



CHARLES COUNTY MARYLAND
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**NPDES ANNUAL REPORT
JULY 2010 - JUNE 2011**

Charles County Government
Department of Planning and Growth Management

CHARLES COUNTY, MARYLAND
MUNICIPAL SEPARATE STORM SEWER DISCHARGE PERMIT

02-DP-3322 (MD0068365)

CONTENTS

I.	Introduction	1
II.	Definitions	2
III.A.	Permit Administration	2
III.B.	Legal Authority	3
III.C.	Source Identification	4
III.D.	Discharge Characterization	9
III.E.	Management Programs	22
III.F.	Watershed Restoration	37
III.G.	Program Funding	51
III.H.	Assessment of Controls	54
IV.	Special Programmatic Conditions	60

TABLES

Table 1: Number of Samples for Chemical Monitoring

Table 2: Annual Average Flow-Weighted EMC & No. of Events Sampled, Site 002

Table 3: Annual Average Flow-Weighted EMC & No. of Events Sampled, Site 001

Table 4: Observed Pollutant Removal Efficiencies: 2010-2011 Reporting Year

Table 5: Field Assessment Dates

Table 6: Acton-Hamilton Geomorphic Assessment Results

Table 7: Acton-Hamilton Instream Water Quality and Habitat Assessment Data

Table 8: Summary of Stormwater Management Facility Inspections

Table 9: Summary of Fiscal Year 2011 SWM Credits for Residential Building Permits

Table 10: Field Screening Results for Priority Outfalls

Table 11: Outfall and Inlet Repair Projects

Table 12: Stream Restoration and Stormwater Management Pond Repairs

Table 13: County Facilities with NPDES Permits

Table 14: Prioritized Management Practices for Watershed Restoration

Table 15: Watershed Restoration Action Plan and Progress

Table 16: Watershed Restoration Details for Carrington Projects

Table 17: Education and Outreach Projects

Table 18: Program Funding – Fiscal Years 2003 through 2011

Table 19: Charles County Planning Division Staff Hours

Table 20: Capital Improvements Program Expenditures

Table 21: Fiscal Year 2011 Capital Improvement Program for NPDES Retrofits

Table 22: Capital Improvement Program Appropriations per Year

Table 23: EMC Data (mg/l)

Table 24: Estimates of Pollutant Loading (lb/yr)

Table 25: County-wide Pollutant Loading Reductions (lb/yr)

Table 26: Surrogate Parameters

FIGURES

Figure 1: Impervious Area Delineation

APPENDIXES

Appendix A: SWM Facilities Completion Database

Appendix B: Chemical Monitoring Data

Appendix C: Stream Monitoring Report

Appendix D: Technical Memorandum: North Point High School Pond Outfall

Appendix E: SWM Facilities Found Unacceptable

Appendix F: SWM Facility Inspections During Calendar Year 2010

Appendix G: Illicit Discharge Screening Report

- Appendix H: Illicit Discharge Investigations
- Appendix I: Construction Permits for Earth Disturbances Greater Than 1 Acre
- Appendix J: Fiscal Year 2012 Approved Budgets
- Appendix K: Pollutant Loads and Reductions
- Appendix L: Additional County Activities

DIGITAL DATA (ATTACHED CD)

GIS Data (shapefiles)

- Best Management Practices
- Non Structural Best Management Practices
- Best Management Practices Treated Area
- Forest Conservation
- Storm Drain Structures, Pipes and Outfalls
- Outfall Drainage Areas
- Development Plan Index (PGM Index)

Chemical Monitoring Data

- Flow Data (Excel)
- 2010 – 2011 Event Mean Concentrations (Excel)

Urban BMPs

- SWM Inventory (Access)

Illicit Discharge Data

- Map (pdf)
- Matrix (Excel)
- Photos (jpg)

PLOAD Data

- 2010-2011 EMC Update (Excel)
- PLOADS 2011 (Excel)

Other Data (pdf)

- Final Report
- Appendixes

I. Introduction

Charles County, Maryland received its second National Pollutant Discharge Elimination System permit on July 31, 2002 for Municipal Separate Storm Sewer Discharge (Permit No. 01-DP-3322). This permit covers stormwater discharges from the municipal separate storm sewer system within the Development District. As part of this comprehensive water quality control permit, the County is required to report to the Maryland Department of the Environment, Water Management Administration (MDE/WMA) annually regarding the status and progress of the permit conditions.

On June 7, 2010, the MDE/WMA completed a review of Charles County's 2006-2009 Annual Reports for the National Pollutant Discharge Elimination System (NPDES) municipal stormwater program. Overall the evaluation noted significant progress with many of the requirements, including using the latest technology for its geographic information system (GIS) database, implementing monitoring programs to assess the performance of restoration projects, and developing long range plans to meet restoration goals. Additionally, the County was commended by MDE/WMA for its efforts to incorporate various elements of the NPDES program to identify key problems, develop and implement plans to improve water quality, and evaluate the success of restoration activities.

Charles County's NPDES permit is for the five year period ending July 31, 2007. MDE/WMA was delayed in reissuing permits due to legal actions surrounding Montgomery County's permit. In September 2010 MDE/WMA submitted a draft permit to Charles County for review. Since September 2010, EPA has done at least two rounds of review and comments on the draft permits to MDE/WMA. Because the Charles County permit is not yet reissued operation continues under the current permit.

This report summarizes the actions taken by the County to fulfill the requirements for the ninth year of the NPDES permit. Following each permit condition is a description of the work completed during the reporting year. The sections of the report are numbered to correspond with the permit numbering.

Activities for the permit year have continued to focus on working with a consultant to assist with the technical work needed to meet the permit conditions, including stream and outfall monitoring, GIS-related work for source identification, illicit discharge investigations, and watershed restoration. KCI Technologies, Inc., headquartered in Sparks, Maryland, worked under an extended contract to complete these tasks until the County is issued a new permit.

This permit year, Charles County has made several important efforts, which support permit activities and should be recognized. New accomplishments include:

- contracting KCI Technologies, Inc. for a fourth year extension of permit tasks;
- completing a third watershed restoration study;
- contracting Vista Consulting, Inc. to design and engineer watershed restoration projects in various neighborhoods per RFP 11-09;
- maintaining Environmental Service Fee funding of Watershed Restoration Projects;
- adopting the interim Water Resources Element of the Comprehensive Plan;
- continuing coordination with the Potomac Heights Homeowners Association and their engineer to incorporate water quality improvements with the Association's planned drainage improvements;
- beginning implementation of U.S. Army Corps of Engineers recommendations for improvements in neighborhoods with flooding and severe stream erosion issues;
- contracting with U.S. Geological Survey to prepare a Scientific Investigations Report to summarize and analyze the trends found in 10 years of monitoring data from the Mattawoman Station; and
- coordinating the Phase II Watershed Implementation Plan local team.

Ongoing activities include: updating the NPDES MS4 information page on the County's website; partnering with the U.S. Geological Service to maintain a long-term, real-time monitoring station on the Mattawoman Creek; installing nitrogen removal technology on 91 septic systems with Bay Restoration Funding through May 2011; cooperating with the Environmental Protection Agency's partnership in developing the Watershed Resource Registry and continuing to pursue protection of the Mattawoman Creek Stream Valley as refined using Topographic Position Index by the Maryland Department of Natural Resources.

The above efforts are further described under Section IV. Special Programmatic Conditions.

II. Definitions

Terms used in this permit are defined in relevant chapter of the Code of Federal Regulations (CFR) or the Code of Maryland Regulations (COMAR). Terms not defined in CFR or COMAR shall have the meanings attributed by common use unless the context in which they are used clearly requires a different meaning.

III.A. Permit Administration

Overview of Permit Conditions

1. *By 7/31/2003, Charles County shall provide MDE with the names, titles, addresses, phone numbers, and functions of all primary administrative and technical personnel responsible for compliance with this permit.*

2011 Status

Three County staff have primary responsibility for compliance with this permit:

Mr. Steven Ball, Planning Director
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Ms. Karen Wiggen, Planner III
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III.B. Legal Authority

Overview of Permit Conditions

1. *By 7/31/2003, Charles County shall provide MDE with recertification from the County Attorney that it possesses the authority to directly perform the activities described in 40 CFR 122.26 (d)(2)(I), and this permit.*
2. *Charles County shall maintain adequate legal authority, 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.*

2011 Status

Recertification was provided by the County Attorney via a letter forwarded to Mr. Brian Clevenger of the Maryland Department of the Environment, Water Management Administration, dated June 19, 2003. A copy of this letter was included in the 2003 NPDES Annual Report.

The County will maintain adequate legal authority throughout the term of this permit, and in the event that any provision of its legal authority is found to be invalid, the County will make the necessary changes to maintain adequate legal authority.

III.C. Source Identification

Overview of Permit Conditions

1. *By 7/31/2003, Charles County shall submit an example of its Geographic Information System (GIS) capabilities that includes the identification of all data layers available, the stage of development, metadata, and a description of how data are stored, accessed, and used. The example shall include the following information:*
 - a. *Geologic features: topography, soils, steep slopes, etc.*
 - b. *Land use: existing and planned based on present zoning or current master plans, public and private ownership, and population density.*
 - c. *Resources: streams, stream buffer areas, floodplains, wetlands, forests, forest conservation areas, areas of special concern*
 - d. *Infrastructure: storm drain systems, including major outfalls, inlets, appurtenant conveyances, and associated drainage areas; stormwater management facilities; sanitary sewer systems within the resource areas identified in Part III.C.1.c above; and chemical, physical, and biological monitoring sites.*
 - e. *Significant discharges: sewage treatment plants, industrial operations, hazardous waste sites, landfills, NPDES permitted sites (both point source and stormwater permittees), impervious areas (e.g. roads, parking lots, and rooftops), known as problem areas (e.g. flood prone or water quality impaired areas), and estimated pollutant loads; and*
 - f. *Schedule: time-frame for completing GIS development County-wide.*

2011 Status

In 2003 the County submitted an example of its GIS capabilities and continues to update this information each year. The enclosed CD contains the most recently updated versions of the

County's NPDES-related GIS data. All coverages are in ArcView shapefile format, projected to Maryland State Plane coordinates in NAD83 datum in meters. Metadata is also included for these coverages.

In Spring 2004 Charles County partnered with the Maryland Department of Natural Resources to obtain county-wide Light Detection and Ranging (LIDAR) topographic data and 2' contours at a reduced cost. The County's previous, 1993, 5' contours are for the Development District only. The 2' contours in GIS format became available to County staff in December 2005. Additionally, the Charles County Department of Emergency Services obtained 2004 orthophotography at 1' pixel resolution and digitized outlines of buildings. In 2008, the 2007 orthophotography became available for use by County employees. The 2007 orthophotography is at a higher resolution than the 2004 orthophotography.

In fiscal year 2007 KCI Technologies, Inc. used Feature Analyst software to estimate the impervious surface based on the 2004, 1' pixel full color orthophotography of the County. In fiscal year 2009 KCI again used Feature Analyst software to estimate the impervious surface based on the higher resolution 2007 full color orthophotography. Due to the higher resolution of the new aerial photos, additional impervious surface was captured by the software.

Feature Analyst is sophisticated computer software that can find features of interest in digital imagery. It provides robust capabilities for feature extraction within the ArcGIS environment utilizing standard satellite and aerial orthophotography. The impervious surface extraction requires access to current, high quality aerial orthophotography. Feature Analyst setup requires establishing training samples of the desired impervious features. The software uses these samples to automatically extract all similar regions by "learning" the samples spectral and neighborhood characteristics. Through repeated application of the Feature Analyst software, the extraction criteria are iteratively refined, thus improving results. Combining and separating classes at intermediate stages of the operation allows complex class definitions that build upon previous class definitions. This is especially useful for the extraction of features such as roads where the shape of the roads are consistent across the scene, but the image radiometry varies due to shadows, reflections, or different pavement materials. This interactive learning process is stored in an associated "learning" file which can be reused to process different sections of the orthophoto tiles. The output of the extraction process is a polygon shapefile.

Utilizing Feature Analyst, an impervious features layer for Charles County was created in support of the NPDES program. This effort utilized 2007 County orthophotography as the base imagery layer. To begin the process, a trainer file was created to target impervious features in the aerial base imagery. Once it was determined that the trainer produced satisfactory results, each image tile was processed with the Feature Analyst software to output an impervious polygon feature class. These output layers were then further processed in ArcGIS to create a seamless impervious polygon vector layer for the County. Figure 1 below shows an example of the impervious area delineation prepared by Feature Analyst.

Figure 1: Impervious Area Delineation



In February 2006 Charles County began requiring digital submittals of as-built drawings by the surveyors and engineers as described in County Green Notice 05-37. These drawings are posted on the County's intranet for use by County employees and for mapping BMPs. In 2011, 25 projects were added to an index map linking the permit number to the shapefile. To date, 1,271 projects have been located on a Department of Planning and Growth Management (PGM) index map.

2. *By 7/31/2003, Charles County shall submit its database identifying major outfalls. Data shall be submitted on CD-ROM(s) and include all major outfalls, associated inlets, appurtenant conveyances, drainage areas, and private storm drain systems.*

2011 Status

This information was included in the County's June 2002 to July 2003 annual report.

3. *Charles County shall compile any new source identification information on a continual basis and summarize the data collection in its annual reports.*

2011 Status

Updates of storm drains and SWM facilities were completed for 23 development plans constructed in the Development District and surveyed for as-built conditions in fiscal year 2011. This included the addition of 14 commercial developments, 4 industrial developments, and 5 residential developments.

Since 23 development plans were completed in FY 2011, the remaining effort was directed towards updating storm drains and SWM facilities in the field using GPS and aerial photography. Several phases of residential development within the Highgrove and Kingsview neighborhoods located along Billingsley Road were selected to be updated in the field. Storm drains and SWM facilities were identified on the aerial photo and verified in the field. Any storm drains or SWM facilities located in the field, but not discernable on the aerial photo were captured using GPS.

NPDES Major Outfall Revisions:

- Two major outfalls were added to the database in fiscal year 2011:
 - Major Outfall #231 – Drains a portion of the Sheffield residential development located near the intersection of St. Charles Parkway and Billingsley Road.
 - Major Outfall #232 – Drains a portion of the Acton Lane Industrial Park located at the end of Acton Lane.
- Drainage areas for major outfall #231 and #232 were added in fiscal year 2011. No other major outfall drainage areas were adjusted in fiscal year 2011.

BMP Mapping:

In fiscal year 2011, existing Best Management Practices (BMPs) were located and mapped utilizing County delivered Planning and Growth Management (PGM) as-built drawings and aerial photos/GPS within the Development District of Charles County. Digital as-built drawings were reviewed for content, if a BMP was identified; then it was digitized and attributed based on the information contained on the PGM drawing. For fiscal year 2011, a total of 40 structural BMPs and 11 non-structural BMPs were mapped from PGM as-built drawings and 14 structural BMPs were mapped using aerial photos/GPS.

In an attempt to create and manage GIS BMP data for Charles County, it was determined that a process was needed to correct a large imbalance between the County's BMP database and the corresponding GIS BMP shapefile attributes. At the end of fiscal year 2007 there were approximately 936 BMP records in the County database compared to only 525 mapped BMPs in the shapefile with regards to the Development District. Despite the large difference in numbers, many of the 525 shapefile records did not contain specific attributes about each BMP/PGM that could be found within the County BMP database, indicating that many of the BMP shapefile features could not be linked to the BMP database or vice versa.

