

2011 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 2012



Submitted by:
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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 2010 through November 2011 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, including data collection and analysis. Digital data and specific reports for the major programs conducted during the reporting term can be found within the Appendices.

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

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 2011 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 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:

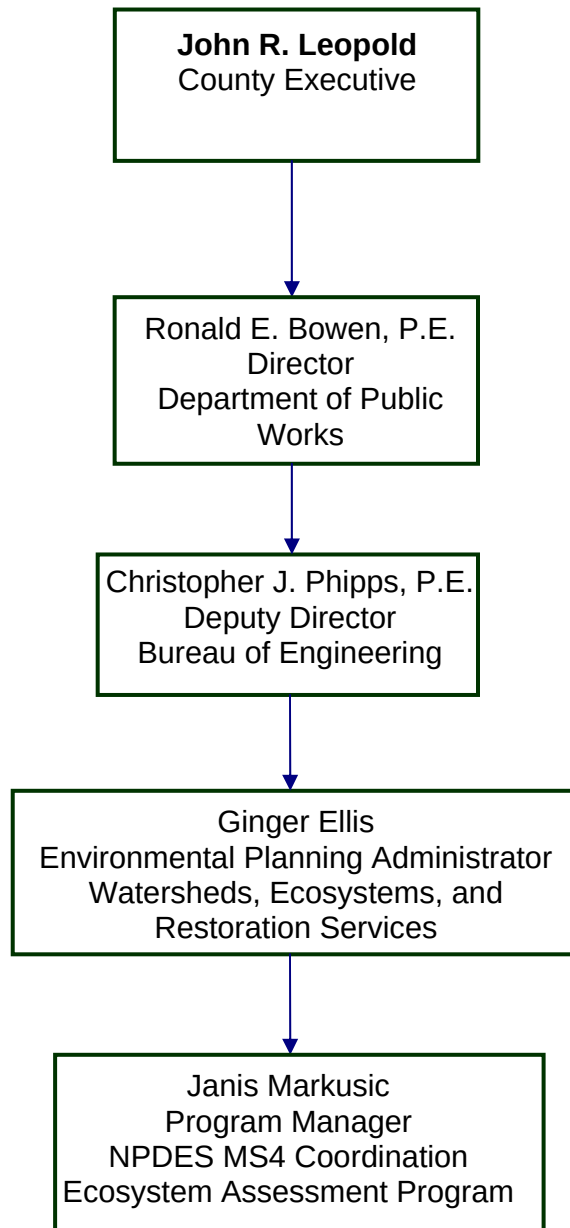
Coordination of Anne Arundel County's NPDES MS4 permit was performed by the Department of Public Works, Watersheds, Ecosystems, and Restoration Services for the 2011 reporting year. The coordinators for the program for this reporting year are:

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Exhibit 1 on the following page of this report contains the current organizational chart.

Exhibit 1: Organization Chart for NPDES Permit Administration (2011)



B. Legal Authority

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

Status:

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

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

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

Revised Article 16 contains the stormwater management program and erosion and sediment control regulations. Article 17 contains the subdivision and development requirements. Article 18 contains the zoning regulations. After a public hearing was held on August 2, 2010, revised Articles 16, 17, and 18 became effective in November 2010 through Bill 74-11. A copy of the final approved Bill is included in **Appendix A**.

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

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

C. Source Identification

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

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

Status:

In 2008, Anne Arundel County completed its County-wide inventory of storm drain inlets, manholes, outfalls, culverts, and pipes for all County watersheds. In 2011, the County continued to capture updates for incorporation into the County storm drain maps and the County Geographic Information System (GIS). Furthermore, the County continues to populate the drainage area information for the County outfalls following the watershed study schedule as presented in **Part III.F** of this permit. To maintain accuracy of the closed storm drain system mapping, the County has been conducting a re-inspection of the County-wide system on a regular basis. The storm drain inlet and outfall database was prepared in the format required by MDE and is included in **Appendix A**.

The County is able to identify which storm drain structures are outfalls by querying the GIS for structures with no hydraulic connection to any other structure downstream. The County then focuses on these discharge points for delineation of contributing drainage area. As of November 2011, there are a total of 5,215 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 Nontidal, Patapsco Tidal, Bodkin Creek, and Little Patuxent) has been completed. This drainage area coverage constitutes 4,190 structures out of the total 5,215 closed stormdrain outfalls.

As of November 2011, there are 1,353 major outfalls in the County. According to 40 CFR 122.26, a major municipal separate storm drain outfall is defined as an outfall pipe with an internal diameter of 36 inches or greater or an outfall pipe with an internal diameter of 12 inches or greater that receives storm water from industrially zoned lands. Major outfalls were used by the County to prepare the County's Total Maximum Daily Load (TMDL) Watershed Implementation Plan (WIP) outfall retrofit scenarios. Drainage area delineations have been prepared for this layer and are submitted in a GIS layer with this report. This layer is topologically correct and contains no drainage area boundary overlaps.

In addition, as of November 2011, there are 33,383 storm drain inlets. Out of these, 12,656 inlets are associated with closed section roadways. 1,749 inlets not associated with closed section roadways were inspected and require cleaning. This inlet layer was used by the County to prepare the WIP catchment basin cleanout scenario plan. Drainage area delineations for catchment basins used in the WIP cleanout scenario plan are submitted as a separate GIS layer with this report.

In 2010, the County completed the delineation of drainage areas to all outfalls within the Little Patuxent Watersheds. Mapping showing these outfalls and their drainage areas was submitted with the previous Annual Report. A GIS layer containing outfalls and the drainage areas for the Severn, South, Magothy, Upper Patuxent River, Patapsco 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 the Urban BMP Database, which contains information related to all stormwater management BMPs subject to inspection by the County.

The Urban BMP Database provided in **Appendix A** reflects the on-going effort to improve the quality of Anne Arundel County's BMP data. The total number of BMP records has increased from 11,289 in 2010 to 11,862 in 2011. To comply with the latest released version of Attachment A of the upcoming Permit, the County has been correlating the structure types listed in the Manual with the new and updated structure types within the database. One of the newer treatments, Step Pool Storm Conveyance (SPSC) systems, now has a unique code under "Alternative MS4 BMPs." It is unknown how these systems will be categorized in the future, so they are called out separately for now with undetermined pollutant removal efficiency. Other treatment types, such as plantings and redevelopment, are no longer structure types defined in Attachment A of the Permit. These were left unchanged for this report and will be categorized once the new Permit is issued.

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 not including CIP projects or disconnection credits. This is based on typical impervious cover by land use and not 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	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
DP	Detention Structure (Dry Pond)	5	10	9	10	10	10	0	10	10	Detention Dry	DP
UGVAULT	Underground Storage	5	10	-2	29	29	29	50	10	29	Detention Dry	UGS
BS	Bay Saver	5	10	-2	29	29	29	50	10	29	Detention Dry	BS
OGS	Oil Grit Separator	5	10	-2	29	29	29	50	10	29	Detention Dry	OGS
WQINLET	Water Quality Inlet	5	10	-2	29	29	29	50	10	29	Detention Dry	OGS
STMCEPTOR	Stormceptor	5	10	-2	29	29	29	50	10	29	Detention Dry	SC
SC	Stormceptor	5	10	-2	29	29	29	50	10	29	Detention Dry	SC
Pretreatment	Pretreatment	5	10	-2	29	29	29	50	10	29	Detention Dry	SC
UGS	Underground Storage	5	10	-2	29	29	29	50	10	29	Detention Dry	UGS
ED	Extended Detention	20	20	-2	29	29	29	50	60	29	Extended Detention Dry	ED
EDSD	Extended Detention Structure Dry	20	20	-2	29	29	29	50	60	29	Extended Detention Dry	EDSD
MB	Microbasin - Extended Detention Structure Dry	20	20	-2	29	29	29	50	60	29	Extended Detention Dry	EDSD
O-1	Dry Swale	40	60	0	35	35	35	0	80	35	Filtration	SW
O-2	Wet Swale	40	60	0	35	35	35	0	80	35	Filtration	SW

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

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
ASCD	Attenuation Swale/Check Dam	40	60	0	35	35	35	0	80	35	Filtration	CD
F-1	Surface sand filter	40	60	0	35	35	35	0	80	35	Filtration	SF
F-2	Underground sand filter	40	60	0	35	35	35	0	80	35	Filtration	SF
F-3	Perimeter sand filter	40	60	0	35	35	35	0	80	35	Filtration	SF
F-4	Organic filter	40	60	0	35	35	35	0	80	35	Filtration	BIO
F-5	Pocket Sand Filter	40	60	0	35	35	35	0	80	35	Filtration	SF
F-6	Bioretention Facility	40	60	0	35	35	35	0	80	35	Filtration	BIO
SF	Sand Filter	40	60	0	35	35	35	0	80	35	Filtration	SF
ATTENSWA	Attenuation Swale	40	60	0	35	35	35	0	80	35	Filtration	AS
AS	Attenuation Swale	40	60	0	35	35	35	0	80	35	Filtration	AS
SW	Grass Swale	40	60	0	35	35	35	0	80	35	Filtration	SW
POSAND	Pocket Sand Filter	40	60	0	60	60	60	80	80	60	Filtration	SF
C2/ rain gardens	Rain Gardens	40	60	0	60	60	60	80	80	60	Filtration	BIO
VB	Vegetated Buffer	40	60	0	60	60	60	80	80	60	Filtration	VB
BIO	Bioretention Facility	40	60	0	85	85	85	90	80	85	Filtration	BIO

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

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

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

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

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

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

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

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

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
Other	Other	0	0	0	0	0	0	0	0	0	Other/Not BMPs	Otr
EDSW	Extended Detention Structure Wet	20	45	63	44	69	69	75	60	60.7	Wet Ponds	EDSW
ESDW	Extended Detention Structure Wet	20	45	63	44	69	69	75	60	60.7	Wet Ponds	EDSW
MP	Micro Pool	20	45	36	58	65	65	75	60	62.7	Wet Ponds	MP
P-3	Extended Detention Structure Wet	20	45	63	44	69	69	75	60	60.7	Wet Ponds	EDSW
EXPOND	Wet Pond	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
P-2	Wet Pond	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
SW	Wet Structure	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
P-1	Micro Pool	20	45	36	58	65	65	75	60	62.7	Wet Ponds	MP
WP	Retention Structure (Wet Pond)	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
P-4	Multiple pond system	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
P-5	Pocket pond	20	45	36	58	65	65	75	60	62.7	Wet Ponds	WP
SM	Shallow Marsh	20	45	73	85	85	85	75	60	85	Wetlands	SM
W-1	Shallow Wetland	20	45	73	85	85	85	75	60	85	Wetlands	SM
RSC	Regenerative Wetland	50	60	73	85	85	85	75	90	85	Wetlands	SM

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

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
	Seepage											
W-2	ED shallow wetland	20	45	73	85	85	85	75	60	85	Wetlands	SM
W-3	pond/wetland system	20	45	73	85	85	85	75	60	85	Wetlands	SM
W-4	pocket wetland	20	45	73	85	85	85	75	60	85	Wetlands	SM
Stream Conventional	In-stream Riffles	LF	LF	LF	LF	LF	LF	LF	LF	LF	Stream Restoration	Stream Restoration
A1	Green Roofs	50	60	73	85	85	85	75	90	85	ESD	ESDGR
A2	Permeable Pavement	50	60	73	85	85	85	75	90	85	ESD	ESDPERMP
A3	Reinforced Turf	50	60	73	85	85	85	75	90	85	ESD	ESDRTRF
N1	Disconnection of Roof-top Runoff	50	60	73	85	85	85	75	90	85	ESD	ESDRTD
N2	Disconnection of Non Roof-top Runoff	50	60	73	85	85	85	75	90	85	ESD	ESDNRTD
N3	Sheetflow to Conservation Areas	50	60	73	85	85	85	75	90	85	ESD	ESDSFNAC
M1	Rainwater Harvesting	50	60	73	85	85	85	75	90	85	ESD	ESDRH
M2	Submerged Gravel Wetlands	50	60	73	85	85	85	75	90	85	ESD	ESDSGW
M3	Landscape Infiltration	50	60	73	85	85	85	75	90	85	ESD	ESDIL
M4	Infiltration Berms	50	60	73	85	85	85	75	90	85	ESD	ESDIB

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

AA Co BMP Code	County Name	Pollutant Removal Efficiencies (%)									BMP Treatment Group	MDE BMP Structure Code
		TN	TP	NOx	Cu	Zn	Pb	Fecal Coliform	TSS	Metals Average		
M5	Dry Wells	50	60	73	85	85	85	75	90	85	ESD	ESDDW
M6	Micro-Bioretenion	50	60	73	85	85	85	75	90	85	ESD	ESDMB
M7	Rain Gardens	50	60	73	85	85	85	75	90	85	ESD	ESDRG
M8	Swales	50	60	73	85	85	85	75	90	85	ESD	ESDSW
M9	Enhanced Filters	50	60	73	85	85	85	75	90	85	ESD	ESDEF
Street Sweeping	Regenerative Vacuum Street Sweeping	5	6						25		Alternative Credits	VSS
Inlet Cleaning	Storm drain Vacuuming	5	6						25		Alternative Credits	CBC
Planting pervious	Forestation on pervious urban	66	77						57		Alternative Credits	FPU
Impervious to Pervious	Impervious Area Elimination and conversion to pervious	13	72						84		Alternative Credits	IMPP
Impervious to Forest	Impervious Area Elimination and conversion to forest	71	94						93		Alternative Credits	IMPF

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 is not needed to assess the BMP pollutant removal benefit, rather the individual BMP treatment acres in the database were aggregated to the subwatershed level and the results were used to reduce the total pollutant loading for the subwatershed. 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 2011 Urban BMP Database features the following updates as compared to the 2010 submittal:

- An additional 573 BMP records were added for a new total of 11,862.
- Additional MD grid coordinates were researched and corrected or populated.
- Structure types were populated for additional facilities.
- Drainage areas to individual facilities continued to be delineated.

Table 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	2.12	0.10	27.00
BR	Bioretention	1.61	0.10	341.66
SW	Dry Swale	2.14	0.10	49.78
CD	Attenuation Swale/Check Dam	0.42	0.10	4.20
DW	Attenuation Trench	0.22	0.10	21.00
IT	Infiltration Trench	0.78	0.10	61.00
ITCE	IT with Complete Exfiltration	0.99	0.10	229.99
ITPE	IT with Partial Exfiltration	1.66	0.10	93.00
ITWQE	IT with Water Quality Exfiltration	1.29	0.10	22.18
IB	Infiltration Basin	8.36	0.10	80.19
DP	Dry Pond	16.13	0.10	690.00
ED	Extended Detention	16.16	1.10	50.36
EDSD	Extended Detention, Dry	8.92	0.10	98.00

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

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

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

Status:

During the 2011 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 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 while the 2007/2008 coverage was derived from higher resolution ortho-photography during leaf-off conditions. Details documenting the difference between the 2004 and 2007/2008 datasets were 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 later mapping. The County is currently working on another update to the impervious surface

layer based on more recent ortho-photography. It is anticipated that the updated impervious layer will be included in the 2012 Annual Report.

The impervious surface layer is crucial to the County's Watershed Management Tool (WMT). The WMT consists of many watershed analysis models for characterizing the existing conditions of the watershed. The WMT also provides predictive modeling for future conditions, restoration approaches, and preservation scenarios. These models are fully integrated with GIS and currently use the 2007 impervious layer for many different watershed and planning analyses, including hydrologic analysis, Rosgen Level 1 stream classification, pollutant loading estimates, and stream sediment loading estimates.

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. Using the County's parcel layer along with the Consolidated Property File (CPF), a GIS layer of parcels not considered the responsibility of Anne Arundel County was developed. Data analyses indicate that approximately 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 acres within the total County impervious area 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, 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 have now been applied to rooftops within the all of the County watersheds. All rooftop areas that met the criteria were identified and considered treated. 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 2** illustrates select areas in the Magothy River Watershed that qualify for rooftop disconnection credit. The disconnected rooftop areas and the pervious flow paths are shown in yellow.

Exhibit 2: Disconnected Rooftops and Their Pervious Flow Path



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

Based on the information and assumptions presented above, the controlled versus the uncontrolled impervious cover 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. Please note that the “Disconnected Impervious Acres” column does not take into account areas that are already treated by BMPs, thus there may be some credit duplication. A comprehensive accounting system will be provided with the 2012 Annual Report, so the disconnected impervious acres may be changed with the next report.

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	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)	1,122	313
Upper Patuxent	22,417	1,767	600	173	5,285 (159)	994	835
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	272	4,456 (1,672)	5,985	4,313
Bodkin	6,028	833	149	129	37 (19)	555	536
Little Patuxent	27,681	5,674	Complete by 2012	359	12,552 (1,667)	Complete by 2012	Complete by 2012
Rhode	8,727	615	Complete by 2013	68	2,099 (65)	Complete by 2013	Complete by 2013
West	7,933	567	Complete by 2014	74	1,004 (37)	Complete by 2013	Complete by 2014
Herring Bay	14,252	1,073	Complete by 2015	72	554 (72)	Complete by 2015	Complete by 2015
Middle Patuxent	29,679	1,735	Complete by 2016	173	855 (212)	Complete by 2016	Complete by 2016

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, Parole Plaza, Church Creek, and Picture Spring Branch, where the required chemical, physical, and biological monitoring of watershed restoration efforts and stormwater management application is conducted. A summary of the 2011 permit year monitoring efforts at these sites is found in **Part III.H.**, and the complete monitoring reports for the reporting year are included in **Appendix B** (*Chemical, Biological, and Physical Characterization of the Church Creek and Parole Plaza NPDES Monitoring Stations: 2011*) and **Appendix C** (*Biological and Geomorphological Conditions in the Picture Spring Branch Subwatershed: 2011*).

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 called a Round. Round One began in 2004 and ended in 2008. Round Two began in 2009.

Round Two sampling continued during this reporting period. A total of 55 samples (5 QC sites, 50 assessment sites) distributed within the five PSUs, were collected in 2011. The PSUs and the 8 digit hydrologic units in which they are located are summarized in **Table 6** with all PSUs sampled in 2011 shaded blue. All Round 2 site locations are shown in **Exhibit 3**.

