

**NATIONAL POLLUTANT DISCHARGE
ELIMINATION SYSTEM**
Municipal Separate Storm Sewer System Discharge Permit
Permit Number MD0068306

2012 ANNUAL REPORT



**Anne Arundel County
Department of Public Works
2662 Riva Road
Annapolis, Maryland 21401**

September 2, 2013

2012 Annual Report for
Anne Arundel County
Storm Water National Pollutant
Discharge Elimination System

Permit Number MD0068306

Submitted to:

Water Management Administration
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

September 2013



Submitted by:
Anne Arundel County
Department of Public Works
2662 Riva Road
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Prepared by:



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I. PURPOSE AND SCOPE

This Annual Report was assembled to detail the activities in Anne Arundel County from November 2011 through September 2012 that demonstrate compliance with the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit terms provided by 40 CFR 122.42(c). It describes the components of the stormwater management program, the implementation status, and proposed revisions to the program.

This report also summarizes the monitoring programs implemented by Anne Arundel County, including data collection and analysis. Digital data and specific reports for the major programs conducted during the reporting term can be found within the Appendices.

The current permit expired on November 8, 2009. Negotiations of terms for the next MS4 permit are underway. Until the next permit is issued, Anne Arundel County is continuing to comply with the previous permit. However, digital data, where applicable, have been provided in the updated format contained within Attachment A of the draft permit, unless specified otherwise. This was done to assist in the transition to the new permit terms.

II. IMPLEMENTATION STATUS – STORMWATER MANAGEMENT PROGRAM

Anne Arundel County has developed a detailed stormwater management program to address the requirements outlined in the County's NPDES MS4 permit. The major components of the stormwater program were not changed during the 2012 reporting year. These nine major stormwater management program areas were designed to meet the NPDES MS4 permit requirements and improve water quality within the County's waterways. These program areas include:

- Watershed Master Planning;
- Infrastructure Inventory;
- Monitoring;
- Preventative Maintenance;
- Illicit Connection Detection and Elimination;
- Illegal Dumping and Spills;
- Erosion and Sediment Control;
- Public Education and Outreach; and
- Reduction of Pollution from Road Maintenance.

The County feels the above programs address the major water quality concerns within County watersheds. Monitoring efforts have shown that the implementation of these programs results in the improvement of water quality, which motivates the County to continue its dedication to these programs. Efforts in the nine program areas during the reporting period are addressed under the appropriate permit conditions in **Part III** of this report.

III. STANDARD PERMIT CONDITIONS

A. Permit Administration

Anne Arundel County shall designate an individual to act as a liaison with the Maryland Department of the Environment (MDE) and provide the coordinator's name, title, address, phone number, and email address. Additionally, the County shall submit to MDE an organizational chart detailing personnel and groups responsible for major NPDES program tasks. MDE shall be notified promptly and in subsequent annual reports of any changes in personnel or organization relative to NPDES program tasks.

Status:

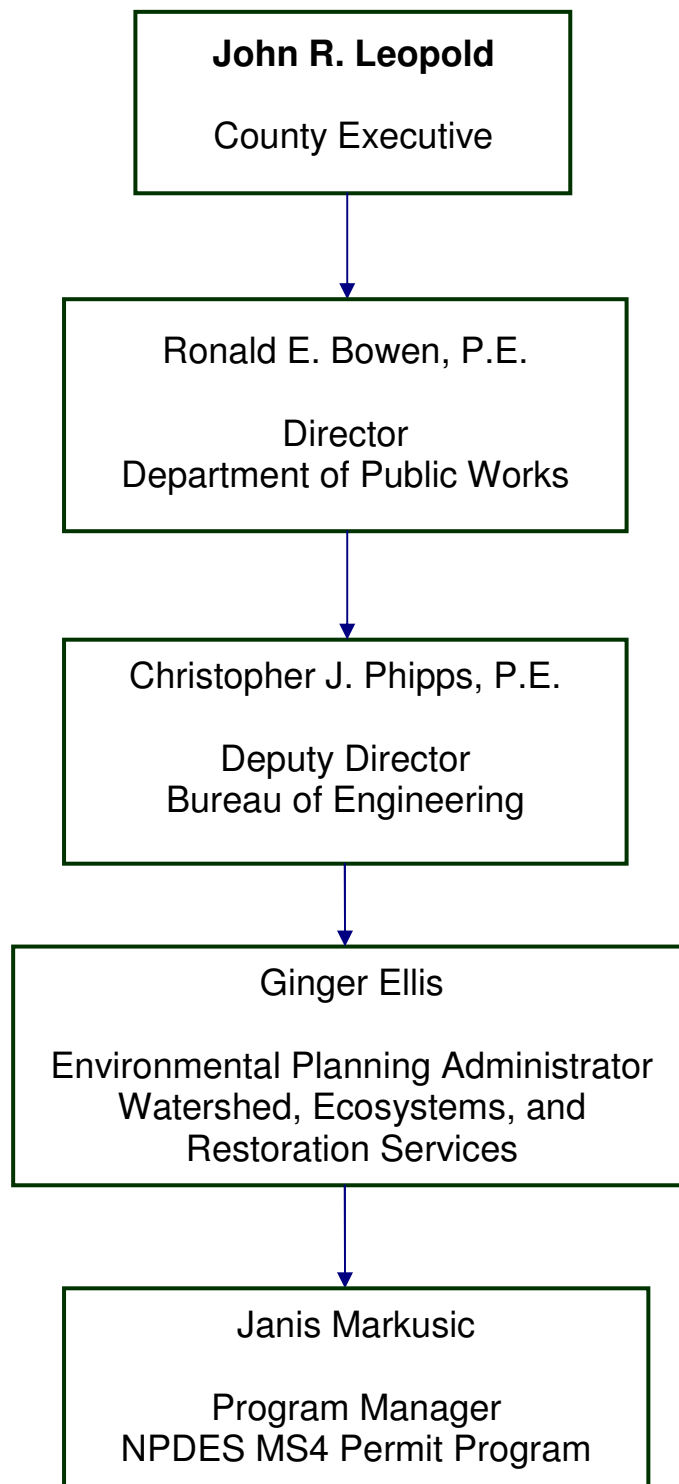
Coordination of Anne Arundel County's NPDES MS4 permit was performed by the Department of Public Works (DPW), Watersheds, Ecosystems, and Restoration Services for the 2012 reporting year. The program coordinators for this reporting year are:

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Figure 1 shows the organizational chart for the 2012 reporting year.

Figure 1. Organization Chart for NPDES Permit Administration (2012)



Additional County staff members responsible for projects related to compliance with the NPDES MS4 Permit are listed below.

Department of Public Works:

- Doug Burkhardt, Engineer Manager
Bureau of Engineering, Technical Engineering
Provides managerial support and oversight for geographic information systems (GIS) data collection and geodatabase development activities associated with urban best management practices and storm drain system records.
- Ramzi Bannura, Program Manager
Bureau of Highways, Infrastructure Management Division
Programs and maintains GIS databases for the closed storm drain system, associated infrastructure databases, and the County's roads inventory.
- Darryl Hockstra, Engineer Manager
Bureau of Highways, Infrastructure Management Division
Administers the Infrastructure Management Division and oversees the capital program associated with stormwater management pond inspection and repair, emergency storm drain and stormwater system inspection and repair.
- Andy Watcher, Engineer III
Bureau of Highways, Infrastructure Management Division
Inspects publicly owned storm drain infrastructure and manages storm drain system and structure repairs.
- Rich Olsen, Program Specialist II
Bureau of Highways, Infrastructure Management Division
Inspects and maintains a subset of urban stormwater best management practices (BMPs) that are the responsibility of the Department of Public Works.
- Alex Baquie, Assistant Chief Road Operations
Bureau of Highways, Road Operation Division
Administers the County's Road Operation Division; maintains the Bureau's permit coverage under the MDE General Permit No. 02-SW (General Discharge Permit for Stormwater Associated with Industrial Activity); develops and implements Stormwater Pollution Prevention Plans (SWPPPs) associated with Road Operations district yard facilities; documents the use of pesticides, herbicides, fertilizers, and de-icing materials associated with road maintenance activities; and implements the County's street sweeping and inlet cleaning programs.
- Hala Flores, Program Manager
Bureau of Engineering, Watershed, Ecosystem & Restoration Services
Administers the Watershed Assessment Program; manages watershed assessment contracts; coordinates data, tracking and reporting of impervious surface reduction

and pollutant load credit in support of the County's Phase II Watershed Implementation Plan (WIP) and the NPDES MS4 Permit requirements. Provides managerial oversight to staff regarding the development and updating of certain GIS layers (land cover and impervious surfaces) used for water quality models.

- Rick Fisher, Senior Engineer
Bureau of Engineering, Watershed, Ecosystem & Restoration Services
Manages the technical engineering and water quality models in support of NPDES MS4 Permit activities and the County's Phase II WIP; manages the County's impervious surface and land cover GIS layers; and documents the locations and descriptions of watershed restoration projects.
- Jeff Cox, Engineer III
Bureau of Engineering, Watershed, Ecosystem & Restoration Services
Maintains, updates, and provides quality control of GIS data layers (e.g., impervious surfaces, land cover) that support the engineering and water quality models utilized for supporting NPDES activities.
- Ken Pensyl, Engineer III
Bureau of Engineering, Watershed, Ecosystem & Restoration Services
Manages design and construction of watershed restoration projects.
- Dennis McMonigle, Engineer III
Bureau of Engineering, Watershed, Ecosystem & Restoration Services
Manages design and construction of watershed restoration projects.
- Ken Weeks, Engineer III
Bureau of Engineering, Watershed, Ecosystem & Restoration Services
Manages design and construction of watershed restoration projects.
- Chris Victoria, Planner II
Bureau of Engineering, Watershed, Ecosystem & Restoration Services
Provides consultant oversight for stormwater monitoring, biological monitoring, and geomorphic assessment of County stream reaches including those identified in Part H. Assessment of Controls. Assists Program Manager with implementation of the Illicit Discharge Detection and Elimination (IDDE) Program.
- Noelle Anuszkiewicz
Bureau of Utility Operations
Responsible for maintaining the Utilities Operations facilities' permit coverage under the MDE General Permit No. 02-SW (General Discharge Permit for Stormwater Associated with Industrial Activity) and the development/implementation of SWPPPs associated with Water Reclamation Facilities.

- Rhody Holthaus
Bureau of Waste Management Services
Responsible for maintaining the Waste Management Services facilities' permit coverage under the MDE General Permit No. 02-SW (General Discharge Permit for Stormwater Associated with Industrial Activity), and for the development and implementation of SWPPPs associated with the County's three landfill facilities.

Office of Planning & Zoning:

- Chris Soldano, Assistant Planning & Zoning Officer
Development Division
Oversees components of the County's Stormwater Management Program to ensure consistency with State requirements, including the updating of County stormwater legislation and of the County's Stormwater Practices and Procedures Manual.
- Elizabeth Burton, Chief Engineer
Development Division
Oversees the review of stormwater management on new development and redevelopment projects.

Department of Inspections & Permits:

- John Peacock, Chief of Environmental Enforcement
Environmental Programs
Administers the County's Stormwater Management Program and the County's Erosion and Sediment Control Program to ensure compliance with State regulations. Tracks, inspects, and enforces all permits for private and public stormwater management BMPs related to new development and redevelopment projects. Oversees triennial inspection of stormwater BMPs. Tracks development projects disturbing more than one acre and reports this information to MDE as required by the Program and the NPDES MS4 Permit. Oversees staff who respond to County Environmental Compliance Hotline and provides follow-up enforcement for IDDE Program.

Anne Arundel Soil Conservation District:

- Vernon Murray, Inspector
Coordinates and conducts the "responsible personnel certification" classes.

B. Legal Authority

Adequate legal authority shall be maintained in accordance with NPDES regulations 40 CFR 122.26(d)(2)(i) throughout the term of this permit. In the event that any provision of its legal authority is found to be invalid, the County shall make the necessary changes to maintain adequate legal authority.

Status:

Anne Arundel County maintained the authority to comply with the terms of this permit, which included implementation of the 2000 Maryland Stormwater Design Manual, under Article 21 of the County Code until 2005. MDE conducted a review of the County's stormwater program in the summer of 2005, and found the County's legal authority to be acceptable.

In late 2005, the County Code was revised, and authority for the County's stormwater management and erosion and sediment control programs were placed under Article 16. These revisions were not reviewed by MDE; however, adequate legal authority was maintained.

Following these revisions, the County began a review of the existing Code to determine what revisions were required to maintain continued authority. After the passage of the 2007 Stormwater Management Act, the County prepared changes to Articles 16, 17, and 18 of the County Code, included implementation of the revised MDE Stormwater Design Manual into the County Code, and submitted the new documents to MDE for review in September 2009. Several drafts of the revisions were submitted to MDE to address comments.

Revised Article 16 contains the stormwater management program and erosion and sediment control regulations. Article 17 contains the subdivision and development requirements. Article 18 contains the zoning regulations. After a public hearing was held on August 2, 2010, revised Articles 16, 17, and 18 became effective in November 2010. A copy of the final approved Bill and other documentation were provided with last year's report.

The County Stormwater Management Practices and Procedures Manual was updated and became effective on November 22, 2010. The Practices and Procedures Manual and revised Articles 16, 17, and 18 were subsequently submitted to MDE for review. A letter was received from MDE in September 2011 stating that Article 16 and the County Stormwater Management Practices and Procedures Manual have been approved.

The entire County Code, including Article 16, can be found online through the County website at <http://www.aacounty.org/CountyCode/index.cfm>, under the link for the County Code.

C. Source Identification

Sources of pollutants in stormwater runoff shall be identified and linked to specific water quality impacts on a watershed basis. This process shall be used to develop watershed restoration plans that effectively improve water quality. The following information shall be submitted in geographic information system (GIS) format with associated tables as required in PART IV of this permit. All information shall be submitted annually except where noted:

1. ***Storm Drain System:*** *major outfalls, inlets, and associated drainage areas. In the first annual report, a schedule shall be provided for completing drainage areas to the storm drain system;*

Status:

In 2008, Anne Arundel County completed its County-wide inventory of storm drain inlets, manholes, outfalls, culverts, and pipes for all County watersheds. In 2012, the County continued to capture updates for incorporation into the County storm drain maps and the County Geographic Information System (GIS). Furthermore, the County continues to populate the drainage area information for the County outfalls following the watershed study schedule as presented in **Part III.F** of this permit. To maintain accuracy of the closed storm drain system mapping, the County has been conducting a re-inspection of the County-wide system on a regular basis. The storm drain inlet and outfall database was prepared in the format required by MDE and is included in **Appendix A**.

The County is able to identify which storm drain structures are outfalls by querying the GIS for structures with no hydraulic connection to any other structure downstream. The County then focuses on these discharge points for delineation of contributing drainage area. As of October 2012, there are a total of 5,373 closed storm drain outfalls in the County. As reported previously, the County has the ability to delineate drainage areas and assess hydrologic conditions at any storm drain outfall within the County. Currently, delineation of drainage areas to all storm outfalls within eight of the twelve County watersheds (Severn, South, Upper Patuxent, Magothy, Patapsco Non-tidal, Patapsco Tidal, Bodkin Creek, and Little Patuxent) has been completed. This drainage area coverage constitutes 4,233 structures out of the total 5,373 closed storm drain outfalls.

As of October 2012, there are 1,396 major outfalls in the County. According to 40 CFR 122.26, a major municipal separate storm drain outfall is defined as an outfall pipe with an internal diameter of 36 inches or greater or an outfall pipe with an internal diameter of 12 inches or greater that receives storm water from industrially zoned lands.

In addition to these outfalls, as of October 2012, there are 34,006 storm drain inlets in the County.

In 2010, the County completed the delineation of drainage areas to all outfalls within the Little Patuxent Watersheds. Mapping showing these outfalls and their drainage areas was submitted with the previous Annual Report. A GIS layer containing outfalls and the drainage areas for the Severn, South, Magothy, Upper Patuxent River, Patapsco Non-tidal, Patapsco Tidal, and Bodkin Creek Watersheds was provided in the 2007, 2008, and 2009 reports. The GIS layer will be reviewed and updated on an annual basis, and as a result of re-inspections, to reflect future development and retrofits.

The County will continue to develop drainage areas for outfalls as the watershed assessments are completed. In calendar year 2013, the County will begin drainage area delineation efforts for the West and Rhode Rivers watersheds with the Herring Bay watershed following shortly thereafter.

2. **Urban Best Management Practices (BMP):** *stormwater management facility data including locations and delineated drainage areas;*

Status:

Anne Arundel County Department of Inspections & Permits (I&P) maintains the Urban BMP Database, which contains information related to all stormwater management BMPs subject to inspection by the County.

The Urban BMP Database provided in **Appendix A** reflects the on-going effort to improve the quality of Anne Arundel County's BMP data. The total number of BMP records has increased from 11,862 in 2011 to 12,891 in 2012; however, not all of these records were included in the 2012 data submittal. For the 2012 reporting year, the County revisited the entire Urban BMP database for the purpose of reconfirming that structures/practices reported annually had been constructed. To that end, records previously submitted for which a built date could not be determined were subsequently removed from the 2012 data submission. Additionally, recent database records for facilities that have received grading permit approval but are not yet constructed were also removed from the 2012 data submission. The end result being only those Urban BMPs that are known to have been constructed (10,294 records) are included in the 2012 annual report submittal. The County will continue to review and revise, as needed, the Urban BMP database records throughout the 2013 permit year and beyond. To comply with the latest released version of Attachment A of the upcoming Permit, the County has also been correlating the structure types listed in the Manual with the new and updated structure types within the database.

In order to assess the pollutant removal benefits associated with the Urban BMPs, the County has researched and assembled average pollutant removal efficiencies associated with all BMP types in the Urban BMP database. This research was conducted as part of the watershed assessment and planning efforts and relied primarily on best available information from multiple studies and published efficiencies within the EPA's online NPDES Urban BMP performance tool. Table 1 depicts the Anne Arundel County BMP structure types in the Urban BMP database, the corresponding MDE BMP code per the NPDES permit requirements, and the average pollutant removal efficiencies for each BMP type.

BMP information, derived from the Urban BMP Database and stored within the County's Watershed Management Tool (WMT), continues to be used for watershed runoff and pollutant load modeling, stream and subwatershed restoration prioritization, controlled and uncontrolled impervious calculations, and other NPDES/TMDL reporting purposes. It should be noted that the smallest pollutant load modeling area selected by the County is the subwatershed boundary. At this scale, a BMP drainage area GIS file is not needed to assess the BMP pollutant removal benefit, rather the individual BMP treatment acres in the database were aggregated to the subwatershed level and the results were used to reduce the total pollutant loading for the subwatershed. Nevertheless, the County will continue to develop the comprehensive BMP drainage area delineation file in GIS.

Table 1. Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
DP	Detention Structure (Dry Pond)	5	10	9	10	10	10	0	10	10	Detention Dry	DP
UGVAULT	Underground Storage	5	10	-2	29	29	29	50	10	29	Detention Dry	UGS
BS	BaySaver	5	10	-2	29	29	29	50	10	29	Detention Dry	BS
OGS	Oil-Grit Separator	5	10	-2	29	29	29	50	10	29	Detention Dry	OGS
WQINLET	Water Quality Inlet	5	10	-2	29	29	29	50	10	29	Detention Dry	OGS
STMCEPTOR	Stormceptor	5	10	-2	29	29	29	50	10	29	Detention Dry	SC
SC	Stormceptor	5	10	-2	29	29	29	50	10	29	Detention Dry	SC
Pretreatment	Pretreatment	5	10	-2	29	29	29	50	10	29	Detention Dry	SC
UGS	Underground Storage	5	10	-2	29	29	29	50	10	29	Detention Dry	UGS
ED	Extended Detention	20	20	-2	29	29	29	50	60	29	Extended Detention Dry	ED
EDSD	Extended Detention Structure Dry	20	20	-2	29	29	29	50	60	29	Extended Detention Dry	EDSD
MB	Microbasin - Extended Detention Structure Dry	20	20	-2	29	29	29	50	60	29	Extended Detention Dry	EDSD
O-1	Dry Swale	40	60	0	35	35	35	0	80	35	Filtration	SW
O-2	Wet Swale	40	60	0	35	35	35	0	80	35	Filtration	SW

Table 1. Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
ASCD	Attenuation Swale/Check Dam	40	60	0	35	35	35	0	80	35	Filtration	CD
F-1	Surface sand filter	40	60	0	35	35	35	0	80	35	Filtration	SF
F-2	Underground sand filter	40	60	0	35	35	35	0	80	35	Filtration	SF
F-3	Perimeter sand filter	40	60	0	35	35	35	0	80	35	Filtration	SF
F-4	Organic filter	40	60	0	35	35	35	0	80	35	Filtration	BIO
F-5	Pocket Sand Filter	40	60	0	35	35	35	0	80	35	Filtration	SF
F-6	Bioretention Facility	40	60	0	35	35	35	0	80	35	Filtration	BIO
SF	Sand Filter	40	60	0	35	35	35	0	80	35	Filtration	SF
ATTENSWA	Attenuation Swale	40	60	0	35	35	35	0	80	35	Filtration	AS
AS	Attenuation Swale	40	60	0	35	35	35	0	80	35	Filtration	AS
SW	Grass Swale	40	60	0	35	35	35	0	80	35	Filtration	SW
POSAND	Pocket Sand Filter	40	60	0	60	60	60	80	80	60	Filtration	SF
C2/ rain gardens	Rain Gardens	40	60	0	60	60	60	80	80	60	Filtration	BIO
VB	Vegetated Buffer	40	60	0	60	60	60	80	80	60	Filtration	VB

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AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
BIO	Bioretention Facility	40	60	0	85	85	85	90	80	85	Filtration	BIO
SPSC	Regenerative Step Pool Storm Conveyance	40	60	0	85	85	85	90	80	85	Filtration	ESDMB
R	Regenerative Step Pool Storm Conveyance	40	60	0	85	85	85	90	80	85	Filtration	ESDMB
GBMP	Bioretention Facility	40	60	0	85	85	85	90	80	85	Filtration	BR
ATTTRENCH	Attenuation Trench	80	85	0	0	0	0	0	95	0	Infiltration	DW
DW	Dry Well	80	85	82	30	21	21	90	95	24	Infiltration	DW
DWIT	Dry Well - Infiltration Trench	80	85	82	30	21	21	90	95	24	Infiltration	DW
DWITCE	Dry Well - Infiltration Trench with Complete Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	DW
DWITCE-2	Dry Well - Infiltration Trench with Complete Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	DW

Table 1. Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
C-2/drywells	Dry Well	80	85	82	30	21	21	90	95	24	Infiltration	DW
DWITCW	Dry Well - Infiltration Trench with Complete Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	DW
DWITPE	Dry Well - Infiltration Trench with Partial Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	DW
DWITWQE	Dry Well - Infiltration Trench with Water Quality Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	ITCE
EDSDITCE	Extended Detention Structure Dry, Infiltration Trench with Complete Exfiltration	80	85	81.64	29	29		60	95	29	Infiltration	ITCE
IB	Infiltration Basin	80	85	83.08	30	21	21	90	95	24	Infiltration	IB

