Management Division.
7. Never hose down spilled material in the DPW Yard.

c. Waste Storage

1. Pick up loose trash and dispose in dumpster.
2. Keep dumpster doors closed at all times.
3. Regularly check area around dumpsters for indication of leaks. Report leaking dumpsters to the disposal company identified on the dumpster. Report overfilled dumpsters.
4. Ensure proper disposal of waste materials, including but not limited to landscape wastes.
5. Contact Mark Luckers at 703-696-2012 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.
6. Always clean up leaks and spills when they are observed. Report large spills to the Installation's Fire Department and the Environmental Management Division.

3.3 Application, Storage, Transport, and Disposal of Pesticides

a. Materials such as fertilizers and pesticides should be applied according to manufacturer's recommendations. When not in use, materials should be stored indoors or under covers, and materials should be disposed of in the proper manner.

3.4 Illicit Discharge Detection and Prevention

a. Illicit discharges are discharges to storm drains not composed entirely of rainwater or snowmelt and that are not allowable under the MS4 permit. Allowable discharges include, but are not limited to, discharges from firefighting activities, hydrant and potable water line flushings, uncontaminated groundwater or spring water, and irrigation water from landscape watering.

b. Prevent illicit discharges by observing practices described in this SOP. Do not allow anything other than rain or snowmelt to be discharged to storm drains.

c. Immediately report any unintentional or suspected illicit discharges to EMD.

3.5 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.

Attachment A

Deicing Materials Standard Operating Procedure

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Environmental and Sustainability Management System

Joint Base Myer-Henderson Hall Standard Operating Procedures: *Deicing Materials*

Owner:	Approved By:	Last Revised:	Review Date:
EMD Stormwater Program Manager	Chief, DPW-EMD Date:	December 2017	December 2017

1.0 PURPOSE

This Standard Operating Procedure (SOP) is a guideline for the use of deicing materials, including salt, sand, and salt brine, during winter control operations. Proper storage and use of deicing materials is a component of 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 designed to minimize or prevent pollutant discharges from municipal operations, including the following:

- Daily operations such as road, street, and parking lot maintenance;
- Equipment maintenance; and
- Application, storage, transport, and disposal of pesticides, herbicides, and fertilizers

This SOP serves as a written guideline for winter operations personnel on how to use road salt in a manner that minimizes potential environmental impacts while maintaining safe and passable roadways during winter storms. Salt is the most commonly used snow and ice control material because it is effective, inexpensive, easily stored, and readily available. However, when dissolved into sodium and chloride ions and carried away via runoff, salt can contaminate and disrupt water quality, human health, wildlife, aquatic life, vegetation, and soil quality. Because salt and other deicing materials can have such negative environmental impacts, it is critical for Installation staff to understand how to properly use salt, from its storage and handling, to its application on roadways, to post-storm cleanup operations.

The application of sand on roadways and sidewalks can have negative impacts on the environment, as well. Sand in runoff can accumulate in waterways and clog spaces between rocks that aquatic species rely on for habitat. This, in turn, can negatively impact the overall health of a body of water and the humans and animals that rely on the water.

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. SOP – Standard Operating Procedure
e. DLA – Direct Liquid Application

2.2 Definitions

a. *Anti-icing* – a proactive winter maintenance strategy of applying salt or salt brine to roadways to prevent snow or ice from bonding to pavement.

b. *Deicing* – a reactive strategy of breaking a snow/ice bond to pavement after it has formed.

c. *Direct liquid application (DLA)* – a control method used when snow/ice has already accumulated on a roadway surface.

d. *Passable roadway* – a roadway surface that is free from snow drifts, snow ridges, and as much ice and snow as is practical that can be traveled safely at a reasonable speed for the condition.

e. *Salt brine* – liquid sodium chloride; used primarily in anti-icing operations via DLA, but also used to pre-wet granular salt for deicing operations to reduce bounce and scatter. Effective down to -6° F.

3.0 OPERATIONAL PROCEDURES

3.1 Material Storage and Handling

a. Salt/sand should be stored in covered structures.

b. Place straw bales, aggregates, or wooden gates at structures' entrance to prevent salt leaching.

c. Immediately gather salt/sand spilled near structures during loading/unloading. Return unused material to the appropriate storage structure.

d. Do not overload trucks, and always travel at a safe speed for optimum performance and safety, in order to avoid salt/sand spillage and to keep it out of roadside ditches.

e. Cover your salt/sand load to avoid unnecessary loss of material when traveling.

f. Salt Storage

1. Store salt in the salt shed located in the Building 447 Yard. The shed should be well-maintained, with no holes in the roof and a tarp covering the salt at the front when enclosed salt pile is not in active use. Any salt that cannot be stored in the shed should be stored covered in a permanent structure.
2. Identify potential problems during routine operations/periodic inspections, such as holes in the roof, deteriorating tarp, or leaching salt.
3. Perform maintenance on the structure in the off-season.
4. If permanent structures are cost-prohibitive, store salt on an impervious surface and cover with a secure tarp.
5. Liquid deicers should be stored in the salt brine tank located at Building 325. The tank must be well-maintained and properly labeled with the contents. Regularly check tanks for bulging, expansion, leaking, or dripping and correct any findings as soon as possible.

g. Sand

1. Store sand in the covered bay located in the Building 447 Yard. Sand stored in the bay should be positioned well-enough within the bay to remain under cover and prevent stormwater contact.
2. Inspect the area regularly for sand being tracked out from under the cover. Promptly sweep up and move sand further under cover when necessary.