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

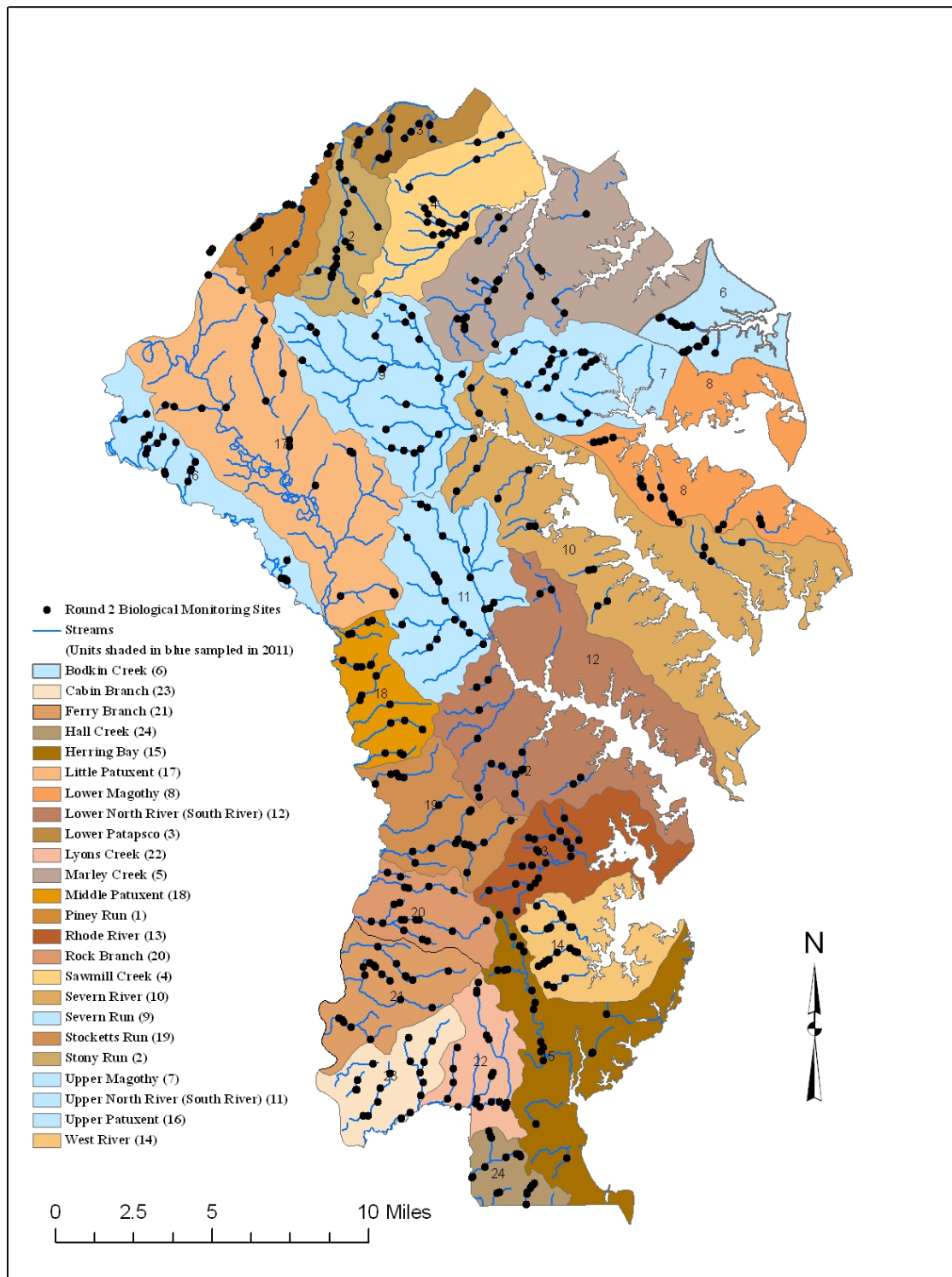


Table 6: Listing of Areas Assessed During Round 1 (2004-2008) and the Schedule for Round 2 (2009-2013) by 8-Digit HUC.

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

With Round Two underway, the County can continue comparing conditions between PSUs over time. Using statistical methods described in Roth et al. (2005), the mean BIBI (benthic index of biotic integrity) scores for Round 1 and Round 2 were evaluated for the five sampling units assessed during the reporting period: Severn Run, Upper North River, Upper Magothy River, Bodkin Creek, and Upper Patuxent. As shown in **Table 7**, trends are mixed with three PSUs showing some downward movement in average BIBI and two showing upward movement. However, none of the changes observed between rounds was considered statistically significant, even though the North River PSU and the Severn Run PSU both moved from one qualitative class to another.

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

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

Primary Sampling Unit (Round 1 Sampling Year)	Mean Round 1 BIBI±1SE (Narrative Condition)	Mean Round 2 BIBI±1SE (Narrative Condition)	Condition Trend¹
Severn Run (2004)	2.80 ±0.23 (Poor)	3.14±0.33 (Fair)	Upward
Upper North River (2005)	3.34±0.15 (Fair)	2.74±0.28 (Poor)	Downward
Upper Magothy River (2006)	2.86±0.21 (Poor)	2.91±0.19 (Poor)	Upward
Bodkin Creek (2006)	2.43±0.19 (Poor)	2.40±0.29 (Poor)	Downward
Upper Patuxent (2007)	2.37±0.12 (Poor)	2.34±0.16 (Poor)	Downward

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

c. Town Center Water Quality Monitoring Program

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

Calcium	NH3
Copper	TP
Lead	TSS
Zinc	PO4
Magnesium	COD
Iron	Turbidity
BOD5	TOC
NO3/NO2	Hardness
TKN	Alkalinity

During the reporting period:

- A total of 7 storms were sampled at Weems Creek.
- A total of 9 baseflow samples were collected at each of the four stations, for a total of 36 samples.

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

d. Restoration Monitoring Sites

Anne Arundel County and the University of Maryland Center for Environmental Sciences (UMCES) and Chesapeake Biological Laboratories (CBL) are collaborating on a long-term monitoring program to quantify water quality improvements associated with specific stream restoration approaches. The object of this program is to determine nitrogen loads and quantify load reductions in degraded versus restored 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.

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

5. Watershed Restoration: restoration project descriptions and locations.

Status:

Watershed restoration/retrofit activities in the design or construction phase or completed during the 2004 to 2011 fiscal years are presented below in **Table 8**. The projects highlighted in yellow are constructed and provide a water quality benefit. Projects with drainage areas that lie entirely within another project's drainage area are referred to as "nested." The treated area for the nested projects was not included in the treated impervious total, since credit for this area is given to the downstream project. GIS layers depicting the location of these projects and the associated drainage areas are included in **Appendix A**.

Table 8: Anne Arundel County Restoration Projects (2004-2011)

Project Name	ID	Project Type	Project Description	Status	Schedule	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed (Section G)	Drainage Area (Acres)	Imperv. Area (Acres) (Based on 2007 Coverage)	Nested Imperv. Area (Acres) (Based on 2007 Coverage)	Impacted Watershed	BMP Group	Impacted Stream Length (LF)
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.	Q516401	AACO	CIP	Future	445.38	68.58	68.58	Magothy River	Wetland	
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	Q530701	AACO	CIP	Yes	21.83	9.59	9.59	Severn River	Filtration	
Brockbridge Elem. Stream Restoration	4	Stream Stabilization	Design and construct a stable stream pattern near Brockbridge Elementary School.	Construction Complete	Complete	Q516301	AACO	CIP	Yes	66.00	22.46	22.46	Upper Patuxent	Stream Rest.	950
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 in Fall 2012.	Q517401/02	TEP Grant	CIP	Future	539.24	312.61	311.99	Severn River	Wetland	
Crofton Tributary Restoration	7	Stream Restoration	Restoration of stream reach from Crofton Parkway upstream to Shaftsbury Ave.	Complete	Initial construction complete.	Q514301	AACO	CIP	Yes	306.60	131.81	121.02	Little Patuxent	Filtration	

Table 8: Anne Arundel County Restoration Projects (2004-2011)

Project Name	ID	Project Type	Project Description	Status	Schedule	Contract Number	Funding Source	Affiliation	Water Quality Credit Claimed (Section G)	Drainage Area (Acres)	Imperv. Area (Acres) (Based on 2007 Coverage)	Nested Imperv. Area (Acres) (Based on 2007 Coverage)	Impacted Watershed	BMP Group	Impacted Stream Length (LF)
Crofton Tributary Restoration Phase II	7a	Stream Restoration	Restoration design for stream reach between Northbound lane of Route 3 to the vicinity of Scribner Place at Shaftsbury Avenue. This reach is downstream of the Crofton Tributary Phase I Restoration.	Design	Pursuing funding, permits, and right of way.		AACO	CIP	Future					Filtration	
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.	Q509401/02	AACO, MDE Grant, TEP Grant	CIP	Future	454.31	201.12	168.13	Magothy River	Stream Rest.	4000
Four Seasons Stream Rehabilitation	9	Stream Restoration	Design and construct a stable stream system from Four Seasons Community SWM pond to Towsters Branch.	Design	Construction documents complete 7/24/2008. Construction anticipated for completion in 12/2012.	D515901	AACO	CIP	Future	167.98	57.26	57.26	Little Patuxent	Stream Rest.	2016
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	Q503901	AACO	CIP	Yes	105.79	25.50	25.50	Severn River	Stream Rest.	2200
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	Design Complete; Construction anticipated in Fall 2012.	Q516601/02	AACO	CIP	Future	10.07	3.50	3.50	Severn River	Filtration	
Gingerville SWMP Upgrade	12	SWM Retrofit / Outfall Stabilization	Rehabilitation of Gingerville Pond and stabilization of the outfall.	Construction Complete	Complete	Q497701	AACO	CIP	Yes	108.76	57.97	55.88	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	Q516801	AACO	CIP	Yes	43.64	9.79	9.79	Magothy River	Wetland	
Harundel SWM Facility	14	SWM Retrofit	Construct an instream wetland seepage system.	Construction Complete	Complete	Q463201	AACO	CIP	Yes	201.49	96.13	96.13	Patapsco Tidal	Wetland	
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	Q437328 & D499916	AACO	CIP	Yes	12.45	0.86	0.86	Severn River	Wetland	
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	Q463301	AACO	CIP	Yes	552.01	236.51	229.29	Patapsco Tidal	Wetland	
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	Q489801	AACO	CIP	Yes	382.35	154.64	154.59	Patapsco Tidal	Other/ Not BMP	
Old County Road SD	18	SWM Retrofit	Storm drain to intercept stormwater runoff and convey it to a stable outfall.	Construction Complete	Complete	D521301	AACO	CIP	No	#N/A	#N/A	#N/A	Magothy River	Other/ Not BMP	
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	Q437338	AACO	CIP	Yes	24.35	8.63	6.63	Magothy River	Wetland	
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	Q497601	AACO	CIP	Yes	33.06	22.05	22.05	Patapsco Nontidal	Other/ Not BMP	

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Picture Spring Branch Stream Restoration	22	Stream Restoration	Project scope to be evaluated.	Project Initiation 2012	Initiate design Spring 2012.	Q536401	AACO	CIP	Future	832.03	303.71	190.90	Severn River		
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.	Q514401	AACO	CIP	Yes	26.80	12.25	12.25	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 nearing completion. Construction in Fall 2012.	Design documents nearing completion. Anticipate construction in Fall 2012.	Q526501	AACO	CIP	Future	130.51	30.98	30.98	Magothy River	Filtration	
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.	Q530801	Applying for Grant		Future	59.26	20.79	20.79	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.	Q540301	AACO	CIP	No	0.42	0.13	0.13	South River	Other/ Not BMP	
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.	Q543001	AACO	CIP	Future	136.49	29.39	29.39	Severn River	Wetland	
Sloop, Eli, & Long Coves Retrofits, Site 2	29	Stream Restoration	Stream restoration at West Drive.	Construction Complete	Complete	Q514102	AACO	CIP	Yes	23.30	6.39	6.39	Patapsco Tidal	Filtration	

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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	Q437337	AACO	CIP	Yes	2.32	0.95	0.95	Magothy River	Wetland	
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.	Construction	Design Complete. Construction to be completed in 3/2012.	Q536101	AACO	CIP	Future	7.28	2.00	2.00	Magothy River	Wetland	
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	Q437316	AACO	CIP	Yes	13.90	9.66	9.66	South River	Filtration	
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	D499917	AACO	CIP	No	#N/A	#N/A	#N/A	Patapsco Tidal	Other/ Not BMP	
Brewer Creek Restoration	36	Wetland Creation	Integrate environmental best management practices along Howard's Branch.	Construction Complete	Complete	Q437319	AACO	CIP	Yes	32.74	3.50	3.50	Severn River	Wetland	

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Sloop, Eli, & Long Coves Retrofits, Site 1	37	Stream Restoration	Stream channel restoration to two tributaries of Sloop Cove. Approximately 750 feet of restoration for the northern tributary to include raising the stream bed to connect the channel with the floodplain and establishing a stable channel. And approximately 300 feet of restoration for the southern tributary to reconstruct the bankfull channel and relocate the channel into the center of the existing floodplain.	Design	Schematic Design Underway. Construction schedule not set.	Q514103	AACO	CIP	Future	122.40	13.20	13.20	Patapsco Tidal	Stream Rest.	1050
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 9/2012.	Q437363	AACO	CIP	Future	41.42	14.94	14.94	Severn River	Filtration	
Wilelinor SWM Rehabilitation	40	Outfall Stabilization	Design and construct a seepage wetland and stable tidal interface in the Wilelinor Estates community.	Construction Complete	Complete	Q514001	AACO	CIP	Yes	187.87	69.25	15.65	South River	Wetland	
Pine Haven Stream Erosion Repair	41	Stream Stabilization	Repairs to the rapidly eroding stream channel in the Pine Haven Community.	Construction Complete	Complete	D499911	AACO	CIP	Yes	91.99	41.41	41.41	Patapsco Tidal	Other/ Not BMP	
Blue Bird Lane Erosion	42	Stream Stabilization	Correct stream erosion problems near Blue Bird Ln.	Construction Complete	Complete	D499912	AACO	CIP	Yes	6.08	1.44	1.44	Severn River	Filtration	

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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	D499901	AACO	CIP	Yes	43.32	19.31	19.31	Patapsco Tidal	Wetland	
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 12/2012.	Q517602	AACO	CIP	Future	49.64	6.26	6.26	Severn River	Stream Rest.	950
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	Q437358	AACO	CIP	Future	7.16	2.95	2.95	Severn River	Filtration	
Capetown SWM Pond Retrofit	46	SWM Retrofit	Design and construct remedial stream stabilization and other infrastructure retrofits.	Construction Complete	Complete	D499905	AACO	CIP	Yes	35.95	13.07	13.07	Severn River	Filtration	
Woods Road Culvert Stream Restoration	47	Instream Culvert Retrofit	Replace culvert beneath Woods Road and stabilize the channel.	Construction Complete	Complete	D499915	AACO	CIP	Yes	282.72	48.02	48.02	Magothy River	Wetland	
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	D499919	AACO	CIP	No	#N/A	#N/A	#N/A	Severn River	Other/ Not BMP	

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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.	Q514504	AACO	CIP	Future	135.72	68.27	68.27	South River	Wetland	
Jabez Branch Repair	50	Stream Restoration	Repair existing grade structures that have moved.	Construction Complete	Complete	D499925	AACO	CIP	Yes	484.56	63.88	63.88	Severn River	Filtration	
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 12/2012.	Q536001	AACO	CIP	Future	102.34	25.09	25.09	Severn River	Wetland	
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	S777203	AACO	CIP/ Facilities	Yes	94.20	23.41	23.32	Severn River	Filtration	
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	D381801-08	AACO	CIP	Yes	10.13	3.51	3.51	Magothy River	Filtration	
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	D499903	AACO	CIP	Yes	46.23	15.80	15.80	Patapsco Tidal	Filtration	

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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	D499908	AACO	CIP	Yes	42.14	10.61	10.61	Severn 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	Q514503	AACO	CIP	Yes	89.65	51.38	51.38	South River	Wetland	
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	Q503801	AACO	CIP	Yes	384.79	78.26	78.26	Severn River	Filtration	
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	D527401	AACO	CIP	Yes	44.60	17.16	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	Design Complete. Construction anticipated in Fall 2012.	D527402	AACO	CIP	Future	68.41	20.74	3.58	South River	Filtration	
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	D499910	AACO	CIP	Yes	127.90	51.29	51.29	South River	Filtration	

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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	N/A	EPA Grant/Private	South River Federation	Yes	2.35	0.96	0.96	South River	ESD	
Bywater Rain Gardens	101	Bioretention	South River Federation Project - Two bioretention areas that treat stormwater coming off the basketball court and recreation facilities.	Construction Complete	Complete	N/A	EPA Grant/Private	South River Federation	Yes	0.71	0.40	0.40	South River	Annapolis City - ESD	
Chartwell Rain Garden	102	Bioretention	Eagle Scout project.	Construction Complete	Complete	N/A	Private	Eagle Scout Project	Yes	0.90	0.16	0.16	Magothy River	ESD	
Manhattan Beach SPSC	103	Outfall Stabilization/Coastal Plain Outfall	Construct a bioretention facility to treat contributory impervious surfaces.	Construction Complete	Complete	N/A	EPA Grant / Private		Yes	2.96	1.50	1.50	Magothy River	Filtration	
Fidanza Residence	104	Bioretention	South River Federation Project - Install residential rain garden.	Construction Complete	Complete	N/A	EPA Grant / Private	South River Federation	Yes	1.35	0.60	0.60	South River	ESD	
Lincoln Drive 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	N/A	EPA Grant / Private	South River Federation	Yes	1.77	1.63	1.63	Severn River	Annapolis City Filtration	
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	N/A	EPA Grant / Private	South River Federation	Yes	2.58	1.31	1.31	South River	ESD	
Randell Road Rain Garden	107	Bioretention	Langston project.	Construction Complete	Complete	N/A	Eagle Scout Project	ESP	Yes	0.76	0.12	0.12	Magothy River	ESD	
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	N/A	EPA Grant/Private	South River Federation	Yes	12.10	2.39	2.39	South River	ESD	
Barker-Donohoe Residence	109	Bioretention	South River Federation Project - Install two residential rain gardens.	Construction Complete	Complete	N/A	EPA Grant/Private	South River Federation	Yes	0.48	0.25	0.25	South River	ESD	

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College Station SWM Pond Retrofit	110	SWM Retrofit	Provide retrofit solution to SWM Pond.	Construction Complete	Complete	D499906	AACO	CIP	Yes	18.96	6.92	6.92	Magothy River	Filtration	
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	D499907	AACO	CIP	Yes	15.24	8.28	8.28	Little Patuxent	Wetland	
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	D499928	AACO	CIP	Yes	1.56	0.79	0.79	South River	Filtration	
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	D537902	AACO	CIP	Yes	0.55	0.26	0.26	Severn River	Infiltration	
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.	Q437361	AACO	CIP	Future	35.16	10.02	10.02	Little Patuxent	Wetland	
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	Q483701/02	AACO	CIP	Yes	28.29	6.48	6.48	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	Q483701/02	AACO	CIP	Yes	18.26	2.00	2.00	Severn River	Filtration	

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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	Q483701/02	AACO	CIP	Yes	26.08	5.91	5.91	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	D537910	AACO	CIP	No	NA	NA	#N/A	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 Hole Road and Waterford Road.	Design Development	Construction anticipated for completion in early 2012.	P479818	AACO	CIP	Future	928.38	168.60	161.14	Magothy River		
Barrensdale Outfall Restoration	120	Outfall Restoration	This project consists of restoring approximately 800 feet of eroded channel downstream of the SWM pond in the Barrensdale Community and includes retrofitting/converting the SWM pond.	Project Initiation	Construction Schedule Not Set.	Q437366	AACO	CIP	Future	22.39	6.28	6.26	Magothy River	Filtration	
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.	Inactive; Project replaced by Contract # S7918119	Preliminary Design initiated; construction schedule not set	Q437365	AACO	CIP	Future	18.02	7.63	7.63	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	Q437345	AACO	CIP	No	NA	NA	NA	Magothy River	Other/ Not BMP	

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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	D481001	AACO	CIP	No	NA	NA	NA	Patapsco Tidal	Other/ Not BMP	
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	N/A	Private	Private	Yes	91.98	77.36	77.35	South River	Filtration	
Cockey Creek Retrofit Project - A St. Outfall	125	Outfall Stabilization	Resolve erosion and deposition of sediment from the storm drain system in the vicinity of Riverside Drive and A Street.	Construction Complete	Complete	Q462902	AACO	CIP	Yes	9.38	2.73	2.73	Magothy River	Other/ Not BMP	
Cockey Creek Retrofit - Riverside Drive & 10th St.	126	Outfall Stabilization	Provide stable outfall for existing storm drain at Riverside Drive and 10th Street.	Construction Complete	Complete	Q462904	AACO	CIP	Yes	31.19	11.80	11.80	Magothy 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.	Inactive	Design plans at 60%, preparing environmental permits.	D537915	AACO	CIP	No	10.74	4.39	4.39	Patapsco Tidal	Other/ Not BMP	
Cypress Creek Concrete Channel Cleanup	128	Channel Cleanup	Debris and sediment removal.	Construction Complete		Q509402	AACO	CIP	No	#N/A	#N/A	#N/A	Magothy River	Other/ Not BMP	
Cypress Pointe Pond Retrofit	129	SWM Retrofit	Retrofit dry pond as a seepage wetland system.	Construction Complete	Complete	D406961	AACO	CIP	Yes	8.65	4.52	4.45	Magothy River	Wetland	