In fiscal year 2007, a link between the County BMP database and the BMP shapefile was created. This link consisted of a unique BMP identifier that was maintained in both the database and the GIS. The goal of implementing a unique identifier was to allow for matching shapefile features with database records or vice versa, so that correlations can be made. By assigning each BMP a unique ID, the County is able to identify which BMPs are not mapped so that field verification or PGM research can be carried out. The unique ID was created by using the PGM number found on each set of drawings and a sequential number. The sequential number was utilized for sets of drawings with more than one BMP. The unique ID was used to populate a common BMP_ID field in the County BMP database and BMP shapefile establishing a link between database record and shapefile feature.

For fiscal year 2011, an additional 14 BMP shapefile features were assigned a unique ID attribute while 40 additional BMP features were not assigned a unique ID. At this time, there are 689 BMP features contained within the BMP shapefile compared to 1183 BMP records in the County database. This difference is mainly due to the BMP shapefile only comprising the development district while the BMP database includes the entire County.

4. *Annually, Charles County shall submit stormwater management facility construction completion data for MDE's Urban Best Management Practice database.*

2011 Status

The current database of BMP information is included in Appendix A and on the attached CD. It shows a total of 1183 BMPs, an increase of 102 from the 1081 shown in the records for fiscal year 2010.

III.D. Discharge Characterization

Overview of Permit Conditions

- I. *Annually, Charles County shall perform long-term discharge characterization monitoring of an outfall and an associated in-stream monitoring station using the following minimum requirements for chemical, biological, and physical monitoring:*
 - a. *For Chemical Monitoring:*
 - i. *Monitoring shall be performed in the Zekiah Swamp watershed at the outfall and its associated in-stream station in the St. Charles area to characterize runoff from commercial land use;*
 - ii. *Continuous flow measurements shall be recorded at the in-stream monitoring station. These data shall be used to facilitate annual and seasonal pollutant load estimates;*
 - iii. *Twelve (12) storm events shall be monitored per year at the outfall and in-stream monitoring locations with at least three (3) occurring per quarter. Quarters shall be based on calendar year. If extended dry weather periods occur, base flow samples shall be taken at least once per month at the in-stream monitoring station, and if flow is observed, at the outfall;*
 - iv. *Discrete samples of stormwater flow shall be collected at the outfall and in-stream monitoring stations using automated or manual sampling methods. Measurements of pH and water temperature shall be taken; and*
 - v. *At least (3) samples determined to be representative of each storm event shall be submitted to a laboratory for analysis according to the methods listed under 40 CFR, Part 136 and event mean concentrations (EMCs) shall be developed for the following parameters;*

<i>Biochemical Oxygen Demand (BOD₅)</i>	<i>Total Cadmium</i>
<i>Total Kjeldahl Nitrogen (TKN)</i>	<i>Nitrate plus Nitrite</i>
<i>Total Petroleum Hydrocarbons (TPH)</i>	<i>Total Phosphorus</i>
<i>Total Copper</i>	<i>Total Phenols</i>
<i>Total Zinc</i>	<i>Fecal Coliform</i>
<i>Total Suspended Solids (TSS)</i>	<i>Total Lead</i>
<i>Oil and Grease (Optional)</i>	
 - b. *For Biological Monitoring*
 - i. *Monitoring shall commence with the chemical monitoring; and*
 - ii. *The stream reach between the outfall and the in-stream monitoring station shall be monitored each Spring and Fall using the U.S. Environmental Protection Agency's (EPA) Rapid Bioassessment Protocol III or other method approved by MDE.*

- c. *For Physical Stream Assessment:*
 - i. *A geomorphologic stream assessment shall be conducted in the stream reach between the outfall and in-stream monitoring station. This assessment shall include, at a minimum, an annual comparison of permanently monumented stream channel cross-sections, an annual comparison of the stream profile, and a stream habitat assessment using techniques as defined by the EPA's "Rapid Bioassessment Protocol for use in Wadeable Streams and Rivers," or other similar method approved by MDE; and*
 - ii. *Annually, a hydrologic and/or hydraulic model shall be used (e.g., TR-20, HEC-RAS, HSPF, SWMM, etc.) to analyze the effects of rainfall; discharge rates; stage; and, if necessary, continuous flow on channel geometry.*

2011 Status

Chemical Monitoring

Charles County continued the long-term chemical monitoring program at the Arthur Middleton Elementary School during the 2010-2011 reporting year. The monitoring period is for this reporting year extended from June 201 through May 2011.

In order to meet the requirements of the Watershed Restoration section of the MS4 permit, Charles County had identified the Arthur Middleton Elementary School as a suitable site for the installation of a stormwater management wetland, designed to treat the flow passing through the existing storm drain prior to its discharge into the stream channel.

The chemical monitoring program was established at the Arthur Middleton Elementary School in December 2005. The sampling stations were located within an inlet upstream of the proposed wetland and at an instream station below the storm drain outfall. The sites were established prior to the construction of the wetland to develop a pre-retrofit baseline for pollutant inflow to the receiving channel. The inlet was established as Site 002, and the instream stations was established as Site 001.

Sampling began at these sites on January 18, 2006, and continued until April 2, 2007, when the sampling array was removed as construction of the wetland began. Construction of the wetland was completed in April, 2008.

In August, 2008, sampling resumed at the Arthur Middleton Elementary School. The inlet was reestablished as the outfall site, and the concrete weir overflow was established as the instream

monitoring station.

A sampling array was permanently secured to the storm drain pipe within the inlet to collect continuous flow data. Flow data for the instream station was calculated by measuring the flow depth at the weir control structure for the wetland and computing the discharge from a rating table. As such, flow data is only available for the instream station for sampled events.

The number of samples to be collected during the 2010-2011 reporting year was reduced to four due to funding constraints. Samples were collected on June 3, 2010 and again on August 18, 2010. It was noted during these sampling events that conditions at the existing inlet (Site 002) were deteriorating; the grating was displaced and sinkholes were developing adjacent to the inlet structure. The deteriorating conditions were reported to the school, and temporary measures were adopted to address safety concerns.

Field crews mobilized for the third event, and noted that construction was ongoing at the site to repair the damage to the existing inlet and address the safety concerns. During the construction activities, the flow meter that had been installed in the inlet had been removed. Due to the ongoing construction of repairs at the site, further monitoring was unable to be conducted during the reporting year. Continuous flow monitoring data is available through August 2010.

Table 1: Number of Samples for Chemical Monitoring at the Arthur Middleton Elementary School Stations

Year	Month	Wet Weather Sample		Baseflow Sample	
		Outfall	Instream	Outfall	Instream
2006	January	1	1		
	February	1	1		
	March				
	April	1	1		
	May	1	1		
	June	1	1		
	July	1	1		
	August	1	1		
	September	1	1		
	October	1	1		
	November	1	1		
	December				
2007	January	1	1		
	February	1	1		
	March	1	1		
	April			1	1
2008	August	1	1		
	September	1	1		

Year	Month	Wet Weather Sample		Baseflow Sample	
		Outfall	Instream	Outfall	Instream
	October	1	1		
	November	1	1		
	December	1	1		
2009	January				
	February	1	1	1	1
	March	1	1		
	April	1	1		
	July			1	1
	August			1	1
2010	January	2	2		
	February	1	1		
	March	1	1		
	April	1	1		
	May	1	1		
	June	1	1		
	August	1	1		

The monitoring protocol consisted of three discrete samples, representative of the rising limb, peak, and falling limb of the storm hydrograph for each storm event, collected at each monitoring station. All samples were collected manually so that fecal coliform and Oil and Grease could also be analyzed. Temperature and pH were monitored in the field during sample collection. Atlantic Coast Labs of Newark, Delaware performed laboratory analyses. The combined results from the chemical monitoring for the current reporting year are contained in Appendix B and included on the CD in the NPDES database.

Event Mean Concentrations

Using the available flow data and laboratory results for each discrete sample collected at the sites, event mean concentrations (EMCs) were computed for each constituent. EMCs were weighted based on the depth of flow for each limb of the storm. Depth was recorded continuously at the outfall station, and during sampling events for the instream station. The chemical concentrations were multiplied by the flow depth, summed and divided by the total flow depth to compute a weighted average for each storm event.

If the parameter was not detected in the laboratory analysis, a value of zero was used for the low end of the possible range, and the detection limit was used for the high end of the range. The flow-weighted EMCs for each storm were then averaged to determine the average EMC for each parameter at each site. Average flow-weighted EMCs by calendar year for the Arthur Middleton Elementary School (Sites 001 and 002) are provided in Tables 2 and 3.

Table 2: Annual Average Flow-Weighted EMC and Number of Events Sampled, Site 002 – Arthur Middleton Elementary School

Year	TKN	NOx	TP	TSS	BOD	Pb	Cd	Cu	Zn	TPH	Phenols	O&G	Fecal Col.
	mg/L Events	MPN Events											
2006	1.73 10	0.67 10	0.29 10	24 10	16 10	0.011 10	0.001 10	0.007 10	0.062 10	2.7 10	0.03 10	3.50 10	4885 10
2007	0.95 4	1.17 4	0.13 4	72 4	5 4	0.022 4	0.001 4	0.011 4	0.049 4	3.3 4	0.03 4	3.27 4	157 4
2008	2.17 5	0.40 5	0.16 5	11 5	9 5	0.071 5	0.002 5	0.011 5	0.284 5	3.9 5	0.04 5	5.59 5	34402 5
2009	1.14 4	0.28 4	0.15 4	17 4	4 4	0.021 4	0.001 4	0.005 4	0.112 4	1.9 4	0.03 4	2.87 4	685 4
2010	1.73 8	0.71 8	0.27 8	68 8	10 6	0.007 8	0.001 8	0.009 8	0.057 8	2.6 8	0.04 8	3.15 8	18,794 8
NURP	2.35	0.960	0.47	140.0	11.0	0.180		0.050	0.180				
MDE	1.75	0.970	0.37	55.1	14.3	0.006		0.014	0.089				

Table 3: Annual Average Flow-Weighted EMC and Number of Events Sampled, Site 001 – Arthur Middleton Elementary School

Year	TKN	NOx	TP	TSS	BOD	Pb	Cd	Cu	Zn	TPH	Phenols	O&G	Fecal Col.
	mg/L Events	MPN Events											
2006	1.05 10	0.61 10	0.14 10	19 10	4 10	0.008 10	0.001 10	0.005 10	0.055 10	2.5 10	0.03 10	2.85 10	3564 10
2007	0.52 4	1.11 4	0.06 4	27 4	3 4	0.007 4	0.001 4	0.004 4	0.080 4	2.5 4	0.03 4	2.5 4	58 4
2008	0.46 5	0.05 5	0.06 5	7 5	2 5	0.003 5	0.001 5	0.002 5	0.018 5	2.4 5	0.02 5	2.6 5	3524 5
2009	0.95 4	0.06 4	0.08 4	9 4	15 4	0.004 4	0.001 4	0.004 4	0.019 4	1.9 4	0.02 4	2.1 4	109 4
2010	0.53 8	0.44 8	0.06 8	13 8	2 8	0.006 8	0.001 8	0.003 8	0.015 8	3.0 8	0.03 8	3.0 8	4,543 8
NURP	2.35	0.960	0.47	140.0	11.0	0.180		0.050	0.180				
MDE	1.75	0.970	0.37	55.1	14.3	0.006		0.014	0.089				

Discussion

The results of the laboratory analysis (both individual samples and EMCs) were reviewed for the storm and base flow events during the permit period. Findings are summarized below:

Inlet Site (002)

- pH at this sampling station is consistently low.
- A first flush effect was observed for biological oxygen demand (BOD) to a high degree, and for total suspended solids to a lesser amount.
- Cadmium, TPH, and phenols were not detected during any event. Lead was only detected in one sample. Oil and grease was only found in levels above the detection limit in one sample. The other contaminants were detected fairly regularly.
- All of the average EMCs for the sampling period were below literature values from the Nationwide Urban Runoff Project (NURP) taken in the early 1980s, as well as published MDE averages.

Instream Site (001)

- pH recordings at this sampling station were similar to the outfall station (002), suggesting the wetland is not affecting pH levels to a significant degree.
- All samples collected had concentrations below the detection limit for BOD, cadmium, lead, TPH, and phenols.
- No first flush effect was observed. The highest concentration sample for a contaminant during an event was just as likely to occur during the peak or falling limb as with the first flush.
- With the exception of lead, all the average EMCs for 2010 are below MDE averages and literature values from the Nationwide Urban Runoff Project (NURP) taken in the 1980s. The average EMC for lead was equal to the MDE average.
- All the average EMCs for the sampling period were below literature values from the Nationwide Urban Runoff Project (NURP) taken in the early 1980s, as well as published MDE averages.

Comparison Between Sites 002 and 001

The upstream monitoring site (002) is located upstream of the wetland. Since there have not been significant changes to the watershed over the course of the monitoring program, the event mean concentrations would be expected to be comparable with data obtained prior to the wetland construction.

In fact, the EMCs are variable, but these continue to be fairly consistent for this sampling station. No significant increasing or decreasing trends are apparent.

The stormwater wetland was constructed with the intent of reducing the discharge of pollutants to receiving waters. Therefore, it is expected that the event mean concentrations present at the downstream monitoring site (001) would be reduced from previous years. Additionally, a reduction from the event mean concentrations present at the upstream station (002) would be expected for each event.

During the reporting year, EMCs at the instream station were significantly lower than those found at the outfall station, with the exception of oil and grease. This continues the trend observed in 2010 and 2009, and indicates that the wetland is functioning to improve water quality.

Table 4 below identifies the pollutant removal efficiencies observed for each reporting year, based on the yearly average EMCs. Efficiencies published by MDE in the recent draft *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated: Guidance for National Pollutant Discharge Elimination System Stormwater Permits, June 2011* are provided for NO_x, TP, and TSS. Monitoring results for all reporting years since the wetland was constructed have suggested removal efficiencies for the wetland that exceed published values for TKN and NO_x. Removal efficiencies for TSS exceeded published values only in 2010.

Table 4: Observed Pollutant Removal Efficiencies: 2010-2011 Reporting Year

Year	TKN	NO_x	TP	TSS	BOD	Pb	Cd	Cu	Zn	TPH	Phenols	O&G	Fecal Col.
	%	%	%	%	%	%	%	%	%	%	%	%	%
2008	78.8	87.5	62.5	36.4	77.8	95.8	50.0	81.8	93.7	38.5	50.0	53.5	89.8
2009	16.7	78.6	46.7	47.1	-275.0	81.0	0.0	20.0	83.0	0.0	33.3	26.8	84.1
2010	69.4	38.0	77.8	80.9	80.0	0.0	0.0	66.7	73.7	-15.4	25.0	4.8	75.8
MDE		20.0	45.0	60.0									

Biological

Beginning in the Fall of 2005, a study site has been monitored for biological and physical condition on a tributary to Mattawoman Creek. This section summarizes data collected by KCI in the Spring of 2011. The study site is located in northern Charles County between Berry Road and Acton Lane just off Timberbrook Lane. This site was previously identified as part of Charles County’s Watershed Restoration Plan and was termed Acton-Hamilton based on the two major roads in the area. The Acton-Hamilton site was ranked as the fifth highest priority for restoration and was therefore one of seven study areas selected for further investigation. The Acton-Hamilton long-term site was monitored to establish baseline values in the Fall of 2005

(geomorphic assessment) and the Spring of 2006 (bioassessment). Table 5 lists the field assessment dates including this baseline assessment.

