

2010 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

June 2011



Submitted by:
Anne Arundel County
Department of Public Works
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Prepared by:



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PART I. PURPOSE AND SCOPE

This Annual Report was assembled to detail the activities in Anne Arundel County from November 2009 through November 2010 that illustrate 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. The monitoring programs, data collection, and analysis are described. 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 terms are finalized, the Anne Arundel County is continuing to comply with the previous permit. However, digital data, where applicable, have been provided in the 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.

PART 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 2010 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.

PART 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:

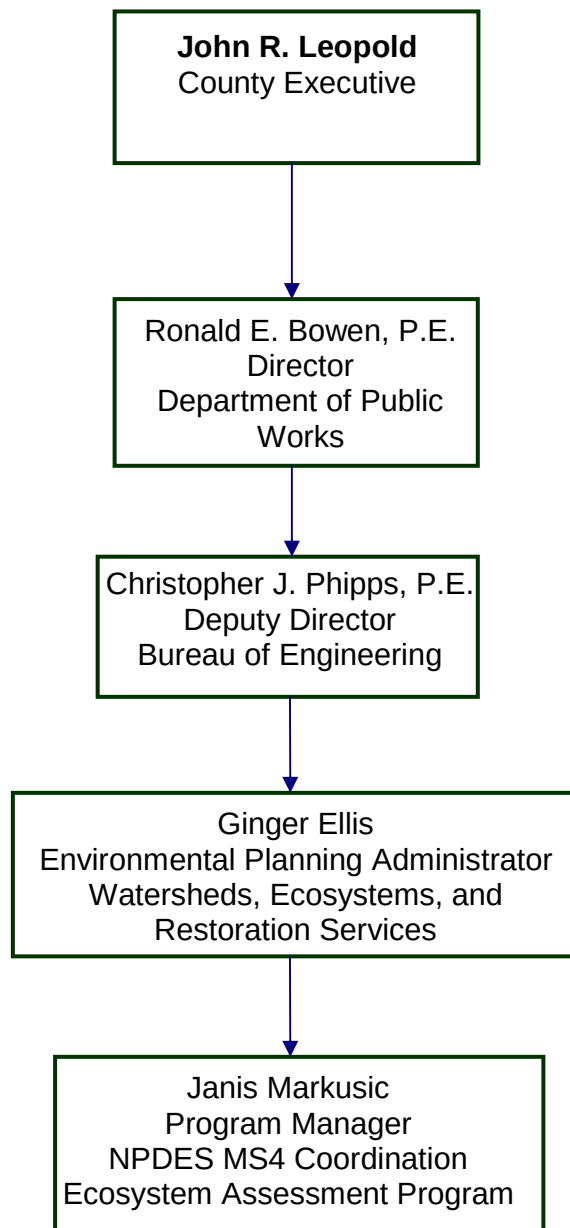
During the 2010 reporting year, coordination of Anne Arundel County's NPDES MS4 permit was performed by the Department of Public Works, Watersheds, Ecosystems, and Restoration Services. The coordinators for the program for the reporting year are:

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Exhibit 1 on the following page of this report contains an organizational chart for 2010.

Exhibit 1: Organization Chart for NPDES Permit Administration (2010)



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 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. With the passage of the 2007 Stormwater Management Act, the County initiated a series of forums with the development community and community leaders promoting environmental reform. Draft revisions were developed and submitted to MDE for review in September 2009. These included changes to Articles 16, 17, and 18 and included implementation of the revised MDE Stormwater Design Manual. Several drafts of the revisions were submitted to MDE to address comments, and the County's Stormwater Management Practices and Procedures Manual was updated.

The 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. These revisions were submitted to the County Council on July 6, 2010. The first public hearing was held on August 2, 2010.

Article 16 was amended twice and approved by the Council as Bill 58-10 on September 20, 2010. Article 17 was amended three times and was approved by the Council as Bill 59-10 on October 4, 2010. Article 18 was amended once and was approved by the Council as Bill 60-10 on September 20, 2010. Articles 16, 17, and 18 became effective in November 2010.

Representatives of the County and MDE met to discuss the stormwater management legal authority and previously submitted MDE comments on October 14, 2010. The County outlined its plan to finalize the County Stormwater Practices and Procedures Manual and fully address outstanding MDE comments.

Following the meeting with MDE, 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. Comments provided by MDE and further revisions to the Code or Practices and Procedures Manual will be discussed in the next Annual Report.

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 2010, 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. Periodically, inspection teams identify outfalls that were not included in the 2008 inventory. Data on these new outfalls are provided to the GIS manager for inclusion in the outfall database. The stormdrain 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 November 2010, there are a total of 5,206 closed stormdrain 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 4,190 structures out of the total 5,206 closed stormdrain outfalls.

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 is included in **Appendix B**. A GIS layer containing outfalls and the drainage areas for the Severn, South, Magothy, Upper Patuxent River, Patapsco Nontidal, 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.

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 a database, referred to as the Urban BMP Database, which contains information related to all stormwater management BMPs subject to inspection by the County.

The copy of the Urban BMP Database provided in **Appendix A** of this 2010 Annual Report 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 10,677 in 2009 to 11,289 in 2010. Required BMP attributes such as the structure type and drainage areas have been verified against as-built documents and populated for all BMPs within the Severn, South, Upper Patuxent, Magothy, Patapsco Nontidal, Patapsco Tidal, and Bodkin Watersheds. In the event that the drainage area information could not be found on the as-built documents, the County delineated the boundaries based on LIDAR information and input the results into the database. Limited field surveys were conducted to further validate the attributes. **Table 1** illustrates the impervious cover, BMP total drainage area, and estimated impervious area controlled for the Severn, South, Magothy, Upper Patuxent, Patapsco Nontidal, Patapsco Tidal, and Bodkin Watersheds. Based on this information, approximately 49 percent of the total impervious acres within these watersheds are controlled by an urban stormwater BMP.

Table 1: Impervious Acres Controlled by Urban BMPs

Watershed	Total Area (Acres)	Total Impervious (Acres)	Acres Treated in BMP	Impervious Acres Treated in BMP*
Severn River	44,238	8,962	6,131	4,800
South River	36,156	5,247	4,823	3,600
Magothy River	22,805	4,982	2,913	2,300
Upper Patuxent River	22,417	1,767	969	600
Patapsco Nontidal	15,286	4,173	3,414	2,561
Patapsco Tidal	30,381	9,616	7,548	3,359
Bodkin	6,028	833	871	149
Total	177,311	30,598	26,669	17,369

*"Acres Treated in BMP" were obtained from design and as-built documents. "Impervious Acres Treated in BMP" is an estimate based on typical impervious cover by land use and not based on actual impervious delineation.

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 2** 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.

Table 2: Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)								BMP Treatment Group (from CBP USWG)	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS		
DP	Detention Structure (Dry Pond)	5	10	9	10	10	10	0	10	Detention Dry	DP
UGVAULT	Underground Storage	5	10	-2	29	29	29	50	10	Detention Dry	UGS
BS	Bay Saver	5	10	-2	29	29	29	50	10	Detention Dry	BS
OGS	Oil Grit Separator	5	10	-2	29	29	29	50	10	Detention Dry	OGS
WQINLET	Water Quality Inlet	5	10	-2	29	29	29	50	10	Detention Dry	OGS
STMCEPTOR	Stormceptor	5	10	-2	29	29	29	50	10	Detention Dry	SC
SC	Stormceptor	5	10	-2	29	29	29	50	10	Detention Dry	SC
Pretreatment	Pretreatment	5	10	-2	29	29	29	50	10	Detention Dry	SC
UGS	Underground Storage	5	10	-2	29	29	29	50	10	Detention Dry	UGS
ED	Extended Detention	20	20	-2	29	29	29	50	60	Extended Detention Dry	EDSD
EDSD	Extended Detention Structure Dry	20	20	-2	29	29	29	50	60	Extended Detention Dry	EDSD
MB	Microbasin - Extended Detention Structure Dry	20	20	-2	29	29	29	50	60	Extended Detention Dry	EDSD
O-1	Dry Swale	40	60	0	35	35	35	0	85	Filtration	SW
O-2	Wet Swale	40	60	0	35	35	35	0	85	Filtration	SW
ASCD	Attenuation Swale/Check Dam	40	60	0	35	35	35	0	85	Filtration	CD
F-1	Surface sand filter	40	60	0	35	35	35	0	85	Filtration	SF
F-2	Underground sand filter	40	60	0	35	35	35	0	85	Filtration	SF
F-3	Perimeter sand filter	40	60	0	35	35	35	0	85	Filtration	SF
F-4	Organic filter	40	60	0	35	35	35	0	85	Filtration	BIO
F-5	Pocket Sand Filter	40	60	0	35	35	35	0	85	Filtration	SF
F-6	Bioretention Facility	40	60	0	35	35	35	0	85	Filtration	BIO
SF	Sand Filter	40	60	0	35	35	35	0	85	Filtration	SF
ATTENSWA	Attenuation Swale	40	60	0	35	35	35	0	85	Filtration	AS

Table 2: Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)								BMP Treatment Group (from CBP USWG)	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS		
AS	Attenuation Swale	40	60	0	35	35	35	0	85	Filtration	AS
SW	Grass Swale	40	60	0	35	35	35	0	85	Filtration	SW
POSAND	Pocket Sand Filter	40	60	0	60	60	60	80	85	Filtration	SF
C2/rain gardens	Rain Gardens	40	60	0	60	60	60	80	85	Filtration	BIO
VB	Vegetated Buffer	40	60	0	60	60	60	80	85	Filtration	VB
BIO	Bioretention Facility	40	60	0	85	85	85	90	85	Filtration	BIO
SPSC	Regenerative Step Pool Storm Conveyance	40	60	0	85	85	85	90	85	Filtration	BIO
GBMP	Bioretention Facility	40	60	0	85	85	85	90	85	Filtration	BIO
ATTTRENCH	Attenuation Trench	50	70	0	0	0	0	0	90	Infiltration	DW
DW	Dry Well	50	70	82	30	21	21	90	90	Infiltration	DW
DWIT	Dry Well - Infiltration Trench	50	70	82	30	21	21	90	90	Infiltration	DW
DWITCE	Dry Well - Infiltration Trench with Complete Exfiltration	50	70	82	30	21	21	90	90	Infiltration	DW
DWITCE-2	Dry Well - Infiltration Trench with Complete Exfiltration	50	70	82	30	21	21	90	90	Infiltration	DW
C-2/drywells	Dry Well	50	70	82	30	21	21	90	90	Infiltration	DW
DWITCW	Dry Well - Infiltration Trench with Complete Exfiltration	50	70	82	30	21	21	90	90	Infiltration	DW
DWITPE	Dry Well - Infiltration Trench with Partial	50	70	82	30	21	21	90	90	Infiltration	DW

Table 2: Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)								BMP Treatment Group (from CBP USWG)	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS		
	Exfiltration										
DWITWQE	Dry Well - Infiltration Trench with Water Quality Exfiltration	50	70	82	30	21	21	90	90	Infiltration	ITCE
EDSDITCE	Extended Detention Structure Dry, Infiltration Trench with Complete Exfiltration	50	70	81.64	29	29	29	60	90	Infiltration	ITCE
IB	Infiltration Basin	50	70	83.08	30	21	21	90	90	Infiltration	IB
IITCE	Infiltration Trench with Complete Exfiltration	50	70	82	30	21	21	90	90	Infiltration	ITCE
INPOND	Infiltration Basin No Outfall	50	70	83.08	30	21	21	0	90	Infiltration	IB
IT	Infiltration Trench	50	70	82	30	21	21	90	90	Infiltration	IT
ITVSW	Infiltration Trench, Extended Detention	50	70	81.64	29	29	29	90	90	Infiltration	IT
ITCE	Infiltration Trench with Complete Exfiltration	50	70	82	30	21	21	90	90	Infiltration	ITCE
ITCEMB	Infiltration Trench with Complete Exfiltration, Microbasin	50	70	82	30	21	21	90	90	Infiltration	ITCE
ITPE	Infiltration Trench with Partial Exfiltration	50	70	0	30	21	21	90	90	Infiltration	ITPE

Table 2: Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)								BMP Treatment Group (from CBP USWG)	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS		
ITWQE	Infiltration Trench with Water Quality Exfiltration	50	70	82	30	21	21	90	90	Infiltration	ITWQE
OGS	Oil Grit Separator	50	70	47	-11	17	17	0	90	Infiltration	OGS
OGSITCE	Oil Grit Separator Infiltration Trench with Complete Exfiltration	50	70	82	30	21	21	90	90	Infiltration	ITCE
PNDTR	Same as infiltration basin	50	70	83.08	30	21	21	0	90	Infiltration	IB
PP	Porous Pavement	50	70	0	99	99	99	90	90	Infiltration	PP
SB	Infiltration Basin	50	70	82	30	21	21	90	90	Infiltration	IB
WQITPE	Water Quality Infiltration Trench with Partial Exfiltration	50	70	82	30	21	21	90	90	Infiltration	ITWQE
WQP	Water Quality Trench	50	70	82	30	21	21	90	90	Infiltration	ITWQE
LS	Level Spreader	0	0	0	0	0	0	0	0	Other/Not BMPs	LS
C-1	Natural Area Conservation Credit	0	0	0	0	0	0	0	0	Other/Not BMPs	
C-2	Disconnection of Rooftop Runoff	0	0	0	0	0	0	0	0	Other/Not BMPs	
C-3	Disconnection of Non Rooftop Runoff	0	0	0	0	0	0	0	0	Other/Not BMPs	
C-4	Sheet Flow to Buffers	0	0	0	0	0	0	0	0	Other/Not BMPs	
C-5	Open Channel Use	0	0	0	0	0	0	0	0	Other/Not BMPs	
C-6	Environmentally Sensitive	0	0	0	0	0	0	0	0	Other/Not BMPs	

Table 2: Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)								BMP Treatment Group (from CBP USWG)	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS		
	Development										
OTHER	Other	0	0	0	0	0	0	0	0	Other/Not BMPs	
Redevelop	Redevelopment	0	0	0	0	0	0	0	0	Other/Not BMPs	
Credits	Credits	0	0	0	0	0	0	0	0	Other/Not BMPs	
RD	Redevelopment	0	0	0	0	0	0	0	0	Other/Not BMPs	
Variance	Variance	0	0	0	0	0	0	0	0	Other/Not BMPs	Variance
Plantings	Plantings	0	0	0	0	0	0	0	0	Other/Not BMPs	
Exempt	Exempt	0	0	0	0	0	0	0	0	Other/Not BMPs	Exempt
Other	Other	0	0	0	0	0	0	0	0	Other/Not BMPs	
PL	Plantings	0	0	0	0	0	0	0	0	Other/Not BMPs	
EDSW	Extended Detention Structure Wet	20	45	63	44	69	69	75	60	Wet Ponds	EDSW
MP	Micro Pool	20	45	36	58	65	65	75	60	Wet Ponds	MP
P-3	Extended Detention Structure Wet	20	45	63	44	69	69	75	60	Wet Ponds	EDSW
EXPOND	Wet Pond	20	45	36	58	65	65	75	60	Wet Ponds	WP
P-2	Wet Pond	20	45	36	58	65	65	75	60	Wet Ponds	WP
SW	Wet Structure	20	45	36	58	65	65	75	60	Wet Ponds	WP
P-1	Micro Pool	20	45	36	58	65	65	75	60	Wet Ponds	MP

Table 2: Anne Arundel County Urban BMP Structures and Pollutant Removal Efficiencies

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)								BMP Treatment Group (from CBP USWG)	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS		
WP	Retention Structure (Wet Pond)	20	45	36	58	65	65	75	60	Wet Ponds	WP
P-4	Multiple pond system	20	45	36	58	65	65	75	60	Wet Ponds	WP
P-5	Pocket pond	20	45	36	58	65	65	75	60	Wet Ponds	WP
SM	Shallow Marsh	40	60	73	85	85	85	75	60	Wetlands	SM
W-1	Shallow Wetland	40	60	73	85	85	85	75	60	Wetlands	SM
RSC	Regenerative Wetland Seepage	40	60	73	85	85	85	75	60	Wetlands	SM
W-2	ED shallow wetland	40	60	73	85	85	85	75	60	Wetlands	SM
W-3	pond/wetland system	40	60	73	85	85	85	75	60	Wetlands	SM
W-4	pocket wetland	40	60	73	85	85	85	75	60	Wetlands	SM
STR STABIL	Stream Stabilization	0	0	0	0	0	0	0	0	Stream Restoration	

The 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 was 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. While the County plans to develop a comprehensive BMP drainage area delineation file in GIS, it is believed that this investment will not result in significant improvement in reporting, nor in modeling accuracies at the subwatershed scale.

In summary, the 2010 Urban BMP Database features the following updates as compared to the 2009 submittal:

- An additional 612 BMP records were added for a new total of 11,289.
- Additional MD grid coordinates were researched and corrected or populated.
- Structure types were populated for facilities in the Patapsco Tidal Watershed.
- Structure types and drainage areas were populated and updated as an attribute field. In 2010, this was done for the Patapsco Tidal Watershed.

Table 3 contains average, minimum, and maximum values, derived from statistical analysis, of the County-wide BMP inventory.

Table 3: 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	2.21	0.02	27.00
BIO	Bioretention	1.47	0.02	40.48
SW	Dry Swale	3.36	0.02	49.78
CD	Attenuation Swale/Check Dam	0.60	0.04	4.20
AS	Attenuation Swale	0.94	0.03	12.00
DW	Attenuation Trench	0.22	0.001	21.00
IT	Infiltration Trench	0.65	0.01	38.00
ITCE	IT with Complete Exfiltration	0.97	0.004	229.99
ITPE	IT with Partial Exfiltration	1.64	0.004	93.00
ITWQE	IT with Water Quality Exfiltration	1.36	0.02	22.18
IB	Infiltration Basin	8.51	0.05	80.19
DP	Dry Pond	13.25	0.04	690.00

MDE BMP Code	Description	Average Area Treated in Acres	Min. Drainage Area in Acres	Max. Drainage Area in Acres
ED	Extended Detention	15.84	1.21	28.94
EDSD	Extended Detention, Dry	9.10	0.02	98.00
EDSW	Extended Detention Wet	15.03	0.02	556.38
WP	Wet Pond	20.45	0.01	274.28
MP	Micro Pool	9.16	0.85	29.07
SM	Shallow Marsh	2.70	0.02	30.64
PP	Porous Pavement	1.77	0.09	8.00
OGS	Oil Grit Separator	3.60	0.04	57.00
SC	StormCeptor	3.17	2.91	6.60
UGS	Underground Storage	3.43	0.03	27.00
Redevelopment*	Redevelopment	5.35	0.20	14.00
Credits*	Credits	0.14	0.01	2.62

* BMP codes refer to standard MDE codes for stormwater facilities, with the exception of “redevelopment” and “credits”. These are codes used by Anne Arundel County.

In the upcoming year, County staff, supplemented by consultant-led projects, will continue to research and improve upon the data stored in the Urban BMP Database. To assist in meeting this goal, the County continues efforts to investigate methods to better integrate the overall capture, storage and sharing of stormwater infrastructure information between the many affected County workgroups. The central component of this program is the creation of a central repository for the storage of stormwater facilities’ information, including that related to BMPs. This should reduce the likelihood of redundant, conflicting, or missing data, and continue to improve the quality of the data submitted in future reports.

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

Status:

During the 2010 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.

- The 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.
- A raster analysis utilizing the impervious cover, the flow direction grid, and the disconnection criteria (i.e. 500 SF of impervious cover requires 75 ft of pervious flow path that does not exceed five percent in slope) to estimate whether the impervious surface is connected or disconnected.

As the development of these GIS layers is completed, controlled versus uncontrolled imperviousness can be quantified at the watershed scale by assuming that impervious surfaces under the County's jurisdiction that do not drain to an urban stormwater BMP facility, or that are not disconnected, are uncontrolled. All other impervious surfaces are considered controlled or not the responsibility of the County. The schedule for completing this delineation follows the comprehensive watershed assessment schedule found in **Part III.F.** of this report. The progress on compiling these layers and assessing the controlled and uncontrolled impervious area follows:

Impervious Cover

Previously, the County provided a delineation of impervious cover based on the 2004 development condition as established from one-meter resolution IKONOS satellite imagery captured in May 2004. In June of 2008, the County updated its impervious surface and land cover layers using six-inch ortho-photography captured in December/January 2007/2008. The 2004 coverage was derived from lower resolution imagery during leaf-on conditions. The result is the 2004 impervious cover does not show detailed impervious features adjacent to forested areas. The 2007/2008 coverage was derived from higher resolution ortho-photography during leaf-off conditions. The result is more detailed features due to the higher accuracy of the 2007/2008 coverage.

Exhibit 2 demonstrates the enhancements of this updated dataset. Direct comparisons between the 2004 and 2007/2008 information are therefore problematic due to the different levels of accuracy. Detail documenting the difference between the 2004 and 2007/2008 datasets was included in the 2008 report. The 2009 report included a breakdown of land cover for each of the County's twelve watersheds, based on the 2007/2008 mapping.

Exhibit 2: 2004 vs. 2007 Impervious Capture Accuracy Comparison



Red – 2004 Impervious Surface Dataset

Green – 2007 Impervious Surface Dataset

*(Right) Note exposed earth (mass grading) classified as impervious surface in 2004 dataset and not classified in 2007 dataset.

The impervious surface and land cover layers are crucial datasets within 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, restoration, and preservation scenarios. These models are fully integrated with GIS and use the 2007 land cover impervious layers for many different watershed and planning analyses. Some of these studies include hydrologic analysis, Rosgen Level 1 stream classification, pollutant loading estimates, and stream sediment loading estimates.

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, the Baltimore Washington International Thurgood Marshall Airport (BWI), Fort George G. Meade (FGGM), the Patuxent Research Refuge, State Highway and Federal Highway roads, State and Federal facilities, and railroad rights-of-way and facilities are examples of land areas that are outside the stormwater authority of Anne Arundel County. Utilizing the County parcel layer along with the Consolidated Property File (CPF), a GIS layer of parcels not considered the responsibility of Anne Arundel County has been developed. Data analyses indicate that approximately eight 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.

Taking this information a step further, **Table 4** shows that approximately 16 percent of the impervious area within the County is outside the jurisdictional authority of the County with respect to stormwater management.

Table 4: Land Cover and Impervious Distribution by Land Ownership/Jurisdiction

Anne Arundel County Land Cover Categories	State	Federal	County	Private	State	Federal	County	Private	State	Federal	County	Private
	Land Acres				Impervious Acres				Percent Imperviousness			
Airport	1032	0	67	113	878	0	50	77	85%	23%	74%	68%
Commercial	716	1351	1896	8135	372	860	1184	5635	52%	64%	62%	69%
Industrial	541	249	492	4045	292	106	197	2503	54%	43%	40%	62%
Transportation	3860	788	3114	1954	3017	482	2204	831	78%	61%	71%	43%
Pasture/Hay	233	596	262	5145	2	4	7	29	1%	1%	3%	1%
Row Crops	310	591	403	10846	3	1	12	65	1%	0%	3%	1%
Residential 1/2-acre	69	43	1165	9045	19	11	656	1865	28%	26%	56%	21%
Residential 1/4-acre	98	149	2659	15318	17	41	1698	4392	18%	27%	64%	29%
Residential 1/8-acre	124	538	3142	14875	34	180	1869	5262	28%	33%	59%	35%
Residential 1-acre	109	19	822	9525	15	1	374	1552	14%	4%	46%	16%
Residential 2-acre	252	38	1229	21823	30	2	464	2865	12%	6%	38%	13%
Residential Woods	6	0	345	2552	0	0	198	535	8%	0%	58%	21%
Open Space	2809	2420	3452	9676	202	83	203	353	7%	3%	6%	4%
Water	125	84	225	991	2	0	5	4	1%	0%	2%	0%
Open Wetland	271	96	362	661	0	0	0	0	0%	0%	0%	0%
Forested Wetland	79	79	35	40	0	0	0	0	0%	0%	1%	0%
Woods	9741	12956	13319	75149	140	54	274	523	1%	0%	2%	1%
Utility	44	204	83	1608	2	2	8	49	4%	1%	9%	3%
SubTotal	20418	20199	33070	191500	5025	1828	9405	26542	25%	9%	28%	14%
Total	265187				42800				16%			

Disconnected Imperviousness - Not Captured as Urban BMPs

As discussed in previous Annual Reports, the difficulty in quantifying controlled versus uncontrolled imperviousness 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, and 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 developed a methodology to identify the rooftop impervious areas that are considered disconnected per the MDE SWM criteria. The criteria limit the credit to 500 square feet of impervious area per downspout. The criteria specify that each downspout must be disconnected with a surface drainage path of at least 75 feet of pervious surface that does not exceed five percent in slope. These criteria/analyses have been applied for rooftops within the Severn, South, Upper Patuxent, Magothy, and Patapsco Nontidal Watersheds. All rooftop areas that met the criteria were identified. Assessment of the disconnected rooftop areas within the remaining watersheds will be conducted during the 2011 reporting year. Non-rooftop disconnected areas have been

calculated using similar methodology for the entire County. These disconnected rooftop and non-rooftop areas are believed to be treated fully by the environmental site design procedures and thus were subtracted from the County's total uncontrolled impervious surface. **Exhibit 3** depicts select areas in the Magothy River watershed that qualify for rooftop disconnection credit. The disconnected rooftop areas and the extent of pervious flow paths are highlighted in yellow.