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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	Design Complete, Phase I Construction Complete.	Q499939	AACO	CIP	Future	54.98	19.00	19.00	Magothy River	Filtration	
Ferry Farms Stormdrain Improvement	131	Stormdrain upgrades and outfall Improvement	Design and construct improvements to the storm drain system including infiltration systems and outfall stabilization in Ferry Farms Road and Elmwood Road (Ferry Farms Community).	Construction Complete	Complete	D521501	AACO	CIP	No	3.57	1.24	1.24	Severn River	Infiltration	
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.	D515601/6	AACO	CIP	Future	0.86	0.39	0.39	Patapsco Nontidal	Filtration	
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.	D537912	AACO	CIP	Future	12.33	5.78	5.78	Patapsco Tidal	Wetland	
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.	D537912	AACO	CIP	Future	32.94	13.87	13.87	Patapsco Tidal	Wetland	
Lake Marion Outfall Repair	135	Impervious Removal	Removal of concrete outfall from Lake Marion and installation of a natural bottom outfall.	Inactive	Schematic design on hold. Priority for Construction under evaluation.	D499937	AACO	CIP	Future	353.20	128.63	128.64	Severn River		

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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).	Complete	Construction complete 4/2011.	P468703	AACO	CIP	No	#N/A	#N/A	#N/A	Rhode River	Alt. Credits	
New Cut Road Culvert Replacement	137	Instream Culvert Retrofit	Replace culvert beneath New Cut Road.	Design	Design Complete in 2013.	D480901	AACO	CIP	Future	10.20	3.65	3.65	Severn River	Filtration	
Norfolk Floodplain Management	138	Stream Restoration	The Norfolk Floodplain improvement project is one of the recommended projects from the Marley Creek Watershed Assessment report. This project will restore the existing stream channel. Runoff water quality from approximately 1200 acres of drainage will be improved.	Complete	Project construction not being pursued; project identified opportunities for retrofit as funds become available.	Q449601	AACO	CIP	No	1094.04	455.18	455.18	Patapsco Tidal		
Old County Road SWM BMP	139	SWM Retrofit	This project consists of the acquisition of permits and the construction of storm drain and stormwater BMP's in Cypress Creek Bog's drainage area, including old County Road, Round Bay Road, Cypress Creek Park and Ticonderoga Avenue.	Design	Scope is being reassessed due to constructability issues.	Q516501	AACO	CIP	Future	65.60	19.79	19.57	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	D537905	AACO	CIP	No	#N/A	#N/A	#N/A	Severn River	Other/ Not BMP	
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	D480601	AACO	CIP	No	2750.27	793.79	665.18	Severn River	Other/ Not BMP	

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Olde Severna Park Outfall	142	Stormdrain Retrofits	Design and construct restoration of a closed storm drain outfall in Olde Severna Park near Hollyberry Road.	Design	Schematic Design complete; construction schedule not set.	Q437364	AACO	CIP	Future	49.68	17.09	17.08	Severn River	Filtration	
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 completed Summer 2012.	D537919	AACO	CIP	Future	34.59	11.74	11.74	Patapsco Nontidal	Wetland	
Pinewood Road Stormdrain	144	Stormdrain upgrades	Design and construct upgrades to the storm drain system.	Project Initiation	Schedule not yet established.	D537923	AACO	CIP	No	26.72	7.46	7.46	Magothy River		
Ponder Cove Storm Drains and SWM Retrofit	145	Storm Drains and SWM Retrofit	Design storm drain system and water quality swales/infiltration in the Ponder Cove and Holly Hill Harbor communities in order to relieve flooding and enhance water quality treatment.	Design	Construction schedule not set.	D537903	AACO	CIP	Future	126.45	35.68	35.68	Rhode River	Infiltration	
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	D510201	AACO	CIP	Yes	7.95	2.20	2.20	Rhode River	Infiltration	
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 anticipated for completion by 5/2012.	D515501	AACO	CIP	Future	67.95	25.02	25.01	South River	Infiltration	

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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	Project redesign underway to address JPA concerns.	D537926	AACO	CIP	Future	5.86	1.08	1.08	Severn 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.	Complete	Design Development is complete. Construction implemented by DNR and SHA.	D499921	AACO	CIP	No	6158.90	1965.09	1890.38	Patpasco Nontidal	Other/ Not BMP	
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 7/2012.	D499900/38	AACO	CIP	Future	15.19	4.09	4.09	Severn River	Wetland	
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	N/A	EPA Grant	Severn River Association	Yes	6.23	2.37	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	N/A	EPA Grant	Severn River Association	Yes	1.09	0.47	0.47	Severn River	Filtration	
116 Avondale Circle Rain Barrel	153	Rain Barrel	Install one rain barrel at 116 Avondale Circle.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
120 Cove View Trail Rain Barrel	154	Rain Barrel	Install two rain barrels at 120 Cove View Trail.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
76 Point Somerset Ln. Rain Barrel	155	Rain Barrel	Install one rain barrel at 76 Point Somerset Lane.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	

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317 Old County Road Rain Barrel	156	Rain Barrel	Install one rain barrel at 317 Old County Road.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
195 Topeg Drive Rain Barrel	157	Rain Barrel	Install one rain barrel at 195 Topeg Drive.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
202 Avondale Circle Rain Barrel	158	Rain Barrel	Install one rain barrel at 202 Avondale Circle.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
216 Springdale Ave. Rain Barrel	159	Rain Barrel	Install one rain barrel at 216 Springdale Avenue.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
105 Avondale Circle Rain Barrel	160	Rain Barrel	Install three rain barrels at 105 Avondale Circle.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.07	0.07	0.07	Severn River	ESD	
91 Point Somerset Ln. Rain Barrel	161	Rain Barrel	Install one rain barrel at 91 Point Somerset Lane.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
896 Randell Road Rain Barrel	162	Rain Barrel	Install one rain barrel at 896 Randell Road.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
Olde Severna Park Improvement Association Beach Rain Barrel	163	Rain Barrel	Install two rain barrels at Olde Severna Park Community Beach.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
1228 Sandalwood Road Rain Barrel	164	Rain Barrel	Install one rain barrel at 1228 Sandalwood Road.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Upper Patuxent	ESD	
1444 Point-O-Woods Ct. Rain Barrel	165	Rain Barrel	Install one rain barrel at 1444 Point-O-Woods Court.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
22 Janwall Court Rain Barrel	166	Rain Barrel	Install two rain barrels at 22 Janwall Court.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.05	0.05	0.05	South River	Annapolis City - ESD	
736 Trenton Ave Rain Barrel	167	Rain Barrel	Install one rain barrel at 736 Trenton Ave.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
1033 Ashe Street Rain Garden	168	Bioretention	Install 200 sq ft rain garden to treat 800 sq ft of rooftop runoff.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	South River	ESD	

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Westfield Annapolis Rain Garden	169	Bioretention	Entrance to Food Court off Jennifer Road; installed 2004.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	1.05	0.78	0.78	South River	ESD	
St. Philips Episcopal Church Rain Garden	170	Bioretention	St. Philips Episcopal Church Raingarden at corner of Bestgate Road and Cottage Grove Rd; installed 2006.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	1.65	0.83	0.83	Severn River	ESD	
1720 Tarrytown Ave Rain Garden	171	Bioretention	Install rain garden to treat 2000 sq ft of front yard.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.05	0.02	0.02	Little Patuxent	ESD	
1720 Tarrytown Ave Rain Garden	172	Bioretention	Install rain garden to treat 2000 sq ft of back yard.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.05	0.00	0.00	Little Patuxent	ESD	
1720 Tarrytown Ave Rain Barrels	173	Rain Barrel	Install four rain barrels to treat rooftop runoff at 1720 Tarrytown Ave.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.04	0.04	0.04	Little Patuxent	ESD	
1721 Tedbury Rd. Rain Barrels	174	Rain Barrel	Install two rain barrels to treat rooftop runoff at 1721 Tedbury Rd.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.03	0.02	0.02	Little Patuxent	ESD	
1708 Truro Rd. Rain Garden	175	Bioretention	Install asphalt bump shunts driveway and house roof runoff into raingarden in front; installed 2007.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.03	0.03	0.03	Little Patuxent	ESD	
1708 Truro Rd. Rain Barrels	176	Rain Barrel	Install two rain barrels to treat rooftop runoff at 1708 Truro Rd.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.03	0.03	0.03	Little Patuxent	ESD	
1737 Urby Dr. Rain Garden	177	Bioretention	Rain garden accepts runoff from roof and driveway asphalt bump; installed 2007.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.04	0.04	0.04	Little Patuxent	ESD	
1733 Urby Dr. Rain Garden	178	Bioretention	Asphalt bump directs driveway and rooftop runoff to raingarden plus side plantings accept side runoff; installed 2007.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.03	0.03	0.03	Little Patuxent	ESD	
2106 Meghan Ct. Rain Garden	179	Bioretention	Dug and planted a rain garden to accept roof runoff; installed 2008.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.06	0.06	0.06	Little Patuxent	ESD	

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St. Elizabeth Anne Seton Church Rain Garden	180	Bioretention	Rain garden in parking lot designed and installed by Underwood 2008.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.77	0.53	0.53	Little Patuxent	ESD	
1535 Eton Way Infiltration	181	Infiltration	Connected downspouts to perforated hose about 8" deep into sandy soils, infiltrates; installed 2008.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.07	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	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.39	0.11	0.11	Little Patuxent	ESD	
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	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.08	0.04	0.04	Little Patuxent	ESD	
Crofton Woods Elem. Rain Garden	184	Bioretention	Curb cuts from parking lot into forest; installed 2007.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	1.32	1.04	0.54	Little Patuxent	ESD	
Crofton Woods Elem. Rain Garden	185	Bioretention	Eagle Scout project, Michael Kane installed 2009.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.67	0.51	0.51	Little Patuxent	ESD	
Crofton Town Hall Rain Garden	186	Bioretention	Elaine Lahn guided volunteers to dig and plant.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.91	0.47	0.47	Little Patuxent	ESD	
Crofton Town Hall Rain Garden	187	Bioretention	Girl Scout Troop dug and planted, funds from Town Hall.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.68	0.35	0.35	Little Patuxent	ESD	
424 & Reidel Rd. Rain Garden	188	Bioretention	Methodist Church, corner of Reidel Road and Rt 424, Crofton, Eagle Scout Raingarden, Patrick Johnston installed Fall 2009.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.42	0.12	0.12	Little Patuxent	ESD	
Beaver Creek Childcare Rain Barrel	189	Bioretention	Private School on Rte. 424. Rainbarrels installed 2007.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.09	0.08	0.08	Little Patuxent	ESD	
Beaver Creek Childcare Rain Garden	190	Bioretention	Private School on Rte. 424. Raingarden installed 2007.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	2.35	1.13	1.13	Little Patuxent	ESD	

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762 Dividing Creek Rd. Rain Garden	191	Bioretention	Eagle Scout Jeff Patrick, installed a raingarden at his home's roadside, Manhattan Beach installed Fall 2009.	Construction Complete	Complete	N/A	EPA Grant / Private	Alliance for Sustainable Communities	Yes	0.73	0.22	0.22	Magothy River	ESD	
Heritage Baptist Church	192	Bioretention	2390 sq ft of bioretention, 2 stormwater planters, 25 trees installed.	Construction Complete	Complete	N/A	EPA Grant / Private	Spa Creek Conservancy	Yes	2.18	1.21	1.21	Severn River	Annapolis City - ESD	
St. Martin's Lutheran Church Rain Garden	193	Bioretention	140 sf of bioretention and 23 trees installed.	Construction Complete	Complete	N/A	EPA Grant / Private	Spa Creek Conservancy	Yes	0.82	0.59	0.59	Severn River	Annapolis City - ESD	
St. Mary's Bioretention	194	Bioretention	850 sf of bioretention and 1 tree installed.	Construction Complete	Complete	N/A	EPA Grant / Private	Spa Creek Conservancy	Yes	4.83	3.36	3.36	Severn River	Annapolis City - ESD	
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 storm water runoff issues destroying Fishing Creek, which opens into the Bay at mouth of South River - Thomas Point Park.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	2.79	0.72	0.72	South River	ESD	
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	Private/ AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
407 Avondale Circle Rain Barrel	197	Rain Barrel	Install one rain barrel at 407 Avondale Circle.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
10 Riggs Ave Rain Barrel	198	Rain Barrel	Install two rain barrels at 10 Riggs Ave.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.05	0.05	0.05	Magothy River	ESD	
657 Creek Rd. Rain Barrel	199	Rain Barrel	Install one rain barrel at 657 Creek Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
603 Cypresspoint Dr. Rain Barrel	200	Rain Barrel	Install one rain barrel at 603 Cypresspointe Dr.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
663 Creek Rd. Rain Barrel	201	Rain Barrel	Install one rain barrel at 663 Creek Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
266 Cypress Creek Rd. Rain Barrel	202	Rain Barrel	Install one rain barrel at 266 Cypress Creek Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	

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660 Creek Rd. Rain Barrel	203	Rain Barrel	Install two rain barrels at 660 Creek Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Magothy River	ESD	
505 Dill Point Dr. Rain Barrel	204	Rain Barrel	Install one rain barrel at 505 Dill Point Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
2923 Edgewater Dr. Rain Barrel	205	Rain Barrel	Install eight rain barrels at 2923 Edgewater Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.06	0.06	0.06	South River	ESD	
669 Dill Rd. Rain Barrel	206	Rain Barrel	Install two rain barrels at 669 Dill Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Magothy River	ESD	
633 Cypresspoint Dr. Rain Barrel	207	Rain Barrel	Install two rain barrels at 633 Cypresspoint Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Magothy River	ESD	
109 Rustic Ridge Rd. Rain Barrel	208	Rain Barrel	Install one rain barrel at 109 Rustic Ridge Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
716 Dill Rd. Rain Barrel	209	Rain Barrel	Install one rain barrel at 716 Dill Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
677 Dill Rd. Rain Barrel	210	Rain Barrel	Install one rain barrel at 677 Dill Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
691 Dill Rd. Rain Barrel	211	Rain Barrel	Install one rain barrel at 691 Dill Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
683 Dill Ct. Rain Barrel	212	Rain Barrel	Install three rain barrels at 683 Dill Ct.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.04	0.04	0.04	Magothy River	ESD	
681 Dill Rd. Rain Barrel	213	Rain Barrel	Install two rain barrels at 681 Dill Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.03	0.03	0.03	Magothy River	ESD	
649 Dunkeld Ct. Rain Barrel	214	Rain Barrel	Install one rain barrel at 649 Dunkeld Ct.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
629 Dunkeld Ct. Rain Barrel	215	Rain Barrel	Install one rain barrel at 629 Dunkeld Ct.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
643 Dunkeld Ct. Rain Barrel	216	Rain Barrel	Install two rain barrel at 643 Dunkeld Ct.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Magothy River	ESD	
56 Bricepoint Ct. Rain Barrel	217	Rain Barrel	Install one rain barrel at 56 Bricepoint Ct.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
209 Wood Loch Ln. Rain Barrel	218	Rain Barrel	Install one rain barrel at 209 Wood Loch Ln.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	

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203 Wood Loch Ln. Rain Barrel	219	Rain Barrel	Install six rain barrels at 203 Wood Loch Ln.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Magothy River	ESD	
52 Taras Trail Rain Barrels	220	Rain Barrel	Install two rain barrels at 52 Taras Trail.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.04	0.04	0.04	Magothy River	ESD	
55 Cypresspoint Ct. Rain Barrel	221	Rain Barrel	Install one rain barrel at 55 Cypresspoint Ct.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
238 Charita Way Rain Barrel	222	Rain Barrel	Install one rain barrel at 238 Charita Way.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
2810 Carrollton Rd. Rain Barrel	223	Rain Barrel	Install two rain barrels at 2810 Carrollton Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
2554 Carrollton Rd. Rain Barrel	224	Rain Barrel	Install two rain barrels at 2554 Carrollton Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
1036 Harbor Dr. Rain Barrel	225	Rain Barrel	Install two rain barrels at 1036 Harbor Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
1029 Pinecrest Dr. Rain Barrel	226	Rain Barrel	Install one rain barrel at 1029 Pinecrest Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
2806 Carrollton Rd. Rain Barrel	227	Rain Barrel	Install five rain barrels at 2806 Carrollton Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
1031 Harbor Dr. Rain Barrel	228	Rain Barrel	Install one rain barrel at 1031 Harbor Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
2834 Carrollton Rd. Rain Barrel	229	Rain Barrel	Install one rain barrel at 2834 Carrollton Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
2670 Carrollton Rd. Rain Barrel	230	Rain Barrel	Install one rain barrel at 2670 Carrollton Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
2655 Carrollton Rd. Rain Barrel	231	Rain Barrel	Install one rain barrel at 2655 Carrollton Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
1034 Old Bay Ridge Rd. Rain Barrel	232	Rain Barrel	Install one rain barrel at 1034 Old Bay Ridge Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
2818 Carrollton Rd. Rain Barrel	233	Rain Barrel	Install two rain barrels at 2818 Carrollton Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	

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2660 Claibourne Rd. Rain Barrel	234	Rain Barrel	Install one rain barrel at 2660 Claibourne Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
2616 Ogleton Rd. Rain Barrel	235	Rain Barrel	Install one rain barrel at 2616 Ogleton Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
2687 Claibourne Rd. Rain Barrel	236	Rain Barrel	Install one rain barrel at 2687 Claibourne Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
2800 Carrollton Rd. Rain Barrel	237	Rain Barrel	Install two rain barrels at 2800 Carrollton Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
2804 Carrollton Rd. Rain Barrel	238	Rain Barrel	Install two rain barrels at 2804 Carrollton Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
207 Riverside Rd. Rain Barrel	239	Rain Barrel	Install two rain barrels at 207 Riverside Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.05	0.05	0.05	South River	ESD	
6433 Weems Ave Rain Barrel	240	Rain Barrel	Install one rain barrel at 6433 Weems Ave.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Herring Bay	ESD	
6656 Highview Terrace Rain Barrel	241	Rain Barrel	Install two rain barrels at 6656 Highview Terrace.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.05	0.05	0.05	Herring Bay	ESD	
401 Arundel Rd. Rain Barrel	242	Rain Barrel	Install one rain barrel at 401 Arundel Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Herring Bay	ESD	
6437 Weems Ave. Rain Barrel	243	Rain Barrel	Install one rain barrel at 6437 Weems Ave.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Herring Bay	ESD	
6714 Duck Lane Rain Barrel	244	Rain Barrel	Install one rain barrel at 6714 Duck Lane.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Herring Bay	ESD	
Captain Salem Avery House Rain Barrels	245	Rain Barrel	Install nine rain barrels at the Captain Salem Avery House.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.10	0.10	0.10	West River	ESD	
6605 Revell Rd Rain Barrel	246	Rain Barrel	Install one rain barrel at 6605 Revell Rd.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	Herring Bay	ESD	
2744 Swan Way Rain Barrel	247	Rain Barrel	Install one rain barrel at 2744 Swann Way.	Construction Complete	Complete	N/A	Private/ AACO	WSA	Yes	0.02	0.02	0.02	South River	ESD	

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2761 Ashe St. Rain Barrel	248	Rain Barrel	Install one rain barrel at 2764 Ashe St.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	South River	ESD	
1712 Truro Rd. Rain Barrel	249	Rain Barrel	Install two rain barrels at 1712 Truro Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Little Patuxent	ESD	
2650 Claibourne Rd. Rain Barrel	250	Rain Barrel	Install one rain barrel at 2650 Claibourne Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
2849 Green Willow Dr. Rain Barrel	251	Rain Barrel	Install one rain barrel at 2849 Green Willow Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
124 Bay Park Way Rain Barrel	252	Rain Barrel	Install one rain barrel at 124 Bay Park Way.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
306 Holland Rd. Rain Barrel	253	Rain Barrel	Install two rain barrels at 306 Holland Rd.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
301 Park Dr Rain Barrel	254	Rain Barrel	Install two rain barrels at 301 Park Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Severn River	ESD	
43 Lockleven Dr. Rain Barrel	255	Rain Barrel	Install one rain barrel at 43 Lockleven Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Magothy River	ESD	
737 Trenton Ct. Rain Barrel	256	Rain Barrel	Install two rain barrels at 737 Trenton Ct.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Magothy River	ESD	
95 Barrensdale Dr. Rain Barrel	257	Rain Barrel	Install two rain barrels at 95 Barrensdale Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Magothy River	ESD	
516 White Oak Dr. Rain Barrel	258	Rain Barrel	Install three rain barrels at 516 White Oak Dr.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.04	0.04	0.04	Magothy River	ESD	
204 Avondale Circle Rain Barrel	259	Rain Barrel	Install one rain barrel at 202 Avondale Circle.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
409 Glenmont Ave Rain Barrel	260	Rain Barrel	Install three rain barrels at 409 Glenmont Ave.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.05	0.05	0.05	Patapsco Tidal	ESD	
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	N/A	Private	Developer	Yes	685.48	66.40	66.40	Little Patuxent	Stream Rest.	1000