Table 5: Field Assessment Dates

Year	Geomorphic Assessment	Biological Assessment
2005-2006	December 14, 2005	April 17, 2006
2006-2007	January 11, 2007	May 4, 2007
2007-2008	December 12, 2007	April 17, 2008
2008-2009	December 15, 2008	April 29, 2009
2009-2010	December 1, 2009	March 08, 2010
2011	April 26, 2011	April 26, 2011

The geomorphic assessment includes cross-sections, longitudinal profiles, and particle size analysis. Spring bioassessment monitoring involves the collection of water quality data, sampling, and analysis of the benthic macroinvertebrate community, assessment of physical and habitat features and photo-documentation of site conditions at monitoring stations on the study reach.

Geomorphic Assessment

The channel substrate along the assessment reach is dominated by medium and coarse gravels. There are two cross-sections located within the 358-foot profile. Cross-section 1 shows that both aggradation and erosion have occurred between the baseline and the 2011 (year 6) monitoring (Table 6). Cross-section 2 shows that minor aggradation has occurred in 2011. Table 6 below summarizes the cross-section, profile, and pebble count data for baseline and subsequent monitoring efforts. Changes in bankfull areas for the two cross-sections are primarily due to minor erosion and aggradation associated with typical stream processes. Full results, including graphical depictions of the profile and cross-sections and pebble count data, are included in Appendix C. In general, the substrate is highly mobile with extensive point bar formations, areas of channel aggradation and some finer sedimentation in the pools. The channel geometry remains consistent with previous years and appears to experience overbank flow in the floodprone zone regularly.

Table 6: Acton-Hamilton Geomorphic Assessment Results

Parameter	Cross Section 1						Cross Section 2					
	2005 0+48.5	2006 0+49.7	2007 0+49.0	2008 0+50	2009 0+51	2011 0+46	2005 3+14	2006 3+12	2007 3+14	2008 3+21	2009 3+15	2011 3+09
Top of Bank Cross-section Area (ft ²)	49.2	53.1	54.0	55.1	53.9	54.5	28.6	27.1	27.6	29.6	29.8	32.5
Bankfull Cross-section Area (ft ²)	24.1	23.5	24.3	23.8	26.2	28.1	18.5	17.0	18.1	18.2	18.1	18.9
Top of Bank Width (ft)	32.3	34.7	34.8	34.9	32.4	33.5	19.5	19.6	19.5	19.7	19.9	21.8
Bankfull Width (ft)	20.9	22.3	21.6	19.7	20.8	20.1	15.0	14.7	14.8	14.3	15	14.9
Mean Depth (ft)	1.2	1.1	1.1	1.2	1.3	1.4	1.2	1.2	1.2	1.3	1.2	1.3
Width-depth Ratio	18.2	21.1	19.2	16.3	16.5	14.3	12.2	12.6	12.0	11.3	12.5	11.8
Velocity (ft/s)	3.8	3.5	3.0	3.2	3.3	3.8	4.0	3.6	3.1	3.3	3.1	3.3
Discharge Rate (cfs)	92.5	82.9	73.0	76.1	85.9	107.2	73.3	61.4	57.1	59.2	55.2	61.8
Entrenchment Ratio	2.4	1.8	2.3	2.5	2.6	2.5	2.7	2.4	3.0	3.1	2.2	2.3
D50 Particle Size (mm)	14	16	18	19	23	20	14	16	18	19	23	20
D84 Particle Size (mm)	28	33	29	30	39	44	28	33	29	30	39	44
Threshold Grain Size (mm)	15	15	10	12	14	18	17	16	11	11	13	17
Channel Slope (%)	0.49	0.49	0.31	0.34	0.4	0.47	0.49	0.49	0.31	0.50	0.4	0.47

Instream Water Quality and Bioassessment

Instream water quality was measured during the bioassessment conducted in the Spring of 2011. Water quality measurements are within the acceptable ranges for *COMAR* regulations. Table 7 summarizes the water quality and habitat assessment data. The physical habitat assessment rated the habitat for both fish and benthic macroinvertebrates at the midrange of sub-optimal. The banks were rated as moderately stable with a good riparian zone width and vegetative protection. The excessive algae noted in the previous four years was not at all present during the 2011 assessment.

From the baseline assessment to 2011, conditions have generally degraded in the study reach. The PHI rating has stayed consistent between years, but the BIBI continued to decrease in 2011. Extensive bar formations have been observed during every monitoring event, but the extensive algae noted in previous monitoring events was not present in 2011. Benthic scores have remained in the “Poor” range. Water quality has remained consistent with previous years with the exception of a slightly acidic pH in 2011. The biological community received a narrative PHI habitat rating of “Partially Degraded” and BIBI rating of “Poor” for the Spring 2011 assessment. Table 7 summarizes the water quality and habitat assessment data.

Table 7: Acton-Hamilton Instream Water Quality and Habitat Assessment Data

Year/Time	Instream Water Quality						Habitat & Biol. Assess.	
	pH	DO (mg/L)	Temp (°C)	Conductivity µS/cm	TDS (mg/L)	Turbidity (NTUs)	PHI	BIBI
Spring 2006 11:00AM	7.04	9.09	13.19	214.2	137.0	14.9	74 (partially degraded)	3.6 (Fair)
Spring 2007 8:30AM	7.13	3.62	13.20	214.0	139.0	4.3	74 (partially degraded)	2.7 (Poor)
Spring 2008 7:00PM	6.85	11.17	15.79	186.0	121.3	2.6	71 (partially degraded)	3.0 (Fair)
Spring 2009 11:00AM	6.73	6.97	16.33	236.9	n/a	3.49	78 (partially degraded)	2.7 (Poor)
Spring 2010 8:30AM	7.76	13.52	4.50	395.7	n/a	4.16	72 (partially degraded)	2.7 (Poor)
Spring 2011 8:30AM	6.19	8.82	18.27	174.3	n/a	8.62	73 (partially degraded)	2.4 (Poor)
COMAR Limits	6.5 - 8.5	> 5.0	< 32.0	n/a	n/a	< 150	n/a	n/a

2. *Charles County shall evaluate the effectiveness of a stormwater management system constructed in accordance with the 2000 Maryland Stormwater Design Manual for stream channel protection effectiveness. The assessment shall include:*
 - a. *By 7/31/2003, a small watershed shall be selected to adequately assess the best management practice (BMP) design criteria found in the 2000 Maryland Stormwater Design Manual. The watershed selected shall be either an area where future development is to occur, where existing BMPs control a majority of the drainage area and can be retrofitted to reflect the design manual design criteria, or a combination of both. The selection of the small watershed to be monitored shall be made in consultation with MDE.*
 - b. *Within six months of MDE's approval of the selected watershed to be monitored, Charles County shall survey the stream for the purposes of evaluating channel stability in conjunction with ensuing development or significant retrofitting. Permanently monumented cross-sections shall be established at areas where stream geometry changes and at critical areas in the flow path (e.g., restrictions, etc.). A baseline stream profile shall also be established to assess aggradation and degradation.*
 - c. *In each annual report, Charles County shall provide MDE with a comparison 18 survey for each established cross-section and a comparison survey of the stream profile*
 - d. *A hydrologic and/or hydraulic model shall be used (e.g., TR-20, HEC-RAS, HSPF, SWMM, etc.) to analyze the effects of rainfall; discharge rates; stage; and, if necessary, continuous flow on channel geometry.*

2011 Status

Maryland Stormwater Manual Effectiveness Study

Since 2003, KCI has monitored the Tributary to Piney Branch to evaluate the effectiveness of stormwater management to adequately provide channel protection. This included survey of five monumented cross sections and 4,500 feet of longitudinal stream profile. This monitoring continued yearly until 2009. In 2010 an inspection was done of the stormwater facility outfalls in the drainage area. See previous NPDES Annual Reports for more information on these evaluations. For the 2011 monitoring, KCI was directed to conduct a survey of an eroded outfall channel draining a stormwater management pond at the North Point High School within the Tributary to Piney Branch watershed. The pond outfall was selected for study due to the presence of channel erosion and potential sediment load entering the Tributary to Piney Branch. The pond is located to the east of the athletic fields at North Point High School in Waldorf. The outfall channel meets the previously monitored reach on the left bank of the Tributary to Piney Branch,

towards the lower quarter of the surveyed reach. The purpose of the monitoring is to document the current physical condition of the outfall channel through survey of a longitudinal profile and cross-section measurements. A total of 406 linear feet of profile was surveyed beginning at the pond outfall. Four cross sections at representative segments of the reach were also surveyed.

The trapezoidal engineered pond outfall channel is stable and extends from station 0+00 at the outfall to station 2+83 where it transitions to a natural channel. Rip rap covers the channel bottom and banks until station 0+34. The channel profile is stable and has a gradual slope of 1.0 percent until station 2+83 where the channel enters the existing forest and a series of minor headcuts have formed and extend for approximately 100 feet. Beginning at the first headcut at 2+83, channel erosion gradually increases in severity and the channel becomes less stable. From station 2+83 to the end of the survey at station 4+06, the slope is 8.0 percent. At station 3+68 a 2.5 foot headcut has formed and bank erosion is moderately severe. Downstream from this headcut the stream becomes more stable and less incised, and meets the main channel approximately 75 feet downstream from the end of the survey at station 4+06. The first three cross sections are in the trapezoidal engineered channel and are very stable. The fourth cross section is directly below the 2.5 foot headcut and shows evidence of scour and bank erosion.

Detailed results of the survey are documented in the attached Technical Memorandum in Appendix D.

3. *Annually, Charles County shall describe in detail its monitoring activities for the previous year and include the following:*
 - a. *A detailed description of weather conditions and any equipment failures;*
 - b. *A detailed description of field data collection methods and documentation of any variations to the minimum requirements for chemical, biological, or physical monitoring;*
 - c. *Chemical, biological, and physical monitoring results recorded on MDE's long-term monitoring databases;*
 - d. *An analysis of monitoring data integrating the field results from the chemical, biological, and physical monitoring;*
 - e. *Annual and seasonal pollutant load estimates using the long-term monitoring data;*
 - f. *A comparison survey for each established cross-section and a comparison survey of the stream profile for the monitoring conducted to assess the stream channel protection effectiveness of a stormwater management system constructed in accordance with the 2000 Maryland Stormwater Design Manual; and*
 - g. *Any requests and accompanying justifications for proposed modifications to the monitoring program.*

2011 Status

No significant difficulties were experienced in collecting the necessary biological and physical data and this information and analysis is provided. The chemical sampling location was disturbed for an emergency construction project. The construction damaged the monitoring equipment that was installed in the storm drain. Due to this, sampling was delayed for the better part of the year. Pollutant loading information is provided in Section III.H.

III.E. Management Programs

Overview of Permit Conditions

1. *Charles County shall maintain an acceptable stormwater management program in accordance with the Environmental Article, Title 4, Subtitle 2, Annotated Code of Maryland. At a minimum, Charles 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 actions(s) used to facilitate inspection order compliance, maintenance inspection schedules, and any other relevant information shall be submitted in the County's annual reports;*
 - b. *Implement the stormwater management design policies, principles, methods, and practices found in the 2000 Maryland Stormwater Design Manual and COMAR;*
 - c. *Track the progress toward satisfying Part III.E.1.b. above; and*
 - d. *Report annually the modifications needed to address problems associated with implementing the 2000 Maryland Stormwater Design Manual in Charles County.*

2011 Status

Stormwater Management Maintenance Inspections

The County continues to conduct preventative maintenance inspections of all stormwater management facilities on a triennial basis. During calendar year 2010 the inspections were comprised of 197 first and third year inspections and 230 compliance and enforcement inspections. As of December 31, 2010, 189 projects have unacceptable facilities, which are listed in Appendix E. This total includes facilities outstanding from previous years' inspections. Seven certified letters were sent to initiate compliance. No major structural problems were found.

During 2010, 59 facilities identified as unacceptable in previous years were brought into compliance. A copy of the County's database showing inspections during calendar year 2010 is included in Appendix F. The entire digital inspection database is included in the Urban Best Management Practice Access database.

The following table summarizes the information found in the database. Facilities found acceptable and unacceptable are reported based on their status at end of the calendar year.

Table 8: Summary of Stormwater Management Facility Inspections

	2004	2005	2006	2007	2008	2009	2010
Total projects inspected	226	129	97	287	212	131	121
Total inspections performed	580	331	365	761	501	378	427
Total facilities inspected	410	220	259	516	363	268	275
Acceptable Facilities	247 (60%)	105 (48%)	207 (80%)	253 (49%)	214 (59%)	140 (52%)	120 (44%)
Unacceptable Facilities	163 (40%)	115 (52%)	52 (20%)	263 (51%)	149 (41%)	128 (48%)	155 (56%)

Implementing the 2000 Maryland Stormwater Design Manual and Tracking Implementation Progress of the 2000 Stormwater Design Manual and Modifications Needed to Improve Deficiencies

The County continues to implement the stormwater management design policies, principles, methods, and practices found in the 2000 Maryland Stormwater Design Manual and COMAR.

In April 2006, MDE found the County’s stormwater program acceptable.

Per the Maryland Stormwater Management Act of 2007, which requires use of environmental site design to the maximum extent practicable, the County adopted new stormwater regulations on July 13, 2010. These regulations went into effect on August 1, 2010. The Notice on the adoption of the Stormwater Management and Storm Drainage Ordinances, including Procedures on Requesting an Administrative Waiver is included in Appendix L.

Under the new regulations and policies, the following projects received stormwater management waivers in fiscal year 2011:

Permit Number	Name	Approval Date
VC 100007	New High School 2013, Fairway Village	7/13/2010
VR 100047	Gleneagles Neighborhood, Parcels C2 & F	2/25/2011
VR 100058	Adams Crossing, Section 1, Phase B	5/11/2011
SDP 100009	Bryans Road Market Place	11/3/2010

In fiscal year 2012, the Stormwater Management Waiver Review Fee increased to \$406 + \$81/study point, from the fiscal year 2011 fee of \$390 + \$77/study point over two. Additionally, in fiscal year 2012 the Stormwater Fee-in-lieu structure changed from a per lot charge to \$1.31/square foot disturbed. The fiscal year 2011 Stormwater Management Fee-in-lieu follows:

NPDES Annual Report, Charles County, MD

Zone	Min. Lot Size	Fee
RC/AC	3 acres	\$296/Lot
RR	1 acre	\$296/Lot
RL	18,000 sq. ft.	\$362/Lot
RM	12,000 sq. ft.	\$434/Lot
RH	8,000 sq. ft.	\$500/Lot
Cluster Development		$(RCN_{post} - RCN_{pre})(A)(\$296)$,
All other zones		Min of \$2,100 or whichever is greater*

*RCN_{pre} = SCS runoff curve number for the pre development condition

RCN_{post} = SCS runoff curve number for the post development condition

A = area

*Based on an estimated CPI, to be adjusted prior to July 1st in accordance with contracts that have present or new bid contractors.

The following table summarizes the stormwater management credits applied to single family lots for fiscal year 2011. Rooftop runoff disconnection continues to be the most used credit, as has been demonstrated in previous years.