Table 1. Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
ITCE	Infiltration Trench with Complete Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	ITCE
INPOND	Infiltration Basin No Outfall	80	85	83.08	30	21	21	0	95	24	Infiltration	IB
IT	Infiltration Trench	80	85	82	30	21	21	90	95	24	Infiltration	IT
ITVSW	Infiltration Trench, Extended Detention	80	85	81.64	29	29	29	90	95	29	Infiltration	IT
ITCE	Infiltration Trench with Complete Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	ITCE
ITCEMB	Infiltration Trench with Complete Exfiltration, Microbasin	80	85	82	30	21	21	90	95	24	Infiltration	ITCE
ITPE	Infiltration Trench with Partial Exfiltration	80	85	0	30	21	21	90	95	24	Infiltration	ITPE

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AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
ITWQE	Infiltration Trench with Water Quality Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	ITWQE
OGSITCE	Oil-Grit Separator Infiltration Trench with Complete Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	ITCE
PNDTR	Same as infiltration basin	80	85	83.08	30	21	21	0	95	24	Infiltration	IB
PP	Porous Pavement	80	85	0	99	99	99	90	95	99	Infiltration	PP
SB	Infiltration Basin	80	85	82	30	21	21	90	95	24	Infiltration	IB
WQITPE	Water Quality Infiltration Trench with Partial Exfiltration	80	85	82	30	21	21	90	95	24	Infiltration	ITWQE
WQP	Water Quality Trench	80	85	82	30	21	21	90	95	24	Infiltration	ITWQE
LS	Level Spreader	0	0	0	0	0	0	0	0	0	Other/Not BMPs	LS
OTHER	Other	0	0	0	0	0	0	0	0	0	Other/Not BMPs	Other

Table 1. Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
Variance	Variance	0	0	0	0	0	0	0	0	0	Other/Not BMPs	Variance
Exempt	Exempt	0	0	0	0	0	0	0	0	0	Other/Not BMPs	Exempt
Other	Other	0	0	0	0	0	0	0	0	0	Other/Not BMPs	OTH
EDSW	Extended Detention Structure Wet	20	45	63	44	69	69	75	60	60.7	Wet Ponds	EDSW
ESDW	Extended Detention Structure Wet	20	45	63	44	69	69	75	60	60.7	Wet Ponds	EDSW
MP	Micro Pool	20	45	36	58	65	65	75	60	62.7	Wet Ponds	MP
P-3	Extended Detention Structure Wet	20	45	63	44	69	69	75	60	60.7	Wet Ponds	EDSW
EXPOND	Wet Pond	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
P-2	Wet Pond	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
SW	Wet Structure	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
P-1	Micro Pool	20	45	36	58	65	65	75	60	62.7	Wet Ponds	MP
WP	Retention Structure (Wet Pond)	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
P-4	Multiple Pond System	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
P-5	Pocket Pond	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
SM	Shallow Marsh	20	45	73	85	85	85	75	60	85	Wetlands	SM

Table 1. Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
W-1	Shallow Wetland	20	45	73	85	85	85	75	60	85	Wetlands	SM
RSC	Regenerative Wetland Seepage	50	60	73	85	85	85	75	90	85	Wetlands	SM
W-2	ED Shallow Wetland	20	45	73	85	85	85	75	60	85	Wetlands	SM
W-3	Pond/Wetland System	20	45	73	85	85	85	75	60	85	Wetlands	SM
W-4	Pocket Wetland	20	45	73	85	85	85	75	60	85	Wetlands	SM
Stream Conventional	In-stream Riffles	LF	LF	LF	LF	LF	LF	LF	LF	LF	Stream Restoration	Stream Restoration
A1	Green Roofs	50	60	73	85	85	85	75	90	85	ESD	ESDGR
A2	Permeable Pavement	50	60	73	85	85	85	75	90	85	ESD	ESDPERM P
A3	Reinforced Turf	50	60	73	85	85	85	75	90	85	ESD	ESDRTRF
N1	Disconnection of Roof-top Runoff	50	60	73	85	85	85	75	90	85	ESD	ESDRTD
N2	Disconnection of Non Roof-top Runoff	50	60	73	85	85	85	75	90	85	ESD	ESDNRTD
N3	Sheetflow to Conservation Areas	50	60	73	85	85	85	75	90	85	ESD	ESDSFNAC

Table 1. Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
M1	Rainwater Harvesting	50	60	73	85	85	85	75	90	85	ESD	ESDRH
M2	Submerged Gravel Wetlands	50	60	73	85	85	85	75	90	85	ESD	ESDSGW
M3	Landscape Infiltration	50	60	73	85	85	85	75	90	85	ESD	ESDIL
M4	Infiltration Berms	50	60	73	85	85	85	75	90	85	ESD	ESDIB
M5	Dry Wells	50	60	73	85	85	85	75	90	85	ESD	ESDDW
M6	Micro-Bioretenion	50	60	73	85	85	85	75	90	85	ESD	ESDMB
M7	Rain Gardens	50	60	73	85	85	85	75	90	85	ESD	ESDRG
M8	Swales	50	60	73	85	85	85	75	90	85	ESD	ESDSW
M9	Enhanced Filters	50	60	73	85	85	85	75	90	85	ESD	ESDEF
Street Sweeping	Regenerative Vacuum Street Sweeping	5	6						25		Alternative Credits	VSS
Inlet Cleaning	Storm Drain Vacuuming	5	6						25		Alternative Credits	CBC
Planting pervious	Forestation on pervious urban	66	77						57		Alternative Credits	FPU
Impervious to Pervious	Impervious Area Elimination and conversion to pervious	13	72						84		Alternative Credits	IMPP

Table 1. Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
Impervious to Forest	Impervious Area Elimination and Conversion to Forest	71	94						93		Alternative Credits	IMPF

In summary, the 2012 Urban BMP Database features the following updates as compared to the 2011 submittal:

- An additional 1,029 records were added to the Urban BMP database during the 2012 reporting year.
- BMP facility built date information was researched and populated as available.
- BMP facilities for which built date information could not be verified were excluded from the 2012 data submission.
- BMP facilities that have approved grading permits but that have not been constructed were excluded from the 2012 data submission.
- The 2012 Urban BMP database submission represents 10,294 stormwater management facilities within the County.
- Additional MD grid coordinates were researched and corrected or populated.
- Structure types were populated for additional facilities.
- Drainage areas to individual facilities continued to be delineated.

Table 2 contains average, minimum, and maximum values, derived from statistical analysis, of the County-wide BMP inventory.

Table 2. Drainage Areas for Known BMP Types in Anne Arundel County

MDE BMP Code	Description	Average Area Treated in Acres	Min. Drainage Area in Acres	Max. Drainage Area in Acres
SF	Sand Filter	2.12	0.10	27.00
BR	Bioretention	1.61	0.10	341.66
SW	Dry Swale	2.14	0.10	49.78
CD	Attenuation Swale/Check Dam	0.42	0.10	4.20
DW	Attenuation Trench	0.22	0.10	21.00
IT	Infiltration Trench	0.78	0.10	61.00
ITCE	IT with Complete Exfiltration	0.99	0.10	229.99
ITPE	IT with Partial Exfiltration	1.66	0.10	93.00
ITWQE	IT with Water Quality Exfiltration	1.29	0.10	22.18
IB	Infiltration Basin	8.36	0.10	80.19
DP	Dry Pond	16.13	0.10	690.00
ED	Extended Detention	16.16	1.10	50.36
EDSD	Extended Detention, Dry	8.92	0.10	98.00

Table 2. Drainage Areas for Known BMP Types in Anne Arundel County

MDE BMP Code	Description	Average Area Treated in Acres	Min. Drainage Area in Acres	Max. Drainage Area in Acres
EDSW	Extended Detention Wet	14.54	0.10	556.38
WP	Wet Pond	20.19	0.10	274.28
MP	Micro Pool	9.11	0.10	28.00
SM	Shallow Marsh	3.03	0.10	26.00
PP	Porous Pavement	1.76	0.10	8.00
OGS	Oil Grit Separator	3.47	0.10	57.00
SC	Stormceptor	3.17	0.10	6.60
UGS	Underground Storage	3.44	0.10	27.00
SPSC	Step Pool Storm Conveyance	10.02	0.61	40.48
Redevelopment*	Redevelopment	1.71	0.10	17.00
IT	Infiltration Trench	0.78	0.10	61.00
ITCE	Infiltration Trench with Complete Exfiltration	0.99	0.10	229.99
ESD	Environmental Site Design	0.37	0.01	18.94
ESDDW	Dry Well	0.10	0.05	0.14
ESDEF	Enhanced Filter	1.58	0.15	6.07
ESDRG	Rain Garden	0.19	0.01	14.00
ESDIB	Infiltration Berm	0.27	0.07	1.00
ESDIL	Landscape Infiltration	0.08	0.01	0.40
ESDMB	Micro-Bioretenion	0.41	0.01	7.00
ESDNRTD	Disconnection of Non Roof-top Runoff	0.10	0.01	0.50
ESDPERMP	Permeable Pavement	0.07	0.03	0.25
ESDRH	Rainwater Harvesting	0.10	0.01	0.40
ESDRTD	Disconnection of Roof-top Runoff	0.26	0.01	13.00
ESDRTRF	Reinforced Turf	0.10	0.10	0.10
ESDSFNAC	Sheetflow to Conservation Area	0.77	0.01	9.45
ESDSGW	Submerged Gravel Wetland	0.29	0.07	1.00
ESDSW	Swales	0.57	0.05	7.00
BS	BaySaver	3.00	3.00	3.00
LS		0.14	0.10	0.38
Planting	Plantings	0.06	0.10	8.00
SC	Stormceptor	3.17	0.10	6.60
SW	Swales	2.14	0.10	49.78

* BMP codes refer to standard MDE codes for stormwater facilities, with the exception of “redevelopment”. This is a code used by Anne Arundel County.

3. **Impervious Surfaces:** *A schedule shall be provided for delineating controlled and uncontrolled impervious areas;*

Status:

During the 2012 reporting year, the County continued to implement the previously-established program for delineating controlled and uncontrolled impervious area. The program requires accurate inventory of five main GIS elements.

- County-wide impervious cover (Polygon Feature Dataset).
- Urban stormwater BMP facility types (Point Feature Dataset) with attribute information for the drainage area treatment.
- Because the County is responsible for assessing the controlled/uncontrolled imperviousness for County-owned lands and private lands directly under the jurisdiction of the County, a GIS layer depicting the non-County controlled lands is necessary to quantify the County's controlled/uncontrolled imperviousness.
- An inventory of environmental retrofit and enhancement projects that are not reflected in the Urban BMP inventory.
- Disconnected rooftops were estimated by assuming residential rooftops on parcels greater than ½ acre were disconnected. This assumption was made considering the size of the parcel would allow for the requirement to meet the 75ft flow path across pervious area with less than a 5 percent slope.

Impervious Cover

The impervious surface layer is crucial to the County's Watershed Management Tool (WMT). The WMT consists of many watershed analysis models for characterizing the existing conditions of the watershed. The WMT also provides predictive modeling for future conditions, restoration approaches, and preservation scenarios. These models are fully integrated with GIS and currently use the 2011 impervious layer for many different watershed and planning analyses, including hydrologic analysis, Rosgen Level 1 stream classification, pollutant loading estimates, and stream sediment loading estimates.

In previous reports Anne Arundel County has described in detail the methods used to determine impervious surfaces. Over the years, the County has taken great efforts to refine the analysis of impervious surfaces. In 2011, The County refined the planimetric GIS layer and enhanced it for the purpose of determining impervious surfaces by adding classes such as decks, driveways, patios, rails, and other paved areas. These data were captured using 6-inch pixel resolution as part of the state-wide imagery capture completed in Spring 2011. This new method for capturing impervious surfaces has greatly improved the County's ability to accurately depict impervious surfaces.

Figure 2 illustrates the comparison between the 2011 and 2007 impervious surface datasets. As the illustration shows, previous years' impervious surface delineations have been overestimated. As a result, values reported for impervious surfaces in this 2012 Annual Report have decreased as a result of these accuracy improvements.

Figure 2. Comparison of 2011 and 2007 Impervious Surface Datasets



Non-Jurisdictional Land within the County

For NPDES reporting, the County is responsible for accounting for all impervious and BMP information pertaining to County-owned land and private lands directly under the jurisdiction of the Anne Arundel County government. The City of Annapolis; Baltimore Washington International Thurgood Marshall Airport (BWI); Fort George G. Meade (FGGM); Patuxent Research Refuge; State Highway and Federal Highway roads; and State and Federal facilities are all examples of land areas that are outside the stormwater authority of Anne Arundel County. Using the County's parcel layer along with the Consolidated Property File (CPF), a GIS layer of parcels not considered the responsibility of Anne Arundel County was developed. Data analyses indicate that approximately seven percent of the land within the County boundary is owned by the State Government, eight percent is owned by the Federal Government, 12 percent is owned by the County local government, and 72 percent is privately owned, including land within the jurisdiction of the City of Annapolis. Digging deeper into this information reveals that approximately 21 percent of the impervious

acres within the entire County's impervious area are outside the jurisdictional authority of the County with respect to stormwater management. A breakdown of impervious surfaces within Anne Arundel County is shown in Table 3.

Disconnected Imperviousness - Not Captured as Urban BMPs

As discussed in previous Annual Reports, the difficulty in quantifying controlled versus uncontrolled impervious acreage lies in the challenge of understanding and documenting the benefits of disconnected impervious, non-structural BMPs, and conservation land management strategies as mitigation for impervious impacts. Many developments built prior to stormwater management regulations include open section roadways, disconnection of the rooftops, swales, and open channels, all of which may be providing a degree of water quality treatment per the Maryland Department of the Environment (MDE) stormwater management (SWM) regulations. In order to quantify these credits, the County has estimated rooftop disconnects by assuming rooftops on residential lots greater than one half acre are disconnected. The assumption is that on residential lots greater than one half acre rooftop runoff will travel at least seventy-five feet over a pervious surface with a slope less than five percent in order to meet the requirements. This method differs from the previously reported method of actually measuring the flow path length and slope using the County's Digital Elevation Model (DEM). Although the previously described method is considered more accurate, the County desires to report results derived in a manner consistent with those found in the Phase II Watershed Implementation Plan (WIP). The time constraints of developing the Phase II WIP required use of the method based on residential lots greater than one half acre. As the Phase II WIP is revised, and the methodology for estimating disconnected impervious area is streamlined, the County will revise and further refine the disconnected impervious area data to be reported here and in the WIP.

The County is also investigating means of quantifying the benefit of other environmental site designs, such as open section roadways, water quality swales, sheet flow to buffers, and other natural conservation measures that are not typically captured in the impervious layer or the urban BMP database.

Based on the information and assumptions presented above, the controlled versus the uncontrolled impervious cover was computed based on the following equation, using the 2011 impervious area capture:

$$I_u = I_T - (I_t + I_{nj} + I_{di})$$

where:

- I_u = Total Uncontrolled Impervious Area
- I_T = Total Impervious Cover within the County
- I_t = BMP Treated Impervious Area
- I_{nj} = Impervious Area within Non Jurisdictional County Lands
- I_{di} = Disconnected Impervious Surfaces as Outlined in the MDE Stormwater Criteria

Table 3. Land Cover and Impervious Distribution by Land Ownership/Jurisdiction

Anne Arundel County Land Cover Categories	City of Annapolis	State	Federal	County	Private	City of Annapolis	State	Federal	County	Private	City of Annapolis	State	Federal	County	Private	
	Land Acres					Impervious Acres					Percent Impervious					
Airport	0	1032	0	68	105	0	844	0	48	74	0%	82%	22%	71%	70%	
Commercial	978	691	1609	1877	7403	636	331	967	1076	4774	65%	48%	60%	57%	64%	
Industrial	21	512	365	424	3919	13	285	166	192	2420	61%	56%	46%	45%	62%	
Transportation	189	3775	928	3057	1688	145	2794	528	1982	484	77%	74%	57%	65%	29%	
Pasture/Hay	0	147	565	231	5070	0	1	4	5	18	0%	1%	1%	2%	0%	
Row Crops	0	135	565	395	10977	0	2	0	8	39	0%	1%	0%	2%	0%	
Residential 1/2-acre	110	60	46	1225	9422	28	14	11	644	1708	26%	24%	24%	53%	18%	
Residential 1/4-acre	1786	99	129	2783	14694	640	14	33	1614	3384	36%	14%	25%	58%	23%	
Residential 1/8-acre	568	132	678	3309	15395	242	33	211	1830	4664	43%	25%	31%	55%	30%	
Residential 1-acre	46	108	21	909	10513	9	13	1	376	1483	19%	12%	7%	41%	14%	
Residential 2-acre	35	224	58	1207	22187	9	24	5	402	2510	26%	11%	8%	33%	11%	
Open Space	254	2949	2925	3741	10977	15	154	94	172	216	6%	5%	3%	5%	2%	
Water	13	241	224	375	1510	1	0	1	1	8	4%	0%	0%	0%	1%	
Open Wetland	1	280	107	397	1053	0	0	0	0	1	0%	0%	0%	0%	0%	
Forested Wetland	0	64	93	53	75	0	0	0	0	0	0%	0%	0%	0%	0%	
Woods	523	9028	12922	12762	70302	7	80	36	197	278	1%	1%	0%	2%	0%	
Utility	0	39	216	75	1600	0	2	1	6	30	0%	4%	0%	7%	2%	
SubTotal	4523	19516	21452	32888	186889	1745	4591	2058	8552	22091	39%	24%	10%	26%	12%	
Total	265268					39037						15%				

Table 4 is a summary of the statistical accounting of controlled versus uncontrolled imperviousness. Please note that the “Disconnected Impervious Acres” column does not take into account areas that are already treated by BMPs, thus there may be some credit duplication. A comprehensive accounting system will be provided with the 2013 Annual Report, so the number of disconnected impervious acres may be different in the next report.

Table 4. Summary of Controlled vs. Uncontrolled Impervious Area

(Summary statistics do not include treatment from Restoration Activities)

Anne Arundel County Watersheds	Area in Acres						
	Total Acres	2011 Impervious Acres	BMP Impervious Treated	Disconnected Impervious Acres	Non-Jurisdictional Lands (Impervious Acres)	Total Uncontrolled Impervious Acres	Impervious Acres Needing Control by the County
Severn	44,214	8,183	1,877	668	9,138 (2,524)	5,638	3,114
South	36,185	4,430	1,384	518	3,572 (732)	2,528	1,796
Upper Patuxent	22,417	1,225	174	177	5,285 (127)	874	747
Magothy	22,802	4,425	930	468	1,182 (278)	3,027	2,749
Patapsco Non-tidal	15,267	4,166	713	204	4,842 (1,195)	3,249	2,054
Patapsco Tidal	30,852	8,626	1,320	273	4,880 (1,568)	7,033	5,465
Bodkin	5,034	614	111	133	35 (16)	370	354
Little Patuxent	27,976	4,408	<i>Complete by 2013</i>	359	12,595 (1,595)	<i>Complete by 2013</i>	<i>Complete by 2013</i>
Rhode	8,783	473	<i>Complete by 2014</i>	70	2,095 (60)	<i>Complete by 2014</i>	<i>Complete by 2014</i>
West	7,809	492	<i>Complete by 2014</i>	77	506 (29)	<i>Complete by 2014</i>	<i>Complete by 2014</i>
Herring Bay	14,239	824	<i>Complete by 2015</i>	107	547 (66)	<i>Complete by 2015</i>	<i>Complete by 2015</i>
Middle Patuxent	29,691	1,172	<i>Complete by 2016</i>	161	816 (205)	<i>Complete by 2016</i>	<i>Complete by 2016</i>

4. ***Monitoring locations:*** *locations established for chemical, biological, and physical monitoring of watershed restoration efforts and the 2000 Maryland Stormwater Design Manual or other innovative stormwater management technologies approved by MDE;*

Status:

a. Parole Plaza, Church Creek, and Picture Spring Branch

The County maintains three monitoring sites, Parole Plaza, Church Creek, and Picture Spring Branch, where the required chemical, physical, and biological monitoring of watershed restoration efforts and stormwater management

application is conducted. A summary of the 2012 permit year monitoring efforts at these sites is found in **Part III.H**, and the complete monitoring reports for the reporting year are included in **Appendix B** (*Chemical, Biological, and Physical Characterization of the Church Creek and Parole Plaza NPDES Monitoring Stations: 2012*) and **Appendix C** (*Biological and Geomorphological Conditions in the Picture Spring Branch Subwatershed: 2012*).

The shapefile contained in **Appendix A** gives the location of the Parole Plaza, Church Creek, and Picture Spring Branch monitoring sites.

b. County-Wide Biological Monitoring Program

The County has designed and is implementing a County-wide biological monitoring program. Focusing on benthic macroinvertebrates and modeled after the Maryland Biological Stream Survey (MBSS), the program uses a probability-based random sampling approach so that overall watershed condition can be evaluated and comparisons between different watershed units of the County can be made. A total of 24 Primary Sampling Units (PSUs) have been identified, all of which are sampled in a five-year rotation called a Round. Round One began in 2004 and ended in 2008. Round Two began in 2009.