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1343 Hollywood Ave Rain Barrel	262	Rain Barrel	Install one rain barrel at 1343 Hollywood Ave.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
1343 Hollywood Ave Rain Garden	263	Bioretention	Install one rain garden at 1343 Hollywood Ave.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.26	0.12	0.12	Severn River	ESD	
Arundel on the Bay Rain Garden	264	Bioretention	Install rain garden near entrance to Arundel on the Bay.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.37	0.19	0.19	Severn River	ESD	
210 Mill Church Road (Divinity Cove) Rain Garden	265	Bioretention	Install a rain garden near the Divinity Cove SPS station to treat runoff coming down the driveway to SPS.	Construction Complete	Complete	N/A	Private/AACO	WSA	Yes	0.57	0.35	0.35	Magothy River	ESD	
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	N/A	Private/AACO	Facilities	Yes	0.19	0.08	0.08	Severn River	ESD	
Gray's Luck SWMP Retrofit	267	Pond Retrofit/SPSC/Wetland Seepage	Retrofit dry pond as a seepage wetland system.	Schematic Design	Schematic design complete. Construction scheduled for FY13.	D499940	AACO	CIP	Future	41.90	9.02	9.02	Patapsco Tidal	Wetland	
Dunkeld Manor SWM Retrofit	268	SWM Retrofit	This project will retrofit the basin with a regenerative storm conveyance system to improve water quantity and water quality management to Cypress Creek and alleviate downgradient residential flooding issues.	Design	Right of way acquisition meetings underway; design complete; anticipated construction 5/2012.	D499943	2010 Trust Grant	CIP	Future	19.55	8.56	4.03	Magothy River	Wetland	

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Leelyn Drive SWM Retrofit	269	SWM Retrofit	This project will retrofit an existing extended detention BMP that is located South of Leelyn Drive and North of the Village Square Shopping center and drains a largely residential area, with a regenerative storm conveyance (step-pool storm conveyance) system to improve water quantity and water quality management to Cypress Creek.	Complete	Construction complete	D499941	2010 Trust Grant	CIP	Yes	55.77	23.90	20.12	Magothy River	Wetland	
Cypress Creek Park and Ride Bioretention	270	Bioretention	The drainage around an existing County-owned Park n Ride parking lot is poorly managed. The parking lot contributes drainage to the headwaters of a poorly rated tributary of Cypress Creek. This project will install two bioretention facilities near the parking lot to limit drainage and improve runoff water quality.	Complete	Construction complete	D499942	2010 Trust Grant	CIP	Yes	6.46	3.78	3.78	Magothy River	ESD	
Cypress Creek Recreation Bioretention	271	Bioretention	This project will install a bioretention facility near an existing storm drain on the north side of the overflow parking for the Cypress Creek Recreation Area. Poor drainage currently contributes to frequent flooding events of portions of the parking lot.	Complete	Construction complete	D499942	2010 Trust Grant	CIP	Yes	0.76	0.46	0.46	Magothy River	ESD	

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Park Drive Rain Garden	272	Bioretention	Installation of a rain garden on Park Drive in Olde Severna Park. Over 35 community members and volunteers participated in the planting on May 15, 2010. The community received grants to fund the project.	Construction Complete	Complete	N/A	EPA Grant/Private	WSA	Yes	0.61	0.26	0.26	Severn River	ESD	
Little Magothy View Rain Garden	273	Bioretention	Diversion of drainage ditch water into adjacent created depression, to mitigate direct flow into Little Magothy River. Device built on highly infiltrating land, planted with flood tolerant native species.	Construction Complete	Complete	N/A	EPA Grant/Private	WSA	Yes	2.27	0.41	0.41	Magothy River	ESD	
Hillsmere Rain Garden	274	Bioretention	Installed 4500 sq ft rain garden near Hillsmere swimming pool. Installed 920 native plants and 80 native trees.	Construction Complete	Complete	N/A	EPA Grant/Private	WSA	Yes	6.11	1.73	1.73	South River	ESD	
Discovery Village Rain Garden	275	Bioretention	Install rain garden to treat runoff from surrounding rooftops, roads, and parking lots.	Construction Complete	Complete	N/A	EPA Grant/Private	WRR	Yes	1.61	0.88	0.88	West River	ESD	
Galesville Rain Garden	276	Bioretention	Install combination rain garden/ living shoreline to treat runoff from surrounding rooftops, roads, and parking lots and protect existing wetland system.	Construction Complete	Complete	N/A	EPA Grant/Private	WRR	Yes	0.54	0.39	0.39	West River	ESD	
Captain Salem Avery House Rain Gardens	277	Bioretention	Install rain garden to treat runoff from surrounding rooftops, roads, and parking lots.	Construction Complete	Complete	N/A	Chesapeake Trust Grant	WRR	Yes	6.22	1.85	1.75	West River	ESD	
Science Drive In-Stream Weir	278	Stream Stabilization	Install instream weir to protect exposed sewer main.	Complete	Complete		AACO	CIP	Yes	108.87	52.04	52.04	Patapsco Nontidal	Stream Rest.	650

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Concorde Circle Dry Pond Retrofit	279	SWM Retrofit	The existing dry pond will be converted into a shallow wetland to provide water quality treatment for the entire 60-acre drainage area. A forebay is proposed at the inflow from the storm drain and the main upstream channel. A 1-foot deep low flow channel will be provided that will meander through the bottom of the facility at a 0% grade, before entering a 4-foot deep micropool adjacent to the pond embankment. The remaining facility will consist of 0.5-foot deep high marsh area, with shallower, gently sloping areas transitioning out of the wetland.	Planning	Concept Design 30%			AACO	Future	60.30	15.85	15.85	Patapsco Nontidal	Wetland	
Shipley Road SPSC	280	SWM Retrofit	Restore severely eroded channel - PTB Concept Design Plan.	Planning	Concept Design 30%			AACO	Future	18.11	6.46	6.46	Patapsco Nontidal	Filtration	
Brooklyn Park LID	281	Porous Pavement	Implement pervious pavement for the Brooklyn Park alleyways.	Planning	Concept Design 30%			AACO	Future	9.30	6.42	6.42	Patapsco Nontidal	ESD	
Brooklyn Park Rain Garden	282	Bioretention	Implement bioretention facilities in public open space pockets in the Brooklyn Park neighborhood.	Planning	Concept Design 30%			AACO	Future	2.47	1.89	1.89	Patapsco Nontidal	ESD	

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South River Federation Project Clean Stream 2011	283	Dumpsite Cleanup	This was an actual cleanup activity. It was sponsored by the South River Federation as part of the Alliance for the Chesapeake Bay's annual Project Clean Stream. We cleaned up the portion of Church Creek that is bordered by Forest Plaza shopping center, Forest Dr., and Rt 2. The volunteers picked up approximately 83 bags of trash as well as 6 tires, part of a recliner, sink, vacuum, TV, and a few other unusual objects, in all 1.38 tons of trash removed.	Complete	Complete	NA		SRF	No	#N/A	#N/A	#N/A	South River	Other/ Not BMP	
Stoney Run Watershed Area Clean-up	284	Dumpsite Cleanup	Clean-up in Stoney Run Watershed area.	Complete	Complete	N/A		Friends of Patapsco Valley & Heritage Greenway	No	#N/A	#N/A	#N/A	Patapsco Nontidal	Other/ Not BMP	
West River Center Rain Garden	285	Rain Garden	Constructed 2 rain gardens at entrance to new Dining Hall with signage.	Complete	Complete	N/A	WSA	West River	Yes	3.70	0.75	0.75	West River	ESD	
Cat Branch Cleanup	286	Dumpsite Cleanup	Project Clean Stream - removed trash from Cat Branch.	Complete	Complete	N/A	#N/A	Little Magothy River Association	No	#N/A	#N/A	#N/A	Magothy River	Other/ Not BMP	
Magothy Steam Bed Cleanup	287	Dumpsite Cleanup	Magothy River Day Stream Clean up; removed trash and dumped refuse from stream bed and surroundings.	Complete	Complete	N/A	#N/A	Magothy River Association (MRA)	No	#N/A	#N/A	#N/A	Magothy River	Other/ Not BMP	
Edgewater Park Pet Waste Stations	288	Pet Waste Station	Installation of the first of three community pet waste stations in Edgewater Beach.	Complete	Complete	N/A	Community Assn	WSA	No	#N/A	#N/A	#N/A	South River	Other/ Not BMP	

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Edgewater Park Pet Waste Stations	289	Pet Waste Station	Installation two of three total community pet waste stations in Edgewater Beach.	Complete	Complete	N/A		WSA/EBCA	No	#N/A	#N/A	#N/A	South River	Other/ Not BMP	
Edgewater Park Pet Waste Stations	290	Pet Waste Station	Final installation (3rd) of three community pet waste stations in Edgewater Beach.	Complete	Complete	N/A		WSA/EBCA	No	#N/A	#N/A	#N/A	South River	Other/ Not BMP	
W. Benfield Blvd. Buffer Planting	291	Buffer Planting	Planted 30 tree/shrubs in a buffer zone along W. Benfield Blvd. that was previously managed as a mowed grass area.	Complete	Complete	N/A	Pointfield West HOA	Arlington ECHO	Future	0.02	0.00	0.00	Severn River	Alt. Credits	
Horn Point Marina Rain Garden	292	Rain Garden	Project involved modifications at the Horn Point Marina (105 Eastern Avenue in Eastport) to reduce the impacts of stormwater runoff from this site on Back Creek. First, a stormwater riser at the lower edge of the property was elevated (which discharges directly into the creek). Then several trees were removed and soil was excavated for three rain gardens and a trench. In addition, native plants were planted in rain gardens and three magnolias were planted near shoreline. Finally, a pet waste station was installed at the foot of the pier.	Complete	Complete	N/A	Marina Owner	Arlington ECHO	No	2.71	1.84	1.84	Severn River	Annapolis City - ESD	

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Gingerville Creek Riparian Buffer Planting	293	Buffer Planting	WSA team, along with Gingerville residents, planted native trees and other plants in the riparian buffer near the head of Gingerville Creek to better treat stormwater pollution that has run into the creek. Planting was in about 200' of stream buffer.	Complete	Complete	N/A	WSA	WSA Gingerville team	Future	0.15	0.00	0.00	South River	Alt.. Credits	
South Shore Baptist Church Planting	294	Buffer Planting	Place for conservation planting: both sides of the front South Shore Baptist Church (1400 square feet). Tilled and amended soil with mulch and leaf grow. Planted approximately 195 native plants and 5 native magnolias. Installed 4 rain barrels. Installed soaker hoses. Installed riverjack swales.	Complete	Complete	N/A		Watershed stewardship Academy, Arlington ECHO	Future	#N/A	#N/A	#N/A	Severn River	Alt. Credits	
Rock Creek Cleanup, Project Clean Stream 2011	296	Dumpsite Cleanup	60 people joined together to clean up two sites on Rock Creek. About 13.5 cubic yr of trash.	Complete	Complete	N/A		Alliance for Sustainable Communities (ASC)	No	#N/A	#N/A	#N/A	Patapsco Nontidal	Other/ Not BMP	
Heritage Harbor Tree Planting	297	Buffer Planting	Planted 230 trees along the shores of the South River in the community of Heritage Harbor between the Route 50 bridge and Broad Creek. Over 50 volunteers.	Complete	Complete	N/A	AA County paid for the 230 trees and shrubs	South River Federation (SRF)	Future	0.36	0.00	0.00	South River	Alt. Credits	

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Constellation Energy Beards Creek Cleanup	298	Dumpsite Cleanup	About 90 volunteers from Constellation Energy held their company team building / volunteer day at an old community dumping site along Beards Creek. In total, the group picked up 8.43 tons of trash/tires and 4.34 tons metal.	Complete	Complete	N/A		South River Federation (SRF)	No	#N/A	#N/A	#N/A	South River	Other/ Not BMP	
1026 Ashe St. Rain Barrels	299	Rain Barrel	Neighborhood Rain Barrel.	Complete	Complete	N/A		WSA	Yes	0.01	0.01	0.01	South River	ESD	
1041 Ashe Street Conservation Plantings	300	Conservation Landscape	Turf Reduction, replaced with native grasses.	Complete	Complete	N/A	Private	WSA	Future	0.01	0.00	0.00	South River	Alt. Credits	
1037 Ashe St Rain Barrels	301	Rain Barrel	Installation of 4 rain barrels.	Complete	Complete	N/A	Private	WSA	Yes	0.06	0.06	0.06	South River	ESD	
130 Calhoun St Rain Garden	302	Rain Garden	150 sq ft raingarden built by hand by WSA Class 3 and attendees of the Professional Sustainable Landscape Series Course (ESD and Raingarden Design) sponsored by WSA/AACC.	Complete	Complete	N/A	WSA with CBT grant	Arlington ECHO	Yes	0.24	0.05	0.05	South River	ESD	
Melbourne and 1st Pet Waste Station	303	Pet Waste Station	Placed pet waste sign at community access point to Bay frontage walkway on Melbourne Avenue and on First Street, Masons Beach, Deale.	Complete	Complete	N/A		Home Owner Association (HOA)	No	#N/A	#N/A	#N/A	Herring Bay	Other/ Not BMP	
Gingerville Rain Garden	304	Rain Garden	Riparian planting and rain garden by St. Andrew's School.	Complete	Complete	N/A	CBT,WSA, Unity Gardens	South River Federation (SRF)	Yes	10.30	2.55	2.55	South River	ESD	
Anne Arundel Community College Rain Garden	305	Rain Garden	Installed a 300 square foot raingarden as part of Earth Day activities.	Complete	Complete	N/A	Unity Gardens grant	Anne Arundel Community College	Yes	0.85	0.31	0.31	Magothy River	ESD	

Table 8: Anne Arundel County Restoration Projects (2004-2011)

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1506 Winchester Rd Rain Garden	306	Rain Garden	Install 650sq ft terraced rain garden in community row to remedy erosion and filter runoff from adjacent streets runoff. Volume is contributing to downstream sediment accumulation.	Complete	Complete	N/A	Private		Yes	0.24	0.14	0.14	Severn River	ESD	
Gambrills Road Culvert and Stream Retrofit	307	Stream Stabilization	Repair damaged culvert and install in-stream stabilization in order to minimize impacts from downstream headcuts.	Complete	Complete		AACO	CIP	No	527.31	39.34	39.34	Severn River	Stream Rest.	170
Wells Branch @ Aurora Hills	308	Stream Stabilization	Install instream weir to transition the Aurora Hills SPSC into Wells Branch.	Complete	Complete	Q483701/02	AACO	CIP	Yes	732.95	63.90	10.17	Severn River	Stream Rest.	150
Severn Run Stream Stabilization	309	Stream Stabilization	Install in-stream weir to protect exposed sewer main and reconnect stream with floodplain.	Complete	Complete		AACO	CIP	Yes	2810.53	805.16	11.37	Severn River	Stream Rest.	150
Picture Spring Branch Stream Stabilization	310	Stream Stabilization	Install in-stream weir to reconnect stream with floodplain. Approximately 500 ft upstream of weir will be impacted by this restoration project.	Complete	Complete		AACO	CIP	Yes	1559.34	523.38	215.59	Severn River	Stream Rest.	500
Breitwert Ave Storm Drain Improvements	311	SWM Retrofit	Restore degraded outfall as part of stormdrain improvement project.	Design	Design to begin Spring 2012.	D537913	AACO	CIP	Future	28.53	8.48	8.48	Severn River	Filtration	
Oakleaf Villa SWM Retrofit	312	SWM Retrofit	Design and construct three shallow marsh retrofits to maximize the water quality benefit.	Project Initiation	Design to begin 1/2012.	D537916	AACO	CIP	Future	5.88	3.82	3.82	Severn River	Wetland	
Valentine Creek SWM Retrofit	313	SWM Retrofit	Design and construct three shallow marsh retrofits to maximize the water quality benefit.	Project Initiation	Design to begin 1/2012.	D537916	AACO	CIP	Future	34.95	4.25	4.25	Severn River	Wetland	
Marabrook SWM Retrofit	314	SWM Retrofit	Design and construct three shallow marsh retrofits to maximize the water quality benefit.	Project Initiation	Design to begin 1/2012.	D537916	AACO	CIP	Future	14.04	2.72	2.72	Severn River	Wetland	

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Lionsgate Stream Stabilization	315	Stream Stabilization	Install instream weir to protect exposed sewer main and reconnect stream with floodplain.	Complete	Complete		AACO	CIP	Yes	323.24	104.33	104.33	Severn River	Stream Rest.	200
Park Road Infiltration Trench	316	Infiltration	The Olde Severna Park Improvement Association installed an infiltration trench which leads to a grassy swale which leads to a rain garden on Park Drive.	Complete	Complete	N/A	Private	OSP/IA/ WSA	Yes	19.55	5.10	4.75	Severn River	Infiltration	
Homeport Farms SPSC	317	Outfall Stabilization		Complete	Complete		Private		Yes	9.40	2.27	2.27	South River	Filtration	
Olde Severna Park Community Rain Garden	318	Bioretention	Olde Severna Park Second Community Rain Garden.	Complete	Complete	N/A	Private	OSP/IA/ WSA	Yes	23.74	5.83	0.39	Severn River	ESD	
Little Beach Tree Planting	319	Conservation Landscape	Planted herbaceous native plants at Little Beach CSC. Students from National Honor Society Magothy Middle School volunteer hours. Students will care for 20 native trees over the summer for planting in the fall in the Little Magothy Sub-watershed and Magothy River Tidal area.	Complete	Complete	N/A	Private	WSA	Future	0.00	0.00	0.00	Magothy River	Alt. Credits	
Oyster Harbor Citizen Assn Rain Barrel	320	Rain Barrel	Installed two rain barrels on the community shed.	Complete	Complete	N/A	HOA Funding, Private Donation	WSA	Yes	0.004	0.00	0.00	Severn River	ESD	
Fishing Creek Park Rain Garden	321	Bioretention	Installed a native garden to reduce erosion and nutrient pollution.	Complete	Complete	N/A	Federal/ State Grant, HOA Funding, Private Donation	WSA	Yes	8.70	2.99	2.79	Severn River	ESD	
Arundel on the Bay Pumping Station VI No-Mow Zone	322	Conservation Landscape	Installed a no-mow zone to reduce nutrient and air pollution.	Complete	Complete	N/A	Federal/ State Grant, Private Donation	WSA	Future	0.22	0.05	0.05	Severn River	Alt. Credits	