Table 9: Summary of FY 2011 SWM Credits for Residential Building Permits

Number of approved Residential Building Permits:	454
SWM Credits Approved:	
Rooftop Runoff Disconnection	235
Non Rooftop Runoff Disconnection	1
Grass Channel	11
Sheet Flow to Buffer	8
Environmental Site Design	0
Standard Plan	8
Stormwater Management Facility	204
Natural Area of Conservation	0
Rain Garden	1
Rain Barrels	4
Drywells	191

(Table does count townhouses per stick of units, and multifamily units per building.)

2. *Charles County shall maintain its illicit detection and elimination program. At a minimum, Charles County shall:*
 - a. *Ensure that all discharges to the municipal separate storm sewer that are not composed entirely of stormwater are either permitted by MDE or eliminated;*
 - b. *Annually, field screen at least 100 outfalls. Each outfall having a discharge or suspected of having an illicit discharge shall be sampled using a chemical test kit;*
 - c. *Report annually the results of field screening activities on MDE's illicit connection detection database. The following narrative shall also be included: the number of illegal storm drain connections, the results of investigations made, any enforcement used, the disposition of all illegal storm drain system connections found as a result of this portion of Charles County's stormwater management program, and an updated list of targeted outfalls and an inspection schedule; and*
 - d. *Identify all County-owned facilities requiring an NPDES discharge permit and submit documentation that a permit has been obtained for each. The implementation status of pollution prevention plans for these County-owned facilities shall also be submitted with the County's annual reports.*

2011 Status

Illicit Connection Detection

During the fiscal year 2011 screening, 99 sites were sampled. One additional site was visited (Outfall #18); however, access to this outfall was prevented by multiple fences. This includes 11 draining industrial areas, 34 draining commercial areas, and 54 draining residential areas.

Outfalls that were not sampled during the 2010 reporting year were selected for screening in 2011.

The screening was conducted in May and June of 2011. A two-person field crew visited each site following 72-hours of dry weather. The physical condition of each site was recorded on field sheets. If a dry-weather flow was present, a sample was taken and tested with a Hach chemical test kit. Tests were conducted for pH, detergents, chlorine, temperature, ammonia nitrogen and nitrate nitrogen. When a chemical test was conducted, and the results showed a high concentration for any contaminant, the site was retested after 4 hours but within 24 hours to verify the results.

The results of the chemical test performed were compared with the accepted statewide averages described in *Dry Weather Flow and Illicit Discharges in Maryland Storm Drain Systems* (MDE, 1997). Using the statewide averages, the 1997 study provides a threshold for each constituent, based on watershed land use. The results from the chemical tests performed during the 2010-reporting year were compared with this threshold to determine which results are considered abnormal for each constituent, and to make recommendations as to which storm drain systems should be investigated further as having possible illicit connections. The thresholds listed were 0.4 ppm for chlorine, and 0.5 ppm for detergents. No state-approved threshold limits exist for nitrate and ammonia. Based on EPA and USGS documentation, values of 2.0 ppm for both constituents appear reasonable. This is consistent with the high outlying values found in previous screening efforts. Review of past data shows that typical pH values in Charles County fall outside the standard threshold range of 6.5 to 8.5. Therefore, for the 2010 reporting year, the following thresholds were used to determine if an upstream investigation was necessary:

- 5.5-8.5 pH
- 0.5 ppm Detergents
- 0.4 ppm Chlorine
- 0.17 ppm Phenols
- 0.21 ppm Copper
- 2.0 ppm Nitrate
- 2.0 ppm Ammonia

When a confirmed high concentration of a contaminant was found, field crews followed the stormdrain system upstream attempting to locate the source of the contamination. Additional tests at upstream structures were conducted as needed, especially where two systems converged.

All data collected during the illicit discharge screening was recorded in a database conforming to the MDE formatting requirements.

The results show that, of the 99 sites, 24 had observed flow. Of these, 2 had chlorine present and 1 had detergents present. None of the chlorine or detergent concentrations were above the threshold limit during the first inspection.

One site had signs of severe erosion (Outfall #106). This site was reported with severe erosion and CMP corrosion in 2008. The result of this investigation is included in Appendix G.

Outfall #56 was sampled again in 2011 due to the continued presence of excessive algae and a white residue in the stormdrain pipe. Investigations from previous sampling efforts have been unable to determine the source of the nutrients or white residue; however, the source appears to be located within the Smallwood Village Shopping Center based on tracing the stormdrain system upstream. A detailed report can be found in Appendix G.

Outfall #159, which drains a large commercial area, was found to be discharging high concentrations of ammonia on the 1st and 2nd inspections with a gaseous odor. A windshield survey was performed on the drainage area; however, a specific source of the ammonia was not located. A detailed report can be found in Appendix G.

Algae were found at 28 outfalls, which indicate excessive nutrients in the water. Except for Outfalls #24 and #26, which had a cloudy discharge, all other sites inspected had acceptable color and clarity. Except for Outfall #159, which had a gaseous odor, all other sites inspected had acceptable odor.

Oil sheen and trash along with sediment and iron flocculent deposits were found at many sites. Moderate erosion, excessive growth, metal corrosion and concrete cracking/spalling were noted at several outfalls as well.

The priority outfalls are listed below in Table 10.

Table 10: Field Screening Results for Priority Outfalls

Outfall #	Problem
#56	Excessive algae and white residue in stormdrain pipe
#106	Embankment and outfall erosion and CMP corrosion
#159	High concentration of ammonia on 1 st and 2 nd inspection

Two outfalls (#23 and #96) have been repaired due to structural and erosion concerns that were discovered in 2008. Outfall #54 had improved site conditions found in 2011.

Repairs to several of the outfalls identified as having erosion in the previous inspections have been repaired as listed below in Table 11. Additionally, two areas noted with erosion are being addressed as shown in Table 12.

Table 11: Outfall and Inlet Repair Projects

Outfall	Location	Description	Cost	Date Completed	Acres Treated
179	Beechwood Drive	Outfall Repair	15,000	1-Jul-07	TBD
157	Briarwood	Outfall Repair	4,000	9-Jun-09	TBD
96	St. Charles	Outfall Repair	2,600	16-Jun-09	TBD
54	Kipling Drive	Trash Removal	2,000	9-Jun-09	TBD
139	Shiloh Church Road	Outfall Repair	1,520	1-Jul-10	TBD
14	Theodore Green Blvd.	Outfall Repair	1,800	1-Jul-10	TBD
212	Duckhorn Court	Inlet Repair	475	3-Jun-10	TBD
121	Holly Avenue	Pipe & Outfall Repair	TBD	TBD	TBD

Table 12: Stream Restoration and Stormwater Management Pond Repairs

Outfall	Location	Description	Cost	Date Completed	Acres Treated
106	Tanglewood Drive Pond VCI #08-67 (a.k.a. Tawny Road)	Outfall Repair & 400 lf Stream Restoration	TBD	TBD	TBD
207	Holly Tree Lane VCI #08-68	1,200 lf Stream Restoration	TBD	TBD	TBD

County Owned Facilities Requiring a NPDES Discharge Permit

To date, the following County owned facilities requiring a NPDES discharge permit and the status of their pollution prevention plans have been identified in the following table.

Table 13: County Facilities with NPDES Permits

County Owned Facilities	NPDES Discharge Permit #	Pollution Prevention Plan
Landfill #2	97SW registration #: 97-SW-0182 General Permit #: 02-SW (effective 12/1/02-11/30/07)	Unknown
Mattawoman WWTP	97-DP-0472 MD0021865 (effective 10/1/03 - 9/30/08)	Unknown
Mattawoman WWTP	General Permit #: 02-SW MD02SW12 (effective through 11/30/07)	Completed
Cliffton WWTP	92-DP-1457 MD0055557 (effective 5/1/04 - 4/30/09)	Unknown
Cobb Island Systems (groundwater discharge permit)	00-DP-2211 (effective 6/1/00-6/1/05)	Unknown
Jude House WWTP (County does not operate this plant.)	95-DP-1684 MD0057614 (effective 1/1/96-12/31/00)	Unknown
Mount Carmel Woods WWTP	97-DP-1246 MD0053228 (effective 4/1/04-3/31/09)	Unknown
Swan Point WWTP	94-DP-1674 MD0057525 (effective 2/1/04 - 1/31/09)	Unknown

3. *Charles County shall maintain the implementation of its existing program to respond to illegal dumping and spills including procedures for public reporting and citizen complaints.*

2011 Status

On July 1, 2001 the County adopted Water Quality Control Regulations which provides the Department of Planning and Growth Management (PGM) the authority to find and stop illicit discharges into the County's storm drainage and stream system. Subsequently, PGM adopted an implementation method entitled, "Policy/Procedure: Water Quality Violation Notification, Remediation, Case Documentation and Annual Review for Program Effectiveness and Reporting," as attached in the appendix of the Charles County NPDES Annual Report, for June 2002 - July 2003.

On July 13, 2010 the County adopted separate Stormwater Management and Storm Drainage Ordinances, to replace the previously combined Stormwater Management and Drainage Ordinance. At this time Water Quality Regulations were adopted in the *Storm Drainage Ordinance, Section 19.2 Illicit Discharge*.

Under the Policy/Procedure, a Water Quality Control Coordinator is established within PGM to route cases of suspected pollutant discharges to the responsible agency and maintain records of cases for the County's annual NPDES stormwater permit report.

Cases of suspected pollutant discharges, which are the responsibility of PGM, such as odors or unusual discharges in streams or from the storm drain system are managed by the County's Stormwater Management Engineer. A Hach test was purchased for the County's Stormwater Engineer to use for investigation of such cases.

Discharges to the Storm Drain System - The County received the reports of suspected pollutant discharges in FY2011 from the County's NPDES consultant, KCI, Inc. and has forwarded to the appropriate agencies for investigation. See Appendix H for the status.

Construction Related Discharges - In 2000 the County initiated a procedure where County construction inspectors note sediment discharges onto county roads from construction sites. The procedure allows the County to issue a stop work order until the sediment discharge problem is remedied.

4. *Charles County shall consider applying to MDE for delegation of erosion and sediment control enforcement authority. Erosion and sediment control activities in Charles County currently are the responsibility of MDE's Compliance Program. In addition, erosion and sediment control education activities, specifically "responsible personnel" certification classes, are currently conducted by MDE.*

a. *By 7/15/04, Charles County shall complete a report evaluating the potential for*

implementing an erosion and sediment control program. This report shall be submitted to MDE and include feasibility of applying to MDE for delegation of erosion and sediment control enforcement authority in accordance with Environment Article, Title 4, Subtitle 1, Annotated Code of Maryland, benefits, and local support.

- b. *Beginning 7/15/03, report quarterly, information regarding earth disturbances exceeding one acre or more. Data submitted as a result of this permit condition shall include site, name, site owner and address, disturbed area, local grading permit number*

2011 Status

- a) The County's NPDES annual report for June 2003 through July 2004 includes the report evaluating the potential for implementing an erosion and sediment control program. Final delegation by MDE occurred in June 2006.

In October and November 2007, MDE performed field reviews of active construction sites to evaluate the program. Significant improvements and the progress made toward addressing violations were noted at that time.

In September through November 2009 MDE performed another evaluation of Charles County's erosion and sediment control program. MDE's review of the program included recommendations for continued improvements related to proper installation of controls and on-site stabilization. Overall, the review showed continued progress by Charles County and their erosion and sediment control program was found to be acceptable.

- b) For the period July 1, 2010 through June 30, 2011 the County issued 172 Development Services permits, of which 36 were revisions and 57 were blanket permits. Additionally, 460 Single Family Dwelling Building permits and 144 Residential Addition permits were issued. Of the permits issued, 27 Development Services permits and 12 Single Family permits propose to disturb greater than one acre. Revisions are not included in this total, since they have been counted in previous years. Appendix I includes the fiscal year 2011 data for earth disturbances greater than one acre.

- 5) *Charles County shall implement and maintain a public education and outreach program to reduce stormwater pollutants. Public outreach and education efforts are to be integrated with the discharge characterization monitoring, watershed restoration, illicit connection detection, erosion and sediment control, and stormwater management program implementation requirements of this permit. These efforts are to be documented and summarized in the County's annual reports. At a minimum, Charles County shall:*
- a. *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 waste;*
 - 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;*
 - x. *Procedures for public identification and reporting of illicit discharges.*

 - b. *Provide information when requested regarding the following water quality issues to the regulated community:*
 - i. *NPDES permitting requirements;*
 - ii. *Pollution prevention plan development;*
 - iii. *Proper housekeeping; and*
 - iv. *Spill prevention and response.*

2011 Status

- a) The County provides information regarding water quality issues to the general public in various ways, including the website, brochures, news media, and one-on-one. Many of these public outreach programs are spearheaded by Charles County's Recycling & Litter Control Superintendent and the University of Maryland Extension Agent.

Website:

In July 2010, the County began the tenth year of a water quality monitoring project for the Mattawoman Creek with the U.S. Geological Survey. This project funds an existing monitoring station previously funded by the Maryland Department of the Environment. The purpose of this station is to develop a long term record of water quality data for determining trends in the watershed. The station is part of the Chesapeake Bay Programs' Long Term Status and Trends Network.

The County posts information on the NPDES MS4 permit program under the Department of Planning and Growth Management's webpage. Included are a summary of the program, the Annual Reports, and numbers to call for suspected pollutant discharges. The link to this webpage is:

<http://www.charlescounty.org/pgm/planning/plans/environmental/npdes/default.htm>

A copy of this website was included in County's June 2004 to July 2005 NPDES MS4 annual report.

The Charles County Government website also provides information on the local VanGo which provides public transit service within the County:

<http://www.charlescounty.org/cs/vango/>

Because Southern Maryland has very high ridership rates on the commuter express bus into Washington, D.C., citizens access the Maryland Mass Transit Authority(MTA) for route schedules via the Tri-County Council for Southern Maryland website for the available Commuter and Regional Ridesharing Programs:

<http://www.tccsmd.org/index.cfm?Content=72&Menu=27>

Or link directly to MTA's website for bus schedules:

<http://www.mtmaryland.com/schedules/>

Updated information is posted on county website regularly detailing recycling opportunities, oil/antifreeze collection sites, volume based tag-a-bag sticker locations, etc. Residents can also request recycling bin delivery and other type information through this website: <http://www.charlescounty.org/pf/sw/recycling>

The County operates dog park and subsequently provides etiquette rules for using the park including scooping and disposing of pet waste appropriately.

http://www.charlescounty.org/webdocs/pf/parks_rec/brochures/dog_turkeyhill.pdf

Water conservation and other natural resource conservation topics are on the University of Maryland Cooperative Extension Service website:

<http://extension.umd.edu/environment/index.cfm>

County environmental planning initiatives including the Mattawoman Creek Watershed Management Plan and the Port Tobacco River Watershed Restoration Action Strategy: <http://www.charlescounty.org/pgm/planning/plans/default.htm>

Brochures and news media:

In addition to internet, information is provided by handouts and news media outlets. Educational literature on recycling and composting is periodically mailed to residents, placed in local papers and homeowners' associations' newsletters, and made available in frequently visited locations such as libraries, government building, etc.

The University of Maryland Cooperative Extension Service in Charles County distributes handouts on septic maintenance, lawn care and other topics.

Each year at the County Fair the County distributes information on recycling as well as natural resources and low impact development techniques. As part of the Charles County Commissioners' Environmental Program, several brochures are distributed by the Department of Public Facilities. These include, "Reduce Reuse Recycle Directory" and "It is Easy Being Green." In addition, coloring and activity books titled, "Learn About Water Conservation" and "Keep Our Environment Clean" are provided for children.