Round Two sampling continued during this reporting period. A total of 44 samples (4 QC sites, 40 assessment sites) distributed within the four PSUs, were collected in 2012. The PSUs and the 8 digit hydrologic units in which they are located are summarized in Table 5 with all PSUs sampled in 2012 shaded blue. All Round 2 site locations are shown in

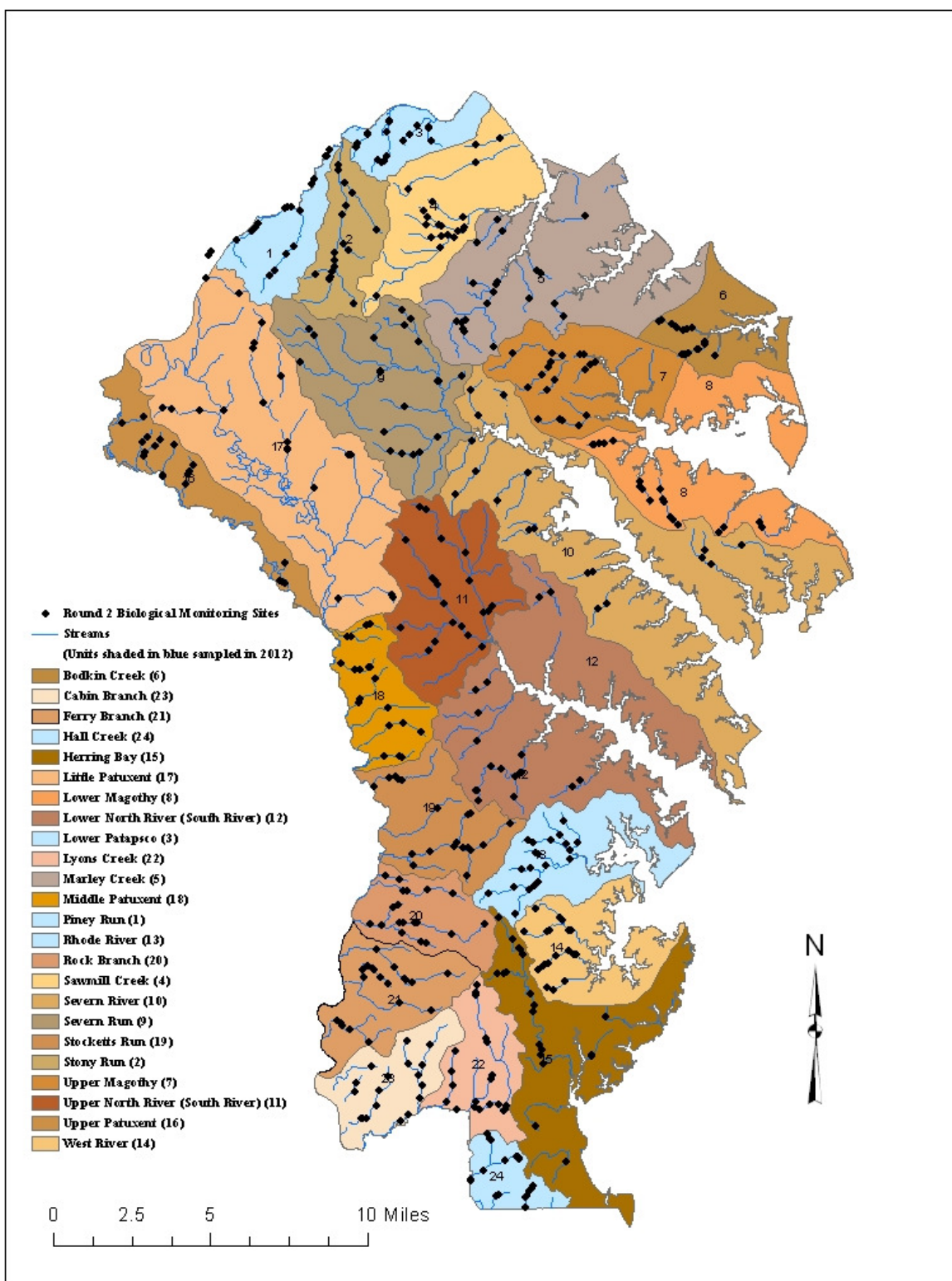


Figure 3. Location of all Round 2 (2009-2013) Primary and Alternate Random Biological Sampling Sites

Table 5. Listing of Areas Assessed During Round 1 (2004-2008) and the Schedule for Round 2 (2009-2013) by 8-Digit HUC

County Sampling Unit	Round One Year Sampled	Round Two Sample Year	MDE 8-digit Watershed Code	MDE 8-digit Watershed Name
Severn River	2004	2013	02131002	Severn River
Severn Run	2004	2011	02131002	Severn River
Lower Patapsco	2004	2012	02130906	Patapsco LNB
Middle Patuxent	2004	2010	02131104	Patuxent R. Upper
Ferry Branch	2004	2010	02131102	Patuxent R. Middle
Herring Bay	2005	2010	02131005	West Chesapeake Bay
Lyons Creek	2005	2013	02131102	Patuxent R. Middle
Stocketts Run	2005	2013	02131004	Patuxent R. Upper
Upper North River	2005	2011	02131003	South River
Lower North River	2005	2009	02131003	South River
Upper Magothy River	2006	2011	02131001	Magothy River
Hall Creek	2006	2012	02131102	Patuxent R. Middle
Bodkin Creek	2006	2011	02130902	Bodkin Creek
Marley Creek	2006	2009	02130903	Patapsco Tidal
Lower Magothy	2007	2013	02131001	Magothy River
Stony Run	2007	2010	02130906	Patapsco LNB
Upper Patuxent	2007	2011	02131104	Patuxent R. Upper
Piney Run	2007	2012	02130906	Patapsco LNB
Little Patuxent	2007	2009	02131105	Little Patuxent
Sawmill Creek	2008	2010	02130903	Patapsco Tidal
West River	2008	2009	02131004	West River
Rhode River	2008	2012	02131004	West River
Rock Branch	2008	2009	02131102	Patuxent R. Middle
Cabin Branch	2008	2013	02131102	Patuxent R. Middle

With Round Two underway, the County can continue comparing conditions between PSUs over time. Using statistical methods described in Roth et al. (2005), the mean BIBI (Benthic Index of Biotic Integrity) scores for Round 1 and Round 2 were evaluated for the four sampling units assessed during the reporting period: Lower Patapsco, Hall Creek, Piney Run, and Rhode River. As shown in It should be noted that any trends, where they exist, are preliminary as they are based upon only two data points. Continued sampling over a longer period of time (15-20 years) will provide better insight into the ultimate trajectory of conditions in the watersheds of the County. As work continues, additional analyses will be performed to better understand conditions in benthic community health between and within PSUs.

Table 6, trends are mixed with two PSUs showing some downward movement in average BIBI, one showing upward movement, and one showing no change. However, none of the changes observed between rounds was considered statistically significant, even though the Rhode River PSU moved from one qualitative class to another.

It should be noted that any trends, where they exist, are preliminary as they are

Primary Sampling Unit (Round 1 Sampling Year)	Mean Round 1 BIBI±1SE (Narrative Condition)	Mean Round 2 BIBI±1SE (Narrative Condition)	Condition Trend ¹
Lower Patapsco (2004)	2.69 ±0.19 (Poor)	2.43±0.23 (Poor)	Downward
Hall Creek (2006)	2.77±0.24 (Poor)	2.20±0.26 (Poor)	Downward
Piney Run (2007)	2.69±0.25 (Poor)	2.69±0.28 (Poor)	No Change
Rhode River (2008)	1.97±0.11 (Very Poor)	2.17±0.14 (Poor)	Upward

¹. No significant differences observed between Round 1 and Round 2 results (p=0.10).

based upon only two data points. Continued sampling over a longer period of time (15-20 years) will provide better insight into the ultimate trajectory of conditions in the watersheds of the County. As work continues, additional analyses will be performed to better understand conditions in benthic community health between and within PSUs.

Table 6. Comparison between Sampling Units Assessed in Round 1 vs. Round 2

c. Town Center Water Quality Monitoring Program

The DPW-Watershed, Ecosystem, and Restoration Services (WERS) staff characterizes the impact on water quality in designated Town Center receiving waters throughout the County. One continuous monitoring station is maintained by the County on the Cowhide Branch tributary of Weems Creek. Part of the Parole Town Center Area, Weems Creek has been monitored since the late 1980s. Continuous flow data and rainfall are collected at this station, and monthly stormwater and baseflow monitoring is performed at this site. In addition, the County also performs monthly baseflow monitoring at three other stations. One is located on Broad Creek and the other two are located on Picture Spring Branch, a tributary of the Severn River. At all stations, a total of 18 parameters are sampled, including:

Calcium	NH3
Copper	TP
Lead	TSS
Zinc	PO4
Magnesium	COD
Iron	Turbidity
BOD5	TOC
NO3/NO2	Hardness
TKN	Alkalinity
Total Phenols*	Oil and Grease*

*E. coli**
(*Cowhide Branch station only)

VOC (EPA 624)*

During the reporting period:

- A total of 9 storms were sampled at Weems Creek.
- A total of 11 baseflow samples were collected at each of the four stations, for a total of 44 samples.

The Chemical Monitoring Site Locations Database is included in **Appendix A**.

d. Restoration Monitoring Sites

Anne Arundel County and the University of Maryland Center for Environmental Sciences (UMCES) and Chesapeake Biological Laboratories (CBL) are collaborating on a long-term monitoring program to quantify water quality improvements associated with specific stream restoration approaches. The object of this program is to determine nitrogen loads and quantify load reductions in degraded versus restored non-tidal streams. Information ultimately obtained from this effort would be applicable to calculation of nonpoint source nitrogen load reductions resulting from stream restoration project implementation.

Eight stream reaches, including three restored streams in headwater systems, three restored streams in lowland boundary systems, and two degraded reaches were selected for long term monitoring. A more detailed discussion of this program is found in **Part III.H**. The locations of the associated monitoring sites are contained in a digital database in **Appendix A**.

5. Watershed Restoration: restoration project descriptions and locations.

Status:

Watershed restoration/retrofit activities in the design or construction phase or completed during the 2004 to 2012 fiscal years are included in **Appendix A**. The projects highlighted in yellow are constructed and provide a water quality benefit. Projects with drainage areas that lie entirely within another project's drainage area are referred to as "nested." The treated area for the nested projects was not included in the treated impervious total, since credit for this area is given to the downstream project. GIS layers depicting the location of these projects and the associated drainage areas are also included in **Appendix A**.

D. Discharge Characterization

Anne Arundel County and ten other municipalities in Maryland have been conducting discharge characterization monitoring since the early 1990s. From this expansive monitoring, a statewide database has been developed that includes hundreds of storms across numerous land uses. Summaries of this dataset and other research performed nationally effectively characterize stormwater runoff in Maryland for NPDES municipal stormwater purposes. These data shall be used by Anne Arundel County for guidance to improve stormwater management programs and develop watershed restoration projects. Monitoring required under this permit is now designed to assess the effectiveness of stormwater management programs and watershed restoration projects developed by the County. Details about this monitoring can be found in Part III.H.

Status:

As part of the County's watershed studies, Event Mean Concentration (EMC) data for the Anne Arundel County urban land covers were compiled for various studied pollutants. The EMC data are weighted mean values derived from statistical assessment of pollutant concentrations measured for multiple storm events. The data are currently utilized for assessing pollutant loadings using the EPA Simple Method.

During the 2005 to 2012 reporting years, the EMC discharge characterization values have been applied to a wide array of land conditions to assist County staff, stakeholders, and decision makers in addressing water quality concerns. The EMC data have been primarily used in the EPA Simple Method to model pollutant loads, correlate the results with the drainage area contributory imperviousness, and develop pollutant loading goals associated with watershed and subwatershed assessments, as well as individual water quality restoration projects.

During the 2011 Phase II Watershed Implementation Plan (WIP) development, the County reconciled its EMCs for various land covers with those used in the Chesapeake Bay Program's (CBP) Watershed Model (Version 5.3). Table 7 identifies the adjustments made to reconcile the concentrations with those used in the Bay Program's Watershed Model (units are in mg/l). Beginning with the 2011 assessment for the Patapsco Tidal and Bodkin Creek watersheds, EMCs based on the CBP Watershed Model have been used to characterize pollutant loading and develop watershed restoration projects. The County anticipates continued use of these reconciled EMCs as future watershed assessments move forward.

Recognizing that EMC values associated with the Bay Model may be updated again in the coming years, the County will continue to monitor and incorporate updates into its watershed modeling scenarios. Additionally, as pre-2011 County watershed assessments are updated and pollutant load models are re-run, the CBP Model values will be utilized in an effort to better align the County's pollutant loading estimates with the Bay Program and the Phase II WIP. Lastly, the County recognizes the importance of keeping records

denoting the EMC values used in each of the pollutant loading characterizations undertaken as part of the watershed assessments.

Table 7. Pollutant Concentrations (mg/l) per Land Cover Code

Land Cover Code	Description	Original WMT values			CBP Reconciled Values for WIP		
		TN	TP	TSS	TN	TP	TSS
OPS	Utility	1.15	0.15	100	1.15	0.15	34
TRN	Transportation	2.59	0.43	400	2.59	0.43	99
R18	Residential 1/8-acre	2.74	0.32	350	2.74	0.32	43
R14	Residential 1/4-acre	2.74	0.32	300	2.74	0.32	43
R12	Residential 1/2-acre	2.74	0.32	250	2.74	0.32	43
R11	Residential 1-acre	2.74	0.32	200	2.74	0.32	43
R21	Residential 2-acre	2.74	0.32	150	2.74	0.32	43
R20	Residential 20-acre	1.15	0.15	100	2.20	0.15	51
IND	Industrial	2.22	0.19	400	2.22	0.19	77
COM	Commercial	2.24	0.3	400	2.24	0.30	43
RWD	Residential Woods	1.55	0.19	75	2.00	0.19	51

As noted in prior year reports, Anne Arundel County continues efforts to relate biological condition metrics to watershed characteristics. The Watersheds, Ecosystems, and Restoration Services (WERS) have collected certain aquatic benthic macroinvertebrate biological data in all the major watersheds of the County as part of a variety of watershed assessment work activities. The County uses a Benthic Index of Biotic Integrity (BIBI) calibrated for the Coastal Plain physiographic region as a surrogate for system health, which is broadly defined as the capacity of an ecosystem to support and maintain a biota that is comparable to that found in natural conditions (Karr and Chu 1999). The County conducted benthic macroinvertebrate sampling and calculated BIBI scores at over five hundred locations throughout the County between 2002 and 2012.

Using the BIBI as a yardstick of ecological health, these data show that most streams and rivers in Anne Arundel County are significantly impaired (KCI 2006, Millard et al. 2001, Victoria and Markusic 2007, Roberts et al. 2006, Stribling et al. 2008a, Stribling et al. 2008b, Victoria et al. 2010.). A variety of factors are responsible for this situation. However, many studies have shown that one of the most important factors in the degradation of streams and rivers is the conversion of relatively open, permeable land to developed, impermeable land uses. The hydrologic, geomorphic, ecological, and water quality consequences of these conversions are well known (Leopold 1994, Schueler 1987, Booth 1990, MDE 2000, Paul and Meyer 2001, and many others).

To better understand the ecological health conditions described above, comparisons of the available biological information with the chemical, habitat, geomorphic, and hydrologic data were developed to determine possible causal relationships. The initial intent of these investigations was to develop management strategies that incorporate an

understanding of those watershed variables that might best explain current biological conditions. Then, appropriate management activities that positively alter those watershed variables would be prescribed, with the expected outcome of a healthier biological community.

During the 2012 reporting year, these comparisons and their outcomes were not significantly changed from prior years. Data from the County-wide Biological Monitoring Program and targeted watershed assessments will continue to be used to further our understanding of the relationship between the biotic community and the chemical, physical, and hydrologic regimes that they encounter. The County refers the reader to the following webpage for additional information on the County-wide Aquatic Biological Assessment Program, and for the link to the Biological Conditions Summary Reports: <http://www.aacounty.org/DPW/Watershed/BioMonitor.cfm>.

E. Management Programs

The following management programs shall be implemented in all areas served by the Anne Arundel County municipal separate storm sewer system. These jurisdiction-wide programs are designed to control stormwater discharges to the maximum extent practicable and shall be maintained for the term of this permit such that they become part of the routine operation of Anne Arundel County. Anne Arundel County shall address any needed program improvements identified as a result of periodic evaluation by MDE and annual self-assessment.

1. Stormwater Management

An acceptable stormwater management program shall be maintained in accordance with the Environment Article, Title 4, Subtitle 2, Annotated Code of Maryland. At a minimum, Anne Arundel County shall:

a. Conduct preventative maintenance inspections of all stormwater management facilities at least on a triennial basis. Documentation identifying the facilities inspected, the number of maintenance inspections, follow-up inspections, and enforcement action(s) used to facilitate inspection order compliance, maintenance inspection schedules, and any other relevant information shall be submitted in the County's annual reports;

Status:

The State and County Stormwater Management Codes require preventative maintenance inspections once during the first year of operation and every three years thereafter. The County's Department of Inspections & Permits is responsible for implementing these requirements. For the November 1, 2011-September 30, 2012 reporting period, the following maintenance inspections were performed:

- 514 First Year of Operation & Maintenance Inspections,
- 1,016 Triennial Maintenance Inspections, and
- 110 Triennial Maintenance Correction Notices.

The required first year inspections are performed by the Area Erosion Control Inspectors as part of the process for issuing grading permits. The first year maintenance inspection dates are reflected in the Maintenance Inspection column of the Urban Best Management Practices Database. Grading permit Certificates of Completion are not issued until all construction is complete and a passing first year maintenance inspection result is obtained.

Currently, there is one Stormwater Management Maintenance Inspector position responsible for performing the triennial maintenance inspections and performing

Illicit Discharge inspections. The scheduling of triennial maintenance inspection is based on the following priority system:

1. On a weekly basis, schedule triennial maintenance inspections by using the Stormwater Management Urban BMP Database. Review the proposed weekly inspection schedule with the assigned supervisor and adjust accordingly. A priority is to be placed on the following BMPs:
 - Large BMPs serving commercial and industrial projects,
 - Large BMPs serving single-family subdivisions with private stormwater management, and
 - Large BMPs serving multi-family subdivisions.
2. Triennial maintenance inspections for private BMPs serving single family residential lots or a non-DPW maintained public device shall be given a secondary scheduling priority and should only be inspected if an inspection request is received by the responsible agency or a complaint is received.

Should the triennial inspection reveal a maintenance need, facility owners are notified of the maintenance required as per their Stormwater Maintenance Agreement with the County. Property owners have been very responsive to correction notices issued for the proper maintenance of the stormwater BMPs on their properties. The written Correction Notice delivered by the inspector serves as the primary enforcement tool for obtaining compliance with the specific preventive maintenance requirements. Occasionally a written Compliance Notice is not sufficient to obtain compliance and in such instances civil citations are issued to the property owners.

Four \$1,000.00 civil citations were issued during the reporting period. Two of the fines were adjudicated in District Court resulting in reduced fines and Court Judgments and two fines were paid in full. The two violations where the fines were paid in full have been properly abated. The two adjudicated violations have been referred to the Office of Law for contempt charges for failing to abate as required by the Court Judgments.

b. Implement the stormwater management design policies, principles, methods, and practices found in the 2000 Maryland Stormwater Design Manual or other innovative stormwater management technologies approved by MDE;

Status:

The 2000 Maryland Stormwater Design Manual was fully implemented by the County in 2002. The Maryland Stormwater Management Act of 2007 significantly altered the Maryland Stormwater Management Regulations. As a result of the Act, the 2000 Maryland Stormwater Design Manual was updated to reflect the new Environmental Site Design (ESD) requirements. During the

reporting period the Office of Planning and Zoning required all proposed new stormwater management plans to comply with the new ESD standards in accordance with the State Code and the current edition of the Maryland Stormwater Management Design Manual.

In response to the revised requirements, Anne Arundel County updated Articles 16, 17, and 18, to ensure adequate legal authority was maintained for the County's stormwater program. A complete discussion of the process for the updates and their approvals is included in **Part III.B**.

Additionally, the County Practices and Procedures Manual relating to the Stormwater Management Act of 2007 became effective on November 22, 2010. The final approved County Code and County Practices and Procedures Manual were submitted to MDE for review. A letter stating the County's Practices and Procedures Manual as well as Article 16 were approved by MDE was received in September 2011. A copy of this letter was provided in the 2011 Annual Report.

c. Track the progress toward implementing the 2000 Maryland Stormwater Design Manual or other innovative stormwater management technologies approved by MDE and report annually the modifications needed to address any programmatic problems; and

Status:

Revisions to the County Code required to implement changes to the Maryland Stormwater Regulations were prepared as discussed in **Part III.B** and were approved under County Council Bill 74-11. Both Article 16 of the County Code and the Anne Arundel County Stormwater Practices and Procedures Manual were approved by MDE in 2011. Copies of the Bill and MDE approval letter were provided in the 2011 Annual Report. During this reporting period, there were no further modifications of County Code to address this permit requirement.

d. Maintain programmatic and implementation information according to the requirements established as part of MDE's triennial stormwater program review.

Status:

MDE's last administrative and field review of the County's stormwater management program took place in 2005. The County has been maintaining all programmatic information required since MDE's last triennial review. MDE has not informed the County when they intend to schedule the next triennial administrative and field review of the County's stormwater management program.

2. Erosion and Sediment Control

An acceptable erosion and sediment control program shall be maintained in accordance with the Environment Article, Title 4, Subtitle 1, Annotated Code of Maryland. At a minimum, the County shall:

a. Address any needed program improvements identified during MDE's evaluation of the County's application for the delegation of erosion and sediment control enforcement authority;

Status:

MDE conducts delegation evaluations every two years. For this reporting period, the last evaluation was conducted in the Fall/Winter of 2010. MDE made no specific recommendations or suggestions as a result of the 2010 evaluation. MDE was in the process of conducting the 2012 delegation evaluation of the County's Erosion & Sediment Control Program shortly after the reporting period covered by this Annual Report. Field inspections and administrative reviews were conducted on November 14, 2012 and November 29, 2012. The results of that 2012 evaluation will be reported in the 2013 Annual Report. The County will incorporate any recommendations or suggestions contained in the evaluation report.

As required by MDE, the County has submitted the proposed changes to the County Erosion and Sediment Control Code. During this reporting period, the County addressed MDE's final review comments and proceeded to develop legislation for public hearing before the County Council.

b. At least three times per year, conduct "responsible personnel certification" classes to educate construction site operators regarding erosion and sediment control compliance. Program activity shall be recorded on MDE's "green card" database and submitted as required in PART IV of this permit; and

Status:

The Anne Arundel Soil Conservation District is responsible for holding Responsible Personnel Green Card trainings. Three trainings were conducted by the District during the reporting period. These were conducted on February 29, 2012, May 3, 2012, and August 2, 2012. The required database is included in **Appendix A**.

c. Report quarterly, information regarding earth disturbances exceeding one acre or more. Quarters shall be based on the calendar year and submittals shall be made within 30 days following each quarter. The information shall be specific to the permitting activity for the preceding three months.

Status:

The County's Department of Inspections and Permits maintains the Construction General Permit Activity database. Based on previous guidance from MDE, quarterly reports are not required provided that the database is submitted annually with this report. The database is included in **Appendix A**.

3. Illicit Discharge Detection and Elimination

Arundel County shall implement an inspection and enforcement program, or other alternative methods approved by MDE, to ensure that all discharges to and from the municipal separate storm sewer system that are not composed entirely of stormwater are either permitted by MDE or eliminated. At a minimum, activities shall include:

a. Field screening at least 150 outfalls annually. Each outfall having a discharge or suspected of having an illicit discharge shall be sampled using a chemical test kit;

Status:

Anne Arundel County has developed and continues to maintain an extensive program designed to detect and eliminate illicit discharges into the municipal storm drain system and upland pollutant sources resulting from dumping, poor housekeeping, and other non-permitted activities.

The program includes the inspection of a minimum of 150 storm drain outfalls annually. This inspection records the presence of dry weather flow, the structural integrity of the outfall, and other maintenance issues. In 2012, illicit discharge screening was conducted within the Little Patuxent Watershed.

Anne Arundel County's GIS coverage of storm drains and closed storm drain utility grids were used to create maps for field activities. Only commercial and industrial storm drain systems were identified on the maps for screening efforts, per the guidance provided by MDE (MDE 1997). No outfalls with primarily residential drainage were inspected. These maps were used in the field to identify the extent of the storm drain systems, locations of outfalls, and contributing businesses or facilities.

The water chemistry, physical condition of each outfall structure, and the conditions surrounding the outfall were recorded on field sheets. When a dry-weather discharge was found at the outfall, a sample was taken and a LaMotte Storm Drain Test Kit was used to test the effluent for certain indicators (pH, temperature, detergents, phenols, copper, and chlorine). The effluent was also tested for fluoride using a LaMotte 1200 Colorimeter (SPANDS Method) and ammonia using a LaMotte Ammonia Nitrogen Test Kit. Physical parameters

recorded at each outfall include structural condition, deposits, vegetative condition, erosion, floatables, odor, algae growth, color, and clarity.