Exhibit 3: Disconnected Rooftops and Their Pervious Flow Path



The County is still investigating a 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 for the Severn, South, Magothy, and Upper Patuxent River Watersheds was computed based on the following equation, using the 2007 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

Refer to **Table 5** for summary statistical accounting of the controlled versus uncontrolled imperviousness.

Table 5: 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	2007 Impervious Acres	BMP Impervious Treated ⁽¹⁾	Disconnected Impervious Acres	Non-Jurisdictional Lands (Impervious Acres)	Total Uncontrolled Impervious Acres	Impervious Acres Needing Control by the County
Severn	44,238	8,962	4,800	721	8,758 (2,620)	3,441	821
South	36,156	5,247	3,600	613	3,309 (809)	1,034	225
Upper Patuxent	22,417	1,767	600	155	5,285 (159)	1,012	853
Magothy	22,805	4,982	2,300	436	1,175 (301)	2,246	1,945
Patapsco Nontidal	15,286	4,173	2,561	300	4,790 (1,189)	1,312	123
Patapsco Tidal	30,381	9,616	3,359	146 ⁽²⁾	4,456 (1,672)	6,111	4,439
Bodkin	6,028	833	149	65 ⁽²⁾	37 (19)	619	600
Little Patuxent	27,681	5,674	Complete by 2012	78 ⁽²⁾	12,552 (1,667)	Complete by 2012	Complete by 2012
Rhode	8,727	615	Complete by 2013	32 ⁽²⁾	2,099 (65)	Complete by 2013	Complete by 2013
West	7,933	567	Complete by 2014	40 ⁽²⁾	1,004 (37)	Complete by 2013	Complete by 2014
Herring Bay	14,252	1,073	Complete by 2015	72 ⁽²⁾	554 (72)	Complete by 2015	Complete by 2015
Middle Patuxent	29,679	1,735	Complete by 2016	44 ⁽²⁾	855 (212)	Complete by 2016	Complete by 2016

(1) The BMP impervious treated area was computed in Acres as outlined in Part III.C.2.

(2) Includes only non-rooftop disconnection. Rooftop disconnection will be included in the next Annual Report.

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; and

Status:

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

The County maintains three monitoring sites where the required chemical, physical, and biological monitoring of watershed restoration efforts and stormwater management application is conducted in Anne Arundel County. These sites are Parole Plaza, Church Creek, and Picture Spring Branch. A summary of the 2010 permit year monitoring efforts at these sites is found in **Part III.H.**, and the complete monitoring year reports are included in **Appendix E** (*Chemical, Biological, and Physical Characterization of Church Creek and Parole Plaza NPDES Monitoring Stations: 2010*) and **Appendix F** (*Biological and Geomorphological Conditions in the Picture Spring Branch Subwatershed: 2010*).

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 completed design of a Countywide biological monitoring program. Focusing on benthic macroinvertebrates and modeled after the Maryland Biological Stream Survey, 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.

With the conclusion of Round 1 in 2008, the County began Round 2 sampling during the 2009 reporting period. In 2010, a total of 55 samples (five QC sites, 50 assessment sites) distributed within the five Primary Sampling Units (PSUs), were collected. The PSUs and the eight-digit hydrologic units in which they are located are summarized in **Table 6** while all Round 2 site locations are shown in **Exhibit 4**. PSUs sampled in 2010 are shaded blue in **Table 6**.

Exhibit 4: Location of all Round 2 (2009-2013) Primary and Alternate Random Biological Sampling Sites

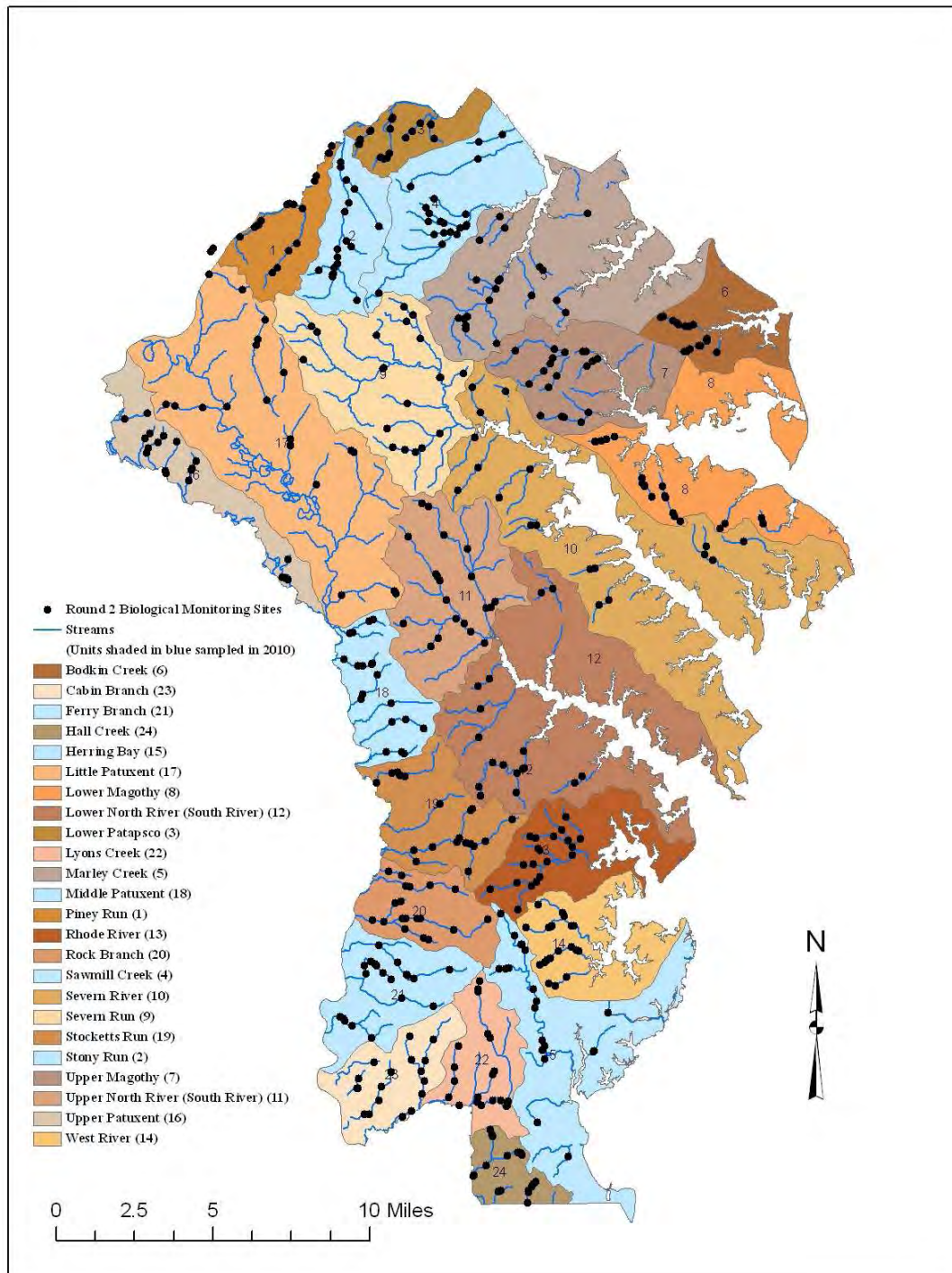


Table 6: Listing of Areas Assessed During Round 1 (2004-2008) and the Proposed Schedule for Round 2 (2009-2013) by MDE 8-Digit Watershed Code

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 the first two years of Round 2 completed, the County can now start 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 five sampling units assessed during the reporting period: Stony Run, Sawmill Creek, Herring Bay, Middle Patuxent, and Ferry Branch. As shown in **Table 7** below, all PSUs show improvement in biological condition, except Ferry Branch, which moved downward in condition class from “Fair” to “Poor.” The Sawmill Creek PSU switched condition classes, moving from “Very Poor” to “Poor”, but the difference between the Round 1 and Round 2 mean BIBIs was not significant. Conversely, the Stony Run PSU had a significant improvement in mean BIBI, but still remained in the “Poor” condition class.

It should be noted that these trends, where they exist, are preliminary since they are based upon only two data points. Continued sampling over the long term (15-20 years) will provide insight into the ultimate trajectory of conditions in the watersheds of the County. As work continues during the next reporting period, additional analyses of Round 1 data will be performed to better understand conditions in benthic community health between and within PSUs.

Table 7: Comparison between Sampling Units Assessed in Round 1 vs. Round 2

Primary Sampling Unit (Round 1 Sampling Year)	Round 1 BIBI±1SD (Narrative Condition)	Round 2 BIBI±1SD (Narrative Condition)	Condition Trend
Stony Run (2007)	2.37 ±0.22 (Poor)	2.69±0.31 (Poor)	Upward*
Sawmill Creek (2008)	1.92±0.13 (Very Poor)	2.35±0.16 (Poor)	Upward
Herring Bay (2005)	2.80±0.34 (Poor)	3.17±0.32 (Fair)	Upward*
Middle Patuxent (2004)	2.94±0.22 (Poor)	3.32±0.19 (Fair)	Upward*
Ferry Branch (2004)	3.20±0.26 (Fair)	2.91±0.15 (Poor)	Downward*

* statistically significant difference (p=0.05)

c. Town Center Water Quality Monitoring Program

The DPW-Watershed, Ecosystem, and Restoration Services (WERS) staff characterizes the impact on receiving stream water quality from designated Town Center drainage areas 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

The highlights of the program during the reporting period:

- A total of ten storms were sampled at Weems Creek.
- A total of nine baseflow samples were collected at each of the four stations, for a total of 36 samples.

The locations of these sites are included in the database 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 nontidal streams. Information ultimately obtained from this effort would be applicable to calculation of nonpoint source nitrogen load reductions resulting from stream restoration project implementation.

At the initiation of this research effort, six stream reaches, representing three restored streams in headwaters systems, three restored streams in lowland boundary systems, and two degraded reaches (e.g., controls) were selected for this long-term program. The reaches, their location in the landscape, GIS coordinates for each monitoring site, and drainage area to each site are found in **Table 8** below. Monitoring at the headwater sites was discontinued during the reporting period. The locations of the active (lowland) monitoring stations for each reach are shown in **Exhibit 9**, in **Part III. H**. A more complete discussion of this program is found in **Part III. H**.

Table 8: Stream Reach Restoration Monitoring – Sampling Site Information

Stream Reach	Landscape Location	Latitude	Longitude	Drainage Area to Monitored Reach (acres)
Weems Creek – Annapolis Mall	Headwaters			
Site 1 (upstream site)		38.99177	76.54061	62.05
Site 2 (downstream site)		38.99203	76.53613	88.96
Weems Creek – Bristol Drive	Headwaters			
Site 1 (upstream site)		38.98576	76.51951	88.96
Site 2 (downstream site)		38.98723	76.51892	107.42
Weems Creek – Moreland Parkway	Headwaters			
Site 1 (upstream site)		38.98444	76.52677	Not calculated
Site 2 (downstream site)		38.98570	76.52726	Not calculated
Picture Spring Branch	Headwaters			
Site 1 (upstream site)		39.09227	76.69767	41.13
Site 2 (downstream site)		39.09319	76.69597	111.65

Howard's Branch	Lowland			
Site 1 (upstream site)		39.02053	76.55075	269.54
Site 2 (downstream site)		39.02138	76.54795	206.60
Wilelinor	Lowland			
Admiral Cochrane site upstream of restoration		38.96797	76.54473	101.19
Site 1 (upstream site within restoration)		38.96695	76.54411	119.65
Site 2 (mid-stream site within restoration)		38.96632	76.54259	190.59
Site 3 (downstream site within restoration)		38.96596	76.54100	197.49
Spa Creek	Lowland			
Site 1a (outfall to channelized reach)		38.97401	76.52145	147.45
Site 1b (end of channelized reach)		38.97330	76.51955	210.83
Site 2 (downstream site)		38.97309	76.51717	336.92
Cypress Creek	Lowland			
Site 1 (upstream site)		39.07422	76.54211	183.47
Site 2 (downstream site)		39.07603	76.53618	377.40

5. Watershed Restoration: restoration project descriptions and locations.

Status:

Watershed restoration/retrofit activities in design or construction during the 2004 to 2010 fiscal years are presented below in **Table 9**. Projects that are completely constructed and provide a water quality benefit are identified and highlighted in yellow. Projects constructed during the reporting period are highlighted in green. Projects with drainage areas that lie entirely within another project drainage area are referred to as “nested”; the treated area for these projects was not included in the treated impervious calculations, 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 included in **Appendix A**.

Table 9: Anne Arundel County Restoration Projects (2004-2010)

Project Name	ID	Project Type	Project Description	Status	Schedule	Project Manager	Project Number	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed Section G	Drainage Area Treated (Acres)	Imperv. Area Treated (Acres)(Based on 2007 Coverage)	Impacted Watershed	BMP Group
11th Avenue Fish Passage	35	Fish Passage	Design and Construction a project to alleviate fish passage in Sawmill Creek at 11th Avenue	Construction Complete	Complete	DM	D499900	D499917	AACO	CIP	No			Patapsco Tidal	Other/Not BMP
AA County Dept. of Health	100	Bioretention	South River Federation Project - Bioretention area at the edge of the parking lot to serve as pre-treatment.	Construction Complete	Complete	SRF	N/A	N/A	EPA Grant/ Private	South River Federation	Yes	2.35	0.93	South River	Filtration
Arundel Middle School Wetland	114	Wetland Creation	Establish wetland treatment area for stormwater runoff at Arundel Middle School.	Inactive	Design Development Complete, Design Modification desired. Schedule not set.	DM	Q437300	Q437361	AACO	CIP	Future	35.16	10.00	Little Patuxent	Wetlands
Aurora Hills SWM Rehabilitation 1	115	Outfall Stab / Instream Rest.	Design and construct a wetland seepage system for existing eroded channels in Aurora Hills, located near Aurora Drive and Ashburton Dr.	Construction Complete	Complete	DM	Q483700	Q483701/02	AACO	CIP	Yes	28.3	7.92	Severn River	Filtration
Aurora Hills SWM Rehabilitation 2	116	Outfall Stab / Instream Rest.	Design and construct a wetland seepage system for existing eroded channels in Aurora Hills, located near Ashburton Dr. and Antrim Dr.	Construction Complete	Complete	DM	Q483700	Q483701/02	AACO	CIP	Yes	26.1	6.33	Severn River	Filtration

Project Name	ID	Project Type	Project Description	Status	Schedule	Project Manager	Project Number	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed Section G	Drainage Area Treated (Acres)	Imperv. Area Treated (Acres)(Based on 2007 Coverage)	Impacted Watershed	BMP Group
Aurora Hills SWM Rehabilitation 3	117	Outfall Stab / Instream Rest.	Design and construct a wetland seepage system for existing eroded channels in Aurora Hills, located near Antrim Dr. and Verona Ct.	Construction Complete	Complete	DM	Q483700	Q483701/02	AACO	CIP	Yes	18.2	2.05	Severn River	Filtration
B&A Trail Culvert Replacement	118	Culvert Replacement	Construct a replacement culvert for a failing culvert under the B&A Trail adjacent to Randell Road.	Construction Complete	Complete	JK	D537900	D537910	AACO	CIP	No			Magothy River	Other/Not BMP
B&A Trail Repair and SWM improvement	119	SWM Retrofit	Design and construction of the repair for the B&A Trail where it collapsed between Jumpers Hold Road and Waterford Road.	Design Development	Construction anticipated for completion in 8/2011	DM	P479800	P479818	AACO	CIP	Future	928		Magothy River	
Barker-Donohoe Residence	109	Bioretention	South River Federation Project - Install two residential rain gardens.	Construction Complete	Complete	SRF	N/A	N/A	EPA Grant/Private	South River Federation	Yes	0.48	0.29	South River	Filtration
Barrensdale Outfall Restoration	120	Outfall Restoration	This project consists of re storing approximately 800 feet of eroded channel downstream of the SWM pond in the Barrensdale community and includes retrofitting/convertng the SWM pond	Project Initiation	Construction Schedule Not Set	KW	Q437300	Q437366	AACO	CIP	Future	22.4	6	Magothy River	Filtration

Project Name	ID	Project Type	Project Description	Status	Schedule	Project Manager	Project Number	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed Section G	Drainage Area Treated (Acres)	Imperv. Area Treated (Acres)(Based on 2007 Coverage)	Impacted Watershed	BMP Group
Beacrane Road Bog Rehab.	2	Wetland Bog Restoration	Construct a weir system to recover water level in a bog that has been lowered by a culvert failure.	Design	Design Development is Complete. Modifications maybe needed for permits. Construction Schedule not set.	DM	Q516400	Q516401	AACO	CIP	Future			Magothy River	
Belvedere Elementary School SWM Outfall Channel	121	Outfall Restoration	Restoration and repair of the outfall channel from Belvedere Elementary School stormwater management pond at the corner of Broadwater Road and Mago Vista Road to its confluence with Mill Creek	Contract Initiation	Preliminary Design Initiated Construction Schedule Not Set	JK	Q437300	Q437365	AACO	CIP	Future			Magothy River	Filtration
Belvedere Elementary School Drainage Improvement	122	Stormdrain upgrades	Design and construct improvements to eliminate the existing inlet bypass condition for stormwater runoff at the school entrance off Mago Vista Road	Construction Complete	Complete	DM	Q437300	Q437345	AACO	CIP	No			Magothy River	Other/Not BMP
Blue Bird Lane Erosion	42	Stream Stabilization	Correct stream erosion problems near Blue Bird Ln.	Construction Complete	Complete	DM	D499900	D499912	AACO	CIP	Yes	6.08	0.67	Severn River	Filtration
Brewer Creek Restoration	36	Wetland Creation	Integrate environmental BMPs along Howard's Branch.	Construction Complete	Complete	DM	Q437300	Q437319	AACO	CIP	Yes	32.74	2.96	Severn River	Wetlands

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Broadneck Rd. Stream Repair	3	Stream Restoration	Repair eroding stream channel using a wetland seepage system from Broadneck Road Operations Yard downstream 500 ft and stabilize the stream channel.	Construction Complete	Complete	DM	Q530700	Q530701	AACO	CIP	Yes	21.8	10.15	Severn River	Filtration
Brockbridge Elem. Stream Restoration	4	Stream Stabilization	Design and construct a stable stream pattern near Brockbridge Elementary School.	Construction Complete	Complete	DM	Q516300	Q516301	AACO	CIP	Yes	66	26.46	Upper Patuxent	Filtration
Buttonwood Trail Outfall Repair	45	Outfall Stabilization	Approximately 250 ft of coastal plain outfall design at the edge of Buttonwood Trail and the intersection with Catalpa Trail in Herald Harbor. Drains to Old Place Creek subwatershed in the Severn River.	Design Phase Being Finalized Construction Schedule Not Set	Design Development	JK	Q437300	Q437358	AACO	CIP	Future			Severn River	Filtration
Bywater Rain Gardens	101	Bioretention	South River Federation Project - Two bioretention areas that treat stormwater coming off the basket ball court and recreation facilities.	Construction Complete	Complete	SRF	N/A	N/A	EPA Grant/Private	South River Federation	Yes	0.71	0.46	South River	Filtration

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Cape St Claire Storm Drains and Bioretention	54	Storm Drain and water quality retrofit	Design and construction of a storm drain system to resolve flooding and erosion in this community. Additionally, a bioretention facility was added at Radford Road and Cape St. Claire Road	Construction Complete	Complete	DM	D381800	D381801-08	AACO	CIP	Yes	10.13	3.51	Magothy River	Filtration
Capetown SWM Pond Retrofit	46	SWM Retrofit	Design and construct remedial stream stabilization and other infrastructure retrofits.	Construction Complete	Complete	DM	D499900	D499905	AACO	CIP	Yes	35.95	11.73	Severn River	Filtration
Central Avenue Culvert Replacement	123	Culvert Replacement	The project consists of replacement of the deteriorating twin barrel Central Avenue culvert for Sawmill Creek in the vicinity of Dorsey Road and Central Avenue.	Construction Complete	Complete	DM	D481000	D481001	AACO	CIP	No			Patapsco Tidal	Other/Not BMP
Central Sanitation Facility Stream Restoration	53	Stream Restoration	Design and construct stream restoration project in association with the Central Sanitary Facility CIP project S777203.	Construction Complete	Complete	Facilities, Heery	S777200	S777203	AACO	CIP/Facilities	Yes	94.2	23.25	Severn River	Filtration
Chartwell Rain Garden	102	Bioretention	Eagle Scout project.	Construction Complete	Complete	Eagle Scout	N/A	N/A	Private	Eagle Scout Project	Yes	0.9	0.11	Magothy River	Filtration

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Chartwell Stream Stabilization	58	Stream Stabilization	To restore an eroded stream in the Chartwell community. The restoration will begin at St. Ives Dr. and follow the stream through the Chartwell Golf Course to St Andrews Rd.	Construction Complete	Complete	DM	Q503800	Q503801	AACO	CIP	Yes	384.74	60.82	Severn River	Filtration
Church Creek Stream Restoration	124	Stream Stabilization	This project consists of the design and construction of the stabilization of the Church Creek stream starting at the Forest drive culvert and ending at the MD Route 2 Culvert.	Construction Complete	Complete	Developer	N/A	N/A	Private	Private	Yes	91.98	77.36	South River	Filtration
Cockey Creek Retrofit Project - A St. Outfall	125	Outfall Stabilization	Resolve erosion and deposition of sediment from the Stormdrain system in the vicinity of riverside drive and A Street.	Construction Complete	Complete	DM	Q462900	Q462902	AACO	CIP	Yes	9.38	2.73	Magothy River	Other/Not BMP
Cockey Creek Retrofit - Riverside Dr & 10th St	126	Outfall Stabilization	Provide stable outfall for existing stormdrain at Riverside Drive and 10th Street.	Construction Complete	Complete	DM	Q462900	Q462904	AACO	CIP	Yes	31.19	11.8	Magothy River	Filtration
College Station SWM Pond Retrofit	110	SWM Retrofit	Provide retrofit solution to SWM Pond	Construction Complete	Complete	DM	D499900	D499906	AACO	CIP	Yes	18.96	6.32	Magothy River	Filtration