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Arundel on the Bay Pumping Station VI Rain Barrel	323	Rain Barrel	Installed 2 rain barrels on the pump station. The water will be used to water the no-mow zone.	Complete	Complete	N/A	Private	WSA	Yes	0.02	0.02	0.02	Severn River	ESD	
Arundel Lodge Rain Garden	324	Bioretention	Rain garden installation.	Complete	Complete	N/A	Federal/ State Grant, Non-Gov'n't Grant	WSA	Yes	0.06	0.06	0.06	South River	ESD	
USNA Nature Center Rain Barrels	325	Rain Barrel	Installation of 6 rain barrels on the USNA Nature Center.	Complete	Complete	N/A	Federal/ State Grant	WSA	Yes	0.06	0.06	0.06	Severn River	ESD	
USNA Nature Center Rain Garden	326	Bioretention	350 sf rain garden installed at USNA Nature Center. Collects parking lot and rooftop runoff.	Complete	Complete	N/A	Federal/ State Grant, Private Donation	WSA	Yes	0.52	0.19	0.19	Severn River	ESD	
258 Lower Magothy Beach Rd Rain Garden	327	Bioretention	Designed and installed 2 rain gardens in front yard at home of John Dawson.	Complete	Complete	N/A	Private	WSA	Yes	0.01	0.01	0.01	Magothy River	ESD	
Popular Ave Rain Garden	328	Conservation Landscape	Provided a low maintenance native garden in place of a bare mud patch caused by frequent flooding.	Complete	Complete	N/A	Private	WSA	No	3.72	1.18	1.18	Severn River	Annapolis City Alternative Credits	
Saefern Upland Tree Planting	329	Conservation Landscape	Planted 7 Red Bud trees - on community property near the tennis courts.	Complete	Complete	N/A		WSA	Future	#N/A	#N/A	#N/A	Severn River	Alt. Credits	
Klinken Native Plantings	330	Conservation Landscape	Turf removal in backyard, replace with native plants. Serves as overflow area from rain garden. Assisted by MWS Lara Mulvaney.	Complete	Complete	N/A	Private	WSA	Future	0.01	0.00	0.01	South River	Alt. Credits	
Klinken Rain Garden	331	Bioretention	Rain garden built to capture rooftop drainage from 2 downspouts in the back yard. All turf in back yard converted to this rain garden and a conservation landscape.	Complete	Complete	N/A	Private	WSA	Yes	0.02	0.02	0.02	South River	ESD	

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Little Magothy Beach Rain Garden	332	Bioretention	Removal of invasive species. Planting of native shrubs to improve drainage of storm water runoff in rain garden.	Complete	Complete	N/A	Private	WSA	Yes	0.92	0.36	0.36	Magothy River	ESD	
Olde Severna Park Community Infiltration Trench	333	Infiltration	Infiltration trench installed that flows to a grass swale and into a rain garden all installed at the same time.	Complete	Complete	N/A	Private	OSP/IA/WSA	Yes	22.22	5.43	0.33	Severn River	Infiltration	
1104 Little Magothy View Rain Garden	334	Bioretention	Removal of an above ground pool and installed rain garden.	Complete	Complete	N/A	Private	WSA	Yes	1.38	0.33	0.33	Magothy River	ESD	
40 Johnson Road Rain Barrel	335	Rain Barrel	Installed rain barrel.	Complete	Complete	N/A	Private	WSA	Yes	0.02	0.02	0.02	Patapsco Tidal	ESD	
Old Herald Harbor Road Emergency Culvert Repair	336	Stream Stabilization	Repair damaged culvert and install in-stream stabilization in order to minimize impacts from downstream headcuts.	Complete	Complete		AACO	Facilities	Yes	407.49	25.64	25.64	Severn River	Stream Rest.	500
Patuxent River Road Emergency Culvert Repair	337	Stream Stabilization	Repair damaged culvert and install in-stream stabilization in order to minimize impacts from downstream headcuts.	Complete	Complete		AACO	Facilities	Yes	119.51	5.46	5.46	Upper Patuxent	Stream Rest.	1000
1414 Ridgeway East Rain Barrels	338	Rain Barrel	Install two rain barrels to treat 100% rooftop runoff.	Complete	Complete	N/A	Private	Private	Yes	0.03	0.03	0.03	Severn River	ESD	
Shady Cove Natural Area Wetland	339	Living Shoreline	Installation of three acres of tidal wetlands at a County-owned park, protecting the peninsula from erosion. The newly created wetland will protect the existing wetland system and a cove near the mouth of Parrish Creek.	Complete	Complete	N/A	EPA Grant/ Private	WRR	Yes	2.86	0.00	0.00	West River	Alt. Credits	

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Hammarlee Road SPSC	340	Outfall Stabilization	Install step pool storm water conveyance system as part of storm water management for Hammarlee House Development.	Complete	Complete	N/A	Private/ Developer	Private	Yes	8.45			Patapsco Tidal	Filtration	
602 Hammonds Ferry Road SPSC	341	Outfall Stabilization	Install step pool storm water conveyance system as part of storm water management for 602 Hammonds Lane Development.	Complete	Complete	N/A	Private/ Developer	Private	Yes	13.83			Patapsco Nontidal	Filtration	

D. Discharge Characterization

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

Status:

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

In 2010, the EMC values used by the County for individual urban land cover categories were compared to local and national literature sources. The sources included the Center for Watershed Protection (2005), Center for Watershed Protection and VA DCR (2007), and Pitt, et al. (2004). The review found that the EMC values used by the County are generally in agreement with literature values for the specific land cover/EMC combinations that were comparable. There were a few differences that prompted the County to revise the EMC values, as reported in the 2010 report. These values continue to be reviewed and updated as new data becomes available and/or literature indicates revisions are warranted.

During the 2005 to 2011 reporting years, the EMC discharge characterization values have been applied to a wide array of land conditions to assist County staff, stakeholders, and decision makers in addressing water quality concerns. The EMC data have been primarily used in the EPA simple method to model pollutant loads, correlate the results with the drainage area contributory imperviousness, and develop pollutant loading goals associated with watershed and subwatershed assessments, as well as individual water quality restoration projects.

During 2011, Anne Arundel County developed a Phase II Watershed Implementation Plan (WIP) to support the Chesapeake Bay TMDL. As part of this process, the County reconciled its Event Mean Concentrations (EMCs) for various land covers with those used in the current version of the Chesapeake Bay Program's Watershed Model (Version 5.3). **Table 9** identifies the adjustments made to reconcile the concentrations with those used in the Bay Program's Watershed Model that have been adopted for development of the County's WIP. Units are in mg/L. Of particular note for this year, the County's

watershed assessments and Phase II WIP efforts focused on urban land covers and, thus, modeling for both agriculture and natural resource land covers were minimal. The EMC values for these remaining land cover categories were not updated to match the Bay Program's model and are not included in this report or the table below.

Table 9: Pollutant Concentrations (mg/L) per Land Cover Code

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

As noted in prior year reports, Anne Arundel County continues efforts to relate biological condition metrics to watershed characteristics. The Watersheds, Ecosystems, and Restoration Services (WERS) have collected certain aquatic benthic macroinvertebrate biological data in all the major watersheds of the County as part of a variety of watershed assessment work activities. The County uses a Benthic Index of Biotic Integrity (BIBI), calibrated for the Coastal Plain physiographic region, as a surrogate for system health, which is broadly defined as the capacity of an ecosystem to support and maintain a biota that is comparable to that found in natural conditions (Karr and Chu 1999). The County conducted benthic macroinvertebrate sampling and assessed BIBI scores at over five hundred locations Countywide between 2002 and 2011.

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, Victoria et al.2010.). A variety of factors are responsible for this situation. However, many studies have shown that one of the most important factors in the degradation of streams and rivers is the conversion of relatively open, permeable land to developed, impermeable land uses. The hydrologic, geomorphic, ecological, and water quality consequences of these conversions are well known (Leopold 1994, Schueler 1987, Booth 1990, MDE 2000, Paul and Meyer 2001, and many others).

To better understand the ecological health conditions described above, comparisons of the available biological information with the chemical, habitat, geomorphic, and

hydrologic data were developed to determine possible causal relationships. The initial intent of these investigations was to develop management strategies that 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 2011 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 2010-2011 reporting period, the following maintenance inspections were performed:

- 385 First Year of Operation & Maintenance Inspections
- 1,080 Triennial Maintenance Inspections

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 (I&P) has one Stormwater Management Maintenance Inspector. This inspector is responsible for performing the triennial maintenance inspections and illicit discharge detection and elimination compliance inspections. The scheduling of triennial 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 11,862 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. If a written correction notice is not sufficient to obtain compliance, a civil citation is issued to the property owners. There were 117 correction notices issued during the reporting year. Two civil citations were issued during the reporting period. One of these citations was paid while the other was referred to the Office of Law for trial where it is currently pending the assignment of a court date 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 significantly altered the Maryland Stormwater Management Regulations. As a result of the Act, the 2000 Maryland Stormwater Design Manual was updated to reflect the new Environmental Site Design (ESD) requirements.

In response to the revised requirements, Anne Arundel County updated Articles 16, 17, and 18, to ensure adequate legal authority was maintained for the County's stormwater program. A complete discussion of the process for the updates and their approvals is included in Part III.B. The Anne Arundel County Council approved the updates to the County Code through Bill 74-11. A copy of the final approved Bill is included in **Appendix A**.

Additionally, the County Practices and Procedures Manual relating to the new State Stormwater Management Regulations became effective on November 22, 2010. The final approved County Code and County Practices and Procedures Manual were submitted to MDE for review. A letter stating the County's Practices and Procedures Manual as well as Article 16 were approved by MDE was received in September 2011. A copy of this letter is also included in **Appendix A**.

During the 2010-2011 reporting period, the Office of Planning and Zoning required all proposed new stormwater management plans to comply with the new Environmental Site Design (ESD) to the Maximum Extent Practicable (MEP) criteria reflected in the current edition of the Maryland Stormwater Management Design Manual.

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

Status:

Revisions to the County Code required to implement changes to the Maryland Stormwater Regulations were prepared as discussed in Part III.B. and were approved under County Council Bill 74-11. Both Article 16 of the County Code and the Anne Arundel County Stormwater Practices and Procedures Manual were approved by MDE in 2011. Copies of the Bill and MDE approval letter are included in **Appendix A**.

- 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. It is anticipated that, once all of the delegated jurisdictions have MDE approved stormwater management programs to implement ESD, MDE will resume the triennial program evaluations.

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 the fall/winter of 2010. MDE made no specific recommendations or suggestions as a result of the evaluation. I&P is currently tracking the progress of the proposed new State Erosion & Sediment Control Regulations and will be ready to move forward with the required modifications of the County Code when the proposed State regulations are adopted.

- 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. Four trainings were conducted by the District during the 2010-2011 reporting period. These were conducted on December 6, 2010, March 24, 2011, June 13, 2011, and September 21, 2011. 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. 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:

- a) Field screening at least 150 outfalls annually. Each outfall having a discharge or suspected of having an illicit discharge shall be sampled using a chemical test kit;*
- b) Conducting routine surveys of commercial and industrial watersheds for discovering and eliminating pollutant sources;*
- c) Maintaining a program to address illegal dumping and spills;*
- d) Using appropriate enforcement procedures for investigating and eliminating illicit discharges, illegal dumping, and spills. Significant discharges shall be reported to MDE for enforcement and/or permitting; and*

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

Status:

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. In 2011, illicit discharge screening was conducted within the 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 storm drain systems, locations of outfalls, and contributing businesses or facilities.

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

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

In 2011, two outfalls with dry weather flow contained a concentration exceeding the threshold limit for one or more tested contaminants. Another site was identified by County staff as having an illegal connection to the storm drain system, but no chemical

tests were performed. Fifteen sites were found with structural deficiencies or erosion. The County inspectors performed follow-up site visits and inspections for the reported problem outfalls. Further details, including site-specific reports for some of the sites, are included in **Appendix D**.

b. Survey of Commercial and Industrial Watersheds

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

The 2011 inspections identified seventeen sites with the potential to discharge pollutants into County storm drains or Waters of the United States. Additionally, an active construction site was identified with poor maintenance of sediment controls. Follow-up compliance investigations and compliance actions were taken for these sites or are underway. Compliance reports and site-specific reports can be found in **Appendix D**.

A full report of the procedures and data collected from the illicit detection and elimination field investigation can be found in **Appendix D**. Digital data are included. The report includes a discussion of the enforcement actions taken in 2011.

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 2011 reporting period, a total of 61 complaints were investigated. These complaints were generated from illicit discharge investigation for the current and past reporting year, and County and citizen complaints. Details regarding these and other complaints are included in the *Illicit Discharge Detection and Elimination* report included in **Appendix D**.

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

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

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

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

For the reporting period, the Department issued one civil citation for improper pumping operations and discharge of sediment-laden water.

Illicit Discharge complaints and referrals are logged into I&P's Compliance Case Database, which is used to track cases from the receipt of a complaint or referral to closure. The Compliance Database is available to be viewed by the public on the Department of Inspection and Permits page of the Anne Arundel County Citizen Information website. The page has a Quick Link to the Compliance Database.

d. Report Significant Illicit Discharges to MDE

Out of the 61 complaints received by the Department of Inspections and Permits for the reporting period, three were referred to MDE. Below is a summary of each case:

- Compliance Case E-2010-0201: Annapolis Roads Golf Course. This case was referred to MDE for enforcement under the Maryland Environmental Article, Section 4-413, as a potential source of sediment pollution. On December 27, 2010, the assigned MDE inspector determined no violations of the State Code existed and the case was closed.
- Compliance Case E-2011-0651: a dumpster leaking into a stormdrain on an industrial site was referred to MDE for enforcement under the Maryland Environmental Article. The site was inspected and no violations were observed at the time of the inspection. The case was subsequently closed.
- Compliance Case E-2011-0682: commercial vehicle washing operations was referred to the MDE Underground Injection Control Program for assistance with enforcement and possible State permitting. The investigation is still underway.

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 Water Reclamation Facilities with NPDES discharge permits are:

- Annapolis WRF, permit number 07-DP-0838, effective August 1, 2009, to July 31, 2014. A renewal package was submitted as per the permit requirement.
- Broadneck WRF, permit number 06-DP-0677, effective June 1, 2010, to May 31, 2015.
- Broadwater WRF, permit number 06-DP-0813, effective March 1, 2010, to February 28, 2015.
- Cox Creek WRF, permit number 07-DP-0698, effective January 1, 2010, to December 31, 2014.
- Maryland City WRF, permit number 02-DP-2393, effective August 1, 2008 to July 31, 2013. A renewal package was submitted as per the permit requirement.
- Mayo Large Communal WRF, permit number 98-DP-2291, effective April 1, 2000 to March 31, 2005. Permit still in force. Application submitted to MDE October 3, 2001.
- Patuxent WRF, permit number 02-DP-0132, effective August 1, 2008 to July 31, 2013. A renewal package was submitted as per the permit requirement.

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

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

Storm Water Pollution Prevention Plans (SWP3s) exist at each of the above facilities as required by the permits. The SWP3 for Cox Creek WRF was last updated in October 2010. The SWP3s for Annapolis and Broadneck WRF were last updated in June 2011. The SWP3s for Broadwater and Mayo WRF were last updated in September 2011, and the SWP3s for Maryland City and Patuxent WRF were last updated in November 2011.

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 Road Operations Division is divided into three Districts with each district having at least two road operations service yards, listed above. These yards are covered under the 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. The Bureau of Highways also operates a facility at 350 West Central Avenue, part of the Southern District, which has stormwater coverage under a site-specific NPDES permit (07-DP-3366).

Each of the SWP3s for the Bureau of Highway facilities was implemented during the 2010 reporting year. Inspections are conducted on an annual basis. Whitman, Requardt, and Associates, Inc. was retained under Open End Agreement No. 5812 to prepare facility-specific training materials to familiarize employees with and support the effective implementation of SWP3s. The development of employee training materials related to each facility's SWP3 was completed in 2011.

The SWP3 for each Bureau of Highways facility continues to be fully implemented and updated annually. The following activities were conducted during the 2011 permit year:

1. Comprehensive annual inspections of each facility,
2. Internal document review during comprehensive annual inspections of each facility,
3. Major rehabilitative maintenance, including replacement of all cinderblock walls around the storage bin locations at 200 Dover Road (completed in 2011),
4. Maintenance improvements that further reduce stormwater impacts, including:
 - o Use of coir log wattles at select locations.
 - o Use of silt-sack inserts at select locations.
 - o Replaced tank bulkhead valve and secondary containment valves associated with the CaCl₂ tank located at 6657 Old Solomons Island Road.

5. Third Party Inspection of underground waste oil storage tanks at the Mountain Road and Crownsville Road yards in June 2011,
6. Spill bucket inspections of underground waste oil storage tanks at all District Yards in March 2011 by MDE Certified UST Inspectors,
7. Repairs of underground waste oil storage tank appurtenances at the following District Yards:
 - o Central District, St. Margaret's Yard, Containment Sump, November 2010
 - o Northern District, Mountain Road Yard, Repair to Tank Probe and Incon Sentinel System (ATG), June 2011.
 - o Northern District, Mountain Road Yard, Programming and Certification for Incon Sentinel System (ATG), July 2011.
 - o Central District, St. Margaret's Yard, Programming and Certification for Incon Sentinel System (ATG), July 2011.

Staff training sessions have been administered to Road District personnel to support SWP3 implementation, as summarized in **Table 10**.

Table 10: SWP3 Training Summary for Bureau of Highways Facilities

Training Number	Training Location	Training Date	Training Session Topic
10784520	1310ND	1/16/2010	SWP3-Reviewing BMP 12 Waste Management
10784933	1312SD	11/19/2010	Training meeting, topic "Yard SWP3 / Drains Yard Clean Up Spills" 11/19/10 DG.
10787735	1311CS	12/08/2010	Crew was trained on understanding stormwater and how it affects our drain system. The name of the topic was "After the Storm".
10788079	1311CO	12/10/2010	Crew meeting on SWP3 understanding stormwater after the storm. When it rains it drains.
11794095	1311CO	01/19/2011	Crew meeting about different mulching for erosion control.
11794200	1311CS	01/20/2011	Training on the positive effects that mulching has on erosion to prevent stormwater runoff.
11797895	1311CO	02/16/2011	Going over BMP waste management requirements.
11798983	1311CC	02/25/2011	Held monthly meeting on waste management and maintenance. 2/25/11 LTC. Given by Lenny Clower.
11800976	1310NM	03/04/2011	SWP3 Training - Mulching BMP 15
11802497	1311CS	03/17/2011	Learn spill prevention and control.
11803681	1311CO	03/25/2011	Going over spill prevention and control with crew members.
11804407	1311CC	03/30/2011	Conducted training on "Spill Prevention and Control" – hand out and Q&A session.
11806441	1312SD	04/08/2011	Stormwater pollution prevention training.
11808166	1311CS	04/21/2011	Geotextiles – The use of, applications, and maintenance.
11808951	1312SD	04/28/2011	Training on when and how to inspect containment facility.

Table 10: SWP3 Training Summary for Bureau of Highways Facilities

Training Number	Training Location	Training Date	Training Session Topic
11808942	1311CC	04/28/2011	SWP3 presentation on BMP 17 entitled “Geotextiles” to staff at HCC; explained function and correct installation; also, copies with diagrams were provided to each person present.
11812263	1312SD	05/13/2011	Training class: “What is Stormwater Runoff? Why is Stormwater Runoff a Problem? The Effects of Pollution.”
11823008	1311CO	07/14/2011	SWP3 – Review of program safety – Chainsaw medic bag contents. Review topics from Superintendent / Supervisors meeting.
11824079	1311CO	07/22/2011	Going over BMP waste management requirements.
11835861	1311CC	09/30/2011	SWP3 training on winter operations.

The Department of Public Works, Waste Management Services, oversees the operation of the County landfills and convenience centers. These landfills are also covered under the General Discharge Permit for Storm Water Associated with Industrial Activities (Permit No. 02-SW). SWP3 Compliance Evaluation Inspection Reports were conducted for the following facilities in November 2010: Millersville Landfill and Resource Recovery Facility, Millersville Convenience Center, Sudley Convenience Center and closed Landfill, Glen Burnie Convenience Center and closed Landfill. The inspection reports are included digitally in **Appendix A** of this report. All BMPs were found to be in place and functioning with no reportable spills or leaks identified for the reporting period. Waste Management Services provided trainings at each of the facilities on the topics and dates listed in **Table 11**.

Table 11: SWP3 Training Summary for Waste Management Services

Number	Training Session Topic	Training Dates
1	Hazardous Waste Operations (Response)	March/April 2011
2	Good Housekeeping and Spill Prevention	March/April 2011
3	Preventative Maintenance for Sediment and Erosion Control	March/April 2011
4	Runoff Control	March/April 2011
5	Other Topics	March/April 2011

5. Road Maintenance

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

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

Status:

a. Street Sweeping

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

Sweeping Schedule

Neighborhood streets are relatively clean because of the work of conscientious residents who assist the County by keeping the areas in front of their homes free of litter and debris. Residential streets are therefore not included in the routine street sweeping program.