One-on-one:

University of Maryland Extension in Charles County promotes environmental stewardship by providing information and educational programs on environmental horticulture, water quality, appropriate and safe fertilizer and pesticide use, and other issues directly to the public, often face-to-face with our citizens, as well as through mass media.

Extension staff members and trained volunteers answer questions from homeowners and farm operators visiting the Extension office in Charles County, answer telephone inquiries from the public, as well as analyze plant and insect samples submitted by county residents and provide fact sheets and other educational materials as needed.

The Agriculture and Natural Resources Extension Agent promotes water conservation, storm water management, and wise use of pesticides and fertilizers through personal appearances on the county cable station. Recent topics have included proper lawn care.

The Extension Agent and Extension staff provide training to commercial landscapers, and farm operators on proper use of fertilizers and pesticides. This training includes managing storm water and farm ponds, pest control, maintaining good turf to prevent erosion, and

an array of other natural resource conservation issues. Extension faculty also train volunteers to become part of the Charles County Master Gardeners, a University of Maryland outreach program providing educational information on environmental horticulture to the public.

Master Gardeners encourage maintaining the quality of our landscapes and environment through the Maryland Bay Wise Yardstick certification program, as well as through field visits throughout the County to assist citizens with their gardening problems. The volunteers also create timely educational displays and hold plant clinics at public events, such as the Charles County Fair. They make presentations to community organizations such as the Kiwanis Clubs and the local libraries, and have an on-going training program at the Charles County Detention Center. They continue to investigate new environmental education opportunities with local schools.

In 2009 through 2011, Extension faculty worked via a public/private partnership with County Government and a local lawn service business, to provide five 2-hour community workshops on environmentally sound lawn care.

Potomac River Watershed Cleanup

Over 6,000 volunteers have collected tons of debris from Charles County's waterways over the past 15 years. Held annually, on the first Saturday of April from 9:00 a.m. to 12:00 noon, items collected over the years have included cans, bottles, appliances, furniture, toys, boats, and cars!

Next steps for improving water quality education:

The County will continue working to publicize methods to report illicit discharges, and water conservation techniques, as well as improving distribution of other water quality information as needed.

- b) The County provides the following information when requested regarding NPDES permitting requirements, pollution prevention plan development, proper housekeeping and spill prevention response:
 - 1) Maryland Department of the Environment websites:
<http://www.mde.state.md.us/Permits/index.asp>
<http://www.mde.state.md.us/BusinessInfoCenter/index.asp>
 - 2) Maryland Center for Environmental Training located at the College of Southern Maryland, LaPlata branch: <http://www.mcet.org/>

6. *Charles County shall develop and implement a plan to reduce pollutants associated with road maintenance activities. At a minimum, an annual progress report shall be submitted that documents the following activities:*
 - a. *Cleaning storm drain inlets;*
 - b. *Reducing the use of pesticides, herbicides, fertilizers, and other pollutants associated with roadside vegetative management practices through the use of integrated pest management; and*
 - c. *Controlling the overuse of winter weather deicing materials through continual testing and improvement of materials and effective decision-making.*

2011 Status

The Road Maintenance Division receives several dozen complaints annually, and will clean out silt/trash when the drain is not operating properly. In fiscal year 2011, storm drains and catch basins in Carrington, Huntington, Pinefield, and Brawners Estates were cleaned using a vacuume truck. The vacuume truck removed 103.19 tons of debris at a cost of \$28,575.

The Road Maintenance Division did not use any herbicide to control roadside weeds in fiscal year 2011. The Division has a roadside herbicide policy in place that was approved in 1998, and is included in the 2003 NPDES MS4 Annual Report.

Roads Division supervisors make every effort to use only the minimum amount of solar salt to effectively treat icy road conditions. Excess salt that may be spilled by salt trucks is cleaned up immediately after a storm.

III.F. Watershed Restoration

Overview of Permit Conditions

1. *Within 12 months of the issuance of this permit, data gathered as a result of prior NPDES activities shall be used to prioritize all watersheds within Charles County in the context of water quality. The methods and scale used to prioritize watersheds shall be determined by Charles County but must include, at minimum, documented water quality problems and the ability to address them. In Charles County's first annual report, the results of this prioritization shall be provided and shall include the methods and scale used as well as the watershed rankings for all land area in the County.*

2011 Status

This task was completed in the June 2002 to July 2003 NPDES Annual Report.

2. *Within 12 months of the issuance of this permit, Charles County shall select a watershed, or a combination of watersheds, to be restored. The selection of the watershed to be restored shall be based upon Charles County's ability to monitor the progress of all those activities identified in PART III.F.3 below to improve water quality. At least one of the following options for watershed selections shall be used:*
 - a. *A combination of the drainage area above the in-stream monitoring station identified in PART III.D. above and additional contiguous areas equaling ten percent of Charles County's untreated impervious area;*
 - b. *A watershed or combination of watersheds equaling ten percent of Charles County's untreated impervious area where surrogate parameters can be used to determine progress toward watershed restoration; or*
 - c. *A combination of PART III.F.2.a. and PART III.F.2.b. above equaling ten percent of Charles County's untreated impervious area.*

2011 Status

In an October 2003 Addendum to the June 2002 - July 2003 NPDES Annual Report, the procedure for identifying the study areas and determining imperviousness was described and is summarized here. County staff and consultants determined that the best method for selecting restoration areas was (b) above.

The 12-digit subwatershed prioritization conducted in 2003 identified part or all of the top nine lowest quality/highest priority for restoration subwatersheds within the Development District.

Thus, the Development District was used as the study area for which untreated impervious calculations were made and where specific study areas for potential restoration/retrofits were identified.

Over the course of preparing watershed restoration studies in 2004, 2007 and 2010, the method for calculating impervious surface has been updated to use the latest available data and technology. In 2004, impervious percentages were calculated for the treated and untreated areas using the 1997 Maryland Department of Planning Land Use/Land Cover GIS data and the recommended imperviousness conversion factors.

In 2007, the impervious coverage was digitized from 2004 aerial photographs using Feature Analyst, a software package that uses ArcGIS and iterative methods to identify color differences on aerial photographs associated with impervious versus open space areas. This method provided a much more accurate measurement of impervious area within the County than was calculated for the 2004 study. In 2010, the impervious area was calculated again using the same ArcGIS software package, and the most recent 2007 aerial photography.

Treated and untreated impervious areas were calculated for the Development District using the following procedure.

- BMP drainage areas were delineated using existing locations of outfalls and their associated drainage areas where data was available. Where data was not available, the remaining BMP drainage areas were delineated using topography and storm drain mapping.
 - Areas draining to BMPs were tagged as ‘treated.’ Areas that did not drain to a BMP were tagged as ‘untreated.’
3. *Within 24 months of the issuance of this permit, Charles County shall complete and submit for MDE approval a detailed assessment of the watershed or combination of watersheds selected in PART III.F.2.above. At a minimum, the assessment 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 in PART III.F.3.c. above.*

After completing the assessment of its selected watershed, Charles County shall submit a detailed watershed assessment for an additional watershed equaling ten percent of the County’s untreated impervious area to MDE by the end of this permit term.

2011 Status

Two watershed restoration studies, dated 2004 and 2007, have been prepared and a third study was completed in 2011. The following summarizes each of the studies.

2004 Watershed Restoration Study

Per the 2004 Watershed Restoration Study, the total treated and untreated impervious acres for the entire Development District, were 2,250.12 acres and 3,456.96 acres respectively. Ten percent of the Development District’s untreated impervious surface was 345.70 acres.

To ensure that an adequate number of sites and untreated impervious acres would be selected that would be eventual candidates for restoration/retrofit design, the study areas were selected to be much larger than the 345.70 acre goal. Seven study areas were ultimately selected that together equal 645.45 acres of untreated impervious area, as shown below.

Study Area Name	Total Study Area (acres)	Area Untreated (acres)	Area of Untreated Impervious Cover (acres)
Acton/Hamilton	865.40	577.43	131.42
Briarwood	51.88	51.86	13.30
Bryans Road	16.24	16.24	11.84
Carrington	1,388.95	1,276.45	212.93
Marbella Delight	103.64	101.95	61.13
Pinefield	687.49	686.62	192.75
Pinefield South	95.23	89.21	22.08
Total	3,208.83	2,799.76	645.45

The complete Watershed Restoration Study was provided in the June 2003-July 2004 NPDES Annual Report. The Study found potential improvements that could be applied to restore watershed hydrology and water quality were identified from literature review and prior experience. The improvement alternatives fall into the following six categories, in the preferred order of implementation.

- Source Control Pollution prevention and non-stormwater discharge control programs
- Land Use Land conservation and site design measures. Low Impact Development (LID) site planning measures are included here.
- BMP Retrofits Conversion of existing quantity controls to water quality BMPs
- Multi-site BMPs End-of-pipe structures, such as ponds, wetlands, and outfall treatments
- Onsite BMPs Systems designed to reduce stormwater impact at the lot level. LID structural BMPs are included here.

-Stream Restoration In-stream projects, such as channel stabilization or riparian buffer restoration.

Capital cost estimates were developed for structural BMPs in the form of unit costs, so that an estimate of the cost of retrofitting a large area can be derived from the size of the systems needed to provide treatment. The costs include design, permitting, and construction, but not land or right-of-way acquisition. Annualized costs for BMP maintenance or outreach programs were not included in the costs, either, due to their highly variable nature.

Finally, the approach to developing restoration alternatives for each study area was as follows:

1. Identify the primary impairment in the drainage area.
2. Identify constraints
3. Select potential improvements which address the impairment within the constraints, in the order listed above in Section 3.0
4. Develop cost estimates
5. Prioritize projects based on cost-effectiveness

Feasible alternatives were developed for the seven restoration areas. When combined, they provided treatment for 418.7 acres of impervious area. The prioritization goal was to treat the amount of area required by the permit with the most cost-effective means, measured by the cost to treat one impervious acre. With this measure, the most expensive options were deleted first.

The following table shows a summary of the remaining prioritized management practices to meet the permit goal. The total cost estimate from the 2004 Watershed Restoration Study is approximately \$6,277,440 at about \$18,173 per treated impervious acre.

Table 14: Prioritized Management Practices for Watershed Restoration

Management Practice	Treated Area (ac)	Impervious Area (ac)	Unit of Measure	No. Of Units	Unit Cost	Total Cost	Cost/ Impervious Acre
Lawn Care Education	270.6	81.2	House	687	Varies	Unknown	Unknown
Pet Waste Education	270.6	81.2	House	687	Varies	Unknown	Unknown
Rain Barrels	270.6	81.2	House	687	\$250	\$171,750	\$2,116
Easements	31.0	1.6	Acre	7	\$2,000	\$13,800	\$8,903
Pond Retrofit	59.2	17.8	CF	163,860	NA	\$132,518	\$7,445
Wet Pond	168.3	59.9	CF	226,077	NA	\$192,373	\$3,212
Wetland 1	96.1	31.1	CF	118,883	NA	\$132,004	\$4,244
Wetland 2	67.1	30.3	CF	111,136	NA	\$125,879	\$4,154

NPDES Annual Report, Charles County, MD

Management Practice	Treated Area (ac)	Impervious Area (ac)	Unit of Measure	No. Of Units	Unit Cost	Total Cost	Cost/ Impervious Acre
Dry Swale- Filtration	117.7	35.6	SY	13,800	\$68	\$938,400	\$26,360
Dry Swale- Infiltration	35.0	10.5	SY	4,066	\$39	\$158,574	\$15,102
Wet Swale	0.0	0.0	SY	0	\$51	\$0	
Grasspave/Infiltration	23.2	7.0	SY	342	\$83	\$28,386	\$4,055
Grasspave/Filtration	0.0	0.0	SY	0	\$146	\$0	
Filtterra Bioretention	146	44.0	Each	176	\$6,000	\$1,056,000	\$24,000
Sidewalk Bioretention	0.0	0.0	SY	0	\$194	\$0	
Median Bioretention	0.0	0.0	SY	0	\$174	\$0	
Parking Lot Bioretention	75.3	57.6	SY	18,694	\$174	\$3,252,756	\$56,471
Green Roofs	0.0	0.0	SY	0	\$135	\$0	
Stream Restoration	0.0	0.0	LF	300	\$250	\$75,000	
TOTAL	993.9	345.4				\$6,277,440	\$18,173

NOTE: Wetland 1 treats some of the same area in Carrington as a wet pond, so this area was removed from the total area treated. Similarly, education and rain barrels treat the same area, so this area was included only once in the total.

The Watershed Restoration Study was presented to the Charles County Commissioners in November 2004, and was approved for implementation. To further refine the proposed projects and the implementation schedule the County separated capital improvements projects (CIP) and outreach projects. See Part III.G. below for further information on the CIP budget.

The following prioritization list includes the three study areas with the greatest amount of impervious surface for restoration: Carrington, Pinefield, and Acton-Hamilton. In addition, Bryans Road is included as a county initiative under the Bryans Road Sub-Area Plan.

The prioritization is based on meeting the 10% restoration goal with the fewest areas of impact, which will enable the County to focus outreach, land acquisition, and management efforts, minimize time and cost of construction, and to completely address water quality in the areas of concentration.

The estimated costs and areas treated have been refined since 2004 and the following table has been updated to reflect this. The updated total areas treated have decreased significantly from original estimates.

NPDES Annual Report, Charles County, MD

Estimated Cost and Implementation Schedule for the 2004 Watershed Restoration Plan:*

	Description	Design	Construction	Area Treated (acres)
FY06-FY09	Carrington	\$126,675		
	Carrington		\$ 1,502,277	45
FY10-FY11	Bryans Road	\$64,110		
	Pinefield	\$214,490		
	Acton-Hamilton	\$96,860		
FY12-FY13	Bryans Road		\$ 1,060,000	10
	Pinefield		\$ 1,820,000	36
	Acton-Hamilton		\$ 1,951,841	18

*Updated in 2011.

2007 Watershed Restoration Study

For the 2007 study, impervious coverage was digitized from 2004 aerial photographs using Feature Analyst, a software package that uses ArcGIS and iterative methods to identify color differences associated with impervious versus open space areas. This method provided a much more accurate measurement of impervious area within the County.

Since the goal of the 2004 and 2007 studies was to provide restoration alternatives for a combined total of twenty percent of the untreated impervious area in the Development District, it was important to analyze existing untreated impervious area and impervious area within the study areas using the same methodology. Therefore, the impervious area within the seven study areas discussed in the 2004 Watershed Restoration Study were recalculated using the delineated impervious area values. The results are as follows:

Study Area Name	Total Study Area (acres)	Area Untreated (acres)	Area of Untreated Impervious Cover (acres)
Acton/Hamilton	865.40	577.43	90.07
Briarwood	51.88	51.86	9.93
Bryans Road	16.24	16.24	11.57
Carrington	1388.95	1276.45	151.66
Marbella Delight	103.64	101.95	41.02
Pinefield	687.49	686.62	165.78
Pinefield South	95.23	89.21	18.32
Total	3208.83	2799.76	488.35

The total impervious area within the Development District was approximately 4,581 acres, based on the digitized impervious boundaries. Of that amount, 2,607 acres is currently untreated. The improvement recommendations outlined in the 2004 study addressed the treatment of 402.58 acres of untreated impervious area, as recalculated with the new impervious coverage. This is approximately 15% of the total untreated area in the Development District. Meeting the 20% restoration goal would require an additional 119 acres treated.