If the indicator test results yielded concentrations higher than established thresholds, the results were recorded and the outfall flagged for a follow-up test within 24 hours. When a second chemical test confirmed a threshold exceedance at an outfall, the field crew followed the storm drain system upstream to attempt to identify the source of the contaminant(s). The results of the investigations were forwarded to the Anne Arundel County Department of Inspections and Permits for corrective action. Within the target area, 150 commercial and industrial storm drain outfalls were inspected.

In 2012, four outfalls with dry weather flow contained a concentration exceeding the threshold limit for one or more tested contaminants. Fourteen sites were found with structural deficiencies or erosion. The County inspectors performed follow-up site visits and inspections for the reported problem outfalls. Further details, including site-specific reports for some of the sites, are included in **Appendix D**.

b. Conducting routine surveys of commercial and industrial watersheds for discovering and eliminating pollutant sources;

Status:

Field personnel perform a visual inspection of all accessible commercial and industrial sites within the target areas. The inspections are designed to identify poor housekeeping, dumping and other non-permitted discharges (e.g., vehicle wash water) that may be intercepted by the County's storm drain system.

The 2012 inspections identified nine sites with the potential to discharge pollutants into County storm drains or Waters of the United States. Follow-up compliance investigations and compliance actions were taken for these sites or are underway. Compliance reports and site-specific reports can be found in **Appendix D**.

A full report of the procedures and data collected from the illicit detection and elimination field investigation can be found in **Appendix D**. Digital data are included. The report includes a discussion of the enforcement actions taken in 2012.

c. Maintaining a program to address illegal dumping and spills;

Status:

The Department of Inspections and Permits (I&P) is responsible for enforcing spills and illegal dumping into the County's storm drain systems. For the 2012 reporting period, a total of 69 complaints were investigated; 35 of the complaints

were for illicit discharges. These complaints were generated from illicit discharge investigations for the current and past reporting year, as well as County and citizen complaints. Details regarding these and other complaints are included in the *Illicit Discharge Detection and Elimination* report included in **Appendix D**.

The Department uses a phased approach to eliminating and enforcing illicit storm drain discharges, which is discussed below.

Phase I enforcement consists of a Violation Notice sent by first class and certified mail to the property owner. The Phase I Violation Notice includes an explanation of the violation and requests a written commitment to immediately cease and desist the illicit discharge. Upon written receipt of the commitment to comply, the Department monitors the site for up to 60 days. If compliance is maintained, the violation is considered abated.

Should the Department fail to receive the written commitment to comply or if further violations are observed, the Department proceeds to Phase II enforcement. At the Phase II level of enforcement, the Department posts a Stop Work Order on the property and issues a \$1,000 civil citation to the property owner. The civil citation must be paid and the violation abated or the civil citations are litigated in court.

Should the violation remain unabated by the court date, the Department requests the full payment of the fines and an abatement order from the judge. The failure to comply with the Court issued abatement order results in Contempt of Court charges being filed by the County Office of Law. Significant violations are screened with the County Office of Law for possible criminal enforcement as authorized in the County Code or are referred to MDE for enforcement under the State Code.

For the reporting period, the Department issued 11 Phase I Violation notices. These notices included stop work orders, correction notices, and stormwater management corrections.

Illicit Discharge complaints and referrals are logged into I&P's Compliance Case Database, which is used to track cases from the receipt of a complaint or referral to closure. The Compliance Database is available to be viewed by the public on the Department of Inspection and Permits page of the Anne Arundel County Citizen Information website (<http://aacoprod.aacounty.org/ComplaintsInternet/welcome.do>); the main page has a Quick Link to the Compliance Database.

d. Using appropriate enforcement procedures for investigating and eliminating illicit discharges, illegal dumping, and spills. Significant discharges shall be reported to MDE for enforcement and/or permitting; and

Status:

Out of the 35 illicit discharge complaints received by the Department of Inspections and Permits for the reporting period, one was referred to MDE.

- Compliance Case E-2012-336: Ed Prout Road. A complaint was made that illegal fill was blocking the stream channel. Site inspection revealed a portion of a private gravel driveway that crosses a stream had collapsed into a sinkhole. Sinkhole is clogging culvert pipe. No violation was found and the case was closed.

e. Reporting illicit discharge detection and elimination activities as specified in PART IV of this permit. Annual reports shall include any requests and accompanying justifications for proposed modifications to the illicit discharge detection and elimination program.

Status:

All activities completed as part of the County's 2012 IDDE program are included in the IDDE 2012 Annual Report, submitted in November 2012 (**Appendix D**). The County makes no request to modify its IDDE program.

4. County Property Management

Anne Arundel County shall identify all County-owned and municipal facilities requiring NPDES stormwater general permit coverage and submit Notices of Intent (NOI) to MDE for each. The status of pollution prevention plan development and implementation shall be submitted annually.

Status:

County-owned facilities requiring NPDES discharge permit coverage submitted appropriate applications to MDE. The County-owned Water Reclamation Facilities (WRFs) with NPDES discharge permits are:

- Annapolis WRF, permit number 07-DP-0838, effective August 1, 2009, to July 31, 2014. A renewal package was submitted as per the permit requirement.
- Broadneck WRF, permit number 06-DP-0677, effective June 1, 2010, to May 31, 2015.
- Broadwater WRF, permit number 06-DP-0813, effective March 1, 2010, to February 28, 2015.
- Cox Creek WRF, permit number 07-DP-0698, effective January 1, 2010, to December 31, 2014.

- Maryland City WRF, permit number 02-DP-2393, effective August 1, 2008 to July 31, 2013. A renewal package was submitted as per the permit requirement.
- Mayo Large Communal WRF, permit number 98-DP-2291, effective April 1, 2000 to March 31, 2005. Permit still in force. Application submitted to MDE October 3, 2001.
- Patuxent WRF, permit number 02-DP-0132, effective August 1, 2008 to July 31, 2013. A renewal package was submitted as per the permit requirement.

Anne Arundel County's wastewater NPDES discharge permits are current or continue in force pending MDE issuance of a revised permit.

For each Water Reclamation Facility, staff performs monthly inspections, quarterly dry weather inspections, quarterly wet weather inspections, annual comprehensive site inspections, annual record review, and annual training. These records are maintained at each facility.

SWPPPs exist at each of the above facilities as required by the permits. The SWPPPs for Maryland City and Patuxent WRFs were last updated in January 2012. The SWPPPs for Cox Creek, Broadwater and Mayo WRF were last updated in June 2012. The SWPPPs for Annapolis and Broadneck WRFs were last updated in December 2012.

The General Discharge Permit for Storm Water Associated with Industrial Activities, Permit No. 02-SW, applies to the following County-owned facilities managed by County Waste Management Services (WMS):

- Glen Burnie Sanitary Landfill and Convenience Center, permit number 02-SW-0298, expired November 30, 2007, Notice of Intent to renew submitted on January 28, 2003;
- Millersville Sanitary Landfill and Resource Recovery Center, permit number 02-SW-1304, expired November 30, 2007, Notice of Intent to renew submitted on January 28, 2003; and
- Sudley Road Sanitary Landfill and Convenience Center, permit number 02-SW-0297, expired November 30, 2007, Notice of Intent to renew submitted on January 28, 2003.

Annual Comprehensive SWPPP Compliance Evaluation Inspection Reports were completed for these facilities November 5 – November 9, 2012. At these facilities the stormwater management facilities (SWMFs) are inspected routinely and all necessary repairs are undertaken immediately. WMS employs two technicians tasked with the maintenance of the SWMFs. No pesticides are used at these facilities; encroaching vegetation is removed entirely by mechanical means.

WMS held trainings at each of the facilities in March 2012 on the following topics: Hazardous Waste Operations (Response); Good Housekeeping and Spill Prevention; Preventative Maintenance for Sediment and Erosion Control; Runoff Control; and other SWPPP-related topics. Documentation regarding these facilities is included in **Appendix E**.

The Department of Public Works, Bureau of Highways Road Operations Division is divided into three Districts with each district having at least two road operations service yards (Table 8); these facilities are also operated per the requirements of General Discharge Permit 02-SW. Previously, 350 West Central Avenue was provided stormwater coverage under a site specific NPDES Permit (07-DP-3366) but is now covered under the general discharge permit as of July 31, 2012. This facility no longer operates a vehicle wash that discharges to groundwater.

Table 8. Bureau of Highways' Facilities

Facility	Permit Number	Effective Dates	Comments
Northern District Roads			NOIs for each facility were submitted to MDE in 2002. The Maryland General Discharge Permit for Storm Water Associated With Industrial Activities (No. 02-SW) was administratively extended in November, 2007. Facilities that were permitted prior to that time continue to be regulated by the permit and their storm water pollution prevention plans. A tentative determination has been made to reissue the permit following a comment period.
200 Dover Rd.	02-SW-1176	Dec 1, 2002 to Nov 30, 2007	
318 Mountain Rd.	02-SW-1181	Dec 1, 2002 to Nov 30, 2007	
Central District Roads			
1427 Duckens St.	02-SW-1177	Dec 1, 2002 to Nov 30, 2007	
1847 Crownsville Rd.	02-SW-1179	Dec 1, 2002 to Nov 30, 2007	
415 Broadneck Rd.	02-SW-1182	Dec 1, 2002 to Nov 30, 2007	
Southern District Roads			
350 West Central Ave.	02-SW-1178	Dec 1, 2002 to Nov 30, 2007	
6657 Old Solomons Island Rd.	02-SW-1180	Dec 1, 2002 to Nov 30, 2007	

During the period November 1, 2011, through September 30, 2012, the following items related to implementation of 02-SW were completed at the Bureau of Highways' Facilities:

- Implemented each SWPPP, including:
 - Performed routine visual inspections of each facility, at least quarterly.

- Completed annual outfall visual assessments of each facility, following a major storm.
 - Completed comprehensive annual inspections of each facility.
 - Completed updates to each SWPPP during 2012.
 - Completed an internal document review during comprehensive annual inspections of each facility.
 - Continuation of maintenance improvements to further prevent stormwater impacts, including:
 - Use of coir log wattles at select locations.
 - Use of silt-sack inserts at select locations.
 - Completed Spill Bucket Inspections of Underground Waste Oil Storage Tanks at all District Yards in February 2012 by Maryland Department of the Environment Certified UST Inspectors.
 - Completed Repairs of Underground Waste Oil Storage Tank appurtenances at the following District Yards:
 - Northern District, Mountain Road Yard, Replaced Concrete Pad over UST, November 2012.
 - Installed a site gauge for determining quantity on hand at (6) Liquid Calcium Chloride tanks located in District Yards due to the increasing opacity of tank walls.
- Staff training sessions have been administered to Road District personnel during the reporting period to support SWPPP implementation, as summarized below in **Table 9**.

Table 9. SWPPP Training Summary for Bureau of Highways Facilities

Training Number	Training Location	Training Date	Training Session Topic
11848381	1311CC	12/21/2011	SWPPP TRAINING "LONG TERM EFFECTS OF A COMPREHENSIVE SWPPP AND ITS EXECUTION"
12851990	1311CC	1/19/2012	SWPPP TRAINING DELIVERED "WHAT IS SWPPP"
12855691	1311CS	2/14/2012	SWPPP TRAINING TOPIC: WHEN IT RAINS IT DRAINS
12856076	1312SD	2/16/2012	WILL HAVE SWPPPSD TRAINING
12856067	1310NM	2/16/2012	PERFORMED SWPPP TRAINING SESSION 1 "WHEN IT RAINS, IT DRAINS" WO#12861460 IS J.BURTON'S CREW COSTING
12856070	1311CO	2/16/2012	MEETING WITH CREW: WHEN IT RAINS IT DRAINS
12856068	1311CC	2/16/2012	TRAINING CONDUCTED SESSION #1 WHEN IT RAINS IT DRAINS
12861460	1310NM	3/23/2012	SAFETY TRAINING / SWPPPNM TRAINING- "WHEN IT RAINS IT DRAINS"
12863428	1312SD	4/4/2012	WILL HAVE TRAINING ON WHAT IS A SWPPP 4/23/12

Table 9. SWPPP Training Summary for Bureau of Highways Facilities

Training Number	Training Location	Training Date	Training Session Topic
12863426	1310NM	4/4/2012	PERFORMED SWPPP SESSION 2 TRAINING
12863427	1311CC	4/4/2012	SWPPP TRAINING - VIDEO PRESENTATION FROM KIOSK BOH TRAINING PAGE "WHAT IS SWPPP"
12864990	1311CS	4/18/2012	TOPIC: WHAT IS SWPPP
12872309	1310ND	5/24/2012	MONTHLY SWPPPND TRAINING
12871897	1312SD	5/30/2012	B MOREHEAD WILL SCH TRAINING FOR SWPPPSD NO #3
12871891	1310NM	5/30/2012	PERFORMED BI-MONTHLY SWPPP TRAINING SESSION# 3
12871894	1311CO	5/30/2012	CARRIED CREW UNDER WORK ORDER #12876547. SWPPP PRESENTATION WITH DUB DEASON-COMPUTER KIOSK AS AN EMPLOYEE RESOURCE.
12871893	1311CC	5/30/2012	NO TRAINING GIVING FOR THE MONTH OF JUNE
12884079	1312SD	8/3/2012	B MOREHEAD WILL HAVE THE BI MONTHLY TRAINING ON SWPPP PART 2
12884073	1310NM	8/3/2012	PERFORMED BI MONTHLY SWPPP TRAINING
12884070	1310ND	8/3/2012	DOVER RD - MINIMIZING EXPOSURE, GOOD HOUSEKEEPING.
12884077	1311CS	8/3/2012	TRAINING WASTE MANAGMENT
12884075	1311CO	8/3/2012	WENT OVER (WHAT IS SWPPP)
12884074	1311CC	8/3/2012	TAILGATE SESSION ON MULCHING 8/28/12 LTC
12888185	1310ND	8/31/2012	SWPPP TAILGATE TRAINING SESSION WITH C. MCGOWAN. JD
12889664	1310ND	8/31/2012	SWPPP TAILGATE TRAINING SESSION WITH C. MCGOWAN.
12894710	1312SD	10/4/2012	B MOREHEAD WILL HAVE TRAINING FOR SWPPPSD YARD,WORK WAS DONE UNDER WORK ORDER NO 12901513
12894709	1311CS	10/4/2012	TOPIC: SECONDARY CONTAINMENT
12894708	1311CO	10/4/2012	WENT OVER SPILLS AND CLEAN UP
12894707	1311CC	10/4/2012	PERFORMED BI MONTHLY SWPPP TRAINING

5. Road Maintenance

A plan to reduce pollutants associated with road maintenance activities shall be developed and implemented. At a minimum, an annual progress report shall be submitted that documents the following activities:

a. Street sweeping;

Status:

Street Sweeping

Anne Arundel County's street sweeping program is designed to keep debris out of storm drains, our creeks, rivers and ultimately the Chesapeake Bay. We operate a modest program that includes two county-owned street sweepers.

Our neighborhood streets are relatively clean because of the work of conscientious residents who assist us by keeping the areas in front of their homes free of litter and debris. Residential streets are not included in our program for routine street sweeping.

Main thoroughfares, business districts and industrial areas are scheduled for street sweeping up to four times per year. We target arterial, major collector and roads in business districts for routine sweeping. This allows us to capture the most debris for each available hour of street sweeping effort.

The County swept 296 miles of streets from November 1, 2011 to October 31, 2012, which equates to 24.7 curb-miles/month; this is a 29% decrease from the last reporting period. Major equipment repairs and associated downtime on the County's two street sweepers reduced the sweeping effort during the reporting period. For comparison, an average of 35 curb-miles/month were swept during the previous reporting period.

Manual Litter Collection

Litter is collected from County roadways on a routine basis. A total of 8,407 bags of litter, able to hold 30 gallons each, were removed from roadsides during the November 1, 2011 to October 31, 2012 period. 2,445 of these bags were collected during our routine work week; the remaining 5,961 bags were collected by our weekend sign and litter removal program. This represents a 26% increase and a 4% decrease, respectively.

b. Inlet cleaning;

Status:

The County cleaned and removed debris from catch basins, inlets, and outlets of pipes to maintain proper drainage for 12,070 structures during the reporting period. This is an 11% decrease from the last reporting period, during which 13,597 structures were cleaned. In addition, the County inspects catch basins, manholes, and associated pipes/ditches to identify structures for cleaning with a sewer vacuum. From November 2011 to October 2012, 3,209 structures were cleaned with a Vactor™ truck, an 18% increase from the last reporting period during which 2,712 structures were cleaned with a sewer vacuum.

The County cleaned and removed debris from roadside inlet and outlet ditches and concrete swales; removed leaves from ditch lines and curbs using a leaf vacuum; and cleaned and reshaped roadside ditches by machine totaling 112,452 feet during the reporting period. This is a 2% increase from the last reporting period in which the County cleaned 110,679 feet.

c. Reducing the use of pesticides, herbicides, fertilizers, and other pollutants associated with roadside vegetation management through the use of integrated pest management (IPM); and

Status:

Use of Pesticides, Herbicides, and Fertilizers

Pesticides

Anne Arundel County makes a financial contribution annually to support Maryland Department of Agriculture (MDA) programs for Gypsy Moth control (http://www.mda.state.md.us/plantspests/forest_pest_mgmt/gypsy_moth/gypsy_moth_program_policy.php) and Mosquito control (<http://www.mda.state.md.us/plants-pests/mosquitocontrol/index.php>). Some of this work occurs along County-maintained roadways. No data regarding the quantity of pesticides applied along roadways is recorded by the Bureau of Highways.

Herbicides and Fertilizers

Herbicide use associated with road maintenance performed by the Bureau of Highways is limited to the activities included in the performance standard for H0040, which covers the application of Glyphosate (e.g., Roundup™) on County rights-of-way (ROW) to control vegetative growth and prior to crack sealing operations in the traveled portion of the roadway. A total of 120 gallons of Glyphosate were used during the reporting period. This is a 25% decrease over the previous reporting period in which 160 gallons were applied.

Anne Arundel County does not use fertilizer in its road maintenance and roadside vegetation management. Other than that noted above, the Bureau of Highways recorded no other pesticide application as part of the Bureau's work program. Please note, however, that other County agency projects and non-County projects may involve the application of pesticides, herbicides, and fertilizers along County roadside ROW. For example, special care of median landscaping along certain County and State roads in Anne Arundel County is completed under the direction of The Department of Central Services Facilities Management Division. The Bureau of Highways does not record pesticide, herbicide, and fertilizer use that occurs outside of the Bureau of Highways.

d. Controlling the overuse of winter weather deicing materials through continual testing and improvement of materials, equipment calibration, employee training, and effective decision-making.

Status:

The amounts of de-icing chemicals used from November 2011 through September 2012 are found in Table 10. De-icing chemical data for the 2010 and 2011 reporting period are provided as a comparison. The quantity of deicing chemicals used each year is highly variable because it is based on actual winter weather conditions including precipitation type, and other factors such as road surface temperature.

Table 10. Deicing Material Applied

Material	Quantity 2010	Quantity 2011	Quantity 2012
Salt	34,242 tons	23,438 tons	1,689 tons
Sand/ Salt mix	0 tons	0 tons	0 tons
Liquid Calcium Chloride	3,359 gallons	3,641 gallons	0 gallons
NWS ¹ Snow Totals (BWI)	77.0 inches	14.4 inches	1.8 inches

⁽¹⁾ Average annual snowfall total at BWI Thurgood Marshall Airport is 20.2 inches, according to the National Weather Services (NWS). Winter 2011-2012 snowfall totals were 1.8 inches, 81 percent below average.

In 2012, the Bureau continued its use of a maintenance decision support system (MDSS); MDSS uses real-time data from our Road Weather Information System (RWIS). The RWIS is a series of pavement and bridge deck sensors and other instruments installed along certain County-owned bridges and roadways. The integration of RWIS data into a MDSS allows the management team to select the most appropriate winter treatment for actual weather conditions in each area of the County during a winter storm event. Studies have shown use of an MDSS can help reduce the use of deicing chemicals. Screen shots (Figure 4 and Figure 5) from the MDSS are shown below and are from our subscription weather service, MxVision WeatherSentry Online at <http://weather.dtn.com/dtnweather/>.

Annual training on proper snow plowing techniques is also offered. It includes information on the application of deicing products and proper application rates.

Figure 4. MDSS Hourly Weather Forecast With Treatment Recommendations

Hour	Sat 03AM	Sat 04AM	Sat 05AM	Sat 06AM	Sat 07AM	Sat 08AM	Sat 09AM	Sat 10AM	Sat 11AM	Sat 12PM	Sat 01PM	Sat 02PM	Sat 03PM
Weather Condition													
Weather	Mostly Cloudy	Mostly Cloudy	Cloudy	Cloudy	Snow Likely	Snow Likely	Snow Likely	Snow Likely	Snow Likely	Snow Likely	Ice Likely	Ice Likely	Ice Likely
Temperature (°F)	11	12	13	13	14	14	15	17	18	21	22	23	24
Feels Like (°F)	0	1	2	1	0	0	0	1	2	6	7	9	9
Wind Direction	ESE	ESE	ESE	ESE	ESE	ESE	ESE	ESE	ESE	ESE	ESE	ESE	ESE
Wind Speed/Gusts (mph)	7	7	8	9	12 G 20	14 G 24	15 G 25	17 G 28	18 G 29	19 G 32	19 G 32	19 G 32	20 G 33
Dew Point (°F)	5	6	8	8	9	10	12	14	16	18	19	21	22
Humidity (%)	77	77	80	80	80	84	88	88	92	88	88	92	92
Precipitation Chance (%)	-	-	-	-	78	78	78	78	79	79	80	80	80
Precipitation Type	-	-	-	-	DRY Snow	DRY Snow	DRY Snow	NRM Snow	NRM Snow	NRM Snow	Freezing	Freezing	Freezing
Precipitation Amount (Rain:in., Snow:in.)	None			None			S: <1.0 L: 0.01			S: 1-2 L: 0.16			Ice .10-.24
24Hr Snow/Ice Accum (12PM-12PM) (in.)	0	0	0	0	0	0	0	0.95	-	-	-	-	-
Blowing Snow Potential	-	-	-	-	-	-	-	-	High	High	-	-	-
Bridge Temp (°F)	8	10	11	13	14	15	16	18	19	20	22	-	-
Road Temp (°F)	17	18	18	19	20	20	21	22	23	24	24	-	-
Bridge Frost Likely?	No	No	No	No	No	No	No	No	No	No	No	-	-
Road Frost Likely?	No	No	No	No	No	No	No	No	No	No	No	-	-
Treatment Recommendation	-	-	-									-	-

Figure 5. MDSS Treatment Recommendation

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Light Snow Storm - less than 1/2 inch per hour (Below 15°F, steady or falling) Cycle Time: 3 hours

Hanlontown RWIS IA049 - Sat 12/01/07 06AM

Initial Operations				Subsequent Operations			
Initial Pavement Surface Conditions	Maintenance Action	Dry Chemical Spread Rate kg/lane-km (lb/lane-mi)		Maintenance Action	Dry Chemical Spread Rate kg/lane-km (lb/lane-mi)		
		Liquid	Solid or prewetted solid		Liquid	Solid or prewetted solid	
Dry or light snow cover	Plow as needed			Plow as needed			

Comments

- It is not recommended that chemicals be applied in this temperature range.
- Abrasives can be applied to enhance traction

Notes:

CHEMICAL APPLICATIONS.