Main thoroughfares, business districts and industrial areas are scheduled for street sweeping up to four times per year. Arterial, major collector, and roads in business districts are targeted for routine sweeping. This strategy maximizes debris removal per hour of street sweeping.

The County swept 418 miles of streets from November 1, 2010 to October 31, 2011, which equates to 35 curb-miles/month, a 46 percent decrease from the last reporting period. Major equipment repairs and associated downtime on the County's street sweepers reduced the sweeping effort during the reporting period. For comparison, an average of 64 curb-miles/month were swept during the previous reporting year.

Manual Litter Collection

Litter is collected from County roadways on a routine basis. A total of 8,165 thirty gallon bags of litter were removed from roadsides during the November 1, 2010 to October 31, 2011 period, with 1,943 bags collected during the routine work week and 6,222 bags collected by the weekend sign and litter removal program.

b. Inlet Cleaning

The County cleaned and removed debris from catch basins, inlets and outlets of pipes to maintain proper drainage for 13,597 structures during the reporting period. This is a 15 percent decrease from the last reporting period (16,084 structures). In addition, the County inspected catch basins, manholes, and associated pipes/ditches to identify structures for cleaning with a sewer vacuum. From November 2010 to October 2011, 2,712 structures were cleaned with a Vactor™ truck, a 36 percent decrease from the last reporting period (4,270 structures). To ensure adequate drainage, the County also cleaned and removed debris from roadside inlet and outlet ditches and concrete swales, removed leaves from ditch lines and curbs using a leaf vacuum, and cleaned and reshaped roadside ditches by machine for a total of 110,679 feet during the reporting period.

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 are recorded by the County.

Herbicides

Herbicide application, 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 vegetative growth and prior to crack sealing operations in the traveled portion of the roadway. A total of 160 gallons of Glyphosate were used during the reporting period, a 100 percent increase over the previous reporting period (80 gallons were applied during the 2010 reporting year).

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 work completed by Holmes Lawn Care, Inc. under Blanket Order 3448-OB. The contract includes fertilizer application at specific times of the year depending on median condition. A complete listing of Blanket Contracts available to County agencies is available at:

<http://countyweb/CentralServices/FormsCentralServices/PurchaseBlanketTitle.xls>.

d. Snow and Ice Control

The amounts of de-icing chemicals used from November 2010 to October 2011 are found in **Table 12** below. De-icing chemical data for the 2009 and 2010 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 12: Deicing Material Applied

Material	Quantity 2009	Quantity 2010	Quantity 2011
Salt	12,405 Tons	34,242 Tons	23,438 Tons
Sand/ Salt mix	0 Tons	0 Tons	0 Tons
Liquid Calcium Chloride	160 Gallons	3,359 Gallons	3,641 Gallons
NWS ¹ Snow Totals (BWI)	9.1 Inches	77.0 Inches	14.4 Inches

⁽¹⁾ Average annual snowfall total at BWI Thurgood Marshall Airport is 20.2 inches, according to the National Weather Services (NWS). Winter 2010-2011 snowfall totals were 14.4 inches, 29 percent lower than average.

The average winter temperature at BWI Thurgood Marshall Airport is 35.1°F according to the National Weather Service (NWS). The average temperature during the winter 2010-2011 was 32.8°F. An increase of calcium chloride was used from 2010 to 2011 because it depresses the freezing-point and is used more extensively during colder periods to prevent ice formation and to deice road surfaces.

In 2011, the Bureau of Highways continued its use of a Maintenance Decision Support System (MDSS) which uses real-time 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 (**Exhibit 4** and **Exhibit 5**) and are from our subscription weather service, MxVision WeatherSentry Online at <http://weather.dtn.com/dtnweather/>.

Exhibit 4: MDSS Hourly Weather Forecast With Treatment Recommendations

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

Exhibit 5: MDSS Treatment Recommendation



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

Cycle Time: 3 hours

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

Initial Operations				Subsequent Operations			
Initial Pavement Surface Conditions	Maintenance Action	Dry Chemical Spread Rate kg/lane-km (lb/lane-mi)		Maintenance Action	Dry Chemical Spread Rate kg/lane-km (lb/lane-mi)		
		Liquid	Solid or pretwetted solid		Liquid	Solid or pretwetted solid	
Dry or light snow cover	Plow as needed			Plow as needed			
Comments 1. It is not recommended that chemicals be applied in this temperature range. 2. 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.

Annually, County road crews are offered training on snow plowing techniques. This training also includes information on proper application of deicing products.

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 835 environmentally-related complaints were received and investigated by the Department. The complaints received typically involve potential Critical Area violations (e.g. tree clearing in the buffer), 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. From **Section III.E.3.c** above, complaints E-2011-0211 and E-2011-0461 were reported over the hotline.

- 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 water quality-related information related to County-provided services. Information, presentations, and fliers available through this website address such issues as:

- Annual Drinking Water Quality Report,
- Rehabilitation and maintenance of County sewer infrastructure,
- Information on recent wastewater spills,
- Fix a Leak Week,
- West County Groundwater Quality,
- Homeowner's Guide to Septic Tanks, and
- Homeowner's Guide to Grinder Pumps

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

Water Quality Protection Associated with Land Development

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

Household Hazardous Waste, Recycling, Landfill Services, and Composting

Outreach pertinent to these issues has been reported in prior Annual Reports. The Department of Public Works, Waste Management Services Division (DPW WMS) manages an extensive outreach campaign geared toward residential recycling. Additionally, the County advertises and conducts Household Hazardous Waste drop-off days several times a year at the County Landfills and Convenience Centers. Literature

outlining alternatives to hazardous household chemicals, and safe disposal of such chemicals, is provided to the public through many different venues. DPW WMS also provides information such as what can be recycled, ways to get recycling and composting bins, how much different areas of the County are recycling, local events that promote recycling, and question and answer forums at outreach events, in County offices, through the County website (<http://www.aacounty.org/DPW/WasteManagement/index.cfm>), on the “Recycle. More. Often” website (www.recyclemoreoften.com) and on the Anne Arundel County Recycling Division Facebook page (www.facebook.com/annearundelrecycling).

Transportation Planning

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

Environmental Health Information (Anne Arundel County Department of Health)

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

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

Digital copies of some of the recent Health Matters fact sheets are provided in **Appendix E**. 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 current advisories and closures at any of the 106 recreational waters monitored by the Department between Memorial Day and Labor Day. The test results can also be found on the Department of Health’s website, <http://www.aahealth.org/index.php>. The Department also promotes an e-alert system so an individual can be notified by email should the Department issue an advisory or closure of a recreational water. Individuals can sign up for the e-alert system via the Department’s website. The Department of Health, in conjunction with MDE and the

Maryland Department of Health and Mental Hygiene, also promotes the Maryland Healthy Beaches campaign. The campaign makes people aware of their own impact to the waterways in the state of Maryland. The website, www.marylandhealthybeaches.org, provides the current conditions of beaches in Maryland, answers common questions about water-borne organisms, and tips on how to prevent water-related illnesses. A primary focus of this campaign is the importance of picking up pet waste.

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

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

Watersheds, Ecosystems, and Restoration Services Online Mapping

As reported in the 2010 Annual Report, the County developed a website to track restoration projects undertaken by non-County organizations such as the Watershed Stewards Academy and other watershed organizations. The restoration project locations are displayed graphically on the County's Watersheds, Ecosystems, and Restoration Services (WERS) Mapping Application (<http://gis-world.aacounty.org/wers/>). In 2011, the County provided enhanced functionality to the WERS online mapping application to facilitate environmental data sharing with the public. Enhancements to the functionality included adding a hyperlink to the stream problem area inventory pictures, the addition of stream and subwatershed priority for restoration and preservation results, and providing an interactive parcel layer that allows the public to review the property ownership information for any specific parcel. These additions were among numerous other enhancements that were made as a result of feedback from the public. In addition, an online form was developed to allow the public to enter their community restoration and outreach activities directly into the Anne Arundel County database. Outreach activities conducted by the stewards in 2011 ranged from organizing cleanup days and planting efforts to constructing community rain gardens and conducting rain barrel sales.

Watershed Stewards Academy

The Watershed Stewards Academy (WSA) was established in 2008 to train and support community leaders to become "Master Watershed Stewards" who will work toward the protection, restoration, and conservation of the local watersheds. The WSA trained its third class of 26 Master Watershed Stewards and recruited a fourth class of 26 since November 2010.

Year 3 class training consisted of 64 hours of class room and field instruction followed by a capstone project. The Capstone projects completed during this reporting period include:

- 6 neighborhood assessments,
- 30 outreach events,
- 5 stenciled storm drains,
- 8 conservation landscapes or tree plantings,
- 5 rain gardens,
- 50 rain barrels,
- 1 living shoreline,
- 1 stormwater planter, and
- The removal of approximately 300 square feet of invasive species.

The WSA has supported Certified Master Watershed Stewards through four networking meetings, five continuing education classes, and connection to resources and people to help make their projects and outreach as effective as possible. Certified Master Watershed Stewards gave over 3,000 hours of volunteer time to work with their communities to reduce pollution and gave 167 presentations reaching over 6,300 people in the County with the message of reducing stormwater pollution. To date, there are 70 Certified Master Watershed Stewards and 26 Steward candidates.

The WSA continued adding to its new website, www.aawsa.org. The website offers an array of educational information about the local watersheds, the water quality of area waterways, and links to RiverKeepers and other Watershed organizations. The website also offers ideas for residents to improve the quality of their watershed. A section on “Invasive Species Removal” gives pictures of common invasive/noxious species to help residents identify what should be removed while “Capture Your Stormwater” gives pictures and names of native trees that should be planted.

The Founding Board of Directors released a 2011 Annual Report. The document outlines the goals of the WSA, the role of each Watershed Steward, and projects completed by Stewards to enlighten the community on the WSA. This Founding Board of Directors Annual Report also solicits donors to support the WSA through monetary, tax-deductible donations.

Appendix A contains a pdf of some of the accomplishments of the WSA over the reporting period.

Maryland Tributary Teams

During 2011, 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, and the Phase II WIPs.

Stream Cleanups in 2011

During 2011, 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. The clean-up sites are listed below.

South River Watershed

Organization: South River Federation (SRF)

Activity: On 1/16/11, the SRF coordinated the Martin Luther King Day of Service stream clean-up. Activities were centered mainly along highways adjacent to streams within the watershed (e.g., Church Creek). 30 large bags of trash and recyclables, 4 tires, and a stroller were removed.

Rock Creek Watershed – April 2011

Unnamed tributary to Rock Creek

Organization: Project Clean Stream/Watershed Stewards Academy

Activity: Approximately 60 volunteers worked together to clean up two dump sites on a non-tidal tributary to Rock Creek. In all, approximately 13.5 cubic yards of trash were removed.

Severn River Watershed – April 2011

Clements Creek

Organization: Severn River Association/Project Clean Stream

Activity: Project Clean Stream and Severn River Association volunteers worked to remove tires, recyclables, and general trash and debris from dumpsites in the Clements Creek subwatershed. In total, between 700 and 800 tires, 1.96 tons of trash, and 500 pounds of recyclables were removed.

South River Watershed – April 2011

Beards Creek

Organization: South River Federation

Activity: On 13 April 2011, 86 volunteers from Constellation Energy held their company team building/volunteer day at a dump site along Beards Creek. The volunteers spent an entire business day cleaning up three ravines on farm property adjacent to the creek. This was the 4th time that South River Federation had taken volunteers to this site. In total, 8.43 tons of trash/tires and 4.34 tons of metal were removed from this subwatershed.

Church Creek

Organization: South River Federation

Activity: South River Federation volunteers removed 1.38 tons of trash from Church Creek in Parole.

Patapsco River Watershed - January through December 2011

Organization: The Friends of Patapsco Valley & Heritage Greenway coordinate stream clean-ups throughout the Patapsco River Watershed. During the 2011 permit term, stream and watershed cleanups occurred at Stoney Run near Furnace Avenue and at Deep Run along Race Road between Park Circle Drive and Hanover Road (Parkway Industrial Center). Trash, tires, litter, scrap metal, appliances, and other items removed from the streams and floodplain areas are collected and properly disposed at the County landfill with the cooperation of Anne Arundel County Bureau of Highways road operations staff. Specific details associated with the stream clean-ups are documented below. Photos of stream clean-up activities can be access through the FPVHG web site at www.patapscoheritagegreenway.org/eventcal.html or <http://patapscofriend.smugmug.com>.

Stoney Run at Furnace Avenue

1/4/11 through 1/12/11: Volunteers removed approximately 176 tires from a reach of Stoney Run.

2/1/11 through 2/17/11: Volunteers removed approximately 90 tires from a reach of Stoney Run.

3/10/11: Volunteers removed additional tires and trash from a reach of Stoney Run.

4/29/11 through 5/5/11: Volunteers removed approximately 1 ton of tires and junk from a reach of Stoney Run.

6/6/11 through 6/7/11: Volunteers removed additional tires placed in a gravel parking lot off Furnace Avenue as well as lumber and construction debris discarded approximately one block from the gravel parking lot.

Deep Run and Piney Run at Race Road (Parkway Industrial Center in Hanover)

Since April 2011, Friends of Patapsco Valley & Heritage Greenway (FPVHG) has led a team of volunteers in a stream cleanup, including 18 Lockheed Martin employees/family members plus up to 20 additional volunteers, focusing on this area. These volunteers have contributed well over 80 man hours of time which has resulted in over 7 tons of debris being removed. Below are examples of stream cleanups at this location:

4/2/11 through 4/4/11: Volunteers removed approximately 1 ton of debris and tires.

4/15/11: Volunteers removed 27 bags of trash, 7 tires, 3 mattresses, a television, and miscellaneous debris.

4/25/11: Volunteer stream watcher coordinated removal of trash (broken recliner, clothing) dumped in same location that a prior stream clean-up occurred.

5/6/11: Volunteers removed 21 tires, 9 garbage bags of trash, plastic pipe, and approximately 100 pounds of scrap metal.

7/14/11: Volunteer stream watcher coordinated removal of discarded furniture from this stream reach.

9/6/11: Volunteer stream watcher coordinated removal of construction debris and landscaping waste.

10/5/11: Volunteers removed an intact motorcycle (500 to 600 pounds), an additional 4 tires, miscellaneous trash, and landscaping waste from the stream at this location.

10/24/11: Volunteer stream watcher coordinated removal of discarded home furnishings and toys.

11/12/11 through 11/22/11: Approximately 25 volunteers participated in removing trash and junk from this area of the watershed. Aside from the usual bottles, cans, fast food wrappers and plastic bags normally found, the volunteers also removed car tires, truck tires, tractor trailer tires, sofas, box springs, mattresses, TVs, cinder blocks, sheet metal, rusted auto parts, inner tubes, oil filters, PVC pipes, bakery truck trays, shipping pallets, a deer stand ladder, a No Parking sign, used lumber, piles of broken antique glass drinking bottles, and scores of other unique items – totaling over 5,000 pounds of junk and debris. 12/2/11 through 12/16/11: Volunteers removed tires (tractor trailer and car tires), plumbing fixtures, wood scraps, plastic gas can, conduit, and general trash and litter from this stream reach.

Bureau of Highways

Rain Gardens

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

Stormwater Management Facility Maintenance & Leaf Disposal

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

Support of Area Organizations for Stream Cleanups

As described above, the Bureau of Highways has supported a number of stream cleanup initiatives during the reporting period. These have included work with the Friends of the Patapsco Valley & Heritage Greenway and South River Federation, among others.

Ice Control and Snow Removal

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

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

Anne Arundel County uses covered storage facilities for its road salt and stores a total of approximately 11,650 tons of salt at the following locations: Dover Road (Glen Burnie), Mountain Road (Pasadena), Crownsville Road (Annapolis), Broadneck Road (St. Margarets), Duckins Street (Odenton), West Central Avenue

(Davidsonville), and at a storage yard in Friendship, MD. At the present time, a small portion of Anne Arundel County's fleet is equipped with liquid calcium chloride pre-wetting equipment. Pre-wetting dry salt during its application helps the salt to adhere to the roadway. In contrast, dry salt can "bounce" and blow off the roadway and be less effective.

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

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

Stormwater Presentations

Public presentations on water quality issues made during the period of November 2010 to November 2011 include the following:

- November 15, 2011
Severn River Association
Anne Arundel County Draft Phase II Watershed Implementation plan
- October 14th, 2011
Chesapeake Environmental Protection Association (CEPA) Presents "The Pollution Diet"
Anne Arundel County – Chesapeake Bay TMDL
- September 28th, 2011
20th Annual Maryland Groundwater Symposium
Anne Arundel County Septic System Strategic Plan – Chesapeake Bay TMDL
- July 29th, 2011
Governor's Task Force on Sustainable Development and Wastewater Disposal
Anne Arundel County Septic System Strategic Plan – Chesapeake Bay Total Maximum Daily Load
- July 28th, 2011
Senior Bay Scientists and Policymakers
Anne Arundel County Draft Phase II Watershed Implementation Plan

- June 11th, 2011
Stormwater Education Seminar, Chesapeake Ecology Center
Anne Arundel County, Maryland Chesapeake Bay TMDL Draft Phase II Watershed Implementation Plan
- June 10th, 2011
Mid-Atlantic Regional Environmental Professionals Association – TMDL for the Chesapeake Watershed
Anne Arundel County, Maryland Chesapeake Bay TMDL Draft Phase II Watershed Implementation Plan
- June 6th, 2011
Interagency Coordination Meeting
Anne Arundel County – Approach to Urban Stormwater Load Reductions
- May 11th, 2011
American Council of Engineering Companies (ACEC) Annual Environmental Forum
Anne Arundel County Septic System Strategic Plan – Chesapeake Bay TMDL
- May 5th, 2011
Annual MD-DC-VA APWA Chapter Conference – Region-wide Stormwater Issues & Challenges Panel
Anne Arundel County, Maryland – Chesapeake Bay TMDL Draft Phase II Watershed Implementation Plan
- March 9th, 2011
Joint Evaluation Team
Anne Arundel County – Wetland, Stream and Outfall Restoration
- March 8th, 2011
Greater Severna Park Council
Anne Arundel County Draft Phase II Watershed Implementation Plan
- February 24th, 2011
Chesapeake Executive Council Citizen Advisory Committee
Anne Arundel County Draft Phase II Watershed Implementation Plan
- February 15th, 2011
Councilman John Grasso
Anne Arundel County Draft Phase II Watershed Implementation Plan
- February 2nd, 2011
Law Seminars International
Anne Arundel County – TMDL in the Chesapeake Watershed
- January 20th, 2011
Master Watershed Stewards Class II Graduation Ceremony
Anne Arundel County Draft Phase II Watershed Implementation Plan
- January 18th, 2011
Metropolitan Washington Council of Governments
Anne Arundel County Draft Phase II Watershed Implementation Plan
- January 13th, 2011
Lower Western Shore Tributary Team
Anne Arundel County Draft Phase II Watershed Implementation Plan
- January 11th, 2011

- Choose Clean Water Chesapeake Bay Restoration Conference
Anne Arundel County Phase II WIP
- January 10th, 2011
Montgomery County Water Quality Advisory Group
Anne Arundel County Draft Phase II Watershed Implementation Plan
- January 7th, 2011
State Water Quality Advisory Committee
Anne Arundel County Draft Phase II Watershed Implementation Plan
- January 7th, 2011
MACo Winter Conference
Anne Arundel County
- December 3rd, 2010
MACo TMDL – WIP Workgroup
Anne Arundel County Draft Phase II Watershed Implementation Plan
- December 2nd, 2010
Severn River Commission
Anne Arundel County Draft Phase II Watershed Implementation Plan
- December 1st, 2010
Middle Potomac Tributary Team
Anne Arundel County Draft Phase II Watershed Implementation 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 erosion and sediment/runoff control.

Managers of each of the County-owned facilities requiring coverage under an NPDES permit has updated the SWP3 recently, or has the update in progress, and is scheduled to update them again following the issuance of the new General Permit by MDE. Training is performed yearly, which is critical to ensure staff are fully knowledgeable of the potential pollutant sources at each facility, how to properly store and handle these sources, and the procedures for responding to a spill or emergency. Refresher trainings are provided when necessary.