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Courts of Crofton Pond Retrofit	111	SWM Retrofit	Refurbish existing stormwater pond in Crofton, construct micropools for water quality treatment. (Included in the future Crofton Tributary Restoration)	Construction Complete	Complete	DM	D499900	D499907	AACO	CIP	Yes	15.24	7.39	Little Patuxent	Wet Ponds
Cowhide Branch Retrofit	6	SWM Retrofit / Stream Rest.	Construct wetland seepage systems in Weems Creek. Includes retrofit of Annapolis Mall Pond and reconstruction of stream from pond to Medical Parkway; rehabilitation of stream from Medical Parkway to tidal interface with Weems Creek.	Design	Pursuing Permits and R/W. Construction anticipated to start in 9/2011	DM	Q517400	Q517401/02	TEP Grant	CIP	Future			Severn River	Filtration
Creek Road Stormdrain System and outfall Upgrades	127	Stormdrain and Outfall Upgrades	Design and Construct upgrades to the storm drain system and outfall at the end of Creek Road in Riviera Beach to alleviate poor drainage conditions and persistent flooding.	Design	Design plans at 60 percent, preparing environmental permits.	JK	D537900	D537915	AACO	CIP	No			Patapsco Tidal	Other/Not BMP

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Crofton Tributary Restoration	7	Stream Restoration	Restoration of stream reach from Crofton Parkway upstream to Shafsbury Ave. Restoration design for the open section that runs from northbound lane of Route 3 to the vicinity of Scibner Place at Shaftsbury Avenue.	Construction Underway Phase I	Pursuing Permits. Anticipated for completion in 3/2011	DM	Q514300	Q514301	AACO	CIP	Yes	306.6	117.2	Little Patuxent	Filtration
Cypress Creek Concrete Channel Cleanup	128	Channel Cleanup	Debris and Sediment Removal	Construction Complete		MG	Q509400	Q509402	AACO	CIP	No			Magothy River	Other/Not BMP
Cypress Creek Retrofit	8	Stream Restoration	This contract consists of design and construction of the restoration of the North Branch of Cypress Creek as discussed in the North Cypress Creek Branch Watershed BMP Report.	Design	Pursuing Permits, right of way, and SHA approval. Construction anticipated for completion in 8/2012	DM	Q509400	Q509401/02	AACO, MDE Grant, TEP Grant	CIP	Future			Magothy River	Filtration
Cypress Rd. Rain Garden	103	Bioretention	Construct a bioretention facility to treat contributory impervious surfaces.	Construction Complete	Complete	SRF	N/A	N/A	EPA Grant/Private	South River Federation	Yes	2.96	1.22	Magothy River	Filtration
Cypress Pointe Pond Retrofit	129	SWM Retrofit	Retrofit dry pond as a seepage wetland system.	Construction Complete	Complete	DM	D406900	D406961	AACO	CIP	Yes	8.65	4.52	Magothy River	Wetlands

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Dulls Corner Stream Restoration	10	Stream Restoration	Design and construct a stable stream configuration for the tributary of Mill Creek that begins at the intersection of MD Rt. 648 and MD Tr. 179 and ends 2200 feet downstream.	Construction Complete	Complete	DM	Q503900	Q503901	AACO	CIP	Yes	105.79	21.49	Severn River	Filtration
Eastport-Annapolis Neck Library	112	SWM Retrofit	Design and construct a bioretention facility retrofit within existing SWM facility area behind the Eastport-Annapolis Neck Library (Hillsmere).	Construction Complete	Complete	MG	D499900	D499928	AACO	CIP	Yes	1.56	0.86	South River	Filtration
Edgewater Elementary BMP	57	Stream Restoration	Design and construct a seepage wetland at the Edgewater Elementary School to provide water quality treatment.	Construction Complete	Complete	DM	Q514500	Q514503	AACO	CIP	Yes	89.65	50.71	South River	Wetlands
Evergreen Road Outfall Restoration	11	Stream Valley Restoration	Rehabilitation of historic Cedar Valley and outfall in the Cypress Branch Stream Valley, 12 acres of AWC wetland and tidal march (Severn River Watershed).	Design	Schematic Design Complete Construction Schedule anticipated for 12/10	JK	Q516600	Q516601/02	AACO	CIP	Future			Severn River	Filtration
Fairoaks Outfall Retrofit	130	Outfall Stabilization/ Stream Restoration	The design and construction of a step pool storm conveyance system to provide water quality and alleviate erosion for the Fairoaks Community.	Design Development	Schematic Design Complete, Phase I construction anticipated for completion on 9/2011	DM	Q499900	Q499939	AACO	CIP	Future			Magothy River	Filtration

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Ferry Farms Stormdrain Improvement	131	Stormdrain upgrades and outfall Improvement	Design and construct improvements to the Stormdrain system including infiltration systems and outfall stabilization in Ferry Farms Road and Elmwood Road (Ferry Farms Community)	Construction Complete	Complete	DM	D521500	D521501	AACO	CIP	Yes	3.57	3.57	Severn River	Infiltration
Fidanza Residence	104	Bioretention	South River Federation Project - Install residential rain garden.	Construction Complete	Complete	SRF	N/A	N/A	EPA Grant/ Private	South River Federation	Yes	1.35	0.39	South River	Filtration
Forest Drive Outfall Repair	39	Outfall Stabilization/ Coastal Plain Outfall	Design and construct a coastal plain outfall for the closed storm drain system near Forest Dr. and Hilltop Ln.	Design	Design development complete on 2/14/2008. Right of way is being pursued. Construction anticipated for completion in 10/2011	DM	Q437300	Q437363	AACO	CIP	Future			Severn River	Filtration
Four Seasons Stream Rehabilitation	9	Stream Restoration	Design and construct a stable stream system from Four Seasons Community SWM pond to Towsers Branch.	Design	Construction documents complete 7/24/2008. Construction anticipated for completion in 12/15/2011	DM	D515900	D515901	AACO	CIP	Future			Little Patuxent	Filtration
Gingerville SWMP Upgrade	12	SWM Retrofit / Outfall Stabilization	Rehabilitation of Gingerville Pond and stabilization of the outfall.	Construction Complete	Complete	MG	Q497700	Q497701	AACO	CIP	Yes	108.76	57.54	South River	Filtration

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Gray's Creek Bog	13	Wetland Bog Restoration	Design and construction of the Gray's Creek Bog restoration. The bog was filled in many years ago from prior dredging of Gray's Creek.	Construction Complete	Complete	DM	Q516800	Q516801	AACO	CIP	Yes	43.64	9.71	Magothy River	Wetlands
Harmans Road Culvert Rehabilitation	132	Instream Culvert Retrofit	Replace culvert beneath Harmans Road.	Design	Design Notice to Proceed issued. Anticipate construction completion in 9/5/2012	KW	D515601	D515601/6	AACO	CIP	Future			Patapsco Non-tidal	Filtration
Harundel SWM Facility	14	SWM Retrofit	Construct an instream wetland seepage system.	Construction Complete	Complete	DM	Q463200	Q463201	AACO	CIP	Yes	201.49	100.67	Patapsco Tidal	Wetlands
Heritage Office Complex BMP Demonstration	33	BMP Retrofit	Heritage Office Complex BMP demonstration project (bioretention facility to treat imperviousness from parking lot).	Construction Complete	Complete	DM	Q437300	Q437316	AACO	CIP	Yes	13.9	10.53	South River	Filtration
Hidden Pond Restoration	15	Wetland Upgrade	Design and construction of the restoration of Hidden Pond; includes removal of silt, construction of beaches, pier, and plantings. The pond flows to the Severn River. (Also see contracts Q437328 and D499916).	Construction Complete	Complete	DM	Q437300 & D499900	Q437328 & D499916	AACO	CIP	Yes	12.45	1.13	Severn River	Wetlands

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Hospital Drive Pond #2 SWM Retrofit	133	Pond Retrofit	Design and construct retrofit of existing stormwater management pond at Foxchase Drive to increase water quality benefits.	Design	Schematic design complete. Construction date not set.	JK	D537900	D537912	AACO	CIP	Future			Patapsco Tidal	Wetlands
Hospital Drive Pond #3 SWM Retrofit	134	Pond Retrofit	Design and construct retrofit of existing stormwater management pond on Hospital drive across from Foxmanor Lane to increase water quality benefits.	Design	Schematic design complete. Construction date not set.	JK	D537900	D537912	AACO	CIP	Future			Patapsco Tidal	
Jabez Branch Repair	50	Stream Restoration	Repair existing grade structures that have moved.	Construction Complete	Complete	DM	D499900	D499925	AACO	CIP	Yes	484.56	60.49	Severn River	Filtration
Lincoln Dr. Bioretention	105	Bioretention	South River Federation Project - An end of road bioretention retrofit that treats stormwater before it makes its way into the storm drain system.	Construction Complete	Complete	SRF	N/A	N/A	EPA Grant/Private	South River Federation	Yes	1.77	1.65	Severn River	Filtration
Marley Station Wetland	16	Wetland Creation	Design and construct seepage wetlands on the western side of Ring Road to improve the water quality of Marley Creek.	Construction Complete	Complete	DM	Q463300	Q463301	AACO	CIP	Yes	552.01	250.68	Patapsco Tidal	Wetlands
Marabrook, Oakleaf villa, & Valentine Cr. SWM Retrofits	272	SWM Retrofit	Design and construct three shallow marsh retrofits to maximize the water quality benefit.	Project Initiation	Design begin 1/2011	JK	D537900	D537916	AACO	CIP	Future	54.9		Severn River	Wetlands

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Mayo Beach Park	136	Shoreline Improvement	Design and construction of shoreline erosion control structures at Mayo Beach Park (no water quality improvements included)	Construction	Construction complete 4/2011	JK	P468700	P468703	AACO	CIP				Rhode River	
MDA Rain Gardens	106	Bioretention	South River Federation Project - Install three separate rain gardens along Harry Truman Parkway to treat runoff from road and MDA parking lots.	Construction Complete	Complete	SRF	N/A	N/A	EPA Grant/Private	South River Federation	Yes	2.58	1.58	South River	Filtration
National Business Park - NBP324, Downstream Mitigation	261	Stream Restoration	Install a rock weir to connect the upstream drainage area with the floodplains.	Construction Complete	Complete	Developer	N/A	N/A	Private	Developer	Yes	685	66	Little Patuxent	Filtration
North Carolina Wetland Recreation Phase 2	32	Wetland Creation	Construction of a wetland at the intersection of North Carolina Ave. and South Rd. Phase two of the project; phase one was completed under project #H349402.	Design	Construction drawing review meeting on 11/05/2009. Construction anticipated in completion in 8/2011	DM	Q536100	Q536101	AACO	CIP	Future			Magothy River	Filtration
New Cut Road Culvert Replacement	137	Instream Culvert Retrofit	Replace culvert beneath New Cut Road.	Design	For FY11 project budgeting	KW	D480900	D480901	AACO	CIP	Future			Severn River	Other/Not BMP

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Norfolk Floodplain Management	138	Stream Restoration	This project will restore the existing stream channel. Runoff water quality from approximately 1200 acres of drainage will be improved.	Design	Project is on hold due to budgetary constraints	DM	Q449600	Q449601	AACO	CIP	Future			Patapsco Tidal	
North Carolina Avenue Outfall	20	Outfall Stabilization and Wetland Creation	Design and construct an outfall and small wetland area located at the end of North Carolina Avenue. Also see contract H349403.	Construction Complete	Complete	DM	Q437300	Q437338	AACO	CIP	Yes	24.35	7.32	Magothy River	Wetlands
NPDES Storm Drain Retrofits - Foxchase	43	Storm Drain Retrofit and Water Quality	Design and construct retrofits to the Foxchase storm drain system. This included the conversion of a peak management facility to a water quality facility by installing of a low head berm and micro-pool system.	Construction Complete	Complete	DM	D499900	D499901	AACO	CIP	Yes	41.52	16.76	Patapsco Tidal	Wet Ponds
Old County Road SD	18	SWM Retrofit	Storm drain to intercept stormwater runoff and convey it to a stable outfall.	Construction Complete	Complete	DM	D521300	D521301	AACO	CIP	No			Magothy River	
Old Herald Harbor Road Culvert	140	Culvert Replacement	Design and construct a replacement to an existing deteriorated 60-inch culvert for Plum Creek Crossing of Old Herald Harbor Road.	Construction Complete	Complete	JK	D537900	D537905	AACO	CIP	No			Severn River	

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Old Mill Road Culvert Replacement	141	Instream Culvert Retrofit	This project consists of design and construction of a cross culvert to replace the existing system on Old Mill Road near the intersection with Redmiles Lane.	Construction Complete	Complete	DM	D480600	D480601	AACO	CIP	No			Severn River	
Olde Severna Park Outfall	142	Stormdrain Retrofits	Design and construct restoration of a closed stormdrain outfall in Olde Severna Park near Hollyberry Road.	Design	Schematic Design Complete, Construction schedule not set.	DM	Q437600	Q437364	AACO	CIP	Future			Severn River	Filtration
Olin Drive Fish Passage	17	Stream Restoration	Design and construct a fish passage on a tributary of Sawmill Creek where it crosses Olin Drive. The project included limited stream stabilization work.	Construction Complete	Complete	DM	Q489800	Q489801	AACO	CIP	Yes	382.35	154.02	Patapsco Tidal	Other/Not BMP
Park Road Outfall Rehabilitation	21	Outfall Stabilization	Design and construct a stable outfall for Park Rd. and Valley Rd in Brooklyn Park.	Construction Complete	Complete	DM	Q497600	Q497601	AACO	CIP	Yes	33.06	21.82	Patapsco Non-tidal	Other/Not BMP
Peach Orchard SWM Retrofit	143	SWM Retrofit	Design and construct retrofit to existing stormwater management pond off Harmans Road to increase water quality benefits.	Design	Construction to begin 7/2011	JK	D537900	D537919	AACO	CIP	Future			Patapsco Non-tidal	Wetlands
Picture Spring Branch Stream Restoration	22	Stream Restoration	Design and construction of a stable stream channel and stabilization of pipe outfall.	Project Initiation 2012	Anticipate programming into FY2012 budget year	JK			AACO	CIP	Future	89.8		Severn River	

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Pine Haven Stream Erosion Repair	41	Stream Stabilization	Repairs to the rapidly eroding stream channel in the Pine Haven Community.	Construction Complete	Complete	DM	D499900	D499911	AACO	CIP	Yes	91.99	43.32	Patapsco Tidal	Other/Not BMP
Pinewood Road Stormdrain	144	Stormdrain upgrades	Design and construct upgrades to the stormdrain system.	Project Initiation		JK	D537900	D537923	AACO	CIP	No			Magothy River	
Ponder Cove Storm Drains and SWM Retrofit	145	Storm Drains and SWM Retrofit	Design storm drain system in the Ponder Cove and Holly Hill Harbor communities in order to relieve flooding.	Design	Construction schedule not set.	JK	D537900	D537903	AACO	CIP	No			Rhode River	
Randell Rd Rain Garden	107	Bioretention	Langston project.	Construction Complete	Complete	Bureau of Highway	N/A	N/A	Eagle Scout Project	ESP	Yes	0.76	0.11	Magothy River	Filtration
Riva Annapolis Storm Drain & Outfall Rehabilitation (Riva 400)	23	Outfall Stabilization	Design and construct stable outfall system for the Annapolis High School, to include groundwater recharge and bioretention.	Construction Complete	Construction Complete 12/09	DM	Q514400	Q514401	AACO	CIP	Yes	19.82	11.09	South River	Filtration
Riva Trace Baptist Church	108	Bioretention	South River Federation Restoration Project - Large bioretention area serves as pre-treatment for SWM pond and 6-7 small bioretention areas in parking lot median.	Construction Complete	Complete	SRF	N/A	N/A	EPA Grant/Private	South River Federation	Yes	12.1	1.9	South River	Filtration
Riverdale Outfall Rehabilitation	24	Stream Restoration	Design and construct a stable stream channel in the Riverdale community. Located near the intersection of Dartmouth Road and Riverdale Road.	Design	Contract Initiation	KW	Q526500	Q526501	AACO	CIP	Future			Magothy River	Filtration

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Riverside Drive Slope Erosion	48	Slope Stabilization	Evaluate the utility easement for slope stability, located between properties at 735 & 737 Riverside Drive in Herald Harbor.	Construction Complete	Complete	DM	D499900	D499919	AACO	CIP	No			Severn River	Other/Not BMP
Ruppert Ravine Phase 2	25	Stream Restoration	Design and construct a stable stream channel (wetland seepage) near the intersection of Maryland Routes 3 and 424.	Design	Construction documents complete. Construction to be scheduled contingent on grant funding.	DM	Q530800	Q530801	Applying for Grant		Future			Little Patuxent	Filtration
Rutland Rd Fish Passage	26	Fish Passage	Design and construct the removal of a fish migration barrier created by the existing culvert system for Rutland Road near the intersection of Rutland Rd. and MD 450.	Design	Construction date is not set.	JK	Q540300	Q540301	AACO	CIP	No			South River	Other/Not BMP
Saunders Point Storm Drains and SWM retrofit	146	Storm Drain and SWM retrofit	Design and construction of a storm drain system and SWM retrofits (swales/infiltration) for the Saunder's Point community to alleviate flooding and improve water quality.	Construction Complete	Complete	KW	D510200	D510201	AACO	CIP	Yes	7.95	2.2	Rhode River	Infiltration

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Selby on the Bay Storm Drains	147	Storm Drain Improvement	Design and construct storm drainage systems and SWM retrofits (swales/infiltration) within the Selby Heights community to alleviate flooding and improve water quality.	Design	Schematic Design complete. Construction anticipate for completion by 5/2011	KW	D515500	D515501	AACO	CIP	Future			South River	
Severn Drive Stormdrain and Outfall Improvement	148	Stormdrain and Outfall Stabilization	This project consists of design and construction of storm drainage improvements in the area of Severn Drive cul-de-sac and the adjacent private community beach. Work includes a regenerative step pool storm conveyance system with water quality filter.	Design	Schematic design complete. Construction anticipated for completion in 11/2010	KW	D537900	D537926	AACO	CIP	Future	3.06		Severn River	Filtration
Severn Station SWM Pond	56	SWM Retrofit	Design a water quality retrofit for the existing stormwater management pond at the intersection of Severn Station Road and Ricker Road.	Construction Complete	Complete	DM	D499900	D499908	AACO	CIP	Yes	42.14	10.05	Severn River	Filtration

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Shipley's Choice Dam Rehab.	28	Dam Decom & Stream Restoration	Decommission Shipley's Choice dam near Oak Stump Dr., replace downstream culvert crossing at West Benfield Rd, and restoration of Bear Creek between the dam and it's confluence with the Severn River.	Design	Design development complete by 9/2010. Construction anticipated for completion by 3/2013	Heery (Brent Ross)	Q543000	Q543001	AACO	CIP	Future			Severn River	Filtration
Sloop, Eli, & Long Coves Retrofits, Site 2	29	Stream Restoration	Stream restoration at west drive.	Construction Complete	Complete	DM	Q514100	Q514102	AACO	CIP	Yes	23.3	6.09	Patapsco Tidal	Filtration
Sloop, Eli, & Long Coves Retrofits, Site 1	37	Stream Restoration	Stream channel restoration to two tributaries of Sloop Cove.	Design	Schematic Design Underway. Construction Schedule not set	JK	Q514100	Q514103	AACO	CIP	Future			Patapsco Tidal	Filtration
North Carolina @ Severn Rd. Wetland creation at storm drain outfall.	30	Outfall Stabilization	Design and construct an outfall retrofit and wetland recovery area located at the storm drain outfall near the intersection of South Carolina and Severn Rd. Also see contract H349402.	Construction Complete	Complete	DM	Q437300	Q437337	AACO	CIP	Yes	2.32	0.8	Magothy River	Wetlands

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South Down Shores Storm Drain Improvement	59	Storm Drain Improvement	Upgrade storm drains along Stewart Drive, relieve flooding problems on Duvall Lane, and implement a water quality facility within drainage areas. Schematic design completed under D49909.	Construction Complete	Complete	KW	D527400	D527401	AACO	CIP	Yes	44.6	17.16	South River	Infiltration
Southdown Road Culvert Replacement, Regenerative Step Pool Storm Conveyance, and Wetland Seepage System	60	Wetland Creation and Outfall Stabilization	Replace the culvert beneath Southdown Road, create SPSC sand filter system outfalls at multiple locations, and implement a wetland seepage water quality facility.	Design	Schematic Design Complete, Construction anticipated for completion on 12/2011.	KW	D527400	D527402	AACO	CIP	Future	23.8		South River	Filtration
Stoney Run Fish Passage	149	Fish Passage	Provide fish passage at the crossing of Furnace Avenue over Stoney Run and proceeds 200 feet downstream and 4000 ft upstream.	Design	Design Development is complete. Construction is on hold contingent upon funding and SHA collaboration	DM	D499900	D499921	AACO	CIP	Future			Patapsco Non-Tidal	
Sunnyfield Outfall Restoration	55	Stream Restoration and BMP Retrofit	Design and construct a stream restoration for the outfall of Sunnyfield Pond #2 located near the intersection of Sunnyfield Lane and House Lane.	Construction Complete	Complete	DM	D499900	D499903	AACO	CIP	Yes	46.23	15.52	Patapsco Tidal	Filtration

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Wainwright Avenue Storm Drain Retrofit	113	Storm Drain Retrofit and Water Quality	Construction of a storm drain system with infiltration and water quality inlets for Wainwright Avenue in Bay Ridge.	Construction Complete	Complete	DM	D537900	D537902	AACO	CIP	Yes	0.55	0.41	Severn River	Infiltration
Warehouse Creek Restoration	49	Stream Restoration	Restoration of Warehouse Creek from Washington Road to the tidal interface and installation of associated water quality BMPs.	Design	Design and Construction schedule not set.	JK	Q514500	Q514504	AACO	CIP	Future	136		South River	Wetlands
Western Tributary Stream Restoration	64	Stream Stabilization	Stream restoration for the western tributary of Church Creek. (55.3 Acres within the Wilelinor Drainage Area)	Construction Complete	Complete	DM	D499900	D499910	AACO	CIP	Yes	127.9	Nested	South River	Filtration
Wethersfield Pond SWM Retrofit	150	SWM Retrofit	Design and construct retrofit to existing stormwater management pond located on Council Oak Drive to increase water quality benefits.	Design	Construction to begin on 7/2011	JK	D499900	D499900/38	AACO	CIP	Future			Severn River	Wetlands
Whitehall Creek Stream Rehabilitation	44	Stream Restoration	Design and construct Whitehall Creek Stream Restoration, located downstream of the triple 81"x59" culverts under Whitehall Rd. east of the US 50/301 and MD RTE 179 interchange.	Construction Bid Underway	TEP grant acquired. Construction anticipated for completion in 10/2011	DM	Q517600	Q517602	AACO	CIP	Future	49.6		Severn River	Wetlands

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Wilelinor SWM Rehabilitation	40	Outfall Stabilization	Design and construct a seepage wetland and stable tidal interface in the Wilelinor Estates community.	Construction Complete	Complete	DM	Q514000	Q514001	AACO	CIP	Yes	188	74.13	South River	Wetlands
Windsor Ridge Stream Stabilization	52	Stream Restoration/ Wetland Seepage System	Stabilize an eroded stream channel that is directly adjacent to Windsor Ridge Road by using a seepage wetland configuration with cobble weir design.	Design	Construction documents completed. Currently pursuing permits and right of ways. Construction anticipated for completion by 10/2011.	DM	Q536000	Q536001	AACO	CIP	Future			Severn River	Filtration
Woods Road Culvert Stream Restoration	47	Instream Culvert Retrofit	Replace culvert beneath Woods Road and stabilize the channel.	Construction Complete	Complete	MG	D499900	D499915	AACO	CIP	Yes	282.72	48.02	Magothy River	Wetlands
Carriage Hills Outfall Stabilization and Stream Restoration	151	Outfall Stabilization and Stream Restoration	Stabilize an eroded stream gully using a regenerative step pool storm conveyance system. Approximately 2000 Ft of stabilization.	Construction Complete	Complete	Severn River Association	N/A	N/A	EPA Grant	Severn River Association	Yes	6.23	2.37	Severn River	Filtration
Saefern Outfall Stabilization	152	Outfall Stabilization	Stabilize eroded slope using a regenerative step pool storm conveyance system. Approximately 200 ft.	Construction Complete	Complete	Severn River Association	N/A	N/A	EPA Grant	Severn River Association	Yes	1.09	0.47	Severn River	Filtration
116 Avondale Circle Rain Barrel	153	Rain Barrel	Install one rain barrel at 116 Avondale Circle	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/ AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
120 Cove View Trail Rain Barrel	154	Rain Barrel	Install two rain barrels at 120 Cove View Trail	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/ AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry

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76 Point Somerset Lane Rain Barrel	155	Rain Barrel	Install one rain barrels at 76 Point Somerset Lane	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
317 Old County Road Rain Barrel	156	Rain Barrel	Install one rain barrels at 317 Old County Road	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
195 Topeg Drive Rain Barrel	157	Rain Barrel	Install one rain barrels at 195 Topeg Drive	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
202 Avondale Circle Rain Barrel	158	Rain Barrel	Install one rain barrel at 202 Avondale Circle	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
216 Springdale Avenue Rain Barrel	159	Rain Barrel	Install one rain barrels at 216 Springdale Avenue	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
105 Avondale Circle Rain Barrel	160	Rain Barrel	Install three rain barrels at 105 Avondale Circle	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.07	0.07	Severn River	Extended Detention Dry
91 Point Somerset Lane Rain Barrel	161	Rain Barrel	Install one rain barrel at 91 Point Somerset Lane	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
896 Randell Road Rain Barrel	162	Rain Barrel	Install one rain barrel at 896 Randell Road	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
Olde Severna Park Improvement Association Beach Rain Barrel	163	Rain Barrel	Install two rain barrels at Olde Severna Park Community Beach	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
1228 Sandalwood Road Rain Barrel	164	Rain Barrel	Install one rain barrel at 1228 Sandalwood Road	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Upper Patuxent	Extended Detention Dry
1444 Point-O-Woods Court Rain Barrel	165	Rain Barrel	Install one rain barrel at 1444 Point-O-Woods Court	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry

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22 Janwall Court Rain Barrel	166	Rain Barrel	Install two rain barrels at 22 Janwall Court	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	South River	Extended Detention Dry
736 Trenton Ave Rain Barrel	167	Rain Barrel	Install one rain barrel at 736 Trenton Ave	Construction Complete	Complete	Ann Jackson	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
1033 Ashe Street Rain Garden	168	Bioretention	Install 200 sq ft rain garden to treat 800 sq ft of rooftop runoff	Construction Complete	Complete	Lara Mulvaney	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	South River	Filtration
Westfield Annapolis Rain Garden	169	Bioretention	Entrance to Food Court off Jennifer Road Installed 2004	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	1.05	0.78	South River	Filtration
St. Philips Episcopal Church Rain Garden	170	Bioretention	St. Philips Episcopal Church Rain Garden corner of Bestgate Road and Cottage Grove Rd, installed 2006	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	1.65	0.83	Severn River	Filtration
1720 Tarrytown Ave Rain Garden	171	Bioretention	Install rain garden to treat 2000 sq ft of front yard	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.05	0.01	Little Patuxent	Filtration
1720 Tarrytown Ave Rain Garden	172	Bioretention	Install rain garden to treat 2000 sq ft of back yard	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.05	0.01	Little Patuxent	Filtration
1720 Tarrytown Ave Rain Barrels	173	Rain Barrel	Install four rain barrels to treat rooftop runoff at 1720 Tarrytown Ave	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.04	0.04	Little Patuxent	Extended Detention Dry
1721 Tedbury Rd. Rain Barrels	174	Rain Barrel	Install two rain barrels to treat rooftop runoff at 1721 Tedbury Rd.	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.05	0.05	Little Patuxent	Extended Detention Dry

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1708 Truro Rd. Rain Garden	175	Bioretention	Install asphalt bump shunts driveway and house roof runoff into rain garden in front Installed 2007	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.04	0.01	Little Patuxent	Filtration
1708 Truro Rd. Rain Barrels	176	Rain Barrel	Install two rain barrels to treat rooftop runoff at 1708 Truro Rd.	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.05	0.05	Little Patuxent	Extended Detention Dry
1737 Urby Dr. Rain Garden	177	Bioretention	Rain garden accepts runoff from roof and driveway asphalt bump. Installed 2007	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.04	0.02	Little Patuxent	Filtration
1733 Urby Dr. Rain Garden	178	Bioretention	Asphalt bump directs driveway and rooftop runoff to rain garden plus side plantings accept side runoff. Installed 2007	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.11	0.05	Little Patuxent	Filtration
2106 Meghan Ct. Rain Garden	179	Bioretention	Dug and planted a rain garden to accept roof runoff. Installed 2008	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.05	0.05	Little Patuxent	Filtration
St. Elizabeth Anne Seton Church Rain Garden	180	Bioretention	Rain garden in parking lot designed and installed by Keith Underwood 2008	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.77	0.77	Little Patuxent	Filtration
1535 Eton Way Infiltration	181	Infiltration	Connected downspouts to perforated hose about 8" deep into sandy soils, infiltrates. Installed 2008	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.07	0.07	Little Patuxent	Infiltration
1732 Tarreytown Rd. Rain Garden	182	Bioretention	Blocked passage of stormwater from their property into storm drain, so it's contained on site. Installed 2008	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.19	0.06	Little Patuxent	Filtration

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1456 Harwell Ave. Rain Garden	183	Bioretention	Dug a hole in slope to Creek, filled with stones and infiltrates SW. Driveway runoff ponds in his lawn. Installed 2007	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.17	0.07	Little Patuxent	Filtration
Crofton Woods Elem. Rain Garden	184	Bioretention	Curb Cuts from parking lot into forest Installed 2007	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.23	0.23	Little Patuxent	Filtration
Crofton Woods Elem. Rain Garden	185	Bioretention	Eagle Scout project, Michael Kane Installed 2009	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.31	0.31	Little Patuxent	Filtration
Crofton Town Hall Rain Garden	186	Bioretention	Elaine Lahn guided volunteers to dig and plant.	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.91	0.47	Little Patuxent	Filtration
Crofton Town Hall Rain Garden	187	Bioretention	Girl Scout Troop dug and planted, funds from Town Hall.	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.68	0.35	Little Patuxent	Filtration
424 & Reidel Rd. Rain Garden	188	Bioretention	Methodist Church, corner of Reidel Road and Rt. 424, Crofton, Eagle Scout Rain Garden, Patrick Johnston installed fall 2009.	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.42	0.12	Little Patuxent	Filtration
Beaver Creek Childcare Rain Barrel	189	Bioretention	Private School on 424 Rain barrels installed 2007.	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.02	0.02	Little Patuxent	Filtration
Beaver Creek Childcare Rain Garden	190	Bioretention	Private School on 424 Rain garden installed 2007.	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	2.35	1.13	Little Patuxent	Filtration
762 Dividing Creek Rd. Rain Garden	191	Bioretention	Eagle Scout Jeff Patrick installed a Rain garden at his home's roadside, Manhattan Beach, installed fall 2009.	Construction Complete	Complete	Anne Pearson	N/A	N/A	EPA Grant/Private	Alliance for Sustainable Communities	Yes	0.19	0.06	Magothy River	Filtration

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Heritage Baptist Church	192	Bioretention	2390 sq ft of bioretention, two stormwater planters, 25 trees.	Construction Complete	Complete	Amy Clements	N/A	N/A	EPA Grant/Private	Spa Creek Conservancy	Yes	2.18	1.21	Severn River	Filtration
St. Martin's Lutheran Church Rain Garden	193	Bioretention	140 sf of bioretention, 23 trees	Construction Complete	Complete	Amy Clements	N/A	N/A	EPA Grant/Private	Spa Creek Conservancy	Yes	0.82	0.59	Severn River	Filtration
St. Mary's Bioretention	194	Bioretention	850 sf of bioretention, one tree	Construction Complete	Complete	Amy Clements	N/A	N/A	EPA Grant/Private	Spa Creek Conservancy	Yes	4.83	3.36	Severn River	Filtration
1262 Creek Dr. Rain Garden	195	Bioretention	Construct a major Bioretention Cell/Swale - Rain Garden system. Phase 1 of multiple phases to restore wetland area and mitigate stormwater runoff issues destroying Fishing Creek, which opens into the Bay at mouth of South River - Thomas Point Park	Construction Complete	Complete	Norm Macleod	N/A	N/A	Private/AACO	WSA	Yes	2.79	0.72	South River	Filtration
542 Paw Paw Cove Ct. Rain Barrel	196	Rain Barrel	Install two rain barrels at 542 Paw Paw Cove Ct.	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
407 Avondale Circle Rain Barrel	197	Rain Barrel	Install one rain barrel at 407 Avondale Circle	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
10 Riggs Ave Rain Barrel	198	Rain Barrel	Install two rain barrels at 10 Riggs Ave	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Magothy River	Extended Detention Dry
657 Creek Rd. Rain Barrel	199	Rain Barrel	Install one rain barrel at 657 Creek Rd.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
603 Cypresspointe Dr Rain Barrel	200	Rain Barrel	Install one rain barrel at 603 Cypresspointe Dr.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	Nested in 129	Magothy River	Extended Detention Dry

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663 Creek Rd. Rain Barrel	201	Rain Barrel	Install one rain barrel at 663 Creek Rd	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
266 Cypress Creek Rd. Rain Barrel	202	Rain Barrel	Install one rain barrel at 266 Cypress Creek Rd	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
660 Creek Rd. Rain Barrel	203	Rain Barrel	Install two rain barrels at 660 Creek Rd	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Magothy River	Extended Detention Dry
505 Dill Point Dr. Rain Barrel	204	Rain Barrel	Install one rain barrel at 505 Dill Point Dr.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
2923 Edgewater Dr. Rain Barrel	205	Rain Barrel	Install eight rain barrels at 2923 Edgewater Dr.	Construction Complete	Complete	Tait/Riddle	N/A	N/A	Private/AACO	WSA	Yes	0.06	0.06	South River	Extended Detention Dry
669 Dill Rd. Rain Barrel	206	Rain Barrel	Install two rain barrels at 669 Dill Rd.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Magothy River	Extended Detention Dry
633 Cypresspoint Dr. Rain Barrel	207	Rain Barrel	Install two rain barrels at 633 Cypresspoint Dr.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Magothy River	Extended Detention Dry
109 Rustic Ridge Rd. Rain Barrel	208	Rain Barrel	Install one rain barrel at 109 Rustic Ridge Rd.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
716 Dill Rd. Rain Barrel	209	Rain Barrel	Install one rain barrel at 716 Dill Rd.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
677 Dill Rd. Rain Barrel	210	Rain Barrel	Install one rain barrel at 677 Dill Rd.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
691 Dill Rd. Rain Barrel	211	Rain Barrel	Install one rain barrel at 691 Dill Rd.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
683 Dill Ct. Rain Barrel	212	Rain Barrel	Install three rain barrels at 683 Dill Ct.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.04	0.04	Magothy River	Extended Detention Dry
681 Dill Rd. Rain Barrel	213	Rain Barrel	Install two rain barrels at 681 Dill Rd.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.03	0.03	Magothy River	Extended Detention Dry

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649 Dunkeld Ct. Rain Barrel	214	Rain Barrel	Install one rain barrel at 649 Dunkeld Ct.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
629 Dunkeld Ct. Rain Barrel	215	Rain Barrel	Install one rain barrel at 629 Dunkeld Ct.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
643 Dunkeld Ct. Rain Barrel	216	Rain Barrel	Install two rain barrel at 643 Dunkeld Ct.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Magothy River	Extended Detention Dry
56 Bricepoint Ct. Rain Barrel	217	Rain Barrel	Install one rain barrel at 56 Bricepoint Ct.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
209 Wood Loch Ln Rain Barrel	218	Rain Barrel	Install one rain barrel at 209 Wood Loch Ln.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
203 Wood Loch Ln Rain Barrel	219	Rain Barrel	Install six rain barrels at 203 Wood Loch Ln.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Magothy River	Extended Detention Dry
52 Taras Trail Rain Barrel	220	Rain Barrel	Install two rain barrels at 52 Taras Trail	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Magothy River	Extended Detention Dry
55 Cypresspoint Ct. Rain Barrel	221	Rain Barrel	Install one rain barrel at 55 Cypresspoint Ct.	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
238 Charita Way. Rain Barrel	222	Rain Barrel	Install one rain barrel at 238 Charita Way	Construction Complete	Complete	Ed Krause	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
2810 Carrollton Rd. Rain Barrel	223	Rain Barrel	Install two rain barrels at 2810 Carrollton Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
2554 Carrollton Rd Rain Barrel	224	Rain Barrel	Install two rain barrels at 2554 Carrollton Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
1036 Harbor Rain Barrel	225	Rain Barrel	Install two rain barrels at 1036 Harbor Dr.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
1029 Pinecrest Dr. Rain Barrel	226	Rain Barrel	Install one rain barrel at 1029 Pinecrest Dr.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry

Project Name	ID	Project Type	Project Description	Status	Schedule	Project Manager	Project Number	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed Section G	Drainage Area Treated (Acres)	Imperv. Area Treated (Acres)(Based on 2007 Coverage)	Impacted Watershed	BMP Group
2806 Carrollton Rd Rain Barrel	227	Rain Barrel	Install five rain barrels at 2806 Carrollton Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
1031 Harbor Dr. Rain Barrel	228	Rain Barrel	Install one rain barrel at 1031 Harbor Dr.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
2834 Carrollton Rd. Rain Barrel	229	Rain Barrel	Install one rain barrel at 2834 Carrollton Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
2670 Carrollton Rd. Rain Barrel	230	Rain Barrel	Install one rain barrel at 2670 Carrollton Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
2655 Carrollton Rd. Rain Barrel	231	Rain Barrel	Install one rain barrel at 2655 Carrollton Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
1034 Old Bay Ridge Rd. Rain Barrel	232	Rain Barrel	Install one rain barrel at 1034 Old Bay Ridge Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
2818 Carrollton Rd. Rain Barrel	233	Rain Barrel	Install two rain barrels at 2818 Carrollton Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
2660 Claibourne Rd. Rain Barrel	234	Rain Barrel	Install one rain barrel at 2660 Claibourne Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
2616 Ogleton Rd. Rain Barrel	235	Rain Barrel	Install one rain barrel at 2616 Ogleton Rd	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
2687 Claibourne Rd. Rain Barrel	236	Rain Barrel	Install one rain barrel at 2687 Claibourne Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
2800 Carrollton Rd. Rain Barrel	237	Rain Barrel	Install two rain barrels at 2800 Carrollton Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
2804 Carrollton Rd. Rain Barrel	238	Rain Barrel	Install two rain barrels at 2804 Carrollton Rd.	Construction Complete	Complete	Jon Kesler	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry

Project Name	ID	Project Type	Project Description	Status	Schedule	Project Manager	Project Number	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed Section G	Drainage Area Treated (Acres)	Imperv. Area Treated (Acres)(Based on 2007 Coverage)	Impacted Watershed	BMP Group
207 Riverside Rd. Rain Barrel	239	Rain Barrel	Install two rain barrels at 207 Riverside Rd.	Construction Complete	Complete	Carolyn Ricketts	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	South River	Extended Detention Dry
6433 Weems Ave Rain Barrel	240	Rain Barrel	Install one rain barrel at 6433 Weems Ave.	Construction Complete	Complete	Lindsay Hollister	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Herring Bay	Extended Detention Dry
6656 Highview Terrace, Rain Barrel	241	Rain Barrel	Install two rain barrels at 6656 Highview Terrace.	Construction Complete	Complete	Lindsay Hollister	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Herring Bay	Extended Detention Dry
401 Arundel Rd Rain Barrel	242	Rain Barrel	Install one rain barrel at 401 Arundel Rd.	Construction Complete	Complete	Lindsay Hollister	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Herring Bay	Extended Detention Dry
6437 Weems Ave Rain Barrel	243	Rain Barrel	Install one rain barrel at 6437 Weems Ave.	Construction Complete	Complete	Lindsay Hollister	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Herring Bay	Extended Detention Dry
6714 Duck Lane Rain Barrel	244	Rain Barrel	Install one rain barrel at 6714 Duck Lane	Construction Complete	Complete	Lindsay Hollister	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Herring Bay	Extended Detention Dry
Captain Salem Avery House Rain Barrels	245	Rain Barrel	Install nine rain barrels at the Captain Salem Avery House	Construction Complete	Complete	Lindsay Hollister	N/A	N/A	Private/AACO	WSA	Yes	0.1	0.1	West River	Extended Detention Dry
6605 Revell Rd Rain Barrel	246	Rain Barrel	Install one rain barrel at 6605 Revell Rd.	Construction Complete	Complete	Lindsay Hollister	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Herring Bay	Extended Detention Dry
2744 Swan Way Rain Barrel	247	Rain Barrel	Install one rain barrel at 2744 Swann Way	Construction Complete	Complete	Lara Mulvaney	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	South River	Extended Detention Dry
2764 Ashe St. Rain Barrel	248	Rain Barrel	Install one rain barrel at 2764 Ashe St.	Construction Complete	Complete	Lara Mulvaney	N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	South River	Extended Detention Dry
1712 Truro Rd. RainBarrel	249	Rain Barrel	Install two rain barrels at 1712 Truro Rd.	Construction Complete	Complete	Lara Mulvaney	N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Little Patuxent	Extended Detention Dry
2650 Claibourne Rd. Rain Barrel	250	Rain Barrel	Install one rain barrel at 2650 Claibourne Rd.	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry

Project Name	ID	Project Type	Project Description	Status	Schedule	Project Manager	Project Number	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed Section G	Drainage Area Treated (Acres)	Imperv. Area Treated (Acres)(Based on 2007 Coverage)	Impacted Watershed	BMP Group
2849 Green Willow Dr. Rain Barrel	251	Rain Barrel	Install one rain barrel at 2849 Green Willow Dr	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
124 Bay Park Way Rain Barrel	252	Rain Barrel	Install one rain barrel at 124 Bay Park Way	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
306 Holland Rd. Rain Barrel	253	Rain Barrel	Install two rain barrels at 306 Holland Rd.	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
301 Park Dr Rain Barrel	254	Rain Barrel	Install two rain barrels at 301 Park Dr.	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Severn River	Extended Detention Dry
43 Lockleven Dr. Rain Barrel	255	Rain Barrel	Install one rain barrel at 43 Lockleven Dr.	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Magothy River	Extended Detention Dry
737 Trenton Ct. Rain Barrel	256	Rain Barrel	Install two rain barrels at 737 Trenton Ct.	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Magothy River	Extended Detention Dry
95 Barrensdale Dr. Rain Barrel	257	Rain Barrel	Install two rain barrels at 95 Barrensdale Dr.	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Magothy River	Extended Detention Dry
516 White Oak Dr. Rain Barrel	258	Rain Barrel	Install three rain barrels at 516 White Oak Dr.	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.04	0.04	Magothy River	Extended Detention Dry
204 Avondale Circle Rain Barrel	259	Rain Barrel	Install one rain barrel at 202 Avondale Circle	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
409 Glenmont Ave Rain Barrel	260	Rain Barrel	Install three rain barrels at 409 Glenmont Ave	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.05	0.05	Patapsco Tidal	Extended Detention Dry
1343 Hollywood Ave Rain Barrel	262	Rain Barrel	Install one rain barrel at 1343 Hollywood Ave	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.02	0.02	Severn River	Extended Detention Dry
1343 Hollywood Ave Rain Garden	263	Bioretention	Install one rain garden at 1343 Hollywood Ave	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.261	0.116	Severn River	Filtration

Project Name	ID	Project Type	Project Description	Status	Schedule	Project Manager	Project Number	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed Section G	Drainage Area Treated (Acres)	Imperv. Area Treated (Acres)(Based on 2007 Coverage)	Impacted Watershed	BMP Group
Arundel on the Bay Rain Garden	264	Bioretention	Install rain garden near entrance to Arundel on the Bay.	Construction Complete	Complete		N/A	N/A	Private/AACO	WSA	Yes	0.367	0.191	Severn River	Filtration
210 Mill Church Road (Divinity Cove)	265	Bioretention	Install a rain garden near the Divinity Cove SPS station to treat runoff coming down the driveway to SPS.	Construction Complete	Complete	Juliet Page	N/A	N/A	Private/AACO	WSA	Yes	0.56	0.196	Magothy River	Filtration
1509 Circle Drive Infiltration Trench/Rain Garden	266	Bioretention	Install and infiltration trench and rain garden at 1509 Circle Dr to treat road runoff before it flows down ravine into Chase Creek.	Construction Complete	Complete	Rhody Holthaus	N/A	N/A	Private/AACO	Facilities	Yes	0.186	0.083	Severn River	Infiltration
Gray's Luck SWM Retrofit	267	SWM Retrofit	Retrofit dry pond as seepage wetland system	Design	Schematic design complete; construction scheduled for FY 13	DM	D499900	D499940	AACO	CIP	Future	41.9		Patapsco Tidal	Filtration
Dunkeld Manor SWM Retrofit	268	SWM Retrofit	Retrofit failed infiltration basin with regenerative storm conveyance system to improve water quantity.	Design	Right of Way acquisition meetings; preparation of final design documents.	DM	D499900	D499943	2010 Trust Grant	CIP	Future	19.5		Magothy River	Filtration
Leelyn Drive SWM Retrofit	269	SWM Retrofit	Retrofit existing extended detention BMP located south of Leelyn Drive and north of the Village Square Shopping Center with regenerative storm conveyance.	Design	Construction scheduled for spring 2011	DM	D499900	D499941	2010 Trust Grant	CIP	Future	55.8		Magothy River	Filtration

Project Name	ID	Project Type	Project Description	Status	Schedule	Project Manager	Project Number	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed Section G	Drainage Area Treated (Acres)	Imperv. Area Treated (Acres)(Based on 2007 Coverage)	Impacted Watershed	BMP Group
Cypress Creek Park and Ride Bioretention	270	Bioretention	Install two bioretention facilities near the parking lot to limit drainage and improve runoff water quality.	Design	Construction scheduled for Spring 2011	DM	D499900	D499942	2010 Trust Grant	CIP	Future	6.46		Magothy River	Filtration
Cypress Creek Park and Ride Bioretention	270	Bioretention	Install two bioretention facilities near the parking lot to limit drainage and improve runoff water quality.	Design	Construction scheduled for spring 2011	DM	D499900	D499942	2010 Trust Grant	CIP	Future	6.46		Magothy River	Filtration
Cypress Creek Recreation Bioretention	271	Bioretention	Install bioretention facility near an existing storm drain on the north side of the overflow parking for the Cypress Creek Recreation Area.	Design	Construction scheduled for spring 2011	DM	D499900	D499942	2010 Trust Grant	CIP	Future	0.758		Magothy River	Filtration
Park Drive Rain Garden	272	Bioretention	Installation of a rain garden on Park Drive in Olde Severna Park.	Construction Complete	Complete	Ann Jackson	N/A	N/A	EPA Grant/Private	WSA	Yes	0.61	0.26	Severn River	Filtration
Little Magothy View Rain Garden	273	Bioretention	Diversion of drainage ditch into adjacent created depression, to mitigate direct flow into Little Magothy River.	Construction Complete	Complete	Brad Knopf	N/A	N/A	EPA Grant/Private	WSA	Yes	2.27	0.42	Magothy River	Filtration
Hillsmere Rain Garden	274	Bioretention	Installed 4500 sq ft rain garden near Hillsmere swimming pool.	Construction Complete	Complete	Chris Moore	N/A	N/A	EPA Grant/Private	WSA	Yes	6.11	1.73	South River	Filtration
Discovery Village Rain Garden	275	Bioretention		Construction Complete	Complete		N/A	N/A	EPA Grant/Private	WRR	Yes	1.61	0.8	West River	Filtration
Galesville Rain Garden	276	Bioretention		Construction Complete	Complete		N/A	N/A	EPA Grant/Private	WRR	Yes	0.54	0.4	West River	Filtration

Note: SWM = Stormwater Management; AACO = Anne Arundel County; CIP = Capital Improvement Program; WSA = Watershed Steward Academy

Projects constructed by November 2009 that achieve a water quality benefit are highlighted in yellow. Projects constructed in 2010 are highlighted in green. Nested projects were assigned 0 for impervious area treated.