For the 2007 Watershed Restoration Study, ten study areas were identified that contained a large percentage of untreated impervious area within an impaired stream system. To ensure that an adequate number of sites and untreated impervious acres would be selected that would be eventual candidates for restoration/retrofit design, the study areas were selected to be much larger than the 119 acre goal. The ten study areas that were ultimately selected equal 276.16 acres of untreated impervious area, as shown below.

Study Area Name	Total Study Area (acres)	Area Untreated (acres)	Area of Untreated Impervious Cover (acres)
Fox Run	33.82	33.82	9.40
Lancaster	42.90	40.84	13.06
West Lake Village	267.59	261.45	63.81
Ryon Woods	140.39	136.80	27.08
White Plains	327.97	231.04	31.21
St. Charles	1609.18	409.67	77.21
Wakefield	49.20	49.20	12.94
Bannister	28.33	28.33	6.30
Hunt Club Estates	135.61	131.55	15.39
Northwood	107.72	61.11	19.76
Total	2742.71	1383.81	276.16

These study areas include impervious area from state highways, which are subject to Maryland State Highway Administration’s (MSHA) Statewide NPDES permit and not part of the County's responsibility. As highway projects are constructed, there may be an opportunity to share funding for BMP construction, along with credit for pollutant removal from runoff subject to both MSHA and County permits.

Of the nine selected areas, three were selected for stream walks (West Lake Village, White Plains, and St. Charles). The inspection consisted of a walk-through of approximately 7,400 linear feet of perennial/ephemeral streams. The inspection included physical and habitat assessment and documentation of problem areas, including:

- Storm drain outfalls
- Stream channel lateral and vertical erosion
- Channel blockages and/or fish obstructions

- Dumping
- Failing septic or sewer systems
- Buffer impairments or encroachments
- Exposed utilities

Study Area	Type of Monitoring
Fox Run	Habitat, geomorphic assessment
Lancaster	Habitat, geomorphic assessment
West Lake Village	Biomonitoring, physical water quality, habitat, water quality grab
Ryon Woods	Geomorphic assessment
White Plains	Biomonitoring, physical water quality, habitat, water quality grab
St. Charles	Physical water quality, habitat, water quality grab, geomorphic assessment
Wakefield	Physical water quality, habitat, water quality grab
Hunt Club Estates	Habitat, geomorphic assessment
Northwood	Physical water quality, habitat, geomorphic assessment

POTENTIAL MANAGEMENT ALTERNATIVES

The improvement alternatives identified to address some of the issues described above fall into the following six categories:

- **Source Control:** Pollution prevention and non-stormwater discharge control programs
- **Land Use:** Land conservation and site design measures. Low Impact Development (LID) site planning measures are included here.
- **BMP Retrofits:** Conversion of existing quantity controls to water quality BMPs
- **Multi-site BMPs:** End-of-pipe structures, such as ponds, wetlands, and outfall treatments
- **Onsite BMPs:** Systems designed to reduce stormwater impact at the lot level. LID structural BMPs are included here.
- **Stream Restoration:** In-stream projects, such as channel stabilization or riparian buffer restoration

Several categories of restoration measures have already been put in place through the County's NPDES permit. These are municipal pollution prevention measures, some residential source controls, and reduction of non-stormwater discharges.

Currently, forty-two restoration opportunities have been identified within the study areas, which combined would treat approximately 142 untreated impervious acres. These include construction of bioretention areas, small wet ponds, water quality swales, and performing stream restoration or stabilization of failing outfalls. Site-specific discussions and concept plans are

included in the 2007 Watershed Restoration Study Report for the priority projects. Prioritization was based on the level of impairment within the receiving waters, amount of impervious drainage to the project limits, and estimated cost of the project. This Study is included with the 2007 NPDES Annual Report.

2011 Watershed Restoration Study

In January 2010 the County contracted with KCI Technologies, Inc. to prepare a third watershed restoration study for an additional 10% untreated impervious surface. It was determined that the total impervious area within the Development District, based on the 2007 data, was 5,508 acres. Of this 2,863 acres have been identified as untreated. Therefore, the restoration goal for the 2011 study was 286.3 acres, which represents 10% of the untreated impervious area.

A variety of study areas were identified for retrofit. These areas were identified based primarily on the amount of untreated area in the development draining to the sites. The study areas include impervious area from state highways, which are subject to Maryland State Highway Administration’s (MSHA’s) Statewide NPDES permit and not part of the County’s responsibility. As highway projects are constructed there may be an opportunity to share funding for BMP construction, along with credit for pollutant removal from runoff subject to both MSHA and County permits.

The potential project areas were identified in ArcGIS using the treated area polygon and aerial photography. These areas were printed on maps and compared against known proposed development to narrow down the areas most likely for retrofits. 75 individual retrofit sites were identified within the 28 study areas. The proposed impervious area to be treated was approximately 50% of the 286 acre goal. Design and construction of such a large number of sites would be prohibitively expensive. Therefore the majority of sites, with modest to minimal treatment benefits, were eliminated from consideration.

Concept plans were developed for a final list of 17 proposed projects within 9 study areas treating approximately 37 acres of impervious surface. The study estimates the average restoration cost is \$129,000 per impervious acre. See the following table for the list of projects.

Study Area	Number of Proposed Projects
Marbella Delight	3 (Dry Swales, Bioretention)
Northwood	2 (Bioretention, Filterra)
Jenifer Elementary School	1 (Shallow Marsh)
Berry Road North	2 (Bioretention, Dry Swales)
Briarwood	1 (Step Pool Stormwater Conveyance)
Leonardtwn Road	2 (Pond Retrofit, Dry Swales)
Pinefield Center	1 (Retention Pond/ Improved Drainage System)
Potomac Branch Library	1 (Bioretention)
MD-301 Commercial Corridor	4 (Bioretention, Pavement Removal)

4. *Within 30 months of the issuance of this permit, Charles County shall begin to implement restoration efforts according to the schedule outlined in PART III.F.3.f. above. Annual reports shall document:*
 - a. *The progress toward meeting the schedule identified in PART III.F.3.f. above;*
 - b. *The estimated cost and the actual expenditures for program implementation; and*
 1. *The monitoring data or surrogate parameter analyses used to determine water quality improvements.*

2011 Status

Carrington Watershed Restoration Projects

In fiscal year 2005 the County began the first three CIP watershed restoration projects in Carrington Neighborhood. Two of these are wetland habitat projects on elementary school sites and the third is a water quality feature on neighborhood association property. Success of the proposed Carrington watershed restoration projects depended on support and interest from the community and the schools.

Charles County issued a request for proposals in the Fall of 2005 to have the three Carrington projects designed. Two bids were received, and A. Morton Thomas, Inc. was selected to design and engineer the projects. Design began January 2006, and was completed in the Fall of 2006. Construction of the project was bid in November 2006 and awarded to Environmental Quality Resources, LLC in February 2007.

A ribbon-cutting event for both wetland projects was held on April 16, 2008. The event was titled, "Connecting Children to Nature – Schoolyard Habitat Celebration and Fishing Derby." This event was videotaped for running on the County's and the School's cable channels and was aired in 2008.

See permit Section III.D.3 for proposed chemical, biological and physical monitoring of the restoration projects.

Pinefield and Acton-Hamilton Watershed Restoration Projects

Request for Proposals (RFP) 08-36 for the design and engineering of these two projects was released in April 2008. The RFP was for full concept and engineering, which was determined to be too open-ended and causing inflated bid pricing. To address the inflated bid pricing, Addendum #1 was issued in May 2008, postponing bids, until the County could have 25%

design completed and remove the uncertainty in project scope. In July 2009, RFP 09-40 was released which included completed concepts. Bids were received in August 2009. Vista Design, Inc. was awarded the contract and began work November 2009. The County's permits are: Pinefield VCI #09-111 and Acton-Hamilton VCI #09-112.

Improvements in Pinefield include expanding a wet pond, adding filterrras, as well as pipe repair and outfall replacement of the pipe on Dogwood Drive that daylights behind Holly Avenue and an outfall pipe on Temi Drive.

Improvements in Acton-Hamilton were subject to re-evaluation in 2010. This included issuing change orders to (1) delete proposed bioretention facilities and replace with filterrras, (2) delete dry swales and replace with bioretention, and (3) preliminary surveying, engineering and permitting services in support of a regional stormwater concept.

Bryans Road Watershed Restoration Project

In June 2007, the County hired Johnson, Mirmiran and Thompson (JMT) to develop a preliminary design study report for the Bryans Road Town Common to incorporate stormwater management for the site. On June 11, 2008 JMT presented the final concept to the County Commissioners who agreed to take the project to the Bryans Road Improvement Committee for discussion and proceed with land acquisition and engineering. The project proposes to treat approximately 9 acres of untreated impervious surface and also serve as a Bryans Road Town Square to help revitalize the town center and increase mixed use development.

In July 2009 the engineering of the Bryans Road Town Common was awarded to Vista Design, Inc. The owner of the property did not allow soil borings during the County's acquisition process, which delayed the engineering until June 2010, when the property was acquired. The engineering is expected to be completed in late 2011.

Potomac Heights Community Watershed Restoration Project

Potomac Heights is a 126 acre site in the County's Development District along the Potomac River just north of the Town of Indian Head. The community is owned by the Potomac Heights Mutual Homeowner's Association (HOA) with no individual home lots. The community was constructed long before codes regulating stormwater were in place. The existing stormwater treatment and drainage system includes improperly placed and non-standard structures, under-sized pipes, lack of appropriate cover, flat or negligible slopes and no means for treating stormwater runoff for quality. In many areas stormwater runoff from the roadways is directed towards homes causing flooding and property damage.

The project includes road improvements, swales, pipes and stormwater facilities to address the flooding problems and water quality management for 20.5 acres of untreated impervious surface. The HOA is primarily interested in drainage improvements, however the County offered to fund any water quality improvements that could be achieved through the proposed drainage improvements.

The project was submitted to the County for permit review in August 2009 under VR #09-77. The total cost for water quality improvements is estimated at \$614,405. This is proposed to be funded through the NPDES program at an average of \$30,000 per treated acre. In early 2010 the project was submitted to MDE for funding assistance.

Bannister, Fox Run, Lancaster, Northwood, Ryan Woods and White Plains

Request for Proposals (RFP) 11-09 for design and engineering of watershed restoration projects was issued for response in January 2011. The County received 17 bids and selected Vista Design, Inc. The project consists of field and research reconnaissance of site-specific data, conceptual, preliminary, semi-final, and final design phases. Public information meetings will be held with the stakeholders of each of the six affected neighborhoods to solicit input and address concerns. The conceptual projects for each community propose to address 54.6 acres of untreated impervious area as described below.

Community	Project Type	Treated Impervious Area
Bannister	Retention Pond	6.3
Fox Run	Outfall Stabilization, Channel Restoration	9.4
Lancaster	Channel Restoration	12.5
Northwood	Retention Pond, Infiltration, Bioretention	12.3
Ryan Woods	Channel Restoration, Infiltration	4.7
White Plains	Infiltration/Shallow Wetland	9.4

Strawberry Hills Stormwater Management and Stream Improvements

In March 2011, the US Army Corps of Engineers, completed the final *Stormwater and Stream Improvement Plan for Strawberry Hills*, under the Floodplain Management Services (FPMS) Program. In April 2011 the final plan was presented to the County Commissioners. This plan was requested by the Department of Planning and Growth Management to be the first step in taking corrective action to address stream erosion and flooding issues in this neighborhood, which was constructed in the early 1970s. The objectives were to: (1) determine the locations and causes of stream instability causing property loss; (2) determine the causes of flooding and the extent and depth, and; (3) develop alternatives and an improvement plan to correct stream instability and eliminate flooding during the 10-year storm event. In July 2011, the County issued RFP 12-13 for construction of the project under permit VCI# 10-93.

Table 15: Watershed Restoration Action Plan and Progress

	Description	Design	Construction	Acres Treated	Balance
					286
FY06-FY07	Carrington	126,675			
FY08-FY09	Carrington		1,502,277	45	241
FY10-FY11	Bryans Road	64,110			
	Pinefield	214,490			
	Acton-Hamilton	96,860			
	Bannister, Fox Run, Lancaster, Northwood, Ryan Woods, White Plains	248,500			
FY12-FY13	Bryans Road		1,060,000	10	231
	Pinefield		1,820,000	36	195
	Acton-Hamilton		1,951,841	18	177
	Bannister		260,000	6.3	170.7
	Fox Run		340,000	9.4	161.3
	Lancaster		280,000	12.5	148.8
	Northwood		1,100,000	19	129.8
	Ryan Woods		230,000	4.7	125.1
	White Plains		260,000	9.4	115.7
	Acton Lane Ph 3 Pond			22	93.7
	Westlake	80,000			
	St. Charles	200,00			
	Potomac Heights		614,405	20.5	73.2
FY14-FY15	Westlake		600,000	10	63.2
	St. Charles		1,800,000	29	34.2
	Cross County Connector 5, 6, 7			3	31.2
	Future Concept 1	105,000	900,000	60	-28.8
	Future Concept 2	105,000	900,000	60	-88.8
FY16-FY17	Future Concept 3	79,000	900,000	60	-148.8
	Future Concept 4	70,000	888,000	57	-205.8

Bold indicates final number.

Table 16: Watershed Restoration Details for Carrington Projects

	Type of BMP	Drainage Area (ac.)	Impervious Area (ac.)	Impervious Area Treated (%)	Impervious Area Treated (ac.)
Gustavus Brown Elementary School Wetland VCI# 06-34	Shallow Marsh	75.5	25.33	100	25.3
Arthur Middleton Elementary School Wetland VCI #06-35	Shallow Marsh	36.4	13.1	92	12.1
Arthur Middleton Elementary School Weir VCI# 06-35	Existing Channel	60.5	18.1	24	4.5
Fillmore Road Weir VCI #06-36	Existing Channel	33.7	10.1	27.8	2.8
					44.7

Table 17: Education and Outreach Projects

Location	Description	Cost	Date Completed	Acres Treated
Carrington	Community Watershed Restoration Outreach, BayScapes, and Environmental Technical Assistance	27,520	12-Apr-08	TBD
Pinefield	Rain Barrel Distribution	TBD	TBD	TBD
Acton-Hamilton	Rain Barrel Distribution	TBD	TBD	TBD

III.G. Program Funding

Overview of Permit Conditions

1. *Annually, Charles County shall submit a fiscal analysis of the capital, operation, and maintenance expenditures necessary to comply with all conditions of this permit.*
2. *Charles County shall maintain adequate program funding to comply with all conditions of this permit.*

2011 Status

Funding Sources

Charles County continues to implement a two-pronged funding approach in order to ensure that adequate funds are available for carrying out permit program conditions.

1. **Charles County Environmental Service Fee Fund:** In 1997 the County adopted a \$2.03 increase to its existing annual environmental service fee for all improved properties county-wide, and allocated the \$2.03 to the NPDES budget. In fiscal year 2008 the Environmental Service Fee allocated to the NPDES budget was increased to \$4.00, in fiscal year 2009 it was increased to \$5.00, and in fiscal year 2010 it was increased to \$6.00. In fiscal year 2011 the fee was increased to \$8.00. In fiscal year 2012 the fee charged was not increased, however the portion allotted to NPDES was increased to \$12.00. As the number of improved properties increases annually in Charles County, the amount collected for the NPDES budget also increases.
2. **Recordation Fee:** In 1997 the County also implemented a NPDES per lot recordation fee of \$81.25 per lot, for all lots recorded in the Development District. In fiscal year 2001 the County increased this fee to \$84.50. In fiscal year 2005 the fee was increased to \$87.00, and with subsequent annual increases the fee in fiscal year 2009 and fiscal year 2010 is \$117.00. No increase occurred in fiscal year 2011 or fiscal year 2012. Due to the variation in the number of lots recorded per year this fee fluctuates annually.