The SWP3 Evaluation Report for the four Waste Management Services facilities are included digitally in **Appendix A**, including a training outline for each. The outline includes dates the trainings were held during the 2011 reporting year and proposed dates for the 2012 reporting year. Pollution prevention plans and spill prevention, control, and countermeasure plans are kept at these facilities and updated regularly.

F. Watershed Assessment and Planning

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

At a minimum, the County shall:

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

Status:

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

<http://gis-world.aacounty.org/WERS/>

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

The Patapsco Nontidal study was developed and completed in 2011. The plan characterizes the current conditions, provides an inventory and rating for problem areas within the watershed, identifies improvement opportunities, prioritizes restoration and preservation actions, and proposes alternative implementation plans along with cost/benefit analysis for each action. Additionally, the watershed study provides preliminary designs for five recommended restoration projects and an estimate of costs to design and construct those projects. The completed study can be found on the County's website:

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

During 2011, the County completed the field assessment work for the Patapsco Tidal and Bodkin Creek Watersheds and began analyses of the data. While most analysis was completed in 2011, the report is expected to be published in the spring of 2012. All study related material will be published on the County website:

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

During 2011, the County also completed a targeted benthic bioassessment study for 50 sampling locations within the Little Patuxent Watershed. In addition, the County has initiated a contract to begin the comprehensive study for the Little Patuxent Watershed. The stream assessment data are anticipated to be ready by the next reporting period. Available study reports are published under

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

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

Chesapeake Bay Watershed TMDL – Watershed Implementation Plan Phase II

Anne Arundel County is working collaboratively with MDE and various stakeholders within the County to develop a Chesapeake Bay TMDL Watershed Implementation Plan (WIP) to reduce the nutrient and sediment load within Anne Arundel County's portion of three major tributary basins (Lower Western Shore, Patuxent, and Patapsco). The

County's target load allocation and waste load allocation for these major tributary basins are apportioned by MDE and are part of the larger Chesapeake Bay TMDL allocation.

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

The County also developed a comprehensive draft WIP depicting core and supplemental strategies aimed at meeting the TMDL MS4 allocations. The draft WIP included 2013 milestones, a 2017 plan to meet 70 percent of the target load, and a 2020 plan to meet the target allocation loads for Total Nitrogen (TN), Total Phosphorus (TP), and Total Suspended Solids (TSS). The draft plan was uploaded on the Maryland Assessment Scenario Tool (MAST), the web-based nutrient and sediment load estimator, and submitted to the State for review on November 18, 2011.

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

Status:

The County is continuing with its efforts to develop watershed management plans for the 12 major watersheds within the County. The County is on schedule to complete the first round of assessments by spring 2016. The next round of assessments will be conducted as a County-wide effort to update the condition assessments for the highest priority for restoration and preservation areas. **Table 13** shows the current schedule established to complete these studies:

Table 13: 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	Complete
Patapsco Tidal	02130903	Complete	Complete	2012
Bodkin	02130902	Complete	Complete	2012
Little Patuxent	02131105	Complete	2012	2013
Rhode	02131004	2012	2013	2014

Table 13: 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)
West	02131004	2012	2013	2014
Herring Bay	02131005	2013	2014	2015
Middle Patuxent	02131102	2014	2015	2016

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

Status:

In 2011, the County developed a complete watershed management plan for the Patapsco Nontidal watershed. In addition, field assessments, rating, and prioritization of action have been developed for the Patapsco Tidal and Bodkin Watersheds. All GIS data associated with the Patapsco Nontidal study have been appended to the WERS mapping application and are published online. <http://www.aacounty.org/DPW/Watershed/WatershedStudies.cfm> It is anticipated that the remaining recommendations for the Patapsco Tidal and Bodkin Watershed studies will be submitted with the 2012 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 8** 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 2004-2011 time period.

As reported in **Part III.C.5**, numerous water quality enhancement projects were implemented between 2004 and 2011. 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. The drainage and impervious areas listed in **Table 8** have been delineated for only those projects that are believed to provide a water quality benefit and are completely constructed as of November 2011. It is noted that no treatment credit was claimed for overlapping drainage areas, or for over management. It is also important to note that it is not possible for the County to distinguish between jurisdictional responsibilities when implementing a stream restoration project or SWM facility. Due to this, Anne Arundel County currently claims credit for the total area restored by all implemented projects, regardless of the jurisdictions from which the impervious areas drain (e.g., privately-owned impervious lands). The total impervious area treated can then be compared to the County jurisdictional uncontrolled impervious land total to determine the County impervious percentage restored.

Two hundred ninety-five projects were implemented between 2004 and 2011. The total area draining to these projects is approximately 21,685 acres (6,551 acres of impervious surface). One hundred twelve of these projects were funded and constructed through

Anne Arundel County Capital Improvement Program (CIP) projects. One hundred thirteen 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.

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 high priority watersheds, including the Patapsco Tidal at 13.6 percent treatment, the Patapsco Nontidal at 23.0 percent treatment, the Severn River at 31.1 percent treatment, and the South River at 100 percent treatment. On a County-wide, comprehensive basis, the restoration projects provide treatment that is equivalent to 9.7 percent of the County's total uncontrolled impervious surface. However, according to CWP published research, watersheds with less than ten percent imperviousness are considered minimally impacted as far as the habitat and biological functions of the receiving streams. Watersheds with less than ten percent imperviousness are considered a low priority for urban restoration and are highlighted in yellow in **Table 14**. If these low priority watersheds are removed from the County's total uncontrolled impervious surface treatment calculations, the County has restored the equivalent of 12.6 percent of its uncontrolled impervious surface.

Table 14: Summary of Impervious Area Restored 2004-2011

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	126	146	13.6%	3,726	5,398
Patapsco Nontidal	15,286	4,173	27%	2,561	4,790 (1,189)	423	28.3	187	113	23.0%	95	1,284
Little Patuxent	27,681	5,674	20%	Incomplete ⁽²⁾	12,552 (1,667)	4,007	194.5	281	78	5.3%	3,454	5,121
Severn River	44,238	8,962	20%	4,800	8,758 (2,620)	1,542	255.0	420	301	31.1%	566	3,186
Magothy River	22,805	4,982	22%	2,300	1,175 (301)	2,381	98.8	263	173	5.1%	1,846	2,147
South River	36,156	5,247	15%	3,600	3,309 (809)	838	312.7	295	318	100.0%	0	809
Bodkin Creek	6,028	833	14%	149	37 (19)	665	0.0	64	65	0.0%	536	555
Upper Patuxent	22,417	1,767	8%	600	5,285 (159)	1,008	36.5	69	104	4.4%	799	958
Herring Bay	14,252	1,073	8%	Incomplete ⁽²⁾	554 (72)	1,001	0.2	0	72	0.0%	929	1,001
West River	7,933	567	7%	Incomplete ⁽²⁾	1,004 (37)	530	6.2	34	40	1.4%	450	487
Rhode River	8,727	615	7%	Incomplete ⁽²⁾	2,099 (65)	550	2.2	36	32	0.5%	480	545
Middle Patuxent	29,679	1,735	6%	Incomplete ⁽²⁾	855 (212)	1,523	0.0	129	44	0.0%	1,350	1,562
Total	265,583	45,244	17%	17,369 (39%)	44,874 (8,822)	19,053	1,522	1,904	1,486	9.7%	14,229 (39.1%)	23,051 (50.9%)
	⁽¹⁾ Restoration project impervious area treated based on County projects constructed between 2004 and 2011.											
	⁽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 12.6 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.***

Status:

The progress toward meeting the goals established in **Part III.G.1** and **III.G.2** are listed below in **Table 15**. The projects listed are those that have completed the construction phase and that provide a water quality benefit. The projects constructed during the 2011 reporting year have been 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 15**. 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 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	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	—	—

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
AA County Dept. of Health	100	Bioretention	Construction Complete	N/A	N/A	EPA Grant	—	—
Aurora Hills SWM Rehabilitation 1	115	Outfall Stab / Instream Rest.	Construction Complete	Q483700	Q483701/02	AACO	\$893,000	\$829,679
Aurora Hills SWM Rehabilitation 2	116	Outfall Stab / Instream Rest.	Construction Complete	Q483700	Q483701/02	AACO		
Aurora Hills SWM Rehabilitation 3	117	Outfall Stab / Instream Rest.	Construction Complete	Q483700	Q483701/02	AACO		
Barker-Donohoe Residence	109	Bioretention	Construction Complete	N/A	N/A	EPA Grant	—	—
Blue Bird Lane Erosion	42	Stream Stabilization	Construction Complete	D499900	D499912	AACO	\$116,121	\$116,121
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	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

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
Church Creek Stream Restoration	124	Stream Stabilization	Construction Complete	N/A	N/A	Private	—	—
Cockey Creek Retrofit Project - A St. Outfall	125	Outfall Stabilization	Construction Complete	Q462900	Q462902	AACO	\$64,250	\$64,225
Cockey Creek Retrofit - Riverside Dr & 10th St	126	Outfall Stabilization	Construction Complete	Q462900	Q462904	AACO	\$30,100	\$30,022
College Station SWM Pond Retrofit	110	SWM Retrofit	Construction Complete	D499900	D499906	AACO	\$184,000	\$183,454
Courts of Crofton Pond Retrofit	111	SWM Retrofit	Construction Complete	D499900	D499907	AACO	\$420,000	\$414,500
Cypress Rd. Rain Garden	103	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Cypress Pointe Pond Retrofit	129	SWM Retrofit	Construction Complete	D406900	D406961	AACO & Private	\$25,000	\$21,021
Dulls Corner Stream Restoration	10	Stream Restoration	Construction Complete	Q503900	Q503901	AACO	\$400,000	\$334,274
Eastport-Annapolis Neck Library	112	SWM Retrofit	Construction Complete	D499900	D499928	AACO	\$132,300	\$131,692
Edgewater Elementary BMP	57	Stream Restoration	Construction Complete	Q514500	Q514503	AACO	\$534,800	\$515,384
Ferry Farms Storm drain Improvement	131	Storm drain upgrades and outfall	Construction Complete	D521500	D521501	AACO	\$247,000	\$185,939
Fidanza Residence	104	Bioretention	Construction Complete	N/A	N/A	EPA Grant	—	—
Gingerville SWMP Upgrade	12	SWM Retrofit / Outfall	Construction Complete	Q497700	Q497701	AACO	\$716,000	\$716,552

Table 15: Summary of Restoration Expenditures

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

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
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 Project	—	—
Riva Annapolis Storm Drain & Outfall Rehabilitation (Riva 400)	23	Outfall Stabilization	Construction Complete	Q514400	Q514401	AACO	\$1,087,000	\$1,061,566
Riva Trace Baptist Church	108	Bioretention	Construction Complete	N/A	N/A	EPA Grant/	—	—
Saunders Point Storm Drains and SWM retrofit	146	Storm Drain and SWM retrofit	Phase 1 Construction Complete	D510200	D510201	AACO	\$888,000	\$496,000
Severn Station SWM Pond	56	SWM Retrofit	Construction Complete	D499900	D499908	AACO	\$375,000	\$354,377
Sloop, Eli, & Long Coves Retrofits, Site 2	29	Stream Restoration	Construction Complete	Q514100	Q514102	AACO	\$151,770	\$148,947
North Carolina Wetland Recovery @ Severn Rd.	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	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

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
Woods Road Culvert Stream Restoration	47	Instream Culvert Retrofit	Construction Complete	Q462900 & D499900	Q462903 & D499915	AACO	\$90,522	\$89,697
Carriage Hills Outfall Stabilization and Stream Restoration	151	Outfall Stabilization and Stream Restoration	Construction Complete	N/A	N/A	EPA Grant	—	—
Saefern Outfall Stabilization	152	Outfall Stabilization	Construction Complete	N/A	N/A	EPA Grant	—	—
116 Avondale Circle Rain Barrel	153	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
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/	—	—

Table 15: Summary of Restoration Expenditures

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

Table 15: Summary of Restoration Expenditures

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

Table 15: Summary of Restoration Expenditures

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

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
2923 Edgewater Dr. Rain Barrel	205	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
669 Dill Rd. Rain Barrel	206	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
633 Cypress Pointe Dr. Rain Barrel	207	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
109 Rustic Ridge Rd. Rain Barrel	208	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
716 Dill Rd. Rain Barrel	209	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
677 Dill Rd. Rain Barrel	210	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
691 Dill Rd. Rain Barrel	211	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
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/	—	—

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
203 Wood Loch Ln Rain Barrel	219	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
52 Taras Trail Rain Barrel	220	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
55 Cypress Pointe Ct. Rain Barrel	221	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
238 Charita Way. Rain Barrel	222	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2810 Carrollton Rd. Rain Barrel	223	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2554 Carrollton Rd Rain Barrel	224	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1036 Harbor Rain Barrel	225	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1029 Pinecrest Dr. Rain Barrel	226	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2806 Carrollton Rd Rain Barrel	227	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1031 Harbor Dr. Rain Barrel	228	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2834 Carrollton Rd. Rain Barrel	229	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2670 Carrollton Rd. Rain Barrel	230	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2655 Carrollton Rd. Rain Barrel	231	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1034 Old Bay Ridge Rd. Rain Barrel	232	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
2818 Carrollton Rd. Rain Barrel	233	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2660 Claibourne Rd. Rain Barrel	234	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2616 Ogleton Rd. Rain Barrel	235	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2687 Claibourne Rd. Rain Barrel	236	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2800 Carrollton Rd. Rain Barrel	237	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2804 Carrollton Rd. Rain Barrel	238	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
207 Riverside Rd. Rain Barrel	239	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6433 Weems Ave Rain Barrel	240	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6656 Highview Terrace, Rain Barrel	241	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
401 Arundel Rd Rain Barrel	242	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6437 Weems Ave Rain Barrel	243	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6714 Duck Lane Rain Barrel	244	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
Captain Salem Avery House Rain Barrels	245	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
6605 Revell Rd Rain Barrel	246	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
2744 Swan Way Rain Barrel	247	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2764 Ashe St. Rain Barrel	248	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
1712 Truro Rd. Rain Barrel	249	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2650 Claibourne Rd. Rain Barrel	250	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
2849 Green Willow Dr. Rain Barrel	251	Rain Barrel	Construction Complete	N/A	N/A	Private/	—	—
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/	—	—

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
The following projects were completed during the current reporting year.								
Captain Salem Avery House Rain Gardens	277	Bioretention	Construction Complete	N/A	N/A	Chesapeake Trust Grant	—	—
Science Drive In-Stream Weir	278	Stream Stabilization	Complete			AACO	—	121,000
West River Center Rain Garden	285	Rain Garden	Complete	N/A	N/A	WSA	—	—
W. Benfield Blvd. Buffer Planting	291	Buffer Planting	Complete	N/A	N/A	Pointfield West HOA	—	—
Horn Point Marina Rain Garden	292	Rain Garden	Complete	N/A	N/A	Marina Owner	—	—
Gingerville Creek Riparian Buffer Planting	293	Buffer Planting	Complete	N/A	N/A	WSA	—	—
South Shore Baptist Church Planting	294	Buffer Planting	Complete	N/A	N/A		—	—
Heritage Harbor Tree Planting	297	Buffer Planting	Complete	N/A	N/A	AA County paid for 230 trees / shrubs	—	1,000
1037 Ashe St Rain Barrels	301	Rain Barrel	Complete	N/A	N/A	Private	—	—
130 Calhoun St Rain Garden	302	Rain Garden	Complete	N/A	N/A	WSA with CBT grant	—	—
Anne Arundel Community College Rain Garden	305	Rain Garden	Complete	N/A	N/A	Unity Gardens grant	—	—
1506 Winchester Rd Rain Garden	306	Rain Garden	Complete	N/A	N/A	Private	—	—
Severn Run Stream Stabilization	309	Stream Stabilization	Complete			AACO	—	30,000

Table 15: Summary of Restoration Expenditures

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

Table 15: Summary of Restoration Expenditures

Project Name	ID	Project Type	Status	Project Number	Contract Number	Funding Source	AA County Budgeted	AA County Expenditure To date
Popular Ave Rain Garden	328	Conservation Landscape	Complete	N/A	N/A	Private	—	—
Saefern Upland Tree Planting	329	Conservation Landscape	Complete	N/A	N/A		—	—
Klinken Native Plantings	330	Conservation Landscape	Complete	N/A	N/A	Private	—	—
Klinken Rain Garden	331	Bioretention	Complete	N/A	N/A	Private	—	—
Little Magothy Beach Rain Garden	332	Bioretention	Complete	N/A	N/A	Private	—	—
Olde Severna Park Community Infiltration Trench	333	Infiltration	Complete	N/A	N/A	Private	—	—
1104 Little Magothy View Rain Garden	334	Bioretention	Complete	N/A	N/A	Private	—	—
40 Johnson Road Rain Barrel	335	Rain Barrel	Complete	N/A	N/A	Private	—	—
Old Herald Harbor Road Emergency Culvert Repair	336	Stream Stabilization	Complete			AACO	—	270,525
Patuxent River Road Emergency Culvert Repair	337	Stream Stabilization	Complete			AACO	—	275,000
1414 Ridgeway East Rain Barrels	338	Rain Barrel	Complete	N/A	N/A	Private	—	—
Shady Cove Natural Area Wetland	339	Living Shoreline	Complete	N/A	N/A	EPA Grant/ Private	—	—
Hammarlee Road SPSC	340	Outfall Stabilization	Complete	N/A	N/A	Private/ Developer	—	—
602 Hammonds Ferry Road SPSC	341	Outfall Stabilization	Complete	N/A	N/A	Private/ Developer	—	—

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.

Status:

Nontidal streams have become widely recognized for their crucial role in controlling nutrient loads to downstream waters. Stream restoration is 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 has 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 Environment Science (UMCES) and Anne Arundel County are collaborating on a research effort to determine nutrient loads and quantify load reductions in degraded versus restored streams. Information obtained from this effort would be applicable to calculation of nonpoint source nutrient load reductions resulting from stream restoration project implementation. Total suspended sediment loads were also evaluated, but those data were not available in time for this report.

During the initiation of this research effort, UMCES surveyed eight streams (**Exhibit 6, Table 16**) with varying nitrogen and phosphorus inputs and different water pathways within the County. Headwater and lowland boundary streams were chosen for the study; headwater streams 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 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. Monitoring at the headwater sites was discontinued during the 2010 reporting period. Location information for each monitoring site is included in the **Appendix A** database. It should be noted that the format of the reporting for this work is different than in prior years. The results presented here will not be directly comparable with past results as the data were reinterpreted over a different standard time period (the USGS water year) to allow year over year comparisons. Also, to standardize the comparisons, loading results are presented in kilograms per day for each site. Additionally, the summary results presented here are only part of a much

larger body of work. Occasional reference is made to some of this work in the Conclusions part of this discussion, but in the interest of brevity, it is not thoroughly discussed elsewhere. Finally, the monitoring work associated with this project has essentially ended. Consequently, this discussion will be the final summary of results and will not be continued into the next reporting period.

Table 16: Summary of Sampling Sites

Sample Station	Years Sampled	Sampling Type		Parameters Sampled ¹
		Average Flow	Storm Flow	
Headwater Sites				
Weems-Mall ²	2007-2010	X		TN, NO ₃ , NH ₄ ,DON, PN, TDP
Weems-Moreland	2007-2008	X		TN, NO ₃ , NH ₄ ,DON, PN
Weems-Bristol ²	2007-2010	X		TN, NO ₃ , NH ₄ ,DON, PN, TDP
Picture Spring ²	2007-2010	X		TN, NO ₃ , NH ₄ ,DON, PN, TDP
Tidal Zone Sites				
Howard's Branch ³	2007-2011	X	X	TN, NO ₃ , NH ₄ ,DON, PN, TSS, TDP, PO ₄
Wilelinor ³	2007-2011	X	X	TN, NO ₃ , NH ₄ ,DON, PN, TSS, TDP, PO ₄
Spa-Restored ⁴	2007-2008, 2010-2011	X		TN, NO ₃ , NH ₄ ,DON, PN, TSS, TDP, PO ₄
Spa-Unrestored	2007-2008	X		TN, NO ₃ , NH ₄ ,DON, PN

NOTES:

1. TN = total dissolved nitrogen, NO₃=dissolved nitrate/nitrite, NH₄= dissolved ammonium, DON= dissolved organic nitrogen, PN = particulate nitrogen, TSS= total suspended solids, TDP = total dissolved phosphorus, PO₄ = dissolved orthophosphate
2. TP sampled only from January 2009 to March 2010.
3. TP sampled only from January 2009 to March 2011, PO₄ sampled only from April 2010 to March 2011.
4. TP and PO₄ sampled only from April 2010 to March 2011.