- Time initial and subsequent chemical applications to prevent deteriorating conditions or development of packed and bonded snow.
- Apply chemical ahead of traffic rush periods occurring during storm.

PLOWING. If needed, *plow before chemical applications* so that excess snow, slush, or ice is removed and pavement is wet, slushy, or lightly snow covered when treated.

6. Public Education

A public education and outreach program shall be implemented to reduce stormwater pollutants. Outreach efforts are to be integrated with all aspects of the County's activities. These efforts are to be documented and summarized in each annual report. At a minimum, the County shall:

a. Continue to publicize a compliance hotline for the public reporting of suspected illicit discharges, illegal dumping, and spills;

Status:

The County's Department of Inspections & Permits maintains a 24-Hour Environmental Hotline for citizens to report environmentally-related complaints including spills and illegal dumping into the County storm drain system. The Hotline has been in existence since 1988 and has been advertised in numerous ways including the County Website (www.aacounty.org/IP/EnvironmentalPrograms/index.cfm). For the reporting period, a total of 707 environmentally-related complaints were received and investigated by the Department. The complaints typically involved potential Critical Area violations, sediment control issues or illegal grading activities. All the Illicit Discharge complaint information was provided to the Department of Public Works in previous correspondence. All complaints (including their compliance status, inspection results, enforcement and completion dates) are viewable on the Department's Compliance Database which is available for viewing on the Department's homepage (<http://www.aacounty.org/IP/index.cfm>).

b. Provide information regarding the following water quality issues to the general public:

Status:

The County continues to provide residents with information necessary to make informed decisions regarding water quality issues and environmental stewardship, as well as how to keep themselves and their family healthy. Several County departments have public outreach programs tailored to their specific discipline. Examples of some of the outreach activities are below.

Water Conservation and County Utilities

Via the County website, Anne Arundel County, Department of Public Works, provides water quality-related information related to County-provided services (<http://www.aacounty.org/DPW/index.cfm>). Information, presentations, brochures and fliers available through this website address such issues as:

- Annual Drinking Water Quality Report,

- Rehabilitation and maintenance of County sewer infrastructure,
- Information on recent wastewater spills,
- Fix a Leak Week,
- Preventing Sewer Backups,
- It Takes Teamwork to Protect the Bay,
- West County Groundwater Quality,
- Homeowner's Guide to Septic Tanks, and
- Homeowner's Guide to Grinder Pumps.

The Department of Public Works webpage includes a link to a Kids Page. This page uses brightly colored pictures and interactive games to teach the importance of water as a valuable resource and to instill water saving habits at a young age. The page also includes a description of the Water Cycle (<http://www.aacounty.org/DPW/Kids/index.cfm#.UcMeapwa74Y>) and information on the County's Jr. Smart Water Saver Program (www.aacounty.org/DPW/Kids/util03.cfm). The Jr. Smart Water Saver Program teaches elementary-aged children about the importance of water and water conservation through games and coloring activities.

Water Quality Protection Associated with Land Development

The Department of Inspection & Permits website contains general information related to stormwater management, buffer management, grading and permits, the Chesapeake Bay Critical Area, invasive species, and sensitive areas: (<http://www.aacounty.org/IP/FAQs/Environment.cfm>).

Household Hazardous Waste, Recycling, Landfill Services, Litter Control and Composting

Outreach pertinent to these issues has been reported in prior Annual Reports. The Department of Public Works, Waste Management Services Division (DPW WMS) manages an extensive outreach campaign geared toward residential recycling. Additionally, the County advertises and conducts Household Hazardous Waste drop-off days several times a year at the County Landfills and Convenience Centers. Literature outlining alternatives to hazardous household chemicals, and safe disposal of such chemicals, is provided to the public through many different venues. DPW WMS also provides information such as what can be recycled; ways to get recycling and composting bins; dealing with yard waste and grasscycling; amounts recycled in different areas of the County; local events that promote recycling; and question and answer forums at outreach events, in County offices, through the County website (<http://www.aacounty.org/DPW/WasteManagement/index.cfm>), on the "Recycle. More. Often." website (www.recyclemoreoften.com) and on the Anne Arundel County Recycling Division Facebook page (www.facebook.com/annearundelrecycling).

Transportation Planning

Information on ride sharing, mass transit, bus schedules, and the Pedestrian and Bicycle Master Plan is available on the County Office of Planning and Zoning website (<http://www.aacounty.org/PlanZone/Transportation/Index.cfm>). County staff members routinely offer this information to the public at outreach events and speaking engagements, encouraging the use of mass transit and alternative transportation.

Environmental Health Information (Anne Arundel County Department of Health)

The Anne Arundel County Department of Health publishes fact sheet series entitled “Health Matters” (see examples in **Appendix F**). These fact sheets are distributed at events run by the Department of Health and can also be found on their website (www.aahealth.org). Some of the subjects covered include:

- Water Quality and Swimming or Fishing In Anne Arundel County Rivers and Creeks;
- On-site sewage disposal systems and private water wells;
- Bay Restoration Fund (BRF) Program, for nitrogen-reducing pretreatment units for septic systems to be installed within the Chesapeake Bay Critical Area;
- Collapsed Septic Tanks, Overflowing Septic Systems and Failing Septic Systems Interim Health and Safety Requirements; and
- Application Procedures for Property Improvements Where Well or On-Site Septic Systems are Utilized.

The Anne Arundel County Department of Health also continues to publicize a hotline (410-222-7999) on the Department of Health's website (www.aahealth.org), where the public can listen to current advisories and closures of recreational water at any of the 106 bathing beaches that the Department monitors from Memorial Day through Labor Day. The department also promotes an e-alert system so an individual can be notified by e-mail should the Department issue an advisory or closure. Individuals can sign up for the e-alert system via the Department's website.

The Department of Health, in conjunction with the Maryland Department of the Environment and the Maryland Department of Health and Mental Hygiene, promotes the Maryland Healthy Beaches campaign. The campaign makes people aware of everyone's impact to the waterways in the State of Maryland. A major focus of the campaign is the importance of picking up pet waste. In 2013, the Department of Health plans to create a mobile application, 'Swim Guide', to keep the public abreast of recreational water quality in the County.

The Department of Health also publicizes information about on-site sewage disposal systems and private water wells. Each individual homeowner is provided

by the Department with a DVD on the maintenance and care of an on-site sewage disposal system for each newly installed system. Material on the DVD may also be viewed on the Department's website.

The Department of Health sponsored a Septic System and Bay Restoration Fund Expo at the Anne Arundel County Community College in September and continues its local promotion of the Bay Restoration Program. This program is a grant that continues to pay for a nitrogen-reducing pretreatment unit that must be installed in conjunction with an on-site sewage disposal system that is in the Chesapeake Bay Critical Area. The grant funds the entire cost of the treatment unit and a five-year service and maintenance program for repairs of failing systems in the Critical Area. The Department of Health administers this grant, awarded by the Maryland Department of the Environment and funds about 250 nitrogen reducing pretreatment units annually. These treatment units reduce the nitrogen load from an on-site sewage disposal system by at least 50%. This is a direct reduction to the nitrogen load that is reaching the Chesapeake Bay.

There are many other environmental health information topics located on the Department's website, under Environmental Health, including:

- The Bay Restoration Fund,
- Environmental Assistance Programs,
- Environmental Health Fees,
- Recreational water quality, and
- Well and Septic Systems.

Watersheds, Ecosystems, and Restoration Services (WERS) Online Mapping

As originally reported in the 2010 Annual Report, the County developed an online mapping application to track restoration projects undertaken by non-County organizations such as the Watershed Stewards Academy, grassroots environmental preservation groups, and local Riverkeepers. The mapping application also allows these organizations, and anyone with internet access and interest, to open the mapping application and view the many data layers that have resulted from the County's watershed assessments. Since 2010, the online mapping application has been progressively improved. In 2012, the County provided additional enhanced functionality by making changes to the overall look and feel of the application. The viewer was changed from a default ArcServer viewer to a more robust Geocortex viewer. This required a change in the URL of the mapping application, the new address is <http://gis-world2.aacounty.org/silverlightviewer/?Viewer=WERS>.

The upgrade to the Geocortex viewer has allowed for a better user experience by adding intuitive functionality to the mapping application. This functionality includes the addition of built in queries called "I want to...". This feature allows the user to quickly locate a known street address, restoration project, or landmark

by using the predetermined intuitive selections from a drop down menu that begins with the phrase “I want to...”. The user selects a phrase such as “I want to find an address” or “I want to find a restoration project name”. This enhancement allows a non-GIS user to quickly locate features on the map without having to construct complex queries. Another new enhancement for 2012 is the ability to add maps and external data sources. Links are provided in the toolbar to add maps from Microsoft Bing and Google Maps. Users can view Microsoft’s Birds Eye View and Google Street View directly from the mapping application. Users can overlay their own data in the mapping application by adding. Basic GIS tasks such as drawing tools, measuring tools, having the ability to save a project, and printing a map have also been added to the mapping application. Local environmental groups now have the power of a full scale GIS system at their finger tips without actually having to invest limited resources necessary to develop their own GIS. The new functionality added to the mapping application has greatly enhanced the ability of the Watershed Master Stewards and other environmental organizations to conduct restoration and outreach activities. These activities range from organizing stream cleanups, planting efforts, and constructing community rain gardens.

Watershed Stewards Academy

The Watershed Stewards Academy (WSA) was established in 2008 to train and support community leaders to become “Master Watershed Stewards” who will work toward the protection, restoration, and conservation of the local watersheds. As of October 2012, WSA completed training with its fourth class of Master Watershed Stewards; a fifth class began training in October 2012, and will graduate in December 2013, bringing the total number of certified Master Watershed Stewards to over 110.

Year 4 class training consisted of 64 hours of class room and field instruction followed by a capstone project. The Capstone projects completed during this reporting period include:

- 20 neighborhood assessments,
- 50 outreach events,
- 10 stenciled storm drains,
- 20,000 square feet of rainscaping (conservation landscapes, tree plantings, rain gardens, living shorelines),
- 170 rain barrels,
- 2 living shorelines, and
- The removal of approximately 10,000 square feet of invasive species.

The WSA has supported Certified Master Watershed Stewards through four networking meetings, five continuing education classes, and connection to resources and people to help make their projects and outreach as effective as possible. The Summer Behavior Change Institute (a 12-hour continuing education

training) guided Stewards through the process of creating targeted social marketing campaigns to reduced polluting behaviors such as improper handling of pet waste and removing leaves from curbs and storm drain inlets. The First Annual WSA Conference was held with over 100 Stewards and Consortium in attendance. Certified Master Watershed Stewards gave over 3,000 hours of volunteer time to work with their communities to reduce pollution and gave 169 presentations reaching over 5,900 people in the County with the message of reducing stormwater pollution. To date, there are 90 Certified Master Watershed Stewards and 23 Steward Candidates. Watershed Stewards have led their communities in investing over \$47,000 of private monies in community restoration projects and have obtained over \$13,000 in grant funding.

In partnership with the Center for Watershed Protection, Chesapeake Ecology Center/Rainscaping Campaign, Anne Arundel County Department of Public Works, OpinionWorks, Maryland's Watershed Assistance Collaborative, The Growth Action Network, and several Master Watershed Stewards, Arlington Echo's Watershed Stewards Academy has created the Clean Water Communities neighborhood certification program which will connect Stewards and their communities with the pollutant reductions necessary to improve our waterways. By reducing pollutants through landscape and behavior changes, communities may earn a designation as a Clean Water Community. Certification is obtained when a community achieves 30% runoff reduction on a minimum of 25 contiguous parcels in the community and 100 "Personal Pollution Pledge Points" across the entire community for reducing polluting behaviors. Care has been taken to coordinate the development of this program with many other statewide efforts to capture and count residential and community scale BMPs, including the new Urban Nutrient Management credits. All actions from Clean Water Communities will be accounted in the WERS Restoration Activity Data Form. This program will be piloted in two communities in 2013/2014.

The Founding Board of Directors released a 2012 Annual Report (posted at www.aawsa.org). The document outlines the goals of the WSA, the role of Watershed Stewards, and projects completed by Stewards to enlighten the community on the WSA. This Founding Board of Directors Annual Report also solicits donors to support the WSA through monetary, tax-deductible donations.

Maryland Tributary Teams & Chesapeake Bay TMDL WIP Implementation

During 2012, Anne Arundel County continued to actively participate in the Patuxent River Commission. County staff members associated with the NPDES MS4 Permit administration continued to serve as the County's designated Commissioner and as the alternate for the Patuxent River Commission. Staff members continued to represent the County on the State WIP Stakeholders Advisory Committee and the Anne Arundel County WIP Team. Work this year focused on drafting and finalizing the County's Phase II WIP Strategy for submittal to MDE on July 2, 2012.

Stream Cleanups in 2012

During 2012, County staff from the Department of Public Works (Highways, Engineering, and Solid Waste Bureaus) coordinated with local volunteer organizations to remove trash and large debris from local watersheds. The clean-up sites are listed below.

South River Watershed

Organization: South River Federation (SRF)

Activity: Broad Creek Cleanup. Twenty (20) South River Federation volunteers came together to clean up the headwaters of Broad Creek along Harry S. Truman Parkway in Annapolis. Volunteers spent two hours picking up trash along the length of Truman parkway from Riva Road to South Haven Road. In total, volunteers picked up over 30 bags of trash and recyclables along with four tires and a stroller.

Activity: Crab Creek Stream Cleanup. Twenty (20) volunteers from the Maryland Conservation Corps (MCC) worked for 3 hours and picked up 70 bags of trash along Green Briar & Wagon Trail Roads in Annapolis, downstream of a community without any stormwater management practices in place.

Activity: Warehouse Stream Cleanup. Nine (9) volunteers, including 3 Watershed Master Stewards, picked up 19 bags of trash along the headwaters of Warehouse Creek.

Activity: Annapolis Harbour Center Stream Cleanup. Volunteers from the SRF participated in the Alliance for the Chesapeake Bay's annual Project Clean Stream on April 14, 2012 at the Annapolis Harbour Center. Approximately 35 volunteers removed 0.83 tons of trash, 0.5 tons of recyclables, and 15 tires.

Activity: South River Farm Park Shoreline Cleanup: The SRF organized a beach cleanup of South River Farm Park. Fifteen (15) volunteers picked up 15 bags of trash and one tire.

Severn River Watershed

Organization: Severn River Association (SRA)

Activity: Volunteers removed 3.5 dumpsters of tires, metal, and trash from Clements Creek watershed. Total weight of trash was over 16 tons.

Activity: Luce Creek Stream Cleanup. Volunteers removed 15 tons of tires, metal, and trash from Luce Creek watershed.

Rhode River Watershed

Organization: West/Rhode Riverkeeper

Activity: Volunteers removed 600 pounds of trash and 15 tires from streams along Muddy Creek Road and along Blue Jay Branch in Edgewater.

Patapsco River Watershed

Friends of the Patapsco Valley & Heritage Greenway continue to coordinate stream cleanups throughout the Patapsco River Watershed. Information on their 2012 Accomplishments can be found at <http://www.patapscoheritagegreenway.org/accomplish.html>.

Stormwater Presentations

Speaking engagements and presentations pertaining to water quality issues and stormwater management were conducted during the reporting period as follows:

May 17, 2012

Leadership Anne Arundel, Flagship Environment Day
Anne Arundel County Draft Phase II Watershed Implementation Plan

February 29, 2012

Anne Arundel County Chamber of Commerce Environmental Committee Meeting
Anne Arundel County Draft Phase II Watershed Implementation Plan

January 21, 2012

WSA First Annual Conference, Keynote Address
Strategies for Pollutant Load Reduction Complimented with Communities Committed to Maximize Pollutant Source Reduction

November 21, 2011

Meeting with Anne Arundel County Commercial Property Owners – Tom Ballentine (NAIOP)
Anne Arundel County Draft Phase II Watershed Implementation Plan

November 18, 2011

Anne Arundel Nutrient Trading Program
Anne Arundel County Draft Phase II Watershed Implementation Plan

November 15, 2011

Severn River Association
Anne Arundel County Draft Phase II Watershed Implementation Plan

October 14, 2011

Chesapeake Environmental Protection Association (CEPA) Presents The
Pollution Diet

Anne Arundel County – Chesapeake Bay TMDL

Bureau of Highways

Rain Gardens

The Bureau of Highways developed a website and authored material to act as a Resident's Guide to Rain Gardens in Anne Arundel County at <http://www.aacounty.org/DPW/Highways/RainGarden.cfm>. It explains relevant County requirements, and outlines opportunities for homeowners to use rain gardens to provide flood control, groundwater recharge, and water-cooling benefits, while removing many types of pollutants and other contaminants from stormwater runoff.

Stormwater Management Facility Maintenance & Leaf Disposal

The Bureau of Highways has authored and published a Leaf Brochure at http://www.aacounty.org/DPW/Highways/Resources/Leaf_Brochure_091707.pdf. It explains relevant County services, and suggested opportunities for homeowners to manage leaves most responsibly.

Support of Area Organizations for Stream Cleanups

The Bureau of Highways has supported several stream cleanup initiatives during the reporting period. This includes Project CleanStream 2012, sponsored by the Severn River Association and involving the headwaters of Clements Creek and Luce Creek in Annapolis, Maryland during the weekend of March 31, 2012. Significant support was also provided to The Friends of the Patapsco Valley & Heritage Greenway who sponsored several watershed cleanups in Patapsco State Park off of Race Road in Hanover, Maryland (see "Stream Cleanups in 2012" above). Additionally, the Bureau of Highways removed in excess of 25 loads of trash, tires, chemicals, metal, and glass dumped illicitly along roadsides and reported by these and other volunteer organizations.

Ice Control and Snow Removal

The Bureau of Highways webpage, www.aacounty.org/dpw/highways/snowremoval.cfm explains our winter deicing strategy and resources to help shape customer expectations. An excerpt is included below.

Winter operations activities related to snow and ice control include plowing snow from the roadway and shoulders, and responsibly applying deicing chemicals to arterial and collector roads and isolated icy spots to facilitate snow plowing.

Anne Arundel County uses covered storage facilities for its road salt and stores a total of approximately 11,650 tons of salt at the following locations: Dover Road (Glen Burnie), Mountain Road (Pasadena), Crownsville Road (Annapolis), Broadneck Road (St. Margarets), Duckins Street (Odenton), West Central Avenue (Davidsonville), and at a storage yard in Friendship, Maryland. At the present time, a small portion of Anne Arundel County's fleet is equipped with liquid calcium chloride pre-wetting equipment. Pre-wetting dry salt during its application helps the salt to adhere to the roadway. In contrast, dry salt can "bounce" and blow off the roadway and be less effective.

Deicing materials are an effective tool for maintaining safe winter road conditions. However, Anne Arundel County is aware that excessive use can have negative impacts on the environment. We strive to only apply as much salt as necessary to achieve safe driving conditions. So, what are some of the environmental concerns associated with road salts? Heavy use of road salts has been assessed to cause damage to vegetation, organisms in soil, birds and to other wildlife. Chloride ions from road salts find their way eventually into waterways, whether by direct runoff into surface water or by moving through the soil and groundwater. In surface water, road salts can harm freshwater plants, fish and other organisms that are not adapted to living in saline waters.

In winter months, as soon as snow begins to accumulate, equipment is dispatched to service arterial and collector roadways. Our next priority will be insuring each community road is passable. Passable means that although the road may be snow-covered or snow-packed, at least one travel lane will be accessible with a front-wheel drive car. All-weather tires are a must. If our snowplow driver determines that your street meets our definition of passable, no further service will be provided.

c. Provide information regarding the following water quality issues to the regulated community when requested:

- i. NPDES Permitting requirements;***
- ii. Pollution prevention plan development;***
- iii. Proper housekeeping; and***
- iv. Spill prevention and response.***

Status:

The County provides training for staff working at County facilities with stormwater discharge permits as discussed in **Part III.E.4**. The trainings include information on and application of stormwater pollution prevention plans and applicable permit requirements, proper housekeeping and spill prevention, and erosion and sediment/runoff control.

Managers of each of the County-owned facilities requiring coverage under a NPDES general permit have updated the SWPPP recently, or have the update in progress, and are scheduled to update them again following the issuance of the new General Permit by MDE. Training is performed yearly, which is critical to ensure staff are fully knowledgeable of the potential pollutant sources at each facility, how to properly store and handle these sources, and the procedures for responding to a spill or emergency. Refresher trainings are provided when necessary.

The SWPPP Evaluation Reports for the four Waste Management Services facilities are included digitally in **Appendix E**, including training outlines for each. The outline includes dates the trainings were held during the 2012 reporting year and proposed dates for the 2013 reporting year. Pollution prevention plans and spill prevention, control, and countermeasure plans are kept at these facilities and updated regularly.

F. Watershed Assessment and Planning

Anne Arundel County shall continue the systematic assessment of water quality within all of its watersheds. These watershed assessments shall include detailed water quality analyses, the identification of water quality improvement opportunities, and the development and implementation of plans to control stormwater discharges to the maximum extent practicable. The overall goal is to ensure that each County watershed has been thoroughly evaluated and has an action plan to maximize water quality improvements.

At a minimum, the County shall:

- 1. Continue to develop watershed management plans for all watersheds in Anne Arundel County. A watershed management plan has been completed for the South River watershed and an additional one is currently under development for the Severn River watershed. Future plans shall be performed according to priorities established by the County. At a minimum, watershed management plans shall:*
 - a. Determine current water quality conditions;*
 - b. Identify and rank water quality problems;*
 - c. Identify all structural and non-structural water quality improvement opportunities;*
 - d. Include the results of a visual watershed inspection;*
 - e. Specify how the restoration efforts will be monitored; and*
 - f. Provide an estimated cost and a detailed implementation schedule for those improvement opportunities identified above*

Status:

Anne Arundel County developed a Watershed Assessment and Planning Program (WAP) to comply with the conditions outlined in the NPDES MS4 permit. One of the components of the WAP is to perform watershed assessments as stipulated by the permit requirements above for each of the County's 12 watersheds. The watershed studies involve a partnership between the County, various consultants, and citizen stakeholders. The field data collection is performed primarily by consultants specifically for each watershed study effort. All modeling, analysis, and reporting are performed in-house by County staff. Once the data are collected and analyzed for a watershed, the WAP staff collaborates with the consultants and other citizen stakeholders in a series of professional management team meetings to thoroughly review the information and reach consensus pertaining to assumptions and data interpretations. Once consensus is reached, the County publishes the study, including recommended restoration/preservation actions and desired implementation strategies. Additionally, environmental concerns and recommendations are portrayed in GIS files published on the County website on

the interactive WERS mapping application found at the following website address: <http://gis-world.aacounty.org/WERS/>.

Recommendations developed during watershed studies are used to advise and prioritize land use decisions and Capital Improvement Program expenditures relating to environmental restoration and preservation. To expedite implementation, preliminary restoration designs are developed as part of the watershed assessment and planning effort for some of the highest priority recommendations.