3.2 Equipment Cleaning and Maintenance

a. Calibrate all salt spreading equipment prior to the start of the winter season, and periodically check its accuracy during the season.

b. Equip dump trucks with well-maintained front plows that can mechanically remove as much snow as possible.

c. Equip dump trucks with well-maintained salt spreaders/spinners that can apply an appropriate amount of salt on roads in an effective pattern, in order to reduce material waste.

d. Using other specialty equipment for snow removal when applicable can reduce overall salt usage.

1. Use snow blowers to remove a heavy buildup of snow from road shoulders.
2. Front end loaders are effective in removing heavy buildup where plows are not effective, e.g. from residential streets with parking on both sides.

e. Clean snow plows and trucks as soon as possible after operations are complete. Whenever possible, use dry cleaning methods to remove accumulated salt and sand and return material to the salt shed. Avoid hosing off equipment and allowing wastewater to discharge to the storm drain system.

f. Clean salt spreaders and plow blades in a manner whereby wastewater does not discharge into the storm drain system.

g. Return all unused salt to a storage facility. Do not spread salt to get rid of it.

3.3 Winter Storm Management: Planning, Execution, and Review

a. A key component of effective winter storm management is good weather and pavement condition forecasting.
    1. Consult multiple weather services (regional and local) in order to obtain all pieces of information needed (approximate starting times, snowfall amounts over generalized areas, localized forecasts, pavement temperature, etc.).

b. Pre-storm planning equates to better performance during a storm, including more efficient salt usage.
    1. Conduct resource planning well in advance to the forecasted start of a storm:
        i. Personnel should report to their shops or garages with enough time to thoroughly inspect plow trucks and make minor repairs.
        ii. All major repairs should be addressed prior to the season’s start, or immediately after the end of the previous storm.
        iii. Perform anti-icing operations, if appropriate for the storm. In general, anti-icing operations are more effective and less resource intensive than deicing operations.

3.4 Anti-Icing Operations

a. The primary goal of anti-icing is to prevent snow and ice from bonding to a roadway, allowing for more effective plowing operations during the event, reduced salt usage, and increased motorist safety.

b. Anti-icing can be accomplished by:
    1. Applying a material, usually salt brine or other liquid, to roadways 2 to 48 hours prior to the onset of frozen precipitation.
    2. Applying pre-wetted salt on roadways immediately before the onset of precipitation.
    3. Applying salt as snow is first starting to accumulate.

c. Anti-icing operations are generally not recommended if a winter storm is forecasted to begin with rain or if pavement temperatures are forecasted to be 15° or colder at the onset of the storm.

d. Anti-icing may not be necessary if salt residue is already present on roadways from a recent winter storm.

3.5 Winter Storm Operations

a. In all cases, plowing should be the primary tool for snow removal, with only enough salt and/or salt brine applied or re-applied to prevent a bond from forming.

b. Begin deicing operations as early as possible once a storm begins and precipitation starts to accumulate on roadway surfaces:

    1. For a winter storm beginning with light snowfall, apply a light coat of pre-wetted granular salt or salt brine. For winter storms with moderate snowfall, adjust application accordingly.
    2. As the initial application of salt loses effectiveness and snow continues to build on roadways, begin plowing operations. Reapply just enough salt or brine to keep subsequent snowfall from bonding to the pavement.
    3. If pavement temperatures are very cold, always pre-wet granular salt with a liquid deicer to increase its effectiveness.

c. Do not salt roads that have already been salted.

d. Sand can be applied in conjunction with salt to provide traction for vehicles and pedestrians. Sand may be especially useful on steeper slopes or in areas that have already iced over.

3.6 Severe Winter Storms

a. During heavy accumulation, limit salt applications and concentrate on plowing operations. Plow trucks should still spread a small amount of salt/brine to prevent snow from packing; however, emphasis should remain on continuous plowing.

b. The best treatment for freezing rain is to pre-treat and reapply salt brine. Ensure salt brine is applied and remains on the roadway at all times during the storm to prevent ice formation.

c. During storms with freezing rain or very cold pavement temperatures when salt becomes less effective, consider using a mix of salt and abrasives (sand) to reduce salt usage and still provide a level of safety. However, abrasives can clog drainage structures and contribute to air pollution, and may require post-storm cleanup operations.

d. Provide adequate rest for employees during severe storms. This allows operators to make good choices while plowing and salting. An appropriately rested workforce should translate into effective salt management.

5.0 FIGURES

Figure 1: Improper Salt Storage – Salt shed should have tarp and barriers at entrance when pile is not actively in use

Figure 2: Proper Salt Storage

Figure 3: Improper Sand Storage – Sand should be swept up and exposed pile covered, stored further under cover or inventory reduced

Figure 4: Proper Sand Storage – Sand stored further under cover

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APPENDIX L

NUTRIENT MANAGEMENT PLAN

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

REPLY TO
ATTENTION OF

IMMH-PWE 18 November 2020

MEMORANDUM FOR RECORD

SUBJECT: Nutrient Management Plan

JBM-HH's Municipal Separate Storm Sewer System (MS4) General Permit requires MS4 operators to "maintain and implement turf and landscape nutrient management plans on all lands owned or operated by the permittee where nutrients are applied to a contiguous area greater than one acre."

Turf and landscaped areas at JBM-HH 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 approximately 9 acres and is used for ceremonies, parades, and other activities. The coordinates for this area are: N38.881746, E-77.081838. According to DPW Grounds Maintenance Division, nutrients are not applied. The need for a nutrient management plan will be periodically reviewed and evaluated, and if a plan is required it will be prepared and inserted as Appendix J in JBM-HH's MS4 Program Plan.

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RICHARD P. LAFRENIERE
Chief
Environmental Management Division, DPW

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