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 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.

A review was completed in 2008 that compared the EMC values used by the County for individual land use categories to local and national literature sources. The sources included the Center for Watershed Protection (2005), Center for Watershed Protection and VA DCR (2007), and Robert Pitt, et.al. (2004). The review found that the EMC values used by the County are generally in line with literature values for the specific land use/EMC combinations that were comparable. There were a few differences that prompted the County to revise the EMC values. Some of these changes include commercial, industrial, residential, and open space land uses relating to fecal coliform, TSS, zinc, and lead. The values used by the County for fecal coliform were increased while the values used for TSS, zinc, and lead were decreased to align with comparable literature values. The EMCs have been included in previous annual reports. These values will continue to be updated as new data becomes available and/or literature indicates revisions are warranted.

During the 2005 to 2010 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 utilized in the EPA simple method to model pollutant loads, correlate the results with the drainage area contributory imperviousness, and develop pollutant loading goals.

Beginning in 2010 and continuing into 2011, Anne Arundel County has been working with MDE and other stakeholders to develop the Phase II Watershed Implementation Plan (WIP) to support the Chesapeake Bay TMDL. As part of this process, the County is reconciling its pollutant discharge loading rates for various land uses with those used in

the current version of the Chesapeake Bay Program's Watershed Model (Version 5.3). **Table 10** identifies the adjustments needed to reconcile the County's previous values and those used in the Watershed Model that have been adopted for development of the County's WIP. Units are in mg/L.

Table 10: Pollutant Concentrations per Land Cover Code

Landuse Code	Description	Original WMT values			CBP Reconciled Values for WIP		
		TN	TP	TSS	TN	TP	TSS
SRC	Row Crops	1.71	1	400	36.70	6.01	2391
WDS	Woods	1.15	0.15	50	1.15	0.15	50
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
WAT	Water	1.2	0.03	400	1.20	0.03	43
RWD	Residential Woods	1.55	0.19	75	2.00	0.19	51
PAS	Pasture/Hay	1.71	1	250	17.89	5.23	779

Anne Arundel County continues efforts to relate biological condition metrics to watershed characteristics. Over the last seven years, Watershed, Ecosystem 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 assessed BIBI scores at over five hundred locations Countywide between 2002 and 2010.

Using the BIBI as a yardstick of ecological health, these data show that most streams and rivers in Anne Arundel County are experiencing significant impairment (KCI 2006, Millard et al. 2001, Victoria and Markusic 2007, Roberts et al. 2006, Stribling et al. 2008a, Stribling et al. 2008b, Stribling et al. *in prep.*). 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 intent of these investigations was to develop management strategies that use biological conditions as ultimate endpoints of restoration success by understanding which watershed variables 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 2010 reporting year, these comparisons and their outcomes were not significantly changed. The County refers the reader to the 2008 NPDES MS4 Annual Report for detailed information regarding the relationships developed between watershed characteristics and ecological health. Data obtained from the targeted watershed assessments and the Countywide biological monitoring efforts will continue to be used as these relationships are further refined in the future.

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. For the 2010 reporting period, the following maintenance inspections were performed:

- 453 First Year of Operation Maintenance Inspections
- 1,031 Three Year Maintenance Inspections
- 78 Three Year Maintenance Correction Notices

The required first year inspections are performed by the Erosion Control Inspectors as part of the process for issuing grading permits Certificates of Completion. Grading permit Certificates of Completion are not issued until a passing first year maintenance inspection result is obtained.

The Department of Inspections and Permits currently has one Stormwater Management Maintenance Inspector position, which is responsible for performing the 3-year maintenance inspections and performing illicit discharge detection and elimination compliance inspections. The scheduling of 3-year maintenance inspections is based on a priority system developed in 2006. Large BMPs treating commercial, industrial, and residential drainage are given the highest priority for inspection. Secondary priority is given to private BMPs serving single family residential lots or public facilities not maintained by the Department of Public Works. These lower priority facilities are only

inspected if an inspection request is received by the responsible agency or a complaint is received.

At present there are 11,289 stormwater management BMPs in the County requiring inspection. Private property owners have been very responsive to correction notices issued for the proper maintenance of the stormwater BMPs on their properties. As such, the written Correction Notice delivered by the inspector serves as the primary enforcement tool for obtaining compliance with the specific preventative 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. No civil citations were issued during the reporting period; however, two civil citations issued during the 2009 reporting period were referred to the Office of Law for contempt of previously issued Court Judgments. These cases are still pending the assignment of court dates by the Clerk of the County Court.

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, which significantly altered the Maryland Stormwater Management Regulations and the 2000 Maryland Stormwater Design Manual, has superseded this condition. Updates to the County Code, including implementation of the revised MDE Stormwater Management Manual, were submitted to and approved by Council in September 2010 via County Council Bills 58-10, 59-10, and 60-10. The specific legislative changes contained in these bills are available through the County webpage (www.aacounty.org/CountyCouncil/approvedLegis.cfm).

Additionally, the County Procedures Manual relating to the new State Stormwater Management Regulations was adopted by the County Council through Bill 58-10 and became effective on November 8, 2010. In addressing comments from MDE and the ongoing reviews by County agencies and design consultants, the manual was revised and reissued on November 22, 2010.

The final approved Code and Practices and Procedures Manual were submitted to MDE for review following the end of the 2010 permit year. Comments provided by MDE and subsequent revisions to the Code and/or Practices and Procedures Manual will be discussed in the next 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:

The revised County Procedures Manual was adopted and became effective on November 8, 2010. The Manual was submitted to MDE for approval, and revisions were made to address comments. The County continues interaction with the State to fine tune the stormwater management ordinance and County Procedures Manual.

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

The last triennial review of the County's stormwater management program took place in 2005, and the County was found to be in compliance.

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 reviews the County's Erosion & Sediment Control Program every two years, with the last evaluation conducted in November 2008. At the completion of the reporting year, MDE was in the process of completing the 2010 program evaluation, which began on October 20, 2010. MDE had not made specific recommendations or suggestions by the end of the reporting year. Any suggestions or recommendations resulting from the completion of the review will be implemented to the maximum extent practicable.

During 2010 the Department of Inspections and Permits implemented a new Policy and Procedure for enforcement of the new General NPDES Permit for Construction Site Runoff. The Policy and Procedure memorandum was designed to clarify the procedures for inspections and response actions to be implemented by the Erosion Control Inspectors. This memorandum discusses the importance of and criteria for identifying "Triggering Events" that are indications of erosion control violations or deficiencies. The memorandum also discusses the required response during the first Triggering Event for a project, and outlines the corrections, notices, and follow-up inspections that must occur. The requirement for the Engineer of Record to reevaluate the Erosion and Sediment Control Plan following a second Triggering Event is discussed. Finally, the

memorandum discusses monitoring and record keeping requirements, and includes standard forms to be used. The memorandum has previously been provided to MDE as part of the 2010 Erosion and Sediment Control Program Review.

- 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 in 2010. These were conducted on January 12, 2010, April 28, 2010, and September 15, 2010. 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 Department of Inspections and Permits maintains the Construction General Permit Activity database in the required format. Based on previous guidance from MDE, quarterly reports were 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

Anne 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:

- 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;***
- Conducting routine surveys of commercial and industrial watersheds for discovering and eliminating pollutant sources;***
- Maintaining a program to address illegal dumping and spills;***
- 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***

- ***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:

a. Field Screening of Outfalls

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.

The County generally uses a watershed-based approach to identify target areas for field screening. In 2010, illicit discharge screening was focused within two major areas of the County:

- Patapsco Nontidal Watershed
- Patapsco Tidal 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 systems, locations of outfalls, and contributing businesses or facilities.

The water chemistry and physical condition of each outfall and its surrounding conditions 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 included structural condition, deposits, vegetative condition, erosion, floatables, odor, color, and clarity.

If the indicator tests results yielded concentrations higher than stated 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 areas, 157 commercial and industrial storm drain outfalls were inspected.

In 2010, only one outfall with dry weather flow contained a concentration of ammonia exceeding the threshold limits. None of the other outfalls had high levels of contaminant concentrations. However, the County inspectors, through complaint-driven inspections, also identified eight other potential illicit discharges. Eleven sites were found with structural deficiencies or erosion. The County inspectors performed follow-up site visits and inspections for these reported problems. Further details, including site-specific reports for some of the sites, are included in **Appendix C**.

b. Survey of Commercial and Industrial Watersheds

Field personnel perform a visual inspection of all accessible commercial and industrial sites within the target watershed 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 2010 inspections identified ten sites with the potential to discharge pollutants into County storm drains or Waters of the United States. Compliance action was taken for each of these sites. Compliance reports and site-specific reports can be found in **Appendix C**.

A full report of the procedures and data collected from the illicit connection detection and elimination field investigation can be found in **Appendix C**. Digital data are included. The report includes a discussion of the enforcement actions taken in 2010.

c. Illegal Dumping and Spills

The Department of Inspections and Permits is responsible for enforcing spills and illegal dumping into the County's stormdrain systems. For the 2010 reporting period, the Department received 19 Illicit Discharge complaints, including citizen complaints, and referrals from the Department of Public Works. Details regarding these complaints are included in the *Illicit Discharge Detection and Elimination* report included in **Appendix C**.

The Department uses a phased approach to eliminating and enforcing illicit stormdrain discharges 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 the referral to MDE for enforcement under the State Code.

For the reporting period, the Department issued one civil citation for the failure to abate illicit discharges at the Phase II level of enforcement. The \$1,000 civil citation, which was issued to the owners of Shoreline Seafood, was paid. Three civil citations issued during the 2009 reporting period went to trial in 2010 with all three reduced by the presiding judge to Court Judgments.

d. Report Significant Illicit Discharges to MDE

Out of the 19 Illicit Discharge complaints received by the Department of Inspections and Permits for the reporting period, only one was referred to MDE. Specifically, Compliance Case E-2010-0201 for the Annapolis Roads Golf Course was referred to MDE for enforcement under the Maryland Environmental Article, Section 4-413 as a potential source of sediment pollution.

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 that require an NPDES discharge permit submitted applications to MDE. The County-owned facilities with NPDES discharge permits include:

- Annapolis WRF, permit number 07-DP-0838, effective August 1, 2009, to July 31, 2014.
- 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.
- 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.

Anne Arundel County's wastewater NPDES discharge permits are current or continue in force pending MDE issuance of a revised permit. The County has committed to ENR (Enhanced Nutrient Removal) improvements at all water reclamation facilities. Over \$250 million will be needed to realize this upgrade at the facilities.

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.

Storm Water Pollution Prevention Plans (SWPPPs) exist at each of the above facilities as required by the permits. The SWPPP for Cox Creek WRF was last updated in October 2010. The Mayo, Broadwater, Broadneck, Maryland City, and Patuxent WRF SWPPPs were updated in November 2010. The Annapolis WRF SWPPP was updated in February 2010.

Trainings are conducted annually at each WRF facility, and when new employees begin work. The trainings discuss the SWPPPs, specifically the sections relating to spill prevention and response, good housekeeping, proper material handling, storage and transfer of materials, and disposal and control of waste.

The General Discharge Permit for Storm Water Associated with Industrial Activities, Permit No. 02-SW applies to the following County-owned facilities:

- Northern District Road Yard at 200 Dover Road (02-SW-1176), effective December 1, 2002 to November 30, 2007;
- Northern District Road Yard at 318 Mountain Road (02-SW-1181), effective December 1, 2002 to November 30, 2007;
- Central District Road Yard at 1427 Duckens Street (02-SW-1177), effective December 1, 2002 to November 30, 2007;
- Central District Road Yard at 1847 Crownsville Road (02-SW-1179), effective December 1, 2002 to November 30, 2007;
- Central District Road Yard at 415 Broadneck Road (02-SW-1182), effective December 1, 2002 to November 30, 2007;

- Central Services (Southern District) at 350 West Central Avenue (07-DP-3366), effective December 1, 2002 to November 30, 2007;
- Southern District (Friendship) satellite storage yard at 6657 Old Solomon's Island Road (02-SW-1180), effective December 1, 2002 to November 30, 2007;
- Glen Burnie Landfill, permit number 02-SW-0298, expired November 30, 2007, Notice of Intent to renew submitted on January 28, 2003;
- Millersville Landfill, permit number 02-SW-1304, expired November 30, 2007, Notice of Intent to renew submitted on January 28, 2003; and
- Sudley Road Landfill, permit number 02-SW-0297, expired November 30, 2007, Notice of Intent to renew submitted on January 28, 2003.

The Department of Public Works, Bureau of Highways, performs road maintenance and construction activities. The Bureau's Road Operations Division is divided into three Districts with each district having at least two road operations service yards. These yards are covered under the County's General Discharge Permit (02-SW), which expired November 30, 2007. A letter was received from the Maryland Department of the Environment, dated September 18, 2007, that extended coverage of the General Discharge Permit until 60 days after the new permit is issued. The County has therefore continued operations per the requirements of General Discharge Permit 02-SW.

Whitman, Requardt, and Associates, Inc. have been retained under Open End Agreement No.5812 to develop updates to Stormwater Pollution Prevention Plans developed between 1997 and 2001 for the Bureau of Highway facilities. These updates were completed in 2009. Each SWPPP was submitted directly to the EPA.

Each of the SWPPPs for the Bureau of Highway facilities was implemented during the 2010 reporting year. The implementation included comprehensive inspections of each facility; inspections will continue to be conducted on an annual basis. An internal document review was conducted to ensure that staff are following document collection procedures.

Capital improvement projects, associated with stormwater pollution prevention at the road operations yards, are as follows:

- A project to install a Vactor® dewatering area at the Northern District Yard at 318 Mountain Road in Pasadena, MD was designed under CIP Project C436800. Construction is underway.
- A pond retrofit and stream restoration project, which included construction of a step pool stormwater conveyance system, was designed for the Central District Yard at 415 Broadneck Road in Annapolis, MD under CIP Project Q530700. Construction is underway.

Maintenance was conducted at the District Road Yards as follows:

- A failing riser and barrel within a stormwater facility was repaired at the Friendship Yard, 6657 Old Solomons Island Road.
- A scour hole was also repaired at the Friendship Yard.
- A structural failure was repaired at the Dover Road Yard, 200 Dover Road.
- An inlet was installed at the Crownsville Yard, 1847 Crownsville Road.
- Cinderblock walls were replaced with reinforced concrete walls around select storage bins at the three Central District Road Yards and the Southern District Friendship Road Yard.
- Coir fiber logs and silt bags were installed in key locations as perimeter controls.
- Installed CaCl₂ containment area dewatering procedure signage at all facilities outfitted for CaCl₂ storage.
- Installed asphalt curbing to direct clean stormwater away from operational areas at key locations.
- Performed third party inspections of underground waste oil storage tanks at the Northern District Dover Road Yard, Central District St. Margaret's Yard, and the Southern District Friendship Yard.

Staff training sessions were developed and administered to Road District Yards on the following dates:

Table 11: SWP3 Training Summary for Bureau of Highways Facilities

Number	Training Session Topic	Training Dates
1	What is a SWPPP?	11/25/09
2	EPA's When It Rains, It Drains	11/20/09, 11/25/09
3	Secondary Containment	11/20/09, 11/24/09, 11/25/09
4	Pollution Prevention Team	4/4/10
5	Waste Management	11/16/10
6	Spill Prevention and Control	11/19/10
7	Mulching	To Be Determined
8	Geotextile Use	To Be Determined
9	Winter Operations	11/16/10, 11/17/10

The Department of Public Works, Waste Management Services, oversees the operation of the County landfills. These landfills are also covered under the General Discharge Permit for Storm Water Associated with Industrial Activities (Permit No. 02-SW). The County landfill annual comprehensive SWP3 Compliance Evaluation Inspection Reports were prepared for the following facilities and are included digitally in **Appendix A** of this report. All BMPs were found to be in place and functioning, and no signs of polluted runoff were present in receiving waters for the reporting period. Waste Management Services provided trainings on the following topics:

Table 12: SWP3 Training Summary for Waste Management Services

Number	Training Session Topic	Training Dates
1	Hazardous Waste Operations (Response)	3/10
2	Good Housekeeping and Spill Prevention	3/10
3	Preventative Maintenance for Sediment and Erosion Control	3/10
4	Runoff Control	3/10
5	Other Topics	3/10

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:

- *Street sweeping;*
- *Inlet cleaning;*
- *Reducing the use of pesticides, herbicides, fertilizers, and other pollutants associated with roadside vegetation management through the use of integrated pest management (IPM); and*
- *Controlling the overuse of winter weather deicing materials through continual testing and improvement of materials, equipment calibration, employee training, and effective decision-making.*

Status:

a. Street Sweeping

Anne Arundel County's street sweeping program is designed to keep debris out of storm drains, creeks, rivers and ultimately the Chesapeake Bay. The County's program uses two County-owned street sweepers.

Neighborhood streets are relatively clean because of the work of conscientious residents who assist by keeping the areas in front of their homes free of litter and debris. Residential streets are therefore not included in the County's program for routine street sweeping. Main thoroughfares, business districts and industrial areas are scheduled for street sweeping four times per year. The County targets arterial, major collector and roads in business districts for routine sweeping. This allows the County to capture the most debris for each available hour of street sweeping effort.

The County swept 771 miles from November 1, 2009 to October 31, 2010, which equates to 64 curb-miles/month, which is a 54 percent decrease from the last reporting period. The decrease in street sweeping efforts is primarily due to staffing reductions resulting

from budget cuts and downtime associated with major equipment repairs. For comparison, an average of 140 curb-miles/month were swept during the previous reporting year.

Litter is also collected from County roadways on a routine basis using manual labor. A total of 18,000 thirty-gallon sized bags of litter were removed from roadsides during the reporting period.

b. Inlet Cleaning

The County cleaned and removed debris from the tops of catch basins, inlets and outlets of pipes to maintain proper drainage for 16,084 structures during the reporting period. This represents a 33 percent decrease from the last reporting period (23,850 structures). This decrease is due to staffing reductions resulting from budget cuts. In addition, the County inspects catch basins, inlets, and associated ditches to identify structures for cleaning with a sewer vacuum. From November 2009 to October 2010, 4,270 stormwater inlets were cleaned with a Vactor™ truck, a 22 percent increase from the last reporting period (3,488 structures). To ensure adequate drainage, the County also cleaned a total of 113,385 feet of ditch and curb lines using a leaf vacuum. This is a 47 percent decrease from the last reporting period (215,216 feet). One of the County's leaf vacuums was out of service for most of the reporting year, resulting in the reduction.

c. Use of Pesticides, Herbicides, and Fertilizers

Pesticides

Anne Arundel County makes a financial contribution annually to support Maryland Department of Agriculture 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/mosquito_control/index.php). Some of this work occurs along County-maintained roadways. No data regarding the quantity of pesticides applied along roadways are recorded by the County.

Herbicides

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 to control vegetation growth and prior to crack sealing operations in the traveled portion of the roadway. A total of 80 gallons of Glyphosate were used during the reporting period, the same amount as used the previous reporting period. The Bureau of Highways recorded no other pesticide or fertilizer application.

Fertilizer

The Anne Arundel County does not use fertilizer in its road maintenance and roadside vegetation management.

Special care of median landscaping along certain County and State roads in Anne Arundel County is completed by Holmes Lawn Care, Inc. under Blanket Order 3448-OB. This contract includes fertilization at specific times of the year, depending on the roadway, as well as weed control applications. The quantities of fertilizer and weed control products are not available.

d. Snow and Ice Control

The amounts of de-icing chemicals used from November 2009 to October 2010 are found in **Table 13** below. De-icing chemical data for the 2008 and 2009 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 and factors such as road surface temperature.

Table 13: Deicing Material Applied

Material	Quantity 2008	Quantity 2009	Quantity 2010
Salt	7,662 Tons	12,405 Tons	34,242 Tons
Sand/ Salt mix	0 Tons	0 Tons	0 Tons
Liquid Calcium Chloride	0 Gallons	160 Gallons	3,359 Gallons
NWS ¹ Snow Totals (BWI)	8.5 Inches	9.1 Inches	77.0 Inches

⁽¹⁾ Average annual snowfall total at BWI Thurgood Marshall Airport is 18.2 inches, according to the National Weather Services (NWS). Winter 2009-2010 snowfall totals were 77.0 inches, 323 percent greater than average.

In 2010, the Bureau of Highways continued its use of a Maintenance Decision Support System (MDSS) which uses realtime data from the Road Weather Information System (RWIS). The RWIS system 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 from the MDSS are shown below in **Exhibit 5** and **Exhibit 6**.

Exhibit 5: 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	5	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)	6	6	6	6	9	10	12	14	15	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 (Rainin., Snowin.)	None			None			S: <1.0 L: 0.01			S: 1-2 L: 0.18			Ice 10-24
24Hr Snow/Ice Accum (12PM-12PM) (in.)	0	0	0	0	0	0	0	0.85	-	-	-	-	-
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	-	-	-									-	-

Exhibit 6: 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.

Annual training on proper snow plowing techniques is also offered. It includes information on application of deicing salt.

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 Department of Inspections and Permits maintains a 24-hour Environmental Hotline for citizens to report environmentally-related complaints, including spills and illegal dumping into the County stormdrain systems. The Hotline has been in existence since 1988 and has been advertised in numerous ways, including the County Citizens Information Web Site (www.aacounty.org/IP/EnvironmentalPrograms/index.cfm) and on County environmental organizations' websites (e.g., www.southeriverfederation.org).

For the reporting period, a total of 735 environmentally-related complaints were received and investigated by the Department. The complaints received typically involve potential Critical Area violations, sediment control issues or illegal grading activities. All complaints received, and the subsequent investigation results, are tracked in the Department of Inspection and Permit's Compliance Case database.

- b) Provide information regarding the following water quality issues to the general public:***

- i. Water conservation;***
- ii. Stormwater management facility maintenance;***
- iii. Erosion and sediment control;***
- iv. Lawn care and landscape management (e.g., the proper use of herbicides, pesticides, and fertilizers, ice and snow control, cash for clippers, etc.);***
- v. Household hazardous wastes;***
- vi. Litter control, recycling, and composting;***
- vii. Car care, mass transit and alternative transportation;***
- viii. Private well and septic system management;***
- ix. Pet waste management; and***
- x. Procedures for public identification and reporting of illicit discharges.***

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 (www.aacounty.org), Anne Arundel County, Department of Public Works, provides certain water quality-related information pertinent to County-provided utilities (e.g., potable water, sewer). Fact sheets and fliers available through this website address such issues as:

- Preventing sewer backups,
- Rehabilitation and maintenance of County sewer infrastructure,
- Sanitary Sewer Overflow response and public notification,
- Water conservation tips,
- Be a Smart Water Saver – Try Xeriscaping!,
- Homeowner's Guide to Septic Tanks, and
- Homeowner's Guide to Grinder Pumps

Additionally, the Department of Public Works web page includes a Kids Page. This page includes tips for saving water at home (www.aacounty.org/DPW/Kids/tips.cfm), as well as information on the County's Jr. Smart Water Saver Program (www.aacounty.org/DPW/Kids/util03.cfm). The Jr. Smart Water Saver Program is designed to teach elementary grade children about the importance of water and water conservation.

Water Quality Protection Associated with Land Development

General information pertaining to stormwater management, water quality control, grading, disturbance, Critical Area, reforestation, and sensitive areas is provided on the Department of Inspection & Permits website: (<http://www.aacounty.org/IP/FAQs/Environment.cfm>).

Household Hazardous Waste, Litter Control, Recycling, E-Cycling, and Composting

Outreach pertinent to these issues has been reported in prior Annual Reports. The Department of Public Works, Waste Management Services Division manages an extensive outreach campaign geared toward recycling and composting. Additionally, the County advertises and conducts Household Hazardous Waste drop-off days approximately three to four 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 at outreach events, in County offices, and through the County website:

(<http://www.aacounty.org/DPW/WasteManagement/index.cfm>).