Consultant expenses in fiscal year 2011 include KCI Technologies, Inc.(NPDES consultant) and the County's partnership agreement with USGS to perform water quality monitoring in the Mattawoman Creek.

KCI consulting expenses include: mapping, stream monitoring, illicit discharge inspections, BMP monitoring and pollutant load estimates. The operating budget sufficiently funded KCI's services through the one-year extensions beyond the end of the permit period. The following tables summarize program funding from fees collected, staff activities and capital improvements.

The fiscal year 2012 NPDES consulting budget was appropriated as \$306,700. Beginning in fiscal year 2011, fifty percent of one NDPEs staff salary and fringe is funded by the NPDES program.

NPDES Annual Report, Charles County, MD

Table 18: Program Funding- Fiscal Years 2003 through 2011

	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11
Budget:	111,600	156,200	153,000	163,000	151,100	160,600	163,800	184,500	184,500
Revenue:									
Collected ESF	81,643	83,521	85,277	70,802	88,989	181,787	230,212	278,528	375,789
Collected RF	39,727	76,657	80,102	86,906	84,748	54,246	33,705	35,928	80,847
Carryover Balance	114,217	104,918	115,915	157,543	155,765	153,932	171,255	130,341	81,627
Total	235,578	265,095	281,294	321,715	329,502	389,965	435,172	444,797	538,263
Expenditures:									
Salary & Fringe	0	0	0	0	0	0	0	0	49,525
KCI	103,994	86,618	72,691	81,302	85,639	40,853	112,595	89,926	42,156
USGS	26,454	62,079	47,500	73,235	64,090	68,393	71,603	90,389	117,527
County	221	00	00	00	177	00	00	00	7,500
Bond Service	00	484	3,559	4,949	25,666	109,463	120,633	182,855	217,865
Balance:	104,918	115,915	157,543	155,765	153,932	171,255	130,341	81,627	103,656

ESF-Environmental Service Fee, RF-Recordation Fee

Table 19: Charles County Planning Division Staff Hours

	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11
NPDES Activities	27,620	31,187	19,042	16,388	24,329	20,785	26,720	66,178
Tributary Teams	3,668	3,444	4,558	2,097	3,510	5,744	1,955	2,739
Watershed Plan Implementation:								
Mattawoman Creek			6,236	19,748	24,523	14,447	11,740	771
Port Tobacco River			6,768	12,052	3,734	8,820	2,385	329
Bay Restoration Fund				2,328	1,141			
Total	31,288	34,631	36,604	52,613	57,237	49,796	42,800	70,017

Planning Division staff hours shown in the table above show an increase in fiscal year 2011 due to additional time and activities necessary for renewal of the County's NPDES MS4 permit.

Funding necessary to implement the Watershed Restoration requirement of the permit is provided through the County's Capital Improvements Program (CIP) budget. This funding was originally approved to begin in FY 2003 at the rate of \$200,000 per year for a five year period totaling \$1 million, and was to cover permit retrofit requirements of the County's first NPDES MS4 permit. Shortly after this approval, the County was issued a new NPDES MS4 permit which increased the retrofit requirements and identified the requirements as Watershed Restoration.

In November 2004 the County Commissioners reviewed and supported the Charles County Watershed Restoration Study and the projects needed to meet the new permit requirements. Subsequently, the County Commissioners increased the fiscal year 2006 - 2011 CIP budget to \$7.69 and the fiscal year 2010 – 2014 budget to \$12.04 million to implement the proposed projects.

In February 2004 the County began issuing bonds for the Capital Improvements (CIP) budget. In March 2007 construction was initiated on the County's first watershed restoration projects, which is reflected by the increased expenditures shown in the table below.

In fiscal year 2011 the County funded a \$25,000 watershed restoration study from the NPDES CIP fund. This study is to identify additional watershed restoration projects for construction.

A service fee associated with the bonds needed for this funding was paid fiscal year 2004 through fiscal year 2011 from the NPDES operating budget. See Appendix J for approved capital budgets.

Table 20: NPDES Capital Improvements Program Expenditures

	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	TOTAL
Bonds Issued	40,000	0	100,000	1,000,000	400,000	471,800	500,000	1,400,000	3,911,800
Bonds Expended	40,000	0	100,000	1,000,000	400,000	471,800	373,891	509,890	2,954,718

Table 21: Fiscal Year 2011 Capital Improvement Program for NPDES Retrofits

	Budget	Spent
Carrington	1,867,230	1,867,219
Pinefield	439,760	393,687
Acton/Hamilton	221,860	154,888
Bryans Road	551,800	474,811
Fox Run	85,910	0
Lancaster	46,060	0
Northwood	49,510	0
Ryon Woods	50,560	0
White Plains	42,760	0
NPDES Study	24,740	24,738
TBD	8,029,810	65,548
	11,410,000	2,980,890

Table 22: Capital Improvements Program Appropriation per Year

FY03	214,000	FY 08	1,452,000
FY 04	220,000	FY 09	2,127,000
FY 05	224,000	FY 10	2,409,000
FY 06	72,000	FY11	2,409,000
FY 07	778,000	FY12	1,505,000

III.H. Assessment of Controls

Overview of Permit Conditions

- 1. Annually, Charles County shall submit estimates of expected pollutant load reductions as a result of its proposed management programs.*

2011 Status

One key component of Charles County's pollution reduction program is the identification of current pollution loads. This enables the County to identify current trends in water quality within receiving waters and evaluate the success of the overall NPDES MS4 program. The pollutant loading estimate is prepared annually and is determined based on two factors: loads produced from current land uses within the County and reductions from existing stormwater controls.

Pollutant Loads

The pollutant loading rates were updated from the 2010 calculations based off of several methods and sources. Loading rates for residential and institutional land uses continued to be based off of chemical monitoring results from the Arthur Middleton Elementary School sampling stations. Loading rates for total nitrogen, total phosphorus, and total suspended solids were taken from Chesapeake Bay Program literature in lbs/acre/year, for all other land use categories, except "extractive" and "agricultural buildings", which were developed from the PLOAD manual. Loading rates for biological oxygen demand and lead for commercial, industrial, and transportation land uses were unchanged from 2010, and were taken from the Maryland Department of the Environment's published monitoring results from 1997. Loading rates for the remaining constituents were taken from the National Stormwater Quality Database (2004).

Loading rates for residential and institutional land uses were calculated from sampling event mean concentrations (EMCs) using the Simple Method, which integrates drainage areas, land use, pollutant concentrations, and types of BMPs to determine annual loading and load reductions for each watershed or drainage area. It uses the following parameters:

- Rainfall, P, is the average long-term annual rainfall amount of 39 inches
- Land use coverage for the 2011 estimate was determined from the 2007 Maryland Department of Planning coverage
- Drainage area, A, is based on the coverage of each land use coverage within the County boundary
- Event mean concentrations (EMCs)

Pollutant loads are calculated using A, R_v, and the pollutant concentration, C, which is the Event Mean Concentration (EMC) for a particular pollutant. Because removal efficiencies for nitrogen removal are only reported for TN, the loads have been reported similarly, using the relationship TN = TKN + NO_x. EMCs are shown in Table 23.

The expected pollutant load computations use chemical monitoring data developed by Charles County as part of the monitoring component of the NPDES MS4 permit. The watershed currently being chemically monitored consists primarily of residential and institutional drainage. Therefore, the event mean concentrations (EMCs) developed as part of the monitoring program are used as pollutant loading rates for the residential and institutional land uses throughout the County.

Table 23: EMC Data (mg/l)

Land Use	LU Code	TN	TKN	NO ₃ +NO ₂	TP	TSS	BOD	Cu	Zn	Pb
Low Density Residential	11	4.21	2.46	1.75	0.42	79.26	25.6	0.02	0.12	0.02
Medium Density Res'l	12	4.21	2.46	1.75	0.42	79.26	25.6	0.02	0.12	0.02
High Density Residential	13	4.21	2.46	1.75	0.42	79.26	25.6	0.02	0.12	0.02
Institutional	16	4.21	2.46	1.75	0.42	79.26	25.6	0.02	0.12	0.02

Spreadsheets showing the pollutant load results are attached as Appendix K and a summary is shown in Table 24.

Table 24: Estimates of Pollutant Loading (lb/yr)

	TN	TP	TSS	BOD	Cu	Zn	Pb
Entire County FY 2011***	2,708,902	1,817,089	22,707	1,817,089	2,639	31,151	3,731
Entire County FY 2010**	487,937	73,413	11,712,911	2,115,516	1,705	15,278	2,204
Entire County FY 2009	427,474	71,437	10,344,933	1,770,138	1,395	12,718	1,821
Entire County FY 2008*	429,412	72,216	10,694,197	1,876,824	1,396	11,437	1,206
Entire County FY 2007	429,412	72,216	10,694,197	1,876,824	1,396	11,437	1,206
Entire County FY 2006	429,205	72,376	11,009,554	1,954,360	1,401	11,414	884
Entire County FY 2005	423,309	72,137	10,893,776	2,061,298	1,338	11,233	908
Entire County FY 2004	398,653	72,963	10,159,796	853,772	1,161	10,769	1,001

*Pollutant loads unchanged from previous reporting year due to no chemical monitoring being performed, and land use data input being unchanged.

**Updated 2007 land use data, generated by the Maryland Department of Planning, was used in FY10 and subsequent years.

***Significant changes to loads result from updates to loading rates in FY11.

As can be seen from Table 24 above, the pollutant loads have increased significantly from the 2010 results. This is a result of the updated loading rates that were used in the model. The pollutant load calculations will continue to be updated as land use information is updated.

The loads presented in this Annual Report are those that occur in the storm runoff itself. No attempt was made to estimate pollutants from baseflow or stream erosion outside of what was taken into account by developing the rates. Similarly, the load reductions were not estimated for the volume of runoff which flows to natural wetlands. Wetlands would effectively reduce the pollutants to receiving waters, particularly the Potomac River and the Chesapeake Bay.

Pollutant Load Reductions

Pollutant load reductions resulting from installation of best management practices (BMPs) were calculated by applying the loading rate discussed above to the drainage area to the facility, and multiplying by the pollutant removal efficiency. The pollutant removal efficiencies were developed for BMPs in each category contained in the draft MS4 permits, including: dry detention ponds, hydrodynamic structures, dry extended detention ponds, wet ponds and wetlands, infiltration practices, filtering practices, vegetated open channels, and erosion and sediment control practices.

The pollutant removal efficiencies for each of these categories was taken from the recent MDE publication *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated: Guidance for National Pollutant Discharge Elimination System Stormwater Permits, June 2011* for total nitrogen, total phosphorus, and total suspended solids. Pollutant removal efficiencies for other contaminants were developed from the Center for Watershed Protection (2000) or the International Stormwater BMP Database (2008). Pollutant removal efficiencies used for each BMP category are included in the spreadsheet computations in Appendix K.

The BMPs used for the reduction modeling were taken from Charles County's Urban BMP Database. There were 1,183 BMPs recorded in the database, an increase of 102 facilities over what was used in the calculations in 2010. Not all of the BMPs contained in the database had enough information to be included in the model, such as land use, drainage area, and BMP type. The County is continually refining its data, and as such, the pollutant load reduction computations are improved as more data is available.

Pollutant load reductions were summed for each BMP that had the required data. The total reductions for each contaminant are provided in Appendix K and summarized in Table 25 below.

NPDES Annual Report, Charles County, MD

Table 25: County-Wide Pollutant Loading Reductions (Lb/Yr)

		TN	TP	TSS	BOD	Cu	Zn	Pb
		lbs/yr	lbs/yr	tons/yr	lbs/yr	lbs/yr	lbs/yr	lbs/yr
FY 2011	Total Load	2,708,902	284,403	22,707	1,817,089	2,639	31,151	3,731
	Reductions	9,014	2,508	590	0.00	76	814	150
	Percent Reduced	0.3%	0.9%	2.6%	0.0%	2.9%	2.6%	4.0%
FY 2010	Total Load	487,937	73,413	11,712,911	2,115,516	1,705	15,278	2,204
	Reductions	19,881	2,594	1,096,399	0	154	1,598	0
	Percent Reduced	4.1%	3.5%	9.4%	0.0%	9.0%	10.5%	0.0%
FY 2009	Total Load	427,474	71,437	10,344,933	1,770,138	1,395	12,718	1,821
	Reductions	17,982	2,475	992,584	0	152	1,516	0
	Percent Reduced	4.2%	3.5%	9.6%	0.0%	10.9%	11.9%	0.0%
FY 2008	Total Load	429,412	72,216	10,694,197	1,876,824	1,396	11,437	1,206
	Reductions	18,479	2,543	1,039,673	0	151	1,413	0
	Percent Reduced	4.3%	3.5%	9.7%	0.0%	10.8%	12.4%	0.0%
FY 2007	Total Load	429,412	72,216	10,694,197	1,876,824	1,396	11,437	1,206
	Reductions	17,009	2,384	967,809	0	145	1,352	0
	Percent Reduced	4.0%	3.3%	9.0%	0.0%	10.4%	11.8%	0.0%
FY 2006	Total Load	429,205	72,376	11,009,554	1,954,360	1,401	11,414	884
	Reductions	14,286	1,946	817,645	0	126	1,189	0
	Percent Reduced	3.3%	2.7%	7.4%	0.0%	9.0%	10.4%	0.0%
FY 2005	Total Load	423,309	72,137	10,893,776	2,061,298	1,338	11,233	908
	Reductions	3,438	579	190,951	113	20	207	0
	Percent Reduced	0.8%	0.8%	1.8%	0.0%	1.5%	1.8%	0.0%
FY 2004	Total Load	436,758	77,826	10,477,051	1,019,049	1,187	11,290	929
	Reductions	1,682	314	97,703	54	11	114	0
	Percent Reduced	0.4%	0.4%	1.0%	0.0%	1.0%	1.1%	0.0%

Surrogate Parameters

Charles County has developed a surrogate parameters table to assist in evaluating its Management Programs. Table 26 below contains parameters that represent NPDES Management Program goals. These parameters are documented on a county-wide basis.