The Patapsco Tidal and Bodkin Creek study was developed and completed in Calendar Year 2012. The plan characterizes the current conditions, provides an inventory and rating for problem areas within the watershed, identifies improvement opportunities, prioritizes restoration and preservation actions, and proposes alternative implementation plans along with cost/benefit analysis for each action. Additionally, the watershed study provides preliminary designs for five recommended restoration projects and an estimate of costs to design and construct those projects. The completed study can be found on the County's website: <http://www.aacounty.org/DPW/Watershed/PatapscoBodkinStudy.cfm>.

During 2012, the County completed the field assessment work for the Little Patuxent Watershed. The County has begun the data analysis task and expects to be finished in 2013, with the report to be published in late fall of 2013. All study related material will be published on the County website: <http://www.aacounty.org/DPW/Watershed/LittlePatuxentStudy.cfm>.

During 2012, the County also completed a targeted benthic bioassessment study for 50 sampling locations within the West and Rhode River Watersheds. In addition, the County initiated a contract to begin the comprehensive study for the West and Rhode River Watersheds. The stream assessment data are anticipated to be ready by the next reporting period. Available study reports are published under: <http://www.aacounty.org/DPW/Watershed/WestRhodeStudy.cfm>.

Watershed restoration efforts are monitored through the County Capital Improvement Program (CIP) Project Q540400: Stream Monitoring. This project funds the ongoing assessment of restoration project efficacy. At a minimum, restoration projects are monitored for stability and native vegetation survivability for up to 5 years following project completion. During this monitoring period, any identified issues that may lead to project failure are either addressed through immediate remediation via the Stream Monitoring project, or are put forward for re-design and construction through a stand-alone capital project.

Chesapeake Bay Watershed TMDL – Watershed Implementation Plan Phase II

During the 2012 reporting year, Anne Arundel County continued collaboration with MDE Science Services Administration and various stakeholders within the

County to develop the Chesapeake Bay TMDL Watershed Implementation Plan (WIP). The County's target load allocation and waste load allocation for these major tributary basins are apportioned by MDE and are part of the larger Chesapeake Bay TMDL allocation.

During the reporting period, Anne Arundel County conducted a thorough assessment of the current total baseline pollutant load and the County's existing programmatic capacity to reduce their share of the load. This work led to a determination of the "gap" in capacity needed to attain the interim and final target loads.

The County also developed a comprehensive draft WIP depicting core and supplemental strategies aimed at meeting the TMDL MS4 allocations. The draft WIP included 2013 milestones, a 2017 plan to meet 60 percent of the target load, and a 2025 plan to meet the target allocation loads for Total Nitrogen (TN), Total Phosphorus (TP), and Total Suspended Solids (TSS). The draft plan was uploaded on the Maryland Assessment Scenario Tool (MAST), the web-based nutrient and sediment load estimator, and submitted to the State for review. The final Anne Arundel County Phase II WIP can be found on MDE's webpage at:

http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/FINAL_PhaseII_Report_Docs/Final_County_WIP_Narratives/Anne_Arundel_WIPII_2012.pdf.

2. *Develop watershed management plans until all land area in Anne Arundel County is covered by a specific action plan to address the water quality problems identified. At a minimum, the County shall perform a detailed watershed management plan for one County watershed during this permit term.*

Status:

The County is continuing with its efforts to develop watershed management plans for the 12 major watersheds within the County. The County is on schedule to complete the first round of assessments by spring 2016. The next round of assessments will be conducted as a County-wide effort to update the condition assessments for the highest priority for restoration and preservation areas. Table 11 shows the current schedule established to complete these studies.

Table 11. Watershed Assessment Schedule

Watershed	MDE 8-Digit Watershed Code	Timeline for Targeted Bioassessment Completion (Calendar Year)	Timeline for Habitat Assessment Completion (Calendar Year)	Timeline for Analysis Completion (Calendar Year)
Severn	02131002	Complete	Complete	Complete
South	02131003	Complete	Complete	Complete
Upper Patuxent	02131104	Complete	Complete	Complete
Magothy	02131001	Complete	Complete	Complete
Patapsco Non-Tidal	02130906	Complete	Complete	Complete
Patapsco Tidal	02130903	Complete	Complete	Complete
Bodkin	02130902	Complete	Complete	Complete
Little Patuxent	02131105	Complete	Complete	2013
Rhode	02131004	Complete	2013	2014
West	02131004	Complete	2013	2014
Herring Bay	02131005	2013	2014	2015
Middle Patuxent	02131102	2014	2015	2016

3. *Provide, in the first annual report for this permit, a complete watershed management plan for a priority watershed. Subsequent annual reports shall continue progress reporting and the detailed watershed management plan required in Part III.F.2 shall be submitted no later than the fourth annual report.*

Status:

In 2012, the County developed a complete watershed management plan for the Patapsco Tidal and Bodkin watersheds. In addition, field assessments have been completed for the Little Patuxent watershed. All GIS data associated with the Patapsco Tidal and Bodkin Watershed study have been appended to the WERS mapping application and are published online: <http://www.aacounty.org/DPW/Watershed/WatershedStudies.cfm>. It is anticipated that the remaining prioritizations and recommendations for the Little Patuxent Watershed study will be submitted with the 2013 report

G. Watershed Restoration

Anne Arundel County shall implement those practices identified in Part III.F to control stormwater discharges to the maximum extent practicable. The overall goal is to maximize the water quality in a single watershed, or combination of watersheds, using efforts that are definable and the effects of which are measurable. At a minimum, the County shall:

- 1. Complete the implementation of those restoration efforts that were identified and initiated during the previous permit term to restore ten percent of the County's impervious surface area. The watershed, or combination of watersheds where the restoration efforts are implemented shall be monitored according to Part III.H to determine effectiveness toward improving water quality.*
- 2. Begin to implement restoration efforts in a watershed, or combination of watersheds, to restore an additional ten percent of the County's impervious surface area. These efforts shall be separate from those specified in Part III.G.1 and shall be monitored according to Part III.H to determine effectiveness toward improving water quality.*

Status:

To establish a baseline from which impervious area restoration can be determined, includes accounting for existing impervious area treated by stormwater BMP facilities. Currently, Anne Arundel has an inventory of spatial BMP drainage area polygons for the Patapsco Tidal, Patapsco Non-tidal, and Bodkin Creek watersheds. Drainage area polygons for these watersheds are intersected with the County's impervious surface dataset and the amount of impervious surfaces for each drainage area polygon was calculated using GIS software. While the stormwater BMP inventories for the Magothy, Severn, South, and Upper Patuxent River watersheds were evaluated for completeness and data were refined if accurate information was identified through the watershed assessments, spatial drainage area polygons do not currently exist for these BMPs. Thus, the County is unable to derive an accurate spatial accounting of total drainage area, nor intersect these BMP drainage areas with the impervious surface polygon and derive an accurate accounting of impervious surface treatment.

Impervious surface management for these BMPs is estimated by assuming thirty percent treatment of the total drainage area attributed for these BMPs. For the remaining watersheds, Little Patuxent, West, Rhode, Middle Patuxent, and Herring Bay impervious surface treatment is assumed to be zero. BMP information for these watersheds is considered incomplete; therefore, we have decided not to take credit for their treatment of impervious surfaces. As part of our Watershed Master Plan Studies we evaluate the locations and drainage areas of these BMPs and fill in any missing information based on data pulled from As-

Built design plans and grading permits and delineate drainage areas for these BMPs. Once this information has been completed we will then intersect the drainage area polygons with our impervious surfaces and report the appropriate impervious surface treatment. The timeframe for completing impervious surface treatment for these BMPs is outlined in the Watershed Assessment Schedule in **Part III.F**, Table 11.

For stormwater BMPs without an attribute drainage area, the impervious acres treated is assumed to be zero. This differs from past reports where the unknown treatment area was based on an average for a similar treatment type in the County. For example, an infiltration basin (IB) with no attributed drainage area was assumed to treat the average impervious drainage area for all infiltration basins in the County. Beginning with the 2012 reporting period, it was decided to assume zero treatment for BMPs without an attributed treatment area rather than potentially over estimate the area treated. As a result, reported acres of impervious treatment in this section and Section C of this report are less than what has been reported in prior years.

Implementation of environmental enhancement and watershed restoration projects is administered by the Anne Arundel County Department of Public Works (DPW). The projects, which are funded under the County Capital Improvement Program (CIP) or conducted by other entities in collaboration with the County, are aimed at treating water quality through both structural and non-structural BMP implementation. **Appendix A** includes the water quality improvement and waterway restoration projects that are either completed or under active CIP contract during the 2004-2012 time period. Three hundred and five (305) restoration projects were completed between 2004 and 2012. Fifty-eight of these projects were funded and constructed through Anne Arundel County Capital Improvement Program (CIP) projects. One hundred eighty five of these projects were privately funded by Watershed Steward Academy (WSA) affiliates in collaboration with Anne Arundel County. The remaining projects were funded through grants and private funds awarded to watershed stakeholders such as the South River Federation, the Severn River Association, and the Alliance for Sustainable Communities.

The total drainage and impervious areas listed in **Appendix A** have been delineated for only those projects that are believed to provide a water quality benefit and are completely constructed as of October 2012. It is noted that no treatment credit was claimed for overlapping drainage areas, or for over management. It is also important to note that it is not possible for the County to distinguish between jurisdictional responsibilities when implementing a stream restoration project or SWM facility. Due to this, Anne Arundel County currently claims credit for the total area restored by all implemented projects, regardless of the jurisdictions from which the impervious areas drain (e.g., privately-owned impervious lands). The total impervious area treated can then be compared to the

County jurisdictional uncontrolled impervious land total to determine the County impervious percentage restored.

Summing the drainage area to each of the 305 restoration projects reveals a total drainage area treated of 11,309 acres. Many of these projects, however, have overlapping drainage areas. As noted above, the County discounts the overlapping areas, such that treatment credit is not given to the same area twice. This exercise resulted in a total drainage area for the 305 restoration projects of 6,884 acres. It should be noted that the total drainage area treated is significantly less than that reported in the 2011 Annual Report. The County attributes this reduction to a comprehensive review and evaluation of the County's CIP and Restoration Projects database to adjust for only those projects that have been completed and that provide water quality benefits. Restoration projects such as those providing fish passage do not always provide a quantifiable water quality benefit and, thus, are excluded from the water quality restoration accounting. Additionally and as noted earlier in this section, the County is no longer assuming an average drainage area or treated impervious area for those BMPs that are not already attributed with a drainage area. As the County moves forward with the Urban BMP database refinements, these drainage areas and treated impervious areas will be identified and documented for future accounting purposes.

The impervious area treated by implementation of the 305 projects has been recalculated this year, using the impervious area calculation guidance from "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" (MDE 2011). This accounting methodology reveals that the County, through the 305 projects implemented, has restored 1,307 impervious acres. Again, and for the reasons listed above, this number is significantly less than that reported in the 2011 Annual Report.

In 2012 alone, 93 restoration projects were implemented with the majority of those projects being rain barrel installation. The 2012 projects addressed a total drainage area of 215 acres and provided impervious area treatment for 54 acres. The total amount of treated impervious area within the County will be updated as additional water quality restoration projects are completed.

The County has focused its efforts and expenditures on implementing projects within areas with a completed comprehensive watershed study. The County has exceeded the 10 percent treatment requirement in the South River watershed (16% treatment), and is approaching the 10% treatment requirement in the Patapsco Tidal watershed (9.3%) and Severn River Watershed (9.0%). On a County-wide, comprehensive basis, the restoration projects provide treatment that is equivalent to 6.2% of the County's total uncontrolled impervious surface. However, according to CWP published research, watersheds with less than ten percent imperviousness are considered minimally impacted as far as the habitat and biological functions of the receiving streams. Watersheds with less than ten percent imperviousness are considered a low priority for urban restoration and are

highlighted in yellow in Table 12. If these low priority watersheds are removed from the County's total uncontrolled impervious surface treatment calculations, the County has restored the equivalent of 7.1% of its uncontrolled impervious surface.

3. Report annually

- a. The progress toward meeting the goals established in Part III.G.1 and III.G.2;*
- b. The estimated cost and the actual expenditures for all watershed restoration activity; and*
- c. The progress toward meeting the overall watershed restoration goals established in Part III.F.*

Status:

The progress toward meeting the goals established in **Part III.G.1** and **III.G.2** are listed below in Table 13. The projects listed are those that have completed the construction phase and that provide a water quality benefit. The projects constructed during the 2012 reporting year have been highlighted in green.

The total budget and actual expenditure for the completed CIP restoration projects (referenced in **Part III.C.5** and detailed in **Appendix A**) are in Table 13. The project budget information was obtained from the Anne Arundel County Project Information Management Systems (PIMS). The expenditures to date were confirmed using the County's OneWorld accounting system. Blank values in the table indicate that the information is not available or the projects were constructed by a third party in collaboration with the County but not funded by the County.

Table 12. Summary of Impervious Area Restored 2004-2012

Anne Arundel County Watersheds	Area in Acres											
	Total Area	Total Impervious Acres	Percent Impervious	Impervious Managed by Stormwater BMP	Non-County Lands (Non- Jurisdictional Impervious Area)	Jurisdictional Impervious Acres Not managed by BMPs	Impervious Managed by CIP Restoration Projects ⁽¹⁾	Rooftop Disconnections	Non-Rooftop Disconnections	% Equivalent County Impervious Area Restored	Remaining County Uncontrolled Impervious ⁽⁴⁾	Remaining Total Uncontrolled Impervious ⁽⁵⁾
Patapsco Tidal	30,852	8,626	28%	1,320	4,880 (1,568)	5,738	508.2	195	77	9.3%	4,958	6,526
Patapsco Non-Tidal	15,267	4,166	27%	713	4,842 (1,195)	2,258	39.7	144	60	1.9%	2,014	3,209
Little Patuxent	27,976	4,408	16%	<i>Incomplete</i> ⁽³⁾	12,595 (1,595)	2,813	35.3	311	48	1.4%	2,419	4,014
Severn River	44,214	8,183	18%	1,877 ⁽²⁾	9,138 (2,524)	3,782	280.0	510	158	9.0%	2,834	5,358
Magothy River	22,802	4,425	19%	930 ⁽²⁾	1,182 (278)	3,217	127.1	365	103	4.6%	2,622	2,900
South River	36,185	4,430	12%	1,384 ⁽²⁾	3,572 (732)	2,314	291.1	392	126	16.2%	1,505	2,237
Bodkin Creek	5,034	614	12%	111	35 (16)	487	0.1	91	42	0.0%	354	370
Upper Patuxent	22,417	1,225	5%	174 ⁽²⁾	5,285 (127)	924	19.5	159	19	2.6%	727	854
Herring Bay	14,239	824	6%	<i>Incomplete</i> ⁽³⁾	547 (66)	758	0.1	72	35	0.0%	651	717
West River	7,809	492	6%	<i>Incomplete</i> ⁽³⁾	506 (29)	463	3.7	57	19	1.0%	383	412
Rhode River	8,783	473	5%	<i>Incomplete</i> ⁽³⁾	2,095 (60)	413	2.0	55	15	0.6%	341	401
Middle Patuxent	29,691	1,172	4%	<i>Incomplete</i> ⁽³⁾	816 (205)	967	0.0	188	0	0.0%	779	984
Total	265,268	39,255	15%		45,530 (8,397)	24,134	1,306.9	2,538	703	6.2%*	19,586 (63.5%)	27,983(71.3%)
	⁽¹⁾ Restoration project impervious area treated based on County projects constructed between 2004 and 2012 using MDE accounting criteria.											
	⁽²⁾ A 30% impervious treatment is assumed. Values will be updated once BMP drainage areas are completed.											
	⁽³⁾ These data will be completed in accordance with the County watershed assessment schedule. No credit is claimed for incomplete analysis.											
	⁽⁴⁾ Remaining County Uncontrolled Impervious area to be treated by the County.											
	⁽⁵⁾ Remaining Total Uncontrolled Impervious: includes treatment responsibilities outside the County's jurisdiction.											
	* Not including low priority watersheds, the equivalent County percent impervious is 7.1%											
	Rows highlighted in yellow represent watersheds with less than 10% imperviousness. According to CWP, 10% imperviousness is considered the threshold for attaining good biological and habitat conditions. Urban SWM treatment for these areas is a low priority.											

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
Broadneck Road Stream Repair	3	Stream Restoration	Construction Complete	Q530700	Q530701	AACO	\$425,000	\$420,000
Crofton Tributary Restoration	7	Stream Restoration	Construction Complete	Q514300	Q514301	AACO	\$652,000	\$600,000
1343 Hollywood Ave Rain Barrel	262	Rain Barrel	Construction Complete	N/A	N/A	Private	—	—
1343 Hollywood Ave Rain Garden	263	Rain Garden	Construction Complete	N/A	N/A	Private	—	—
Arundel on the Bay Rain Garden	264	Rain Garden	Construction Complete	N/A	N/A	Private	—	—
210 Mill Church Road (Divinity Cove)	265	Bioretention	Construction Complete	N/A	N/A	Private	—	—
1509 Circle Drive Infiltration Trench/Rain Garden	266	Bioretention	Construction Complete	N/A	N/A	Private	—	—
Park Drive Rain Garden	272	Bioretention	Construction Complete	N/A	N/A	EPA Grant / Private	—	—
Little Magothy View Rain Garden	273	Bioretention	Construction Complete	N/A	N/A	EPA Grant / Private	—	—
Hillsmere Rain Garden	274	Bioretention	Construction Complete	N/A	N/A	EPA Grant / Private	—	—
Discovery Village Rain Garden	275	Bioretention	Construction Complete	N/A	N/A	EPA Grant / Private	—	—
Galesville Rain Garden	276	Bioretention	Construction Complete	N/A	N/A	EPA Grant / Private	—	—
Captain Salem Avery House Rain Gardens	277	Bioretention	Construction Complete	N/A	N/A	Ches. Trust Grant	—	—
AA County Dept. of Health	100	Bioretention	Construction Complete	N/A	N/A	EPA Grant	—	—
Aurora Hills SWM Rehabilitation 1	115	Outfall Stab / Instream Rest.	Construction Complete	Q483700	Q483701/02	AACO	\$893,000	\$829,679
Aurora Hills SWM Rehabilitation 2	116	Outfall Stab / Instream Rest.	Construction Complete	Q483700	Q483701/02	AACO		
Aurora Hills SWM Rehabilitation 3	117	Outfall Stab / Instream Rest.	Construction Complete	Q483700	Q483701/02	AACO		
Barker-Donohoe Residence	109	Bioretention	Construction Complete	N/A	N/A	EPA Grant	—	—
Blue Bird Lane Erosion	42	Stream Stabilization	Construction Complete	D499900	D499912	AACO	\$116,121	\$116,121

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
Brewer Creek Restoration	36	Wetland Creation	Construction Complete	Q437300	Q437319	AACO	\$21,000	\$21,073
Brockbridge Elem. Stream Restoration	4	Stream Stabilization	Construction Complete	Q516300	Q516301	AACO	\$502,000	\$480,000
Bywater Rain Gardens	101	Bioretention	Construction Complete	N/A	N/A	EPA Grant/Private	—	—
Cape St Claire Storm Drains and Bioretention	54	Storm Drain and water quality retrofit	Construction Complete	D381800	D381801-08	AACO	\$4,714,300	\$4,609,114
Capetown SWM Pond Retrofit	46	SWM Retrofit	Construction Complete	D499900	D499905	AACO	\$107,615	\$107,615
Central Sanitation Facility Stream Restoration	53	Stream Restoration	Construction Complete	S777200	S777203	AACO	\$916,065	\$819,000
Chartwell Rain Garden	102	Bioretention	Construction Complete	N/A	N/A	Private	—	—
Chartwell Stream Stabilization	58	Stream Stabilization	Construction Complete	Q503800	Q503801	AACO	\$318,000	\$316,625
Church Creek Stream Restoration	124	Stream Stabilization	Construction Complete	N/A	N/A	Private	—	—
Cockey Creek Retrofit Project - A St. Outfall	125	Outfall Stabilization	Construction Complete	Q462900	Q462902	AACO	\$64,250	\$64,225
Cockey Creek Retrofit - Riverside Dr & 10th St	126	Outfall Stabilization	Construction Complete	Q462900	Q462904	AACO	\$30,100	\$30,022
College Station SWM Pond Retrofit	110	SWM Retrofit	Construction Complete	D499900	D499906	AACO	\$184,000	\$183,454
Courts of Crofton Pond Retrofit	111	SWM Retrofit	Construction Complete	D499900	D499907	AACO	\$420,000	\$414,500
Cypress Rd. Rain Garden	103	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Cypress Pointe Pond Retrofit	129	SWM Retrofit	Construction Complete	D406900	D406961	AACO & Private	\$25,000	\$21,021
Dulls Corner Stream Restoration	10	Stream Restoration	Construction Complete	Q503900	Q503901	AACO	\$400,000	\$334,274
Eastport-Annapolis Neck Library	112	SWM Retrofit	Construction Complete	D499900	D499928	AACO	\$132,300	\$131,692
Edgewater Elementary BMP	57	Stream Restoration	Construction Complete	Q514500	Q514503	AACO	\$534,800	\$515,384

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
Ferry Farms Storm drain Improvement	131	Storm drain upgrades and outfall Improvement	Construction Complete	D521500	D521501	AACO	\$247,000	\$185,939
Fidanza Residence	104	Bioretention	Construction Complete	N/A	N/A	EPA Grant	—	—
Gingerville SWMP Upgrade	12	SWM Retrofit / Outfall	Construction Complete	Q497700	Q497701	AACO	\$716,000	\$716,552
Gray's Creek Bog	13	Wetland Bog Restoration	Construction Complete	Q516800	Q516801	AACO	\$503,000	\$446,222
Harundale SWM Facility	14	SWM Retrofit	Construction Complete	Q463200	Q463201	AACO	\$456,000	\$453,548
Heritage Office Complex BMP Demonstration	33	BMP Retrofit	Construction Complete	Q437300	Q437316	AACO	\$23,009	\$23,009
Hidden Pond Restoration	15	Wetland Upgrade	Construction Complete	Q437300 & D499900	Q437328 & D499916	AACO	\$91,190	\$91,190
Jabez Branch Repair	50	Stream Restoration	Construction Complete	D499900	D499925	AACO	\$25,000	\$25,000
Lincoln Dr. Bioretention	105	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Marley Station Wetland	16	Wetland Creation	Construction Complete	Q463300	Q463301	AACO	\$477,000	\$412,164
MDA Rain Gardens	106	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
National Business Park - NBP324, Downstream Mitigation	261	Stream Restoration	Construction Complete	N/A	N/A	Private	—	—
North Carolina Avenue Outfall	20	Outfall Stabilization and Wetland	Construction Complete	Q437300 & H349400	Q437338 & H349403	AACO	\$269,708	\$299,913
NPDES Storm Drain Retrofits - Foxchase	43	Storm Drain Retrofit and Water	Construction Complete	D499900	D499901	AACO	\$199,000	\$145,043
Olen Drive Fish Passage	17	Stream Restoration	Construction Complete	Q489800	Q489801	AACO	\$374,000	\$302,648
Park Road Outfall Rehabilitation	21	Outfall Stabilization	Construction Complete	Q497600	Q497601	AACO	\$149,000	\$145,043
Pine Haven Stream Erosion Repair	41	Stream Stabilization	Construction Complete	D499900	D499911	AACO	\$80,150	\$80,150