Transportation Planning

Information on ride sharing, mass transit, bus schedules, and transportation plans for the County is housed on the County Office of Planning and Zoning website (<http://www.aacounty.org/PlanZone/index.cfm>). County staff routinely offers this information to the public at outreach events and speaking engagements, as well as through the website.

Environmental Health Information (Anne Arundel County Health Department)

The Anne Arundel County Health Department publishes a fact sheet titled “Health Matters.” The information on these fact sheets can also be found on their website (www.aahealth.org). Some of the subjects covered include:

- The presence of arsenic, radium, and MTBE within well water, including mapping of the affected area,
- Water Quality and Swimming or Fishing in Anne Arundel County Rivers and Creeks, and
- Guidelines for Locating and Maintaining Your Septic System.

Digital copies of some of the Health Matters fact sheets are provided in **Appendix D**. Previously developed distributable materials have been provided with past reports.

The Anne Arundel County Department of Health maintains a 24-hour, automated hotline (410-222-7999) that the public can call and listen to the latest water quality test results at local beaches. This test results can also be found on the Department of Health’s website, <http://www.aahealth.org/index.php>. To keep residents informed on an ongoing basis, residents can also sign-up to receive Recreational Water Quality E-Alerts, which provide the subscriber with information on recreational water closures and advisories.

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

- The Bay Restoration Fund,
- Clean Indoor Air Act,
- Disaster Preparedness: Well Water, Food Safety, and Mold,
- Food Facility Inspection,
- Housing and Food Protection Program, (includes trash, garbage, sewage/wastewater discharge, safety hazard complaint investigation),
- Sanitary Engineering Program (private well and septic system information),
- Radium in Well Water Grant Program,
- Well and Septic System Assistance Program,

- Recreational water quality, and
- Licenses and permits.

Watershed Stewards Academy

During the 2010 reporting year, Anne Arundel County Department of Public Works, the County Board of Education's Arlington Echo Outdoor Education Center, the Keith Campbell Foundation, the Chesapeake Bay Trust and NOAA continued to provide leadership and funding to the Watershed Stewards Academy (WSA). The WSA was established in 2008 as an organized framework to educate community leaders to become "Master Watershed Stewards". The WSA trained its' second class of 24 watershed stewards and began its Year 3 training during 2010. In recruiting both of these classes the Academy targeted minority and underserved areas of the County and greatly increased representation to the northern and southern ends of the County.

These two classes also included six individuals from other local jurisdictions (Queen Anne's, Montgomery, Prince Georges and Howard Counties) whom the WSA is assisting in transferring the WSA concept to their respective counties. Year 2 class training consisted of 52 hours of class room and field instruction and a 7 month capstone project period. Capstone projects were completed in groups and included 4 elements:

- Neighborhood Assessment,
- Education and Outreach (minimum of 3 events/groups),
- Pollution Source Reduction Strategy (targeting one major pollution source such as pet waste or lawn fertilizer), and
- Rainscaping (minimum of 3 projects/groups which could included rain barrels, rain gardens, tree plantings, conservation landscapes, etc).

Year 2 Master Watershed Steward candidates conducted 37 outreach events, installed 209 rain barrels, 4 pet waste stations or signs, 8 rain gardens/conservation landscapes and 2 stream buffer plantings. All of the instruction for the Master Watershed Stewards Certification Course was given by professionals and certified Master Watershed Stewards and consisted of 42 volunteer instructors logging over 126 hours of volunteer time spent on certification course instruction.

The WSA continued to support and engage Year 1 Class Master Watershed Stewards through the following activities:

- Conducted 4 bi-monthly networking meetings, designed to allow Stewards to share their successes, and learn new techniques for engaging communities.
- Offered 6 continuing education classes (GIS, Environmental Site Design, Clean Water Act, Residential Site Assessment) to train Stewards on additional topics of current relevance).
- Coordinated the use of training and outreach materials.
- Coordinated plant orders to give Stewards wholesale rates for additional rainscaping projects in their communities.

- Connected interested communities with their closest Master Watershed Steward for consultation and presentations.

As a group, the Year 1 Master Watershed Stewards completed over 1,100 hours of volunteer restoration and education work within their communities, engaged over 450 volunteers, created over 6,300 square feet of bio-retention, and planted over 2,000 native plants, including 218 trees.

The WSA began the development of its new website aawsa.org. The site features both a public section, which offers a variety of information about Anne Arundel County watersheds and ways that individual, businesses and communities can restore their rivers, and a private section which serves as a networking tool for Stewards and Consortium members as well as a clearinghouse for WSA resources. On the private networking section of the website, each Steward is able to post his/her restoration activities.

This year the WSA has also coordinated a major revision of “From My Backyard to Our Bay”. Additionally, the WSA updated its comprehensive “Restoration Resource List”, the WSA Tool Box, the Residential BMP Handbook, and participated in the reprinting of the newly revised Rain Gardens Across Maryland and Plant Invaders of mid-Atlantic Natural Areas. The WSA also created a Residential Site Assessment protocol and developed and produced pet waste education signs and restoration project identification signs for distribution.

The WSA facilitated the networking of AA County restoration resources via involvement of watershed organizations, the WSA Consortium of Support Professionals, AA County restoration projects and private communities to avoid duplication and further common goals. Together with several members of the Consortium of Support Professionals, the WSA has planned a professional level training program for landscape designers, contractors and landscape maintenance companies, which will be offered in the spring of 2011 at Anne Arundel Community College.

To sustain the WSA, a ten-member Founding Board of Directors was engaged during the fall of 2010. Articles of Incorporation and Bylaws were developed and have been filed with the State of Maryland and the IRS. The WSA has received its employer identification number and is awaiting approval of its 1023 application for non-profit status. In the coming year, the Founding Board will identify and implement a strategy for funding the WSA that is not solely grant dependent, and will begin a marketing and outreach program to engage a wider audience of citizens in the WSA. A specific mission will be to reach geographic areas of the County that are not engaged in watershed restoration.

To evaluate program success the County worked with the WSA to develop a website (<http://www.aacounty.org/DPW/Watershed/Restoration/RestorationActivity.cfm>) to track restoration projects installed by Master Watershed Stewards or their communities via a GIS application. These efforts are displayed graphically on the County’s Watershed, Ecosystem & Restoration Services GIS Mapping Application ([---

2010 Annual NPDES Report
Anne Arundel County](http://gis-</p>
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world.aacounty.org/wers/). The WERS team at the County is able to connect a pollutant load reduction for most BMPs and graphically summarize the extent of education efforts in the County.

Appendix D contains a summary of some of the accomplishments of the WSA over the reporting period.

Maryland Tributary Teams

During 2010, Anne Arundel County continued to actively participate in the Lower Western Shore Tributary Team and the Patuxent River Commission. County staff associated with the NPDES MS4 Permit administration continued to serve as Chair of the Lower Western Shore Team, and as the County's designated Commissioner and alternate for the Patuxent River Commission. Staff continued to represent the County on the State Tributary Strategy Steering Committee and the newly formed State Watershed Implementation Plan Stakeholders Advisory Committee. Work this year focused on providing input into Chesapeake Bay TMDL Pilot Watershed Implementation Plan.

Stream Cleanups in 2010

During 2010, 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 waterways. Exhibits containing photographs from the cleanup activities are included digitally in **Appendix D**. The clean-up sites are listed below.

- Patapsco River Watershed - April, October, November, December 2010
Stoney Run
Organization: Friends of Patapsco Valley & Heritage Greenway
Activity: In April 2010, volunteers removed discarded furniture, mattresses, debris, trash, and over 500 tires from portions of the Stoney Run subwatershed off Furnace Avenue in Linthicum Heights. In October, this same organization revisited these areas and removed an additional 500 tires and assorted debris and junk. Also in October, the Friends of Patapsco Valley & Heritage Greenway teamed with the Maryland Correctional Pre-Release System to organize a small group of supervised inmates to continue the cleanup work in the Stoney Run subwatershed area. This coordinated effort removed over 1000 tires from the Stoney Run subwatershed during October, November, and December 2010.

The tonnage of material removed from the Stoney Run dump sites in the Patapsco River Watershed was not tabulated. Information and photos from these dump site clean-ups can be found at <http://patapscofriend.myphotoalbum.com>.

- Magothy River Watershed – March 2010

Magothy Branch

Dividing Creek

Organization: Girl Scout Troop #2292 (Severna Park, MD)

Activity: Girl Scouts removed trash and debris from a reach of Magothy Branch between Obrecht Road and Brookwood Road in Millersville, MD and from a tributary to Dividing Creek adjacent to the 7-Eleven on Ritchie Highway in Arnold, MD. The Girl Scouts worked a total of 12 hours on both sites. In total, the following items were removed from these two sites:

56 large bags of trash	17 pallets
54 plastic crates	1 automobile gas tank
1 television	1 propane tank
Sheet metal	Lawn chairs
14 tires	5 boxes of broken floor tiles

- Magothy River Watershed – June 2010

Cattail Creek

Organization: Magothy River Association

Activity: In June 2010, volunteers from the Magothy River Association and Anne Arundel County Master Watershed Stewards conducted a stream cleanup at Cattail Creek. Approximately 60 tires were removed from this site. Additionally, eight propane tanks were removed and delivered to the household hazardous waste collection site at the County landfill. While conducting this clean-up, the volunteer crew identified another tank, approximately four feet tall that may have contained acetylene. Because this tank was not accepted by the household hazardous waste collection facility, subsequent coordination between the County and MDE resulted in this item being removed by the Emergency Response Division of MDE.

- Severn River Watershed – April 2010

Maynadier Creek

Clements Creek

Jabez Branch

Saltworks Creek

Organization: Severn River Association

Activity: Fifty volunteers, comprising five teams, worked to remove trash, tires, metal, and other debris from dumpsites in these subwatersheds of the Severn River watershed. The dumpsites were identified through the County's watershed assessment program. Information from the stream assessments conducted as part of the Severn River Watershed Study, including dumpsite photographs and aerials with site locations denoted, were compiled and provided to the Severn River Association to assist in this cleanup effort. The 50 volunteers were assisted by a local automotive

company who provided staff and a Jartran trailer to haul away an abandoned car (relic Nash Rambler) and various car parts and other metal debris. In total, over eight tons of trash/debris was removed from these sites, including five truckloads of tires, four truckloads of trash, and three trailer loads of metal.

- South River Watershed – April 2010
Beards Creek
Organization: South River Federation
Activity: Approximately 15 volunteers from the South River Federation removed trash, metal, and tires from an old farm dump in the Beards Creek watershed. The dumpsite was identified through information provided by the property owners. In total, 2.42 tons of metal, 1.49 tons of trash, and approximately 20 tires were removed from this site.
- West/Rhode River Watershed – November 2010
Unnamed Tributary to Lerch Creek
Organization: West and Rhode River Keeper
Activity: Twenty-five volunteers, including Webelos from Pack 853 Den #4, participated in a trash clean up in the Lerch Creek subwatershed. The site was located behind a High's gas station at the intersection of Muddy Creek Road and Owensville Road in Galesville, MD. Runoff from this area drains to the unnamed tributary to Lerch Creek. In two hours, volunteers unearthed roughly 75 tires, car parts, appliances, and paint cans. The debris was sorted for recycling purposes, placed in dumpsters provided by the County, then transported to the County landfill in Owensville.

Reduction of Stormwater Pollutants Presentations

Public presentations on water quality issues made during the period of November 2009 to November 2010 include the following:

- 12/4/2009 – Chesapeake Conservation Landscaping Council
“Turning a New Leaf”
Watershed Stewards Academy, Engaging Communities in Environmental Action
- 12/10/2009 – Elephant Club Presentation
- 1/20/2010 – Chamber of Commerce
Watershed Stewards Academy, Engaging Communities in Watershed Restoration
- 1/27/2010 – Watershed Stewards Academy Session
- 5/11/2010 – SWAM (Stormwater Assn of Maryland) Meeting
Anne Arundel County, Watershed Implementation Plan – Development Capacity
- 6/13/2010 – Living Shoreline Seminar
Sponsored by United Gardens, Inc., London Towne Community Hall
- 6/23/2010 – Washington Area Council of Govts. Transferability Meeting
Watershed Steward Academy

- Engaging Communities, Transforming the Landscape, One Watershed at a Time
- 6/25/2010 – Coastal & Watershed Resources Advisory Committee
 - 7/9/2010 – Anne Arundel County, Watershed Implementation Plan – Development Capacity Bureau of Utilities Staff Meeting
 - 7/13/2010 – Grater Severna Park Council Board Meeting
 - 7/15/2010 – Gibson Island Garden Club Contributing to the Health of the Chesapeake Bay
 - 7/20/2010 – Soil Conservation Board Meeting
 - 7/22/2010 – Governors Bay Cabinet Meeting
 - 7/30/2010 – Anne Arundel County, Phase II Watershed Implementation Plan Development
 - 7/30/2010 – Chesapeake Bay Total Maximum Daily Load, Local Government Roles and Responsibilities
 - 8/18/2010 – Maryland Association of Counties, MACO Workshop The Chesapeake Bay TMDL: Coming to you in December, 2010! Anne Arundel County Phase II Watershed Implementation Plan Development
 - 10/20/2010 – Anne Arundel County Soil Conservation District, Cooperator's Dinner Step Pool Storm Conveyance Systems: An Innovative Tool for Agriculture?
 - 11/8/2010 – Patuxent River Commission Anne Arundel County Phase II Plan
 - 11/13/2010 – Chesapeake Watershed Forum Anne Arundel County Phase II Plan
 - 11/19/2010 – WIP Anne Arundel County Phase II Plan

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 discussions of stormwater pollution prevention plans and applicable permit requirements, proper housekeeping, and spill prevention and response measures (if applicable). Refresher trainings are provided when necessary.

Each of the County-owned facilities requiring coverage under an NPDES permit has updated the SWPPP recently and has schedules for regular trainings. These trainings are 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.

As an example, an outline of the training program for SWPPP implementation at the four Waste Management Services facilities is included digitally in **Appendix A**. The outline includes dates the trainings were held during the 2010 reporting year and proposed dates for the 2011 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 Magothy River Watershed Management study was completed in 2009. The plan characterizes the current conditions, provides inventory and ratings for problem areas within the nontidal streams and the watershed, identifies improvement opportunities, prioritizes restoration and preservation action, and proposes alternative implementation plans with cost/benefit analyses for each action. Additionally, the watershed study provides preliminary designs for six recommended restoration projects. The completed study is published at the following website address:

<http://www.aacounty.org/DPW/Watershed/MagothyRiverStudy.cfm>

During 2009, the County completed the field assessment work for the Patapsco Nontidal Watershed and began analyses of the data. While most analyses were completed in 2010, the study report is not expected to be published until the spring of 2011. **Exhibit 7** and **Exhibit 8** show an excerpt of the comprehensive study information, and include a summary of the current condition peak flows, runoff, and pollutant loads (without BMP attenuation/credit).

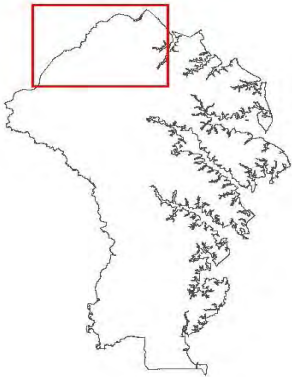
During 2009, the County also completed a targeted benthic bioassessment study for 50 sampling locations within the Patapsco Tidal and Bodkin Creek Watersheds. The study report is published at the following website address:

<http://www.aacounty.org/DPW/Watershed/PatapscoBodkinStudy.cfm>

During 2010, The County completed the field assessment work for the Patapsco Tidal and Bodkin Creek Watersheds. The County has begun analysis of the data. The Study report is expected to be published by the end of 2011. The stream problem area inventory data are published online on the WERS mapping application at the website referenced earlier.

Exhibit 7: Patapsco Non-Tidal Subwatershed Summary of Peak Flow and Runoff for Existing Conditions

SHEDCODE	SHEDNAME	ACRES
PN1	Patapsco Mainstem	1030
PN2	Holly Creek	856
PN3	Patapsco Mainstem	526
PN4	Unnamed Tributary	1175
PN5	Patapsco Mainstem	574
PN6	Stoney Run 1	431
PN7	Stoney Run 2	1908
PN8	Stoney Run 3	1440
PN9	Stoney Run 4	2401
PNA	Deep Run	710
PNB	Piney Run	2646
PNC	Deep Run	1571



Anne Arundel County
Department of Public Works
Watershed and Ecosystem Restoration Services
Watershed Assessment and Planning



Date: November 8, 2010
File: J:\Shared\ENR\Watershed Management Program\WMP\Share\Watershed Studies\Patapsco River Non-Tidal Study\Study Reports\Map\Map 3.1 Summary of Peak Flow and Runoff for Existing Conditions.mxd
Map Production: Watershed Assessment and Planning Program
Copyright: 2010

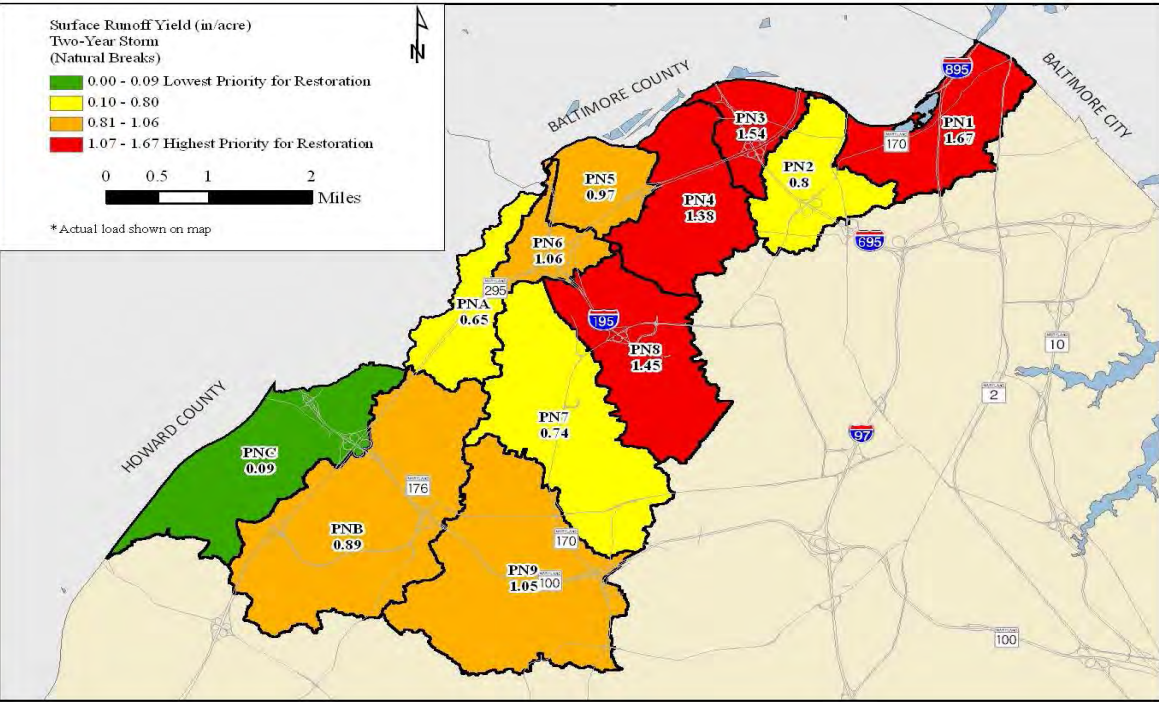
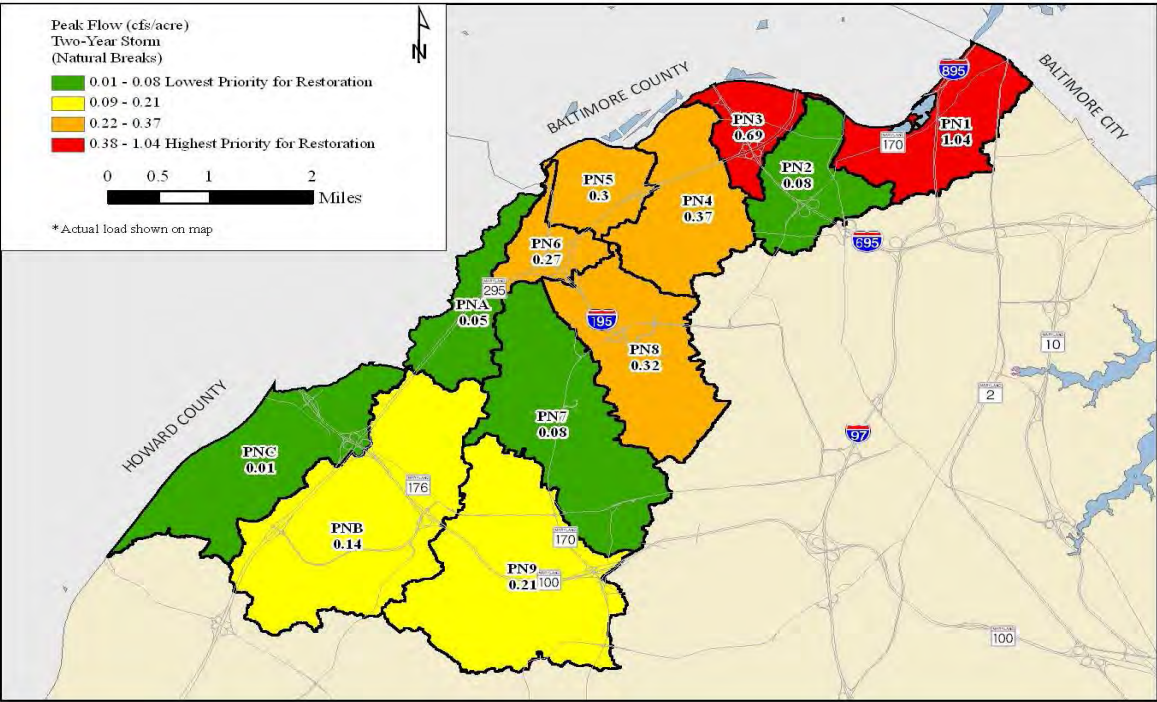
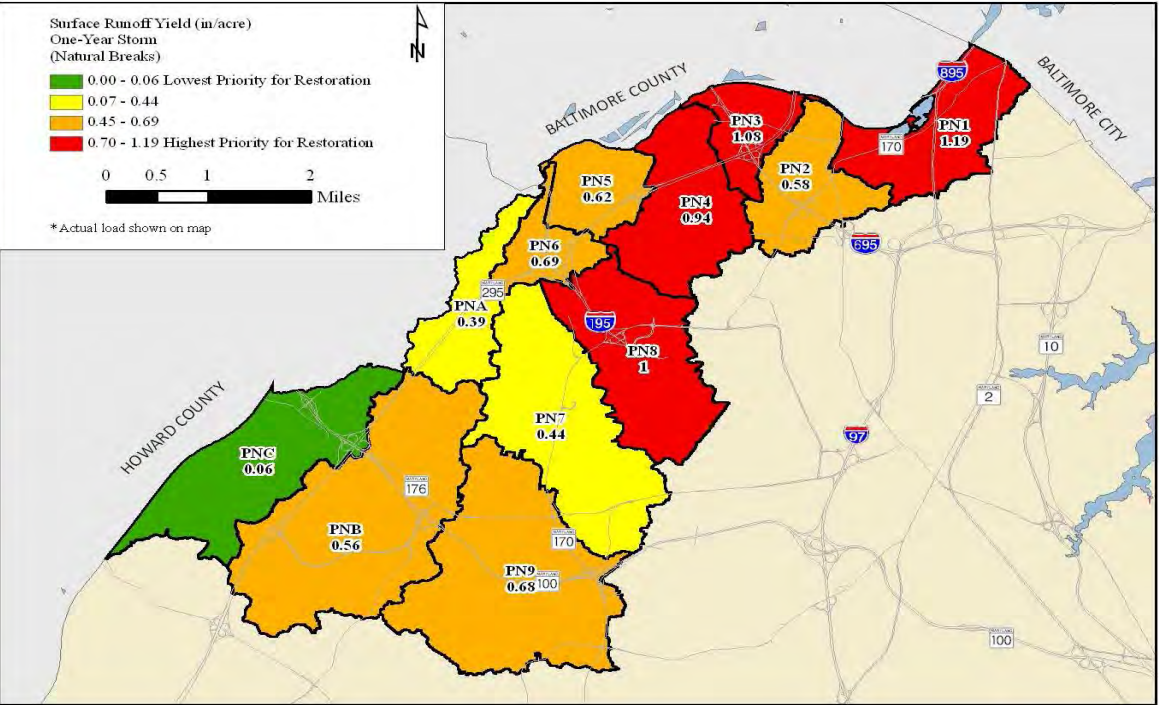
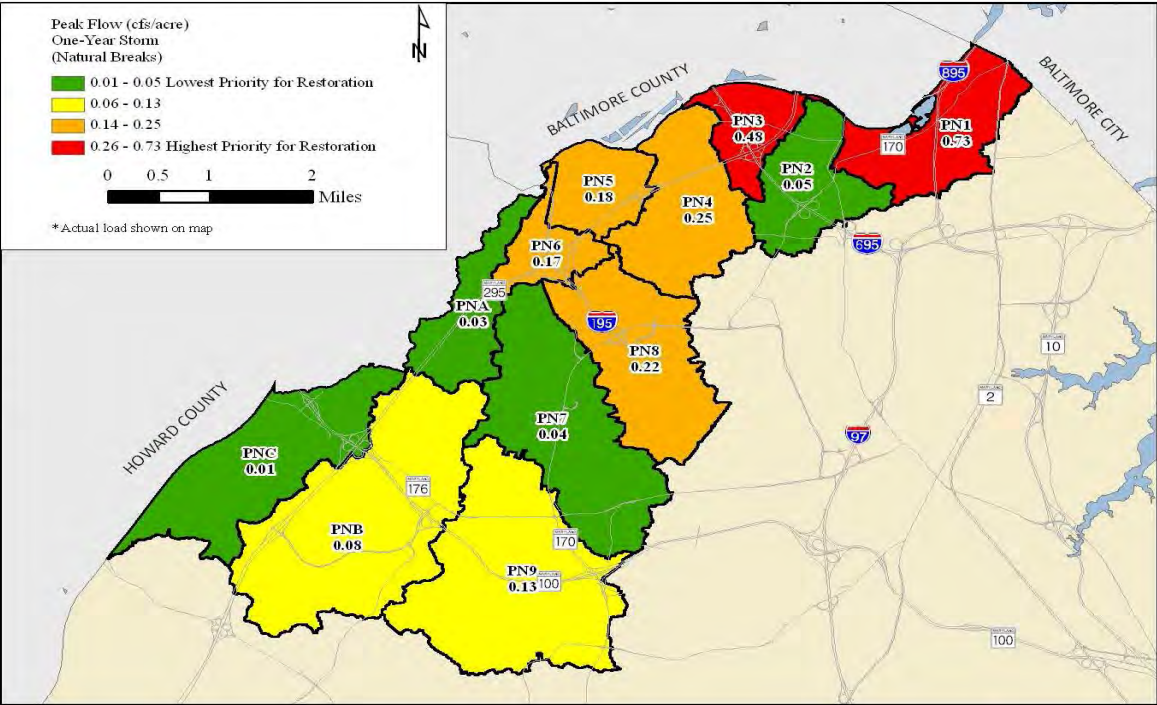