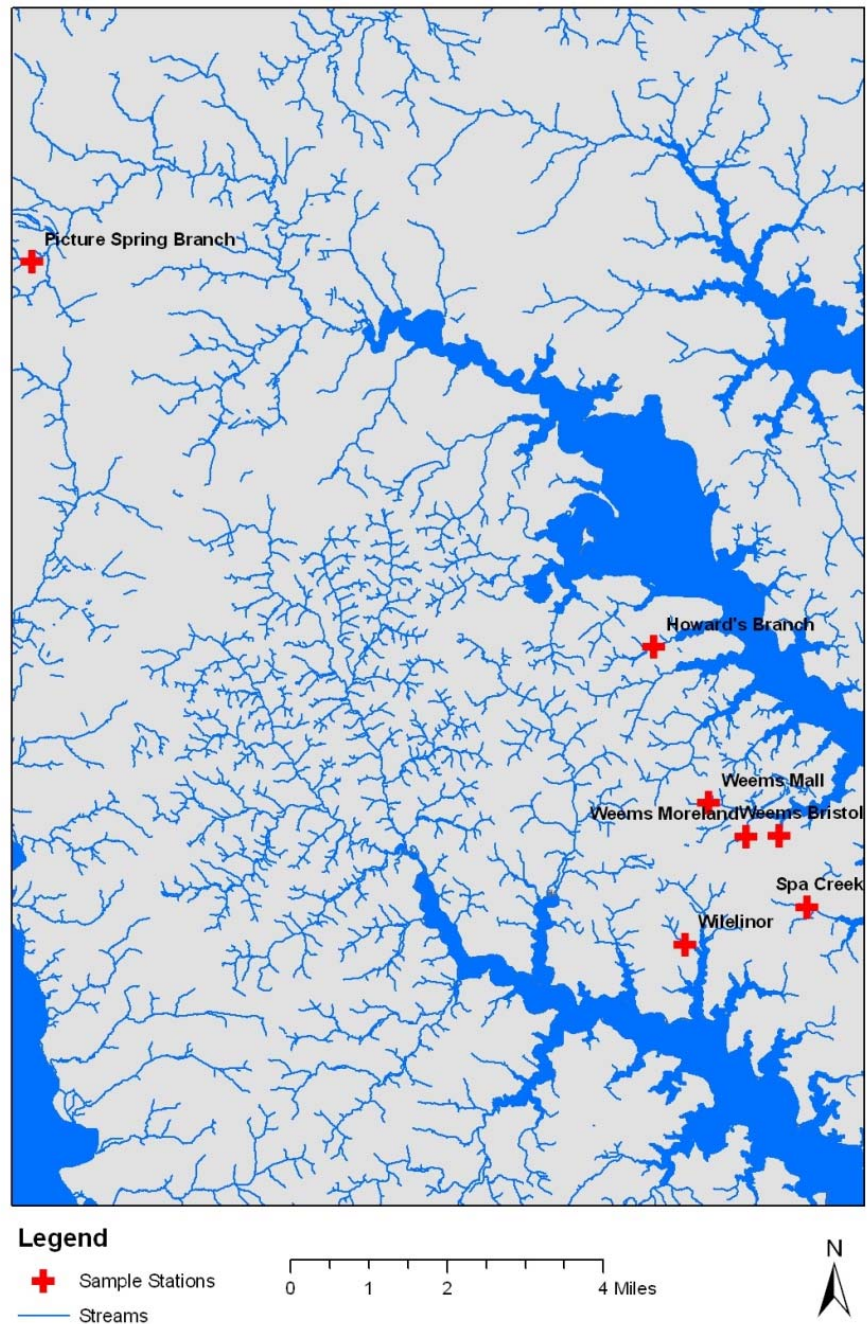


Exhibit 6: Anne Arundel County Stream Restoration Monitoring Site Locations

Each site in **Table 16** had samples taken at the upstream and downstream ends of the restored reach, which were analyzed for the listed parameters. Any differences in nutrient flux between upstream and downstream sites were assumed to be related to processes occurring within the reach associated with restoration activities. At all sites, water samples were collected during average flow conditions over the time periods listed

in **Table 16**. Average flow condition was defined as periods of low to moderate flows judged as minimally impacted by precipitation. Usually, such samples were collected at least two days after a given storm event, when the flow record had returned to near baseflow conditions. Storm flow samples were also collected at the sample reaches listed in **Table 16**. Storm samples were collected using either manual grab sampling or via automated water quality sampling equipment (ISCO 6712 sampler).

Stream flows were estimated using a stage-discharge relationship developed for each site, which was based upon direct discharge measurements made several times at each station over a variety of flow conditions. Continuous stream level records were collected and the rating equation derived from this relationship was used to compute stream discharge over the period of record. Rainfall data were also collected at selected stations.

As summarized in **Table 17**, the average daily nitrogen loading rates during average flow conditions in headwater streams varied considerably with landscape position of the restoration work, with clear reductions associated with restoration implemented in tidal versus headwater sites. The unrestored headwater control site (Picture Spring Branch) had an average loading rate of 0.80 kg/day, with an increase of about 186 percent over the loading rate observed at the upstream end of this reach. The restored headwater sites mostly followed this pattern, with the Moreland site showing the only average decrease (from 0.12 kg/day at the upstream end versus 0.10 kg/day at the downstream end, a decrease of approximately 16 percent). The Mall and the Bristol headwater sites experienced increases from upstream to downstream of 425 percent and 325 percent, respectively. Conversely, all restored sites in tidal areas showed nitrogen load reductions ranging from about 7 percent (Wilelinor) to 49 percent (Spa-Restored). The unrestored tidal control showed an average increase of about 84 percent (from 0.19 kg/day to 0.35 kg/day) from top to bottom over the assessment period.

In addition to total nitrogen reductions, the dominant forms of nitrogen changed when moving from upstream to downstream through the restoration reaches. Generally speaking, much of the nitrogen entered the reaches as nitrate and was transformed into various types of organic and particulate nitrogen and ammonium. There are implications associated with this transformation, which are discussed in the Conclusions section.

A similar pattern was observed in phosphorous delivery. An examination of **Table 18** shows that uniform increases occurred amongst headwater sites, regardless of restoration status. Increases in phosphorus flux ranged from about 4 to 14 times input values. In tidal sites, reductions in phosphorus flux were observed at all restored sites, which ranged from 33 percent (Howard's Branch) to 67 percent (Spa-Restored). At the unrestored control site (Spa-Unrestored), phosphorus flux increased from 0.005 kg/day at the upstream end to 0.008 kg/day at the downstream sample site, an increase of approximately 60 percent.

Table 17: Summary of total nitrogen flux for all sites (Units are kg/day)

	2007-2008		2008-2009		2009-2010		2010-2011 ¹		All Years Average	
Headwater Sites	In	Out	In	Out	In	Out	In	Out	In	Out
Mall	0.05	0.25	0.04	0.17	0.04	0.20	-	-	0.04	0.21
Moreland	0.15	0.13	0.08	0.07	-	-	-	-	0.12	0.10
Bristol	0.26	0.30	0.26	0.35	0.31	0.47	-	-	0.28	0.37
Picture Spring	0.49	1.32	0.10	0.36	0.24	0.71	-	-	0.28	0.80
Tidal Sites										
Howard's Branch	0.62 ²	0.75	1.52	0.74	1.21	0.79	0.37	0.29	0.93	0.64
Wilelinor	1.06	1.29	0.96	1.15	1.64	1.19	0.59	0.31	1.06	0.99
Spa-Restored	0.45	0.21	0.26	0.16	0.68	0.32	0.20	0.15	0.41	0.21
Spa-Unrestored	0.21	0.43	0.16	0.27	-	-	-	-	0.19	0.35

1. Based upon six months of data, from October 2010 to March 2011
2. Based on five months of discharge data.

Table 18: Summary of total dissolved phosphorus flux for all sites (Units are kg/day)

	2007-2008		2008-2009		2009-2010		2010-2011 ¹		All Years Average	
Headwater Sites	In	Out	In	Out	In	Out	In	Out	In	Out
Mall	-	-	-	-	0.0001	0.0010	-	-	0.0001	0.0010
Moreland	-	-	-	-	-	-	-	-	-	-
Bristol	-	-	-	-	0.0002	0.0030	-	-	0.0002	0.0030
Picture Spring	-	-	-	-	0.0003	0.0016	-	-	0.0003	0.0016
Tidal Sites										
Howard's Branch	-	-	0.010	0.005	0.031	0.017	0.010	0.006	0.018	0.012
Wilelinor	-	-	-	-	0.030	0.012	0.016	0.003	0.023	0.008
Spa-Restored	-	-	0.004	0.005	-	-	0.002	0.004	0.003	0.005
Spa-Unrestored	-	-	0.005	0.008	-	-	-	-	0.005	0.008

1. Based upon six months of data, from October 2010 to March 2011

Conclusions

While there is some variation among sites, the results of this work allow for the following general assessments to be made:

Landscape Position Matters

Projects located near the tidal interface were able to remove nutrients more consistently across sample years than headwater sites. For example, two out of three restored lowland streams (Howard's Branch and Wilelinor) reduced loads of both N and P during storm flow conditions on average across all study years. The same cannot be said about projects located in headwater areas. With the exception of the Moreland site, all such projects were net exporters of N and P. As there are no pre-restoration water quality data on these projects, however, it cannot be determined if the restoration activities in the headwater reaches had a positive or negative impact compared to pre-restoration conditions.

Restoration Design Matters

Projects that enhanced connectivity of the stream to its surrounding floodplain retained and processed more nutrients than those where restoration activities were mostly confined to the active channel for the purposes of enhanced physical stability.

Nitrogen Transformation and Restoration Design

The tidal projects typically consist of turning an entrenched stream reach into a series of wetland pools interconnected by single thread stream channels, all hydrologically connected to a surrounding floodplain of varying width where such connectivity did not exist or existed only during the largest storm events experienced by the system. This approach enhances retention time of stream water within the project reach, believed to be a primary driver of the reductions in nutrient loading observed in this work. However, the complex water quality conditions created by these project designs may not always result in optimum permanent nitrogen losses via denitrification. Often times, these streams transform large amounts of nitrogen into organic and particulate forms, which can be exported downstream and into the estuary. Also, anoxic conditions created in deep retention ponds may prevent nitrification of ammonium and thus denitrification.

Groundwater Inputs

Limited data on ground water inputs at some of the projects suggest that continuous inputs of shallow ground water in addition to remineralization in the stream channel can add significant amounts of nutrients to these systems, which may account for some of the increase as you move from upstream to downstream at some of these reaches.

Upland Management Still Necessary

While impressive reductions are possible, tracer studies done during this project suggest that there is an upper limit to the nutrient processing capacity of restored streams. If inputs associated with developed land continue to increase, it is unlikely that streams will be able to increase their capacity to process nitrogen at increasing rates in order to effectively reduce loads to downstream waters. While stream restoration approaches like

these can potentially improve nutrient uptake and reduce fluxes to downstream waters, their effectiveness can be maximized if combined with upland BMP installation in a holistic approach to pollutant control in these watersheds.

1. Watershed Restoration Assessment

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

a. Chemical Monitoring

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

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

- iv. Continuous flow measurements shall be recorded at the in-stream monitoring station or other practical locations based on an approved study design. Data collected shall be used to estimate annual and seasonal pollutant loads and for the calibration of watershed assessment models;*

Status:

Anne Arundel County continues to conduct a long-term monitoring program to satisfy the above permit conditions. This monitoring program includes chemical, biological, and physical monitoring in the Church Creek subwatershed located in the South River Watershed. Monitoring for this permit year extended from November 2010 through

October 2011. The full Church Creek monitoring report can be found in **Appendix B** and the data required to support this section are also provided in **Appendix B** in the prescribed format.

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

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

During the 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 plus Hardness, which will be a requirement in the fourth generation NPDES MS4 Permit.

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

Over several years of monitoring, the EMCs for many of the parameters are fairly consistent; however, during the redevelopment of the Annapolis Towne Centre, many of the EMCs increased dramatically. This coincides with documented discharges of sediment-laden stormwater from the construction site. Following completion of the construction, substantial reductions in many of these EMCs were found. The reductions continued beyond historic preconstruction levels. During the 2010 reporting year, however, EMCs for many of the parameters stabilized, and remained fairly consistent through 2011.

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

b. Biological Monitoring

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

Status:

A total of four 75-meter biological monitoring reaches are positioned along Church Creek between the Annapolis Towne Centre outfall and the Church Creek in-stream chemical monitoring station. Benthic macroinvertebrate samples were collected from these stations in March 2011, 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 2011 sampling period indicate that biological conditions within the Church Creek study area continue to be impaired by urbanization within the surrounding watershed. Since 2006, all stations have consistently been rated as either 'Poor' or 'Very Poor.' The number of EPT taxa, the number of *Ephemeroptera* and the percent *Ephemeroptera* were low for all stations. In general, the lack of instream woody debris and stable epifaunal substrate prohibits the stream from supporting a diverse and healthy macroinvertebrate community, while high levels of dissolved solids indicate the presence of water quality stressors. These appear to be a few of the factors limiting the biological conditions within Church Creek. The results of the biological monitoring program are included in **Appendix B**.

c. Physical Monitoring

- i. A geomorphologic stream assessment shall be conducted between the outfall and in stream monitoring locations or in a reasonable area based on an approved study design. This assessment shall include an annual comparison of permanently monumented stream channel cross-sections and the stream profile;*
- ii. A stream habitat assessment shall be conducted using techniques defined by the EPA's "Rapid Bioassessment Protocol for use in Streams and Rivers," or other similar method; and*
- iii. A hydrologic and/or hydraulic model shall be used (e.g., TR-20, HEC-2, HSPF, SWMM, etc.) to analyze the effects of rainfall; discharge rates; stage; and, if necessary, continuous flow on channel geometry.*

Status:

Due to the highly altered conditions of the drainage area and stream channel in the study area, reliable bankfull indicators were often difficult to locate in the field, thus leading to a fair amount of professional judgment used to interpret the data and categorize the stream segments. This means that categorization of some of the stream segments may change dramatically from year to year. **Table 19** is a summary of each reach and its classification.

Table 19: Physical Characterization Summary

Reach	2010 Classification	2011 Classification	Notes
XS-1	E5 to C5	C4/5 to F4/5	Channel degradation, loss of floodplain connectivity, and widening indicate this channel is not stable.
XS-2	E5	G5c	Actively degrading and widening with lack of sinuosity; shifting to a less-stable form.
XS-3	G5c	Not classified	This section was recently restored with modification to the channel dimensions, so it was deemed inappropriate to classify.
XS-4	E6	E5	Low entrenchment, low width/depth ratio, low slope, and well-connected floodplain.
XS-5	C3/5	C3/5	Slight entrenchment, moderate width/depth ratio, and low sinuosity.

There are indications of channel instability in the upper reaches, and thus, a need for additional stormwater management to prevent further erosion. The physical and habitat assessments of Church Creek are included in the *Chemical, Biological, and Physical Characterization of the Church Creek and Parole Plaza NPDES Monitoring Stations: 2011*, located in **Appendix B**.

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

compared to those levels in the drainage areas used to develop the regional relationship data.

d. Annual Data Submittal

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

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

Status:

The required EMCs and monitoring database are found in **Appendix B**. This database has been revised from previous versions to comply with the recent update to the database formatting requirements provided by MDE with the draft fourth generation Permit. Also included in this Appendix is the report entitled *Chemical, Biological, and Physical Characterization of the Church Creek and Parole Plaza NPDES Monitoring Stations: 2011*, which provides greater detail on the work performed in this watershed.

During the 2012 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 2011, these cross sections were re-measured and longitudinal profile surveys were conducted along both the North Tributary (totaling 1,935 linear feet) and South Tributary (totaling 366 linear feet). Channel dimensions along the North Tributary have not changed substantially from baseline conditions, although some minor aggradation was noted. However, two of the cross sections along the South Tributary experienced a significant increase in cross sectional area (52 and 22 percent). The channel in this section appears to be down-cutting, and is undermining the right bank. If conditions continue to worsen in this location, some stabilization may be required.

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

In March 2011, 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, and conditions in 2011 were unchanged from 2010. The 2011 results for the three sites include two "Poor" ratings and one "Fair" rating.

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

I. Program Funding

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

Status:

On-going funding for NPDES MS4 Permit compliance is addressed primarily through the County Capital Improvement Program (CIP). Funding for this County fiscal year (FY2012) and the next five fiscal years is allocated to the “Stormwater Runoff Controls” and “Water Quality Improvements” CIP classifications. Specific line items funded through the CIP include stormwater permit compliance program, storm drain rehabilitation, closed storm drain repairs and replacement, stormwater infrastructure inspection and maintenance, stormwater facility retrofits, outfall repairs, and stream and ecological restoration projects. The budget for these project classes for FY2012 and the projected budgets for FY2013 through FY2017 total \$34,778,000. **Table 21** and **Table 22** denote the allocation of these funds by project.

The Anne Arundel County operating budget for FY2012 also provides permit compliance support through funding of personnel services (i.e., staff) associated with permit compliance. Such support is derived primarily from the County’s Office of Planning and Zoning, Department of Inspections and Permits, Soil Conservation District, Department of Public Works, Office of Law, and the County Health Department. Each of these agencies has responsibility or provides support for certain permit requirements and all must work collaboratively to achieve County compliance with permit terms. Review of FY2012 operating budget allocation to each agency, combined with knowledge of MS4 compliance responsibility, indicates approximately \$11,600,000 budgeted to support permit compliance in FY2012.

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

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

Status:

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

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

The full CIP budget allocations are shown in **Table 21** and **Table 22**.

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

Table 20 denotes the distribution of funding from the County's FY2012 Capital and Operating Budgets. This table is provided in the format that will be required under the next generation NPDES MS4 Permit. In some instances, fields are reported in a combined manner (e.g., property management, inlet cleaning, street sweeping, other road maintenance funding is combined). Additionally, some fields (e.g., TMDL Assessment) are not yet separate permit conditions; thus, funds allocated toward these requirements are spread throughout other permit conditions (e.g., watershed assessment).

Table 20: Fiscal Analysis

Permit Condition	Fiscal Year 2012	Comments
Permit Administration	\$265,000	
Legal Authority	\$503,000	
Source ID	\$318,850	
SW Management	\$4,974,000	
Erosion and Sediment Control	\$2,240,500	
Illicit Discharge Detection and Elimination	\$503,200	
Trash and Litter Control	\$279,000	
Property Management	\$1,352,200	Reflects combined costs for maintaining compliance with stormwater general permit coverage as well as program costs for County facility maintenance activities associated with street sweeping, inlet cleaning, de-icing activities, etc.
Inlet Cleaning		
Street Sweeping		
Other Road Maintenance		
Public Education	\$928,500	

Table 20: Fiscal Analysis

Permit Condition	Fiscal Year 2012	Comments
Watershed Assessment	\$1,195,000	
Watershed Restoration	\$5,700,000	
Chemical Monitoring Assessment	\$1,405,000	Reflects combined costs for compliance with “Assessment of Controls” permit condition
Biological Monitoring Assessment		
Physical Stream Assessment		
Stormwater Design Manual Monitoring		
TMDL Assessment	n/a	Not currently a permit requirement. Components of this future requirement are addressed in Watershed Assessments and Watershed Restoration permit conditions, as well as Public Education permit conditions.
Total Annual Cost for NPDES MS4 Program	\$19,664,250	

Table 21: Fiscal Table – Stormwater Runoff Controls

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

Table 22: Fiscal Table – Water Quality Improvements

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

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