Table 26: Surrogate Parameters

Parameter	2003 Total	2004 Total	2005 Total	2006 Total	2007 Total	2008 Total	2009 Total	2010 Total
Litter collected in tons and lane miles	228 4,084	379 4,554	441 4,295	432 6,356	440 6,016	357 6,619	371 5,049	282 1,382
Household hazardous waste collected and recycled (tons)	31	37	32	31	31	40	45	53
Used oil collected and recycled (gal)	54,418	55,916	50,426	53,972	48,908	47,361	44,325	45,625
Antifreeze collected and recycled (gal)	2,565	3,750	2,865	2,815	2,680	2,130	3,005	22,655
Yard waste collected and composted into mulch (tons)	10,023	10,653	8,475	11,304	12,492	16,249	11,874	11,094
Mulch distributed(tons)	6,100	6,400	6,500	7,000	8,157	unknown	unknown	unknown
Tire Amnesty Day (tons)	no event	75	no event	62	63	no event	62	no event
Electronic Recycling (tons) Permanent program began July 1, 2006.	17	14	no event	83 (July-Dec)	169	193	122	209
Adopt a Road Program (groups and miles)	95 117	100 125	95 120	100 130	105 135	105 135	100 130	95 125
# of compost bins sold	1,009	927	655	435	no event	no event	no event	no event
Potomac River Clean- up (tons and volunteers)	36 479	70 626	79 830	81 1,085	104 830	41 636	78 2,280	52 964
# of County staff licensed for pesticide/herbicide application	5 (Roads Div)	6 (Roads Div)	6 (Roads Div)	3 (Roads Div)	(Roads Div)	(Roads Div)	(Roads Div)	(Roads Div)
# of talks, presentations (MD Extension Office & Environmental Resources Div.	15+	15+	25+	35+	50+	50+	50+	50+

IV. Special Programmatic Conditions

Overview of Permit Conditions

...this NPDES permit requires Charles County to assist with the implementation of the strategy designed to meet the nutrient reduction goals of the Lower Potomac River basin. Coordination between and among other jurisdictions is a major requirements and the identification of those appropriate jurisdictions will occur jointly with MDE. Additionally, deadlines, priorities, and scheduling to satisfy specific conditions will be determined in conjunction with MDE. In any case, progress toward meeting these conditions shall be reported to MDE.

2010 Status

Tributary Strategy Teams

The County continues to participate monthly on both the Lower Potomac Tributary Team and the Patuxent River Commission.

The Lower Potomac Tributary Team did not meet regularly this year, due to changing their focus. The Patuxent River Commission (PRC) activities included a daylong Watershed Implementation Plan Phase II (WIP II) Workshop on November 8, 2010 for the watershed jurisdictions, the twenty-fourth annual wade-in at Jefferson Patterson Park June 2010, and holding a forum on June 8, 2011, in which the WIP II Team Leaders within the watershed shared their progress and ideas.

NPDES Permitted Jurisdiction Meetings

The Maryland Department of the Environment hosts quarterly meetings for the NPDES permitted jurisdictions to provide a network for communication that solves permit issues. Meetings were not held from fiscal year 2006 through fiscal year 2010. In fiscal year 2011 a monthly meeting schedule resumed in preparation for the Department's guidance document titled, "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated." The draft was circulated in June 2011.

State Water Quality Advisory Committee

The County continues to maintain membership on this committee and the renamed Watershed Restoration subcommittee (previously called the Stream and Wetland Subcommittee). The committee continued to focus on the Chesapeake Bay TMDL, water appropriation, Plan Maryland, acid mine reclamation and Marcellus shale drilling, among other issues.

US Army Corps of Engineers 2003 Mattawoman Creek Watershed Management Plan

A partnership agreement between the County and the U.S. Army Corps of Engineers was signed in 1998 to calibrate a computer model that would evaluate several “what-if” scenarios analyzing management options to reduce nitrogen, phosphorus, and sediment to the Mattawoman Creek.

In February 2004 the U.S. Army Corps of Engineers presented the Plan to the County Commissioners. Three recommendations were included in the plan: (1) Stream Valley Protection; (2) Best Management Practices for Future Development; and (3) Best Management Practices for Existing Development. In summary the Plan states, “planned development in the Mattawoman Creek watershed should include local and regional efforts for the purpose of creating an economically developed and environmentally protected area. Balancing these seemingly opposing measures was considered when developing the management scenarios.”

The Planning Division received a Coastal Community Initiative (CCI) Grant through the Maryland Department of Natural Resources to draft ordinance amendments to implement best management practices for future development. Bill 2008-1 addresses reduced parking, use of pervious parking, conservation landscaping and increased shading over parking areas, and became effective May 17, 2008. In 2008, 2009 and 2010 County staff continued to work on draft zoning text to implement the refined Mattawoman Creek Stream Valley delineation prepared by the Maryland Department of Natural Resources under a Coastal Community Initiative (CCI) Grant.

Port Tobacco River Watershed Restoration Action Strategy Grant

The Charles County Commissioners applied for a Port Tobacco River Watershed Restoration Action Strategy (WRAS) Grant through the Maryland Department of the Environment (MDE), which was approved in the Fall of 2004 and continued through 2006. The main focus of the WRAS is to identify and prioritize water quality improvement opportunities to meet the Port Tobacco River Watershed nutrient TMDL and reduce bacteria levels to ranges that are safe for recreational uses in the River.

In the first year of the WRAS grant, the State agencies provided water quality analysis, a stream corridor assessment, a biological stream survey and a watershed characterization report.

Stakeholders which participated on the WRAS Steering Committee, include the Town of LaPlata, the College of Southern Maryland, the Charles County Chamber of Commerce, the Port Tobacco River Conservancy, the Charles County Health Department, the Charles Soil Conservation District, the Maryland Extension Service, and the Southern Maryland Resource Conservation and Development Office.

On June 20, 2006 the County Commissioners adopted the WRAS for implementation. In August 2008, the La Plata Town Council adopted the WRAS for implementation. The full WRAS can be found on the County's website at:

<http://www.charlescounty.org/pgm/planning/plans/environmental/wras>

To implement the WRAS, Charles County has been working under four grants/partnerships. These include: (1) The Bay Restoration Fund to install nitrogen removal septic tanks targeted in the watershed FY2007-present; (2) DNR Coastal Communities Initiative grant to develop a commercial component to the County's existing residential transfer of development rights program in FY2009; (3) National Fish and Wildlife Chesapeake Small Watershed grant to revise the County's stormwater management code and to better implement best management practices on new development in FY2008-FY2010; and (4) USGS partnership agreement titled, "Surface-Water and Pore-Water Sampling in Port Tobacco River Watershed, Charles County, MD," for the purpose of better identifying the contaminant source using wastewater compounds in FY2009. The USGS abstract for this project and Open File Report are on <http://pubs.usgs.gov/of/2010/1071/>.

In August 2008, Charles County Government partnered with the Town of La Plata, the Charles Soil Conservation District and the Port Tobacco River Conservancy to apply for a \$3.7 million Local Implementation Grant (LIG) through the Maryland Department of Natural Resources. This proposal is to restore water quality in the La Plata Subwatershed using stormwater retrofits, septic connections, stream restoration, and agricultural best management practices. The project was not awarded funding.

The fiscal year 2012 County approved CIP projects include projects from the Port Tobacco River Watershed Restoration Action Strategy. These include: (1) Upper Port Tobacco River Watershed Sewer Connection Study to be funded in FY2014 from the Sewer Connection Fee; and (2) La Plata Subwatershed Restoration in FY2013 with funding from the Environmental Service Fee. See Appendix J for the approved budgets.

Mattawoman Creek Monitoring Station

In July 2010, the County began the eighth year of a water quality monitoring project for the Mattawoman Creek with the U.S. Geological Survey. This project funds an existing monitoring station previously funded by the Maryland Department of the Environment. The purpose of this station is to develop a long term record of water quality data for determining trends in the watershed. The station is part of the Chesapeake Bay Programs' Long Term Status and Trends Network. An advantage of this station is that USGS posts the data on their website for public access: <http://md.waterdata.usgs.gov>

In FY2011 the USGS prepared a draft Scientific Investigations Report (SIR) to document the ten years of data.

Bay Restoration Fund Grant

In 2008 the County completed installation of the first 32 nitrogen-reducing septic system technology under the \$604,000 grant from Maryland Department of the Environment, received in December 2006. In July 2009 The Charles County Department of Health received an additional grant of \$900,000 from MDE to install an additional 65 nitrogen reducing units, of which 23 have been installed prior to May 2010. As of May 2011, a total of 91 nitrogen units are installed.

Water Resources Element and Priority Preservation Areas Element

Charles County began work on these Comprehensive Plan elements, with the assistance of a consultant, Environmental Resources Management, Inc. A draft of the Water Resources Element was completed early in 2009. The draft Priority Preservation Areas element was completed in early 2010 and includes a strategy for protecting the identified preservation areas, as required to maintain State agricultural preservation funding. Both elements began the public adoption process in the Fall/Winter of 2010.

The Water Resources Element was adopted by the Charles County Commissioners on May 24, 2011. It is an amendment to the 2006 Charles County Comprehensive Plan. The full plan may be viewed on-line at:

<http://www.charlescounty.org/webdocs/pgm/publications/resourceinfrastructure/wre2006.pdf>

The Priority Preservation Element background information is posted on-line at:

http://www.charlescounty.org/webdocs/pgm/spec_interest/priority%20preservation%20area%20-%20background%20information.pdf

Environmental Site Design

The County pursued adoption of Environmental Site Design (ESD) Regulations beginning with a public kick-off meeting in January 2009 held at the Government Building and as described in the 2009 NPDES Annual Report. Subsequent ESD training workshops were held in February 2010.

The public adoption process for ESD began with a County Commissioner briefing on January 26, 2010, the public hearing was held on February 9, 2010, at which time the project was put on hold until the State adopted new grandfathering provisions. On May 11, 2010 an additional County Commissioner worksession was held, followed by a public hearing on June 15, 2010. The County Commissioners voted on July 13, 2010, approving the ordinance with an effective date of August 1, 2010.

Watershed Resources Registry

The Watershed Resources Registry (WRR) is a tool developed as part of a collaborative effort between Maryland state agencies (MDE, DNR, MDE, SHA) and federal agencies (EPA, Fish and Wildlife Service, Army Corps of Engineers, National Marine Fisheries Service, Natural Resources Conservation Service, Federal Highway Administration). The goal in developing the WRR is to identify suitable sites that meet multiple agency priorities and sites that meet multiple environmental goals (i.e. habitat protection and stormwater management). The development of the WRR signals a shift from issuing permits that limit impacts, to proactive preservation and restoration of our most valuable and threatened natural resources. It also serves as a publicly accessible tool in map format that shares the same data between permit applicants and the agency evaluating the application. Currently, the tool has been expanded from Prince George's and Charles County to the entire state of Maryland. The WRR is web-based and can be accessed at: <http://watershedresourcesregistry.com/Default.aspx>

Phase II Watershed Implementation Plan

In February 2011, the Maryland state agencies held a Lower Western Shore Maryland Phase II Watershed Implementation Plan (WIP II) Workshop. At this meeting the State designated liaison for the Charles County WIP II met with County representatives and a Team Leader for each County was identified.

March 8, 2011, Dr. Rich Eskin, Maryland Department of the Environment, presented the background and process for the Phase II Watershed Implementation Plan to the Charles County Commissioners. The Charles County Commissioners supported staff in proceeding with an open meeting process to develop the County's Phase II WIP. The meetings to discuss the WIP began in March and have continued monthly. The meeting agendas, handouts and related links at: <http://www.charlescounty.org/apps/workgroups/publicview/listGroupOptions.jsp?groupCode=312>
A copy of the webpage is included in Appendix L.

Additional County Activities Related to Water Quality Improvement Coordination. Related notices and articles are included in Appendix L.

- The County's Department of Planning and Growth Management issued notices advising the development community of adopted Stormwater Management changes. These include two notices on July 30, 2010: (1) Notice on the Adoption of the Stormwater Management and Storm Drainage Ordinances and includes Procedures for Requesting an Administrative Waiver; and (2) Procedures for Submission of Concept Stormwater Management and Site Stormwater Management Plans.
- The County's Department of Planning and Growth Management held four Continuing Education seminars related to the Municipal Separate Storm Sewer System: August 5, 2010 New Stormwater Management and Storm Drain Requirements; January 20, 2011 3-Step Stormwater Management Review Process, Administrative Waivers and Discussion of Environmental Site Design (ESD); March 31, 2011 Sediment and Erosion Control – Construction and Inspection Sequence; and June 23, 2011 Stormwater Management Maintenance and Homeowner's Responsibilities.
- Charles County Technology Center held its 3rd Annual Going Green Tech Night.
- Turf management workshops for homeowners titled, *Secrets of a Green Lawn*, were held on September 8, 2010 and March 21, 2011. These are sponsored by the University of Maryland Cooperative Extension, Charles County Government and MRW Lawns, Inc. The seminar topics include setting expectations for home turf, calculating the correct fertilizer rates, controlling pests and weeds, and the impacts downstream of lawn care practices.
- Charles County Department of Public Facilities continued to hold Hazardous Waste days on the first Saturday of each month April through December.
- In January 2011, the College of Southern Maryland was one of four Maryland community colleges selected to receive federal grant funds to provide tuition-free courses in environmental technology. The Chesapeake Area Consortium for Higher Education (CACHE) Institute for Environmental Careers has approved curriculum for environmental technology courses that will qualify for a letter of recognition or certificate through CSM for qualified students through fall 2012.
- On February 3, 2011, in preparation for the Phase II Watershed Implementation Plan for the Chesapeake Bay Total Maximum Daily Load, Charles County Department of Planning and Growth Management staff participated in the Lower Western Shore Maryland Phase II

Watershed Implementation Plan Workshop. The second half of the workshop was a breakout by County, at which time each County met with their State designated liason for the process.

- In March 2011 the Mattawoman Water Reclamation Facility experienced a severe rainstorm causing a controlled overflow into a nearby stream.
- March 15, 2011, Governor O'Malley announced Crain Memorial Welcome Center to Receive Clean Energy Funding. Charles County will receive \$50,000 towards installation of a 20-kilowatt wind energy generating system at the county-operated Crain Memorial Welcome Center on US 301.
- In April 2011, the Maryland Department of Planning released the draft PlanMaryland document, which is a statewide plan for future growth.
- In April 2011, the Cooperative Oxford Laboratory Coastal Ecosystem Assessment Program began the second year of water quality monitoring in Nanjemoy Creek for their project: *Assessing the Relationship Between Land Use and Coastal Ecosystem Health in Chesapeake Bay*.
- On April 14, Charles County hosted its first Green Symposium to highlight best practices for sustainable businesses at the College of Southern Maryland. The key speaker was former Governor Glendening, who highlighted Smart Growth and the relationship to the development community.
- On April 9, 2011 the 23rd Annual Potomac River Watershed Clean-up was held from 8 a.m. to noon. In the 2010 clean up, 52 tons of trash and debris were collected by volunteers in Charles County.
- In May 2011, the Maryland Association for Environmental and Outdoor Education Maryland Green School Awards Program named Dr. James Craik and Indian Head elementary schools as Maryland Green Schools. These schools join 11 other Charles County Green Schools.
- May 2011 on Wetlands Day at Arthur Middleton Elementary School, children dig in the dirt.
- June 14, 2011, the Charles County Government Building campus was certified for Bay-Wise landscape practices by the Charles County Master Gardeners.
- June 15, 2011 the "Going Green: What Does It Mean?" Student Video Contest winners were announced and included an elementary, middle school and high school winner.

- Charles County Government held its second annual Green Expo on June 18, 2011 at the North Point High School located in Waldorf, Maryland.
- The approved FY12 Capital Improvement Program includes a new project titled, County Drainage Systems Improvement Program. The purpose of the funding is to provide drainage improvements at various locations that have been recorded as experiencing serious drainage problems. A follow up study is being conducted by the US Army Corps of Engineers for which the County contributed \$104,000 that represented 40% of the cost for the study on Pinefield, Haley Estates, Strawberry Hills, and Acton Village Phase II. A copy of the budget is included in Appendix J.