Exhibit 8: Patapsco Non-Tidal Subwatershed Summary Pollutant Loads Based on Existing Conditions

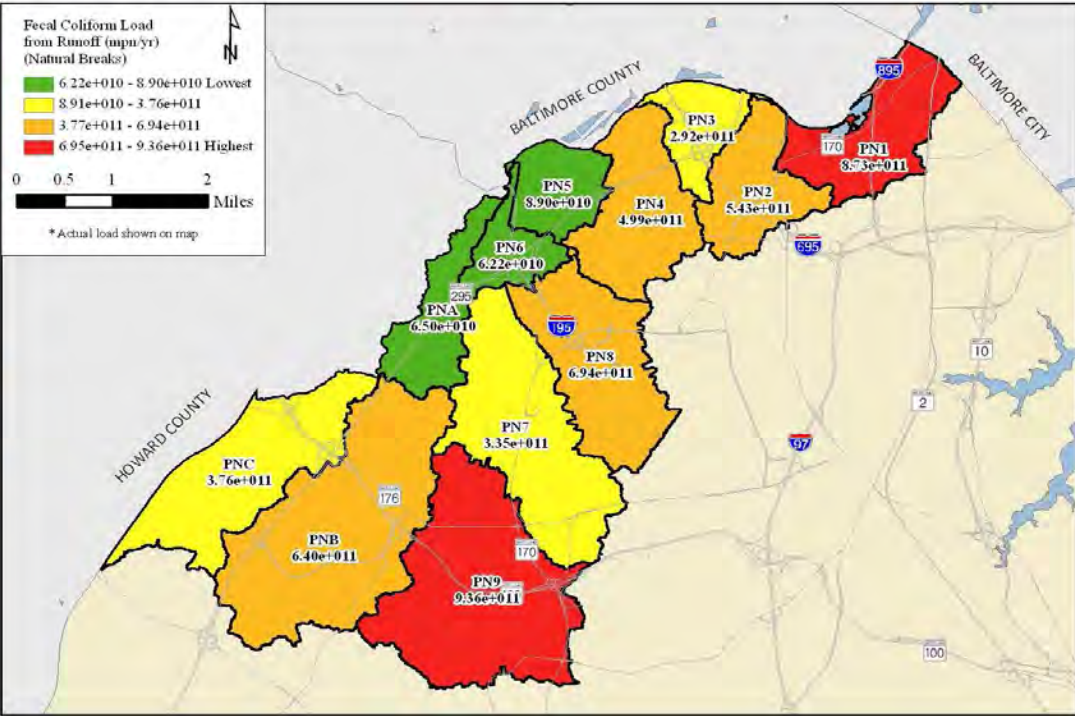
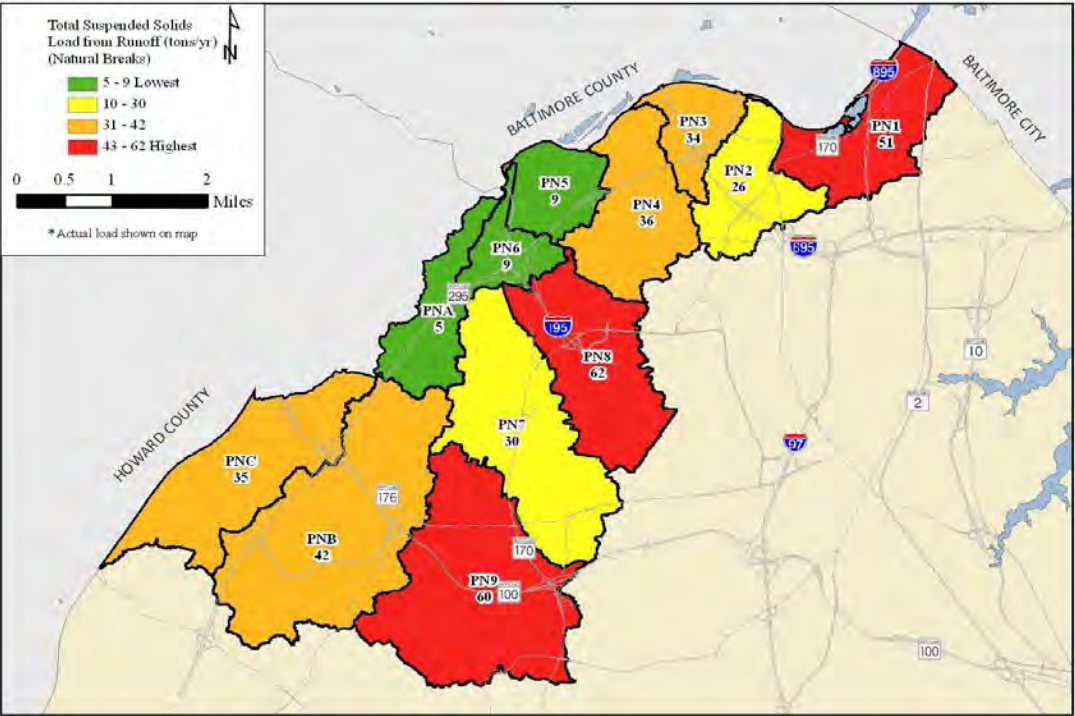
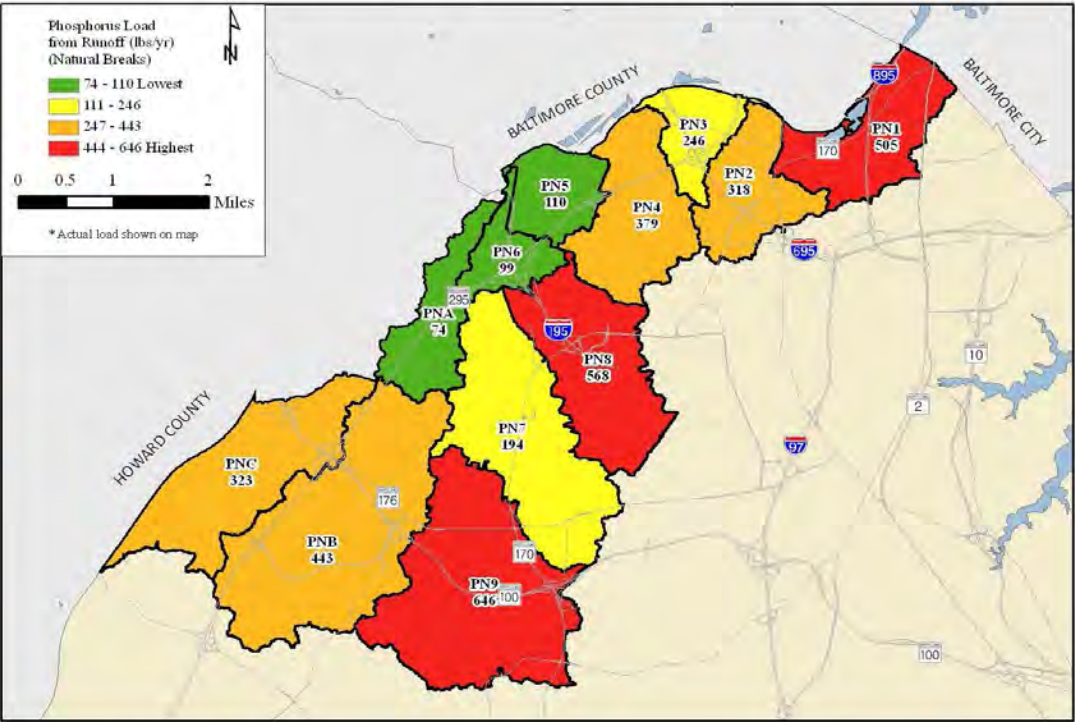
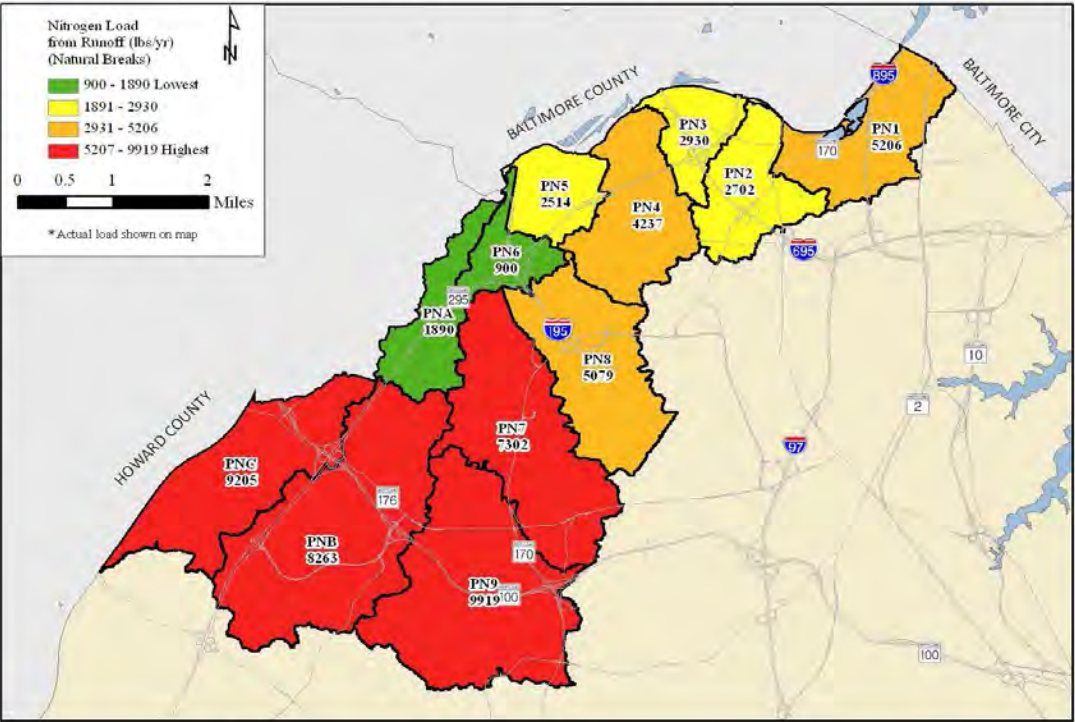
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PN9	Stoney Run 4	2401
PNA	Deep Run	710
PNB	Piney Run	2646
PNC	Deep Run	1571



Anne Arundel County
Department of Public Works
Watershed and Ecosystem Restoration Services
Watershed Assessment and Planning



Date: November 8, 2010
File: J:\Shared\NPDES\Watershed Management Programs\WMP\Share\Watershed Studies\Patapsco River Non-Tidal Study\Study Reports\Map\Map 3.2 Summary Pollutant Loads Based on Existing Conditions.mxd
Map Product: Watershed Assessment and Planning Program
Copyright: 2010



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.

The 2009 Annual Report documented initiation of the physical stability assessment of 25 completed in-stream and wetland rehabilitation projects. That assessment was completed in 2010 and is published at the following website address:

<http://www.aacounty.org/DPW/Watershed/StabilityAssessmentReport.pdf>

The assessed stream and wetland rehabilitation sites were located within urban or suburban areas, and project types included Step Pool Stormwater Conveyance Systems (termed Regenerative Stormwater Conveyance Systems in the monitoring report), stream restoration, fish passage structures, stormwater management pond retrofits, and wetland restoration. Physical monitoring included a visual survey to determine the location of degraded and unstable areas. A geomorphic assessment of the sites was conducted to determine the characteristics of the channel. Substrate material was investigated to assess whether the stream was aggrading or degrading, or if grade control materials had mobilized.

In general, the stormwater pond retrofits were found to be stable, with few problems. Of the in-stream sites that were investigated, four were found to be significantly degraded or failed, 11 were moderately stable, and ten were found to have minor problems. The monitoring assessments included recommendations for remediation of unstable or failed stream reaches. Failures and concerns included the presence of invasive species, scour adjacent or beneath grade control structures, riffle washout, erosion, deposition, and bank slumping. Remediation of two significantly degraded in-stream sites, and additional emergency repairs to another rehabilitated stream site, was initiated by the County in 2010. Physical stability and vegetative management issues that occur on a scale that could be addressed through existing program funding have been and continue to be addressed (e.g., invasive species removal, supplemental planting, cobble weir repairs). Stability issues requiring capital program funding allocation to facilitate repair and/or project redesign and construction are under consideration for inclusion in the capital budget program.

In addition to the Stream Monitoring CIP project, restoration efforts are also monitored through the County's collaboration with the University of Maryland Center for Environmental Science (UMCES). Drs. Margaret Palmer and Solange Filoso have continued several years of monitoring that include assessment of headwater and tidal interface stream restoration projects for uptake of nitrogen and sediment processing.

These studies continued through the 2010 reporting period and are summarized in Section III.H.

Chesapeake Bay Watershed TMDL – Watershed Implementation Plan Phase II

Anne Arundel County is working in collaboration with MDE and various stakeholders within the County to develop the Chesapeake Bay TMDL Phase II Watershed Implementation Plan (WIP). The County's Phase II WIP will establish the framework by which nutrient and sediment loads to Anne Arundel County's major watershed tributaries (Lower Western Shore, Patuxent, and Patapsco) will be reduced. The target load for these tributaries within the County's geographic boundaries will be allocated by MDE and is part of the larger Chesapeake Bay TMDL allocation.

During the reporting period, the County began the Phase II WIP process as one of two pilot WIP development projects in the State. In addition to identification of and collaboration with State, Federal, and private sector stakeholders; the County conducted an assessment of current baseline nutrient loads. Those loads were compared to the preliminary allocations received from the State, and the "gap" between the current loading conditions and the target allocation was determined. This "gap" represents the load reductions required of the stakeholders to meet the Chesapeake Bay TMDL.

Through this effort the County will ultimately develop a Phase II WIP that addresses the eight major elements required by the U.S.EPA, and that provides a refinement to the State's Phase I WIP. Additionally, the component of this effort that focuses on the urban lands (i.e., stormwater) waste load allocation will also serve as the basis from which specific watershed implementation plans, required by individual approved TMDLs, will be developed.

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. **Table 14** shows the current schedule established to complete these studies:

Table 14: 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 Nontidal	02130906	Complete	Complete	2011
Patapsco Tidal	02130903	Complete	Complete	2011
Bodkin	02130902	Complete	Complete	2011
Little Patuxent	02131105	2011	2012	2012
Rhode	02131004	2012	2013	2013
West	02131004	2012	2013	2013
Herring Bay	02131005	2013	2014	2014
Middle Patuxent	02131102	2014	2015	2015

- 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:

The Severn River Watershed Study was completed and submitted with the County's 2006 Annual Report. In 2007, the field assessment data for the South and Upper Patuxent River Watersheds were collected. The final study reports for the South River and Upper Patuxent Watersheds were completed and submitted in 2008. The final study report for the Magothy River Watershed was completed and can be found at the following web address:

<http://www.aacounty.org/DPW/Watershed/MagothyRiverStudy.cfm>.

All GIS data associated with the Patapsco Nontidal study are appended to the WERS mapping application and published online. It is anticipated that the remaining recommendations for the Patapsco Nontidal Watershed study and the Patapsco Tidal and Bodkin Watershed studies will be submitted with the 2011 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:

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 BMPs. **Table 9** in **Part III.C.5** lists all the water quality improvement and waterway restoration projects that are either completed or under active CIP contract during the 2004-2010 time period.

As reported in **Part III.C.5**, numerous water quality enhancement projects were implemented between 2004 and 2010. Many of these projects were funded and constructed directly by Anne Arundel County. Other projects were funded and constructed through grants or other means by private entities and stakeholder groups in collaboration with the County. The drainage and impervious area listed in **Table 9** has been delineated for only those projects that are believed to provide a water quality benefit and are completely constructed as of November 2010. It is noted that no treatment credit was claimed for overlapping drainage areas, or over management. It is also important to note that it is not possible for the County to exclude or 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). This total area restored can then be compared to the County jurisdictional uncontrolled impervious land to determine the County impervious percentage restored.

One hundred seventy seven projects were implemented between 2004 and 2010. The total area draining to these projects is approximately 4,942 acres (1,351 acres of impervious surface). Forty five of these projects were funded and constructed through

Anne Arundel County Capital Improvement Program (CIP) projects. Eighty nine 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 by watershed stakeholders such as the South River Federation, the Severn River Association, and the Alliance for Sustainable Communities. The total amount of treated area within the County is continually updated as the projects are completed.

In the last six years, 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 four of its major high priority watersheds, including the Patapsco Tidal at 13.2 percent treatment, the Patapsco Nontidal at 17.7 percent treatment, the Severn River at 28.2 percent treatment, and the South River at 100 percent treatment. On a County-wide, comprehensive basis, these restoration projects provide treatment that is equivalent to 9.0 percent of the County's total uncontrolled impervious surface. However, it is noted that 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. The County's independent correlations validate this relationship and identify 14 percent as the imperviousness level that correlates to minimal impact on the downstream biota. Watersheds with less than ten percent imperviousness are considered a low priority for urban restoration and are highlighted in yellow in **Table 15**. If these rural low priority watersheds are removed from the County-wide treatment calculations, the County has restored the equivalent of 11.9 percent of its total uncontrolled impervious surface.

Table 15: Summary of Impervious Area Restored 2004-2010

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	30,381	9,616	32%	3,359	4,456 (1,672)	4,585	587.1	Incomplete ⁽³⁾	146	13.2%	3,852	5,524
Patapsco Nontidal	15,286	4,173	27%	2,561	4,790 (1,189)	423	21.8	187	113	17.7%	101	1,290
Little Patuxent	27,681	5,674	20%	Incomplete ⁽²⁾	12,552 (1,667)	4,007	194.5	Incomplete ⁽³⁾	78	5.0%	3,735	5,402
Severn River	44,238	8,962	20%	4,800	8,758 (2,620)	1,542	231.6	420	301	28.2%	589	3,209
Magothy River	22,805	4,982	22%	2,300	1,175 (301)	2,381	97.8	263	173	5.0%	1,847	2,148
South River	36,156	5,247	15%	3,600	3,309 (809)	838	308.4	295	318	100.0%	0	809
Bodkin Creek	6,028	833	14%	149	37 (19)	665	0.0	Incomplete ⁽³⁾	65	0.0%	600	619
Upper Patuxent	22,417	1,767	8%	600	5,285 (159)	1,008	26.5	60	95	3.1%	827	986
Herring Bay	14,252	1,073	8%	Incomplete ⁽²⁾	554 (72)	1,001	0.2	Incomplete ⁽³⁾	72	0.0%	929	1,001
West River	7,933	567	7%	Incomplete ⁽²⁾	1,004 (37)	530	3.7	Incomplete ⁽³⁾	40	0.8%	486	523
Rhode River	8,727	615	7%	Incomplete ⁽²⁾	2,099 (65)	550	2.2	Incomplete ⁽³⁾	32	0.4%	516	581
Middle Patuxent	29,679	1,735	6%	Incomplete ⁽²⁾	855 (212)	1,523	0.0	Incomplete ⁽³⁾	44	0.0%	1,479	1,691
Total	265,583	45,244	17%	17,369 (39%)	44,874 (8,822)	19,053	1,474	1,225	1,477	9.0%*	14,877 (40.8%)	23,699 (52.8%)
	⁽¹⁾ Restoration project impervious area treated based on County projects constructed between 2004 and 2010.											
	⁽²⁾ These data will be completed in accordance with the County watershed assessment schedule. A 30% impervious treatment is assumed.											
	⁽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 area restored is 11.9 percent.											
	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.											

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.***

The progress toward meeting the goals established in **Part III.G.1** and **III.G.2** are listed below in **Table 16**. The projects listed are those that have completed the construction phase and that provide a water quality benefit. The projects constructed during the 2010 reporting year have been grouped at the top of the **Table 16**, and highlighted in green.

The total budget and actual expenditure for the completed CIP restoration projects listed in **Part III.C.5** is tabulated in **Table 16**. 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 16: 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	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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
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/	—	—
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	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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
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 Stabilization	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

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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 Quality	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
Randell Rd Rain Garden	107	Bioretention	Construction Complete	N/A	N/A	Eagle Scout	—	—
Riva Annapolis Storm Drain & Outfall Rehabilitation (Riva 400)	23	Outfall Stabilization	Construction Complete	Q514400	Q514401	AACO	\$1,087,000	\$1,061,566

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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 Retrofit	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	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
116 Avondale Circle Rain Barrel	153	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
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	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/	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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/	—	—
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/	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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/	—	—
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/	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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/	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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/	—	—
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/	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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/	—	—
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/	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
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/	—	—

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted Cost	AA County Expenditure To date
2849 Green Willow Dr. Rain Barrel	251	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
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/	—	—

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.