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
Randell Rd Rain Garden	107	Bioretention	Construction Complete	N/A	N/A	Eagle Scout Project	—	—
Riva Annapolis Storm Drain & Outfall Rehabilitation	23	Outfall Stabilization	Construction Complete	Q514400	Q514401	AACO	\$1,087,000	\$1,061,566
Riva Trace Baptist Church	108	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Saunders Point Storm Drains and SWM retrofit	146	Storm Drain and SWM retrofit	Phase 1 Construction Complete	D510200	D510201	AACO	\$888,000	\$496,000
Severn Station SWM Pond	56	SWM Retrofit	Construction Complete	D499900	D499908	AACO	\$375,000	\$354,377
Sloop, Eli, & Long Coves Retrofits, Site 2	29	Stream Restoration	Construction Complete	Q514100	Q514102	AACO	\$151,770	\$148,947
North Carolina Wetland Recovery @ Severn Rd. outfall.	30	Outfall Stabilization	Construction Complete	Q437300 & H349400	Q437337 & H349402	AACO	\$208,041	\$201,296
South Down Shores Storm Drain Improvement	59	Storm Drain Improvement	Construction Complete	D527400	D527401	AACO	\$414,240	\$414,237
Sunnyfield Outfall Restoration	55	Stream Restoration and BMP	Construction Complete	D499900	D499903	AACO	\$537,000	\$271,676
Wainwright Avenue Storm Drain Retrofit	113	Storm Drain Retrofit and Water Quality	Construction Complete	D537900	D537902	AACO	\$202,000	\$201,650
Western Tributary Stream Restoration	64	Stream Stabilization	Construction Complete	D499900	D499910	AACO	\$457,509	\$379,108
Wilelinor SWM Rehabilitation	40	Outfall Stabilization	Construction Complete	Q514000	Q514001	AACO	\$752,000	\$706,053
Woods Road Culvert Stream Restoration	47	Instream Culvert Retrofit	Construction Complete	Q462900 & D499900	Q462903 & D499915	AACO	\$90,522	\$89,697
Carriage Hills Outfall Stabilization and Stream Restoration	151	Outfall Stabilization and Stream Restoration	Construction Complete	N/A	N/A	EPA Grant	—	—
Saefern Outfall Stabilization	152	Outfall Stabilization	Construction Complete	N/A	N/A	EPA Grant	—	—
116 Avondale Circle Rain Barrel	153	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
120 Cove View Trail Rain Barrel	154	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
76 Point Somerset Lane Rain Barrel	155	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
317 Old County Road Rain Barrel	156	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
195 Topeg Drive Rain Barrel	157	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
202 Avondale Circle Rain Barrel	158	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
216 Springdale Avenue Rain Barrel	159	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
105 Avondale Circle Rain Barrel	160	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
91 Point Somerset Lane Rain Barrel	161	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
896 Randell Road Rain Barrel	162	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
Olde Severna Park Improvement Association Beach	163	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1228 Sandalwood Road Rain Barrel	164	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1444 Point-O-Woods Court Rain Barrel	165	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
22 Janwall Court Rain Barrel	166	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
736 Trenton Ave Rain Barrel	167	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1033 Ashe Street Rain Garden	168	Bioretention	Construction Complete	N/A	N/A	Private/	—	—
Westfield Annapolis Rain Garden	169	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
St. Philips Episcopal Church Rain Garden	170	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
1720 Tarrytown Ave Rain Garden	171	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
1720 Tarrytown Ave Rain Garden	172	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
1720 Tarrytown Ave Rain Barrels	173	Rain Barrel	Construction Complete	N/A	N/A	EPA Grant/	—	—
1721 Tedbury Rd. Rain Barrels	174	Rain Barrel	Construction Complete	N/A	N/A	EPA Grant/	—	—
1708 Truro Rd. Rain Garden	175	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
1708 Truro Rd. Rain Barrels	176	Rain Barrel	Construction Complete	N/A	N/A	EPA Grant/	—	—
1737 Urby Dr. Rain Garden	177	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
1733 Urby Dr. Rain Garden	178	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
2106 Meghan Ct. Rain Garden	179	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
St. Elizabeth Anne Seton Church Rain Garden	180	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
1535 Eton Way Infiltration	181	Infiltration	Construction Complete	N/A	N/A	EPA Grant/	—	—
1732 Tarreytown Rd. Rain Garden	182	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
1456 Harwell Ave. Rain Garden	183	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Crofton Woods Elem. Rain Garden	184	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Crofton Woods Elem. Rain Garden	185	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Crofton Town Hall Rain Garden	186	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Crofton Town Hall Rain Garden	187	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
424 & Reidel Rd. Rain Garden	188	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Beaver Creek Childcare Rain Barrel	189	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Beaver Creek Childcare Rain Garden	190	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
762 Dividing Creek Rd. Rain Garden	191	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
Heritage Baptist Church	192	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
St. Martin's Lutheran Church Rain Garden	193	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
St. Mary's Bioretention	194	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
1262 Creek Dr. Rain Garden	195	Bioretention	Construction Complete	N/A	N/A	Private/	—	—
542 Paw Paw Cove Ct. Rain Barrel	196	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
407 Avondale Circle Rain Barrel	197	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
10 Riggs Ave Rain Barrel	198	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
657 Creek Rd. Rain Barrel	199	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
603 Cypress Pointe Dr Rain Barrel	200	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
663 Creek Rd. Rain Barrel	201	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
266 Cypress Creek Rd. Rain Barrel	202	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
660 Creek Rd. Rain Barrel	203	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
505 Dill Point Dr. Rain Barrel	204	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2923 Edgewater Dr. Rain Barrel	205	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
669 Dill Rd. Rain Barrel	206	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
633 Cypress Pointe Dr. Rain Barrel	207	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
109 Rustic Ridge Rd. Rain Barrel	208	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
716 Dill Rd. Rain Barrel	209	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
677 Dill Rd. Rain Barrel	210	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
691 Dill Rd. Rain Barrel	211	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
683 Dill Ct. Rain Barrel	212	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
681 Dill Rd. Rain Barrel	213	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
649 Dunkeld Ct. Rain Barrel	214	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
629 Dunkeld Ct. Rain Barrel	215	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
643 Dunkeld Ct. Rain Barrel	216	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
56 Bricepoint Ct. Rain Barrel	217	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
209 Wood Loch Ln Rain Barrel	218	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
203 Wood Loch Ln Rain Barrel	219	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
52 Taras Trail Rain Barrel	220	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
55 Cypress Pointe Ct. Rain Barrel	221	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
238 Charita Way. Rain Barrel	222	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2810 Carrollton Rd. Rain Barrel	223	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2554 Carrollton Rd Rain Barrel	224	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1036 Harbor Rain Barrel	225	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1029 Pinecrest Dr. Rain Barrel	226	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2806 Carrollton Rd Rain Barrel	227	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1031 Harbor Dr. Rain Barrel	228	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2834 Carrollton Rd. Rain Barrel	229	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2670 Carrollton Rd. Rain Barrel	230	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2655 Carrollton Rd. Rain Barrel	231	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
1034 Old Bay Ridge Rd. Rain Barrel	232	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2818 Carrollton Rd. Rain Barrel	233	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2660 Claibourne Rd. Rain Barrel	234	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2616 Ogleton Rd. Rain Barrel	235	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2687 Claibourne Rd. Rain Barrel	236	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2800 Carrollton Rd. Rain Barrel	237	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2804 Carrollton Rd. Rain Barrel	238	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
207 Riverside Rd. Rain Barrel	239	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6433 Weems Ave Rain Barrel	240	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6656 Highview Terrace, Rain Barrel	241	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
401 Arundel Rd Rain Barrel	242	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6437 Weems Ave Rain Barrel	243	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6714 Duck Lane Rain Barrel	244	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
Captain Salem Avery House Rain Barrels	245	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6605 Revell Rd Rain Barrel	246	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2744 Swan Way Rain Barrel	247	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2764 Ashe St. Rain Barrel	248	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1712 Truro Rd. Rain Barrel	249	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2650 Claibourne Rd. Rain Barrel	250	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2849 Green Willow Dr. Rain Barrel	251	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
124 Bay Park Way Rain Barrel	252	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
306 Holland Rd. Rain Barrel	253	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
301 Park Dr Rain Barrel	254	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
43 Lockleven Dr. Rain Barrel	255	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
737 Trenton Ct. Rain Barrel	256	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
95 Barrensdale Dr. Rain Barrel	257	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
516 White Oak Dr. Rain Barrel	258	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
204 Avondale Circle Rain Barrel	259	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
409 Glenmont Ave Rain Barrel	260	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
Captain Salem Avery House Rain Gardens	277	Bioretention	Construction Complete	N/A	N/A	Chesapeake Trust Grant	—	—
Science Drive In-Stream Weir	278	Stream Stabilization	Complete			AACO	—	121,000
West River Center Rain Garden	285	Rain Garden	Complete	N/A	N/A	WSA	—	—
W. Benfield Blvd. Buffer Planting	291	Buffer Planting	Complete	N/A	N/A	Pointfield West HOA	—	—
Horn Point Marina Rain Garden	292	Rain Garden	Complete	N/A	N/A	Marina Owner	—	—
Gingerville Creek Riparian Buffer Planting	293	Buffer Planting	Complete	N/A	N/A	WSA	—	—
South Shore Baptist Church Planting	294	Buffer Planting	Complete	N/A	N/A		—	—
Heritage Harbor Tree Planting	297	Buffer Planting	Complete	N/A	N/A	AA County paid for 230 trees / shrubs	—	1,000
1037 Ashe St Rain Barrels	301	Rain Barrel	Complete	N/A	N/A	Private	—	—
130 Calhoun St Rain Garden	302	Rain Garden	Complete	N/A	N/A	WSA with CBT grant	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
Anne Arundel Community College Rain Garden	305	Rain Garden	Complete	N/A	N/A	Unity Gardens grant	—	—
1506 Winchester Rd Rain Garden	306	Rain Garden	Complete	N/A	N/A	Private	—	—
Severn Run Stream Stabilization	309	Stream Stabilization	Complete			AACO	—	30,000
Picture Spring Branch Stream Stabilization	310	Stream Stabilization	Complete			AACO	—	96,000
Lionsgate Stream Stabilization	315	Stream Stabilization	Complete			AACO	—	55,000
Park Road Infiltration Trench	316	Infiltration	Complete	N/A	N/A	Private	—	—
Homeport Farms SPSC	317	Outfall Stabilization	Complete			Private	—	—
Olde Severna Park Community Rain Garden	318	Bioretention	Complete	N/A	N/A	Private	—	—
Little Beach Tree Planting	319	Conservation Landscape	Complete	N/A	N/A	Private	—	—
Oyster Harbor Citizen Assn Rain Barrel	320	Rain Barrel	Complete	N/A	N/A	HOA Funding, Private	—	—
Fishing Creek Park Rain Garden	321	Bioretention	Complete	N/A	N/A	Federal/State Grant, HOA Funding	—	—
Arundel on the Bay Pumping Station VI No-Mow Zone	322	Conservation Landscape	Complete	N/A	N/A	Federal/State Grant	—	—
Arundel on the Bay Pumping Station VI Rain Barrel	323	Rain Barrel	Complete	N/A	N/A	Private	—	—
Arundel Lodge Rain Garden	324	Bioretention	Complete	N/A	N/A	Federal/State Grant, Non-Government	—	—
USNA Nature Center Rain Barrels	325	Rain Barrel	Complete	N/A	N/A	Federal/State Grant	—	—
USNA Nature Center Rain Garden	326	Bioretention	Complete	N/A	N/A	Federal/State Grant	—	—
258 Lower Magothy Beach Rd Rain Garden	327	Bioretention	Complete	N/A	N/A	Private	—	—
Popular Ave Rain Garden	328	Conservation Landscape	Complete	N/A	N/A	Private	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
Saefern Upland Tree Planting	329	Conservation Landscape	Complete	N/A	N/A		—	—
Klinken Native Plantings	330	Conservation Landscape	Complete	N/A	N/A	Private	—	—
Klinken Rain Garden	331	Bioretention	Complete	N/A	N/A	Private	—	—
Little Magothy Beach Rain Garden	332	Bioretention	Complete	N/A	N/A	Private	—	—
Olde Severna Park Community Infiltration Trench	333	Infiltration	Complete	N/A	N/A	Private	—	—
1104 Little Magothy View Rain Garden	334	Bioretention	Complete	N/A	N/A	Private	—	—
40 Johnson Road Rain Barrel	335	Rain Barrel	Complete	N/A	N/A	Private	—	—
Old Herald Harbor Road Emergency Culvert Repair	336	Stream Stabilization	Complete	N/A	N/A	AACO	—	270,525
Patuxent River Road Emergency Culvert Repair	337	Stream Stabilization	Complete	N/A	N/A	AACO	—	275,000
1414 Ridgeway East Rain Barrels	338	Rain Barrel	Complete	N/A	N/A	Private	—	—
Shady Cove Natural Area Wetland	339	Living Shoreline	Complete	N/A	N/A	EPA Grant/Private	—	—
Hammarlee Road SPSC	340	Outfall Stabilization	Complete	N/A	N/A	Private/Developer	—	—
602 Hammonds Ferry Road SPSC	341	Outfall Stabilization	Complete	N/A	N/A	Private/Developer	—	—

The following list of projects were completed during the current reporting year.

Severnview Drive Outfall Restoration	11	Outfall Restoration	Complete	Q516600	Q516601/02	AACO	717,000	717,000
North Carolina Wetland Recreation Phase 2	32	Wetland Creation	Complete	Q536100	Q536101	AACO	299,000	248,864
Fairoaks Outfall Retrofit	130	Outfall Stabilization	Phase I Complete	Q499900	Q499939	AACO	567,000	567,000
Peach Orchard SWM Retrofit	143	SWM Retrofit	Complete	D537900	D537919	AACO	393,000	393,000
Selby on the Bay Storm Drains	147	Storm Drain Improvement	Complete	D515500	D515501	AACO	1,338,000	1,421,517

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
Dunkeld Manor SWM Retrofit	268	SWM Retrofit	Complete	D499900	D499943	AACO	312,000	312,000
Lake Louise Rain Garden	343	Bioretention	Complete	N/A	N/A	Private	—	—
Buena Vista Outfall Repair	344	Outfall Stabilization	Complete	D549600	D000113	AACO	138,000	583,790
Millersville Elementary SPSC	345	Outfall Stabilization	Complete	C478400	C478417	AACO	—	—
4604 Hinchingham Lane Rain Barrel	349	Rain Barrel	Complete	N/A	N/A	Private	—	—
303 Bay View Drive Rain Garden	352	Bioretention	Complete	N/A	N/A	Private	—	—
27 Johnson Road Rain Barrel	357	Rain Barrel	Complete	N/A	N/A	Private	—	—
38 Johnson Road Rain Barrel	358	Rain Barrel	Complete	N/A	N/A	Private	—	—
118 Bar Harbor Road Rain Barrel	359	Rain Barrel	Complete	N/A	N/A	Private	—	—
102 Bar Harbor Road Rain Barrel	360	Rain Barrel	Complete	N/A	N/A	Private	—	—
126 Bar Harbor Road Rain Barrel	361	Rain Barrel	Complete	N/A	N/A	Private	—	—
7748 Glen Avenue Rain Barrel	362	Rain Barrel	Complete	N/A	N/A	Private	—	—
Knights Conservation Garden	363	Rain Barrel	Complete	N/A	N/A	Private	—	—
Bodkin Elementary Rain Barrel	365	Rain Barrel	Complete	N/A	N/A	Private	—	—
202 Nomini Drive Rain Barrel	366	Rain Barrel	Complete	N/A	N/A	Private	—	—
861 Twin Harbor Drive Rain Barrel	367	Rain Barrel	Complete	N/A	N/A	Private	—	—
207 Mill Harbor Drive Rain Barrel	368	Rain Barrel	Complete	N/A	N/A	Private	—	—
205 Mill Harbor Drive Rain Barrel	369	Rain Barrel	Complete	N/A	N/A	Private	—	—
206 Mill Harbor Drive Rain Barrel	370	Rain Barrel	Complete	N/A	N/A	Private	—	—
185 Doncaster Drive Rain Barrel	371	Rain Barrel	Complete	N/A	N/A	Private	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
207 Mackes Bluff Lane Rain Barrel	372	Rain Barrel	Complete	N/A	N/A	Private	—	—
198 West Paddock Circle Rain Barrel	373	Rain Barrel	Complete	N/A	N/A	Private	—	—
180 Dividing Court Rain Barrel	374	Rain Barrel	Complete	N/A	N/A	Private	—	—
204 Mill Court Rain Garden	375	Rain Barrel	Complete	N/A	N/A	Private	—	—
183 Doncaster Drive Rain Barrel	376	Rain Barrel	Complete	N/A	N/A	Private	—	—
221 St. Antons Way Rain Barrel	377	Rain Barrel	Complete	N/A	N/A	Private	—	—
10 Milburn Circle Rain Barrel	378	Rain Barrel	Complete	N/A	N/A	Private	—	—
8353 Forest Glen Dr Rain Barrel	379	Rain Barrel	Complete	N/A	N/A	Private	—	—
8376 Forest Drive Rain Barrel	380	Rain Barrel	Complete	N/A	N/A	Private	—	—
8444 Garland Road Rain Garden	381	Rain Barrel	Complete	N/A	N/A	Private	—	—
85 Milburn Circle Rain Barrel	382	Rain Barrel	Complete	N/A	N/A	Private	—	—
8404 Isles Drive Rain Barrel	383	Rain Barrel	Complete	N/A	N/A	Private	—	—
1242 Doris Avenue Rain Barrel	384	Rain Barrel	Complete	N/A	N/A	Private	—	—
10 Gray Drive Rain Barrel	385	Rain Barrel	Complete	N/A	N/A	Private	—	—
700 Marboro Road Rain Barrel	386	Rain Barrel	Complete	N/A	N/A	Private	—	—
223 Harbor Drive Rain Garden	387	Rain Barrel	Complete	N/A	N/A	Private	—	—
187 Grosvenor Land Rain Barrel	388	Rain Barrel	Complete	N/A	N/A	Private	—	—
8291 Highglade Ct. Rain Barrel	390	Rain Barrel	Complete	N/A	N/A	Private	—	—
303 Maryland Ave Rain Barrel	391	Rain Barrel	Complete	N/A	N/A	Private	—	—
45 Boone Trail Rain Barrel	392	Rain Barrel	Complete	N/A	N/A	Private	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
7 Boone Trail Rain Barrel	393	Rain Barrel	Complete	N/A	N/A	Private	—	—
5 Ridge Road Rain Barrel	394	Rain Barrel	Complete	N/A	N/A	Private	—	—
110 Boone Trail Rain Barrel	395	Rain Barrel	Complete	N/A	N/A	Private	—	—
13 Linstead Road Rain Barrel	396	Rain Barrel	Complete	N/A	N/A	Private	—	—
6 Cedar Point Road Rain Barrel	397	Rain Barrel	Complete	N/A	N/A	Private	—	—
1 Ridge Road Rain Barrel	398	Rain Barrel	Complete	N/A	N/A	Private	—	—
56 Boone Trail Rain Barrel	399	Rain Barrel	Complete	N/A	N/A	Private	—	—
153 Boone Trail Rain Barrel	400	Rain Barrel	Complete	N/A	N/A	Private	—	—
21 Boone Trail Rain Barrel	401	Rain Barrel	Complete	N/A	N/A	Private	—	—
161 Boone Trail Rain Barrel	402	Rain Barrel	Complete	N/A	N/A	Private	—	—
24 Linstead Road Rain Barrel	403	Rain Barrel	Complete	N/A	N/A	Private	—	—
50 Boone Trail Rain Barrel	404	Rain Barrel	Complete	N/A	N/A	Private	—	—
162 Boone Trail Rain Barrel	405	Rain Barrel	Complete	N/A	N/A	Private	—	—
19 Ridge Road Rain Barrel	406	Rain Barrel	Complete	N/A	N/A	Private	—	—
16 Linstead Road Rain Barrel	407	Rain Barrel	Complete	N/A	N/A	Private	—	—
103 Boone Trail Rain Barrel	408	Rain Barrel	Complete	N/A	N/A	Private	—	—
163 Boone Trail Rain Barrel	409	Rain Barrel	Complete	N/A	N/A	Private	—	—
138 Boone Trail Rain Barrel	410	Rain Barrel	Complete	N/A	N/A	Private	—	—
1253 Vintage Drive Rain Barrel	411	Rain Barrel	Complete	N/A	N/A	Private	—	—
1419 Shore Drive Rain Barrel	412	Rain Barrel	Complete	N/A	N/A	Private	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
1228 Daves Road Rain Barrel	413	Rain Barrel	Complete	N/A	N/A	Private	—	—
26 Brookfield Road Rain Barrel	414	Rain Barrel	Complete	N/A	N/A	Private	—	—
3426 Kings Retreat Court Rain Barrel	415	Rain Barrel	Complete	N/A	N/A	Private	—	—
3444 Constellation Drive Rain Barrel	416	Rain Barrel	Complete	N/A	N/A	Private	—	—
1719 Woodlore Road Rain Barrel	417	Rain Barrel	Complete	N/A	N/A	Private	—	—
402 Ben Oaks Drive East Rain Barrel	418	Rain Barrel	Complete	N/A	N/A	Private	—	—
735 Bayard Road Rain Barrel	419	Rain Barrel	Complete	N/A	N/A	Private	—	—
110 Lockleven Drive Rain Barrel	420	Rain Barrel	Complete	N/A	N/A	Private	—	—
1906 Harcourt Avenue Rain Barrel	421	Rain Barrel	Complete	N/A	N/A	Private	—	—
1757 Crofton Parkway Rain Barrel	422	Rain Barrel	Complete	N/A	N/A	Private	—	—
1565 Eton Way Rain Barrel	423	Rain Barrel	Complete	N/A	N/A	Private	—	—
927 Juliet Land Rain Barrel	424	Rain Barrel	Complete	N/A	N/A	Private	—	—
448 West Maple Road Rain Barrel	425	Rain Barrel	Complete	N/A	N/A	Private	—	—
112 Simms Road Rain Barrel	426	Rain Barrel	Complete	N/A	N/A	Private	—	—
511 Whitehorse Court Rain Barrel	427	Rain Barrel	Complete	N/A	N/A	Private	—	—
625 Cadbury Drive Rain Barrel	428	Rain Barrel	Complete	N/A	N/A	Private	—	—
770 Brushwood Court Rain Garden	429	Bioretention	Complete	N/A	N/A	Private	—	—
Richard Henry Lee Rain Garden	430	Bioretention	Complete	N/A	N/A	Private	—	—
8239 Chalet Court Rain Garden	431	Bioretention	Complete	N/A	N/A	Private	—	—
Ben Oaks Living Shoreline	432	Living Shoreline	Complete	N/A	N/A	Private	—	—

Table 13. Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
26 Boone Trail Rain Barrel	445	Rain Barrel	Complete	N/A	N/A	Private	—	—
1 Boone Trail Rain Barrel	446	Rain Barrel	Complete	N/A	N/A	Private	—	—
115 Boone Trail Rain Barrel	447	Rain Barrel	Complete	N/A	N/A	Private	—	—
54 Boone Trail Rain Barrel	448	Rain Barrel	Complete	N/A	N/A	Private	—	—
17 Ridge Road Rain Barrel	449	Rain Barrel	Complete	N/A	N/A	Private	—	—
107 Boone Trail Rain Barrel	450	Rain Barrel	Complete	N/A	N/A	Private	—	—
15 Boone Trail Rain Barrel	451	Rain Barrel	Complete	N/A	N/A	Private	—	—
61 Boone Trail Rain Barrel	452	Rain Barrel	Complete	N/A	N/A	Private	—	—

H. Assessment of Controls

Assessment of controls is critical for determining the effectiveness of the NPDES stormwater management program and progress toward improving water quality. Therefore, the County shall use chemical, biological, and physical monitoring to document work toward meeting the watershed restoration goals identified in Part III.G. Additionally, the County shall continue physical stream monitoring in Picture Spring Branch in the Severn River watershed to assess the implementation of the 2000 Maryland Stormwater Design Manual or other innovative stormwater management technologies approved by MDE. Specific monitoring requirements are described below.