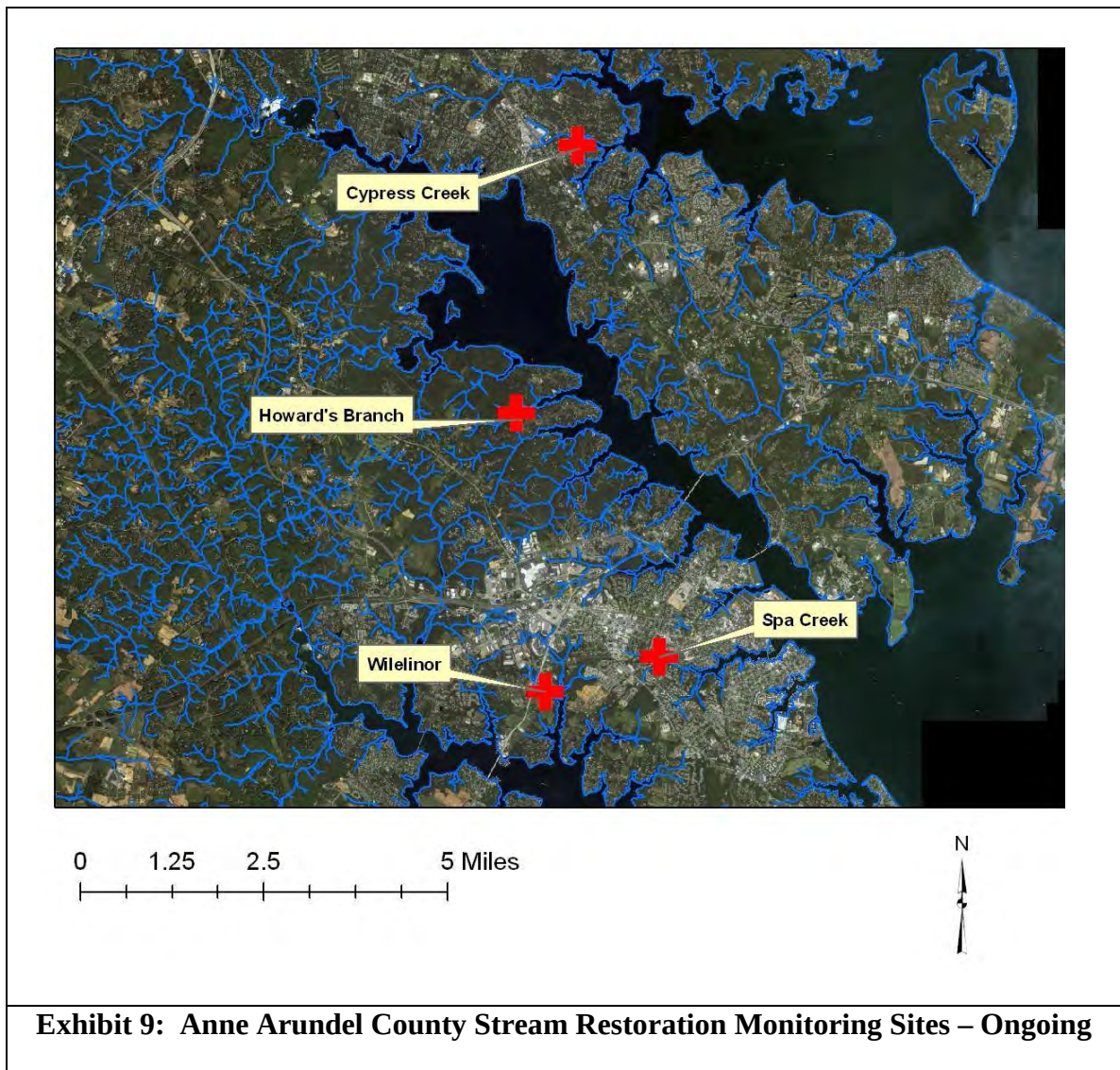
Nontidal streams have become widely recognized for their crucial role in controlling nutrient loads to downstream waters. Stream restoration has become a common tool used by water resources managers to address sediment and nutrient loadings to receiving waters. In recent years, Anne Arundel County has implemented a number of stream restoration projects of varying design. However, only limited long-term quantitative data have been developed to determine the effectiveness of these restoration projects with respect to reducing nonpoint source pollutant loading (i.e., nitrogen and sediment) and improving water quality.

To gather the data necessary to quantify water quality improvements in restored streams within a well-defined physiographic region such as Maryland's Western Coastal Plain, the University of Maryland Center for Environmental Science (UMCES) and Anne Arundel County are collaborating on a research effort to determine nitrogen loads and quantify load reductions in degraded and restored streams.

During the initiation of this research effort, UMCES surveyed eight streams (**Table 17**) with varying nitrogen inputs and different water pathways within the County. Headwater and lowland boundary streams were chosen for study; headwater streams were chosen because they make up the majority of the channel lengths in the Coastal Plain drainage networks and influence all waterways below them, and lowland boundary streams were chosen because they are the final conduit through which water passes prior to entering tidal waters and may represent areas where more extensive opportunities for nitrogen processing could occur. As described below, monitoring at the headwater sites was discontinued during the reporting period. The locations of the active sites are depicted in **Exhibit 9**. GIS coordinates for each monitoring site and the drainage area to that site are found in the Monitoring Locations discussion in **Part III.C.4** of this report.

Table 17: Anne Arundel County Stream Restoration Monitoring Sites

Stream Name/Location	Landscape Location	Condition	Watershed	Years monitored
Weems Creek – Annapolis Mall	Headwater	Restored	Severn River	2007-2009
Weems Creek – Bristol Drive	Headwater	Restored	Severn River	2007-2009
Weems Creek – Moreland Parkway	Headwater	Restored	Severn River	2007-2009
Picture Spring Branch	Headwater	Degraded Control	Severn River	2007-2009
Howard’s Branch	Lowland	Restored	Severn River	Ongoing
Wilelinor	Lowland	Restored	South River	Ongoing
Spa Creek	Lowland	Restored	Severn River	Ongoing
Cypress Creek	Lowland	Degraded Control	Magothy River	Ongoing



During 2007, monitoring focused primarily on baseflow conditions because these conditions provided the best opportunity for in-stream nitrogen processing and removal. An input/output mass balance approach was used to assess nitrogen retention capacity in restored versus degraded streams.

At the end of the 2007 sampling year, the researchers noted a potential for nitrogen processing to occur in the lowland restored stream reaches. However, they also determined that a more inclusive sampling scheme over a wider range of hydrologic conditions was necessary to obtain a more complete estimate of nitrogen retention and removal capacity.

For the 2008 sampling year, UMCES and Anne Arundel County expanded the monitoring regime to include a wide range of hydrologic conditions and to incorporate sediment loading work into the study. Additional flow monitoring devices were deployed to assist in data collection for discharge calculations. The focus of monitoring in 2008 was to compare and contrast quantitative data to determine differences in nitrogen and sediment loading and processing between restored versus unrestored headwater and lowland boundary streams under baseflow and storm event conditions.

During 2009, work was done that built upon the stormflow and baseflow sampling performed in past years. Collection of additional TSS data allowed for a comparison between headwaters and tidal sites and between restored and degraded sites within each location. Additionally, geomorphic conditions such as channel form, bed and bank materials, and width to depth ratio are believed to not have meaningful impact on nutrient retention. Differences between reaches were evident when related to landscape position (headwaters versus lowland). The presence of nitrogen species varied depending upon flow conditions and landscape position, but nitrate-nitrogen was the dominant nitrogen species at most sites. TSS exports varied between restoration types and landscape position and no strong pattern of reduction or generation was evident.

The main focus of research efforts during the 2010 reporting year was on restored lowland streams within the County. Besides providing additional data on their effectiveness at reducing the export of N, P, and TSS to downstream waters, there was a need to better understand how these streams functioned during stormflows associated with different rain depths and intensities, and through different seasons.

The on-going study focuses on four watersheds located in the Severn, South, and Magothy Rivers in Anne Arundel County (**Table 17**). Three of the streams monitored were restored and one is a control, degraded stream. Data from the control stream will also be use as part of a pre-restoration monitoring of a degraded stream targeted for restoration.

The results from the 2010 research effort showed that among the lowland reaches monitored, fluxes of N, PO₄ and TSS during average flow conditions decreased in two reaches and increased in two others. Similar to previous results, fluxes decreased at Spa

Creek and Howard's Branch. In contrast, fluxes increased at Wilelinor as well as in the control stream, Cypress Creek.

Since the beginning of 2010, five storms were successfully sampled at Howard's Branch, three at Wilelinor, and four at Cypress Creek. In each site, stormflow was collected as a series of discrete samples during different storm events with rainfall amounts ranging from 0.24 to 1.71 inches. No stormflow samples have been collected at Spa Creek due to lack of equipment. The reduction in N, PO₄, and TSS fluxes for Spa Creek was determined by baseflow sampling.

Among the streams that were monitored, TN load reduction was observed for all storms sampled at Howard's Branch but in only one of the storms sampled at Wilelinor. At Wilelinor, TN retention amounted to about 0.06 kg N in the one event where load reduction was observed. Overall, nitrogen export from Howard's Branch averaged approximately 0.7 kg N per event, while at Wilelinor it averaged about 2 kg N.

Regarding TSS, load reductions were measured in both streams during stormflow conditions, as observed in previously sampled storms. Because of the similar trend, discharge and concentration data from the entire study period were used to calculate annual TSS loads or fluxes and subsequent retention rates. At Wilelinor, the estimated annual load reduction is in the range of two to four metric tons, while at Howard's Branch the reduction is in the range of six to eight tons. These values are still being evaluated, but they indicate that most of the N and TSS in the streams are exported during periods of high flows. Therefore, the results of this study show that restoration aimed at promoting N and TSS load reduction in urban streams should focus on a wide range of hydrological conditions, but especially at moderating loads during stormflow conditions.

While it remains to be tested, upland stream reaches may have some limited ability to moderate stormflows and promote the uptake and retention of N and TSS in stormwater. Therefore, combining stream restoration with approaches that target the source of the problem (e.g., lowering N inputs to the watershed and subsequent delivery to streams) will in the long run be much more likely to provide significant pollutant reduction and other restoration benefits to the Bay than focusing only on restoring streams, one reach at a time.

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 implement 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 larger South River watershed. Monitoring for this permit year extended from November 2009 through October 2010. The full Church Creek monitoring report can be found in **Appendix E** and the data required to support this section are also provided in **Appendix E** in the prescribed format. In 2010, the County received from MDE a copy of the updated format requirements for database submissions. This reporting period was used as a transition

year to begin modifying both the data collected and the format in which it is presented to comply with the new requirements. Therefore, the data supplied in **Appendix E** have been provided in the updated 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 recently redeveloped as the Annapolis Towne Centre, incorporating 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 reporting period, ten 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 except for oil and grease. Oil and grease is an optional parameter, not a required parameter; therefore, the County does not monitor oil and grease.

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 increase 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 some of the parameters are found to have increased over 2009 levels. Further monitoring efforts in 2011 will identify whether any further reductions in pollutant discharges are detectable.

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

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 chemical monitoring station. Benthic macroinvertebrate samples were collected from these stations in March 2010, 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 2010 sampling period indicate that biological conditions within the Church Creek study area continue to be impaired by urban stressors within the surrounding watershed. Since 2006, all stations have consistently been rated as either 'Poor' or 'Very Poor.' Individuals intolerant to urban stressors were absent or nearly absent (i.e., comprising one percent of the sample) at three of the four stations, and sensitive taxa such as *Ephemeroptera* were low for all stations. Degraded physical habitat conditions as well as urban stressors including altered hydrologic regime and poor water quality appear to be primary factors limiting the biological conditions. The results of the biological monitoring program are included in **Appendix E**.

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:

Although the Church Creek study area has a very high percentage of imperviousness (approximately 64 percent), the majority of the reaches assessed were classified as E and C channels, which are generally considered stable stream types. One reach was classified as a G stream type, due to its entrenchment, low width-depth ratio, and slope. Most of the Parole Plaza Tributary maintains some connectivity to its floodplain, despite significant stormwater inputs feeding into the stream that typically result in accelerated channel erosion and degradation. It is likely that current stormwater management and wetland storage on the Church Creek mainstem contributes to minimizing the adverse effects of the high imperviousness in the watershed. Additionally, grade controls such as the culvert at Solomons Island Road likely prevents degradation from occurring in the channel upstream. Nonetheless, there are indications of channel instability, 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: 2010*, located in **Appendix E**.

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.

Following MBSS protocols, stream physical habitat was assessed using the Maryland Physical Habitat Index (MPHI) for Coastal Plain streams. The overall physical habitat condition was rated as 'Degraded' throughout the study reach. No substantial improvement in physical habitat conditions has been observed since the study began in 2006. Urban stressors such as hydrologic alteration (i.e., increased runoff, increased frequency of peak flows, reduced infiltration) within the watershed have resulted in a reduction of stable instream habitat as well as increased channel erosion and sedimentation.

The redevelopment of the Parole Towne Center is complete. The development put several new BMPs into practice, including three oil/grit separators, an underground detention facility, and two bioretention areas. These BMPs were inspected along with the other BMPs in the watershed for the models mentioned below. The stormwater management report for the site was submitted with the 2007 Annual Report.

Detailed hydrologic and hydraulic models were submitted as part of the 2009 Annual Report. These models were based on existing land use conditions and included pond routing computations for each of the stormwater management facilities within the

subwatershed. This was done so that the modeled hydrologic conditions would be representative of the actual flow regime through the study reach. The *Chemical, Biological, and Physical Characterization of the Church Creek and Parole Plaza NPDES Monitoring Stations: 2010*, located in **Appendix E**, contains the results of a windshield survey conducted during the 2010 reporting-year to determine if any significant changes within the watershed have occurred since the models were developed. Additionally, the condition and assessed functionality of each BMP within the watershed is discussed in the monitoring report.

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 E**. 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: 2010*, which provides greater detail on the work performed in this watershed.

During the 2011 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 2010, 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. Some minor aggradation was noted at one of the cross sections. However, in 2009, the cross sectional area of the South Tributary exhibited some minor enlargement. This continued in 2010, with the cross section measurements identifying a 15 percent increase in cross sectional area over the course of a year. Since the physical monitoring program began in 2003, the cross sectional area has increased 27 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 impacts of stormwater runoff. As noted previously, the South Tributary does not receive significant amounts of drainage from the West County Library site.

In April 2010, 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 a decline was observed at all three sites with two of the sites rating ‘Poor’ and one rating ‘Very Poor’. The results of the 2010 monitoring illustrate improvements in two of the sampling sites. The 2010 results for the three sites include two “Poor” ratings and one “Fair” rating.

The full biological and geomorphological conditions report is included in **Appendix F**.

In 2007, the County began conducting a yearly watershed survey to determine if any significant changes occur within the watershed. This survey included review of the drainage areas to both the North and South Tributaries. This has continued through 2010. During the 2010 survey, ongoing development was identified at several locations within the subwatershed. These developments will likely include the construction of additional stormwater management facilities, and will need to be further assessed in 2011 when construction is complete.

An updated watershed model, consisting of TR-20 and HEC-RAS analyses, was prepared and submitted as part of the 2009 Annual Report. This model was prepared to determine the effects of development on the stability of the downstream channels. The hydrologic model was based on existing land use conditions (as of 2009) and included pond routing computations for each of the stormwater management facilities within the subwatershed. This was done so that the modeled hydrologic conditions would be representative of the actual flow regime through the study reach. Each of the stormwater management facilities was inspected to determine if it was functioning according to its design, and stage-storage-discharge curves were developed to determine the extent of flood attenuation.

Each stormwater management facility within the subwatershed was again inspected during the 2010 reporting-year, and assessed for its functionality and condition. Some maintenance was found to be required at several of the facilities, but overall the facilities appear to be functioning as designed. The results of these assessments are included in the *Biological and Geomorphic Conditions in the Picture Spring Branch Subwatershed – Severn River Watershed: 2010*, included in **Appendix F**.

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:

On-going funding for NPDES MS4 Permit compliance is addressed primarily through the County Capital Improvement Program (CIP). Funding for this County fiscal year (FY2011) 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 FY2011 and the projected budgets for FY2012 through FY2016 total \$32,457,000. **Table 19** and **Table 20** denote the allocation of these funds by project.

The Anne Arundel County operating budget for FY2011 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 FY11 operating budget allocations to each agency, combined with knowledge of MS4 compliance responsibility indicates \$13,680,000 was budgeted to support permit compliance in FY11.

The complete Fiscal Year 2011 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. The County anticipates further budget reductions will be realized in the near term and that such reductions will continue to affect resource allocation. Despite these County-wide budget reductions, funding allocated directly for MS4 compliance has increased in FY11 by \$4,096,000 over FY10. This is primarily attributable to increases associated with certain County funded capital projects, the Chesapeake and Coastal Bays 2010 Trust Fund grant for stream and wetland rehabilitation projects, as well as increased contributions of staff time from the Office of Law. Thus, the County has continued 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 2011, the County allocated \$4,478,000 under the Capital Improvement budget for nonpoint source and stormwater projects. Example projects included in the funding for FY2011 are:

- Implementation of the NPDES MS4 Permit Program \$ 430,000
- Stormwater Pond Maintenance \$ 100,000
- Culvert and Closed Storm Drain Rehabilitation \$ 600,000

The full CIP budget allocations are shown in **Table 19** and **Table 20**.

As noted above, the FY2011 Operating Budget allocated \$13,680,000 in personnel services to support the NPDES MS4 Permit conditions. **Table 18**, provided in the format directed by the previous permit, denotes the distribution of funding from the County's FY2011 Capital and Operating Budgets. Funding is projected for years two through five (County Fiscal Years 2012 through 2015). While there is no guarantee that the out-year budget requests will be approved at these levels, the County will continue efforts to ensure the MS4 Program Permit obligations are met.

Table 18: Allocation of Funds to NPDES Permit Conditions

Permit Condition	Year 1 (FY11)	Year 2 (FY12)	Year 3 (FY13)	Year 4 (FY14)	Year 5 (FY15)
B. Legal Authority	\$503,000	\$503,000	\$503,000	\$503,000	\$503,000
C. Source Identification					
1. GIS	\$325,000	\$200,000	\$380,000	\$200,000	\$380,000
2. Database maintenance					
D. Discharge Characterization (see Part H.)	\$0	\$0	\$0	\$0	\$0

E. Management Programs 1. Stormwater Management 2. Pollution Prevention 3. Erosion and Sediment 4. Public Education 5. Road Maintenance Street Sweeping Inlet Cleaning	\$11,309,000	\$11,334,000	\$11,334,000	\$11,334,000	\$11,334,000
F. Watershed Assessment and Planning 1. Assessment/evaluation 2. Restoration Projects	\$1,170,000	\$1,198,000	\$1,168,000	\$1,168,000	\$1,198,000
G. Watershed Restoration 1. 10% restoration 2. Water quality improvement projects	\$4,498,000*	\$5,576,000	\$4,373,000	\$4,298,000	\$4,218,000
H. Assessment of Controls 1. Chemical Monitoring 2. Biological Monitoring 3. Physical Stream Assessment 4. Design Manual Monitoring	\$1,019,000	\$1,073,000	\$1,100,000	\$1,087,000	\$1,087,000
Total	\$18,824,000	\$19,884,000	\$18,858,000	\$18,590,000	\$18,720,000

*Includes \$480,000 Chesapeake and Atlantic Coastal Bays 2010 Trust Fund grant for watershed restoration in the Magothy River watershed.

Table 19: 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>FY2011</i>	<i>FY2012</i>	<i>FY2013</i>	<i>FY2014</i>	<i>FY2015</i>	<i>FY2016</i>
<i>Project Class: Stormwater Runoff Controls</i>									
D448300	Stormwtr Pond Maint	\$3,375,606	\$1,775,606	\$100,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
D451100	Culvert and Closed SD Rehab	\$4,844,150	\$1,244,150	\$600,000	\$600,000	\$600,000	\$600,000	\$600,000	\$600,000
D478500	Emergency Storm Drain	\$5,077,569	\$1,477,569	\$600,000	\$600,000	\$600,000	\$600,000	\$600,000	\$600,000
D480900	New Cut Rd Cui Rep	\$2,896,000	\$610,000	\$0	\$0	\$2,286,000	\$0	\$0	\$0
D515500	Belby On The Bay SD	\$1,478,000	\$378,000	\$1,100,000	\$0	\$0	\$0	\$0	\$0
D515600	Hamans Road Culvert Rehab	\$1,964,000	\$1,238,000	\$726,000	\$0	\$0	\$0	\$0	\$0
D537900	Storm Drainage/BWM Infrastr	\$7,179,426	\$2,179,426	\$0	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000
D381800	Cape St. Claire S/D	\$4,714,300	\$4,714,300	\$0	\$0	\$0	\$0	\$0	\$0
D510200	Saunders Point Storm Drains	\$1,192,000	\$1,192,000	\$0	\$0	\$0	\$0	\$0	\$0
D521200	Woodlawn Hts SD	\$48,000	\$48,000	\$0	\$0	\$0	\$0	\$0	\$0
D521400	Ponder Cove SD	\$81,000	\$81,000	\$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>		\$34,617,051	\$16,705,051	\$3,126,000	\$2,500,000	\$4,786,000	\$2,500,000	\$2,500,000	\$2,500,000

Table 20: 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>FY2011</i>	<i>FY2012</i>	<i>FY2013</i>	<i>FY2014</i>	<i>FY2015</i>	<i>FY2016</i>
<i>Project Class: Water Quality Improvements</i>									
D406900	NPDES Permit Program	\$14,874,262	\$8,944,262	\$430,000	\$1,100,000	\$1,100,000	\$1,100,000	\$1,100,000	\$1,100,000
D499900	NPDES SD Retrofits	\$4,476,918	\$1,976,918	\$0	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000
Q416000	Chg Agst Cisd Projects	\$76,721	\$141,721	(\$65,000)	\$0	\$0	\$0	\$0	\$0
Q437300	Stream & Ecological Restor	\$2,305,370	\$805,370	\$0	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
Q483700	Aurora Hills SD Rehab	\$833,000	\$893,000	(\$60,000)	\$0	\$0	\$0	\$0	\$0
Q514300	Crofton Trib Restoration	\$1,487,000	\$652,000	\$0	\$835,000	\$0	\$0	\$0	\$0
Q516600	Evergreen Road Outfall Rehab	\$1,442,435	\$1,692,435	(\$250,000)	\$0	\$0	\$0	\$0	\$0
Q530900	Downs SWM Retrofit	\$0	\$13,000	(\$13,000)	\$0	\$0	\$0	\$0	\$0
Q536400	Picture Spring Branch Str Rest	\$368,000	\$0	\$0	\$368,000	\$0	\$0	\$0	\$0
Q540300	Rutland Rd Fish Passage	\$1,211,000	\$295,000	\$916,000	\$0	\$0	\$0	\$0	\$0
Q540400	Stream Monitoring	\$3,571,000	\$687,000	\$364,000	\$575,000	\$575,000	\$500,000	\$420,000	\$420,000
Q515900	Four Season Stream Rehab	\$1,238,000	\$1,238,000	\$0	\$0	\$0	\$0	\$0	\$0
Q514000	Willelnor SWMPB Rehab	\$707,000	\$707,000	\$0	\$0	\$0	\$0	\$0	\$0
Q514400	Rival/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	Beacrae 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
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
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
Q543000	Shipley's Choice Dam Rehab	\$3,713,000	\$3,713,000	\$0	\$0	\$0	\$0	\$0	\$0
<i>Total: Water Quality Improvements</i>		\$45,164,706	\$30,619,706	\$1,352,000	\$3,678,000	\$2,475,000	\$2,400,000	\$2,320,000	\$2,320,000

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