1. Watershed Restoration Assessment

The County shall continue monitoring the Parole Plaza outfall and Church Creek in-stream station in the South River watershed or select and submit for MDE's approval a new watershed restoration project for monitoring. Ample time shall be provided so that pre-restoration monitoring, or characterization monitoring, can take place. Monitoring activities shall occur where the cumulative effects of watershed restoration activities can be assessed. An outfall and associated in-stream station, or other locations based on a study design approved by MDE, shall be monitored. The minimum criteria for chemical, biological, and physical monitoring are as follows:

a. Chemical Monitoring

- i. Twelve storm events shall be monitored per year at each monitoring location with at least three occurring per quarter. Quarters shall be based on the calendar year. If extended dry weather periods occur, baseflow samples shall be taken at least once per month at the monitoring stations if flow is observed;*
- ii. Discrete samples of stormwater flow shall be collected at the monitoring stations using automated or manual sampling methods. Measurements of pH and water temperature shall be taken;*
- iii. At least three samples determined to be representative of each storm event shall be submitted to a laboratory for analysis according to methods listed in 40 CFR Part 136 and EMC shall be calculated for:*

<i>Biochemical Oxygen Demand (BOD₅)</i>	<i>Total Lead</i>
<i>Total Kjeldahl Nitrogen (TKN)</i>	<i>Total Copper</i>
<i>Nitrate plus Nitrite</i>	<i>Total Zinc</i>
<i>Total Suspended Solids</i>	<i>Total Phosphorus</i>
<i>Total Petroleum Hydrocarbons (TPH)</i>	<i>Oil and Grease*</i>
<i>Fecal Coliform or E. coli</i>	<i>(*Optional).</i>

- iv. Continuous flow measurements shall be recorded at the in-stream monitoring station or other practical locations based on an approved*

study design. Data collected shall be used to estimate annual and seasonal pollutant loads and for the calibration of watershed assessment models;

Status:

Anne Arundel County continues to conduct a long-term monitoring program to satisfy the above permit conditions. This monitoring program includes chemical, biological, and physical monitoring in the Church Creek subwatershed located in the South River Watershed. Monitoring for this permit year extended from November 2011 through September 2012, or for eleven months. The full Church Creek monitoring report can be found in **Appendix B** and the data required to support this section are also provided in **Appendix B** in the prescribed format.

The chemical monitoring activities take place at two monitoring stations in the Church Creek subwatershed:

- Parole Plaza Station: Outfall representing a highly impervious (87 percent) commercial land use which was redeveloped in 2007 as the Annapolis Towne Centre; the construction incorporated stormwater management into the redevelopment (i.e. a restoration station); and
- Church Creek Station: An instream station approximately 2,000 feet downstream of the Parole Plaza monitoring station.

During the 2011 reporting period, nine storm events were sampled and two baseflow samples were collected and analyzed. Storm event samples were collected from both stations for the rising, peak, and falling limbs of the hydrograph. Samples were analyzed for the parameters previously listed plus Hardness, which will be a requirement in the fourth generation NPDES MS4 Permit.

Continuous water level measurements were taken at the Church Creek instream station and were used to calculate flows and pollutant loads. Continuous level measurements were also taken within both the 60" CMP and 54" RCP at the Parole Monitoring Station. Flow measurements for sampled storms were used to develop Event Mean Concentrations (EMCs) for the storm events, which were used to calculate pollutant loads for the watershed.

Over several years of monitoring, the EMCs for many of the parameters are fairly consistent; however, during the redevelopment of the Annapolis Towne Centre, many of the EMCs increased dramatically. This coincides with documented discharges of sediment-laden stormwater from the construction site. Following completion of the construction, substantial reductions in many of these EMCs were found. The reductions continued beyond historic preconstruction levels. During the 2010 reporting year, however, EMCs for many of the parameters stabilized, and remained fairly consistent through 2012, with the exception of a

slight rise in BOD5, and a sharp rise in *E. coli*. The sharp rise in *E. coli* observed at each station is probably due to a sewage spill that occurred at the Annapolis Towne Centre at Parole on August 6, 2012.

Further discussion of the monitoring activities at these stations and the resulting data can be found in the included monitoring report in **Appendix B**.

b. Biological Monitoring

- i. Samples shall be gathered each spring between the outfall and in-stream stations or other practical locations based on an approved study design; and*
- iii. The County shall use the EPA's Rapid Bioassessment Protocol III or other similar method approved by MDE.*

Status:

A total of four 75-meter biological monitoring reaches are positioned along Church Creek between the Annapolis Towne Centre outfall and the Church Creek in-stream water quality monitoring station. Benthic macroinvertebrate samples were collected from these stations in March 2012, following the Maryland Biological Stream Survey (MBSS) spring index period protocols. One station is located on the Parole Plaza Tributary just below Forest Drive, two stations are located along the Church Creek mainstem, on either side of Solomons Island Road (Maryland State Highway 2), and a fourth site, located just upstream of the confluence with the Parole Plaza Tributary, was added in 2007 to monitor the effects of runoff from the adjacent Annapolis Harbour Center and Festival at Riva shopping centers. The biological condition at each station was evaluated using the Benthic Index of Biotic Integrity (BIBI) developed for use in Maryland's Coastal Plain streams. Results of the 2012 sampling period indicate that biological conditions within the Church Creek study area continue to be impaired by urbanization within the surrounding watershed. Since 2006, all stations have consistently been rated as either 'Poor' or 'Very Poor.' The number of EPT taxa, the number of *Ephemeroptera* and the percent *Ephemeroptera* were low for all stations. In general, the lack of instream woody debris and stable epifaunal substrate prohibits the stream from supporting a diverse and healthy macroinvertebrate community, while high levels of dissolved solids indicate the presence of water quality stressors. These appear to be a few of the factors limiting the biological conditions within Church Creek. The results of the biological monitoring program are included in **Appendix B**.

c. Physical Monitoring

- i. A geomorphologic stream assessment shall be conducted between the outfall and in stream monitoring locations or in a reasonable area based on an approved study design. This assessment shall include an annual*

comparison of permanently monumented stream channel cross-sections and the stream profile;

ii. A stream habitat assessment shall be conducted using techniques defined by the EPA's "Rapid Bioassessment Protocol for use in Streams and Rivers," or other similar method; and

iii. A hydrologic and/or hydraulic model shall be used (e.g., TR-20, HEC-2, HSPF, SWMM, etc.) to analyze the effects of rainfall; discharge rates; stage; and, if necessary, continuous flow on channel geometry.

Status:

Due to the highly altered conditions of the drainage area and stream channel in the study area, reliable bankfull indicators were often difficult to locate in the field, thus leading to a fair amount of professional judgment used to interpret the data and categorize the stream segments. This means that categorization of some of the stream segments may change dramatically from year to year. Table 14 is a summary of each reach and its classification.

Table 14. Physical Characterization Summary

Reach	2011 Classification	2012 Classification	Notes
XS-1	C4/5 to F4/5	F5	Channel degradation, loss of floodplain connectivity, and widening indicate this channel is not stable.
XS-2	G5c	G5c	Actively degrading and widening with lack of sinuosity; shifting to a less-stable form.
XS-3	Not classified	Not classified	This section was recently restored with modification to the channel dimensions, so it was deemed inappropriate to classify.
XS-4	E5	E5	Low entrenchment, low width/depth ratio, low slope, and well-connected floodplain.
XS-5	C3/5	C3/5	Slight entrenchment, moderate width/depth ratio, and low sinuosity.

There are indications of channel instability in the upper reaches, and thus, a need for additional stormwater management to prevent further erosion. The physical and habitat assessments of Church Creek are included in the *Chemical*,

Biological, and Physical Characterization of the Church Creek and Parole Plaza NPDES Monitoring Stations: 2012, located in **Appendix B**.

While geomorphic data collected in the Church Creek study area were generally consistent with previous measurements, significant departure from expected values, as derived from Maryland Coastal Plain regional relationships of bankfull channel geometry, were observed for cross sectional area, bankfull width, and bankfull depth dimensions. All dimensions were generally larger in the Church Creek study area, and were more similar to relationships of bankfull channel geometry derived from urban watersheds. This reflects the higher level of imperviousness in the study area, as compared to those levels in the drainage areas used to develop the regional relationship data.

d. Annual Data Submittal

The County shall describe in detail its monitoring activities for the previous year and include the following:

- i. EMCs submitted on MDE's long-term monitoring database as specified in Part IV.A.2.d;***
- ii. Chemical, biological, and physical monitoring results and a combined analysis for Parole Plaza or other approved monitoring locations; and***
- iii. Any requests and accompanying justifications for proposed modifications to the monitoring program.***

Status:

The required EMCs and monitoring database are found in **Appendix B**. This database has been revised from previous versions to comply with the recent update to the database formatting requirements provided by MDE with the draft fourth generation Permit. Also included in this Appendix is the report entitled *Chemical, Biological, and Physical Characterization of the Church Creek and Parole Plaza NPDES Monitoring Stations: 2012*, which provides greater detail on the work performed in this watershed.

During the 2013 reporting year, the County will continue the monitoring program at the Church Creek and Picture Spring Branch Stations. In the near future, the County will investigate other potential candidate sites for the long term monitoring program and, should an appropriate candidate site be identified, will propose the relocation of the monitoring stations.

2. Stormwater Management Assessment

The County shall continue monitoring in Picture Spring Branch for determining the effectiveness of stormwater management practices for stream channel protection. Physical stream monitoring protocols shall include:

a. An annual stream profile and survey of permanently monumented cross-sections in Picture Spring Branch to evaluate channel stability in conjunction with the ensuing development of the West County Library site;

b. A comparison of the annual stream profile and survey of the permanently monumented cross-sections with baseline conditions for assessing areas of aggradation and degradation; and

c. A hydrologic and/or hydraulic model shall be used (e.g., TR-20, HEC-2, HEC-RAS, HSPF, SWMM, etc.) to analyze the effects of rainfall; discharge rates; stage; and, if necessary, continuous flow on channel geometry.

Status:

Physical condition and habitat monitoring for Picture Spring Branch, in the vicinity of the West County Library site, began in 2003 and is conducted annually. Five permanent cross-sections were established throughout the study area to evaluate channel stability over time. Three cross-sections are located on the North Tributary, including one downstream of Maryland State Highway 170, and one on the South Tributary. It should be noted that the South Tributary does not receive significant stormwater runoff from the West County Library site. The majority of the runoff from this site drains to the North Tributary.

In 2012, these cross sections were re-measured and longitudinal profile surveys were conducted along both the North Tributary (totaling 1,935 linear feet) and South Tributary (totaling 366 linear feet). Channel dimensions along the North Tributary have not changed substantially from baseline conditions, although some minor aggradation was noted. However, two of the cross sections along the South Tributary experienced a significant increase in cross sectional area (25 and 22 percent). The channel in this section appears to be down-cutting, and is undermining the right bank. If conditions continue to worsen in this location, some stabilization may be required.

Overall, it appears that the BMPs installed as part of the development of the West County Library site have been effective in reducing the geophysical impacts of stormwater runoff. As noted previously, the South Tributary does not receive significant amounts of drainage from the West County Library site.

In March 2012, a biological assessment was conducted at three previously established 75-meter reaches within the study area. From 2006 to 2008, biological condition in these reaches appeared to remain fairly steady with ratings of 'Fair' to 'Poor'; however, during 2009 scores declined at all three sites with two of the sites rating 'Poor' and one rating 'Very Poor'. Since 2009 scores have improved at all sites. In 2012, all sites received a rating of 'Fair'. The full biological and geomorphological conditions report is included in **Appendix C**.

I. Program Funding

- 1. Annually, a fiscal analysis of the capital, operation, and maintenance expenditures necessary to comply with all conditions of this permit shall be submitted as required in Part IV.***

Status:

The 2012 Annual Report covers the reporting period of November 2011 to October 2012, and falls primarily within the County's 2012 Fiscal Year (FY2012). Thus, program funding for FY2012 is addressed in this section (Table 15). The next annual reporting period (October 2012 to July 2013) will incorporate fiscal information from the County's 2013 Fiscal Year.

On-going funding for NPDES MS4 Permit compliance is addressed primarily through the County Capital Improvement Program (CIP) where funding for the current County fiscal year and the next five fiscal years is allocated to the "Stormwater Runoff Controls" and "Water Quality Improvements" CIP classifications. Specific line items funded through the CIP include stormwater permit compliance program, storm drain rehabilitation, closed storm drain repairs and replacement, stormwater infrastructure inspection and maintenance, stormwater facility retrofits, outfall repairs, and stream and ecological restoration projects. The budget for these project classes for FY2012 and the projected budgets for FY2013 through FY2017 total \$34,778,000. Table 16 and Table 17 denote the allocation of these funds by project.

The Anne Arundel County operating budget for FY2012 also provides permit compliance support through funding of personnel services (i.e., staff) associated with permit compliance. Such support is derived primarily from the County's Office of Planning and Zoning, Department of Inspections and Permits, Soil Conservation District, Department of Public Works, Office of Law, and the County Health Department. Each of these agencies has responsibility or provides support for certain permit requirements and all must work collaboratively to achieve County compliance with permit terms. Review of FY2012 operating budget allocation to each agency, combined with interviews with each agency having MS4 compliance responsibility, indicates approximately \$7,135,700 was expended in FY2012 to support permit compliance. This number is less than was what reported in the 2011 Annual Report; however, this number reflects a refinement of how the operating budget allocation to permit compliance is derived. Given the impending implementation of the Watershed Protection and Restoration Fund, the County will be under increased scrutiny regarding the calculation of staff time and operating expenditures allocated to permit compliance and WPRF implementation. Therefore, the County anticipates further procedural improvements in accounting for these operating budget expenditures in upcoming annual reports.

The complete Fiscal Year 2012 approved County budget is available for review and download at www.aacounty.org/Budget/index.cfm. The County is committed to achieving MS4 permit compliance, and strives to maintain adequate funding to meet the permit requirements. In recent years, the County, like many of its sister jurisdictions and the State, has experienced significant decreases in both operating and capital budget allocations. Such decreases affect the County's ability to allocate staff and resources to ensure absolute permit compliance. Nevertheless, the County continues efforts to ensure the MS4 Program funding and staffing allocations remain at a level that allows us to address our permit obligations.

2. Adequate program funding to comply with all conditions of this permit shall be maintained.

Status:

In Fiscal Year 2012, the County allocated \$8,077,000 under the Capital Improvement budget for nonpoint source and stormwater projects. Example projects included in the funding for FY2012 are:

- Implementation of the NPDES MS4 Permit Program \$ 1,100,000
- NPDES Storm Drainage Retrofits \$ 500,000
- Stormwater Pond Maintenance \$ 300,000
- Storm Drainage and SWM Infrastructure Rehabilitation \$ 1,000,000

The full CIP budget allocations are shown in Table 16 and Table 17.

As noted above, the FY2012 Operating Budget allocated approximately \$11,600,000 in personnel services to support the NPDES MS4 Permit conditions.

Table 15 denotes the distribution of funding from the County's FY2012 Capital and Operating Budgets. This table is provided below and also as an electronic file in the spreadsheet format that will be required under the next generation NPDES MS4 Permit.

Table 15. Fiscal Analysis

Permit Condition	Fiscal Year 2012
Legal Authority	\$500,000
Source ID	\$165,500
SW Management	\$1,928,000
Erosion and Sediment Control	\$1,384,000
Illicit Discharge Detection and Elimination	\$103,000
Trash and Litter Control	\$279,000
Property Management	\$328,000
Inlet Cleaning	\$571,000
Street Sweeping	\$86,000
Other Road Maintenance	\$105,000
Public Education	\$155,200
Watershed Assessment	\$971,000
Watershed Restoration	\$7,182,000
Chemical Monitoring Assessment	\$217,500
Biological Monitoring Assessment	\$117,500
Physical Stream Assessment	\$117,500
Stormwater Design Manual Monitoring	\$117,500
TMDL Assessment	\$885,000
Total Annual Cost for NPDES MS4 Program	\$15,212,700

Table 16. Fiscal Table – Stormwater Runoff Controls

<i>Project Class Summary - Project Listing</i>					<i>Council Approved</i>				
<i>Project</i>	<i>Project Title</i>	<i>Total</i>	<i>Prior</i>	<i>FY2012</i>	<i>FY2013</i>	<i>FY2014</i>	<i>FY2015</i>	<i>FY2016</i>	<i>FY2017</i>
<i>Project Class: Stormwater Runoff Controls</i>									
D381800	Cape St. Claire S/D	\$4,669,300	\$4,714,300	(\$45,000)	\$0	\$0	\$0	\$0	\$0
D448300	Stormwtr Pond Maint	\$3,446,492	\$1,646,492	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
D451100	Culvert and Closed SD Rehab	\$4,881,723	\$1,281,723	\$600,000	\$600,000	\$600,000	\$600,000	\$600,000	\$600,000
D478500	Emergency Storm Drain	\$5,170,931	\$1,570,931	\$600,000	\$600,000	\$600,000	\$600,000	\$600,000	\$600,000
D480900	New Cut Rd Cul Rep	\$2,896,000	\$610,000	\$0	\$0	\$2,286,000	\$0	\$0	\$0
D537900	Storm Drainage/SWM Infrastr	\$7,645,000	\$1,645,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
D510200	Saunders Point Storm Drains	\$1,192,000	\$1,192,000	\$0	\$0	\$0	\$0	\$0	\$0
D515500	Selby On The Bay SD	\$1,478,000	\$1,478,000	\$0	\$0	\$0	\$0	\$0	\$0
D515600	Harmans Road Culvert Rehab	\$1,964,000	\$1,964,000	\$0	\$0	\$0	\$0	\$0	\$0
D527400	South Down Shores SD Imp	\$1,767,000	\$1,767,000	\$0	\$0	\$0	\$0	\$0	\$0
D545100	Chg Agst Closed Stormwater Pro	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<i>Total: Stormwater Runoff Controls</i>		\$35,110,446	\$17,869,446	\$2,455,000	\$2,500,000	\$4,786,000	\$2,500,000	\$2,500,000	\$2,500,000

Table 17. Fiscal Table – Water Quality Improvements

<i>Project Class Summary - Project Listing</i>					<i>Council Approved</i>				
<i>Project</i>	<i>Project Title</i>	<i>Total</i>	<i>Prior</i>	<i>FY2012</i>	<i>FY2013</i>	<i>FY2014</i>	<i>FY2015</i>	<i>FY2016</i>	<i>FY2017</i>
<i>Project Class: Water Quality Improvements</i>									
D406900	NPDES Permit Program	\$14,656,922	\$8,056,922	\$1,100,000	\$1,100,000	\$1,100,000	\$1,100,000	\$1,100,000	\$1,100,000
D499900	NPDES SD Retrofits	\$4,989,355	\$1,989,355	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000
Q437300	Stream & Ecological Restor	\$2,605,370	\$805,370	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
Q514300	Crofton Trib Restoration	\$1,487,000	\$652,000	\$835,000	\$0	\$0	\$0	\$0	\$0
Q536400	Picture Spring Branch Str Rest	\$323,000	\$0	\$323,000	\$0	\$0	\$0	\$0	\$0
Q540300	Rutland Rd Fish Passage	\$1,495,000	\$1,211,000	\$284,000	\$0	\$0	\$0	\$0	\$0
Q540400	Stream Monitoring	\$4,048,273	\$1,058,273	\$575,000	\$575,000	\$500,000	\$420,000	\$420,000	\$500,000
Q543000	Shipley's Choice Dam Rehab	\$5,418,000	\$3,713,000	\$1,705,000	\$0	\$0	\$0	\$0	\$0
D515900	Four Season Stream Rehab	\$1,238,000	\$1,238,000	\$0	\$0	\$0	\$0	\$0	\$0
Q416000	Chg Agst Clsd Projects	\$76,721	\$76,721	\$0	\$0	\$0	\$0	\$0	\$0
Q483700	Aurora Hills SD Rehb	\$833,000	\$833,000	\$0	\$0	\$0	\$0	\$0	\$0
Q514400	Riva/Annap SD Outfall Rehab	\$1,087,000	\$1,087,000	\$0	\$0	\$0	\$0	\$0	\$0
Q514500	Warehouse Creek Stream Restr	\$1,821,000	\$1,821,000	\$0	\$0	\$0	\$0	\$0	\$0
Q516400	Beacrane Road Bog Rehab	\$307,000	\$307,000	\$0	\$0	\$0	\$0	\$0	\$0
Q516500	Old County Road Swm Bmp	\$604,000	\$604,000	\$0	\$0	\$0	\$0	\$0	\$0
Q516600	Evergreen Road Outfall Rehab	\$1,442,435	\$1,442,435	\$0	\$0	\$0	\$0	\$0	\$0
Q517400	Cowhide Branch Retro	\$2,310,000	\$2,310,000	\$0	\$0	\$0	\$0	\$0	\$0
Q526500	Riverdale Outfall Rehab	\$509,000	\$509,000	\$0	\$0	\$0	\$0	\$0	\$0
Q530700	Broadneck Rd Stream Repair	\$425,000	\$425,000	\$0	\$0	\$0	\$0	\$0	\$0
Q530800	Ruppert Ravine Phase 2	\$714,000	\$714,000	\$0	\$0	\$0	\$0	\$0	\$0
Q530900	Downs SWM Retrofit	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Q536000	Windsor Ridge Stream Stabilizat	\$785,000	\$785,000	\$0	\$0	\$0	\$0	\$0	\$0
Q536100	N Carolina Wetland Rec Phase 2	\$299,000	\$299,000	\$0	\$0	\$0	\$0	\$0	\$0
Q536200	Cox Branch Stream Res	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Q536300	Severn Run Stream Restor	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<i>Total: Water Quality Improvements</i>		\$47,474,076	\$29,937,076	\$5,622,000	\$2,475,000	\$2,400,000	\$2,320,000	\$2,320,000	\$2,400,000

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